航空学报 » 2009, Vol. 30 » Issue (8) :1392-1397 DOI:

基于失效物理的动量轮贝叶斯可靠性评估

刘强[1,2]，黄秀平[1]，周经伦[1]，金光[1]，孙权[1]

1.国防科学技术大学 信息系统与管理学院 2.麦吉尔大学 计算机科学学院

Failure-physics-analysis-based Method of Bayesian Reliability Estimation for Momentum Wheel

Liu Qiang[1,2], Huang Xiuping[1], Zhou Jinglun[1], Jin Guang[1], Sun Quan[1]

1.College of Information System and Management, National University of Defense Technology 2.School of Computer Science, McGill University

摘要 参考文献 相关文章

Download: PDF (692KB) HTML 0KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 作为卫星姿态控制系统关键部件的动量轮，其可靠性关系到卫星发射的成败。但是由于有小子样、高可靠性和长寿命等特点，受技术、费用和时间等条件的限制，无法获得大样本失效寿命数据，因此利用传统的大样本寿命数据统计推断方法进行可靠性建模、分析与评估存在困难。为此，从失效物理分析的角度出发建立性能退化模型，用贝叶斯方法融合性能退化模型和寿命模型得到产品的可靠性评估模型，并基于该模型充分利用失效物理试验中的性能数据和少量的寿命数据来进行可靠性评估。实例分析表明，该方法与伪寿命方法相比更加符合工程实际，评估精度更高。

关键词： 贝叶斯方法 失效物理 小子样 动量轮 性能退化 可靠性

Abstract： The momentum wheel is one of the most important electromechanical components of a satellite pose control system, and its reliability estimation is a key issue in satellite launch. Limited by technology, cost, and time etc., it is very difficult to model, analyze, and estimate the reliability of a momentum wheel by means of traditional methods, since momentum wheels are characterized by small sample size, high reliability requirements, and long life, and it is hard to get large samples of failure life data in a short time. In view of the problem, this article first establishes a performance degradation model based on failure physics, and then integrates the performance degradation and life models to obtain a reliability model, and uses the performance data and scanty life data to estimate the reliability based on the new model. The instance analysis proves that the failure-physics-analysis-based method of Bayesian reliability estimation for the momentum wheel is more effective and consistent with engineering facts than the fake life-based method.

Keywords： Bayesian method failure physics small sample momentum wheel performance degradation reliability

Received 2008-06-06; published 2009-08-25

Corresponding Authors: 刘强

引用本文:

刘强;黄秀平;周经伦;金光;孙权. 基于失效物理的动量轮贝叶斯可靠性评估[J]. 航空学报, 2009, 30(8): 1392-1397.

Liu Qiang;Huang Xiuping;Zhou Jinglun;Jin Guang;Sun Quan. Failure-physics-analysis-based Method of Bayesian Reliability Estimation for Momentum Wheel [J]. Acta Aeronautica et Astronautica Sinica, 2009, 30(8): 1392-1397.

Service

把本文推荐给朋友

加入我的书架

加入引用管理器

Email Alert

RSS

作者相关文章

刘强

黄秀平

周经伦

金光

孙权