CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S0303

Project Title

Drone Disabling Technology V2.0: High Power Net Launcher and Automated Firing

Abstract

Objectives/Goals

Currently there are no effective means of disabling drones that pose a threat to public safety, security, privacy, aviation or property. My goal is to create a drone mounted net launcher that is capable of disabling an unwanted drone semi autonomously. A pilot flies the drone to intercept the unwanted drone and activates the launch system. When the unwanted drone gets within range, a sensor on board launches the net, disabling and capturing the unwanted drone.

Methods/Materials

Having developed a drone mounted net launcher which operated at 0.76 MPa and launched a net of 2m^2 last year, I realized that the ability to launch a much larger net is needed. Also, the difficulty in flying a drone while simultaneously trying to line the net launcher up and trigger it is quite difficult, making automatic firing crucial.

To launch a much larger net with air and keep component size down, I decided to increase pressure to 6.9 MPa. My design is based off a pressure piloted valve and combines the valve and tank in the same body. I designed parts and made drawings in CAD. I did extensive Finite Element Analysis as well as handbook calculations using Factors of Safety greater than that required by ASME Boiler and Pressure Vessel Code. I fabricated each component using a mill, a lathe and a 3D printer. I hydrostatic tested the net launcher to 3 times the operating pressure.

After testing ultrasonic sensors, I settled on Lidar for detecting a flying drone. I interfaced the Lidar sensor to an Arduino micro controller that triggers the launcher when a drone is in the programmable capture zone.

Initial testing of the valve resulted in only low pressure operation. I changed the valve actuation travel distance by machining two more shafts which resulted in full pressure operation and ran steady state Computational Fluid Dynamics to gain insight into the results.

Results

A drone mounted net launcher was successfully tested that can launch a net of 18.5 m^2 for a distance of 7 m or a net of 5.3m^2 for a distance of 11 m. The integrated Lidar sensor works reliably to detect and fire at an unwanted drone. A net tether prevents the captured drone from falling to the ground.

Conclusions/Discussion

The use of a drone mounted net launcher with automated firing and a net tether is an attractive option for disabling and capturing unwanted drones and carrying them to a safe location.

Summary Statement

I designed, built and successfully tested a drone mounted net launcher capable of automatically firing a net of 18.5m^2 at an unwanted drone, disabling and transporting it.

Help Received

My dad approved the safety of the design and supervised machining and testing.