Design, Construction, and Testing of a Passenger-Capable eVTOL Hexacopter

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Electric-vertical-takeoff-and-landing (eVTOL) aircraft could enable the implementation of large-scale Urban Air Mobility projects, thereby mitigating problems that currently face the transportation sector such as its great infrastructure requirements, high emissions, and frequent congestion. The goal of this engineering study is to provide open-source resources which demonstrate and describe the key processes by which a passenger-capable eVTOL aircraft is designed, constructed, and tested. In doing so, it could become a resource for innovators who will help accelerate the advancement of the field. First, mathematical models reflecting the aircraft's original design are provided and used as the basis for further design choices, which are justified with recourse to the engineering objectives while also considering cost, ease of manufacturing, and available resources. Then, the final design, construction, and integration of these three subsystems of the aircraft is presented and described. Finally, the aircraft is subjected to testing, evaluation, and refinement of its control system. This involved the setup of physical constraints on the aircraft, live monitoring of flight data from a telemetry radio, and the statistical analysis of the performance of the control system before and after its refinement. Broadly, the analyses of these flights indicated that the aircraft outperformed expectations and that its control system was significantly improved by experimental modification. More importantly, however, they established the efficacy of the described aircraft-fabrication procedures, thereby enabling the compilation of this document, one of the first open-source guides for the construction of a passenger-capable eVTOL aircraft.

Awards Won:
First Award of $5,000
Office of Naval Research on behalf of the United States Navy and Marine Corps: The Chief of Naval Research Scholarship Award of $15,000
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