



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

<b>Name(s)</b> <b>Kyle J. Ettinger</b>	<b>Project Number</b> <b>S0308</b>
<b>Project Title</b> <b>Multicopter Disabling Net Launcher</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My goal is to develop a multicopter mounted net launcher that can disable unwanted multicopters. The technology must be robust, light and cost effective for wide implementation. The net launcher should have a large effective capture volume. Currently there are no effective means of disabling multicopters that pose a threat to public safety, security, privacy, aviation and property.</p> <p><b>Methods/Materials</b> I investigated several means of propelling the net. This included building and testing a vacuum and a CO2 cartridge powered launcher, before deciding on compressed air. The design uses 4 bullets that are fired at the same time and expands the net, propelling it forward. Component material and design for low weight was an area of focus. I built and tested several different manifold designs to investigate the effect of bullet size, weight, air pressure, bullet weight, net material and size on net deployment. The final design was mounted and integrated to a multicopter. A servo was added to provide additional aiming control. This design was field tested against another multicopter. A combination of line of sight and FPV (video camera mounted to multicopter) was used to pilot the multicopter and fire the net at the opposing multicopter.</p> <p><b>Results</b> Field testing of the multicopter mounted net launcher showed net deployment was reliable and totally effective at downing the opposing multicopter provided the net made contact with it. The net launcher plus servo control mass is 802 grams making it very feasible to mount on a multicopter. It has a capture volume of up to 3 m<sup>3</sup> which is a useful size and makes precise aiming less critical. The low cost of this system of \$264 makes mounting on a multicopter feasible for wide implementation.</p> <p><b>Conclusions/Discussion</b> Multicopter mounted net launchers could provide an effective means of protecting the public from unwanted multicopters. Improved aiming would make this a compelling technology.</p>	
<b>Summary Statement</b> I developed, built and tested a multicopter mounted net launcher that can disable unwanted multicopters.	
<b>Help Received</b> I designed, built and tested the multicopter net launcher. My dad supervised machining of the components.	