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## C wing tip geometric design in terms of the flying qualities

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The development of unmanned aerial vehicles (UAV), in industry and research centers, has increased substantially in recent years. The configurations and features of the new UAVs are limited only by the imagination of designers. So, the use of techniques based on design optimization algorithms is an essential tool for making decisions during the conceptual design phase. This work formulates the application of a multi-objective design methodology for the conceptual design of a C wing tip for a flying wing powered by an electric power plant. The design objective is to propose C wing geometric configurations regarding flying wing dynamic characteristics, expressed in terms of the longitudinal flying qualities. The multi-objective optimization will be performed using a multi-objective evolutionary algorithm (AEM), which uses the so-called meta-heuristic Differential Evolution. The maximum between the short and long frequencies and the time that would take an unstable aircraft to duplicate the amplitude of the oscillations, after being disturbed, are the optimization objectives. The selection of the solutions that represent the best compromise between the optimization goals is based on Pareto dominance. It is expected that the family of solutions provided by the proposed design method for the C wing may help designers to tailor the appropriate latency of the real-time control system to command the flying wing.

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## External magnetic field of ferrofluids lubrication of journal bearing with twined solenoid

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According to the effect of ferrofluids on the performance of magnetic liquid lubrication with external magnetic field, the mathematical model of internal magnetic induction intensity of oil-film bearing along radial and longitudinal direction was built and the distribution rules of internal magnetic induction intensity were studied. The oil-film bearing with twined solenoid was lubricated by ferrofluids. And the solenoids were designed to produce the magnetic field. The magnetic induction intensity of bearing consisted of exciting field generated by solenoid and derived field generated by magnetization bearing. In order to study the distribution of magnetic induction intensity within the load region of oil-film bearing, the magnetized bearing was simplified as solenoid model. The magnetic induction intensity at any point of finite solenoid was deduced based on Biot-Savart law and the elliptic integral is accomplished. On the basis of numerical solution of solenoid model and experimental measurement of magnetic induction intensity, the magnetizing current formula of bearing was deduced. Then, the magnetic induction intensity distribution of magnetization bearing was theoretically solved. Furthermore, the magnetic flux density of a wedge-shaped gap within the range of 1 mm between the shaft and bearing was obtained. The results showed that the magnetic induction intensity on both ends of the bearing was larger than that on the middle region. Ferrofluid lubrication with the function of external magnetic field can help reduce or prevent side leakage of magnetic fluid and display seal function to some extent. Meanwhile, it is also beneficial to the uniformity of oil film, and can guarantee the stability of lubrication status in load-carrying area.

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