

Mechanical Kayak Loading System

Ruben Abounaja, Colin Gilmore, Jack Kennefick, Alex Robacher, Chase Wescott,
Department of Mechanical Engineering, University of New Hampshire



**University of
New Hampshire**

Introduction

The goal of this project was to build and test a working prototype of a mechanical kayak loading system. The system loads kayaks of any size onto and off of any commercially available kayak roof rack and affix to any make or model of automobile that has a trailer hitch. The final prototype consists of a trailer-hitch-mounted, winched lever arm and a roller guide that suctions to the rear window or roof.

Research & Development

Customer Discovery

- Many kayakers struggle to lift kayaks onto their car alone, especially the elderly or short-statured people

Market Research

- Current products are not compatible with existing roof racks that the kayaker may own
- Current products are prohibitively expensive (typically around \$600)

Design Selections

- The final design was made to fit a 2012 Outback
 - This prototype is not universal, but is a successful proof-of-concept

Construction

- The lever piece was made of 2" steel square tubing and a commercially available winch
- The roller was made of 3/4" pvc with commercially available automobile suction cups

Results

A working prototype is shown in the figures below. This prototype loads any kayak onto any existing, commercially available roof racks. To load a kayak, the operator would lower the lever to the position shown in Figure 1. They would then attach the roller guide to the rear window and drag the kayak's bow up into the guide. The operator would winch the lever up into the vertical position shown in Figure 2. They would then slide the kayak forward if needed, and strap down their kayak to existing racks. To lower the kayak, the operator would perform the same steps in reverse.



Figure 1: Lowered Position



Figure 2: Raised Position

Discussion

This prototype demonstrates the final design's feasibility and satisfies the design requirements. Namely, it loads kayaks as intended and has low fabrication cost (\$183 in materials). However, several improvements could be made to the prototype through further design refinement:

- Use lighter metal for lever
- Make lever height adjustable
- Add second roller for taller cars
- Add hitch adapter for 1" hitches