AERODYNAMIC ANALYSIS AND OPTIMIZATION

OF A REGIONAL TRANSPORT AIRCRAFT

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Abstract

The geometry of a typical regional transport aircraft is modified to reduce drag and improve performances, in particular cruise speed. Once performed a preliminary aerodynamic analysis on the original geometry, in order to detect those portions of the body shape whose modification mostly influences drag variation, an automatic procedure, manageable trough MATLAB, allows to modify those parts using interpolating curves and surfaces, respectively NURBS and NURBCOONS. Within the modification loop, each new geometry is analyzed trough a panel code solver until optimized shapes are found. Finally, the optimized body is exported into a CAD format (IGES) suitable for design and production. The optimization process has guaranteed a reduction of 3 percent of the total drag and an increase of 2 percent of cruise speed respect to the original configuration.

I. Nomenclature

AR = Aspect ratio

A_{ref} = Reference area for Squire-Young formulation

b = Wing span wise

CD_{WB} = 3D total drag coefficient referred to wing-body configuration

CD_0 = 3D drag coefficient at zero lift referred to the full aircraft

$CD_{0,WB}$ = 3D drag coefficient at zero lift referred to wing-body configuration

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