

# TEAM 034

# Guardian Hawk: Advanced Aerial Defense (AAD)

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4



## Problem Statement

Military trucks carrying valuable equipment are vulnerable to hostile drone attacks when passing through remote or unsecured areas without radar coverage. The Guardian Hawk is a semi-autonomous, low-cost drone designed to detect and neutralize such threats quickly and accurately.

## Specifications

1	Response Time < 10 s
2	Accuracy of Detecting Hostile Drone > 0.7
3	Propeller Efficiency > 0.6
4	Total Motors Thrust > 9 Kg
5	Battery Capacity < 22,000 mAh
6	Drone Speed > 70 Km/h
7	Time Until Collision < 20 s
8	Total Power Consumption < 3,000 W
9	Range of Detecting Hostile Drone > 15m
10	Drone Volume < 0.3 m <sup>3</sup>

## Constrains

1	Computational Speed = 31 GELOPS
2	Thrust-to-Weight Ratio > 2
3	Total Drone Weight < 7 kg
4	Operating Temperature < 45 C
5	Sensor Power Consumption > 80% Solar
6	Budget > 9,000 SAR



## Cost

The total prototype cost is approximately 6,937 SAR, according to the bill of materials. However, the actual prototype value ranges between 10,000 to 15,000 SAR due to additional components that were borrowed or sourced from university stores.

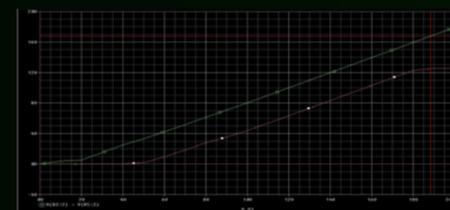
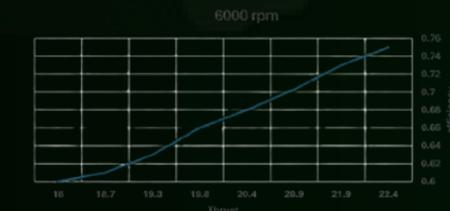
## Conclusion

The drone is fully assembled with a modular frame, optimized propellers, and a ventilation system for better performance and cooling. It supports over 10 minutes of flight and 7 hours of idle sensor operation. The AI-powered object detection system has been tested and reliably detects incoming drones at the required range.

## Future Work

- A. Reusability Development
- B. Sensor Expansion
- C. AI Model Enhancement
- D. Autonomous Decision Making
- E. Field Testing with Defense Agencies
- F. Extended Power Systems

## Proofs



### Hovering Performance :

Hovering Time : 43.25 min.  
Throttle Percentage : 50.1 %  
ESC Current : 4.24 A  
Motor Speed : 4062 rpm  
Motor Power : 73.8 W  
Battery Voltage : 24.1 V  
Battery Current : 25.9 A  
Power Efficiency : 70.4 %

### Max. Throttle Performance :

Flight Time : 8.1 min.  
Total Lift : 162.4 N  
ESC Current : 23.2 A  
Motor Speed : 7051.7 rpm  
Motor Power : 386 W  
Battery Voltage : 23.5 V  
Battery Current : 138.9 A  
Power Efficiency : 68.8 %

### Integral Performance :

Normal Operation : 32.5 min.  
Total Weight : 5.5 kg  
Remaining Load : 7.44 kg  
Max. Takeoff Altitude : 6.83 km  
Max. Tilt Angle : 64.9 °  
Max. Forward Speed : 20.7 m/s  
Max. Flight Range : 22.96 km  
Wind Resistance : 6 Degree