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可应用于民机空气动力设计中的数值优化方法

Sergey PEIGIN¹, 朱自强², Boris EPSTEIN³

1. Optimenga LTD, Tel-Aviv 71720, Israel;
2. 北京航空航天大学 航空科学与工程学院, 北京 100191;
3. Academic College of Tel-Aviv Yaffo, Tel-Aviv 64044, Israel

Applicable Numerical Optimization Methods for Aerodynamic Design of Civil Aircraft

Sergey PEIGIN¹, ZHU Ziqiang², Boris EPSTEIN³

1. Optimenga LTD, Tel-Aviv 71720, Israel;
2. School of Aeronautic Science and Engineering, Beihang University, Beijing 100191, China;
3. Academic College of Tel-Aviv Yaffo, Tel-Aviv 64044, Israel

摘要

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摘要

目前民机成功设计的一个关键要素即在设计中有效地引入计算流体力学(CFD)的模拟方法和软件,特别是具有设计能力的方法和工具。本文概要地叙述了反设计、基于CFD低可信度和高可信度模型等数值优化方法的发展和应用于民机设计的历史和现状;简单地介绍了即将举行的空气动力优化设计系列研讨会;重点讨论了对可应用于民机设计的基于Navier-Stokes方程解算器的OPTIMAS的数值优化方法的要求及其构造方法,并以翼身组合体整流外形和翼身融合体(BWB)外形的算例表明其有效性,说明OPTIMAS可以成为民机日常设计的方法和工具之一。

关键词: 民机 计算流体力学(CFD) 反设计 翼身 数值优化

Abstract:

Now one of the most important factors of a successful civil aircraft design is applying computational fluid dynamic (CFD) numerical methods and software, especially the design tools, to the design. In the present paper, historic development and application of the inverse design concept and numerical optimization methods based on low and high fidelity models are described briefly. The International Aerodynamic Optimization Design Computation Workshop, which will be held soon, is introduced. Optimization methods of design based on the Navier-Stokes solver are discussed in detail, including the requirements to them and their construction issues. Numerical examples of OPTIMAS applying to a wing-body fairing shape design and a blended wing body (BWB) shape design have shown the efficiency of OPTIMAS for use as a daily design tool for civil transport design.

Keywords: civil aircraft computational fluid dynamics (CFD) inverse design wing body numerical optimization

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Corresponding Authors: 朱自强, Tel.: 010-82314186 E-mail: zhuzq@buaa.edu.cn Email: zhuzq@buaa.edu.cn

About author: 朱自强 男, 教授, 博士生导师。主要研究方向: 计算流体力学、飞行器气动设计。Tel: 010-82314186 E-mail: zhuzq@buaa.edu.cn

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