AUTONOMOUS FLIGHT CONTROLLER SYSTEM OF HYBRID VECTORED TRI COPTER VTOL PLANE AS A PROTOTYPING PRODUCT IN SUPPORTING INDONESIAN AIR INDEPENDENCE

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ABSTRACT

The industrial revolution 4.0 demands the acceleration of unusual technological developments and leads to the basis of intelligent systems and automation. One of the rapidly developing technologies is the Unmanned Aerial Vehicle (UAV). In this revolutionary era, of course, the development of UAVs that have more capabilities than UAVs in general. Likewise, the ability to cover a large area, be easy to operate and be able to take off and land in a narrow area is the fulfillment of needs that are sought today. The hybrid vectored tri-copter vtol plane is a UAV model that has this capability. This aircraft configuration can be seen in the use of 3 brushless motor engines mounted on the main wing (right and left) and tail with symmetrical mounting geometry. In addition, there is also a servo motor mounted on the second mounting of the brushless motor located on the wing, where the servo motor acts as a tilting motor for the mode transition from multi-copter (vtol) to fixed wing (flying forward longitudinal motion).
In carrying out flight tasks, the hybrid vectored tri-copter vtol plane UAV requires a system that makes the aircraft run autonomously. The system is called the flight controller. The flight controller accommodates aircraft flight movements independently and in coordination with the control stations below. So that the plane is still monitored even though its presence is far from the station point. In addition, the aircraft is supported in carrying out stable flight movements that are able to make the aircraft defend itself from unwanted things, such as falling. Therefore, this research focuses on building a flight control system for the UAV hybrid vectored tri-copter vtol plane model. The aircraft controller is supported by the Linear Quadratic Regulator Integrator control method which makes the system have robust characteristics and is able to minimize steady state errors and multiple overshoots with small errors.
From the results of the research conducted, a Hybrid Vectored Tri-Copter VTOL Plane unmanned aircraft has been successfully built with specifications for wingspan of 1150 mm, length 920 mm, weight 635 grams, angle of attack (AoA) 1 degree and maximum take-off weight (MToW) 1.5 Kg. This aircraft is equipped with an autonomous system developed with a 160 MHz teensy microcontroller complete with GY86 sensors, GPS and compass. The autonomous system is supported by the LQR Integrator control system which makes the aircraft capable of flying stably and does not experience multiple overshoots and is able to reduce steady state errors to a minimum. This is evidenced by the characteristics of the three orientation angles that meet the minimum system requirement reference, with SSE errors of 0.02 for roll, 0.46 for pitch and 0.80 yaw.

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