DESIGN AND ANALYSIS OF BLENDED AND SPIROID WINGLETS

ABSTRACT

Winglets being a small structure play an important role in reducing the induced drag in Aircraft. Many types of winglets have been designed and their significance in reducing the Drag is published. One of the main objectives of this master thesis work is to study the winglet design and about their contribution in reducing induced drag. A brief overview of wingtip devices and their performance from the manufacturers as well as from the airliner's point of view are discussed. Moreover, the role of winglet in reducing the drag of commercial civil jet aircraft is studied and the percentage of drag reduction is calculated by a conceptual approach. A320 specifications are taken to perform induced drag reduction calculations with and without winglets. Indeed, the total drag count reduced with the help of winglets accounts for additional payload which will be an advantage for the aircraft operator.

Reducing the processing time in design is one of the important criteria for any field and hence automation with the help of CAD tools is very significant in reducing time. This study also aims at developing an automated model for different types of winglets and wingtip devices with the help of CAD technology focused on reducing design time during the initial design process. A knowledge-based approach is used in this work and all the models are parameterized so each model could be varied with associated parameters. The generic model created would take different shapes and switches between different types of wingtip devices as per the user's requirement with the help of available parameters. Knowledge Pattern (KP) approach is used to develop the automation process. User-Defined Features (UDFs) are created for each type of winglet and tip device. CATIA V5 R18 software is used to develop the models of winglets and tip devices.

Keywords: winglet, wingtip, CATIA, aircraft, Analysis