XXIII Twenty Third Annual engineering ▪ design expo2016

University of Idaho College of Engineering

Riflescope Impact Testing Device for NIGHTFORCE®

Team Members: Jason Borth, Dillon Glover, Kylie Touchstone, Jay Anderson (Left to Right)

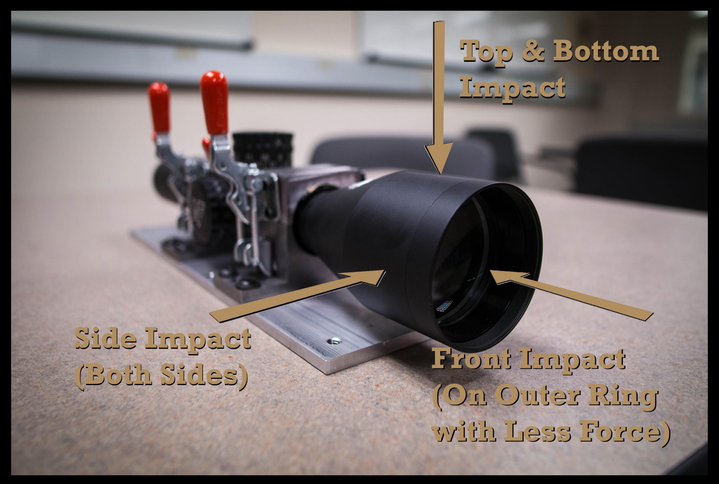
Faculty Advisor: Michael Maughan
Mentor: Dillon Savage

Problem Statement:

Each and every Nightforce riflescope is impact tested as it goes through the production line. This is currently accomplished by impacting the scope by hand against a padded steel pedestal in multiple orientations. After impact the riflescopes are inspected for damage and functionality. When the production line workers manually impact the riflescopes there are inconsistencies with the impacts throughout the day and amongst the workers.

Project Goal:

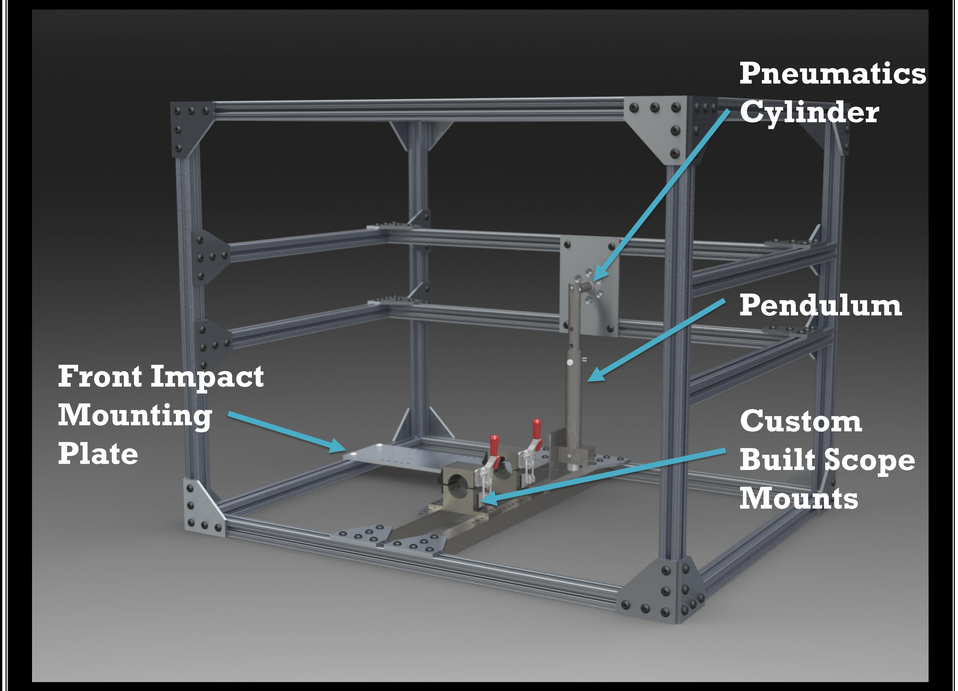
Nightforce Optics is seeking a prototype/proof of concept of an impact device that will consistently deliver a cyclic impact of set value between 200-2000 g's. The prototype needs to allow the user to quickly remove the scope from the device, hit all sides of the scope, and fit an area smaller than 2'x2'x3'. In addition, the prototype cannot cosmetically damage the scope and needs to operate safely.



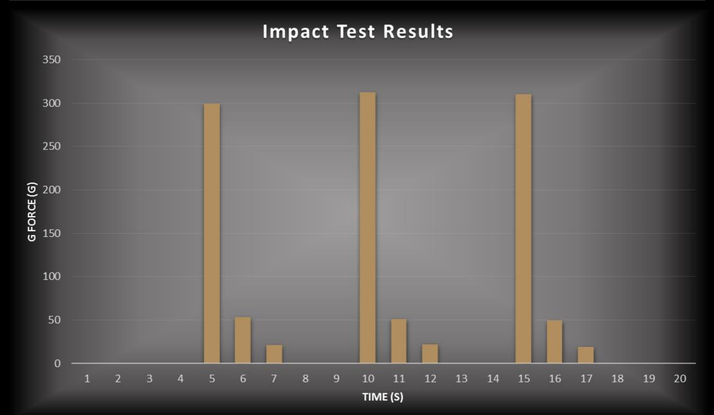
Special Thanks to Russ Porter, Alan Edwards, Pi Boyd, Molly Steiner.

Final Design:

Our solution was to develop an automatic pendulum to consistently hit the riflescope. This automatic pendulum is controlled with an Arduino and propelled by a pneumatic cylinder. The pneumatic cylinder rotates the pendulum allowing it to impact the scope at different forces depending on the air pressure. The Arduino controls the timing and direction of the pendulum swing allowing for cyclic impact. A pressure regulator on the pneumatic system is used to easily adjust the air pressure and vary the impact acceleration. We created custom quick release scope mounts to increase the stability and allow for swift detachment of the riflescope. To increase the safety of our design, acrylic sheets were installed that encase the device.

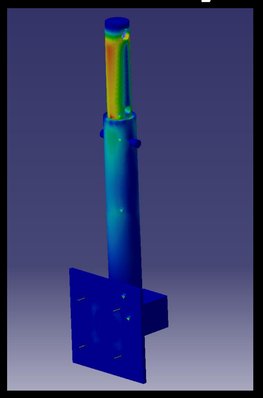


Front impact is accomplished by moving the scope mounts to the front impact mounting plate.



Above is a sample at 30 psi of the results showing the consistence of the impacts. There are also two residual impacts, that help reproduce a real world impact.

FEA Analysis



Using CATIA's FEA analysis tools we were able to verify that the pendulum will not fail and that the stresses will not exceed one tenth of the yielding stress of the metal.