ABSTRACT

Drone construction requires careful planning. Drone frame design is the initial stage that determines drone performance. This frame design tested with simulations. Modeling and simulation provide an initial overview of the drone's potential performance. SolidWorks is used to create the drone model, supported by Matlab as a simulator. The mathematical approach used in Matlab provides a relatively high level of confidence in conducting simulations that are close to real-world conditions. These simulations not only help optimize drone design but also allow adjustments based on various environmental factors and payload considerations. Iterative testing can improve drone efficiency and accuracy before real-world implementation. Simulations depict upward thrust contrasted with the drone's gravity to find lift. Simulation activities produce results that are close to real-world conditions. The use of curves to assess performance is used to facilitate measurement of drone motion. The curve trend that corresponds to actual performance indicates the level of closeness between simulation and real-world flight experiments. Degrading battery conditions cause a decrease in drone flight performance. The results of the study aimed to analyze the effect of frame structure and material on drone flight stability. The X-frame configuration combined with ABS plastic material provides recommendations on which subsystems can support increased stability and efficiency. ABS X-frame drones are suitable for prototypes and lightweight applications, but this material has limitations in supporting optimal flight stability in the X-frame configuration. This is indicated by simulation results, which show instability in the first 1 and 2 seconds due to the upward thrust but remain relatively stable thereafter. This condition was also validated during flight.

Keywords: Drone stability, Frame structure, Material properties, Flight performance, Matlab simulation