MAX

APITZ-GROSSMAN

P**RODUCT **D**ESIGN **M**ECHANICAL **E**NGINEERING **PORTFOLIO 2025

01 **SALICO**

- The world’s first sea asparagus harvester.

02 **SKYDIO**

- X10 dock: electronics enclosure design.
- PT screw boss optimization.

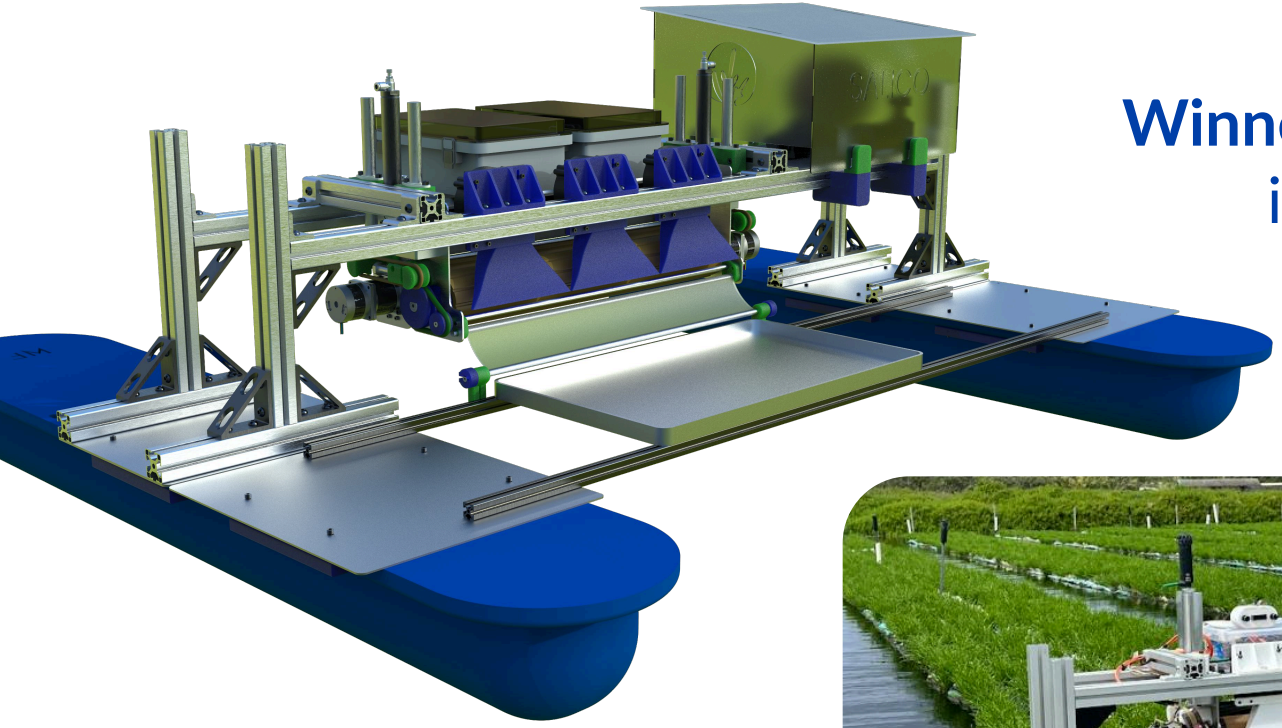
03 **FORMLABS**

- Form Wash: mounting arms rework.
- Form 4: cover damper testing and validation.

PROJECT SALICO

Final Year Design Project

The world's first sea asparagus harvester.



Winner of Best Overall Project
in Waterloo Mechatronics Engineering 2025

https://salico-uw.github.io/

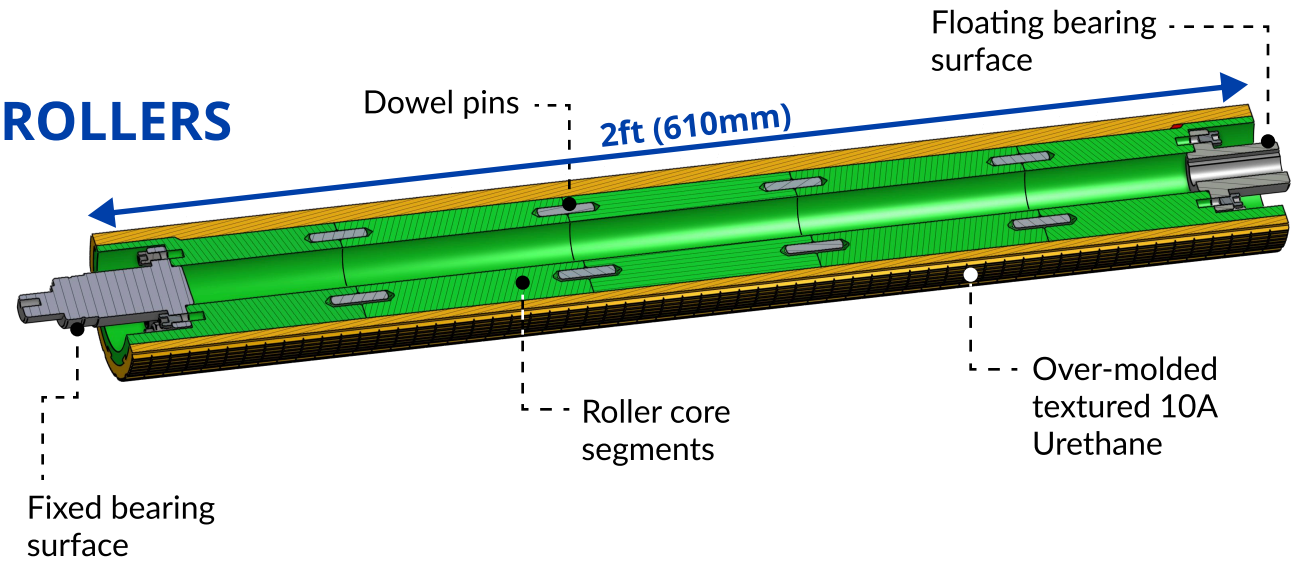
Salicornia, AKA sea asparagus, is a delicious and environmentally friendly salt water vegetable. No specific sea asparagus technology exists. Farms **struggle to scale** because of **manual labour**.

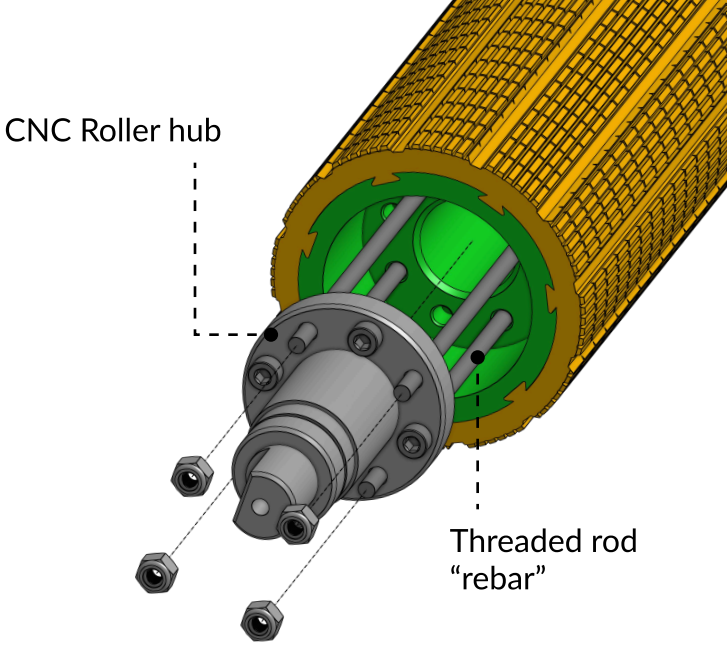
We make up a **5-person cross-functional team** of mechanical, electrical, firmware, and software engineers. My contributions included all the **mechanical design, prototyping, and assembly**.

PROBLEM AND CONTRIBUTIONS

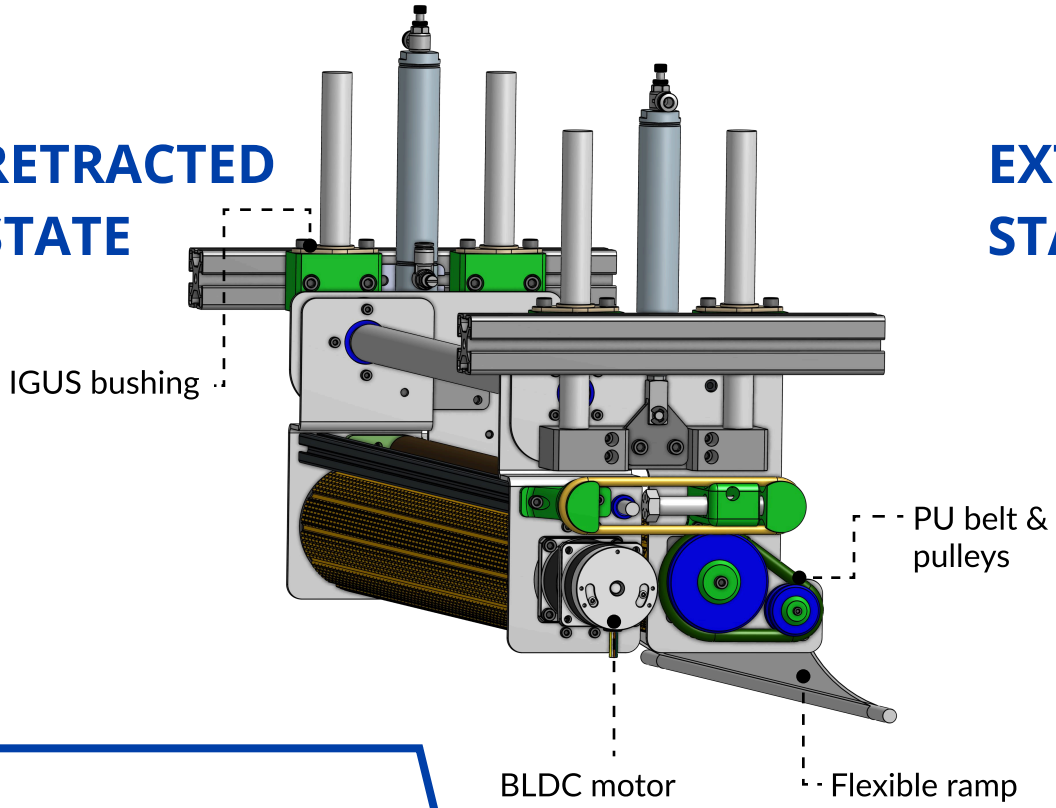
DESIGN OVERVIEW

ROLLERS

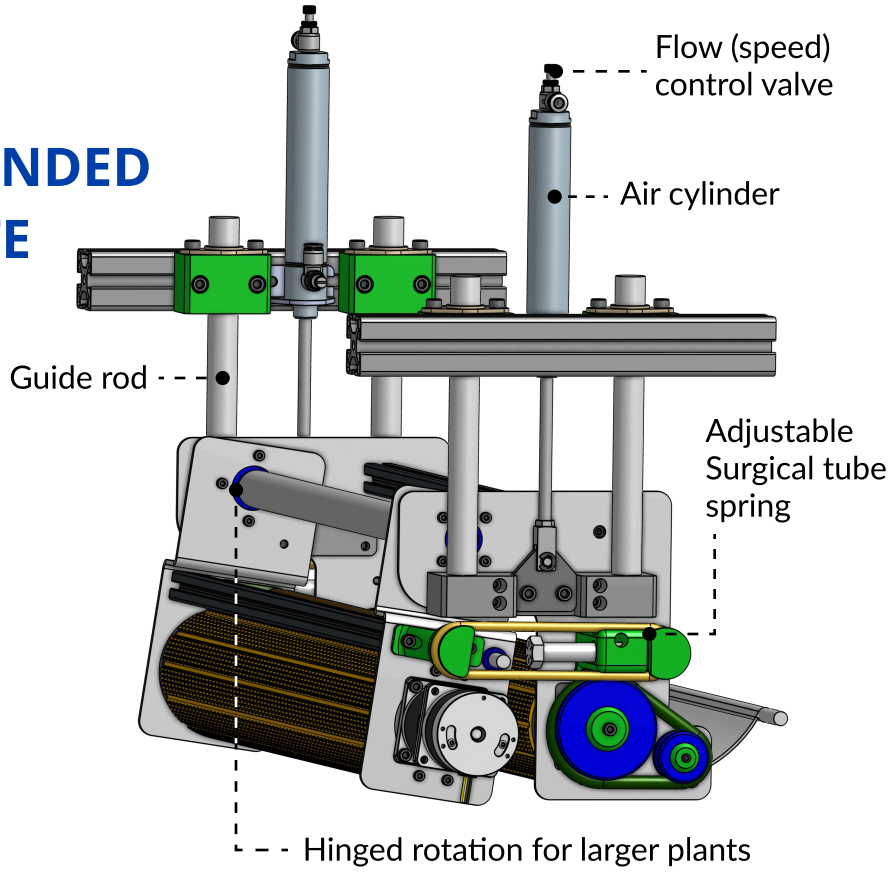




RETRACTED STATE



EXTENDED STATE

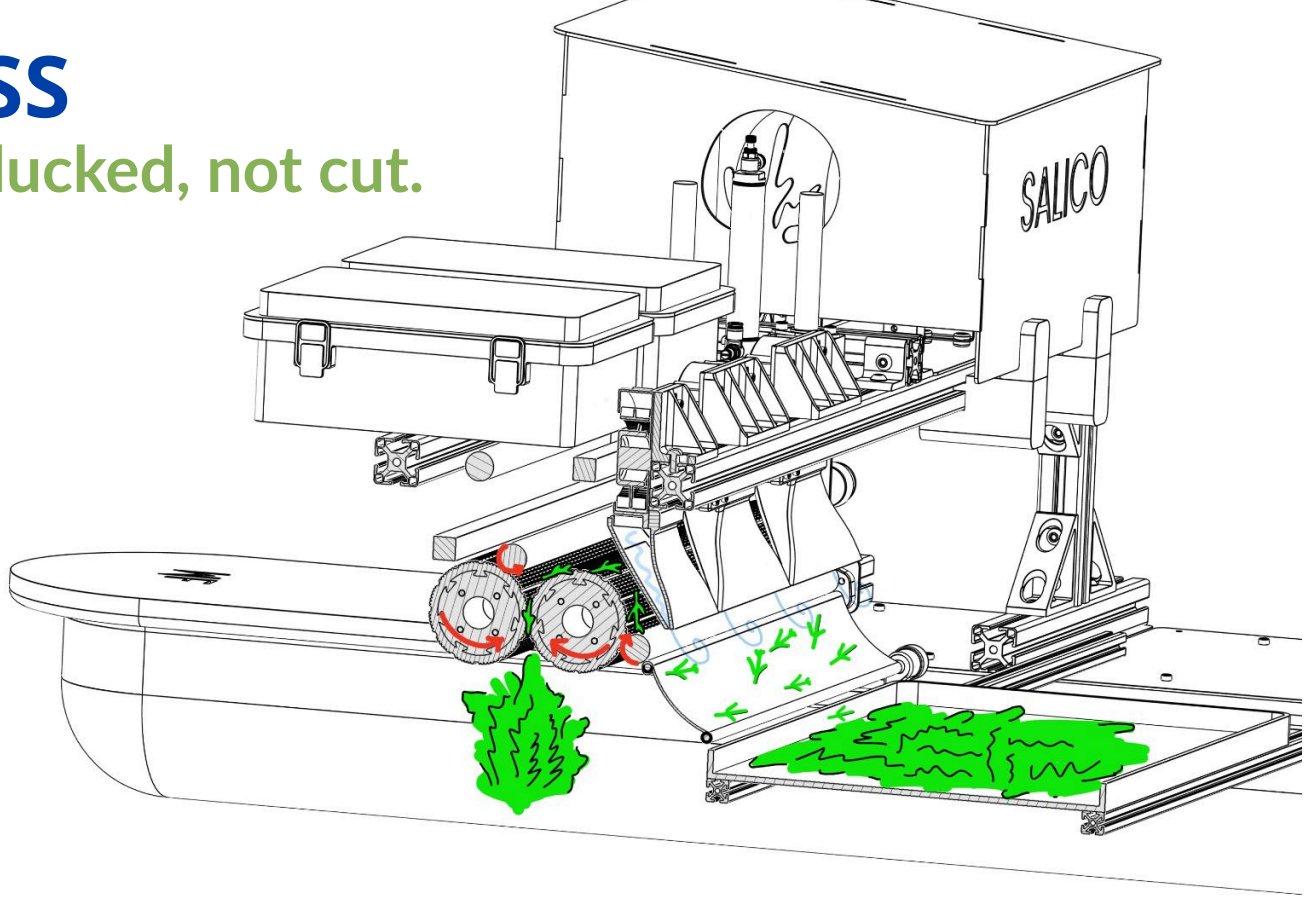


PROJECT SALICO

HARVEST PROCESS

Sea asparagus must be plucked, not cut.

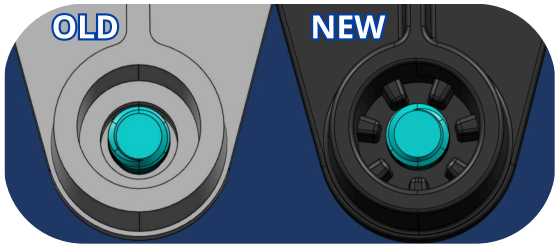
- Extend pistons while spinning rollers.
- Grasp plants between rollers.
- Lock the motors and retract pistons.
- Brushes powered by rollers direct the crops towards collection tray.
- Fans provide extra force to deposit harvest into collection tray.
- Move to next row, repeat.

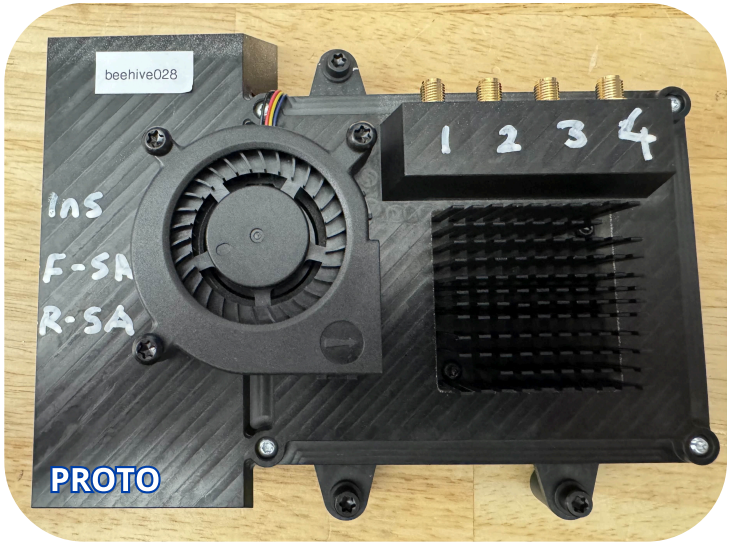


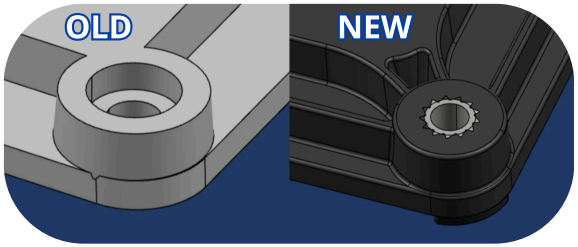
PROJECT SALICO

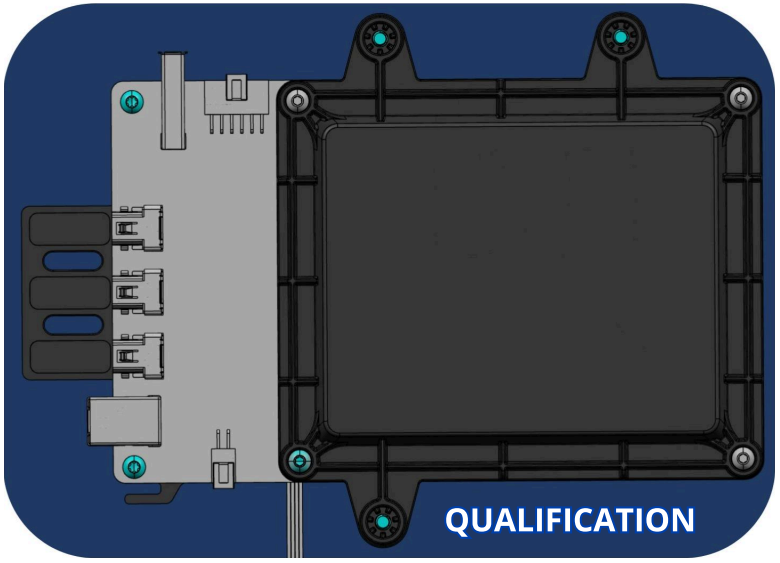
SKYDIO
PDME Internship

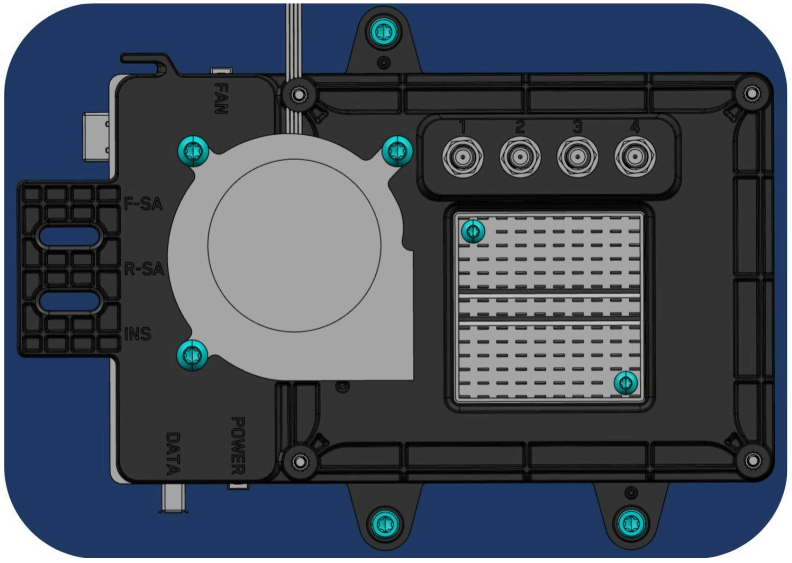
Skydio X10 dock: electronics enclosure design.









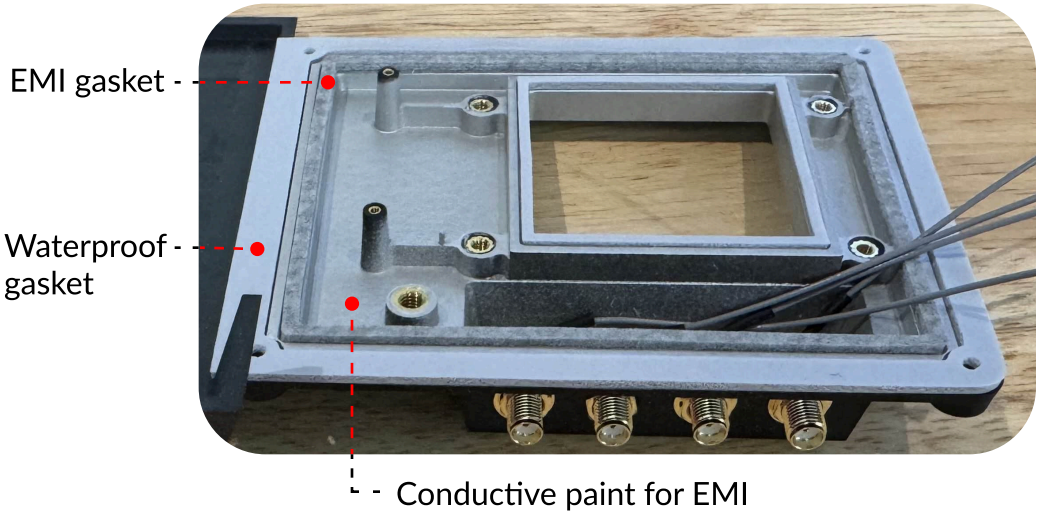


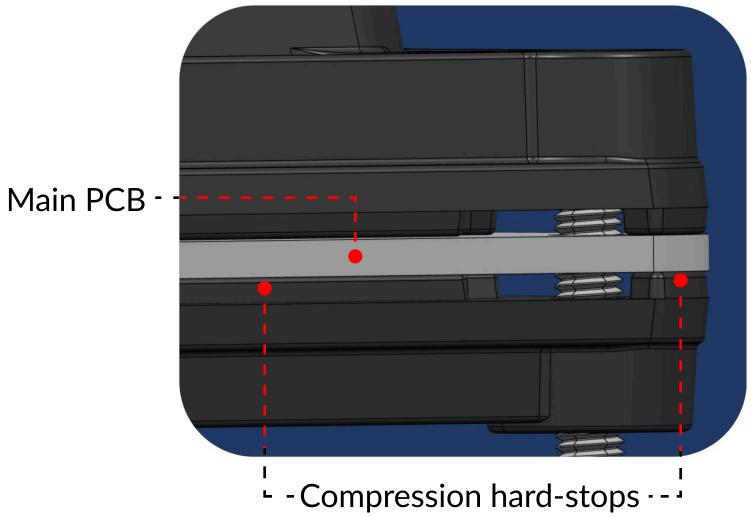
Moving from the **Prototype** to **Qualification** builds, there were a number of DFA, Rel, and manufacturing changes to be made.

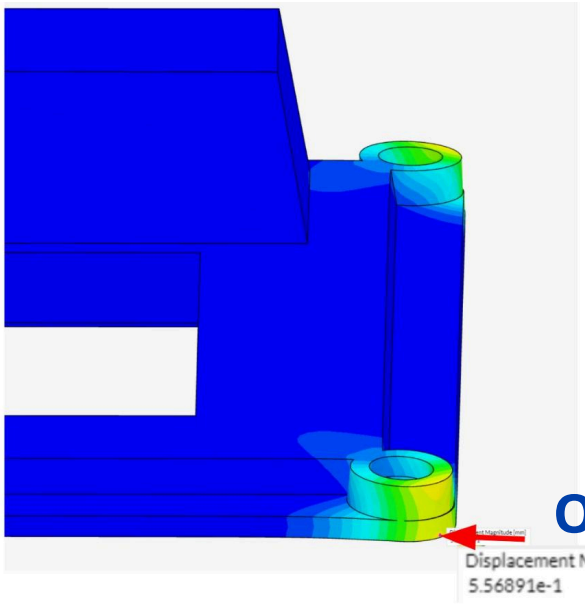
PROBLEM

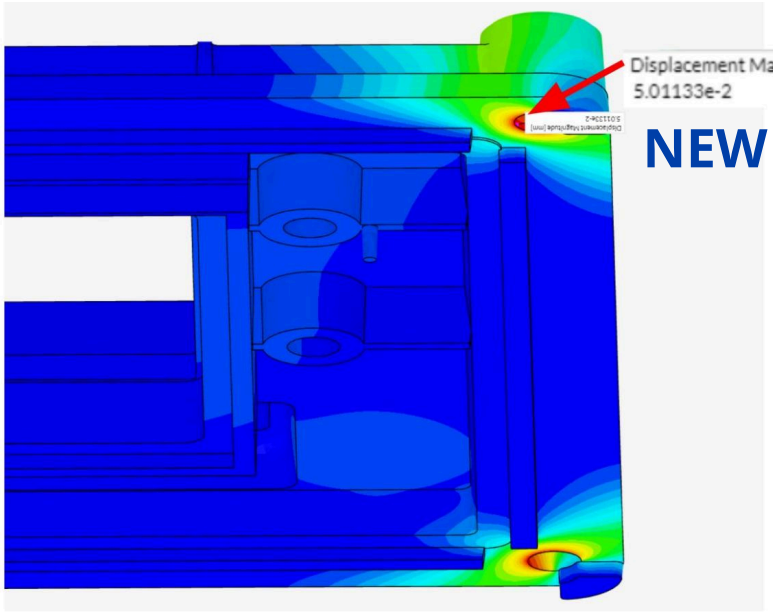
ENCLOSURE OVERVIEW 1

Hard-stops at all corners to control gasket compression distance. Ribs for rigidity.









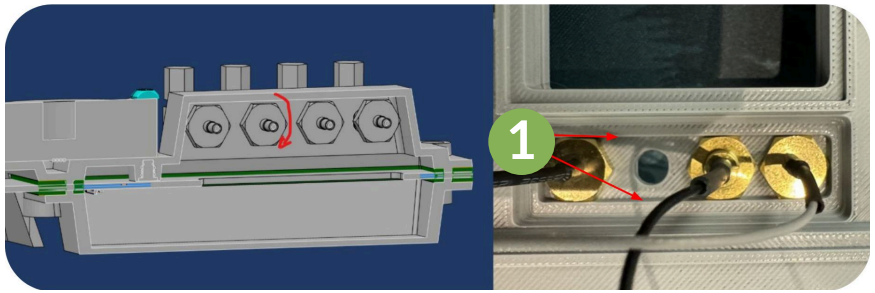
Owned all enclosure changes between Proto 2 and Qual 1 builds including the conversion from CNC to injection molding.

SOLUTION

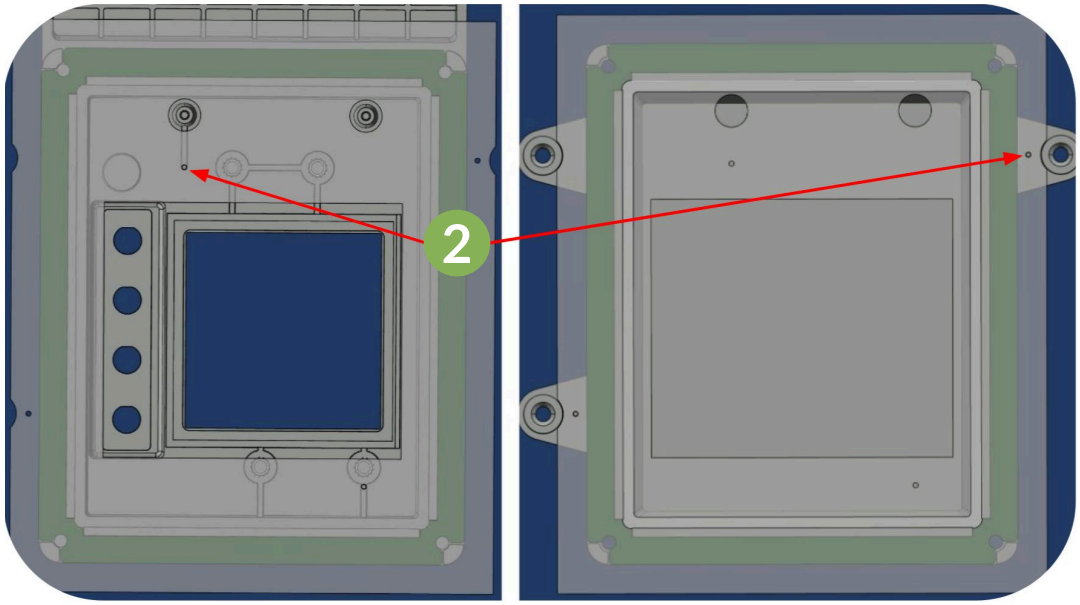
ENCLOSURE OVERVIEW 2

DFA changes to fix issues discovered during the P2 build.

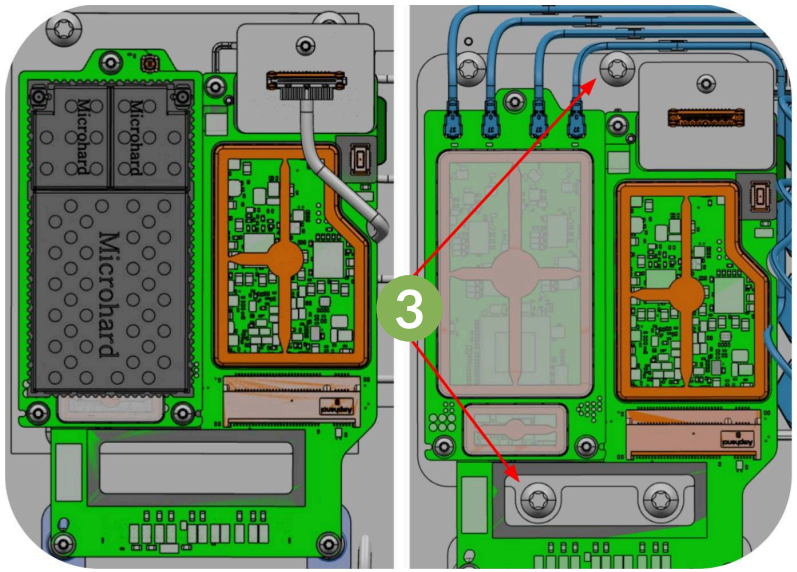
HARD-STOPS FOR ANTENNAS



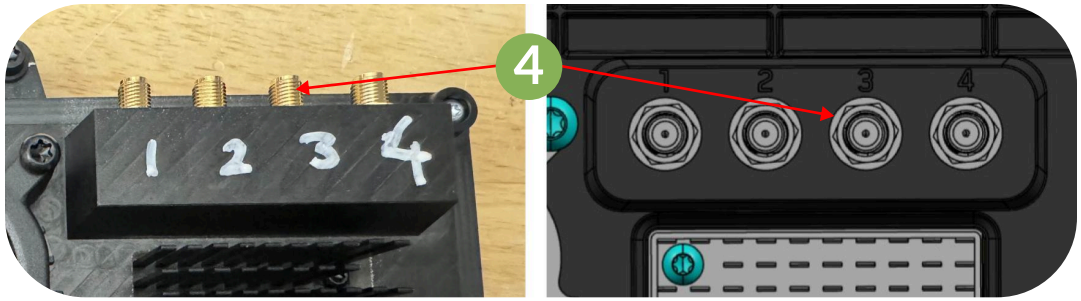
ONE GASKET LINER FOR EVERYTHING



FIXING BURIED SCREW ACCESS



AVOIDING 90° ANTENNA ADAPTERS

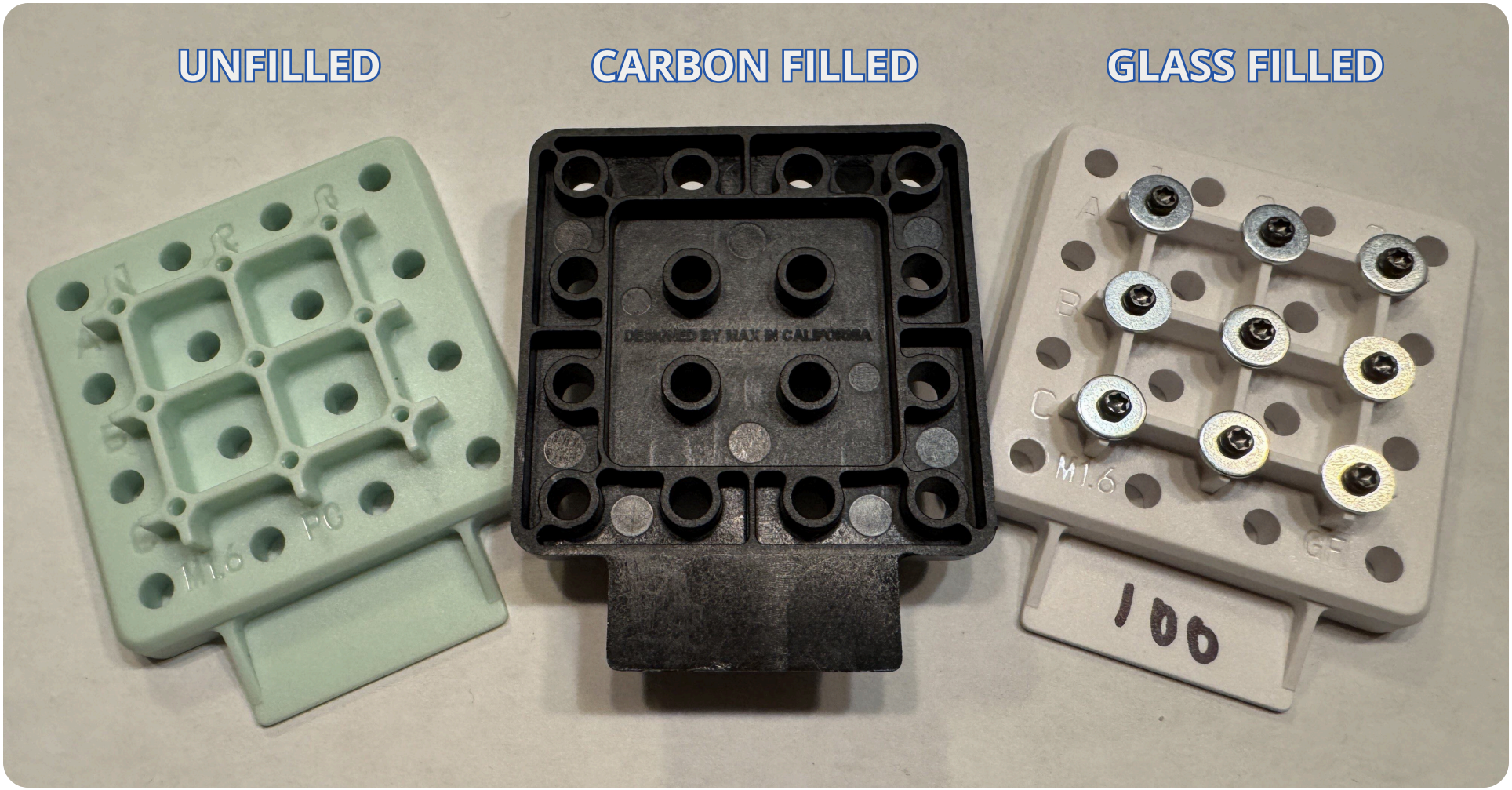


Owned all enclosure changes between Proto 2 and Qual 1 builds including the conversion from CNC to injection molding.

SOLUTION

SKYDIO
PDME Internship

PT boss testing for M1.6 and M2 screws.



PT screw bosses were **stripping** during assembly, **wasting time and money**. The team did not have **reliable PT boss guidelines**.

PROBLEM

PT SCREW OVERVIEW

9 boss geometries and 1620 screws were tested to determine the best design.

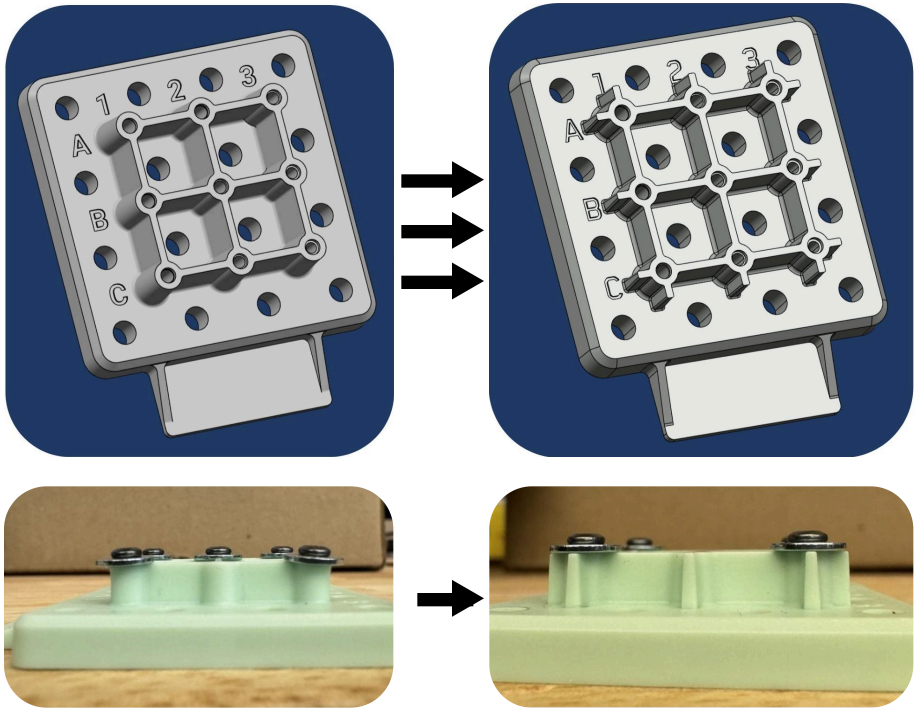
d = major diameter of screw	1		2		3	
	DRAFT	HOLE	DRAFT	HOLE	DRAFT	HOLE
A	2.0°	0.95 x d	2.0°	0.85 x d	2.0°	0.75 x d
B	1.5°	0.95 x d	1.5°	0.85 x d	1.5°	0.75 x d
C	1.0°	0.95 x d	1.0°	0.85 x d	1.0°	0.75 x d

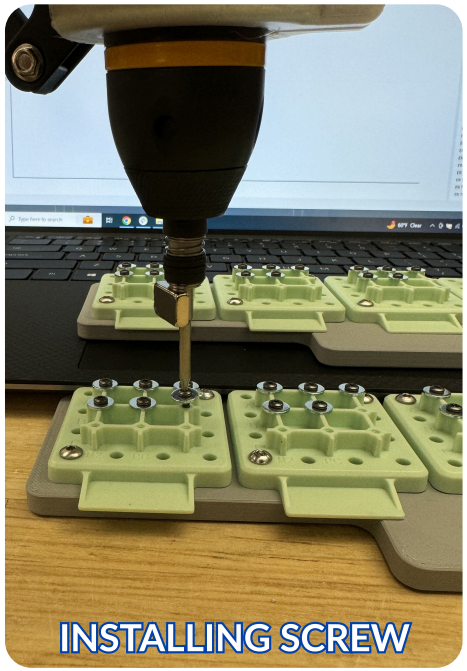
BASELINE

VARIABLES

Hole size: **3 levels**
Draft angle: **3 levels**
Material (PC): **no fill, 20% CF, 20% GF**
Tool RPM: **100, 150, 200**
Screw size: **M1.6, M2**

TOOL MODIFICATIONS



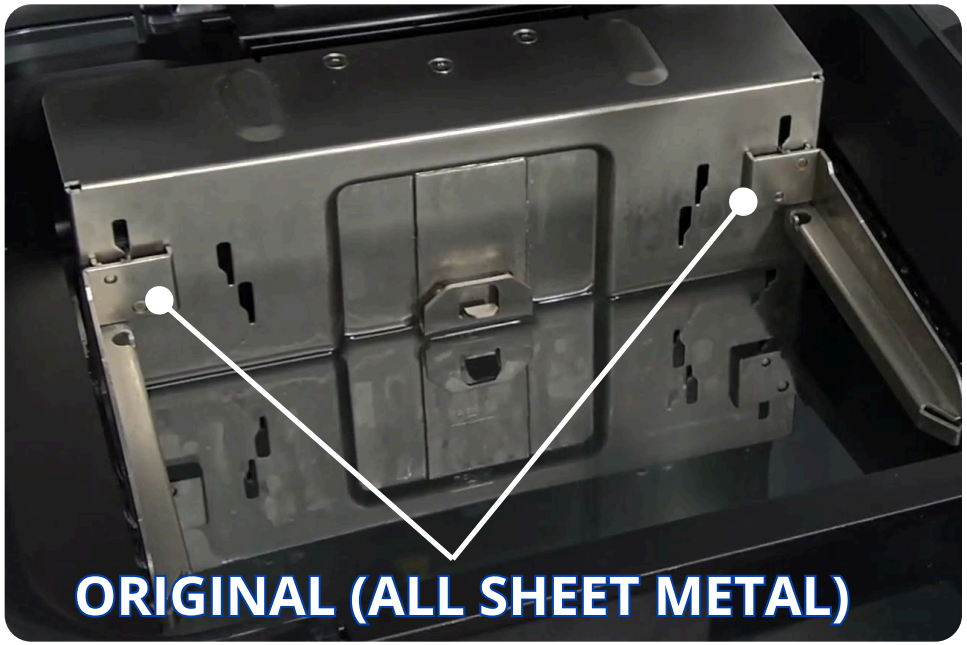


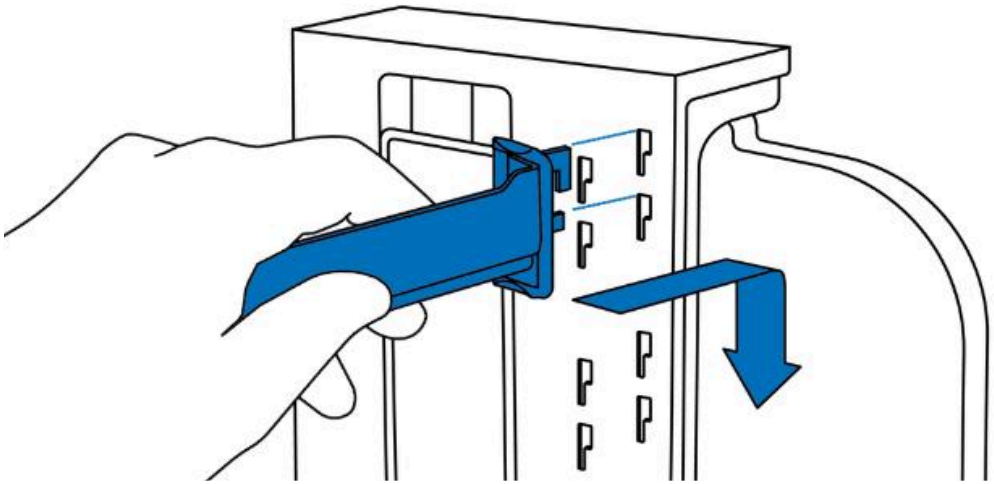
Created a **PT boss design guide** for engineers to reference using the most common **materials** and **screw sizes** at Skydio.

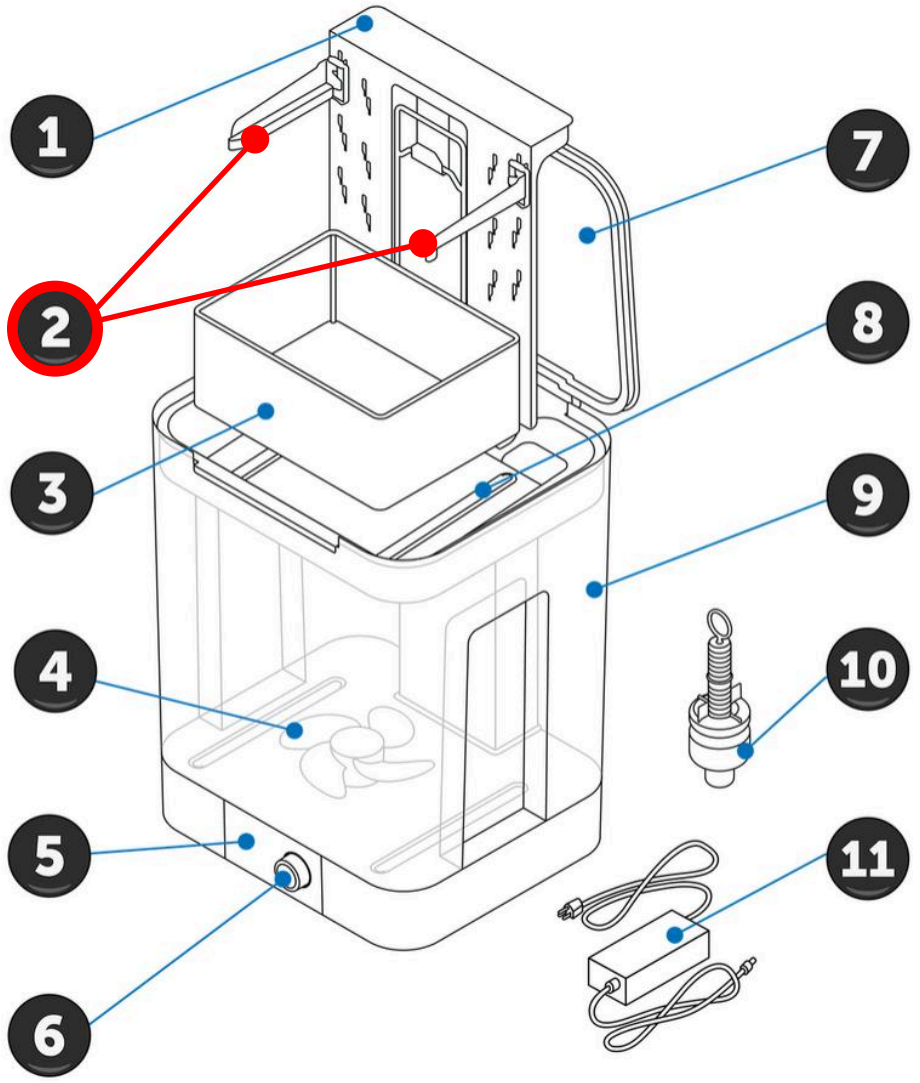
SOLUTION

FORMLABS
ME Internship

Form Wash: Mounting arms rework.





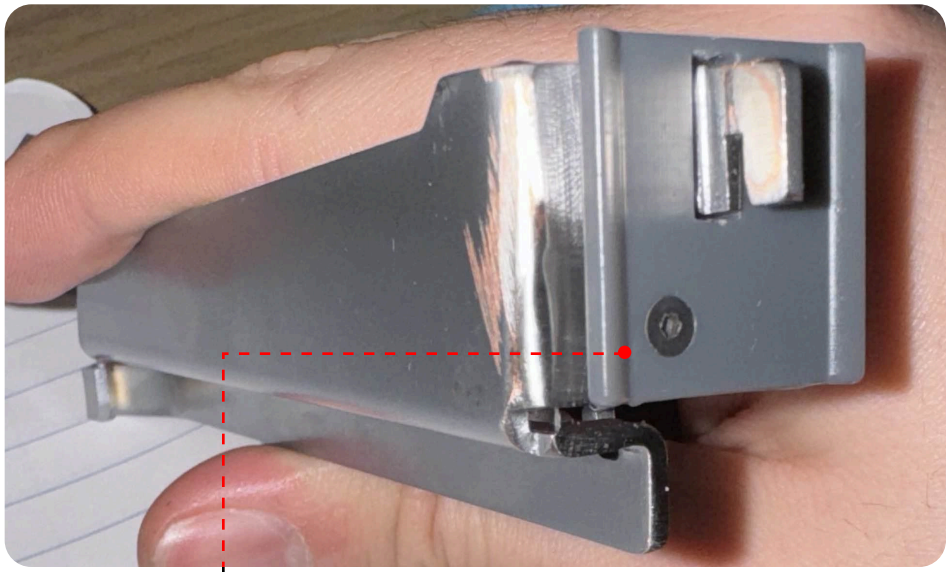


The Form Wash was shipping with **inconsistent** feeling mounting arms for the build plate. **Tolerance issues caused excess friction.**

PROBLEM

MOUNTING ARM OVERVIEW

Exchanged sheet metal bends and welds for compliant polypropylene back plates.



3D printed tests

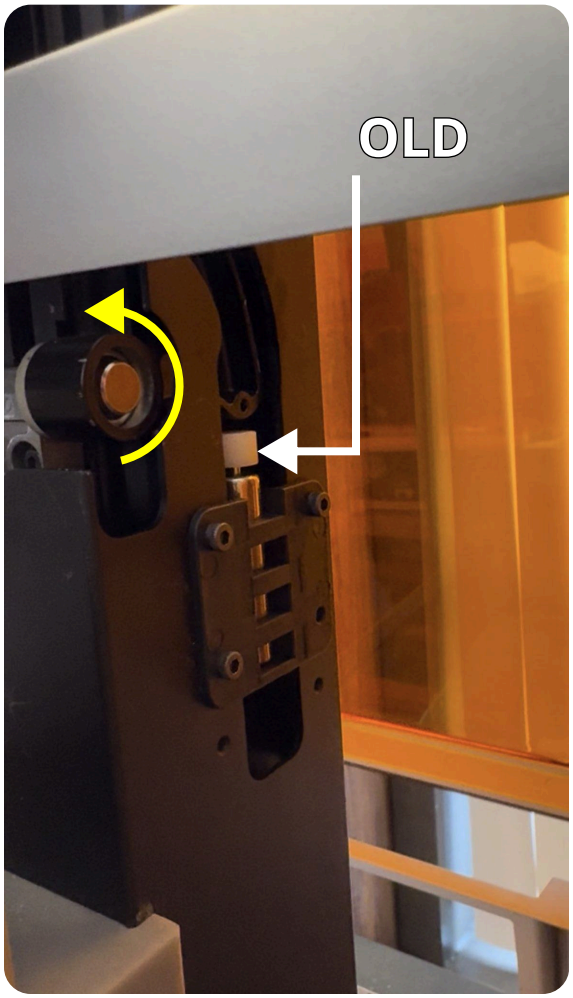
Custom molds for testing (in-house)

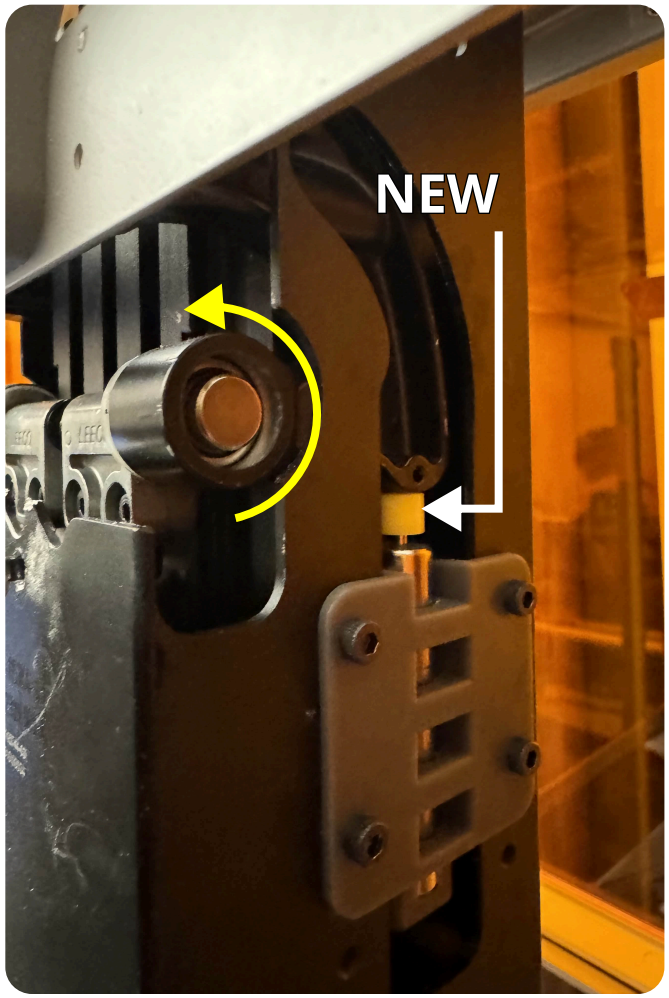
Designed a drop-in replacement that **saved money**, **decreased the tolerance stack**, and **improved the user experience.**

SOLUTION

FORMLABS
ME Internship

Form 4: Cover damper testing and validation.





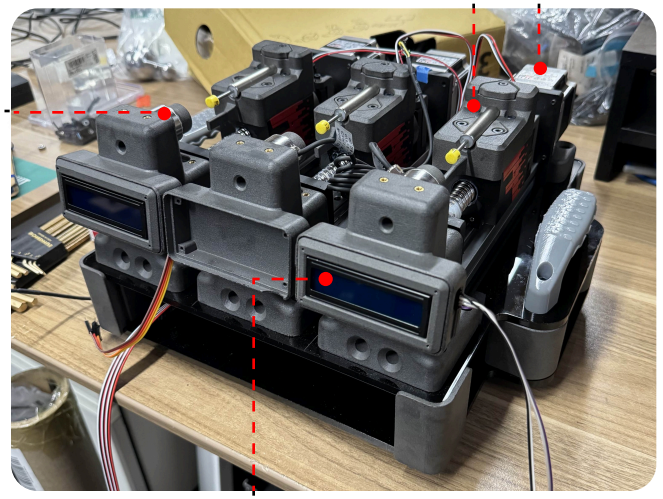
Dampers used for the Form 4 cover soft-close had last minute issues before launch. New dampers required validation.

PROBLEM

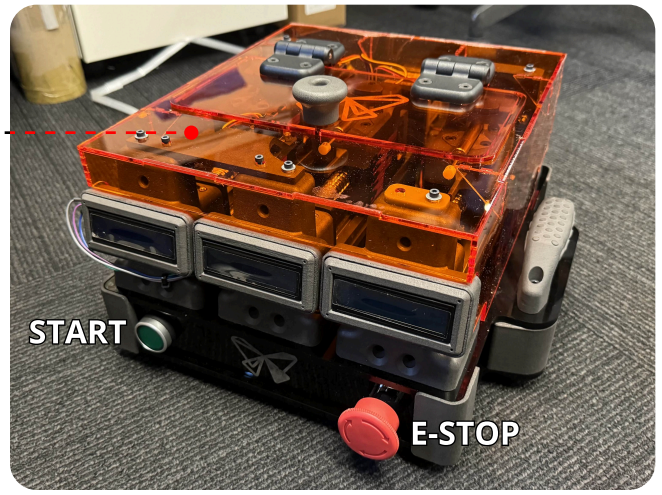
COVER DAMPER OVERVIEW

Cover damper test and validation rigs.

PNEUMATIC LIFETIME TESTER



FACTORY VALIDATION RIG



Lifetime tested 150+ dampers to 10,000 cycles to confirm reliability. Created a rig to easily validate dampers on the line.

SOLUTION