

EnPRO 497-352

Battery-Powered Transport
for Beach Launched Catamarans

Team Members:

Juan Bueno
Raghuveer Cumar
Miry Kim
Mary McCabe
Brian Sklena
Greg Tatkowski
Bill Watts
Jay You

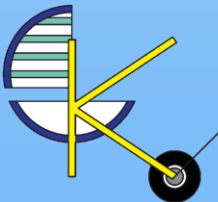
Problem

- Transporting boats across sand beaches is physically challenging
- Current approach requires several strong adults to move the boat from storage to the water



Proposed Solution

- Work together towards an innovative catamaran transporter design efficient enough to be operated by one individual
- Dramatically reduce physical labor

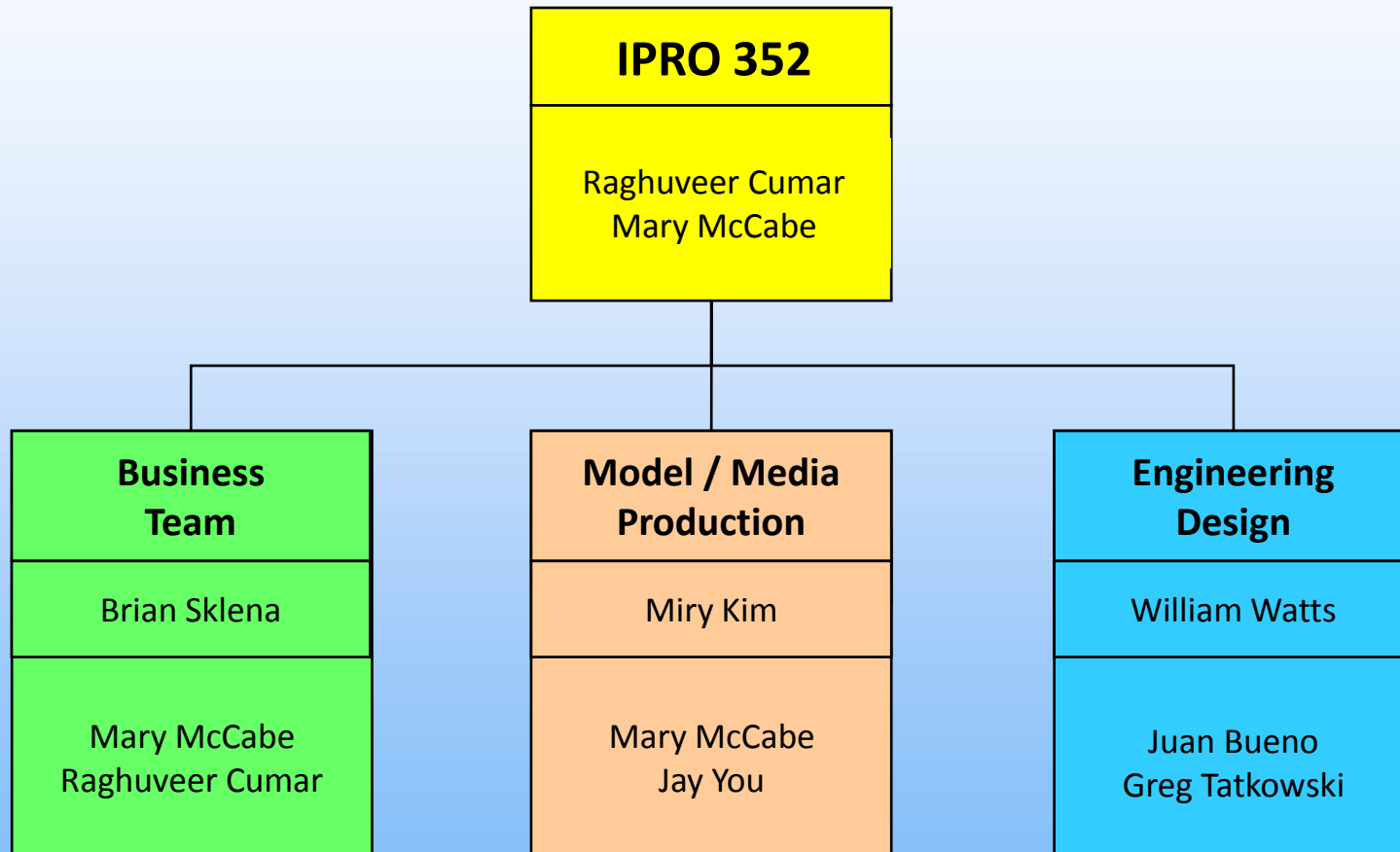


Objectives

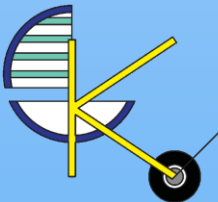
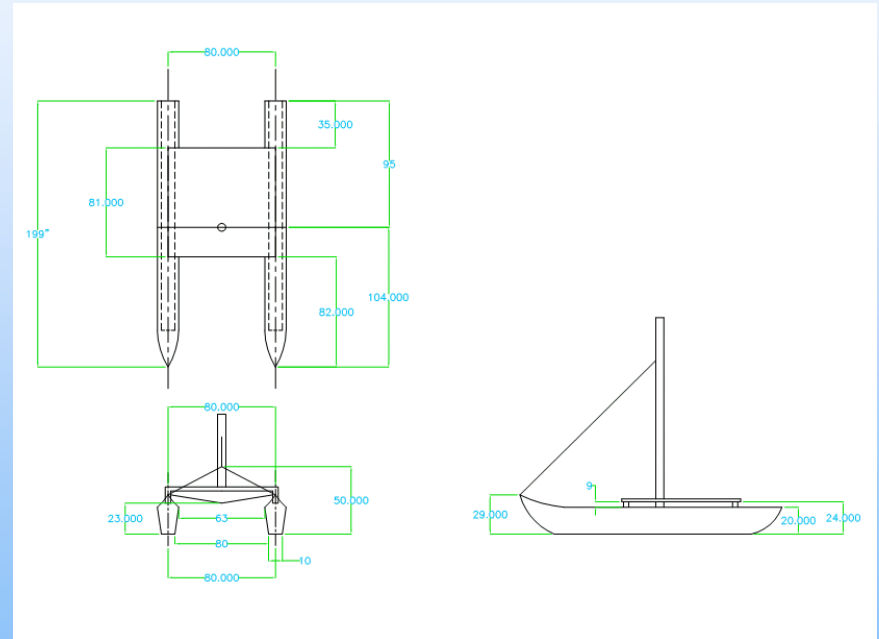
- Design, build and test a prototype that permits single-handed operation
- Investigate the business potential of the product
- Construct an informational website



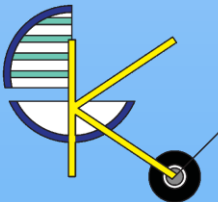
Team Structure



Boat Analysis



Understand User Experience

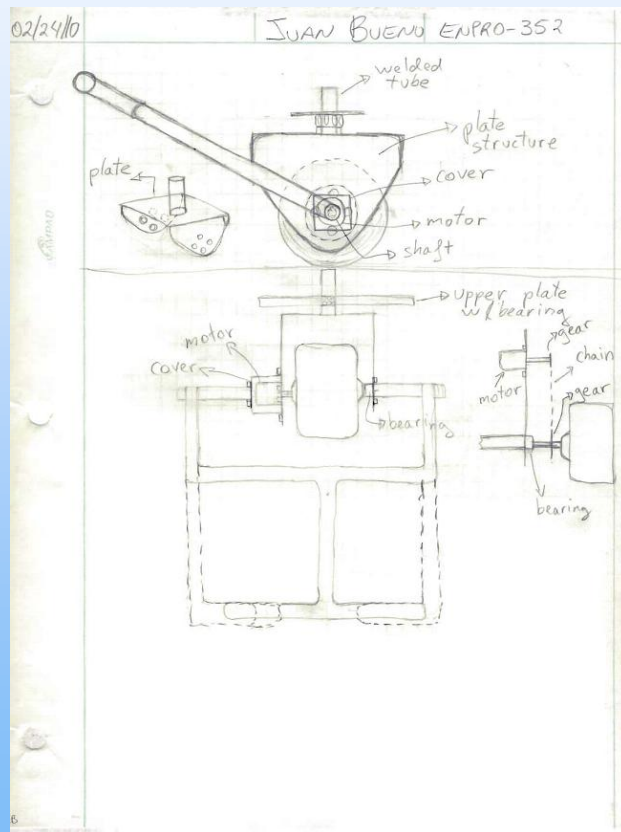


Environmental Impact

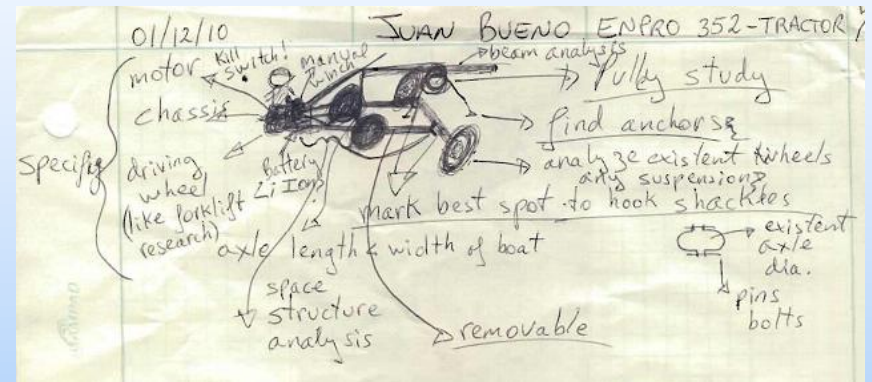


Initial Ideas

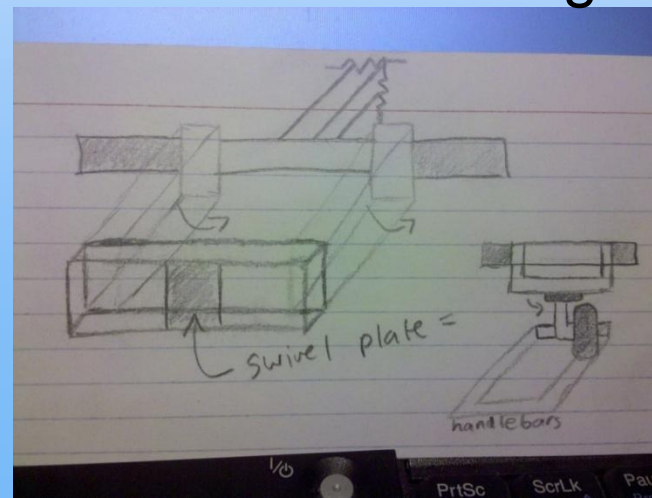
Steering with Hydraulic Lifting



Scissor Lift



Swivel Lifting & Steering

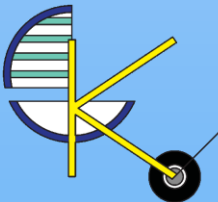
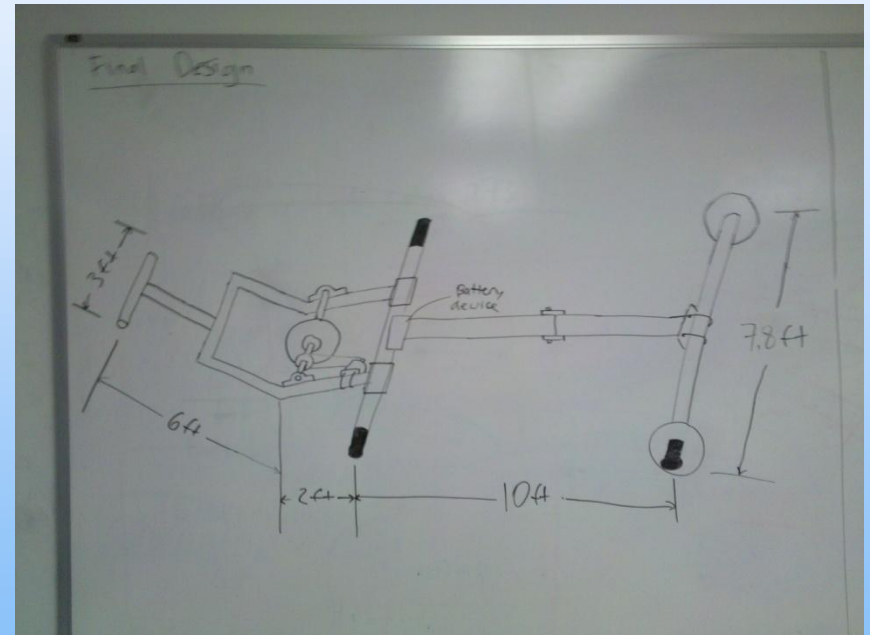


Modeling / Drawings

Lego Model

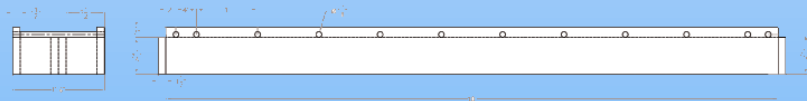
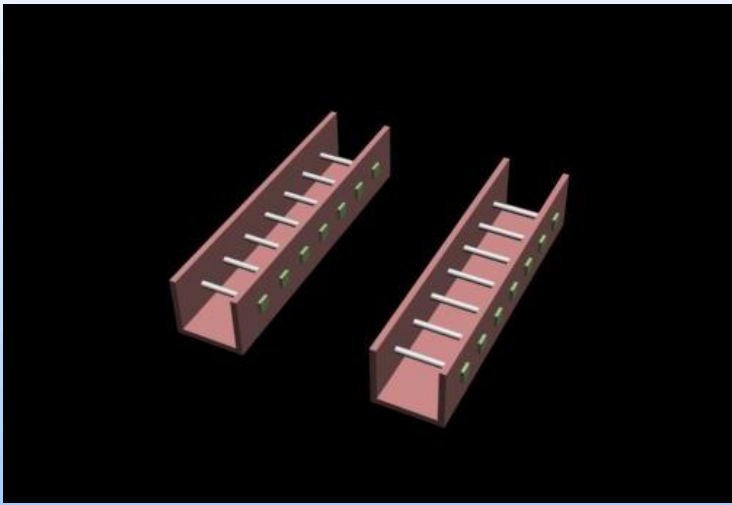


Finalizing Sketches

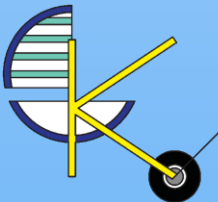
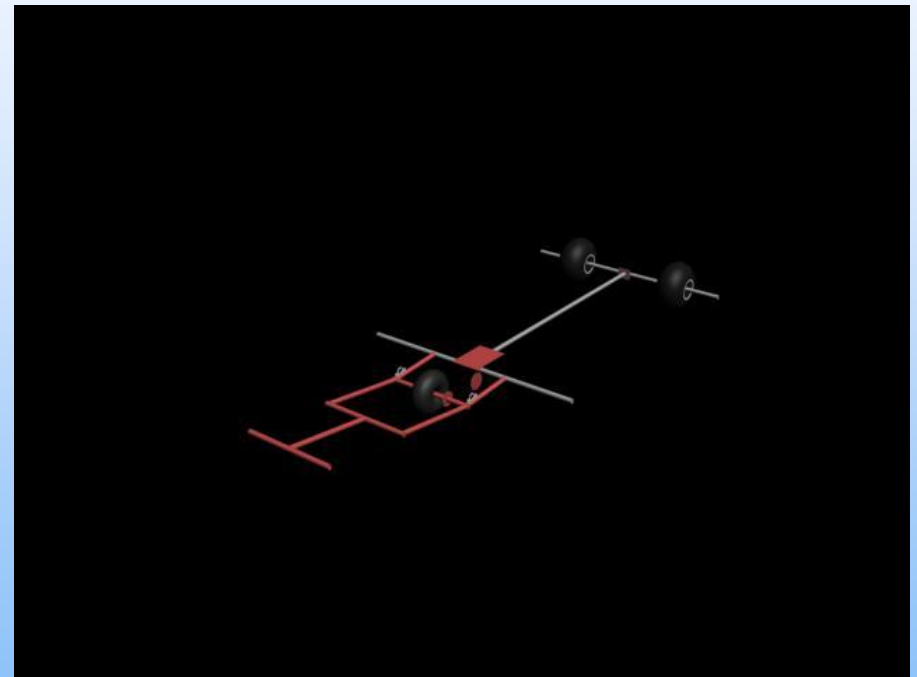


New Design Approach

Cat Slippers



Cat Kart



Cat Slippers Testing

Prototype Construction

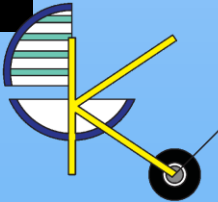
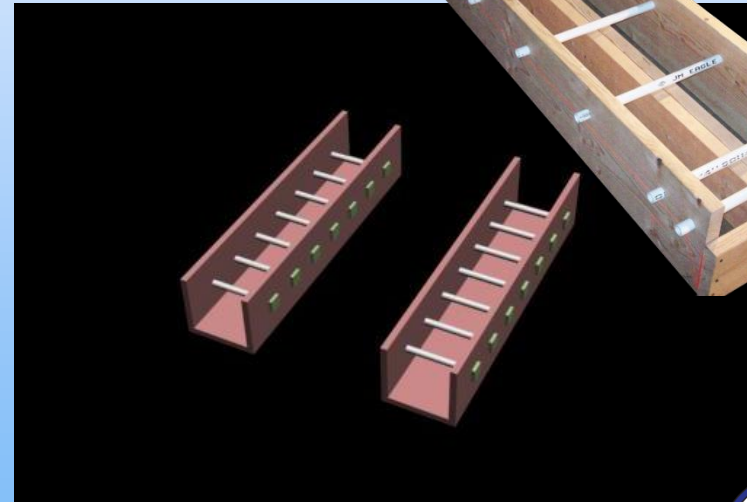
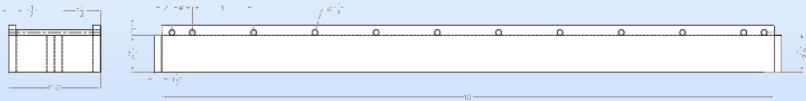


Prototype



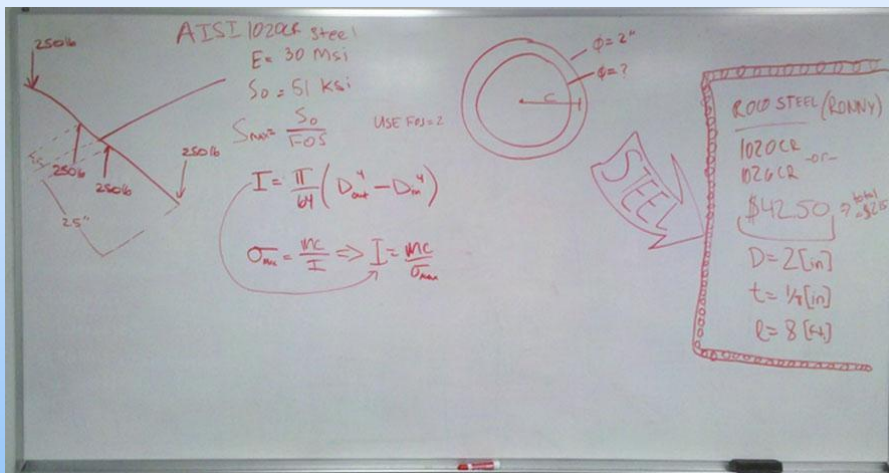
Cat Slippers, Cont.

Final Sketches



Materials Selection for Cat Kart

Stress Analysis

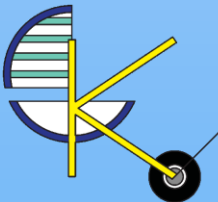


Cross Bar		
> restart;		
> oDia := 2	oDia := 2	(1)
> E := 30·10 ⁶	E := 30000000	(2)
> S ₀ := 50000	S ₀ := 50000	(3)
> X := 2	X := 2	(4)
> S _{max} := $\frac{S_0}{X}$	S _{max} := 25000	(5)
> a := 2.5·12	a := 30.0	(6)
> l := 8·12	l := 96	(7)
> c := $\frac{oDia}{2}$	c := 1	(8)
> F := 250	F := 250	(9)
> M := F·a	M := 7500.0	(10)
> Mol := $\frac{\pi}{64} (oDia^4 - iDia^4)$	Mol := $\frac{1}{64} \pi (16 - iDia^4)$	(11)
> iDia := fsolve($S_{max} = \frac{M \cdot c}{Mol} \cdot iDia$)	iDia := 1.773299361	(12)
> T _w := $\frac{(oDia - iDia)}{2}$	T _w := 0.1133503195	(13)
> delta_max := evalf($\frac{F \cdot a}{24 \cdot E \cdot Mol} (4 \cdot a^2 - 3 \cdot l^2)$)	delta_max := -0.8350000005	(14)
Max Stress in the lever		
> S2max = evalf($\frac{5760 \cdot c}{2 \cdot Mol}$)	S2max = 9600.000006	(15)

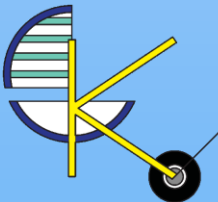


Cat Kart Construction

**Shaft is Steel -> Machining
Still Necessary**

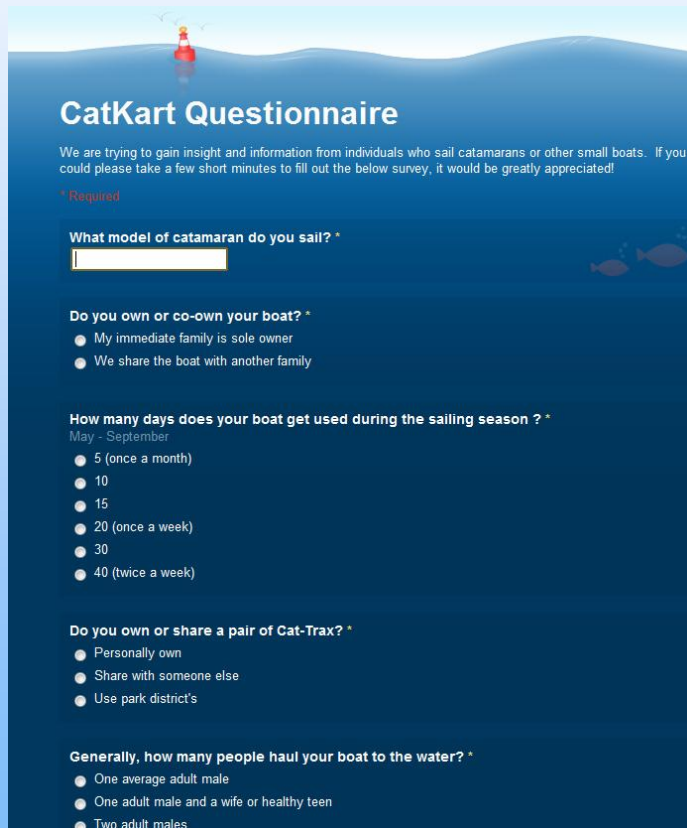


Cat Kart



Market Research

Primary Research



CatKart Questionnaire

We are trying to gain insight and information from individuals who sail catamarans or other small boats. If you could please take a few short minutes to fill out the below survey, it would be greatly appreciated!

** Required*

What model of catamaran do you sail? *

Do you own or co-own your boat? *

- My immediate family is sole owner
- We share the boat with another family

How many days does your boat get used during the sailing season? *
May - September

- 5 (once a month)
- 10
- 15
- 20 (once a week)
- 30
- 40 (twice a week)

Do you own or share a pair of Cat-Trax? *

- Personally own
- Share with someone else
- Use park district's

Generally, how many people haul your boat to the water? *

- One average adult male
- One adult male and a wife or healthy teen
- Two adult males

Secondary Research

- Blogs
- Patent Search
- Trade Associations



Two Business Ideas

Cat Kart

- Beach Valet Service



Cat Slippers

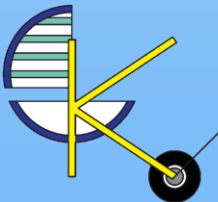
- Direct Sales (kit)



Beach Valet Service

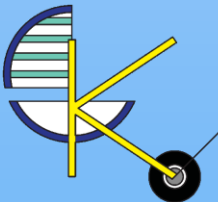
Have a beach stand with personnel to set up and take your boat to and from the water for you.

- Pay Per Use
- Annual Subscription



What we need for this:

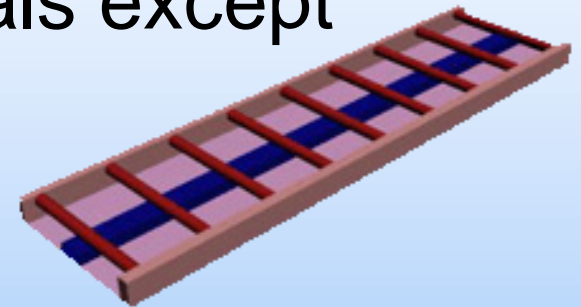
- Operation / Concession Agreement with Park District
- Facility Utilization Data
- User Interest
- Beach Stand / Kiosk
- Personnel
- Electricity / Extra batteries



Cat Slippers Direct Sales

Provide customers with a kit which contains all the needed materials except for the wood.

- Allows for shipping
- Can sell to individuals as well as specialty shops
- Users can use even if not interested in Cat Kart or Beach Valet Service

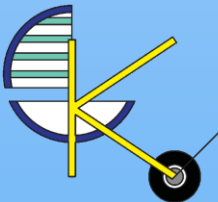


Getting Started

- Beta testing during the first summer
- Provide users with free trial

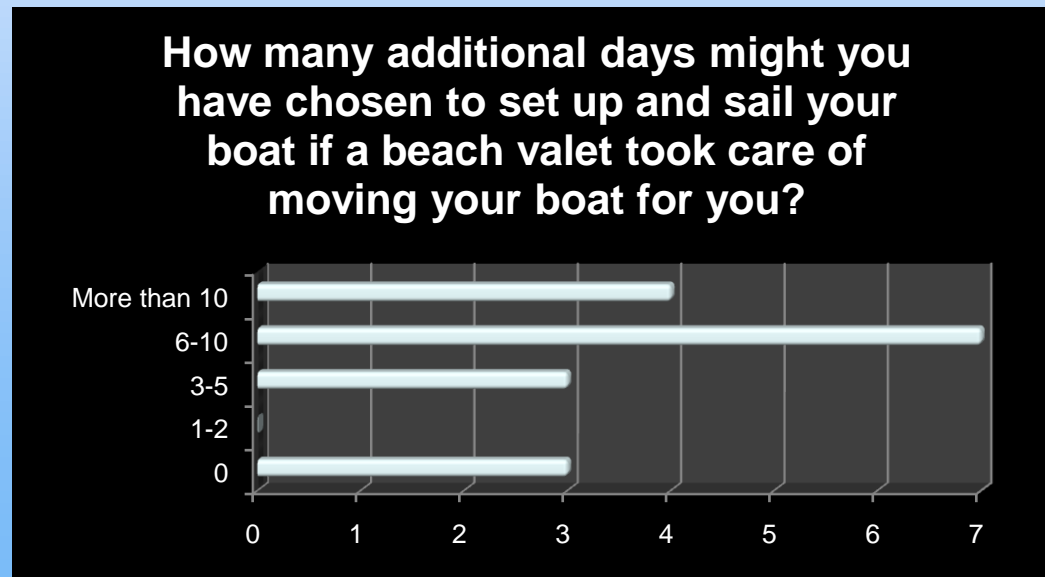
By doing the above, we will gain:

- User feedback on the products
- Measure of actual buyer interest
- Ways to optimize and improve design
- Produce exposure and word of mouth
- Information on the peak hours & days



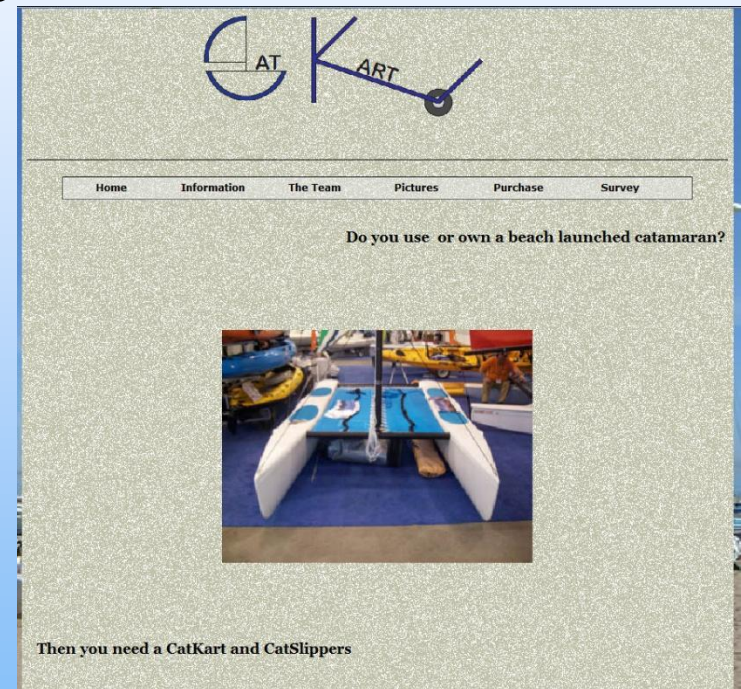
Value Proposition for Facility

- Increased User Satisfaction
- Increased Utilization
- Differentiation vs. Competing Facilities
- Additional Sources of Revenue



Cat Slippers - Marketing Approach

- Require as part of Cat Kart valet service
- Promote through beta testing
- Sell kits through website
 - Individual owners
 - Specialty shops
- Provide service to construct & install kits through valet service kiosk



Financial Basis



- Average customer sails 26 times per season
- 90 customers (50% of current users)
- Season Pass: \$300 for unlimited trips

Financial Summary

Summary of Costs

Capital Costs

Cat Kart Transporter	\$1,500
----------------------	---------

Misc. Operating Costs

Promotional Efforts	\$250
---------------------	-------

Beach Operating Permit (25% of revenues)	\$6,750
---	---------

Insurance Liability	\$500
---------------------	-------

Extra batteries	\$300
-----------------	-------

Total Misc. Operating Costs	\$7,800
------------------------------------	----------------

Projected Revenue

Annual revenue per user	\$300
-------------------------	-------

Total Revenue (90 users)	\$27,000
--------------------------	----------

Labor Costs

Beach valet (total hours)	1230
---------------------------	------

Total Labor Costs for summer (\$10/hr)	\$12,300
--	----------

EBITDA

\$6,900

Summary

This IPRO began in January 2010!

Two products – CatKart and CatSlippers

Two business models: Beach Valet and Direct Sales

Beta testing over the summer

All the set objectives were achieved

