

## Field Oriented Control of Electrical Motor for Efficiency Improvement of Aerial Vehicle

**Authors :** Francois Defay

**Abstract :** Uses of Unmanned aerial vehicle (UAV) are increasing for many applicative cases. Long endurance UAVs are required for inspection or transportation in some deserted places. The global optimization of the efficiency is the aim of the works in ISAE-SUPAERO. From the propulsive part until the motor control, the global optimization can increase significantly the global efficiency. This paper deals with the global improvement of the efficiency of the electrical propulsion for the aerial vehicle. The application case of study is a small airplane of 2kg. A global modelization is presented in order to validate the electrical engine in a complete simulation from aerodynamics to battery. The classical control of the synchronous permanent drive is compared to the field-oriented control which is not yet applied for UAVs. The experimental results presented show an increase of more than 10 percent of the efficiency. A complete modelization and simulation based on Matlab/ Simulink are presented in this paper and compared to the experimental study. Finally this paper presents solutions to increase the endurance of the electrical aerial vehicle and provide models to optimize the global consumption for a specific mission. The next step is to use this model and the control to work with distributed propulsion which is the future for small distance plane.

**Keywords :** electrical propulsion, endurance, field-oriented control, UAV

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