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机载设备吊舱环境控制系统设计及参数优化

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DESIGN AND PARAMETER OPTIMIZATION FOR ENVIRONMENTAL CONTROL SYSTEM OF AIRCRAFT AVIONICS PODS

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摘要

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摘要 介绍了国外机载设备吊舱环境控制系统技术发展的状况,提出了一种新的吊舱环境控制系统方案,结合该系统的研制,分析了吊舱环境控制系统的设计难点并阐述了解决问题的措施。在此基础上建立了4种吊舱环境控制系统优化设计的数学模型,并对其优化方法进行了探讨,采用正弦法结合单纯形加速法,对系统方案及参数选择进行了寻优,并对结果进行了比较分析

关键词: 飞机-吊舱 环境控制 系统 最优设计

Abstract: The latest developments of the technology of the environmental control system (ECS) for avionics pods were presented. A new ECS scheme was raised which operated on a reverse bootstrap air cycle with a regenerative heat exchanger. The design difficulties of the pod ECS were analyzed and the keys to the design of the low Reynolds number flow turbine-compressor unit and high total pressure recovery air-inlet were described. The method for pod ECS optimization was also approached, which included establishment of mathematical model, determination of objective function and constraints, and selection of optimization technique. Four types of ECS presently used in military aircraft pods were considered. The sine method combined with simplex method was applied to seek optimal technologic scheme and parameters for these systems. Finally the contrasts and analyses of the results of the system scheme and parameter optimization were made. The results showed that the new pod ECS had less fuel penalty and higher Coefficient of Performance (COP).

Keywords: aircraft-pod environmental control system optimum design

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