Design Challenge: Test Plans and Manufacturing

Angle Adjustment Test	We need to properly test if the angle adjustment automatically works with the arduino code we made and if it can withstand the weight of the propulsion system.
Propulsion Firing Test	We need to properly test if the spring loaded propulsion system fires with our trigger mechanism and canister design.
Laser Mount Adjustment Test	We need to properly test if the angle adjustment manually works by hand and is easy for MAE staff to use.
Trigger Mechanism Test	We need to properly test if the trigger mechanism is able to be pulled back for loading and won't break due to high stresses.
Durability Test	We need to properly test if the GBL launcher can be fired multiple times and check if every part is secured in place.
Arduino/Coding Test	We need to properly test if the arduino code will function right by giving us the correct exit velocity and angle adjustment to hit the target.
Accuracy Test	We need to properly test how accurate our GBL is by firing multiple times and adjusting the arduino code or design if necessary to hit the target.
Speed Test	We need to properly test how fast the speed of the golf ball is going to be with the trigger mechanism and spring used.
Sensoring Test	We need to properly test the sensors we bought to give us accurate readings of the speed of the golf ball.
Compatibility Test	We need to properly test if the

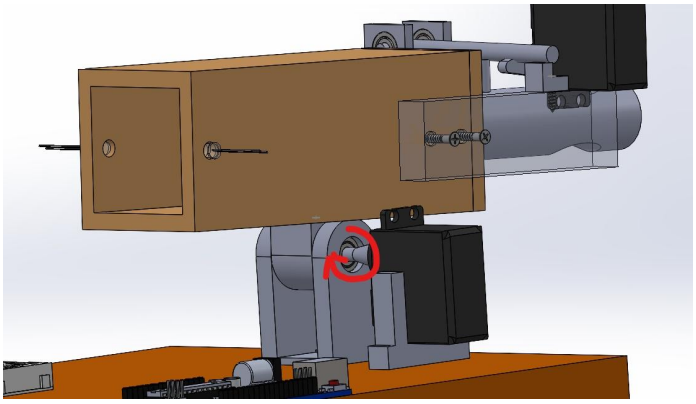
	manufactured parts we made are compatible with the parts we ordered from Amazon and McMaster, along with the baseplate of the laser mount to the base platform.

Propulsion Firing Test full Planned Test

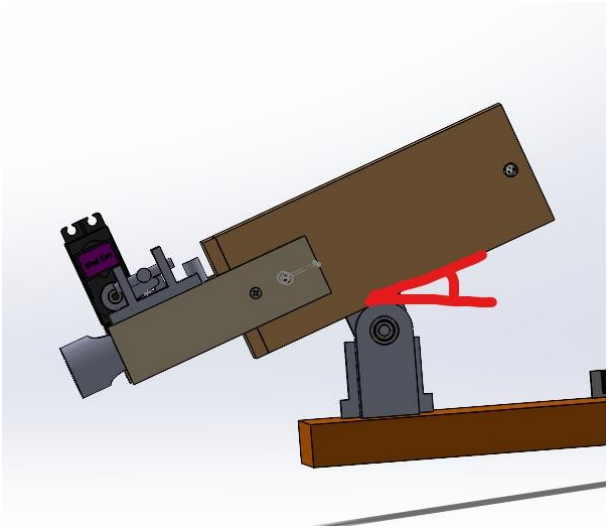
The goal of the propulsion firing test is to verify that our firing mechanism works end to end to reach a desired launch distance in the range of 5-20 feet and allows the recording of all the essential values that we need to report as part of our project objectives, namely angle variation, height variation, and exit velocity.

Our planned setup is as follows:

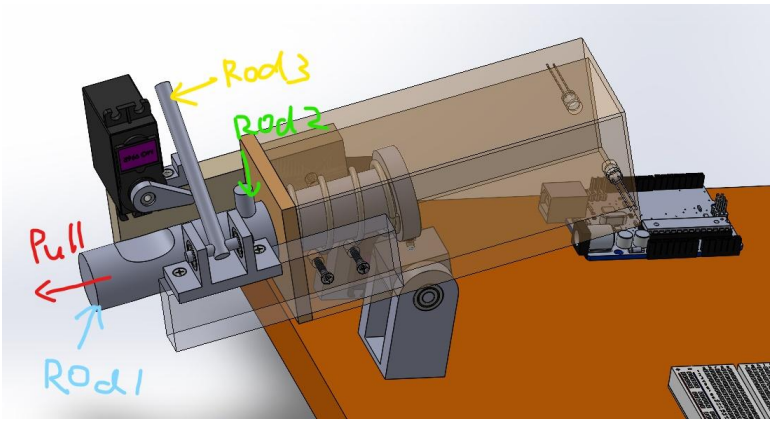
1. Adjust Angle. Input: angle in Arduino. Output: angle adjustment.



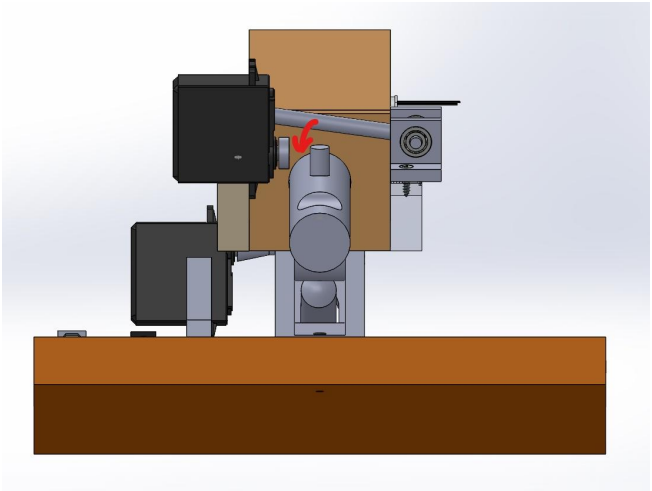
After inputting the desired angle, the servo motor will rotate the canister.



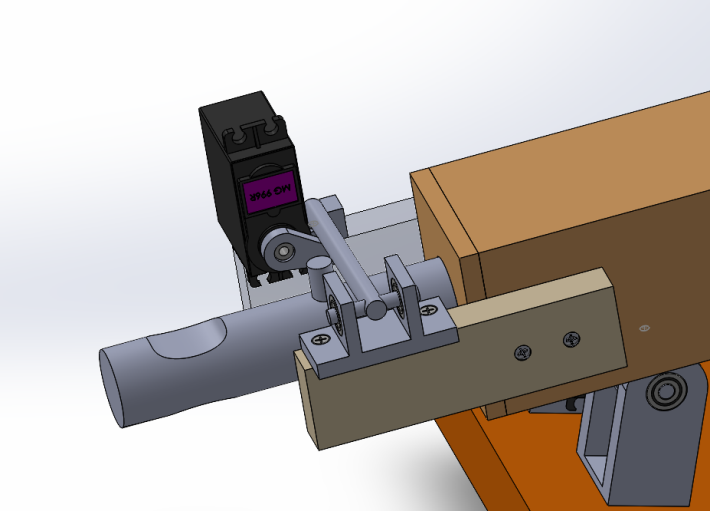
2. Store Energy: Pull Rod 1 and it will compress the spring to store energy.



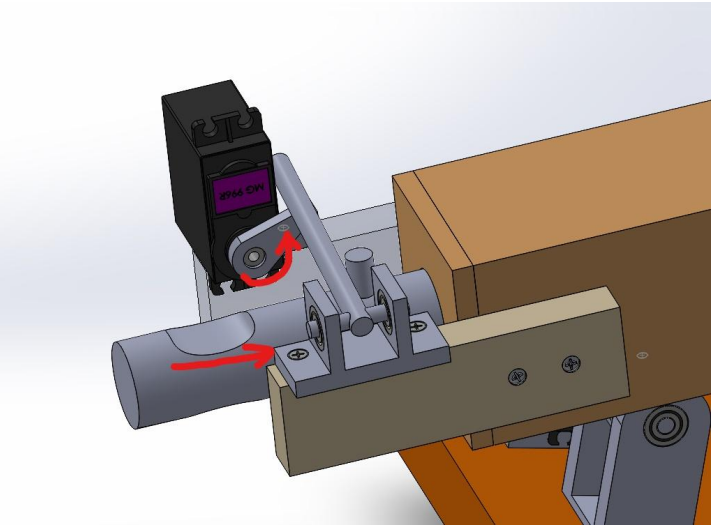
Pull Rod 1 until Rod 2 passes Rod 3.



Put down Rod 3 to block Rod 2.



3. Firing. Input: send Firing signal to Arduino, the servo motor lifts the Rod 3.



After Rod 3 has been lifted, the spring recovers to shoot the ball while the Sensors measure exit velocity.

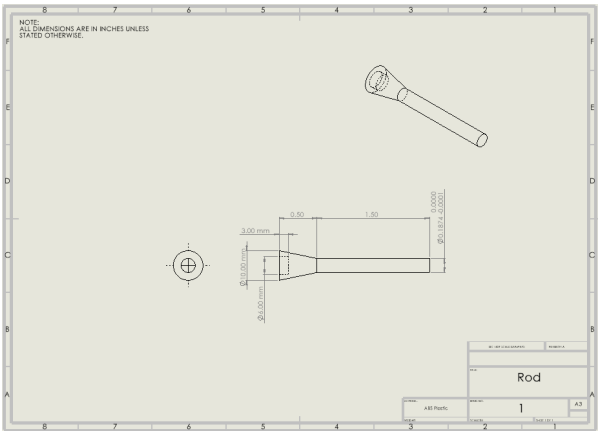
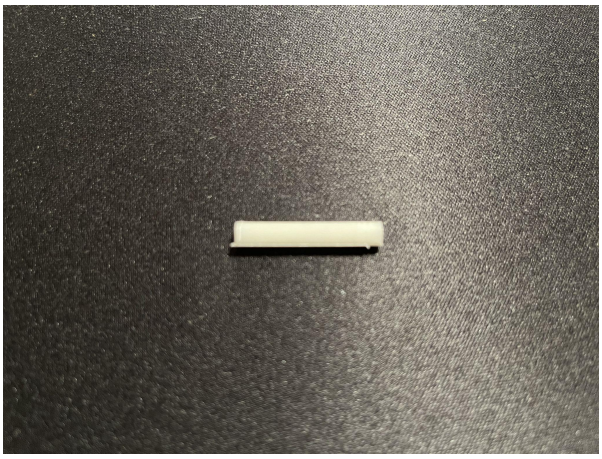
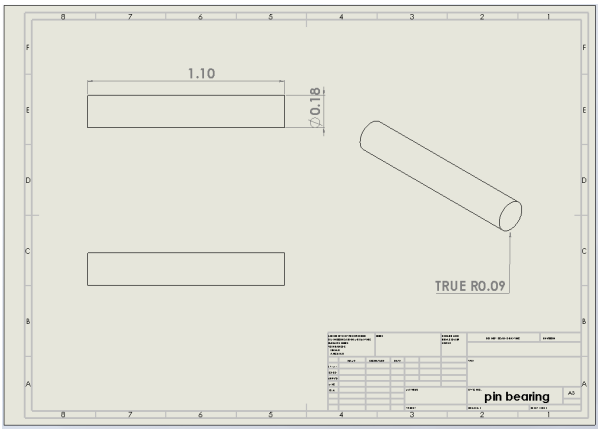
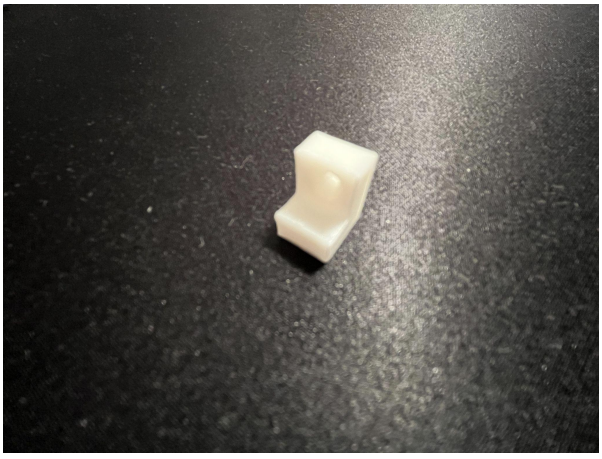
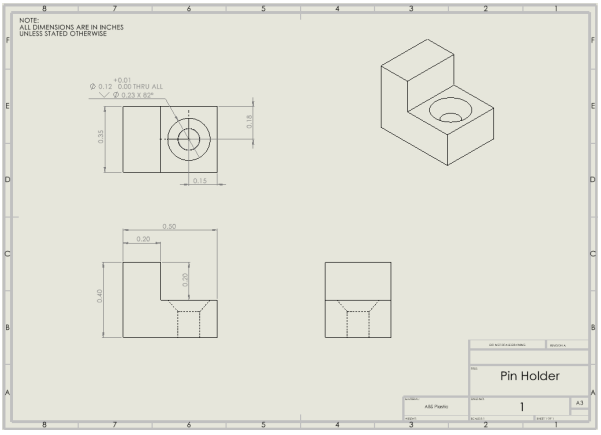
The equipment we will need include a golf ball, Arduino hardware, Arduino software installation, 3D printer from FabWorks, ET301 handtools to make any necessary tightening adjustments, and a notebook/pen to have a physical record of our test results.

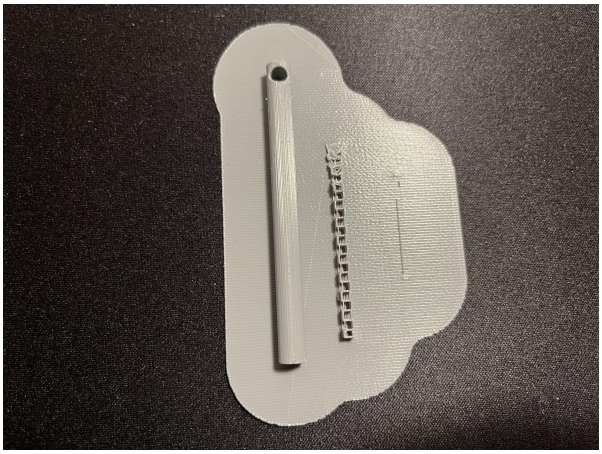
As stated earlier, the parameters that will be varied include angle variation and height variation, which in turn we hope to use to identify the exit velocity under these given initial conditions.

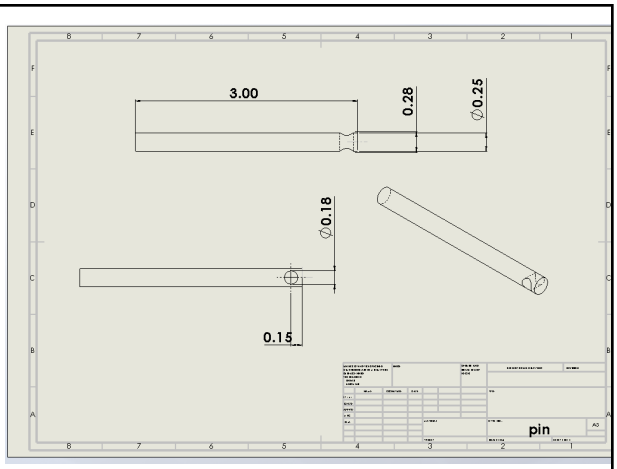
We will input 7 angle values, which in turn will vary 7 height values using trigonometric rules based on the length of our firing rod from initially firing position where the golf ball rests before the triggering mechanism releases to the open end of the rod.

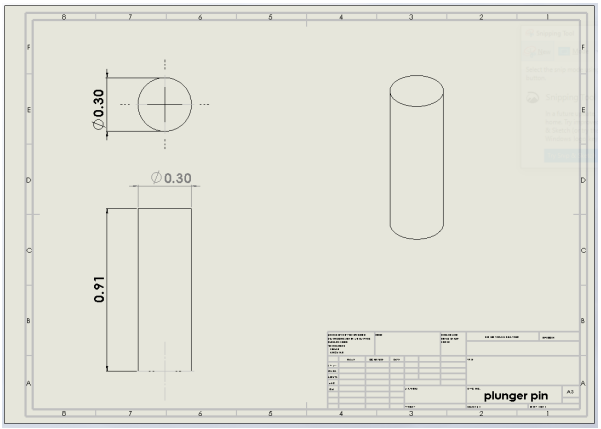
Test Angle (degrees)	Test Height (cm)	Exit Velocity (m/s)
0		
15		
30		
45		
60		
75		
90		

We expect that as the angle increases, the exit velocity will decrease due to gravitational forces as well as air friction.

Manufactured Parts	Engineering Drawings
	
	
	




3.00
0.28
∅0.25
∅0.18
0.15
pin


∅0.30
∅0.30
0.91
plunger pin