ABSTRAK

Drone atau *Unmanned Aerial Vehicle* (UAV) banyak digunakan dalam berbagai bidang, seperti pemetaan, logistik, dan pertanian. *Propeller* berperan penting dalam menghasilkan gaya angkat *(lift)* dan gaya dorong *(thrust)*, sehingga analisis aerodinamika diperlukan untuk mengoptimalkan performanya. Penelitian ini menganalisis distribusi koefisien gaya angkat *(cl)*, gaya dorong *(ct)*, dan gaya torsi *(cq)* pada *propeller drone* menggunakan metode *Blade Element Momentum Theory* (BEMT). Simulasi dilakukan dengan MATLAB menggunakan model *propeller* APC 10x7 *Thin Electric.* Simulasi dilakukan pada rentang kecepatan udara 10-23,5 m/s untuk memperoleh grafik *cl, ct,* dan *cq* terhadap *advance ratio* (J), serta pada kecepatan 18 m/s untuk mendapatkan grafik distribusi *cl, ct,* dan *cq* terhadap *blade span* (r/R). Hasil menunjukkan metode BEMT memberikan estimasi aerodinamika yang cukup akurat dengan *error* rata-rata 0,0880% *(cl)*, 0,1234% *(ct),* dan 0,0574% *(cq)*. Grafik performa aerodinamika terhadap *advance ratio* menunjukkan tren penurunan, sedangkan grafik distribusi aerodinamika menurun mendekati ujung bilah dengan nilai maksimum di sekitar pertengahan bilah. Penelitian ini diharapkan dapat menjadi referensi dalam desain dan optimasi *propeller drone* guna meningkatkan efisiensi aerodinamika *drone*.

Kata kunci: aerodinamika, *propeller, drone, Blade Element Theory,* MATLAB

ABSTRACT

Drones or Unmanned Aerial Vehicles (UAVs) are widely used in various fields, such as mapping, logistics, and agriculture. Propellers play a crucial role in generating lift and thrust, making aerodynamic analysis essential for optimizing their performance. This study will analyze the distribution of lift coefficient (cl), thrust coefficient (ct), and torque coefficient (cq) on drone propellers using the Blade Element Momentum Theory (BEMT) method. Simulations were conducted in MATLAB using the APC 10x7 Thin Electric propeller model. The simulations were performed over an airflow velocity range of 10-23,5 m/s to obtain cl, ct, and cq graphs against the advance ratio (J) and at a velocity of 18 m/s to analyze the distribution of cl, ct, and cq along the blade span (r/R). The results show that the BEMT method provides an accurate aerodynamic estimation, with an average error of 0,0880% (cl), 0,1234% (ct), and 0,0574% (cq). The aerodynamic performance graphs indicate a decreasing trend with the advance ratio, while the aerodynamic distribution decreases toward the blade tip, with maximum values near the middle of the blade. This research is expected to serve as a reference for designing and optimizing drone propellers to enhance aerodynamic efficiency.

Keywords: *aerodynamics, propeller, drone, Blade Element Momentum Theory, MATLAB*