The SlideHive

Team 60: Ellie Kim, Peter Leong, Ghazala Singh, Pranav Upreti

Opportunity

The **Toronto Beekeeping Collective** currently uses (Langstoth) hive boxes that weigh around 40 kg and must be lifted vertically to access the internal frames.

This presents an opportunity to **reduce physical strain through a redesigned hive system for senior beekeepers.**

Goal

- Minimize the force required to access frames
- Maintain optimal internal temperature
- Minimize the number of pests

Concept Summary

A **modified Langstroth-style hive** with an integrated **sliding mechanism** that allows horizontal access to frames. This preserves the familiar shape and modularity of existing hives while greatly reducing physical strain.

Why This Design?

After exploring many alternatives, we focused on refining the current hive used by TBC to ensure **compatibility** and **ease of adoption**.

What makes our design stand out is the detailed iteration process, especially in the development of the connection and sliding system; balancing **simplicity**, **durability**, and **usability**.

→ *Langstroth Hive*

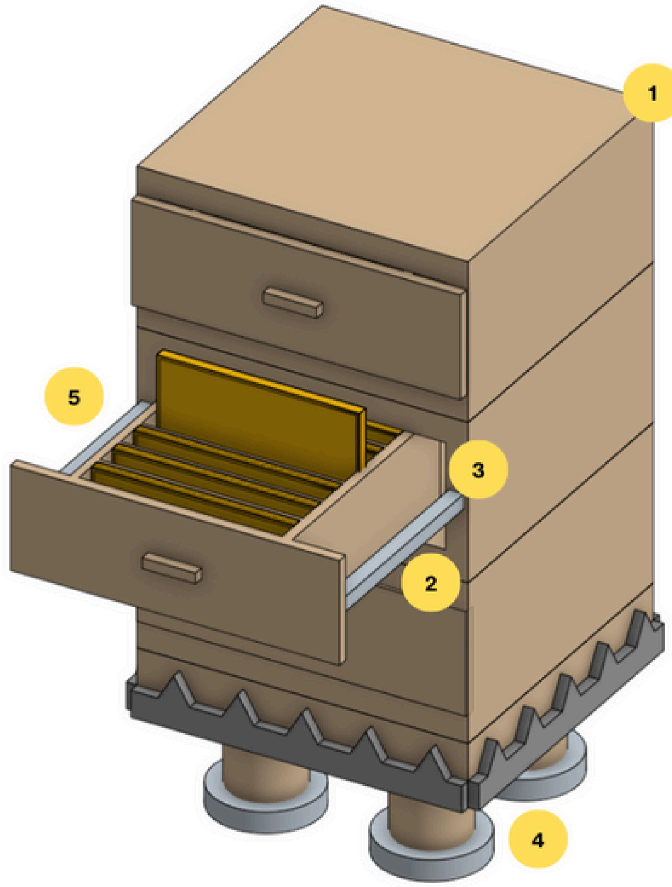
→ Lifting vertically makes inspections physically demanding.

→ Must remove upper boxes to reach brood—time-consuming and inconvenient.

→ Bees struggle to regulate temperature in extreme weather.

→ Lacks integrated defences against mites, ants, and beetles.

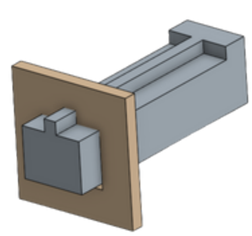
→ Difficult for older or physically limited beekeepers to manage.



Key Design Features

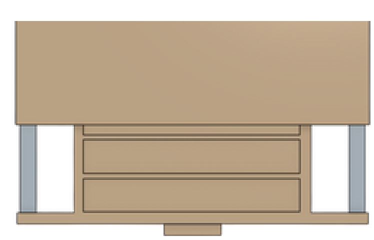
1. **Cedar wood** for insulation and pest protection
2. **Horizontal sliding mechanism** removes vertical lifting
3. **Gap** between hive and drawer to prevent propolis buildup
4. Feet below the ground to prevent tipping when drawers are extended
5. **Stainless steel connections** reduce friction and the required force

Male - Female Connector



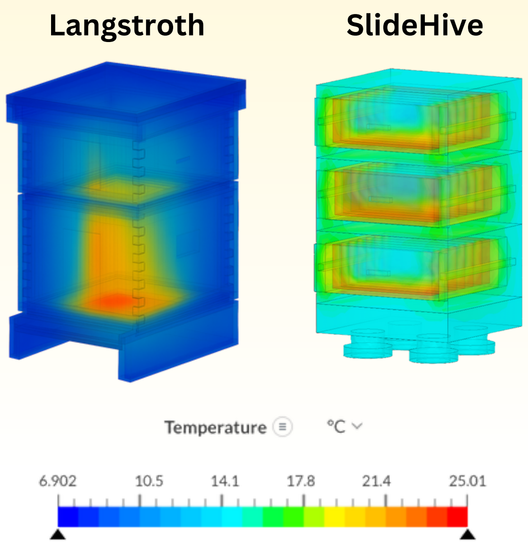
Gap in between the hive and the drawer prevents them from being stuck with propolis

Top View



A ridge on the male connector prevents its full removal, ensuring bees cannot enter

Verification

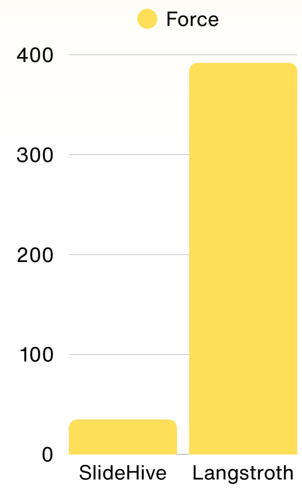


Insulation Testing

To test force, we moved the mass needed to access the hives and calculated force based on the chord's change in length.

To test insulation, we ran thermal simulations on CAD models of candidate designs in Simscale with an ambient temperature of -10°C. Wall temperatures were approximated using Fourier's Law of Heat Conduction.

Force Testing



Longevity, pest mitigation methods, and the number moving parts were informed by secondary research. The results of our testing are summarized in the measurement matrix below.

Measurement Matrix

Design	**Force** (N)	**Longevity** (Years)	**Number of Pest Mitigation Methods**	**Insulation Rank** 1 (best) - 3 (worst)	**Number of Moving Parts**
SlideHive	70	8 - 10	3	1	6 - 8
Langstroth	392	10 - 15	3	2	0 - 2
Pulley	~ 200	4 - 6	1	2	8 - 10
Improved Topbar	27	10	1	2	0 - 2
Spiral	27	8 - 10	2	3	10 +

Next steps

- Determine higher fidelity testing methods for **propolis buildup**
- **Better insulation** for the front side of the hive
- More consideration related to **ventilation** (especially that over winter)
- Explore different methods or metrics of assessing **pest mitigation** and control