

Towards Multi-objective Design of EV55 Winglet with integrated VHF antennas

– EMuS 2019 -

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ABSTRACT

Modern winglet designs tend to introduce more functions than simply improving the efficiency of fixed-wing aircraft by reducing drag. As an example, integration of position and anti-collision lights represents one of the most common ways how to effectively utilize the winglet in more than one way. Hand in hand with new manufacturing technologies and materials, there is an increasing tendency to integrate different types of antennas into the winglet too. This is the case for the ACASIAS project, where one of the systems to be developed is a VHF antenna integrated into the winglet.

A successful design of winglets with integrated antennas is relatively complex and multidisciplinary task, especially when taking into consideration all possible technical trade-offs and bottlenecks. Biggest portion of possible difficulties usually falls into the following three fields of the design: aerodynamics, stress analysis and electromagnetics. However, the design of all such systems integrated in the winglet should be carried out in continuance of development of an aircraft, taking into consideration all system safety analyses at its beginning up to the certifiability, maintainability and repairability at the final stages.

The article is devoted to highlight the challenges, bottlenecks and possible solutions of such the designs from both the designer's and the airframer's perspective. Further, we look into pros and cons specific for different antenna solutions and discuss ways how to protect them against possible electromagnetic environmental effects. As an outlook, a winglet with integrated VHF notch antenna designed within the ACASIAS project will be described in better detail.

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