

Version 3: Get Outside and Learn (G.O.A.L.) Kits - Principles of Projectile Motion & Impulse and Momentum



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Background

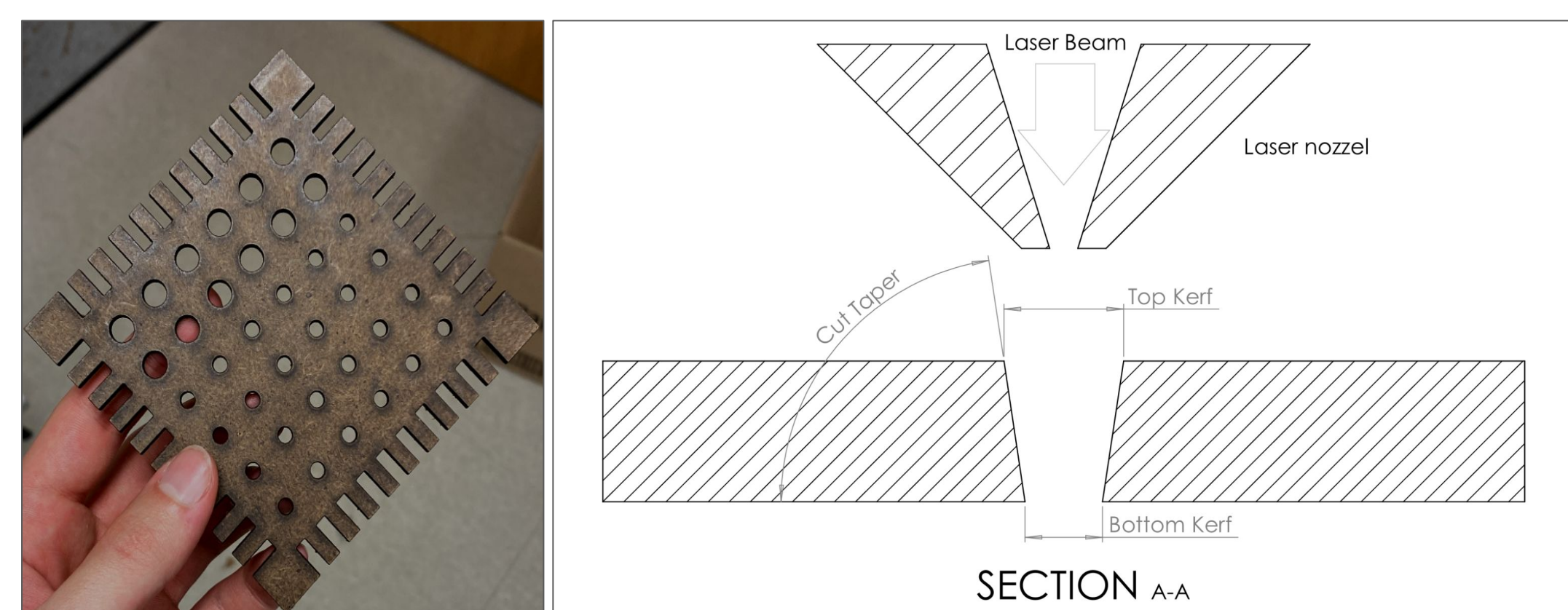
The G.O.A.L. kit program offers fun, hands-on experiences to increase knowledge and understanding of STEM concepts and provides an opportunity for creative problem solving and critical thinking skills. Local underrepresented groups and first generation students are invited to participate in a design challenge to gain exposure into the STEM field and connect different areas and students across the community.

Objective

To design and mass manufacture 750 kits that focus on making principles of projectile motion and impulse momentum digestible to a adolescent audience.

Manufacturing Cost Comparison

*Per each kit	Version 2 (2022)	Version 3 (2024)
Material Cost	\$2.75	\$1.03
Manufacturing Cost	\$0.53	\$0.46
Total Cost	\$3.28	\$1.49



Testing the tolerances of the Fusion Pro Epilog & Kern LaserCell

Structural Design Iteration Process



Top Row: 1st & 2nd Launcher Iterations
Bottom Row: 3rd & 4th Launcher Iterations

- Problem:
 - Finding a material that dimensionally consistent for joining the slots together
- Possible Materials:

Eucalyptus	Plywood	MDF/ hardboards
0.1151" thick with a tolerance of +/- .0052"	0.1231" thick with a tolerance of +/- .0076"	0.1229" thick with a tolerance of +/- .0060"

- Current Material Choice:
- Plywood (Acceptable at Terrapin Works)

Stakeholder Interaction



Stakeholder interactions with the V3 Iteration 2 kits at Maryland Day

Impact Detection Design Iteration Process



Internal	External	Catch-only
Internal (LED Fixture)	External (Spring-Loaded Platform)	Catch-Only
Pros: Clear Visual Impact Indicator, Inexpensive Cons: Inconsistency in LED Sensitivity	Pros: Audible indication of impact Cons: Expensive, Lengthy Assembly Process	Pros: Heavy focus on angle and power accuracy Cons: Lack of Impact Detection

The Impact Detection component of the kit allows for the users to understand the concepts of impulse and momentum through the impact indicator in either the internal or external implementation.

Teacher Partner + Implementation



Bulk order production of the unassembled kits

MCPS Teacher Partner: Ms. Jo Belyea-Doerrman

- Background:
 - Facilitated the earlier iteration of this kit with her classes last year
 - Teaches: 6th, 7th and PLTW

- Week of 4/22:
- Facilitation of 28 kits with 7th grade STEM class
 - Implementation of the 3rd Iteration of the kits

Future Direction

- Reincorporate the impact detection component into the kits
- Revision of the instructions and curriculum