# The Digital Air Rifle Ballistic Measuring Device

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The 10m Air Rifle competition is an ISSF Summer Olympic sport where 1mm can make the difference between winning and losing. Over 57,000 cadets in Canada train with the 853C air rifle in the 10m competition. Aging rifles and damaged components can make rifles inaccurate. To address this challenge, we created a ballistic pellet speed measuring device using a 3D printer, optical sensors, an ESP32, an LCD, a 3D gyro, a 3D accelerometer, and a lithium battery. We tested our device on 21 rifles, with over 2000 shots, in two squadrons, and identified 4 faulty and 4 leaking rifles. Additionally, we evaluated various manual rifle compression methods to determine optimal compression techniques. Using the 3D accelerometer/gyro, we created a marksman profile, logging 512 data points in 5 seconds, recording what the marksman did prior to, during, and after pulling the trigger. This data is incredibly detailed and can be uploaded to the cloud via WiFi for remote viewing. Furthermore, the data can also be downloaded directly via USB. This novel tracking system can efficiently identify good and poor marksmanship techniques and can be used to enhance marksmanship skills such as wobble, breathing, and follow-through. Our project resulted in the replacement of 3 faulty rifles in our squadron and enhanced training for our marksmen. The device fits snuggly on the barrel and doesn't obstruct any sights. Our fast and easy-to-use data can be visualized on a smartphone during training and competition. Overall, this unique, cost-effective device has the potential to be a game-changer for this Olympic sport.