Paraplegic Kayak Entry Assistance System

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Project Concept

Our goal is to create a kayak entry-to-water system for use by paraplegics. The system aids in kayak entry and launching, requires some assistance, and is designed to be seaonal for primarily recreational areas. Similar systems being used right now to lift boats and personal watercraft were used as inspiration, and examples of these can be seen in Figure 1 and 2.

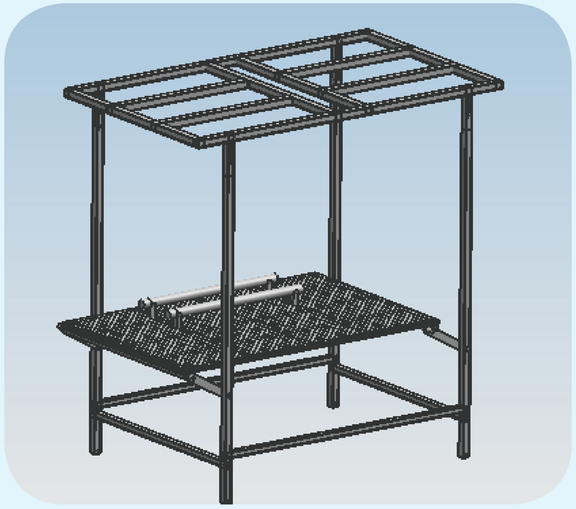
Design Objectives

Objective	Rank	Evaluation	Target
Minimize lifting effort of occupant	5	Vertical distance occupant has to lift themselves	Vertical Distance < 15”
Easy to use	4	Number of operations	< 4
Low maintenance	3	Time it needs to be repaired	< 1 repair/year
Easily removable	3	Time/Man power needed for removal	< 3hr/3 people
Kayak Lifting distance	2	Distance out of water	>3’

Design Constraints

Constraint	Measure	Limit
Accommodate Different Kayaks	Length of Kayak	< 12.0’
Accommodate Different Occupants	Weight of occupant	< 275 lbs
Lifetime	Life without Destruction	15 years
Safety	Minimize pinch points	Occupational Safety and Health Administration
Prototype Budget	Prototype Budget	< $10,000
Deliverable Due Date	Build Plans Complete	4/23/09

Proposed Design

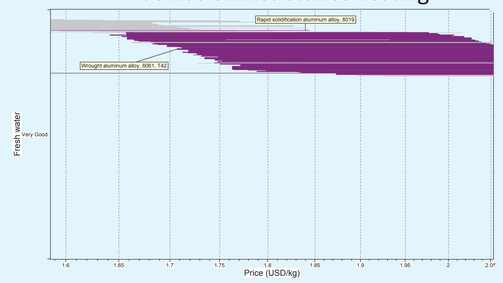


Component Cost

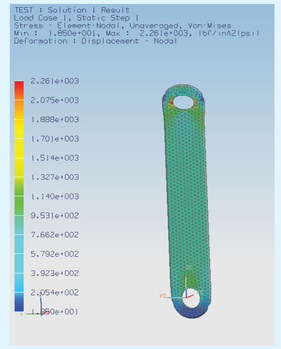
Part	Number	Price	Total
Rescue Triangle	1	$90.00	$90.00
Self Breaking Descender	1	$225.00	$225.00
Petzl Fixe	1	$24.90	$24.90
Petzl Tandem Pulley	2	$55.95	$111.90
Petzl Spirit	1	$8.95	$8.95
Petzl OK Screw-Lock	3	$15.95	$47.85
Stainless Steel Wire Rope	8’	$1.40	$11.20
Forged Wire Rope Clips	6	$3.40	$20.40
Cable Hand Winch	1	$29.95	$29.95
Perforated Aluminum Sheets	5	$56.55	$282.75
Aluminum Tubeing 6’	2	$85.00	$170.00
Aluminum Sheet	1	$155.00	$155.00
6’ Aluminum Strut	24	$35.12	$807.76
Aluminum Sheet for Feet	4	$26.00	$104.00
		TOTAL	**$2109.28**

Technical Aspects

Corrosion Resistance Testing

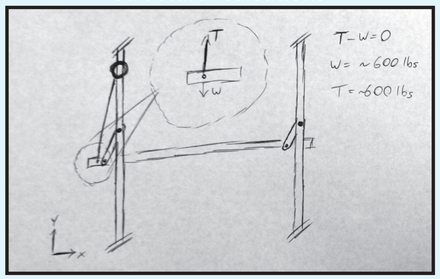


FEA



Showed that support struts should have more support at their tips. Further FEA would be done to optimize each part.

Structural Calcutions



Initial Pugh Analysis

Function	Concepts		
	1	2	3
Energy Source	Hand Crank	Battery Powered	Hand Crank
Structure Material	Aluminum	Aluminum	Stainless Steel
Lowering Method	Cantilever Pulley	Pulley	Cantilever Pulley
Boarding Method	Overhead Lift	Mobile Lift	Overhead Lift
Deck Surface	Plastic Grid	Parallel Bars	Metal Grid
Dech Attachment	Free Standing/Clamped	Free Standing/Clamped	Free Standing/Clamped
Movement Method	Float Move	Wheels/Wagon Pull	Wheels/Wagon Pull
Kayak Stabalization	Raised Preform	Raised Double Bar	Raised Preform

Current Work

- Compared six overall designs for the best choice
- Created a rigging apparatus for supporting the occupant
- Determined possible safety hazards within the design
- Performed material analysis to confirm Al - 6061 is an optimal choice

Future Work

- Optimize design of components with use of FEA (ex.: adding more material to support ends.)
- Testing for further safety concerns
- Compare total cost to Prototype budget; currently we are significantly under budget