



航空学报 » 2012, Vol. » Issue (6) :1030-1035 DOI:

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基于集总虚拟湿源的民机客舱湿度预测

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Moisture Prediction for Aircraft Cabin Based on Lumped Virtual Moisture Source

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摘要

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摘要 热湿环境是影响国内及国际航线民机客舱舒适性的主要因素,准确获得客舱热湿动态变化特性,对于飞机客舱舒适性研究具有重要意义。从现役国内及国际航线民机热湿环境现状测试分析入手,引入集总虚拟湿源(LVMS)项,建立客舱湿度预测模型,并利用跟机测试数据辨识得到相关机型的模型参数,使用该模型来提高涵盖飞行包线的湿度预测精度。该集总虚拟湿源项能使用简单的集总方程整体地反映所有内饰材料湿气吸收和脱附过程。研究结果表明:提出的湿度预测方法与实测数据吻合较好,能够反应不同机型不同飞行剖面下的客舱湿度变化特性,可为未来我国民机客舱热湿控制系统的设计与控制策略的制定提供依据。

关键词: 民机客舱 热舒适 湿度预测 集总虚拟湿源 参数辨识

Abstract: Thermal and moisture conditions are the main environmental factors affecting cabin comfort for domestic and international routes. Therefore, it is important to study and obtain these dynamical change characteristics during a cruise time. Based on the measurement and analytical results for domestic and international flights, a prediction method of moisture is discussed to predict its changing trend accurately. This method introduces a lumped virtual moisture source (LVMS) term into the moisture transport model in order to improve the prediction accuracy of moisture during a cruise flight and its parameters are identified by using the measured data. The LVMS term reflects the absorption-desorption processes of all interiors materials integrally with a simple lumped equation. The research result shows that the prediction method of humidity could agree well with the measured data and reflect the flight characteristics of different types of aircraft and different flight profiles. This work could provide some reference for the design and control of the thermal and humidity environment in the civil aircraft cabin.

Keywords: aircraft cabin thermal comfort moisture prediction lumped virtual moisture source parameter identification

Received 2011-08-05;

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引用本文:

庞丽萍, 巩萌萌, 曲洪权, 张鹤林, 王浚. 基于集总虚拟湿源的民机客舱湿度预测[J]. 航空学报, 2012, (6): 1030-1035.

PANG Liping, GONG Mengmeng, QU Hongquan, ZHANG Helin, WANG Jun. Moisture Prediction for Aircraft Cabin Based on Lumped Virtual Moisture Source[J]. Acta Aeronautica et Astronautica Sinica, 2012, (6): 1030-1035.

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