Hytek Extrusion Masking

Objective & Background

This project develops a tape masking system for Hytek Industries to reduce operator fatigue, improve tape application consistency, and increase throughput when masking two complex aerospace extrusion profiles. These profiles range from 4 to 14 feet in length and are currently masked by hand for painting.

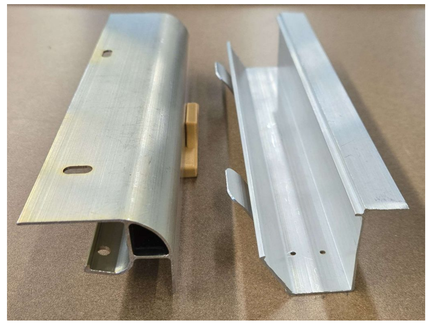


Figure 1: 3136 (Left) and 3137 (Right) Profiles

Design Requirements

- Apply masking tape with ±0.75 mm (0.03 in.) accuracy.
- Reduce masking time by at least 10%.
- Minimize operator strain through ergonomic design.
- Be compatible with existing 15-foot workstations and varied extrusion lengths.

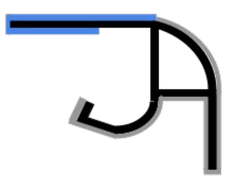


Figure 2: 3136 Profile Outline

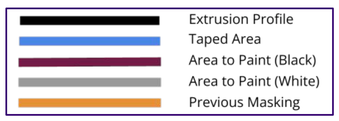


Figure 3: Diagram Key

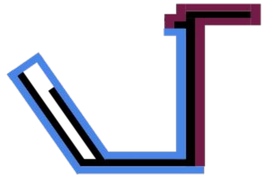


Figure 4: 3137 Phase 1 Tape/Paint Outline

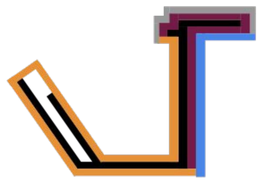


Figure 5: 3137 Phase 2 Tape/Paint Outline

MECHANICAL ENGINEERING
UNIVERSITY of WASHINGTON

Concept Development & Selection

3136 Handheld Masking Device:

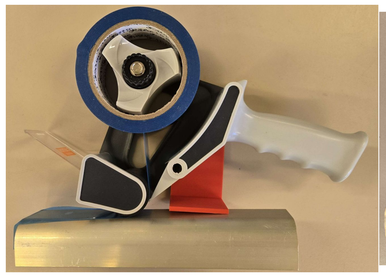


Figure 6: 3136 Initial Prototype Version 1

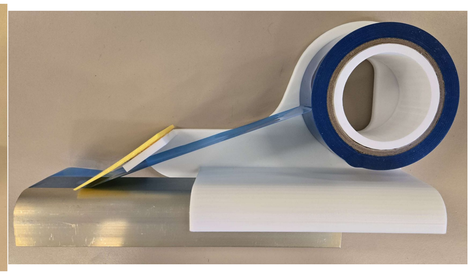


Figure 7: 3136 Profile Masking Device

3137 Profile Rail-guided Gantry System Prototype

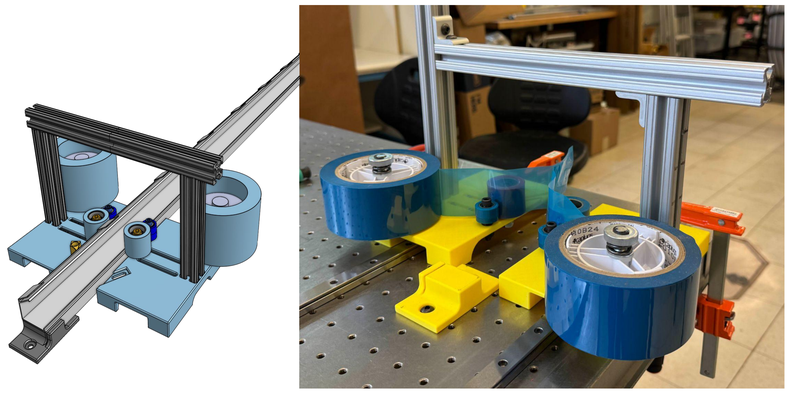


Figure 8: 3137 Profile Masking Device

3136 Ergonomic Features:

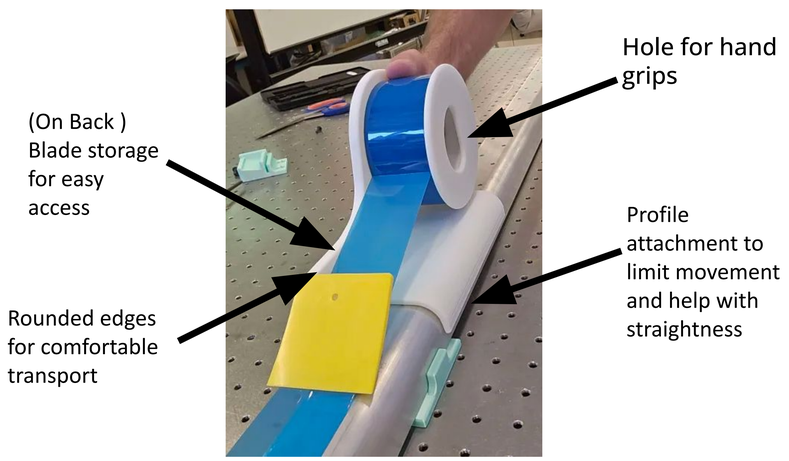
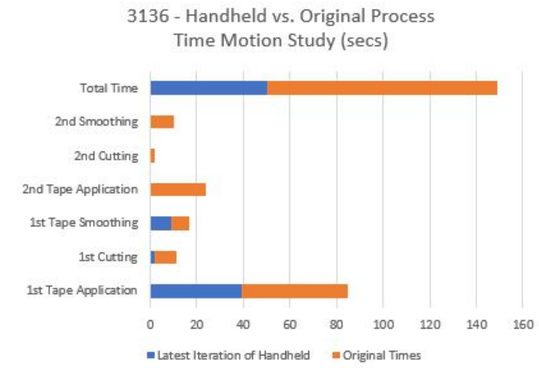
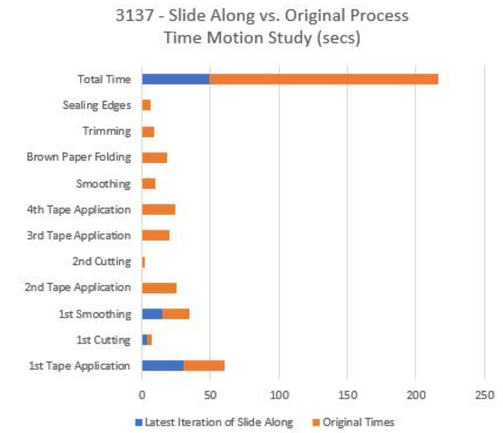


Figure 9: 3136 Handheld Latest design in use

RESULTS/VALIDATION

Time Motion Study Results





Conclusion & Recommendations

The handheld system for the 3136 profile cut masking time by about 50% and reduced operator strain while improving consistency. Profile holders improved efficiency and ergonomics. For the 3137 profile, we recommend adapting the gantry system into a stationary setup to increase rigidity and reduce complexity.

Acknowledgements

We would like to thank **Eli Patten (Faculty Mentor), Chris Adkisson (Industry Mentor) & Damian Walters (Industry Mentor)** for their help and guidance in this capstone project.

Mechanical Engineering Capstone Exposition
June 03, 2025, Husky Union Building, University of Washington, Seattle