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Hexacopter Drone Prototype Equipped with a 90 mm Caliber Rocket Launcher

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Abstract:- UAV technology has been developed to support the military field, especially to support reconnaissance operations through aerial photography and realtime (direct visuals). The types of UAV technology products that have been produced include fixwing types using engines, fixwing electric, rotary wing electric, both manual and auto pilot. The Rotary wing UAV type is more advantageous for obtaining information on difficult terrain about target objects because of its shape and maneuvers that allow reconnaissance units to reach areas that are difficult to reach and keep their secrecy maintained. In this study, the drone was developed from a hexacopter type equipped with a type Cal 90 anti-tank rocket launcher, has a lifting capacity of up to 10 kg, can be controlled up to 2 km, and is flown using manual and autopilot modes. Flying duration of 40 minutes is capable of maneuvering in all terrain and weather. The drone is also equipped with a camera to view targets and destroy targets selected from a remote control or ground station.

I. INTRODUCTION

The Hexacopter drone is a drone made using 6 frames, 6 drives or 6 brushless motors, 6 propellers and 6 ESC (Electronic Speed Control). The hexacopter drone component system consists of flight control, IMU (Intertial Measurement Unit), 8 channel receiver using the FRSKY type, camera, video sender, 4S (14.8 Volt) Lithium Polymer 10000 mAH battery, Radio control 2.4 GHz Taranis. The brushless motor uses 300kv and 40A ESC produces a lift force of 6 propellers of 15 kg, a total component load of about 5 kg, the remaining lift force is 10kg which is used to lift the 90mm caliber rocket launcher with a mass of 5 kg so that it still has a lift force of 5 kg to anticipate the rocket's repulsive force.

This type of hexacopter drone has been made a lot but is only used for photography and watering plants. The Hexacopter drone has good flight stability including Hold Altitude and Loiter conditions. This flying ability can be used to see targets in detail and shoot rockets at targets properly. The Flight Control System (FCS) is used to control drone flight both manually and on autopilot. If the flight is on autopilot, it means that the flight is programmed in a waypoint, namely the coordinate program for the drone's travel route using a mission planner. The ESC is used to adjust the rotation speed of the motor brushless depending on the PWM signal sent from the remote control or program. IMU (Intertial Measurement Unit) is used to adjust the balance of the drone's body when flying based on 3 axes namely x,y,z or pitch, yaw and roll movements. Therefore, this study focuses on investigating the perceptions of postgraduate students and researchers towards the utilization of robotic and drone laboratory resources at the Indonesian Army Polytechnic (Poltekad) which is a prestigious development of national robotic drone technology and looks at the threat of drone technology wars that have been utilized by Ukraine and Russia to combat effectively and efficiently using drones.

II. MATERIALS AND METHODS

A. Materials consist of:

- 1 FCS (Flight Control System)
- 6 ESC (Electronic Speed Control)
- 6 Propeller 20 inch
- 1 Receiver FRSKY 8 Channel double Encript
- 1 Camera IR
- 1 Radio Control 2.4 GHz Taranis
- Baterai LIPO 14,8 V
- Video Receiver
- Laptop

B. Methods

➢ *Rocket Launcher Drone Design*

The design of the hexacopter drone and rocket launcher was made by researchers using 3d studiomax version 2016. As shown in Figure 1 the location of the rocket launcher is placed at the bottom of the hexacopter drone and the balance center of gravity or CoG is at the bottom of the drone.

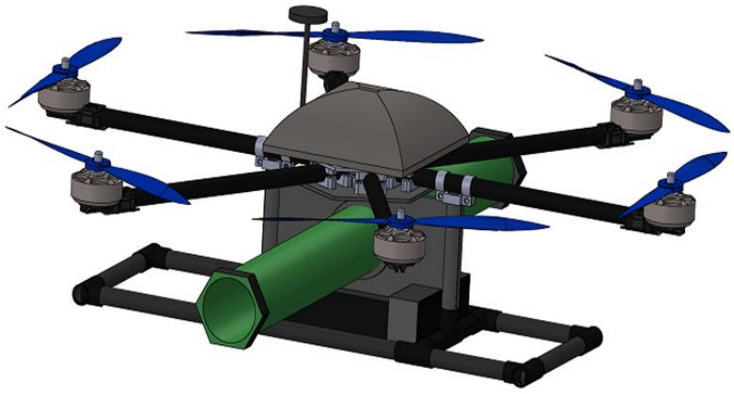

Fig. 1: Rocket Launcher Drone Design

- *Rocket Launcher Drone Protoype as shown in figure 2.*

Fig. 2: Rocket Launcher Drone Prototype

- *Dummy shaped rocket cal 90 mm as shown in figure 3.*

Fig. 3: Dummy shaped rocket cal 90 mm

The material used for this type of rocket propulsion is a solid propellant composite consisting of HTPB as a binder and fuel mixed with ammonium perchlorate as an oxidizer and aluminum as a fuel and catalyst.

III. RESULTS AND DISCUSSION

Test results in the laboratory show that the transmitter and receiver system from radio control can function properly up to a distance of 2 km. Autonomous systems can be programmed by means of waypoints on flight control using a

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mission planner. Waypoint data can be shown through the program according to the route coordinates that have been programmed. The rocket firing system can work properly according to the signal given. The camera system can see the target in the form of video data and can be received properly using a cable. Likewise video data sent by the video sender can be well received by the video receiver and FPV (first person view) up to a distance of 1 km.

Figure 4 shows that there has been data communication or data telemetry from the drone to the laptop. Where is the condition of the drone and what the drone sees every time the data is sent to the ground station or laptop.

Furthermore, Figure 5 shows the flight test and rocket shooting towards the target using manual mode and autopilot mode. Where all the modes result in shooting rockets to the target working well hit the target. When the shooting process is carried out in loiter stability mode, namely the condition of flying in coordinates that are fixed at a fixed altitude so that the target can be seen clearly and shooting can be carried out stably or the effect of the shock when shooting is relatively zero percent. This can happen because rocket launchers are classified as weapons without recoil.

Fig. 4: Rocket Launcher Drone Flight Test


Fig. 5: Drone test fires rockets

IV. CONCLUSION

This anti-tank drone system can be flown manually and on an autopilot waypoint properly. The camera system can see the target well and send information to the ground station and FPV properly. Rocket shooting by drones is carried out after seeing the target, the drone can fire well at the target using loiter mode or silent mode at a fixed coordinate place and the right altitude. The rocket system used for testing is in the form of a dummy with a caliber of 90 mm.

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