

DESIGNING THE

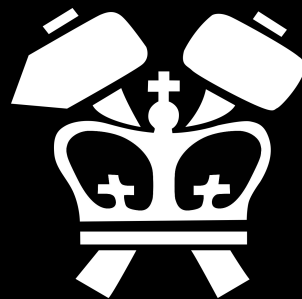
FINAL REVIEW

HENRY TUCHER

FERNANDO A. PASCUAL

AUSTEN PARIS

VALVE



DECEMBER 7, 2018

DESIGN PROCESS

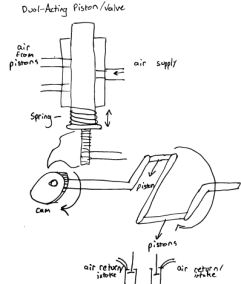


Figure 1: Preliminary Sketch

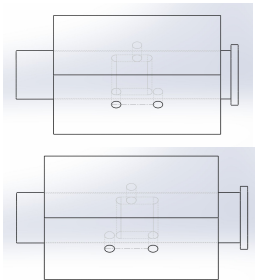


Figure 2: Preliminary CAD

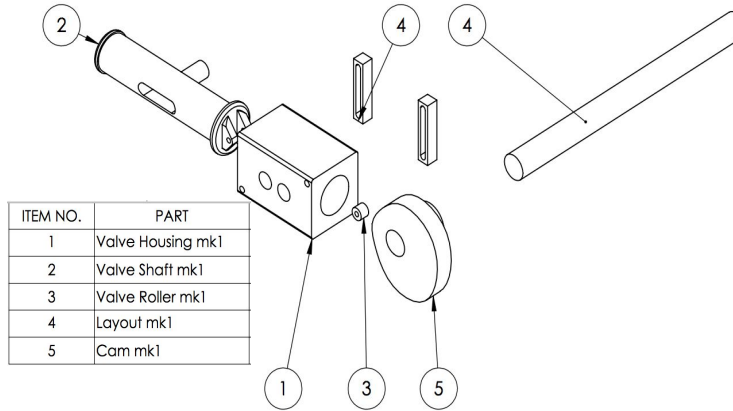
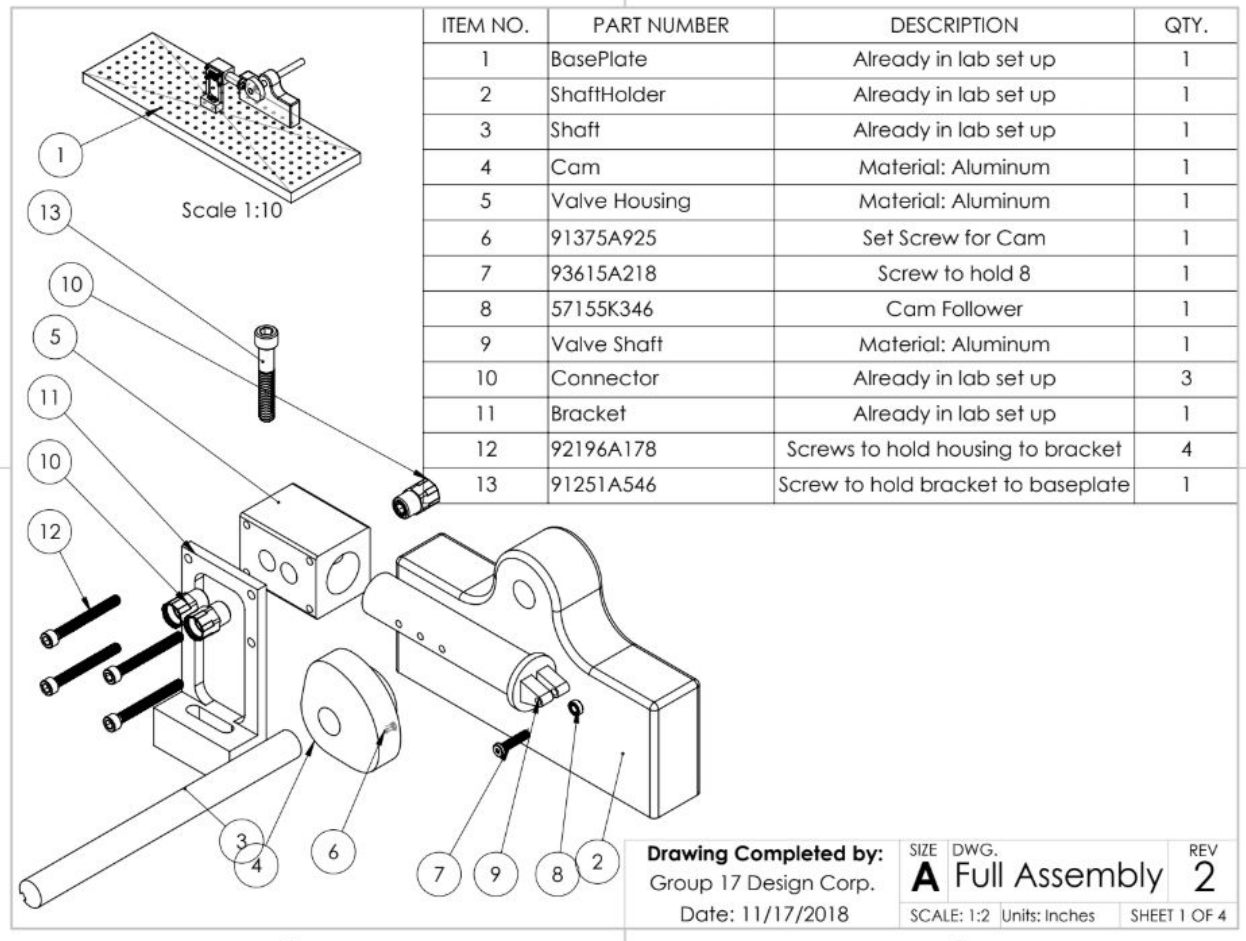


Figure 3: Exploded Assembly of Preliminary Design

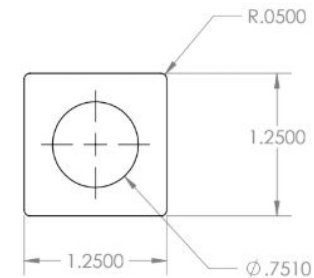
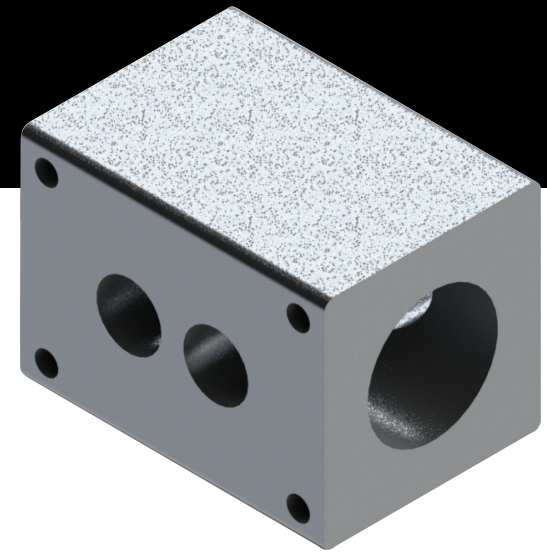
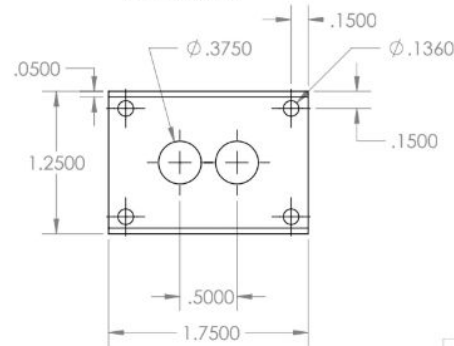
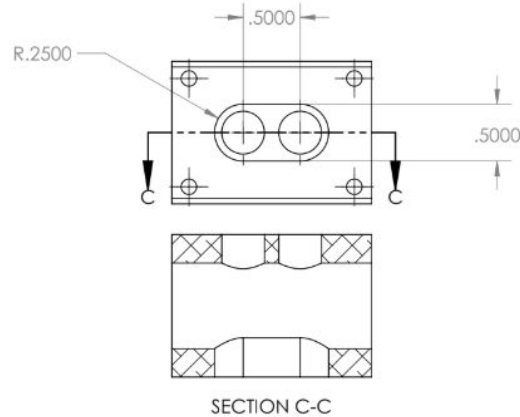
- Modified 3/2 spool valve with two inlets driven by pneumatic pistons and an air inlet
- Cam follower
 - roller bearing
 - .5" stroke
- Cam with cycloidal function chosen from research:
 - Best compromise between velocity, acceleration, and smooth perimeter
- Little to no seizing or major leakage
- Used existing bracket, standard hardware, and lots of lubrication

FINAL DESIGN



FINAL DESIGN: HOUSING

- Milled from aluminum billet
 - Various sized end mills to face and drill 3 hole sizes and slot
 - CNC operation for slot
- Lubrication and sanding to lower friction
 - Properly lubricated aluminum can be close to brass friction coefficient



Drawing Completed by:
Group 17 Design Corp.
Date: 11/17/2018

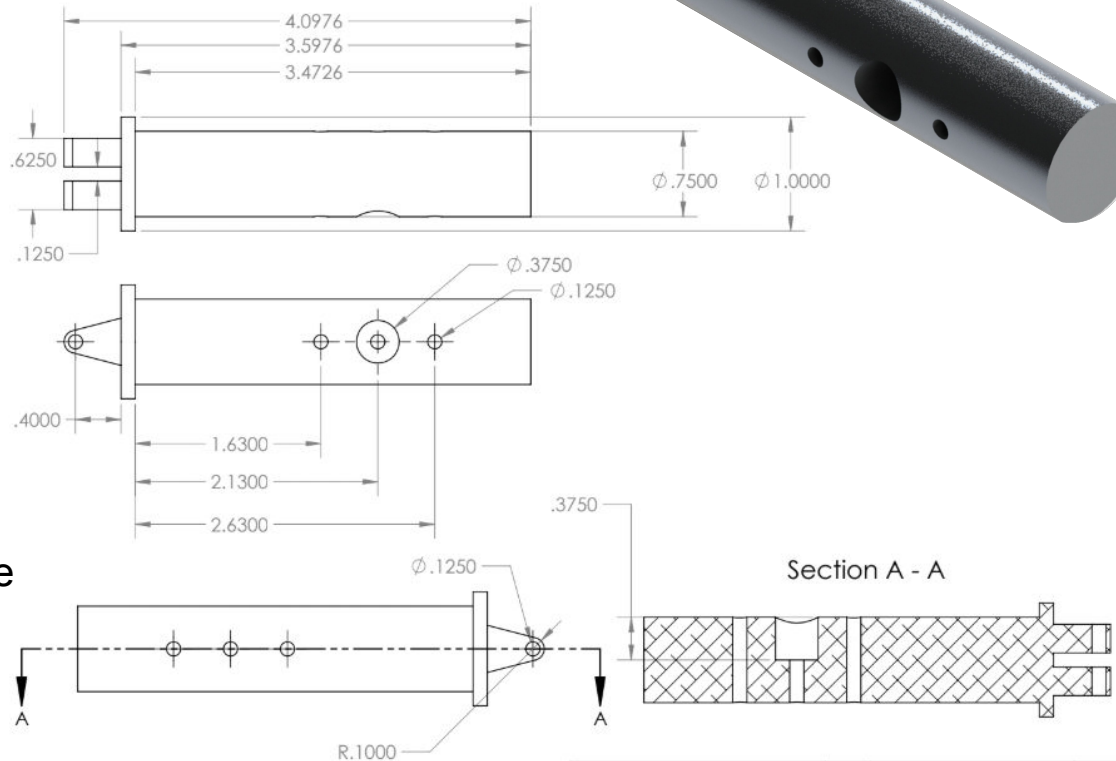
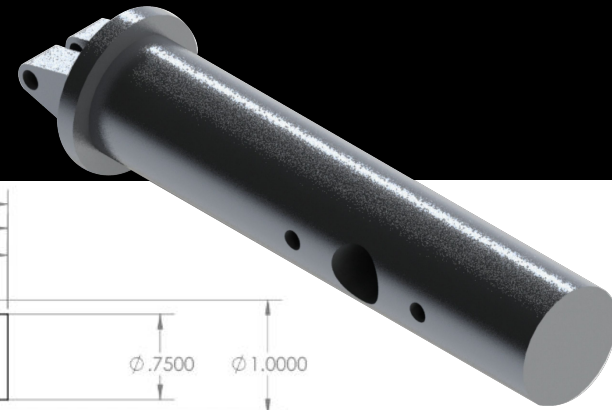
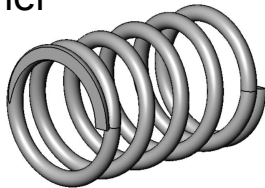
SIZE	DWG.
A	Housing

REV
2

SCALE: 1:1 Units: Inches SHEET 2 OF 4

FINAL DESIGN: SHAFT

- Lathe and mill operations
 - Lathe to reduce to proper shaft size and make flange
 - Mill for through holes and bearing mount
- .5" of stroke
- Wound up using slightly longer spring at 66 lbf/in, instead of shorter compression spring - valve ran smoother

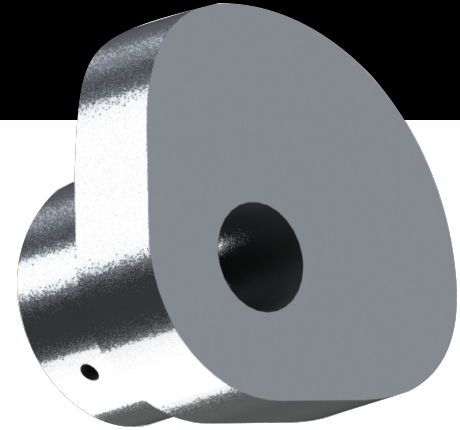
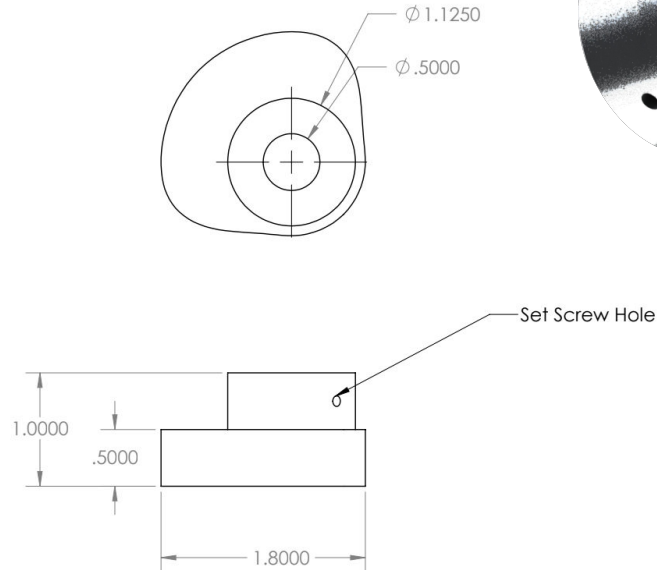


Drawing Completed by:
Group 17 Design Corp.
Date: 11/17/2018

SIZE	DWG.	REV
A	Valve Shaft	2
SCALE: 1:1 Units: Inches		SHEET 3 OF 4

FINAL DESIGN: CAM

- Rise-Dwell-Fall-Dwell
- 90 Degree Increments
- .5" of travel
- Cycloidal rise and fall
 - As compared to 3-4-5
 - Smooth jerk
 - Good acceleration
 - No dips in cam profile
- MasterCam operation for whole part, followed by facing on mill and sanding



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Group 17 Design Corp.
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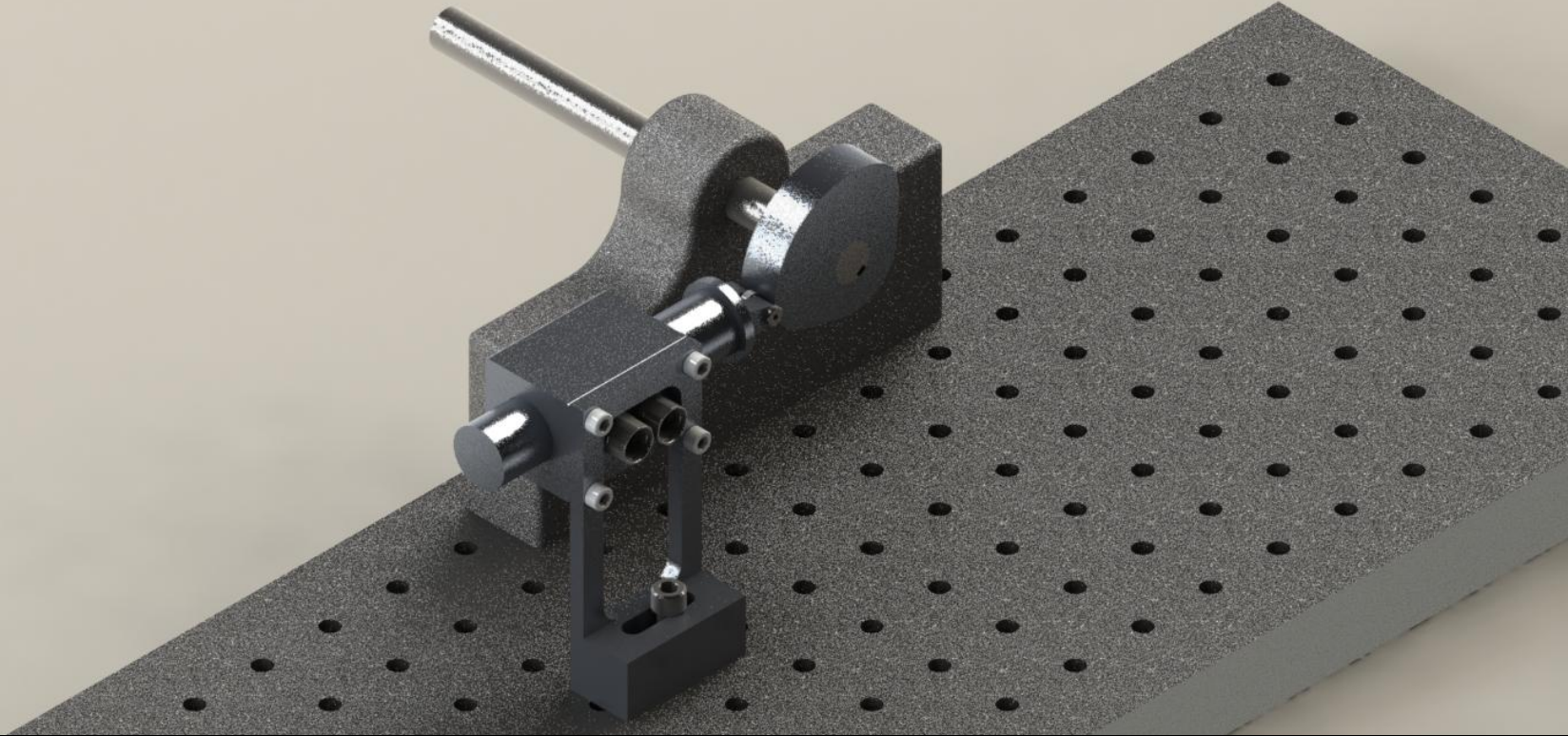
SIZE
A

DWG.
Cam

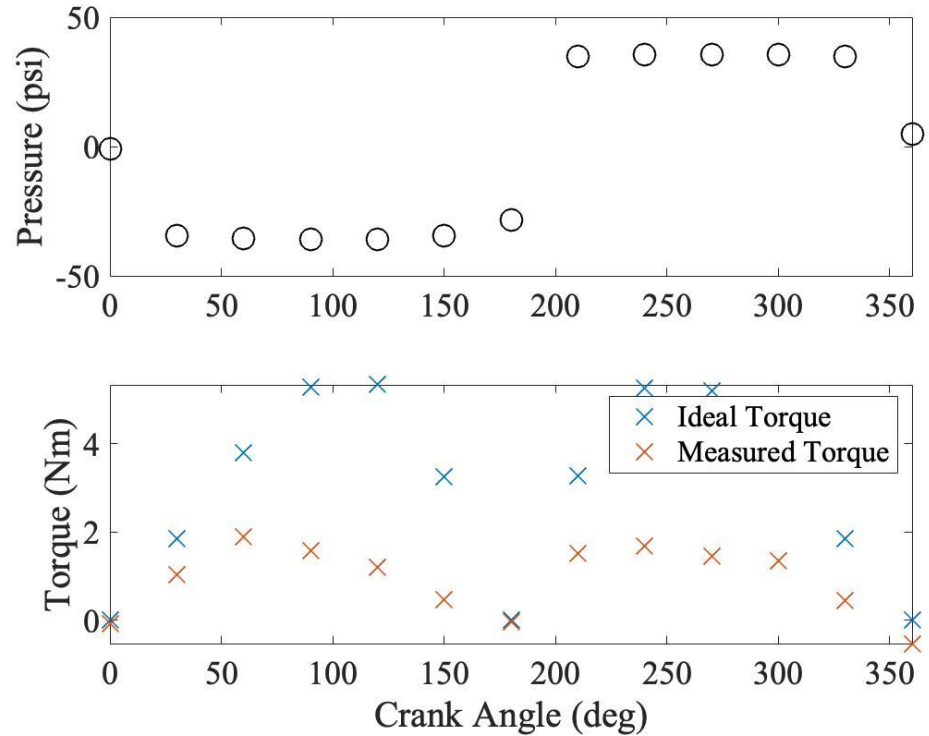
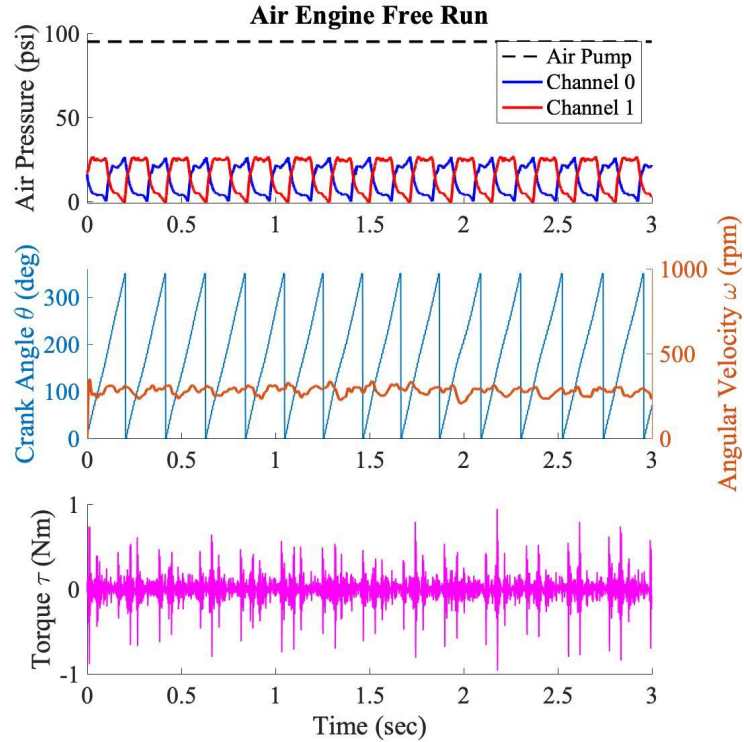
REV
2

SCALE: 1:1 Units: Inches SHEET 4 OF 4

FINAL DESIGN

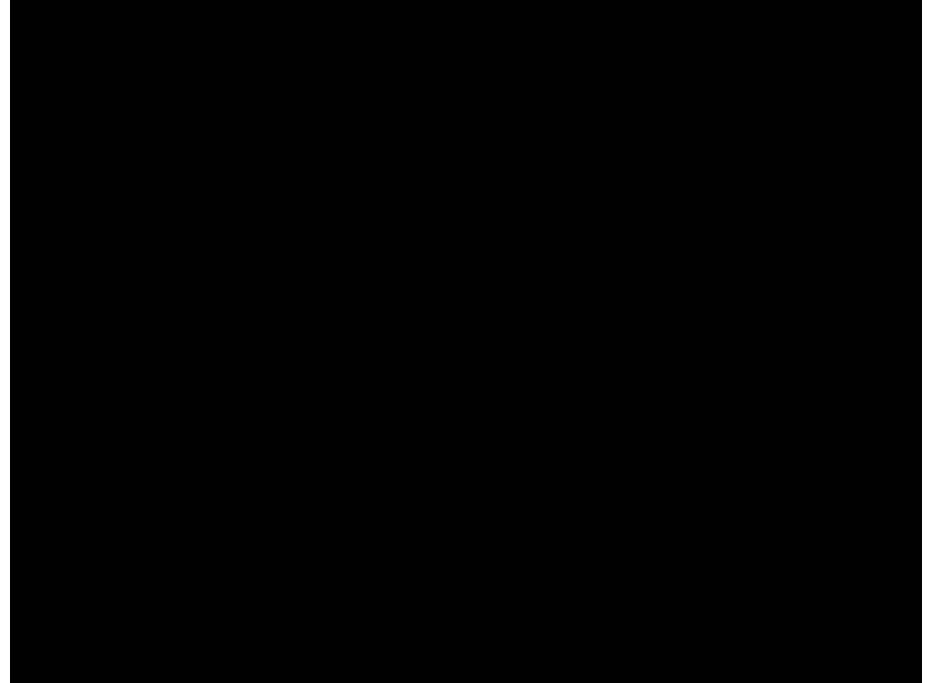


DATA ANALYSIS

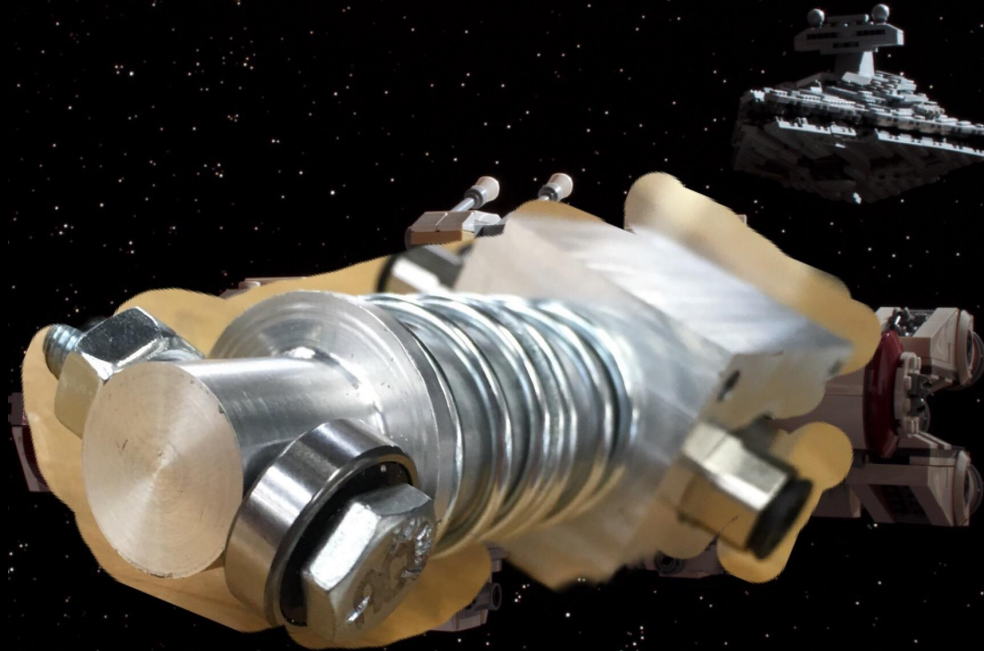


VIDEO AND COSTS

- Our total cost was drastically lower than the average spent by other teams because of both the efficiency in material use for such a compact design and because of our resourcefulness in sourcing parts
- As a result, we were able to keep the budget for materials we actually used to under \$26 according to Bill's calculation, which doesn't include the spring and roller which we sourced from the shop



THE FORCE IS STRONG IN THIS ONE



THANK

YOU