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INNOVATIVE ELECTRIC PROPULSION SYSTEM FOR LSA AND EVTOLS AIRCRAFT APPLICATIONS

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Abstract: The design of electric propulsion for aircraft aims to increase efficiency, reliability and reduce emissions and noise in the aeronautical sector. Despite technological challenges related to weight, torque and speed, the research seeks innovative solutions for vertical flight systems and light aircraft, using advanced generators, motors and controllers. The project focuses on developing efficient and lightweight components, overcoming the limitations of conventional batteries, using composite materials and amorphous metals. The expectation is that these innovations will reduce operating costs and position companies as leaders in the electric propulsion segment. The multidisciplinary development of the project, using agile methodologies, aims to transform electric air mobility at a global level.
Keywords: *Mobility; Sustainability; Electric Propulsion; Electric Aircraft.*

INTRODUCTION

the ESG (Environmental, Social and Go- vernance) scenario, electric propulsion systems have become increasingly present in today's mobility landscape. In the aviation sector, when fully implemented, they have the potential to increase system efficiency, flight reliability, reduce complexity, the need for recurring maintenance and operating costs. In terms of sustainability, electric propulsion contributes to reducing emissions of pollutant gases, for which the conventional aviation sector is responsible for 12% of the world's total emissions caused by transportation, and drastically reduces noise from engines, which is significantly harmful to health [5] . However, the development of the electric propulsion system project is still at the stage of validating the technologies and components that make up the propulsion system, since the technological challenges have not been overcome to effectively and concurrently meet the technical requirements of weight, torque and speed [2][Anderson et al. 2018].

MOTIVATION

The motivation for this project is established in the aim of contributing to the socio-economic goals of the European Union and the development of electric air mobility. As a result, with the evolution of the project and its success in overcoming technological challenges, the costly costs of operating and maintaining traditional aircraft will be reduced.

OBJECTIVE

The aim of the research is to bring innovative solutions to the electric propulsion system for electric aircraft applications, from the power supply to the motors responsible for propulsion. The propulsion system designed caters for vertical take-off and flight aircraft and light sport aircraft in the LSA category. The success of this innovative research is extremely important if companies are to have the know-how and results to position themselves at the forefront of the electric aircraft propulsion segment.

METHODOLOGIES

Developed using agile methodologies, the project brought together multidisciplinary expertise, combining practical and theoretical physics, materials, electrical, mechatronics and aeronautical engineering to build a generator, controller and motor for the air propulsion system.

RESULTS

As a result, the expectation is to design a generator that, through engineering and the principles of air polarity, Bernoulli and boundary layer ingestion, is an efficient and lightweight component when compared to the conventional battery modals used in the application. The motor will have a unique structural architecture and will use composite materials, amorphous metals and

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architectural combi- nations of magnetic fluxes, to increase the torque and power characteristics and contribute to reducing the weight of the system. [Ozer and Yilmaz 2021] [Dehlinger and Dubois 2008] [Wiley 2022]. Finally, the controller will have electronics, responsible for controlling the speed of the engine-propulsion set, and with a dynamic management interface with intelligence, responsible for governing the operation of the propulsion system components and assisting in decision-making in emergency scenarios.

CONCLUSIONS

In the meantime, it is possible to conclude that this project will have the technical and scientific capacity to implement a disruptive innovation in order to overcome the challenges imposed in these areas and contribute to the evolution of electric air mobility on the national and international stage.

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