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**JPM**
**Jurnal Pengabdian Mandiri**
**Vol.3, No.11 Nopember 2024**

# DESIGN OF ENEMY DESTROYER KAMIKAZE DRONE BY DIPOLE_31 TECHNOLOGY

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***Article History:***
*Received: 17-10-2024*
*Revised: 05-11-2024*
*Accepted: 24-11-2024*

**Keywords:**
*Kamikaze Drone, ESP32, Range, Flight Speed, Explosiveness, Accuracy*

***Abstract:*** *The research aims to design and develop a kamikaze drone Dipole_31 prototype based on the ESP32 microcontroller designed as a high-precision long-range enemy target destruction system. The drone was created to focus on high performance and operational efficiency, making it suitable for targeted destruction missions. The research method uses a structured experimental approach to test various key parameters, such as maximum range, flight speed, flight duration, accuracy of attack on the target, blast impact radius, and overall destructive power. The main components of the drone include the ESP32 microcontroller as a control center, brushless motors for propulsion, GPS modules for navigation, and transmitters and receivers for remote control. In addition, fuzes or explosives are installed to ensure the effectiveness of target destruction. The test results show that this kamikaze drone is capable of flying up to a distance of 150 km with a maximum speed of 500 km/h and a flight duration of 120 minutes. The blast radius reached 50 meters, and the drone showed a target accuracy of 99%, with a margin of error of only 1% from 10 tests.The results of this study show that the design of kamikaze drones has met the established technical specifications and has high operational application potential for long-range destruction missions. This drone combines advanced control and navigation technology with reliable destructive capabilities, making it an effective strategic solution in modern military technology*

## PENDAHULUAN

Kamikaze drones, also known as "loitering munitions," are a type of drone designed with fixed-wing and equipped with explosives on the lower front. Its function is not only for long-range reconnaissance but for direct destruction missions where these drones are directed toward the target and explode on impact. Kamikaze drone technology was developed to provide precise long-range strike capabilities, with a high level of accuracy that allows for the elimination of specific targets in a short period. The use of kamikaze drones not only provides flexibility in military strategy but also reduces the need for manned aircraft on dangerous missions, thereby minimizing risks for pilots or combat personnel.

At the global level, various countries have made efforts to develop and improve this technology. The United States was one of the pioneers with the Predator drone, which was originally developed for reconnaissance but was later equipped with weapons, allowing direct air strikes. The Predator was the main inspiration for other kamikaze drones that the United States launched in the next era, especially in military operations in the Middle East in the early 2010s. Meanwhile, Iran has created the Shahed-136 kamikaze drone, which is famous for its wide range of strikes and its use in regional conflicts. Shahed-136 is an example of loitering technology that can rotate in the air for some time before being directed at the target. This technology is widely reported in conflicts such as the one in the Middle East and is part of Iran's defensive and offensive strategy.

Turkey, which has recently become a major player in drone technology, has also produced various models of kamikaze drones used in operations at home and abroad. Turkish kamikaze drone technology has shown high effectiveness in conflicts in border regions as well as in international operations. The country is focusing on developing compact kamikaze drones that can be operated from remote locations, adding an element of surprise to military strikes.

Indonesia has also begun to follow in the footsteps of the development of kamikaze drones, taking into account operational needs for national defense. This step aims to develop kamikaze drones that are able to adapt to Indonesia's geographical characteristics, including the vast archipelago and borders. These innovations include not only the design and structure of the drone, but also the technology of the control system, customized explosives, as well as GPS-based navigation systems, and optical sensors. The development of kamikaze drones in Indonesia shows efforts to achieve technological independence in defense, as well as increasing the ability to defend national territory from potential external threats.
These Dipole_31 kamikaze drones are generally designed with capabilities that can be optimized according to the characteristics and location of the target. The mission of kamikaze drones has a very high level of accuracy, making them an effective strategic tool for destroying enemy targets directly. This technology allows drones to hit targets in a relatively short time and without being detected, increasing operational excellence on the battlefield.

## METHODS

### Material

The material used to make this kamikaze drone consists of several main components. The drone frame is made of balsa, fiber, and foam. The ESP32 is used as the main controller that regulates the automation functions. Brushless motors are used to provide thrust and propellers as propellers. GPS is used to determine coordinates, while IMU (Inertial Measurement Unit) is used to regulate the stability and direction of motion of the drone. In addition, video senders and receivers are used for real-time transmission of video signals. Servo motors are mounted on flaps and wings to control the drone's movement. The power system is obtained from a 22.2V LiPo battery with a capacity of 10,000 mAh. The receiver is used to receive the control signal from the transmitter. Load Cell and gyro sensors are installed to identify fuel levels and stability conditions. This load cell also detects the pressure on explosives when an impact occurs. The explosive used was a type of TNT with a mass of 3 kg, which had an explosion radius of up to 30 meters.

### Methods

The method used in this study is an experimental method that tests several variables, namely range, flight duration, speed, accuracy, and explosiveness. The trial was carried out

10 times, and the average value and margin of error were taken and validated with a maximum margin of error of 1%.

Experimental on kamikaze drone research Dipole_31 as shown in the picture

1. Block diagram system Kamikaze Drone Dipole_31

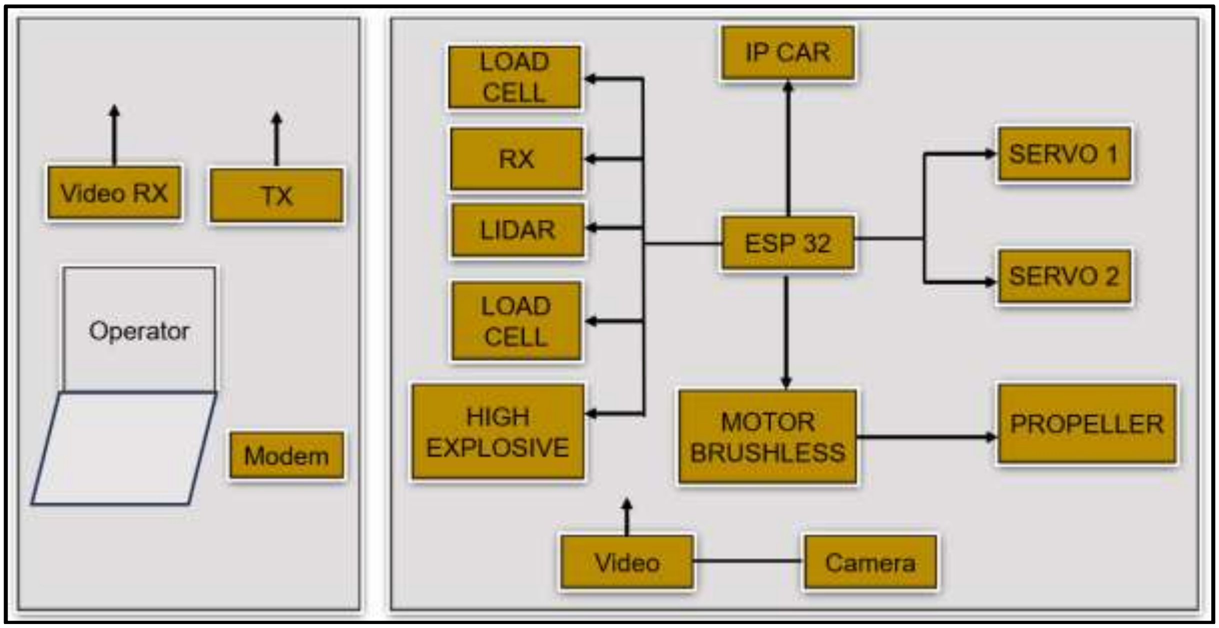


**Figure 1. Block Diagram of Drone System**

The block diagram above represents a control system for a kamikaze drone, which includes components for remote operation, communication, control, and navigation. This system integrates both operator-side and drone-side elements to achieve precise and effective control over the drone's operations.

1. Operator Station:
   - The operator has a Modem that provides network connectivity for long-range communication. This setup enables real-time data transmission and reception.
   - Video RX (Receiver): This module receives video feed from the drone, allowing the operator to monitor live video from the camera onboard.
   - TX (Transmitter): The transmitter sends control commands and data from the operator to the drone.
2. Onboard Drone Components:
   - ESP32: This microcontroller serves as the primary processing unit for the drone, coordinating and managing commands between different components.
   - IP CAR: This module may be used to assign an IP address to the drone, allowing it to connect to a network, enabling remote control and data exchange.
   - Load Cells: Two load cells are included, likely for monitoring payload or detecting pressure changes during flight, which could be used for stability and payload release mechanisms.
   - RX (Receiver): This component receives control signals from the operator, allowing for responsive drone control.

 ISSN: 2809-8889 (Print) | 2809-8579 (Online)

- LIDAR: The LIDAR sensor measures distances and detects obstacles, providing essential data for navigation and collision avoidance.
- High Explosive: This component represents an explosive payload onboard the kamikaze drone, which can be triggered based on mission parameters.
- Brushless Motor: The brushless motor powers the Propeller, which provides thrust for flight. This motor is controlled by the ESP32, adjusting speed as required by flight conditions.
- Servos (Servo 1 and Servo 2): These servos control various flight surfaces or mechanical systems on the drone, enabling precise adjustments to the drone's direction and stability.

3. Observation System:
   - Camera and Video Modules: These components capture visual information, transmitting it back to the operator through the Video RX module for real-time monitoring and navigation assistance.

## RESULT

**Table 1. Experimental Result Kamikaze Drone Dipole_31**

| NO | TRIAL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Average | Error |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Range (Km) | 149,5 | 149,5 | 149,5 | 149,6 | 149,6 | 150 | 149,7 | 150,7 | 149,8 | 149,9 | 149,81 | 0,19% |
| 2 | Flight time (Minutes) | 119,4 | 119,4 | 119,4 | 119,4 | 119,5 | 121 | 120,3 | 119,7 | 120,2 | 120,1 | 119,79 | 0,21% |
| 3 | Speed (Km/h) | 499,5 | 499,5 | 499,7 | 499,5 | 499,5 | 500 | 500,5 | 500,5 | 499,5 | 499,5 | 499,73 | 0,27% |
| 4 | Accuracy (%) | 99,8 | 99,8 | 99,5 | 99,7 | 99,9 | 99,6 | 99,6 | 99,5 | 99,7 | 99,9 | 99,7 | 0,30% |
| 5 | Explosive Power | 49,5 | 49,5 | 49,5 | 49,5 | 49,5 | 49,4 | 49,4 | 49,4 | 49,4 | 49,4 | 49,45 | 0,55% |

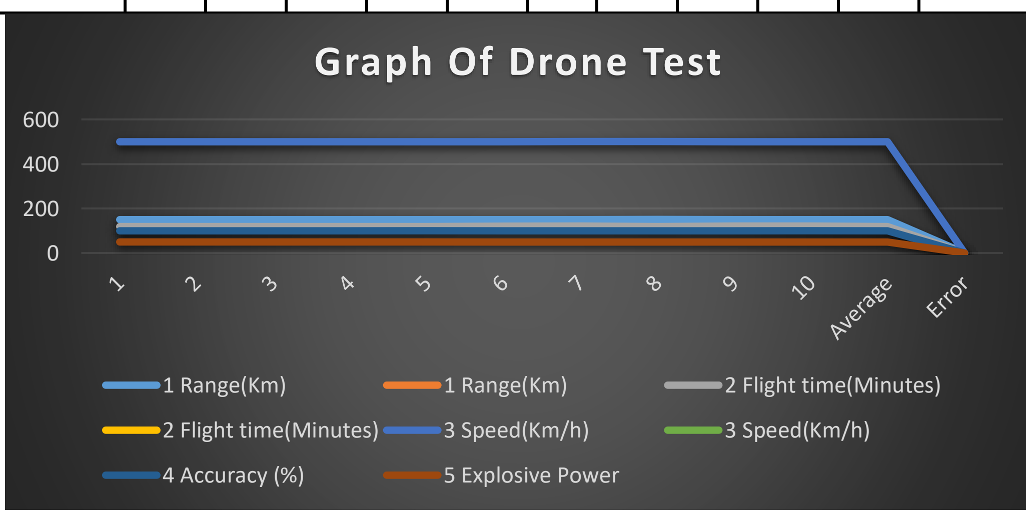


**Figure 2. Graph of Drone Test**

**Table 2. Specification of Kamikaze Drone Dipole_31**

| Capability | Specification |
|---|---|
| Range | 150 Km |
| Flight Time | 120 Minutes |
| Maximum Speed | 500 Km/h |
| Accurate | 99% |
| Payload Capacity | 1-5 kg (explosive or other payloads) |
| Guidance System | GPS, inertial navigation, or camera-guided |
| Operational Altitude | 50-500 meters |
| Communication Range | Up to 50 km (dependent on controller and environment) |
| Weather Resistance | Light rain, moderate wind |
| Camera/Surveillance | Optional real-time video feed |
| Autonomy Level | Semi-autonomous or fully autonomous |
| Stealth Features | Low radar visibility, quiet operation |

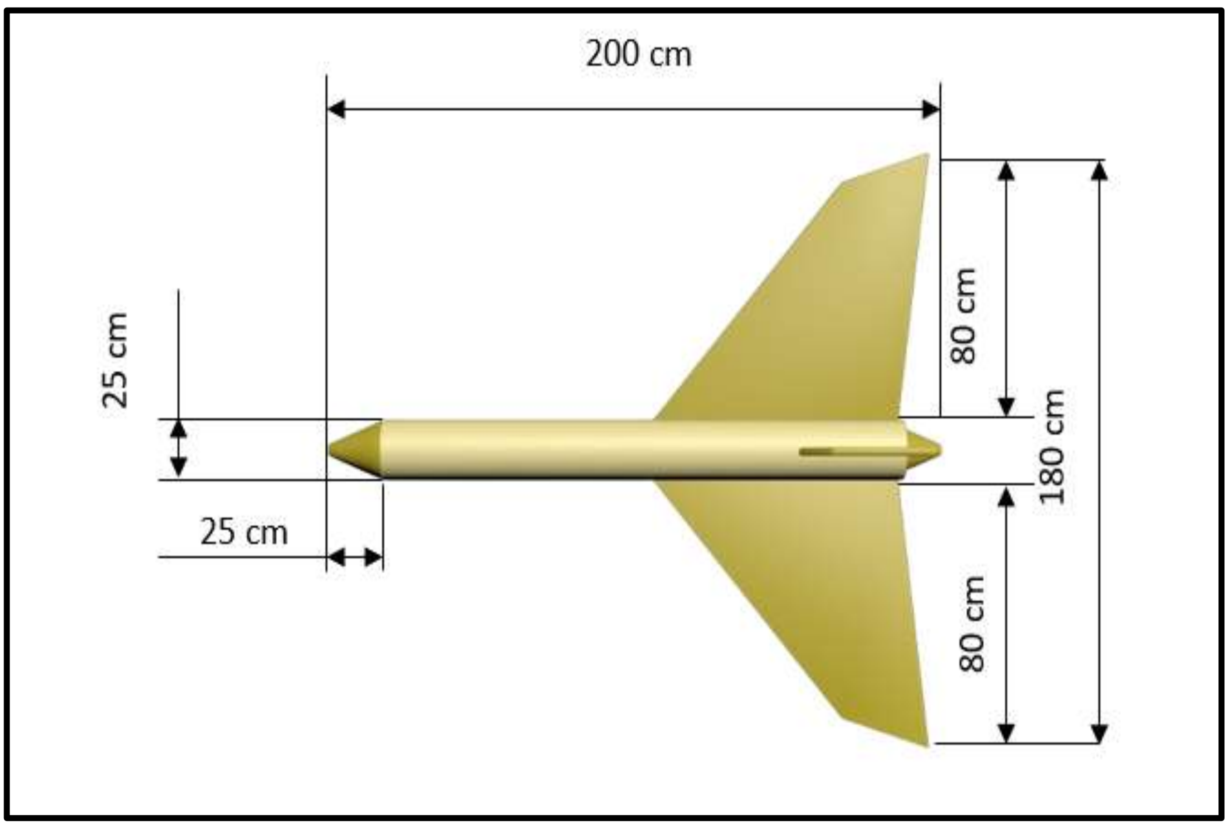


**Figure 3. Dimension Of Design Kamikaze Drone Dipole_31**

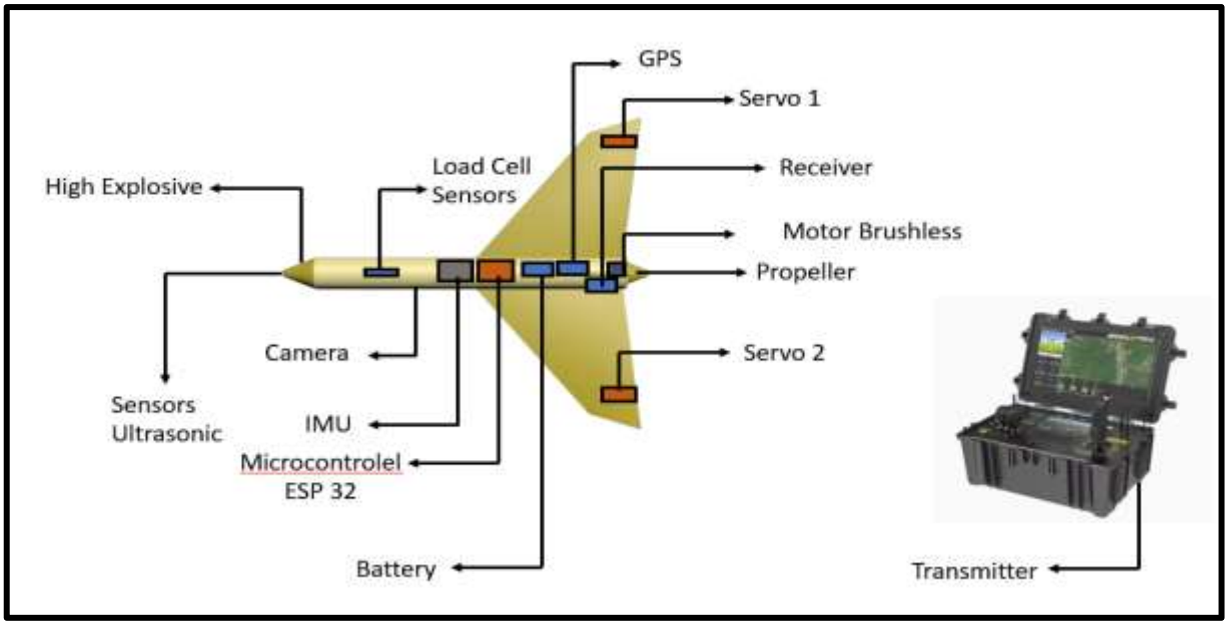


Figure 4. Component Of Design Kamikaze Drone Dipole_31

Figure 5. Application Of Kamikaze Drone Dipole_31

## DISCUSSION

The test results on the kamikaze drone Dipole_31 show excellent performance in several key parameters that have been set. Based on the data presented in the table of experimental results, we can analyze and discuss each parameter in more depth.

1. Coverage Distance (Km)

The average range achieved by the Dipole_31 drone is 149.9 km with a margin of error of 0.19%. This distance is close to the set target, indicating that the drone can carry out missions deep into enemy territory without being detected. Factors that affect this range include the aerodynamic efficiency of the drone design, the power of the brushless motor, and the capacity of the battery used. Although the distance achieved is excellent, environmental factors such as weather conditions (wind, temperature) can affect performance and actual range.

2. Flight Time (Minutes)

The average flight duration of the drone is 119.79 minutes, with an error margin of 0.21%. This duration indicates the drone's ability to remain in the air long enough to complete a mission without the need for recharging. This is especially important in the context of destruction missions, where time is a critical factor. The duration of the flight is affected by the power consumption efficiency of the motors and the total weight of the drone, including the explosive payload. The use of a high-capacity 22.2V LiPo battery helps to achieve this duration.

3. Speed (Km/h)

The Dipole_31 drone shows an average speed of 499,5 km/h with a margin of error of 0.27%. This high speed allows the drone to carry out rapid attacks and avoid detection by enemy defense systems. Factors that affect speed include the aerodynamic design of the drone, the power of the motor, and the propeller used. Although the results show good speed, keep in mind that very high speeds can add to the risk of flight stability, especially in bad weather conditions.

4. Accuracy (%)

The accuracy rate of drone attacks reaches 99.7% with an error margin of 0.30%, which indicates a high ability to accurately target targets. This accuracy is influenced by the navigation technology used, including the GPS module and IMU sensors that help maintain the stability and direction of the drone's movement during flight. High accuracy is crucial in a destruction mission to ensure that the right target can be destroyed without causing unwanted losses.

5. Explosive Power

The average radius of impact of the explosion reached 49.45 meters with an error margin of 0.55%. This significant explosive power shows that the explosives used (TNT) are very effective in destroying targets. Factors affecting explosives include the type and amount of explosives used, as well as the design of the drone that ensures that the explosives can be accurately targeted at the designated target.

Factors Affecting Drone Performance

Some of the factors that can affect the overall performance of Dipole_31 kamikaze drones are:

1. Aerodynamic Design: Optimal drone design can improve flight efficiency, reduce drag, and increase speed and range.
2. Component Quality: The selection of high-quality motors, propellers, and navigation systems has a significant impact on the performance of drones.
3. Environmental Conditions: Weather, temperature, and wind speed can affect the stability and flight performance of drones.
4. Control and Navigation: Good navigation technology and control systems are essential for maintaining accuracy and stability during flight.
5. Payload: The total weight of the drone, including the explosive payload, can affect the distance and duration of the flight.

Overall, the test results show that Dipole_31 drones have excellent potential for use in destruction missions, with a combination of speed, range, accuracy, and explosive power that meets the expected technical specifications. Further development and testing in various conditions will help optimize the performance of this drone for applications in the field.

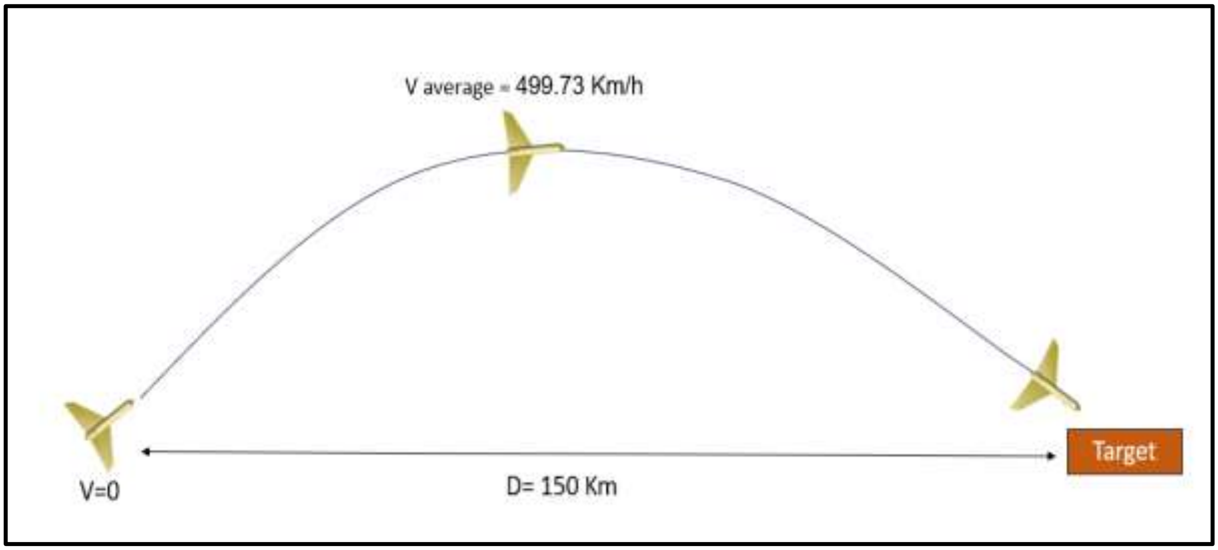


**Figure 5. Simulation of Flight Trajectories Towards the Target at Average SpeedOf Kamikaze Drone Dipole_31**

**How to Operate a Drone**

Dipole_31 drones are designed to be operated automatically using advanced GPS technology and navigation systems that allow for precise routing and destination points. Before the mission begins, flight routes and targets are determined through special software. The operator then uploads the mission data to the drone's control system. Once activated, the drone can air autonomously, following a predetermined route without the need for manual intervention, except in emergencies where the operator can take control.

In addition, target recognition technology combined with optical and thermal sensors allows the drone to identify targets with high accuracy, ensuring that missions can be completed with maximum efficiency. The control system is also equipped with security protocols to avoid detection by enemy radar. This process ensures that the drone can Dipole_31 hit its target and carry out its tasks with a high success rate.

## CONCLUSION

The conclusion of this research shows that the Dipole_31 kamikaze drone prototype was successfully developed as an effective long-range target destruction system. Based on the ESP32 microcontroller, the drone is capable of flying 149.81 km, with a maximum speed of 499,73 km/h, and an average flight duration of 119.79 minutes. High accuracy, reaching 99.7%, ensures a precise strike against the target, while the blast impact radius of 49.45 meters indicates significant destructive power.

Key components such as the brushless motor, GPS module, and TNT explosives play an important role in the drone's performance and effectiveness. These results indicate that the Dipole_31 drone has great potential as a strategic technology that supports long-range destruction missions and strengthens Indonesia's national defense.

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