bi-stable mechanism

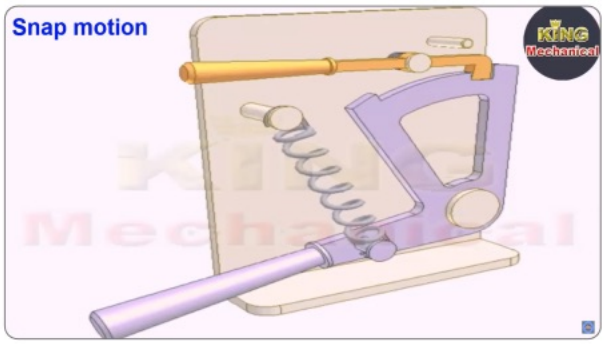
with **Logan Panchot**

Final Project

Demonstrated proficiency with 3D modeling and digital fabrication by designing and constructing a **bi-stable mechanical device** that switches between two unique states and visually displays an indication of its current state.

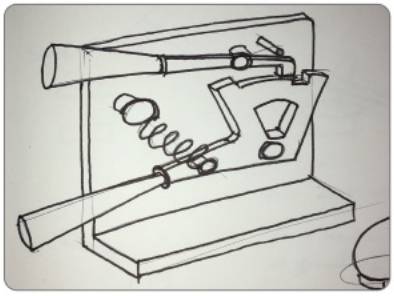
design concept

During our research, we discovered an animation of a mechanism that performed a dynamic snap motion, which generated great inspiration for our design. In retrospect, the user's physical interaction with the device could have been better considered in the beginning stages of design- an important lesson I will never forget.

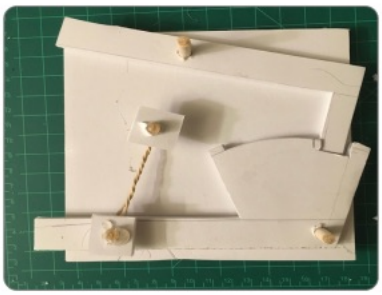


Inspired by
King Mechanical's animation of a bi-stable locking mechanism.

learning from prototypes



early sketching
for scale and proportion

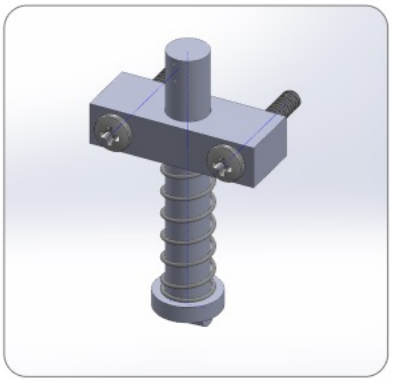


rapid prototyping
forces us to consider moments

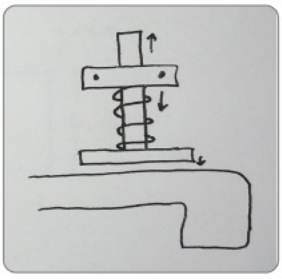
functional prototyping
gave us clear direction

a problem of function

Our first design challenge was to find an elegant solution for applying downward force to the top lever arm, since the first model applied unwanted moments to the lever arm. To create a more controlled movement, we decided to push the arm from the top.

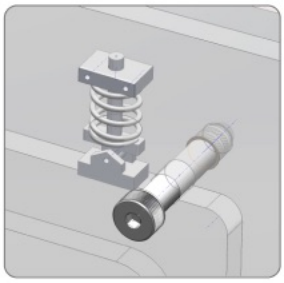


spring assembly
for downward force



sketch
a basic idea

prototype
quickly for perspective



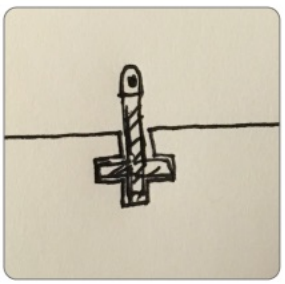
iterate
until it's simple

fabricate
and combine with stock parts

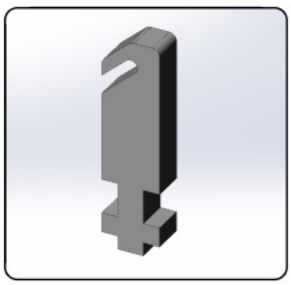
a problem of form

Our original design called for a square bolt and screw to anchor the spring to the bottom lever arm, but the rugged construction clearly diminished the aesthetic we were trying to achieve. By custom designing a solution we achieved a sleek appearance without redesigning any existing parts.

problem
this was not okay



sketch
quick text to my partner



sea horse
spring anchor

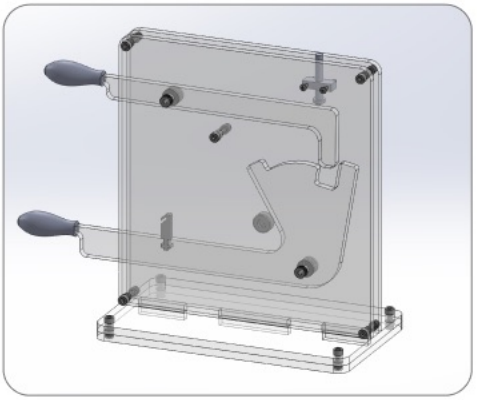
print
a perfect fit

finding meaning

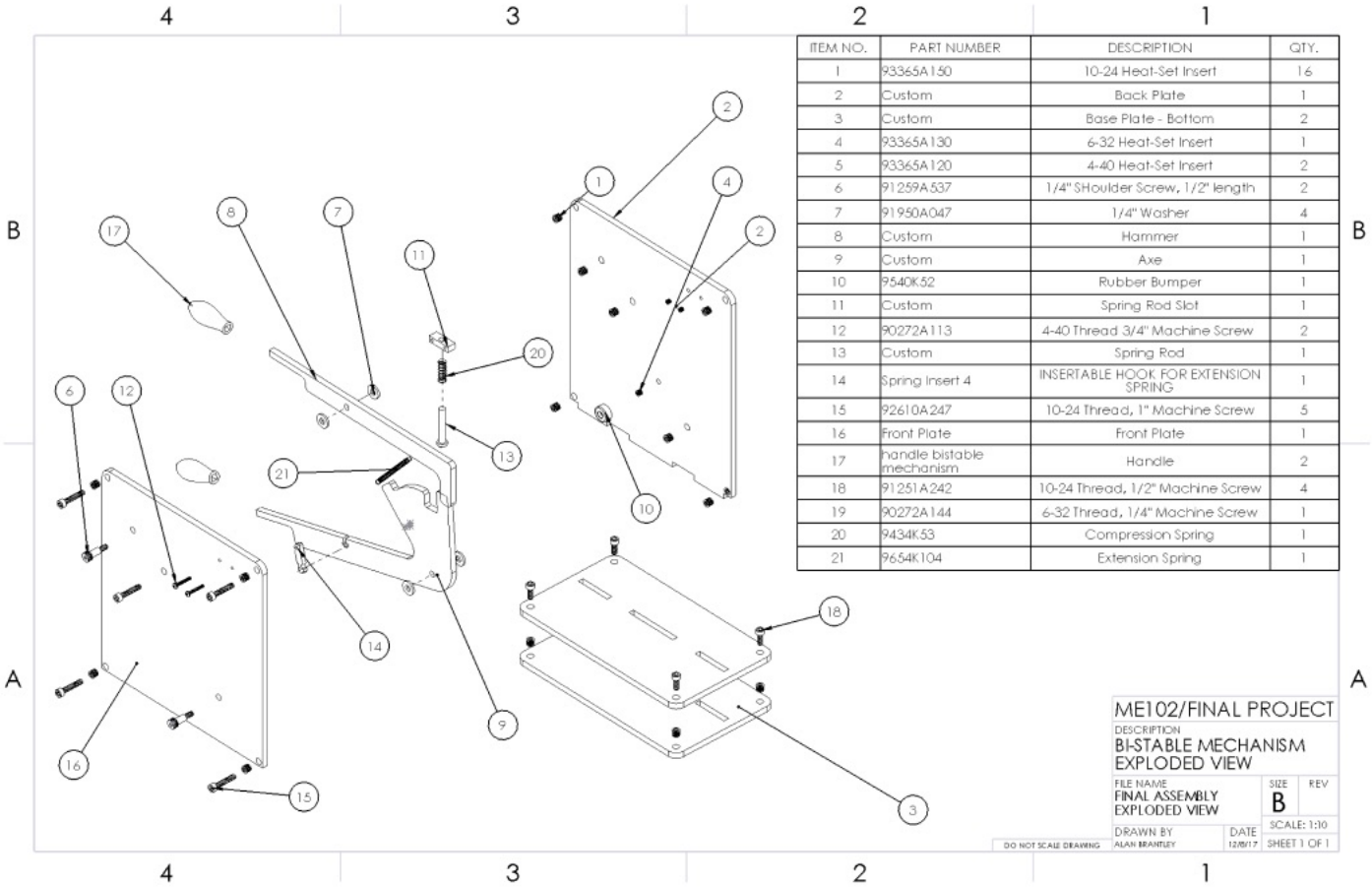
I loved this part of the project because I was completely engaged. I had a vision and was determined to achieve no less.

cad assembly and bill of materials

The final model consists of 87 individual parts and is made primarily of 1/4" acrylic. In total, four components were 3d printed and the rest was purchased or formed with a laser cutter.

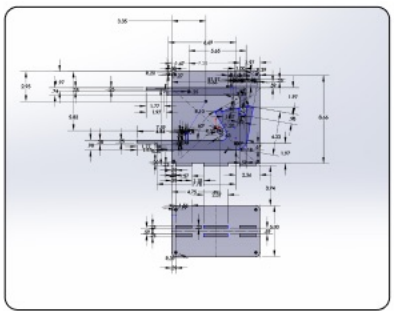


final assembly

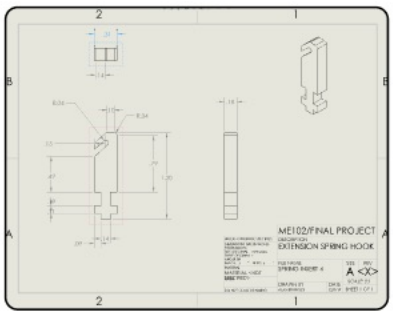


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	93365A150	10-24 Heat-Set Insert	16
2	Custom	Back Plate	1
3	Custom	Base Plate - Bottom	2
4	93365A130	6-32 Heat-Set Insert	1
5	93365A120	4-40 Heat-Set Insert	2
6	91259A537	1/4" SHoulder Screw, 1/2" length	2
7	91950A047	1/4" Washer	4
8	Custom	Hammer	1
9	Custom	Axe	1
10	9540K52	Rubber Bumper	1
11	Custom	Spring Rod Slot	1
12	90272A113	4-40 Thread 3/4" Machine Screw	2
13	Custom	Spring Rod	1
14	Spring Insert 4	INSERTABLE HOOK FOR EXTENSION SPRING	1
15	92610A247	10-24 Thread, 1" Machine Screw	5
16	Front Plate	Front Plate	1
17	handle bistable mechanism	Handle	2
18	91251A242	10-24 Thread, 1/2" Machine Screw	4
19	90272A144	6-32 Thread, 1/4" Machine Screw	1
20	9434K53	Compression Spring	1
21	9654K104	Extension Spring	1

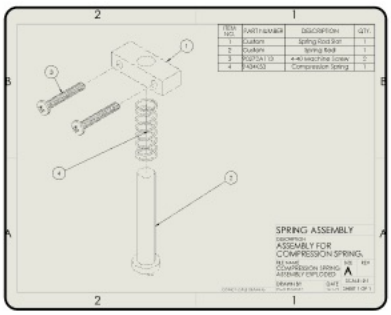
ME102/FINAL PROJECT
DESCRIPTION
BI-STABLE MECHANISM EXPLODED VIEW
FILE NAME: FINAL ASSEMBLY EXPLODED VIEW
SIZE: B
REV:
SCALE: 1:10
DRAWN BY: ALAN BRANTLEY
DATE: 12/05/17
SHEET 1 OF 1
DO NOT SCALE DRAWING



master modeling
propagate changes through model

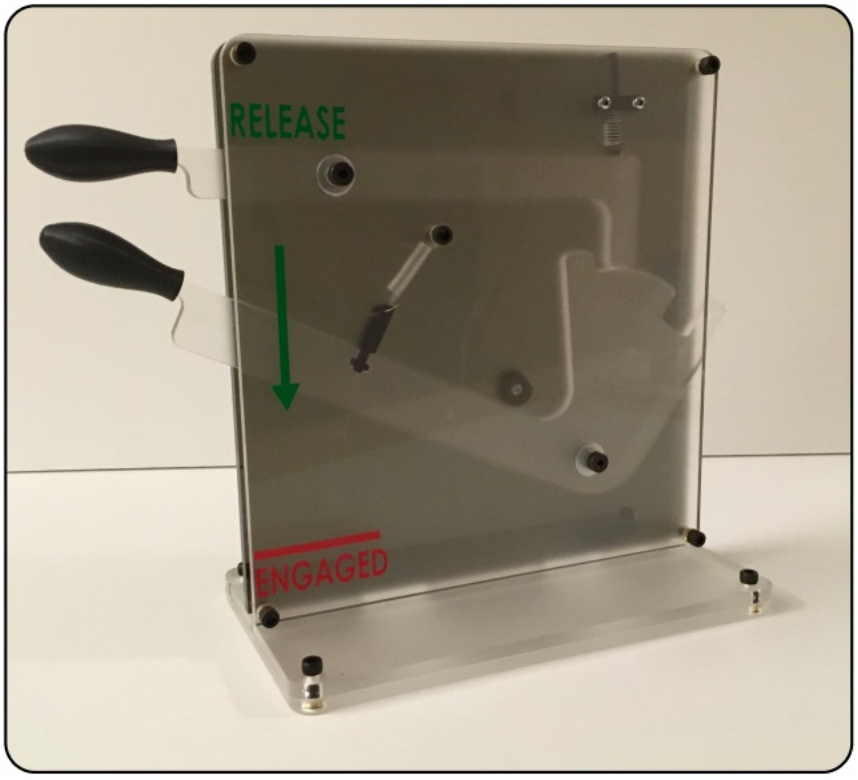


model assemblies
ensure precision fitting



engineering drawings
communicates intent

maker's delight

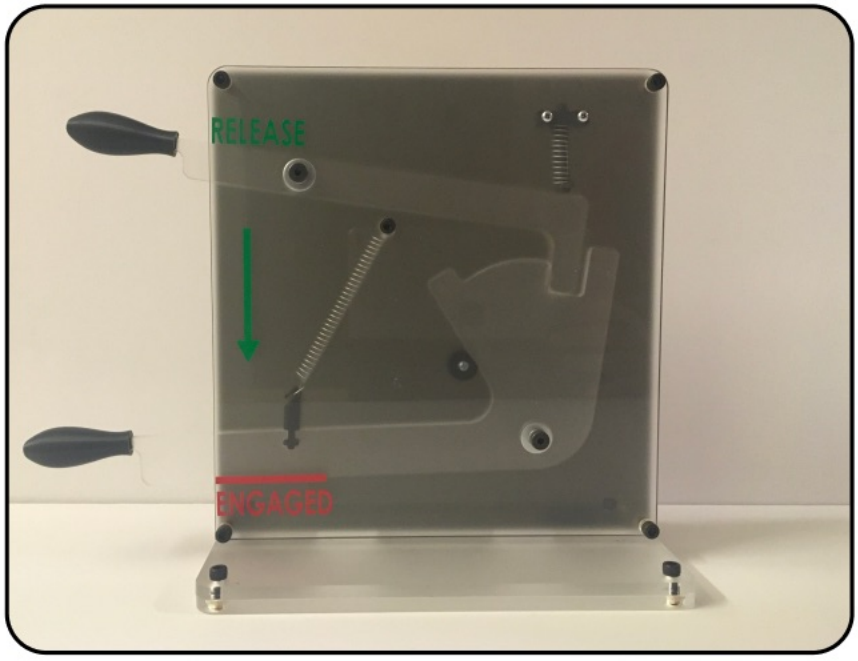


bi-stable locking mechanism
released

meet the maker
alan brantley

reflection

The precise snapping motion achieved was deeply satisfying. Designing parts to meet specific challenges was exhilarating and I found myself *always* wanting to be working on the problem in my free time. It was the first time in my college career that I felt 100% engaged and in the flow with a project as more than an assignment.



engaged