

FIN-DRAG DESIGN

ADAPTIVE DRAG. BETTER TRAINING.

OPPORTUNITY:

Competitive swimmers need equipment providing adjustable resistance levels while swimming, allowing for more personalizable workouts.

BACKGROUND:

Resistance training equipment provides opposing force to a swimmer, and is used to increase their force exerted per stroke. Existing equipment lacks small incremental adjustments between resistance levels to cater to swimmers' individual training needs during in-water workouts.

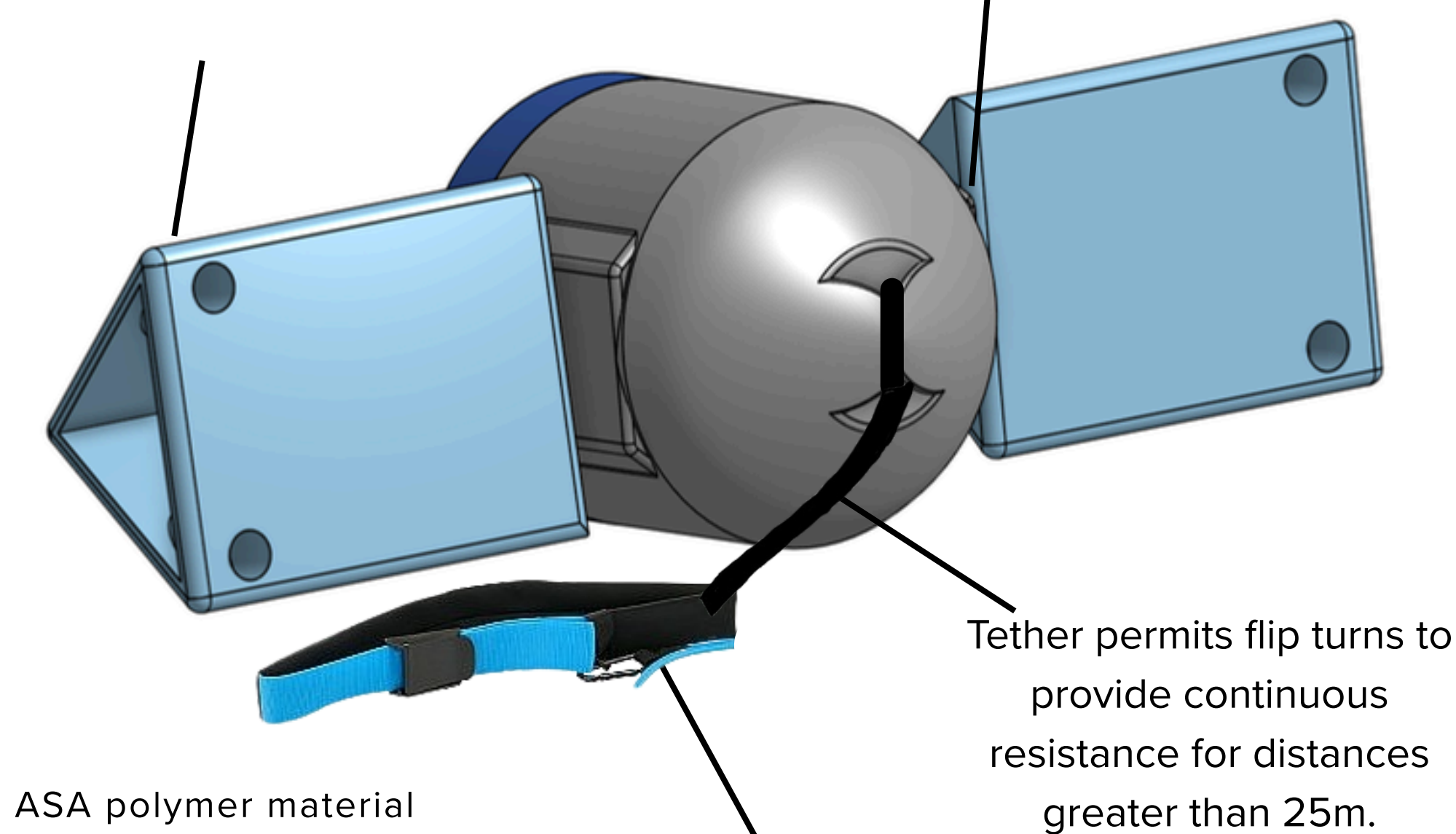
CRITICAL METRICS:

- 1 Provide at least 5 levels of resistive force greater than 36.75N.
- 2 Limit impact on swimmer technique by minimizing impact on shoulder and leg range of motion during stroke execution.
- 3 Minimize setup time (<30 seconds) during fast-paced practices.

CONCEPT: *The design is pulled behind the swimmer using a tether around their waist, creating an opposing drag force. Triangular fins rotate and lock in place to change the area and cross-section exposed to oncoming water, to create a variable resistant force.*

Rounded edges and no electrical components reduces risk of swimmer injury in event of contact with bare skin.

- 3 Twist and lock mechanism for rapid transition between 8 resistance levels in <10s.



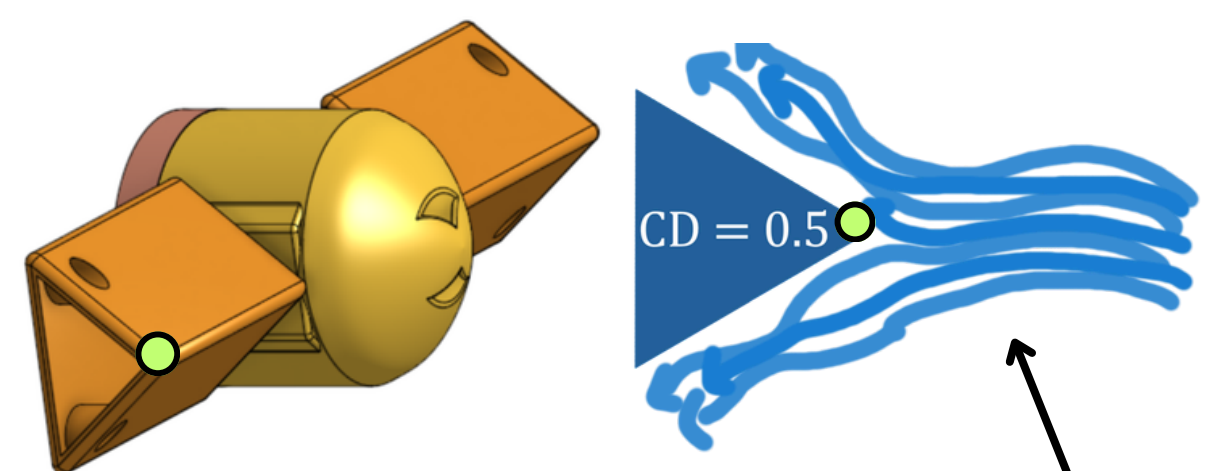
ASA polymer material provides excellent material strength and chlorine and UV resistance.

- 2 Tether eliminates contact between design and swimmer, ensuring swimmers' stroke technique is unaffected.

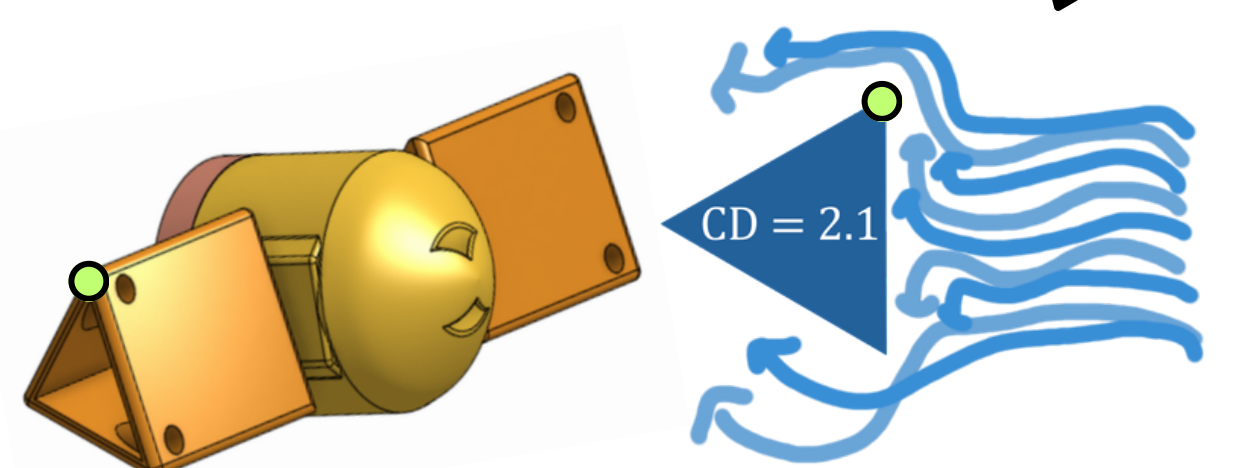
1 Mechanism for Variable Drag:

Rotating the triangular fins through 8 different positions changes their drag coefficient against oncoming water. Swimmers can rapidly switch between resistance levels during training to personalize their workouts.

**Minimum Resistance Position
(Drag Coefficient = 0.5)**



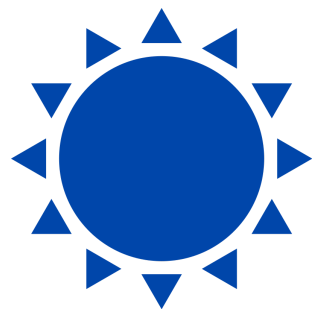
**Maximum Resistance Position
(Drag Coefficient = 2.1)**



SUSTAINABILITY CONSIDERATIONS



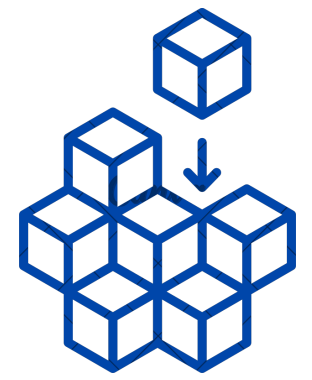
Acrylonitrile Styrene Acrylate (ASA) polymer has excellent **chlorine resistance**, prolonging its lifespan in a pool environment.



UV resistance reduces the likelihood of fracture if design is used in outdoor pools or left to dry in sunlight.



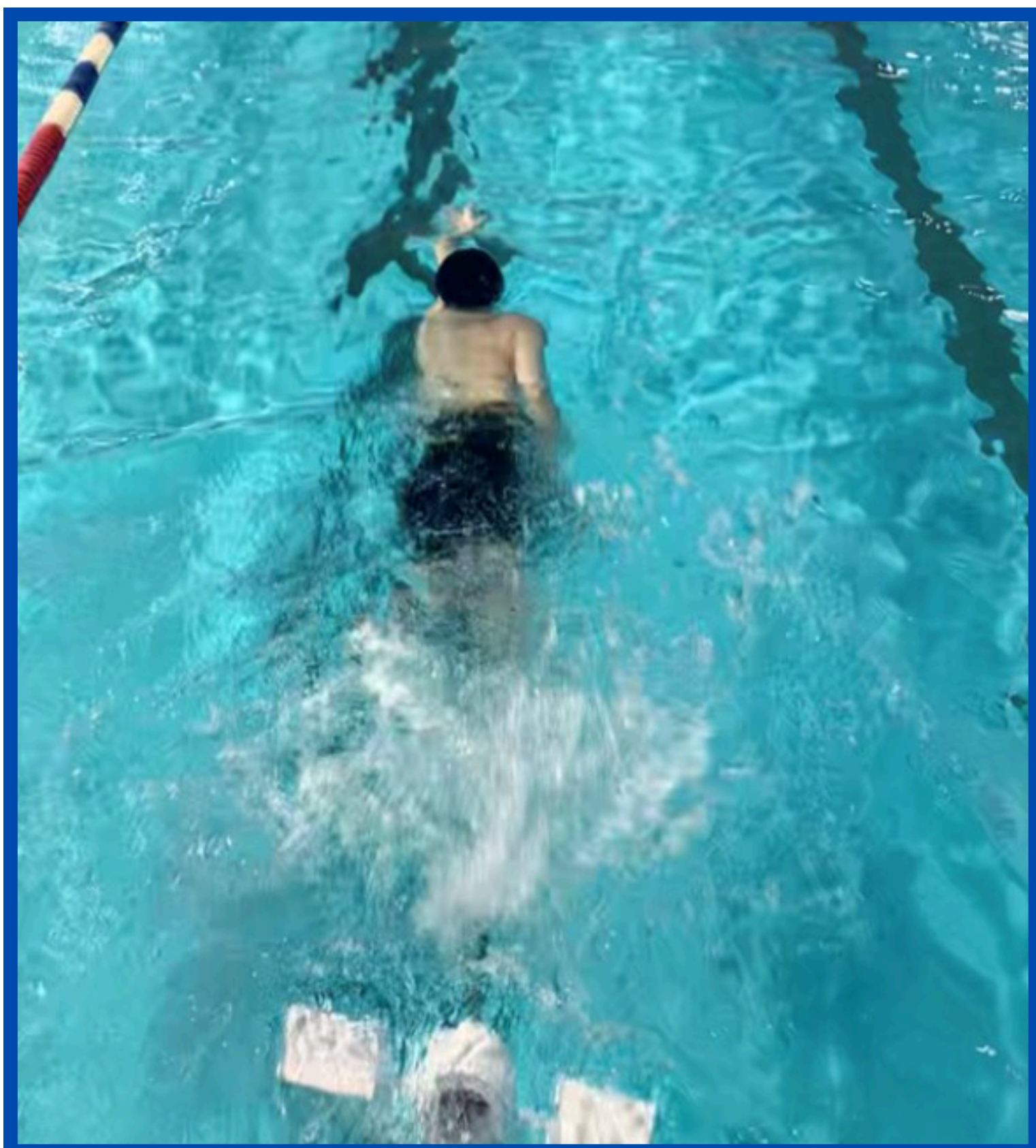
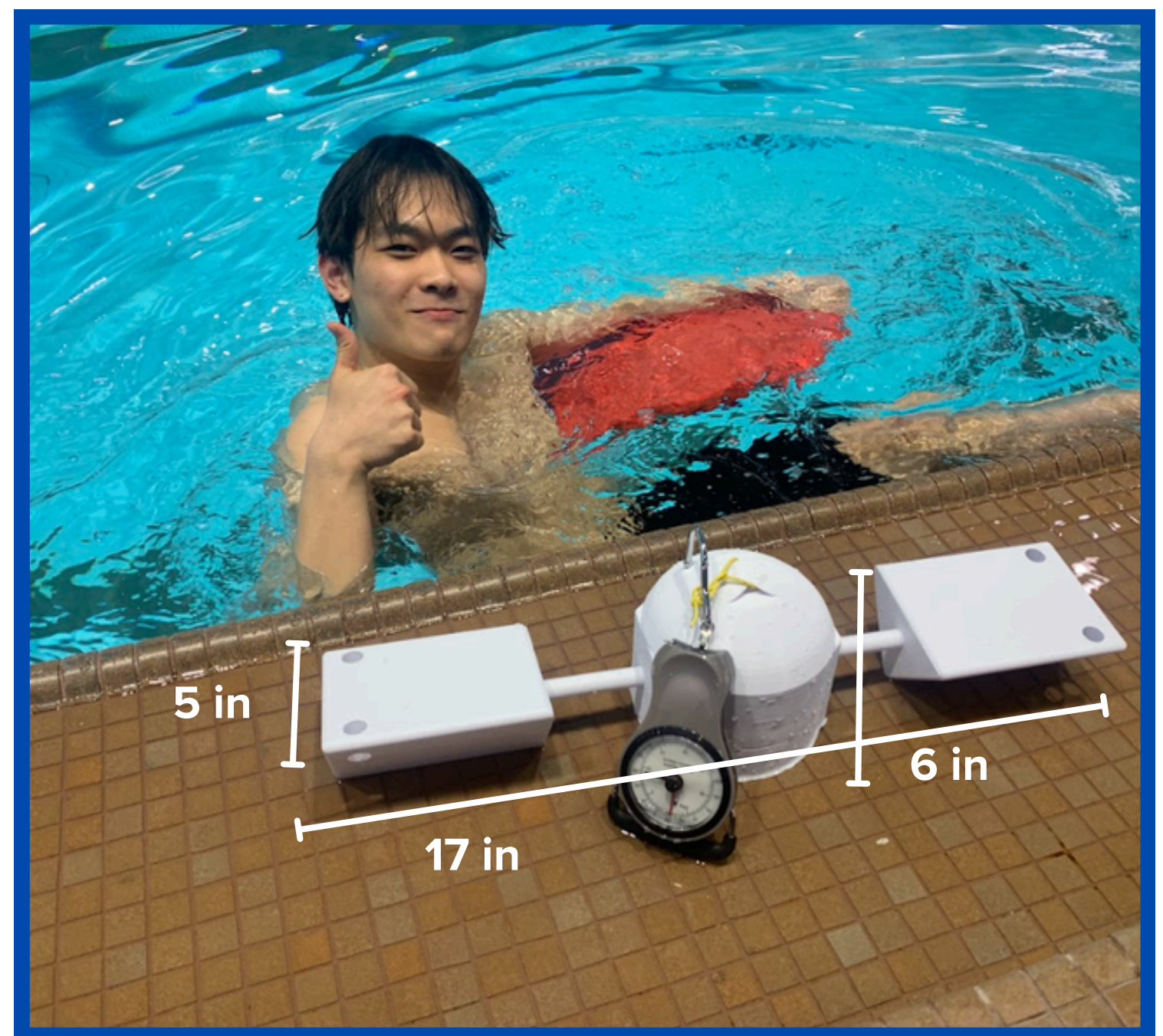
High impact strength (60kJ/m^2) ensures design can withstand falls on pool deck or rough handling during transport.



Modular fins eliminate need to replace entire design should these components become damaged.

SPECIFICATIONS

Dimensions	17x6x5 in
Resistance Levels	8 Levels
Materials	ASA (Acrylonitrile Styrene Acrylate)
Time to Change Resistance Levels	<10s
Force Range	20.3-404.8 N
Mass	0.998 kg



TESTING RESULTS

- ✓ **71.42%** increase in stroke count on max resistance level
- ✓ **14.16%** decrease in stroke rate on max resistance level
- ✓ **8 levels of resistance** achieved

NEXT STEPS

- ➔ Develop screw-based mechanism to improve detachability of fins
- ➔ Increase weight to ensure constant full submersion of design
- ➔ Explore methods to reduce overall size of design