

Product Overview

TagLug is a multifunctional luggage tag with a built-in scale and GPS tracking device. The product is lightweight, durable, ergonomic, and easy to use.



Figure 1: TagLug product logo

Motivation

One out of five people in the United States find out that their baggage is overweight at the check-in counter every day, paying an average of at least \$45 in overweight baggage fees. In 2018 alone, 21% of US Travelers exceeded their luggage allowance and \$1.25 billion worth of baggage was potentially lost or stolen.

We hope to reduce anxiety caused by unnecessary and unforeseen fees and lost or stolen baggage. The design goal of this project is to create a product that can act as a luggage tag, scale, and tracker, while remaining portable and durable enough to remain on the exterior of luggage.

The target customer is young adults in their early 20s who travel frequently for either work or school, and who tend to be on a tighter budget. We hope TagLug is a universally integrated device that helps people save money while also providing peace of mind when traveling.

Design Objectives

Objective	Target Value
Load Capacity	Able to weigh bags between 10 lbs – 100 lbs
Weight Accuracy	Weight displayed is within 0.1 lbs of comparable scales
Lightweight	Product weighs ≤ 2 lbs
Durability	Casing withstands ≥ 10 flights attached to checked bag
Battery Life	Batteries last ≥ 2 weeks
Ergonomics	Handle grip between 0.5 – 1 in wide and 4 – 5.5 in long
Cost	Manufacturing cost \leq \$15 so that selling price can be \leq \$40

Technical Specifications

- Hardware components of the TagLug device include an Arduino Nano, load cell, tensile force sensor, OLED display, momentary and latching push buttons, and battery pack.
- The load cell connects to the force sensor and the Nano to convert the mechanical force values into digital values.
- The OLED display is connected to the Arduino Nano to display the weight from the force sensor.
- The pushbuttons are used to power and reset the device.

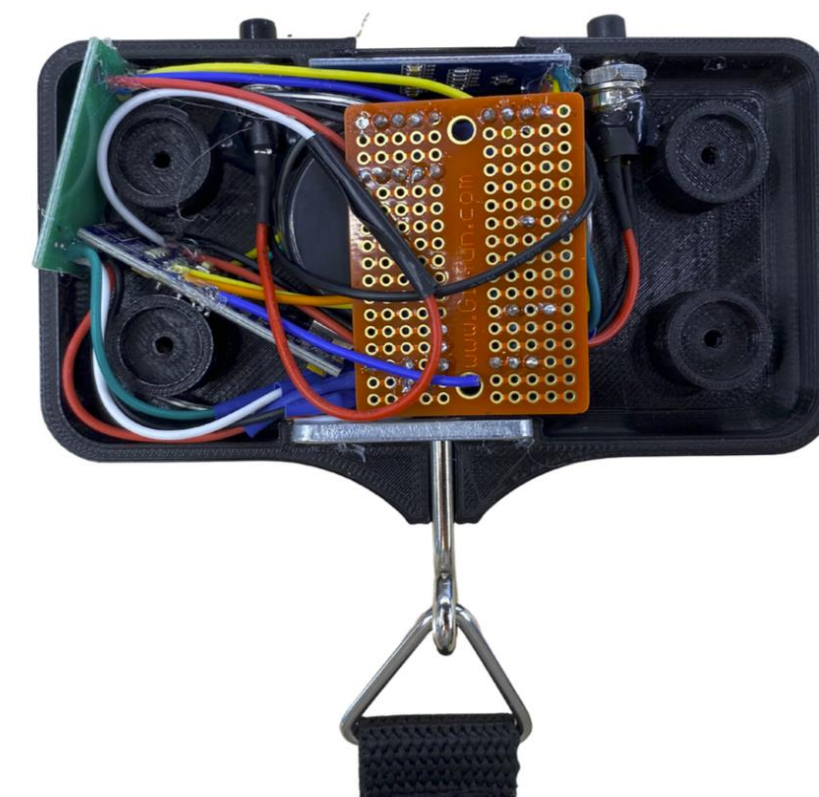


Figure 2: Electrical components of TagLug device

- Mechanical components of the casing include a 3D-printed, hard-shell casing to hold the electronics and a faux leather outer casing for protection and aesthetic purposes.
- The hard-shell casing has specified locations for each of the internal components and is comprised of two halves, held together with screw bosses and heat-set threaded inserts.
- The outer casing includes a pocket for a tracking device (i.e., a Tile) and a plastic covering for the address information. There is foam lining the inside of the handle grip for user comfort and Velcro to slip the casing on and off.

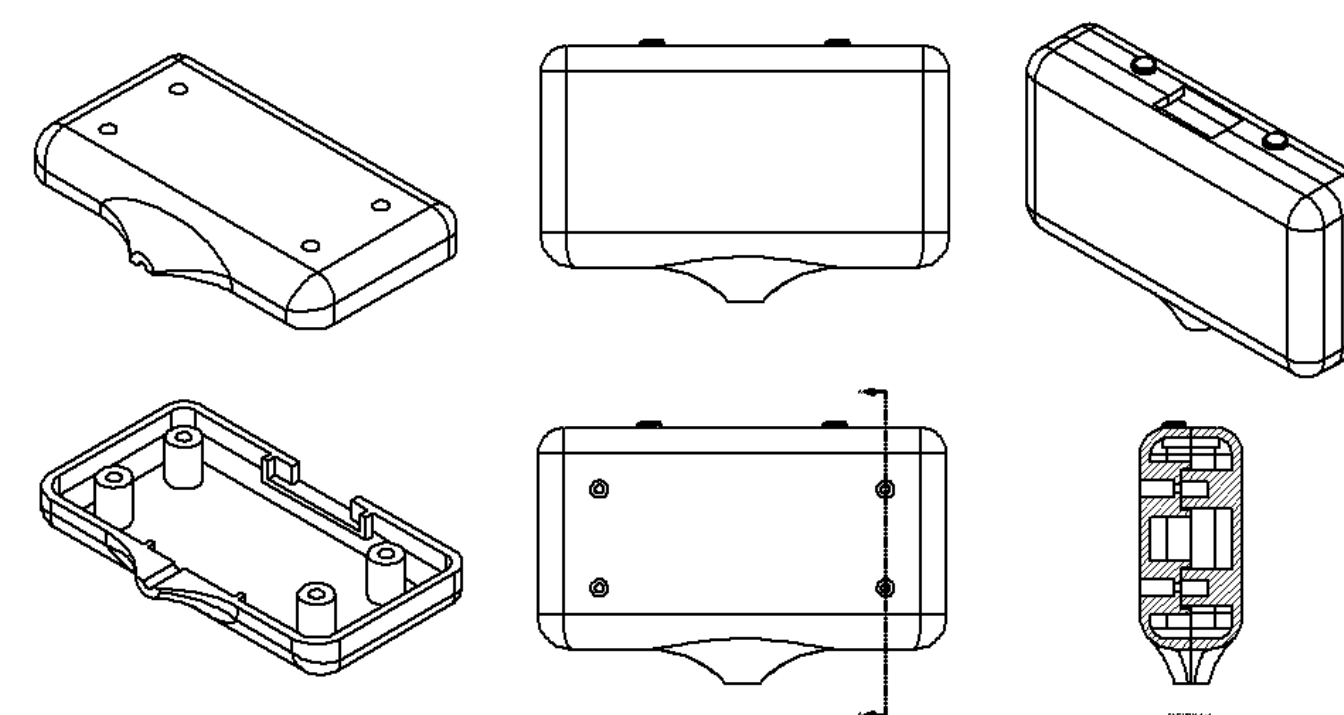


Figure 3: Technical drawings of hard-shell casing

Final Product



Figure 4: Multiple views of final TagLug prototype

Packaging

- Packaging is eye-catching and playful in order to appeal to our target audience, young adults and students.
- Two important features of TagLug, ease of use and portability, are highlighted in the packaging.
 - Designed to look like a hand holding the product, with a sneak peek at the product itself through a vacuum-formed plastic cover.
 - Basic instructions for product use printed on the back side of the packaging.



Figure 5: Front and back of product packaging

Next Steps

- Outsource production of hard-shell casing to utilize injection molding with PC plastic.
- Compile interior electronic components into a single PCB and outsource PCB production.
- Incorporate a locking mechanism in the buckle to increase security.
- Implement process to continuously check and correct calibration factor.
- Create application and compatibility through Bluetooth integration to centralize customer information, luggage weight, and luggage tracking.

References

Allon, G., Bassamboo, A., & Lariviere, M. A. (2015). Who Benefits from Airline Baggage Fees? *Kellogg School of Management at Northwestern University*. Retrieved April 19, 2022, from <https://insight.kellogg.northwestern.edu/article/who-benefits-from-airline-baggage-fees>

Glusac, E. (2022, March 26). Rising Fares, Low-Cost Airlines: Navigating the New Reality in the Sky. *The New York Times*. <https://www.nytimes.com/2022/03/26/travel/rising-airfares-budget-travel.html>

Acknowledgements

Dr. Rebecca Simmons – Project Advisor, Duke University
Dr. Gregory Twiss – Management Advisor, Duke University
Daniel Egger – Entrepreneurial Consultant, Duke University
Omar Abdelwahab, Sanjana Das, & Marco Gonzalez Blancas – Master of Engineering Management Student Team