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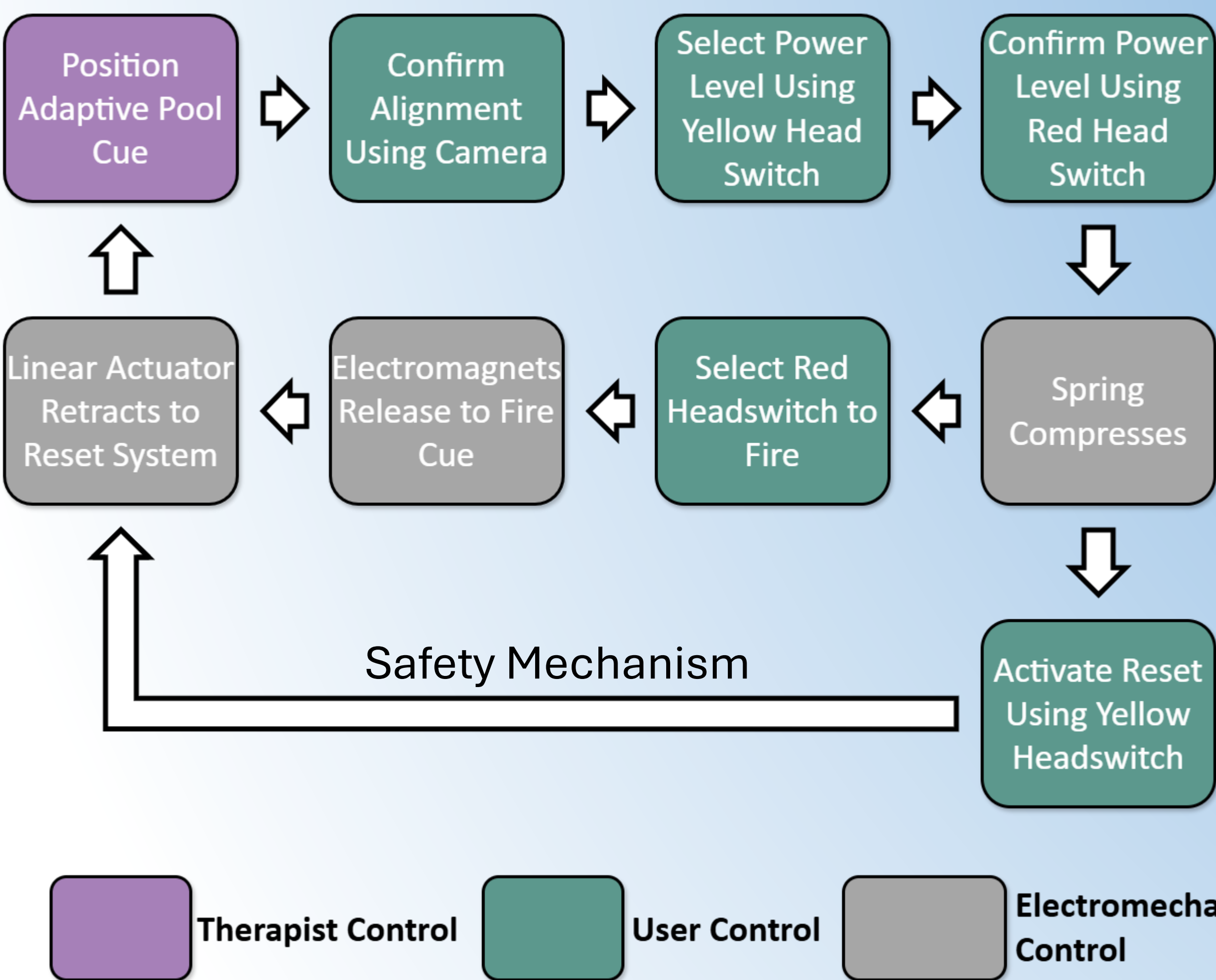
## Motivation & Background

We teamed up with QL+ to develop an adaptive pool cue. This project was inspired by a quadriplegic veteran who had a passion for playing billiards

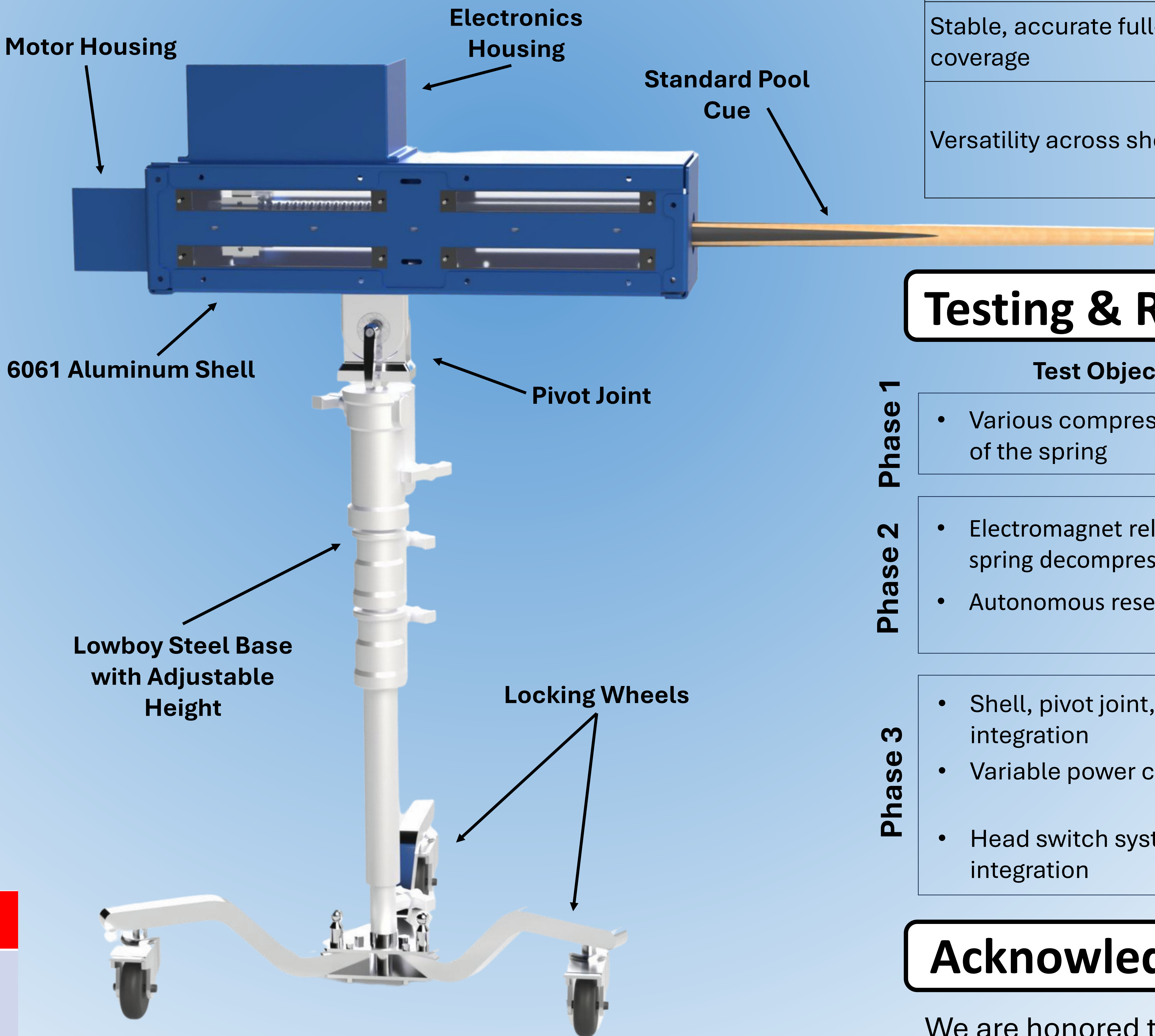
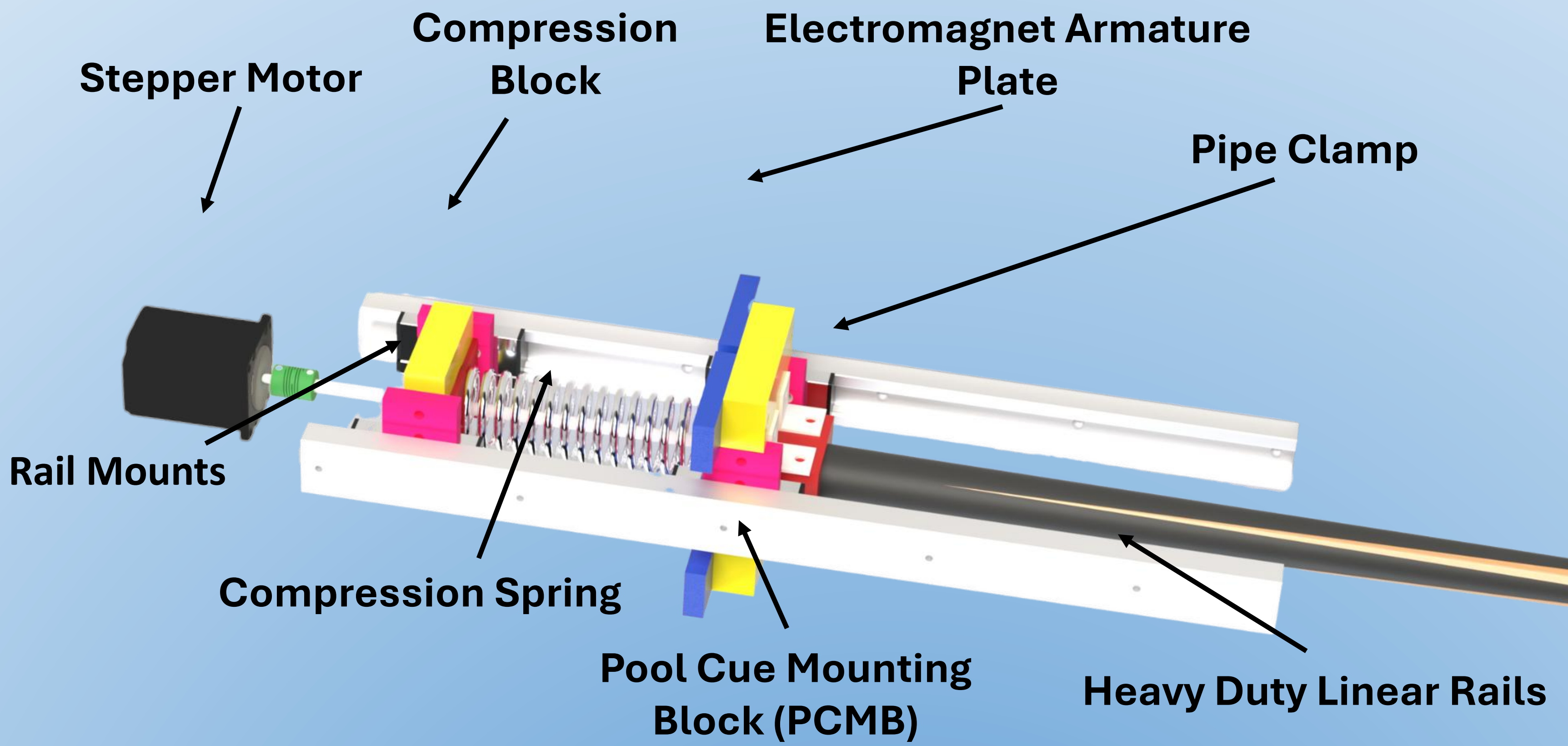
## Key Specifications

- ✓ User has variable power control using a head switch
- ✗ Max power shall translate to a cue ball speed of at least 22 mph for a clean “break” shot
- ✓ Pool cue autonomously resets after striking the ball
- ✓ Product has an adjustable height and pitch for a 33 in table
- ✓ Pool cue shall strike, not push, the ball maintaining a natural feel

## System Operation



Power Level	1	2	3	4	5	6
Spring Compression (Inches)	0.30	0.60	1.00	1.75	2.00	2.50
Cue Ball Speed (mph)	0.5	0.75	2.0	3.6	5.6	6.00



## Design Considerations

Consideration	Design
200 lbs of break force to reach required break speed	<b>Spring</b> – Spring constant of 41.15 lb/in with 5.2 in max compression
Incremental control over spring compression and auto reset	<b>Linear Actuator</b> – Stepper-driven lead screw actuator
Guide actuation and shot along steady linear path	<b>Linear Rails</b> – Heavy duty linear rails rated up to 550 lb load cap.
Hold 200 lbs compression force	<b>Electromagnets</b> – Four electromagnets rated to hold 130 lbs each
Stable, accurate full-table coverage	<b>Rolling Base</b> – Rolling lowboy steel stand with adjustable height
Versatility across shot types	<b>Pivot Joint</b> – Pivot joint with lever arm for tightening and angle adjustment

## Testing & Results

	Test Objectives	Validated Results
Phase 1	<ul style="list-style-type: none"><li>Various compression lengths of the spring</li></ul>	<ul style="list-style-type: none"><li>Can compress spring to different power levels</li></ul>
Phase 2	<ul style="list-style-type: none"><li>Electromagnet release and spring decompression</li><li>Autonomous reset mechanism</li></ul>	<ul style="list-style-type: none"><li>Device can strike the ball</li><li>Reset function operated without manual intervention</li></ul>
Phase 3	<ul style="list-style-type: none"><li>Shell, pivot joint, and base integration</li><li>Variable power calibration</li><li>Head switch system integration</li></ul>	<ul style="list-style-type: none"><li>Adjustable height and pitch</li><li>Didn't reach 22 mph break shot</li><li>Head switches successfully controlled user functions</li></ul>

## Acknowledgements

We are honored to be able to give back to the veteran community who has given up so much for us. We hope to inspire continued innovation in recreational therapy