

OPTIMIZATION OF THE PROPELLER-DRIVEN PROPULSION SYSTEM FOR A SMALL UAV

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Abstract: Integrated in the LEEUAV project, a Long Endurance Electric UAV developed by LAETA, the objective of this work was to optimize the propeller-driven propulsion system designed previously. Following a careful selection of the propulsion systems analysis model, a propeller parametrization was made, including the planform and airfoil shape. relevant functions of interest were used to evaluate the performance of the propeller, such as thrust, power and thrust coefficients, and propeller efficiency. Experimental tests were performed to validate the software, which included three different propellers chosen to study how the performance varies for different propeller diameters and pitches, and electric motors. Since it was not known accurately which airfoil was used in each propeller, two different airfoils were assumed. Following the experimental tests and the validation of the software, a planform shape optimization was performed for cruise and climb. At the end of this optimization, a system motor propeller with an higher efficiency for both flight stages was obtained.