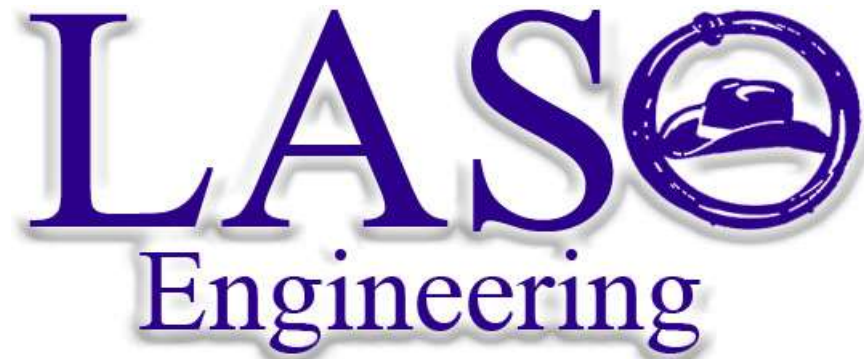


Assistive Technology Fishing Device



Lang, Lucas – Project Manager & Electrical
Axmann, Andrea – Structure
Shears, Bryan – Structure
Overcast, Bryan – Pneumatics

Background & Purpose

- Peter Pauwels volunteers at Craig Hospital
 - adaptive technology fishing equipment
- +20 years of experience
- Builds AT fishing devices at no cost for people and groups around the nation
- User Interfaces
 - Joystick
 - Sip & Puff
 - Chin Switch
- Challenge: Fishing Device Functionality
 - Variable distance casting
 - Hooking action
 - Maintaining fishing experience
- Opportunity to significantly improve lives



The Basics

- Rotational Actuation
- Compressed Gas
- Electrically Controlled
- Batteries



Operating Processes

- Pullback
- Casting
- Hooking
- Reel-in



Design Specifications

- Parts cost < \$1000
- Variable distance casting = 30 → 80 feet
- Have a hooking function
- Water resistance = drip proof

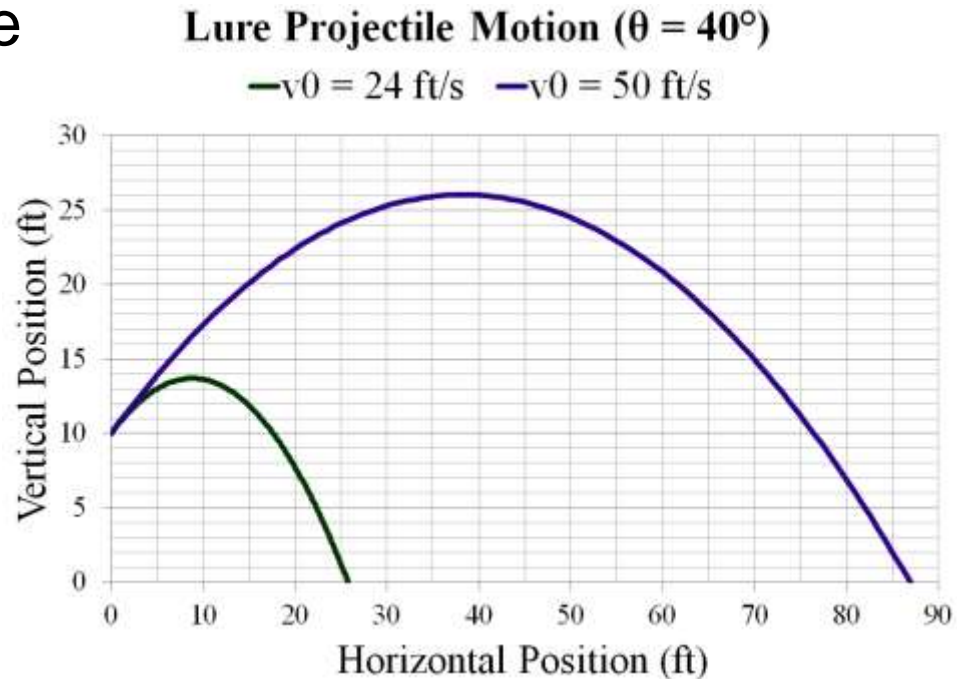


Previous Prototypes

	Distance 30 feet	Distance 80 feet	Hooking	Drip Proof	Cost
Ours	✓	✓	✓	✓	✓
2002 UW	✗	✗	✗	✗	✗
2011 UW	✓	✗	?	?	✗
Torsional Spring	✓	✗	✗	?	✗
Linear Spring	✓	✗	?	✗	✗
Linear Springs	✓	✗	✗	✗	?
Pneumatic Cylinder	✓	✓	✗	✗	?

Projectile Motion of Lure

- Assumptions:
 - Negligible Air Resistance
 - Launch Height
- Varied Inputs:
 - Launch Velocity
 - Launch Angle
- **Determined that:**
 - Launch Angle = $\sim 40^\circ$
 - Launch Velocity = 24-50 ft/s

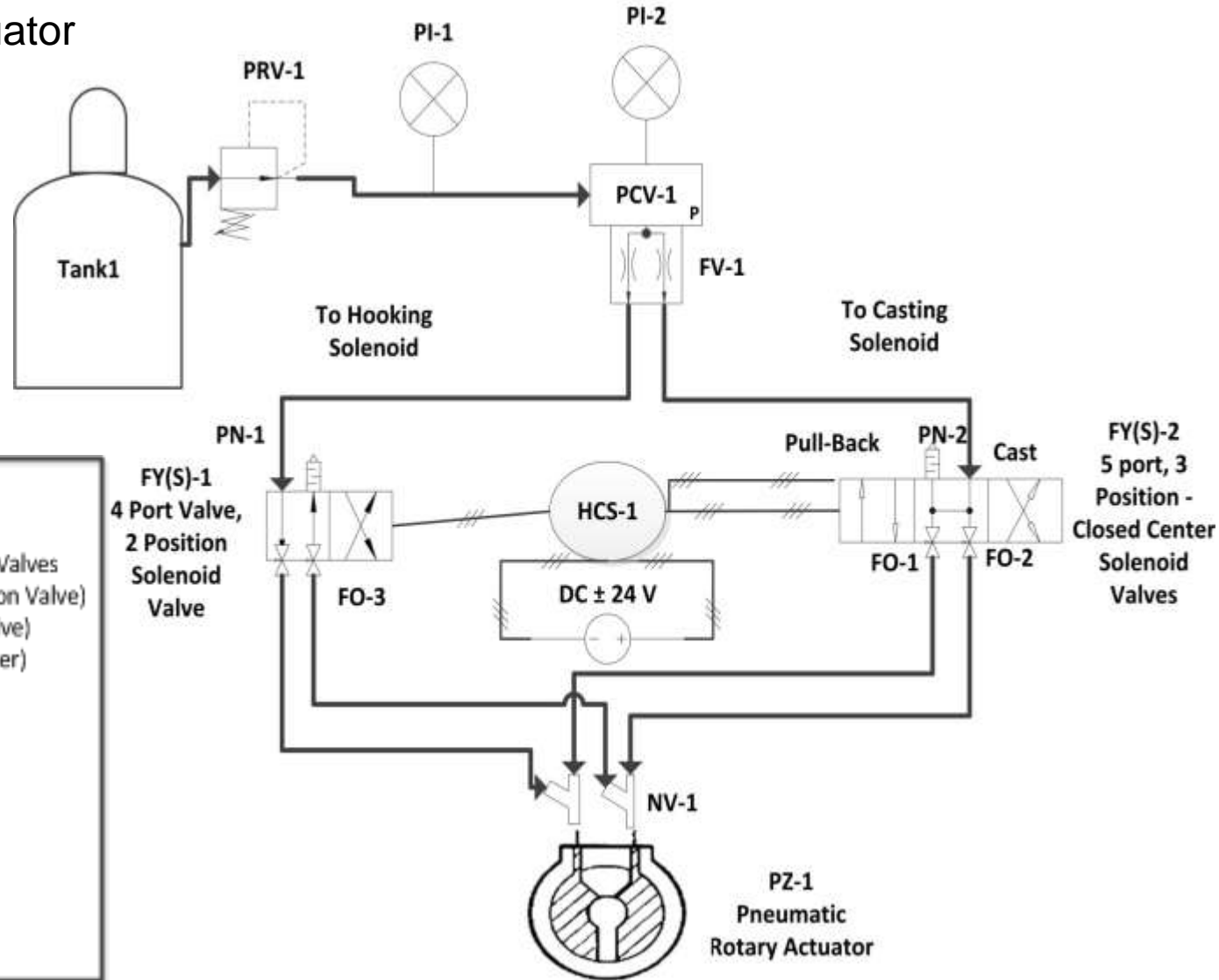


Required Torque to Launch Lure

- Assumptions
 - Rod is rigid
 - Lure attached at tip of rod
 - Lure considered a point mass
 - Pole angular displacement
- Known Values
 - Polar Moment of Inertia
 - Final Lure Velocity
- Calculated
 - **Required Torque = 150-225 in-lb**

Pneumatics

Pneumatic Rotary Actuator



LEGEND

- DC – DC Power Source
- FO – Flow Rate Restrictor (Orifice) – Needle Valves
- FV – Flow Rate Directional Valve (Tee or Union Valve)
- FY (S) – Flow Rate Relay Switch (Solenoid Valve)
- HCS – Hand Control Switch (Joystick Controller)
- NV – Union Valve
- PCV – Pressure Control Valve
- PI – Pressure Indicator (Gage)
- PN – Pressure Exhaust
- PSV – Pressure Relief Valve
- PZ – Pneumatic Rotary Actuator

— // — Electrical Wire

—> Pneumatic Line

Circuitry & Controls

- Joystick
- 24 Volt & 12 Volt Direct Current
- DC Motor for Reel-in Process
- Solenoid Valves for Pneumatics
- Solenoid for Line Release

Line Release



Cam Activated Switch

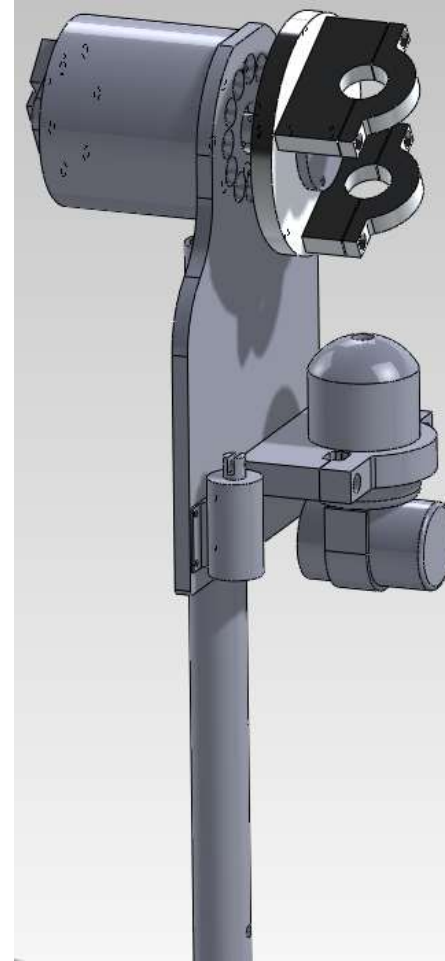


Solenoid Activated Line Release

Device Structure

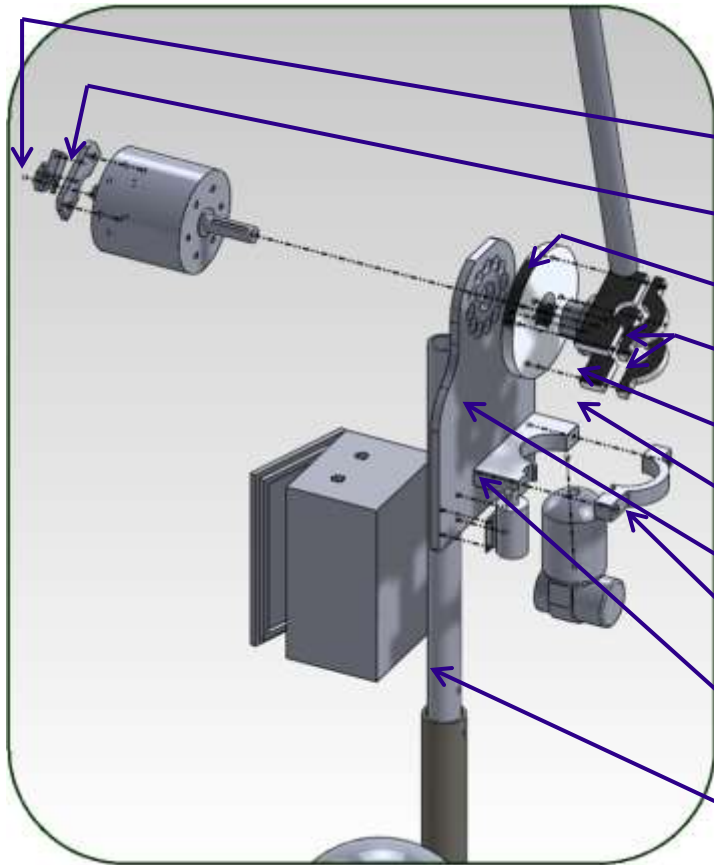


AT Fishing Device



Structural Components

Device Structure



Part Number	Part Description
ATFP3	Cam for line release
ATFP2	Switch base for line release switch
ATFP10	Bushing insert
ATFP6	Pole saddle top (2)
ATFP4	Pole saddle bottom 1
ATFP5	Pole saddle bottom 2
ATFP1	Plate for actuator and reel
ATFP9	Reel saddle top
ATFP8	Reel saddle bottom
ATFP12	Post to mount plate

Economic Analysis

Electrical Components	\$ 90.00
Pneumatic Components	\$ 655.00
Structural Components	\$ 235.00
Component Total	\$ 980.00
Stand	\$ 182.00
Reel and Rod	\$ 50.00
Labor	\$ 1,440.00
Engineering Design	\$18,000.00
Project Total	\$20,652.00

Meeting Design Specifications

- Variable distance casting ✓
- Hooking function ✓
- Drip proof ✓
- Under \$1000 ✓
 - Project cost for Peter: \$1200

Recommendations

- Capability to use sip and puff controller
- Indicator dial to estimate casting distance
- Handle to ease transportation
- Line tensioning solenoid
- Rod Angle Adjustment

Acknowledgements

Sponsored By The National Science Foundation

Biomedical Engineering Research to Aid
Persons with Disabilities: Grant 0962380

Special Thanks to:

Peter Pauwels

Dr. Anne Peck

Dr. Steve Barrett

Mr. Scott Morton

Dr. Robert Erikson

The UW CEAS Machine Shop

Questions?



References

- Alciatore, D., & Hstand, M. (2007). *Introduction to Mechatronics and Measurement Systems*. McGraw Hill.
- Barrett, D. S. (2011, Aug. - December). Private Communications. Laramie, WY.
- Beer, F. (2007). *Vector Mechanics for Engineers: Dynamics*. McGraw-Hill.
- Budynas, R. G., & Nesbett, K. J. (2011). *Shigley's Mechanical Engineering Design* (9th ed.). New York, New York: McGraw-Hill.
- Dorf, R. C., & Svoboda, J. A. (2006). *Introduction to Electric Circuits* (7th ed.). (C. F. Shultz, Ed.) Hoboken, New Jersey: John Wiley & Sons, Inc.
- E-Switch. (2011). *LS Series Standard Snap Action Switches*. Retrieved from <http://www.e-switch.com/product/tabid/96/productid/91/sename/ls-series-standard-snap-action-switches/default.aspx>
- Hong, I., & Tessman, R. (1998). The Dynamic Analysis of Pneumatic Systems Using HyPneu. *FES/BarDyne Thechnology Transfer Publication #8*. BarDyne, Inc. Retrieved 2011, from www.bardyne.com/Documents/ttp08.pdf
- ISA. (1992, July 13). Instrumentation Symbols and Identification. *ISA-5.1-1984 (R1992)*. Research Triangle Park, North Carolina: Instrumentation Society of America.
- Katsuhiko, O. (2004). *System Dynamics* (4th ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.
- MachineDesign.com. (2002, August 8). The Basics of Pneumatic Control. Penton Media, Inc. Retrieved November 2011, from <http://machinedesign.com/article/the-basics-of-pneumatic-controo-valves-0808>
- Morton, S. (2011, September through December). Private Communications. Laramie, Wyoming.
- Norgren, Inc. (2011). Simplified Valve Circuit Guide. *A Guide to Understanding Pneumatic Directional Control Guides*. Norgren, Inc. Retrieved from <http://www.omega.com/auto/pdf/SimpValveCirGuide.pdf>
- Parker. (2011). *Pneumatic Rotary Actuators: PRO-PRN*. Retrieved November 2011, from http://www.parker.com/literature/Pneumatics%20Division%20Europe/PDE-Documents/PRO_Technical%20Catalogue-UK.pdf
- Pauwels, P. (2011, September to November). Private Communications.
- Riley, W. F., & Sturges, L. D. (1993). *Engineering Mechanics: Dynamics*. New York, New York: John Wiley & Sons.
- Roberson, J. A., & Crow, C. T. (1997). *Engineering Fluid Mechanics* (6th ed.). New York, New York: John Wiley & Sons.
- Shames, I. H. (1997). *Engineering Mechanics: Statics and Dynamics* (4th ed.). Upper Saddle River, New Jersey: Prentice-Hall.
- TestCo. (2011). TestCo Electronic Component Distribution. Sunnyvale, CA: DistiSuite eCommerce. Retrieved from <http://www.testco-inc.com/ledex/174419-024>
- Vennard, J. K. (1961). *Elementary Fluid Mechanics*. New York, New York: John Wiley.