Design of a recreational catamaran control area

Master thesis

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Glossary

Brand equity - Brand equity refers to the value a company gains from its name recognition when compared to a generic equivalent. (Hayes, A., 2020)
Cat – Catamaran
Control area - the space where the users of the catamaran interact with the rudder and controlling lines.
Dacron – sturdy but heavy sail cloth.
Dinghy - Small one to two person sailing boat without accomodation
GRP/Fiberglass – Glass reinforced plastic
HPS – Hull Protection System
Mylar - a light type of sail cloth
Platform – the hulls and trampoline
Polyethylene boats – Rotomolded boats
Rig – holds up the sails and attaches to the platform
Rigging – Getting the boat ready to sail
Rotomolded – Production process
Tack – Turning the boat, pointing towards the wind.
Trim, trimming – Changing the shape of the sail to reduce or increase its power.

Catamaran parts overview

Rudder - controls direction of boat
Crossbar - connects both tiller arms
Tiller arm - connects rudder to crossbar
Traveller sheet - controls traveller position
Main sheet - controls the power of the sail

Helmsman - controls steering and main sail
Mainsail - main power source of the catamaran
Jibsheet - controls the Jib's angle to the wind
Jib - secondary power source

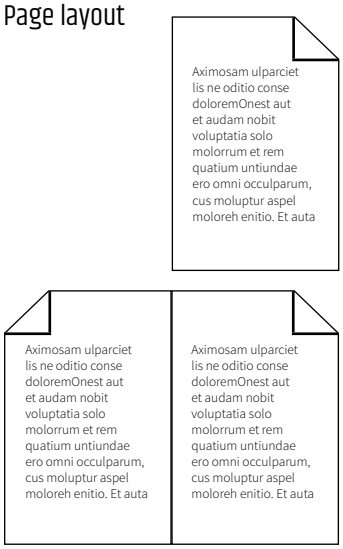
Pro grip - provides grip on slippery hull
Trampoline - supports sailors and is the main interaction area
Hiking strap - supports the lower leg when hanging
Joystick - the way to control the rudder
Traveller - controls the main sail angle to the wind
Rear beam - connects the two hulls

Crew - controls the jib and heel
Shroud - keeps the mast up
Front beam - connects the hulls
Trapeze - allows sailors to hang outside of the boat
Hull - provides buoyancy
Bow - front of the boat

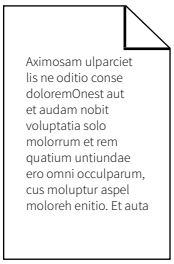
Readers guide

The following reading guides will assist you with reading this report as intended.

Page layout



The page layout of the report works best with facing pages and separate cover page settings.



Alternatively, a single page view works well.

Framework markers

Framework markers show the current framework part

Highlights

The highlights mark critical findings and insights collected by the variety of methods used. These findings and insight often lead to take-aways.

Take-aways

These blocks contain information to understand the critical decisions which lead towards the final design.

Samenvatting

Probleem
Nacra is een catamaran bouwer gefocussed op race catamarans. Nacra wil haar markt breder maken. Door Covid-19 zijn Catamaran regattas afgeblazen. Hierdoor is ook de race markt tot stilstand gekomen. Ondertussen is de markt voor recreationele catamarans aangetrokken. Nacra wil hier meer van gaan profiteren door hun recreationele catamarans te moderniseren. De Nacra 500 is als eerste aan de beurt voor een update.

Nacra wordt gezien als een race catamaran merk wat alleen high-performance catamarans maakt. De catamarans zijn te typeren als licht, stijf, reactief en krachtig. Dit zorgt ervoor dat de catamarans snel en wendbaar zijn. Daarentegen maakt de licht gewicht bouw de catamaran ook kwetsbaar en zijn de snelheid en wendbaarheid overweldigend voor beginnende catamaran zeilers.

Doel
Om Nacra's merkidentiteit effectief te kunnen blijven gebruiken moet de nieuwe versie van de Nacra 500 een high-performance uitstraling hebben en een bijpassend gevoel geven. Daarnaast moet de catamaran robuust en toegankelijk voor beginners zijn om voor deze doelgroep aantrekkelijk te zijn. Het ontwerpdoel is om een oplossing te ontwerpen die Nacra's recreationele catamarans toegankelijk maakt en zorgt dat deze high-performance blijven voelen en eruit zien.

Aanpak
Het ontwerpprobleem wordt aangepakt middels de Brand-driven innovation aanpak van Abbing(2010). Deze aanpak combineert de waarden van het bedrijf en klant om design mogelijkheden te komen.
Eerst wordt het merkimago van Nacra en hun bedrijfswaarden gedefineerd. Waar staat Nacra voor? Ten tweede worden de waarden van potentiële klantgroepen verkregen. Wat vinden klanten belangrijk in hun gebruiksscenario's? Waarom is het moeilijk om een Nacra catamaran te zeilen? Ten derde wordt er focus in het project gebracht door een meer specifieke doelgroep en designfocus te selecteren. Ten slotte worden ontwerpoplossingen gecreëerd waardoor recreatieve zeilers een Nacra kunnen zeilen.

Resultaat
Zeilscholen zijn geselecteerd als doelgroep. Deze scholen hebben behoefte aan een robuuste boot die zowel beginners als gevorderden een uitstekende zeilervaring biedt.

Het project resulteert in een catamaran die toegankelijk is voor beginnende zeilers en zeilers zonder voorafgaande ervaring op een catamaran.
Door de grootschoot en crossbar naar voren te plaatsen lijkt het besturen van de catamaran op de meeste andere instap zeilboten. Hierdoor wordt de overgang naar de catamaran makkelijker gemaakt en heeft de beginnende catamaran zeiler eerder een gevoel van controle over de boot.
De boot robuster gemaakt door een neusbeschermer toe te voegen.
Het gebruiksgemak is ook verhoogd. Door het pro grip verder naar voren door te trekken is het nu makkelijker om aan boord te stappen. Daarnaast wordt er aan de wensen van een zeilschool voldaan door de boot makkelijker te maken om te slepen. Ook kan de boot sneller overeind worden getrokken door de opricht lijn aan de onderzeide van de trampoline te monteren.

Conclusie
Het resulterende catamaranconcept lost het genoemde ontwerpprobleem op. Het is haalbaar om in het komende halfjaar de hoofdontwerpoplossing te implementeren. De relatief lage implementatiekosten en unieke productplaatsing in de recreatiemarkt maken het concept levensvatbaar. Bovendien bevestigden eigenaren van zeilscholen de wenselijkheid van het concept

Summary

Problem
Nacra is a catamaran builder focused on racing catamarans. Nacra wants to broaden its target market. Due to Covid-19, catamaran regattas are canceled, and the racing catamaran market paused. Meanwhile, sales of recreational catamarans have surged up at competing companies. Nacra wants to strengthen its relatively small foothold in the market of recreational catamarans by modernizing their leisure catamarans. The Nacra 500 is on the top of this list.

Customers view Nacra as a racing catamaran brand. Their catamarans are light, stiff, reactive, and powerful. This results in fast and agile catamarans. However, the lightness also makes the catamarans fragile. Moreover, the catamaran's speed and agility are overwhelming for beginning catamaran sailors.

Goal
To use Nacras brand identity effectively, the new version of the Nacra 500 must have a high-performance look and feel. For recreational sailors, it must be robust and more accessible to sail. Therefore, the design goal is to develop a solution that makes Nacra's recreational catamarans accessible but look and feel high-performance.

Approach
The brand-driven innovation approach of Abbing(2010) is used. This approach combines the values of the company and the customer to define design opportunities.
We first define the brand image of Nacra as well as their company values. What does Nacra stand for?
Second, potential customer group's values are obtained. What do customers find important in their respective usage scenario's? Why is it difficult to sail a Nacra?
Thirdly, the focus is brought into the project by selecting a more specific target group and design focus. Sailing schools are selected. These schools require a robust boat that gives an excellent sailing experience to beginners and advanced sailors alike.
Lastly, design solutions are created that allow recreational sailors to sail a Nacra.

Result
The project results in a more accessible catamaran for novice sailors and sailors without prior experience on a catamaran without tampering with the boat's performance.
By moving the mainsheet and crossbar forward, sailing the catamaran resembles most other entry-level sailboats. This setup makes the transition to a catamaran easier for the novice catamaran sailor. Who now has a feeling of control over the boat earlier.
The boat is made more robust by adding a nose guard.
The ease of use of the boat increases through several solutions. By applying the pro grip further forward, it is now easier to get on board. Towing the catamaran becomes straightforward due to the towing line. Plus the catamaran can be righted faster by mounting the righting line to the bottom of the trampoline.

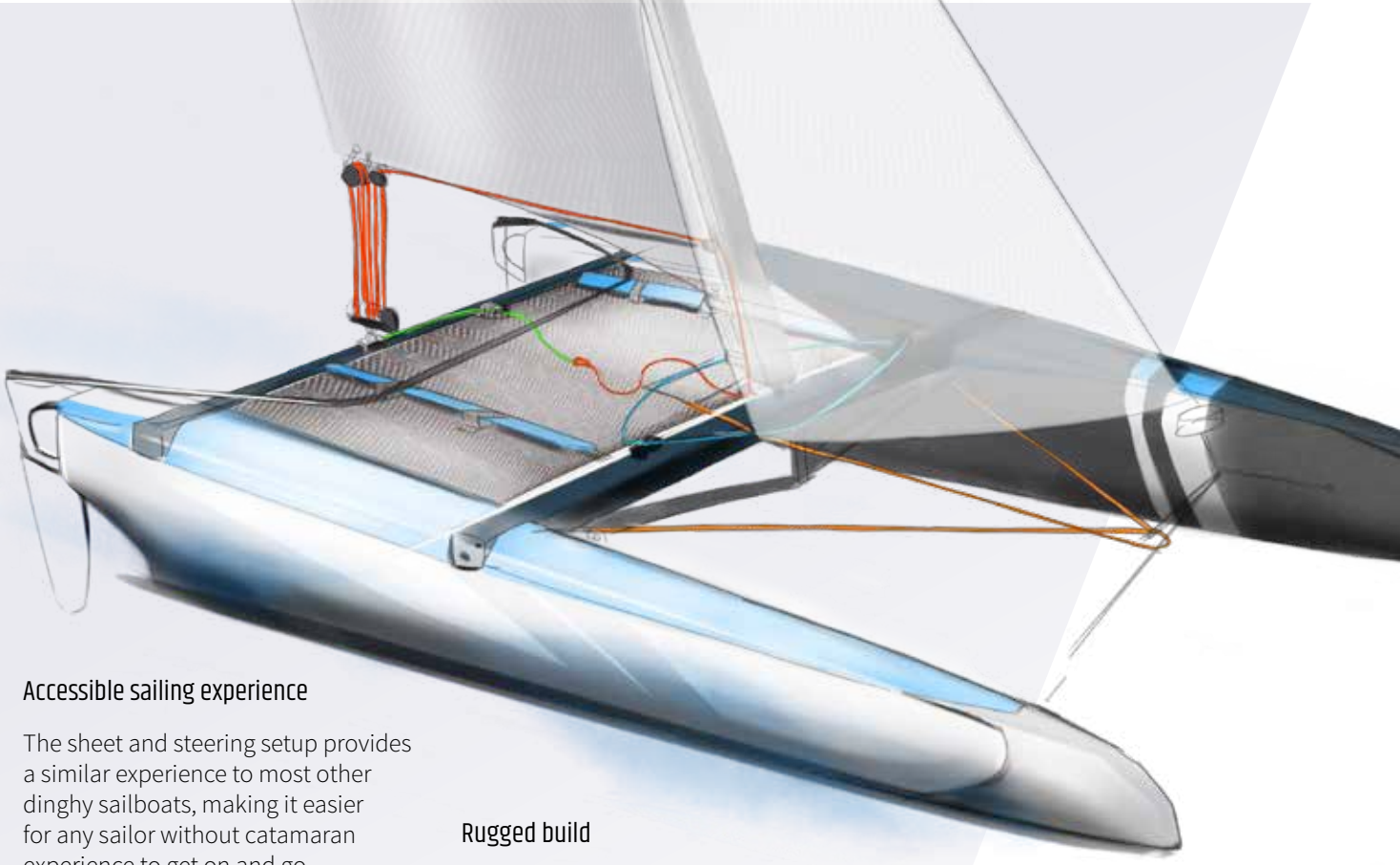
Conclusion
The resulting catamaran concept solves the stated design problem. The solution is feasible to implement in the coming half year. The relatively low implementation cost and unique product placement in the recreational market make the concept viable. Moreover, sailing school employees confirm the desireability of the concept.

Final concept

The all new Nacra 500

The ultimate sailing school catamaran

Designed together with sailing school professionals; this catamaran is rugged, easy to use, and easy to sail while giving you the real catamaran experience. It feels light, stiff, and direct; qualities you would expect from a Nacra.



Accessible sailing experience

The sheet and steering setup provides a similar experience to most other dinghy sailboats, making it easier for any sailor without catamaran experience to get on and go.

If you have grown out of this setup and want the original catamaran sheeting, you change the sheeting and steering layout back within a minute.

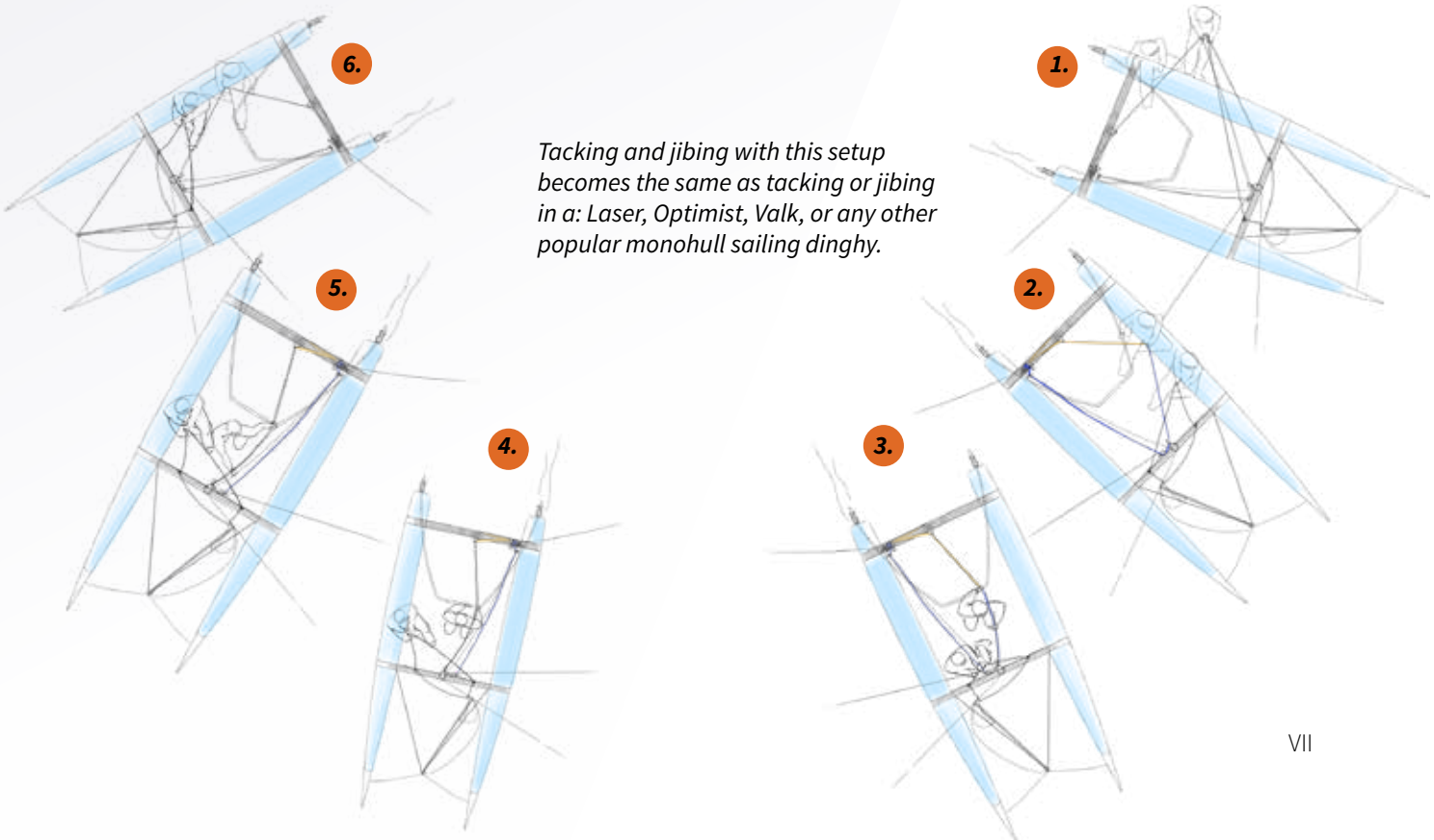
Rugged build

The design accounts for heavy use a sailing school would expect from its fleet. Exchangeable nose protectors protect the lightweight hulls from damage while the hiking straps are mounted to the beams to prevent unnecessary strain on the trampoline.

Ease of handling

A dedicated towing line and a cleat under the rear beam make towing this boat easy. And with the pro grip layered on top of the full length of the hull, you will be able to get on board the catamaran no matter how you have docked it.

Tacking and jibing with this setup becomes the same as tacking or jibing in a: Laser, Optimist, Valk, or any other popular monohull sailing dinghy.



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Preface

There are many stories of industrial designers graduating and claiming it was one of their most demanding tasks. You, as a student, get a grander task than you have ever had before. Some inflate their own expectancies to produce their magnum opus. Moreover, the university asks you to develop it on your own, while you were trained to work in teams.

I get that. However, I had quite a good time working on this project. The subject ticked a lot of my interest boxes. This report will be about sailing, high-performance catamarans, sailing schools, usability, design acceptance, and company strategy. Coincidently, I like working on all of those topics.

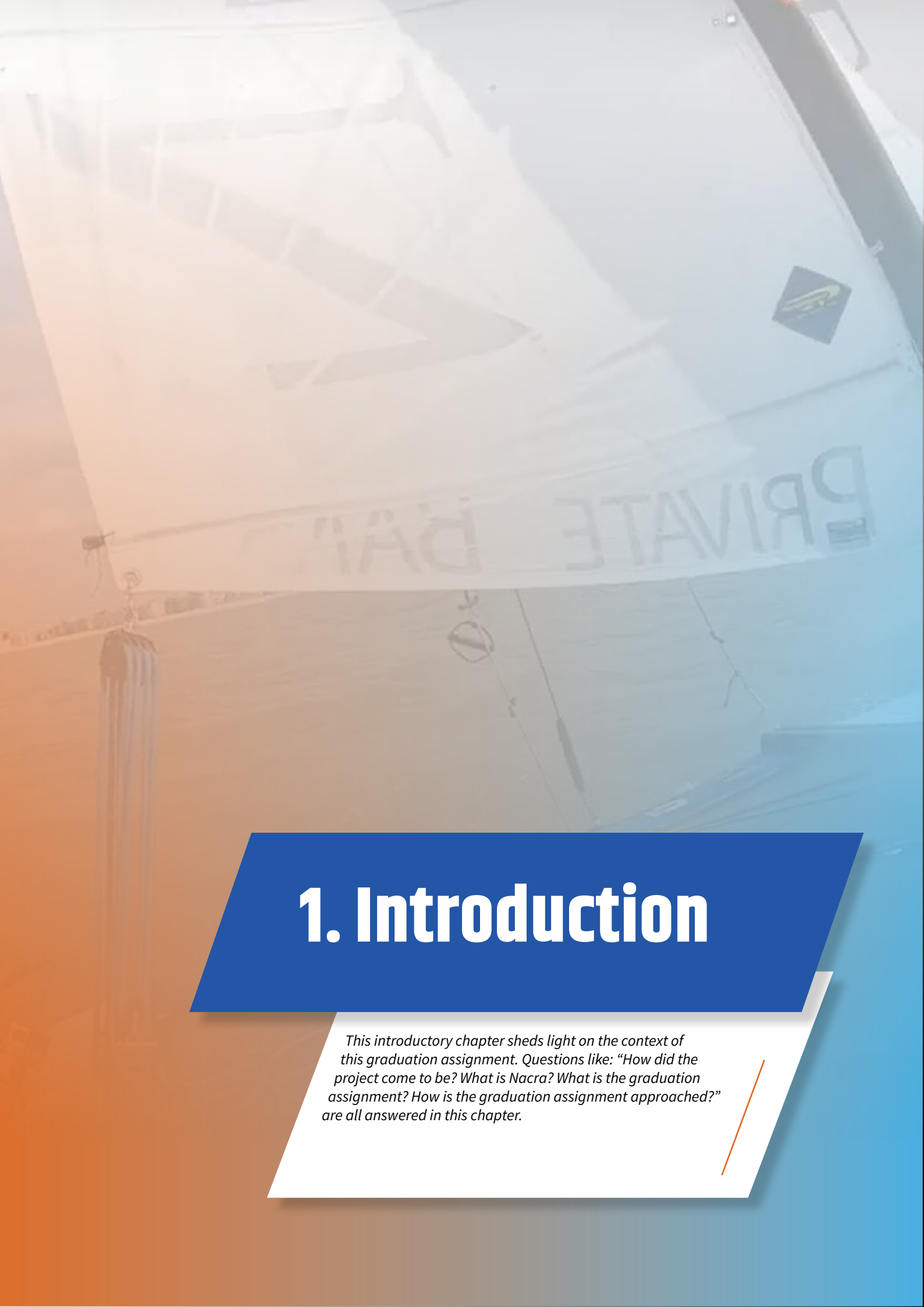
The project began to take shape after arranging a meeting with Nacra's Peter Vink via a sailing school colleague, Karel Begemann. Nacra needed a designer to develop a bench that can be attached to the side of a catamaran. After the obligatory industrial designer "why?" question, I told Peter that this would be too simplistic for the university to accept. Thus the project became; to design a recreational, high-performance catamaran. Nacra missed the Covid-19 growth in the recreational catamaran market and needed to update its product portfolio. A call with Martien Bakker and an E-mail conversation with Arjen Jansen later, I had upgraded from student to graduating student and catamaran designer. Brilliant.

All jokes aside, this report is a serious effort to finish the master Integrated Product Design provided by the TU Delft. It aims to show mastery of design processes, integrating customer, company, and environmental needs and values into product design.

The report is written too for Nacra sailing. A delightful company to work with. You will find the reasoning for the new catamaran concept, as well as many analysis insights that could prove useful for other products or the company in general.

This report is also for those who seek inspiration, as I have read many other graduation reports myself.

I hope this report will serve you well. Enjoy reading.



1. Introduction

This introductory chapter sheds light on the context of this graduation assignment. Questions like: "How did the project come to be? What is Nacra? What is the graduation assignment? How is the graduation assignment approached?" are all answered in this chapter.

1.1. Introduction

How do you use the knowledge of building some of the fastest catamarans on this planet to build the most exiting training catamaran?

Nacra Sailing is a major player in the field of high-performance catamaran development. Being the supplier of the Olympic multi-hull(catamaran) class N17, their brand has international appeal on a professional sailing level.

Due to the Covid-19 pandemic, the recreational watersports market is growing. However, Nacra is not benefiting from this growth due to its focus on the racing market. The racing market has ground to a halt after the cancellation of all racing events.

Using Nacra's brand name, the company wants to strengthen its relatively small foothold in the market of recreational catamarans while staying true to its high-performance brand image. To make this step, Nacra wants to update their three leisure line catamarans: the N470, N500, and N570.

Nacra's catamarans are on the faster side of the spectrum of small multi-hull sailing dinghies and are viewed by sailors as intensely quick, precise to steer but also fragile and expensive.

You can divide catamarans into two categories: rotomoulded and fiberglass(GRP) catamarans. Rotomoulded catamarans are typically viewed as more robust. Moreover, rotomoulded catamarans are heavier and less stiff. These characteristics make them slower and less reactive. These cats will dent on impact while fiberglass catamarans will potentially break. However, fiberglass catamarans are easier to fix. Therefore sailors say they learned to *really* sail a catamaran when they started sailing a fiberglass cat. Nevertheless, rotomoulded catamarans remain the most popular choice for recreational sailors due to their low maintenance and sturdy hulls.

The central contradiction of this project becomes apparent. How do you make a robust catamaran which is accessible to sail but does not compromise in terms of Nacra's performance image?

Some insight into how this document is structured: Chapter 1 will introduce you to the company, the assignment, and the approach to the design project. Chapter 2 will help you understand the context of the project. We review the current products, the interaction between the product and the user, and the company's background. Chapter 3: Focus: combines the insights gathered in the understand chapter and explains how the assignment is narrowed down to create the most beneficial result achievable in the available time. In Chapter 4, the design starts to take shape. It takes you from the earliest ideas to the final concept, which chapter 5 shows. This chapter concludes the design work and explains why the final concept is feasible, viable, and desirable.
Lastly, Chapter 6 rounds up all results, evaluates, and reflects on the work done. Whereafter the recommendations for further development conclude the thesis.

1.2. Meet Nacra

Nacra is a catamaran manufacturer located in Scheveningen, the Netherlands. Nacra does business on a worldwide scale. More than 70% of their sold products going abroad. The company originates from California, USA, but moved to the Netherlands in 2008. With a team of 15-22 employees, it ships approximately 250 catamarans each year.

Fig.1.1 Nacra F18 Evolution Race catamaran

Products

Nacra has a product portfolio consisting of 14 different catamarans. The primary focus of this product portfolio is and always has been racing. All catamaran hulls are made of fiberglass or carbon. This material helps to make the catamarans light and stiff. Lightness and stiffness contribute to making Nacra's catamarans fast and nimble; highly valued properties in the racing world.
The most prominent product in their portfolio is the Nacra 17. This foiling catamaran is the current Olympic multi-hull class. The N17 is build to cater to the most advanced group of multi-hull sailors.

The product portfolio has less focus on the fun and entry-level catamarans. The N470, N500, and N570 differ from the other catamarans by having no daggerboards. These leisure boats are more simple to sail for their removed daggerboards and sail trim controls.

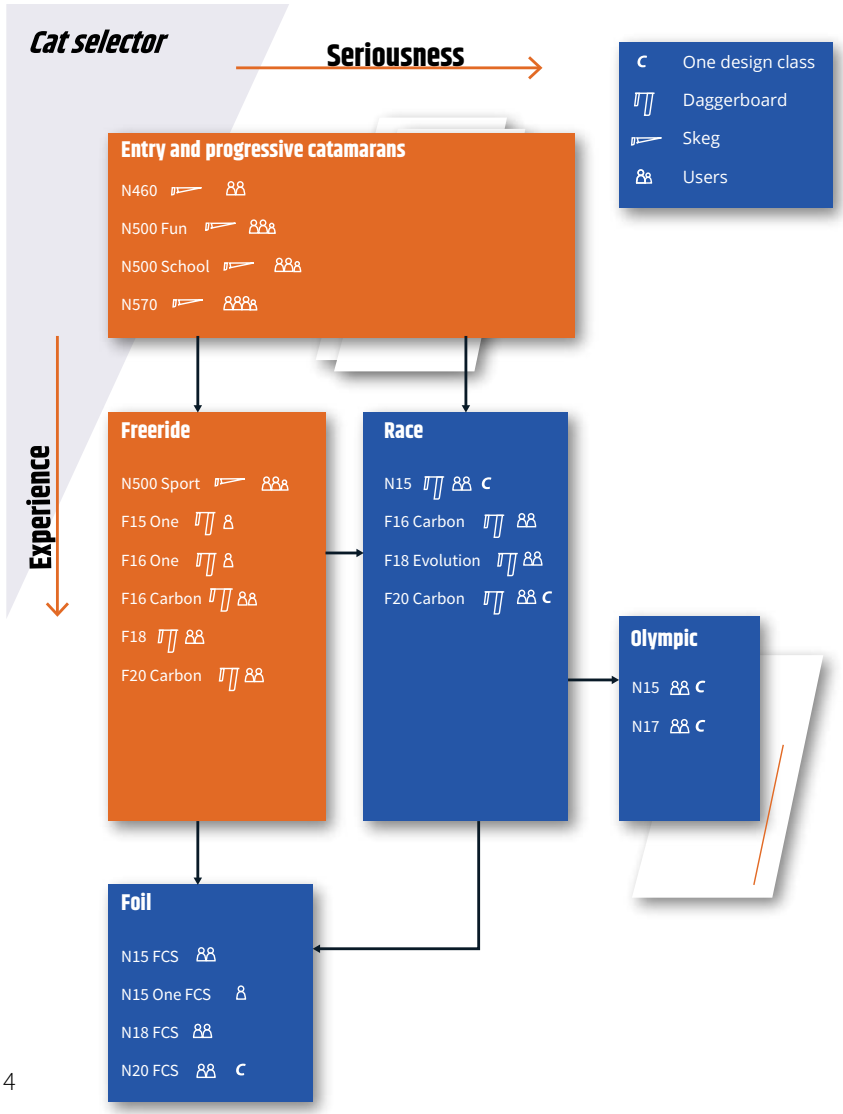


Fig.1.2 Proposed Nacra product selector

Fig.1.3 Nacra 460 Entry level catamaran

Fig.1.4 Nacra 17, The current Olympic multi-hull class

Fig.1.5 Nacra 500

Fig.1.6 Nacra F20 foiling catamarans

Fig.1.7 Hobie cat with bench (from hobie.com)

1.3. Original problem definition

The problem definition of this design project evolved thoughout the project. The initial problem definition is framed as written below.

Nacra wants to expand its foothold in the recreational catamaran market. They want a solution to make their boats more accessible for beginners and older sailors.

Nacra's brand image is built around high performance catamarans which are made to sail on the limit of what the boat can handle. There is little margin for errors, and errors will often lead to dangerous situations in high wind speeds. This sailing on the limit is what makes the boats fast and exciting to sail. A more accessible boat needs a larger margin of error since beginners and older sailors will make more mistakes. Current solutions are unfavorable since they trade away boat speed and handling, and make the boats look and feel less exciting (compare Fig.1.65 and Fig.1.76).

Nacra's current recreational boats do not attract a large enough market share. By simplifying the boats Nacra neglects their "high performance" brand image which they aim to use to expand their foothold in the recreational catamaran market.

The design problem is to develop a solution which makes Nacra's recreational catamarans accessible but look and feel high performance.

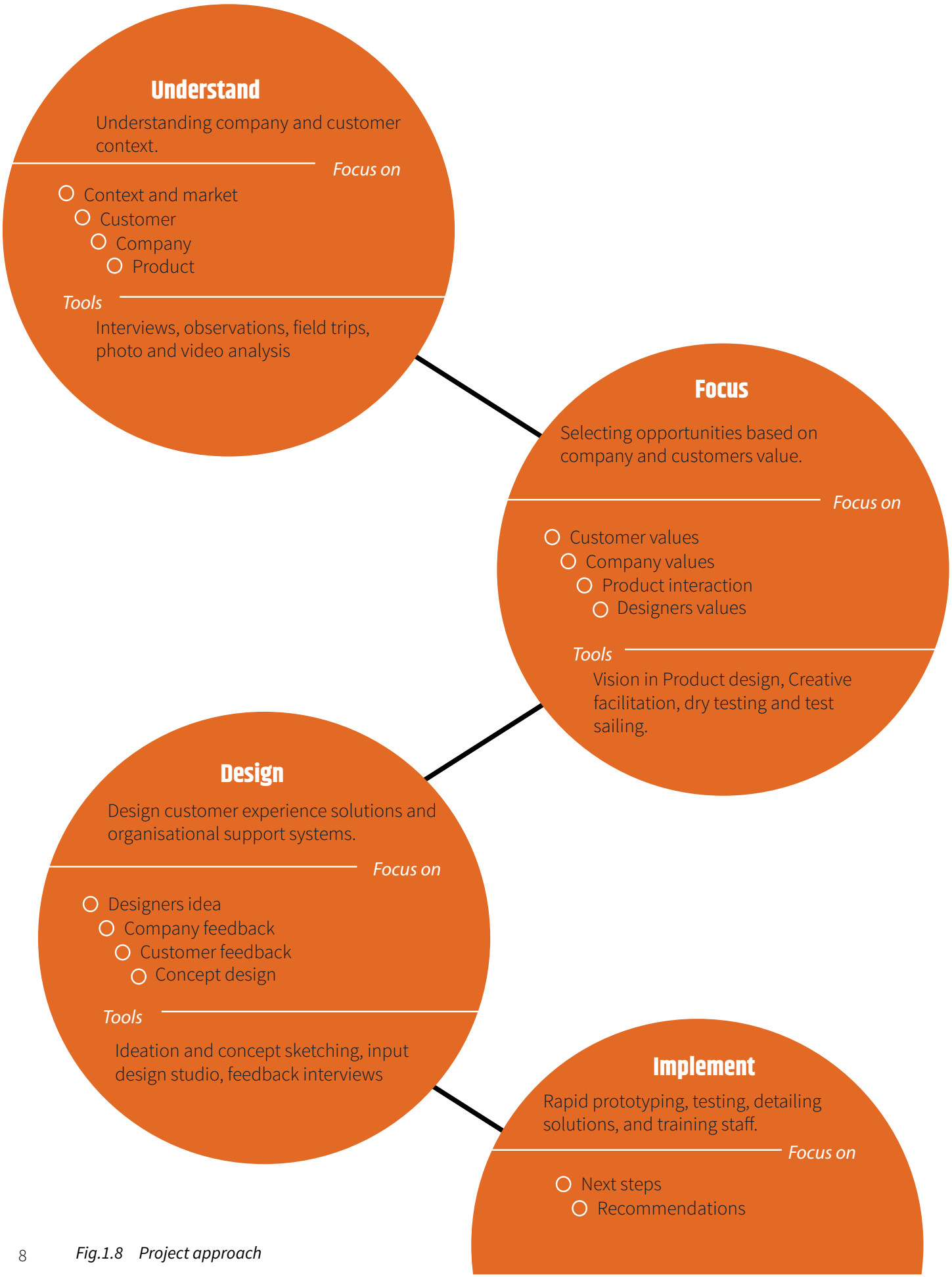


Fig.1.8 Project approach

Approach

The project lends itself to a Brand driven innovation (Abbing, 2010) based approach. Nacra wants to leverage its brand equity to enter a new market. Therefore, it is crucial to understand the brand and the new customer. This approach will do just that.

Two lenses

The brand-driven innovation approach uses two lenses to look at the innovation project at hand. Inside-out and outside-in.

Inside-out: what does the company see?
Using this lens a company can integrate its context, values, vision, and opportunities on the innovation project. This results in an innovation that suits the company.

Outside-in: what does the customer see?
The outside-in lens integrates the customer context, values, and opportunities into the innovation project. This lens makes sure the innovation fits the customer.

Four stages

The two lenses are applied in each of the four stages. Below an explanation of how these four stages contribute to the project.

Understand
Company context and values are found through interviews with directors and personnel and supported by in company observations. Customer understanding was created by interviews with international dealers, sailing schools, rentals, associations, and observations from field trips to a sailing school and catamaran associations. Additional video analysis creates an understanding of the product used on the water.

Focus
The focus phase aims to couple company and customer values to innovation opportunities. The Vision in Product design (ViP) framework (Hekkert, P.P.M., Van Dijk, M.B., 2011) is used to organize all information present. Test sailing, dry movement testing, and a creative session with all of Nacra's employees result in design opportunities. Evaluating these opportunities form a product vision.

This vision thus combines all company and customer values into a direction for innovation opportunity. Translating the vision into concept drivers makes the vision measurable.

Design
According to the Brand-driven innovation approach, the design phase aims to produce customer experience solutions and accompanying organizational support systems. In this case, the phase is reformulated as: "develop solutions which fit both company and customer."
After three iteration cycles, a final design proposal is formulated. The three iteration cycles range from coarse to fine in their level of detail. Also, each cycle is checked by one extra party. The first is checked with respect to the companies values. The second to the company and customer's values. The third should be checked with the company, customer, and designer's values.

Implement
The last stage of the brand-driven design approach is implemented. This stage consists of rapid prototyping & testing accompanied by detailed solutions & training staff. This project does not reach the implementation phase. Instead, a proposal for how this stage can be approached is included in chapter "6. Roundup" nonetheless.

The missing link

The Brand driven innovation approach is a fitting tool for this design assignment, nevertheless, it lacks in one area. The brand-driven innovation approach puts the designer's opinion in the back seat. While there is always added value to be found in the views and personality of the ones operating the tool. Therefore decisions during the project are not solely based on company and customer values but design values and feel as well.

2. Understand

In order to design for Nacra we first need to understand what the company is about. What does Nacra do best? How do people from in and outside the company look at the brand Nacra? What does Nacra sell and how does it compare to competitors? The background of this page already gives it away a little: A Nacra 17 jumping over a wave at high speed.

2.1. Value-driven design

In the catamaran world, it is customary to look from a product-oriented point of view. A product-oriented view misses the value people attribute to a product. Over the years, Catamaran developers optimized Catamarans for speed or cost.

Values can give rise to radically new ideas. This project follows the ViP framework (Hekkert, P.P.M., van Dijk, M.B. 2011) to incorporate these values.

The structure of this chapter
The following sub-chapters follow the stages of the ViP framework. The first three stages deconstruct the past of the product, interaction, and context into values.
The present and future stages of the framework design the new product using these values.
The fourth step envisions a new context for the design. Stage five creates a novel interaction between product and user. Lastly, the final stage designs a new product that incorporates the novel interaction.

For example, Uber eats.
The past product was Uber's taxi service. The interaction between the product and this service was easily-connecting drivers and users. The context was an economic crisis combined with high taxi prices and the mobile app revolution. The analysis of the past results in the values: On-demand, for everybody, and connecting. With these values in mind, one can create a new future of easy, on-demand delivery services for food.

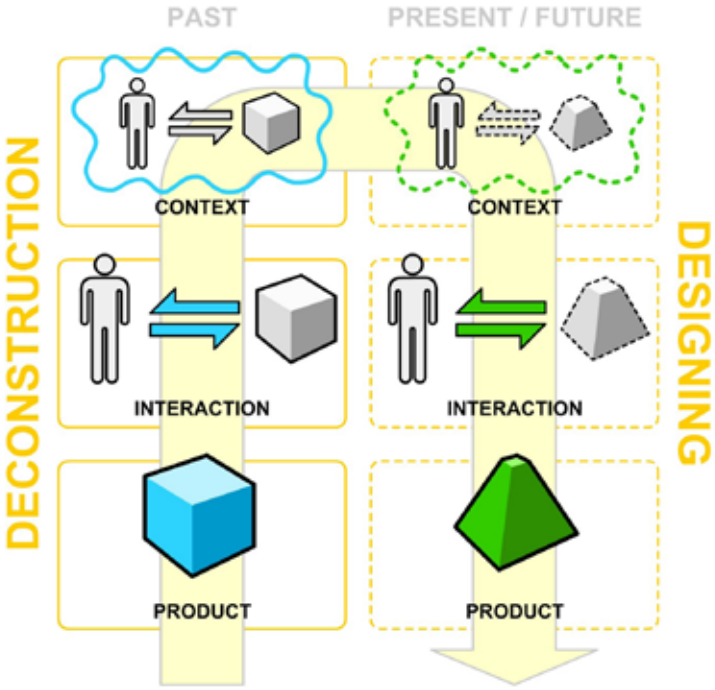


Fig.2.1 ViP framework, visual from Caicedo, D. G. (2020)

2.2. The product

This project focuses on the redevelopment of the Nacra 500. The Nacra 500 is Nacra's primary leisure catamaran. Nacra sells the catamaran with the following text on their website: "the Nacra 500 easily fits two adults that like to sail a catamaran at an affordable price. Perfect for local club racing, or just to go out and have fun with family and friends."

Catamarans in general

Catamarans are two hulled sailing boats. This report reviews beach catamarans in particular. Small, up to 6 meters long, sailing dinghies made for sports and recreation. Two hulls make the catamaran a stable platform on the water. Beach catamarans are fast compared to similar length single hull(monohull) boats. With wind, the catamaran can heel over, lifting one hull out of the water. This greatly reduces drag and therefore high speeds can be obtained. Moreover, catamarans typically have a large sail area compared to the total boat weight. This translates to a high power to weight ratio compared to similar-sized same monohulls. Catamarans are not the most agile boats. Their two hulls form a wide boat, with a high amount of sideways drag. This drag reduces the turning speed.

Nacra product characteristics

Nacra's catamarans differ from other catamarans in speed, stiffness, directness, and precision(from interviews with dealers, sailing schools and rentals, in appendices D-H). Typical are mylar square sails, wave-piercing bows, low cut sails, and forwards pointing pro grip(Fig.2.3). Using Nacra's products to their full potential requires catamaran sailing expertise and physical capability(appendix D-G). To make catamarans more suitable for beginning and recreational sailors; the complexity of the leisure catamarans is reduced, by removing sail trim possibilities.

Nacra vs. competition

Where Nacra tries to set itself apart is the feeling of performance and quality. The speed of Nacra can be compared to competitors by using the SCHRS rating. This rating is a multi-hull sailing standard estimation method. In Fig.2.4 we see that the N460 and N500 are fast in their respective length categories. Length is an important denominator for the speed of boats. The N580 is significantly longer than any of the boats mentioned in interviews. We see this length more often in racing catamarans, like the F18 class.

Fig.2.2 Look and feel of a Nacra 500 "leisure" catamaran

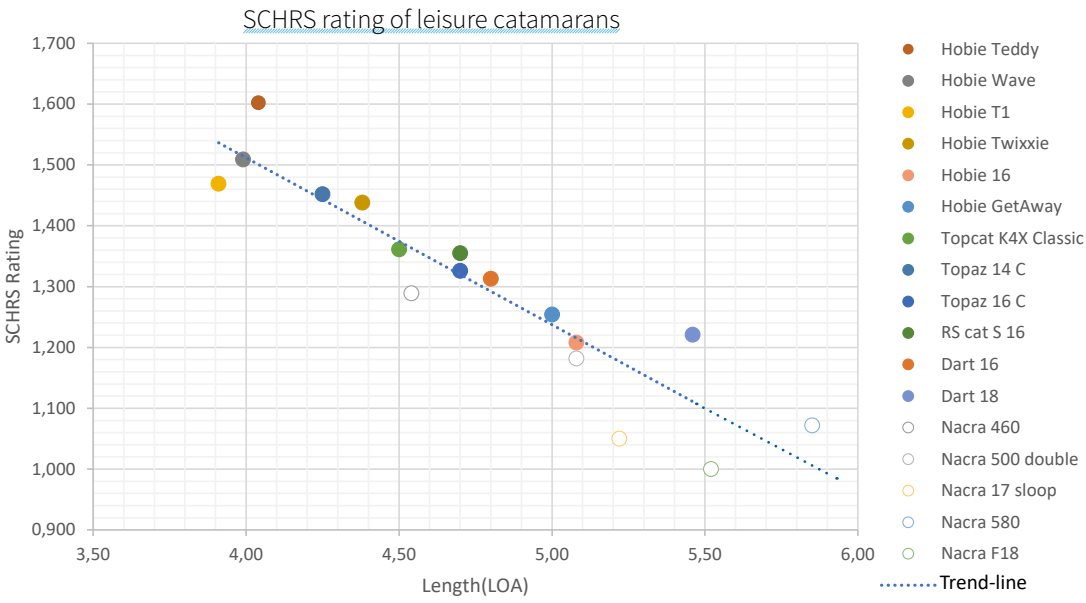


Fig.2.4 The SCHRS rating is a world sailing approved metric to compare boat speeds. A lower rating means a faster boat. Data from SCHRS (2020)

How to recognize a Nacra

Most people will need logos to discern one catamaran from another. Catamarans in similar classes look similar. Fig.2.3 shows a Nacra f18 evolution. Compared to a Goodall F18 viper (Fig.2.5) only small differences in the pro grip and bow are visible. The Nacra 500 shown in Fig.2.2 has a different hull shape and sail plan which is, in turn, more common among leisure catamarans.

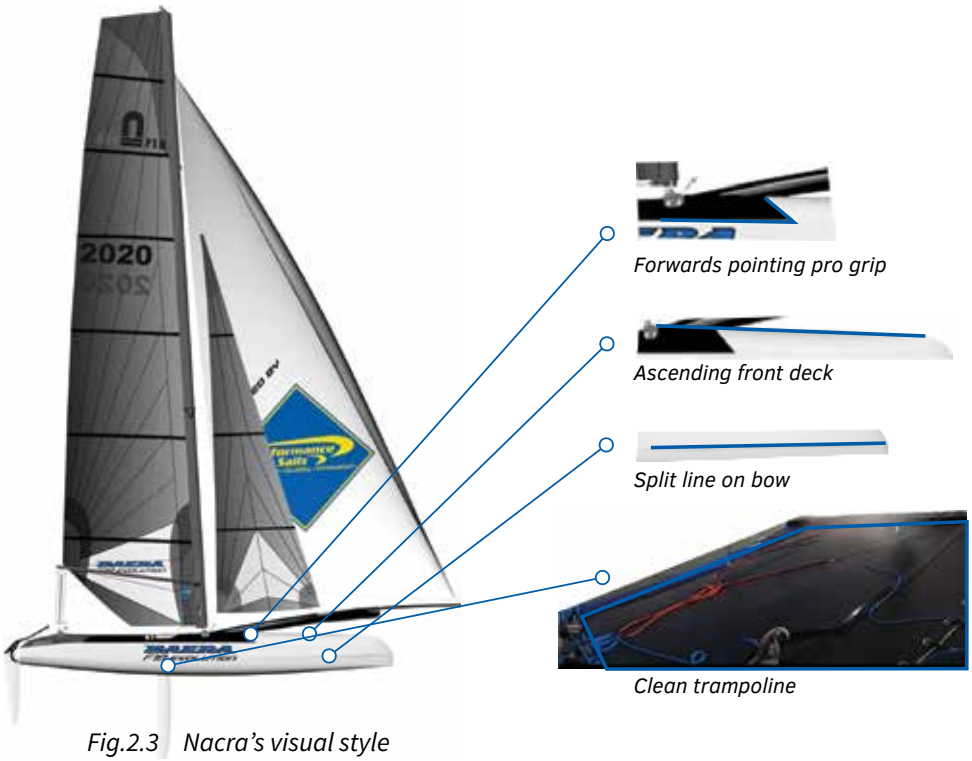


Fig.2.3 Nacra's visual style

Fig.2.6 Nacra's sail logo

Fig.2.7 Nacra's company logo

Fig.2.5 Similarly styled Goodall viper

2.3. Physical interaction

How is a Nacra catamaran currently used? The simplified customer journey in Fig.2.8 presents a broad overview. The customer journey shows all stages of a user who buys a catamaran.

It is important to note that a catamaran is built for sailing but only does so a small part of its lifetime. Besides sailing, the rigging, storing, and troubleshooting stages all repeat. Due to this repetition, these stages are the most important stages for customer satisfaction together with sailing.

Fig.2.9 Left: shipping of a catamaran in 3 boxes. Right: a catamaran fully rigged dragged to the shorefront.

Stage	**Pre engagement**	**Engagement**		**Order**	**Delivery**	**Rigging**
Activities	Brand orientation brand decision - word of mouth - experience	Contact dealer Contact directly Discuss options Decision	Experience	Form filling Waiting	Deliver Unpack Set up on site self Pick up from dealer Dealer builds Store	Rigs for sailing Go to water Sails through - harbor - broken waves
Time	3 months	2 weeks	2 weeks	2-3 weeks	1 day	2 hours

Sail	**Storing**	**Troubleshooting**				**End of life**		
Find wind Make speed Hang Tack Jibe Come back to beach	Out of water Leave on beach Unrig Trailer Store sails Store cat	Broken part	Call dealer order online	Wait	Repair	Unable to sail again to many breakages practically Physically	Store in backyard	Sell off/dump
2 hours	1 hour	3 hours	1 hour	1 week	1-4 weeks	1 month	1 month, years	1 week

Fig.2.8 Customer journey

Fig.2.10 Upper left: A Nacra 500 sailing on one hull. Right: righting a capsized catamaran. Lower right storage of a catamaran on the beach.

Sailing

By looking at video and image material of catamaran sailors we can identify multiple user scenarios.

The video material shows it is customary to look back during tacks and jibes. Beginners do this more often than experts. However, experts do still have their moments of looking inside the boat.

Likewise, beginners tend to search for steadiness. By holding on to the shrouds or the trapeze handle (Fig.2.12) or by putting their feet further apart. (Fig.2.14)

Fig.2.11 Light wind crew position

Fig.2.12 Crew holding on to shrouds. medium wind position

Fig.2.13 Helmsman looking back during a turn

Fig.2.14 Un experienced crew in trapeze. Notice the spread of the feet.

Fig.2.15 Correct trapeze stance. Again notice the spread of the feet. And the twist in the upper body.

Fig.2.16 A pitchpole. One of the hulls slips below the waterline and the whole boat flips. A dangerous situation. A crewmembers are often thrown overboard in these situations.

Fig.2.17 Or people can swing forwards, getting tangled in lines.

Catamarans are used on the beach or at lakes. People use cat tracks and trailers to get the catamaran to the water. Launching happens in harbors or at the beach. With docks or waves as respective hazards. Catamarans are stored on grass or steel constructions at the beach. On a trailer is another possibility.

Fig.2.23 A catamaran ready for launch on a cat track..

Launching

Fig.2.18 Someone singlehandedly launching his boat from a boat ramp.

Fig.2.21 The corners of the dock come dangerously close.

Fig.2.19 A crew member being dragged up the boat by the helmsman.

Man overboard

Fig.2.20 A rope ladder was spotted in a video. To allow easier boarding.

Storage

Fig.2.22 Stored on the grass or on steel poles when the beach is involved (see Fig.2.10)

2.4. Emotional interaction

The emotional interaction of catamarans is the way people experience catamaran sailing mentally. Therefore, 12 catamaran sailors were asked about how feel when sailing a catamaran and how this feeling differs per catamaran. Interviews with Nacra's dealers and three sailing school managers supplement the information for Nacra's catamarans specifically.

This word web is the answer to the question "How do you describe the feeling of sailing on a catamaran?". Answers came from 12 participants varying from 17-23-year-old beginner to expert catamaran instructors. Flying, fast, easy, freedom, happiness, and heavy are written down by five or more participants.

Past: Interaction

This word web is the answer to the question “How do you describe the difference in feeling between sailing on different catamarans?”.The answers came from the same 12 participants. Cutting the waves, speed, difficulty, capsizing, control, precision and stiffness were written down more than five times.

Product Feel

Users describe Nacra’s as high-performance catamarans (Interviews D-H). Currently, catamaran users primarily experience freedom, the feeling of flight, speed, and happiness. Users experience the boat’s feel through lines, tiller, seating position, through the feet, water, and sail noise, spray, and acceleration. All of these inputs combined make sailing catamarans an intense multi-sensory experience.

Conclusion

All catamaran sailing is intense, but few have the steering sensitivity and precision of a Nacra(appendices H-J). New sailors are bombarded with sensory input (Fig.2.24). Therefore the user-product interaction is ***Sensitively-intense.***

Fig.2.24 "Emotion of Nacra" collage

Capabilities
Quality and innovation. Speed and performance.

Picture of sender

Personality
empowered, positive natured, competitive, energetic, serious

Externalisation

Relationship
passion for speed, water and flying is what brings us together.

Empowering sailors

Culture
Easygoing. We perform better then the rest of the field. Experience us and you will believe.

Internalisation

Reflection
Now: competitive sailors that love speed

Picture of reciever

Self image customer
Now: Top sports athlete, clean, composed, exceptionally fast but breakable

Fig.2.25 Nacra's brand identity.

2.5. Past context: Brand

Method

Interviews with technical director P. Vink, lead engineer Wouter-Bas and sales director B. Hensen supplied a general map of Nacra as a brand. Their claims are supported by customer interviews and observations from within the company and an analysis of their communication channels. The result is structured in Kapferer's brand identity prism(Kapferer, 1994) to ensure a clear overview of the current branding situation.

Brand identity prism

Fig.2.25 shows an overview of Nacra's brand communication. It shows how the picture of the sender is received by the customer. As well as the connections that influence this image internally and externally.

Capabilities

Nacra's strengths lie in producing high-performance catamarans. They know the market of racing catamarans well and are capable of designing new and improving old catamarans. Working together with Olympic sailors and the world's most advanced competition the America's cup keeps them at the forefront of innovation in performance.

Nacra is fueled by passion and enthusiasm. The company uses unstructured processes and subsequently has less control over its customer journey. However, this approach does make their contact with customers personal and the company flexible.

Personality

Nacra's personality is positive, brave, and competitive. Nacra takes racing seriously.

Relationship

Nacra has an outspoken passion for speed, water en flying catamarans over the water. This connects Nacra to its customers

Culture

Nacra is competitive, it is convinced that it is better than the competition. However, internally and towards customers, it is an easy-going informal company.

Reflection

Nacra's brand reflects in its users: competitive sailors that love speed.

Self-image customer

Nacra's customers see Nacra as a brand for top sports, clean and composed.

Takeaway

Nacra is fueled by their passion and enthusiasm. Nacra's brand outing needs to be changed. To become known as a good leisure alternative Nacra needs to start developing its brand identity towards potential leisure customers.

2.6. Past context: Company

Method

We review the company using a business analysis framework. The chosen framework, see Fig.2.266, gives insight into the focus and values of the company, as well as the company's position and strategy. The different layers of the framework signify the level of control the company has over the subject. The further away from the center, the less influence from management.

Firstly, interviews with director P. Vink and sales director B. Hensen supplied information about the mission, identity, and beliefs of the company(see appendices A and B). Second, observations during day-to-day activities and conversations within the company informed competencies and behavior insights. Lastly, conversations with P. Vink, supported by desk research into buying a catamaran, gave insight into the business environment.

Mission

Nacra's old mission was to empower competitive sailors. Nacra obtained this goal by attaining the Nacra 17 Olympic class.

Identity

Nacra's DNA as P. Vink describes it, consists of Performance, Quality, and Innovativeness. Nacra sees itself as an A-brand. When compared to car brands, he places Nacra between BMW and Mercedes. The two premier brands resemble trusted build quality and high performance. Not a low-cost price, but make are known for their drivers' experience. Innovativeness of the old BMW and the newer Mercedes cars.

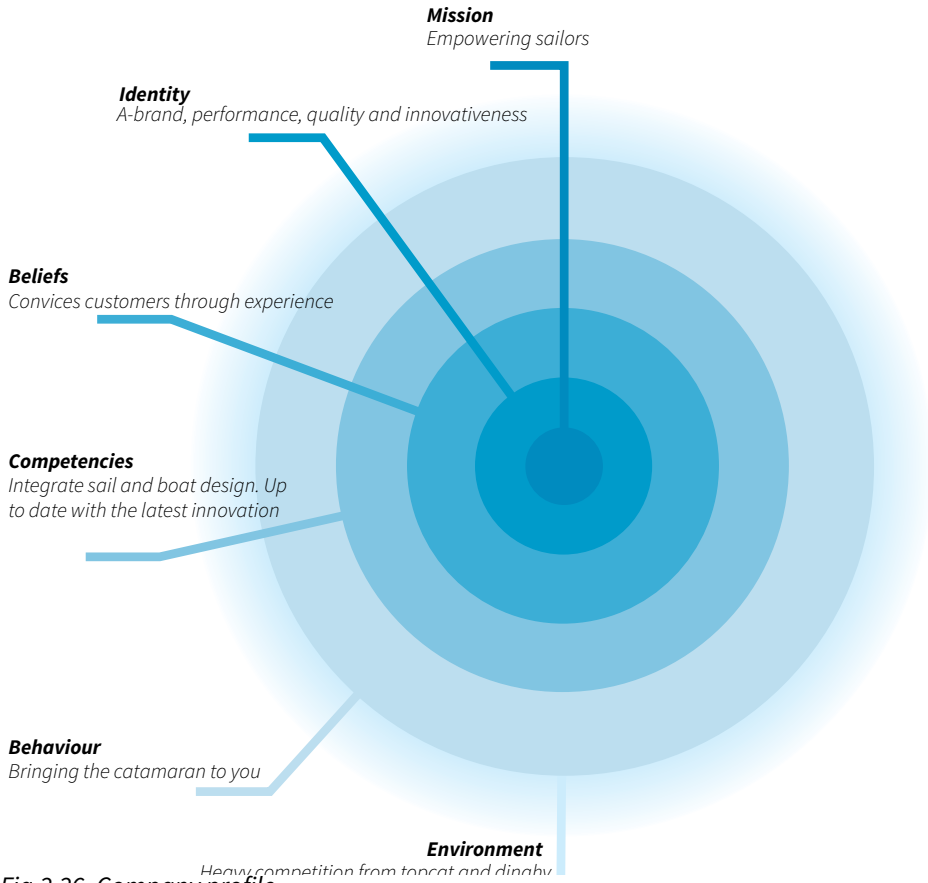


Fig.2.26 Company profile

Beliefs

P. Vink believes Nacra convinces customers through their boats sailing experience. The catamarans build by Nacra perform better than the rest of the field, which gives users the experience of being the first of the pack and fastest on the water.

Competencies

Nacra knows how to build fast boats, which tack effortlessly and will not fail when sailed at their limits. Nacra's in-house involvement with Performance sails(sail making company) and dedicated R&D team makes them able to integrate boat and sail design. They are up to date with innovations in the competitive scene and can consistently improve.

On the design front, all parts, from sails to masts and rigging, are designed in house with only one exception: the design of the hulls is done in collaboration with Morelli & Melvin, an American multi-hull design company.
External manufacturers produce mast, beams, hulls, and rudders. Performance Sails, the in house sailmaker,

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produce the sails and the trampolines in the same building. Nacra manufactures rigging and linework in-house.

When parts come in, Nacra prepares the parts for assembly and ships them to dealers and direct customers, who assemble the catamarans themselves.

Company behavior

Nacra behaves as a racing brand. All of their sales outings are focused on racing (see next chapter). Their innovation focuses on making the boats even quicker and better fitting to international sailing competition class rules.

Operating environment

Nacra serves an international market, with North America and Europe as its largest sales markets. According to Nacra's sales director normally 70% of sales go through dealers in different countries. These dealers are privately owned companies who get a discount when buying a Nacra from the main office. Nacra is categorized as a defender (according to Miles and Snows business strategies(Thomas & Ramaswamy, 1996)), defending its position in the racing market. Nacra defends this position by staying the innovation leader in this market.

Nacra has to deal with two types of dealers. Some dealers are professionals who have a shop set up. But there are also a lot of "lone cowboys" who are old competition sailors who became dealers for the sake of the price reduction. These are often less professional but do influence the image of Nacra.

Fig.2.27 Nacra warehouse and production floor

Fig.2.28 A Nacra F18 in three boxes on its way to Quatar

Fig.2.30 The fruitfull creative session at Nacra.

Nacra sailing was formerly branded as Nacra Racing. Nacra builds products with the Olympics in mind, everything tuned towards speed and high-performance sailors. Every gram extra is stripped of the boats, leaving almost clinical precision tools. Incremental improvements have to lead to a functionally optimized catamaran for the serious racing target group (internal interviews appendices B and C)
The leisure catamarans: N470, N500, N570 are old racing hulls stripped down to limit complexity. Nacra's catamarans are compared to Italian sports cars; Fast but expensive and breakable(appendices D-H).

A creative session leads to the participation of almost the entire company. It created involvement and excitement about the new catamaran project. Using a creative session all employees of Nacra designed a "current character" representing the current state of the company.

The current character is a pro catamaran racer(Fig.2.29). A between 20 and 30-year-old male. He is sporty, technical, and an expert sailor. Who's only focus is winning. This focus makes him more individualistic and inapproachable for non-expert sailors. However, this laser focus is a requirement in the racing world.

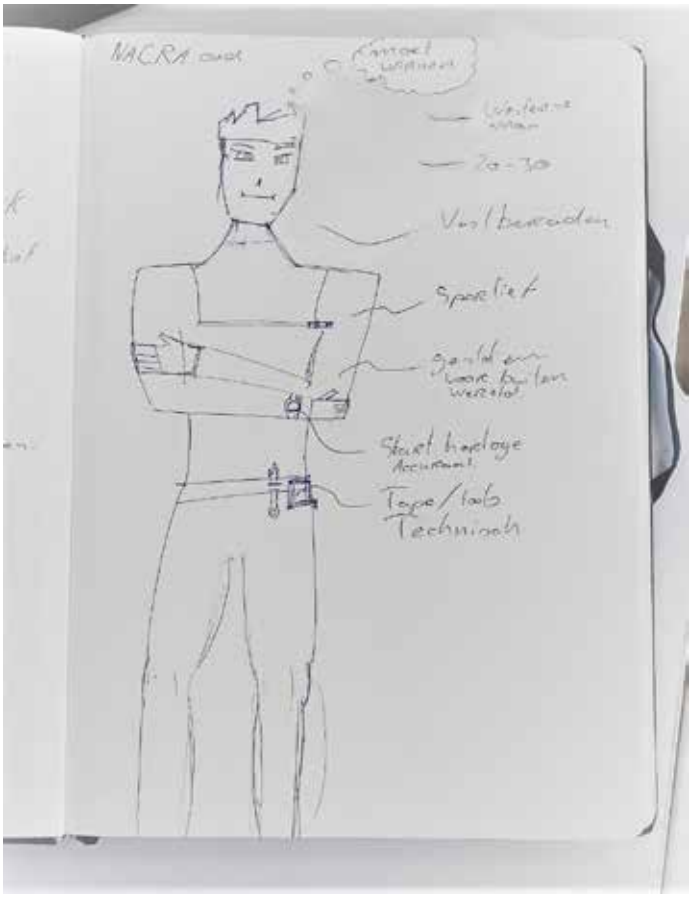


Fig.2.29 Pro racer character

2.7. Chapter conclusion

Customers launch catamarans at the beach or inland waters. Sailors have many different seating positions on a catamaran. Loss of control can lead to burring a bow. The resulting pitchpole can be dangerous, and one of the catamaran sailing challenges is to prevent this.
Nacra's catamarans differ from other catamarans in speed, stiffness, directness, and precision.

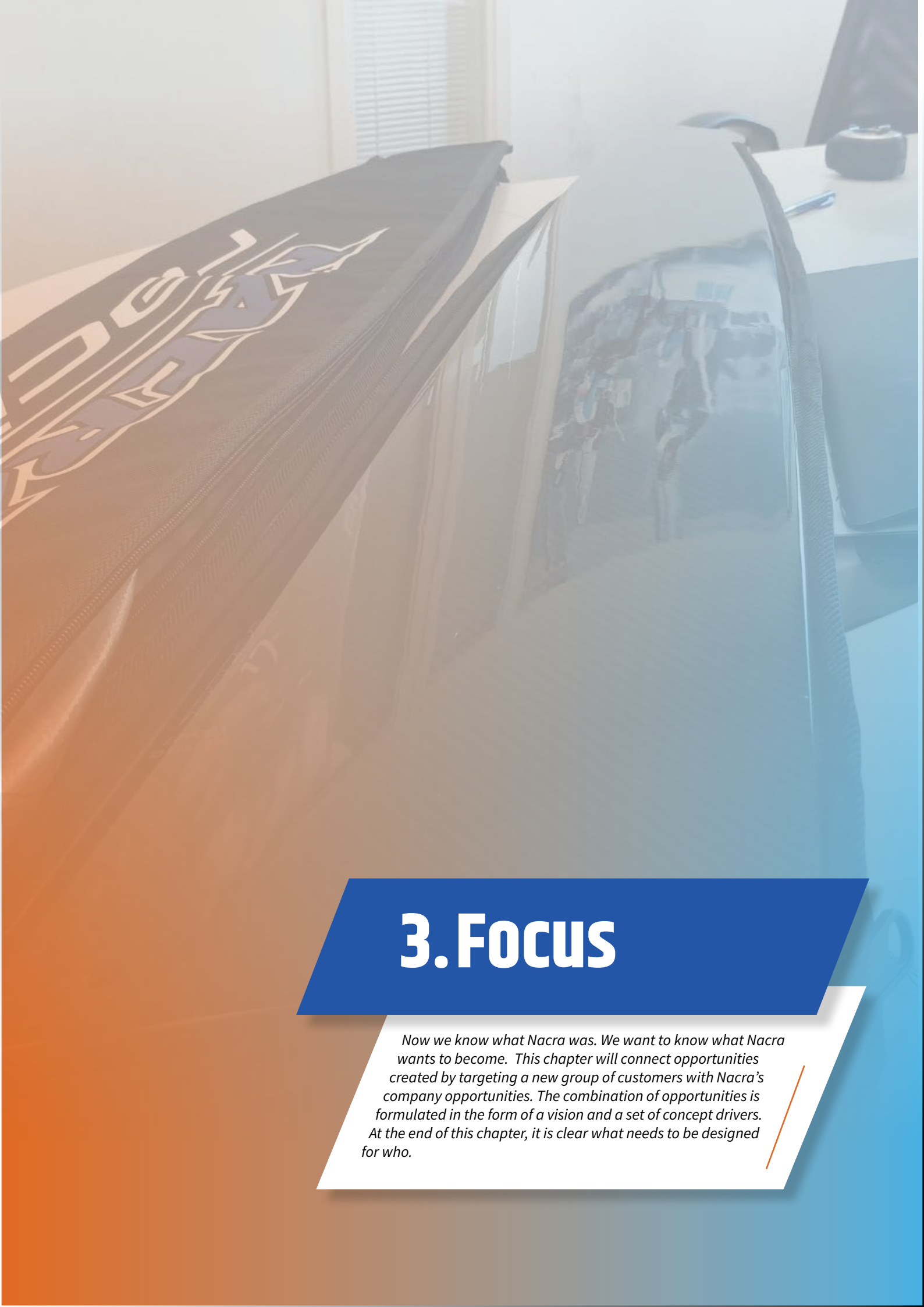
Users describe Nacra's as high-performance catamarans. Currently, catamaran users primarily experience freedom, the feeling of flight, speed, and happiness. Users experience the boat's feel through lines, tiller, seating position, or through the feet, water, and sail noise, spray, and acceleration. All of these inputs combined make sailing catamarans an intense multi-sensory experience.

All catamaran sailing is intense, but few have the steering sensitivity and precision of a Nacra. New sailors are bombarded with sensory input. Therefore the user-product interaction is sensitively-intense.

Nacra is, without a doubt, currently a racing focused company. Everything in the company points towards this goal. It tries to empower sailors by delivering A-brand quality, high-performance catamarans. The company beliefs customers can be convinced by experiencing the quality of a Nacra catamaran. Nacra has proven it can innovate by keeping up with the racing market. Moreover, Nacra communicates it is a racing brand on all marketing channels. Finally, Nacra defends its position in the racing market by being an innovation leader.

Nacra is not used to designing for a leisure target group. Nacra is good at designing high-performance boats. They gather racing customer insights intuitively on racing weekends by keeping in close touch with the racing scene. However, at this time they know comparatively little about the leisure market and its demands. Nacra is aware the company focus needs to change. Nacra is aware that a lack of sturdy processes could lead to lower customer reviews in a leisure market. Subsequently, they are trying to implement these processes. This awareness also applies to their lack of customer insight.

Nacra most of everything values speed on the water. Nacra is determined to win in their markets.



3. Focus

Now we know what Nacra was. We want to know what Nacra wants to become. This chapter will connect opportunities created by targeting a new group of customers with Nacra's company opportunities. The combination of opportunities is formulated in the form of a vision and a set of concept drivers. At the end of this chapter, it is clear what needs to be designed for who.

3.1. Customer discovery

What new target groups exist in the leisure market? And what do these target groups value and need? This subchapter discovers which customers are available on the leisure market.

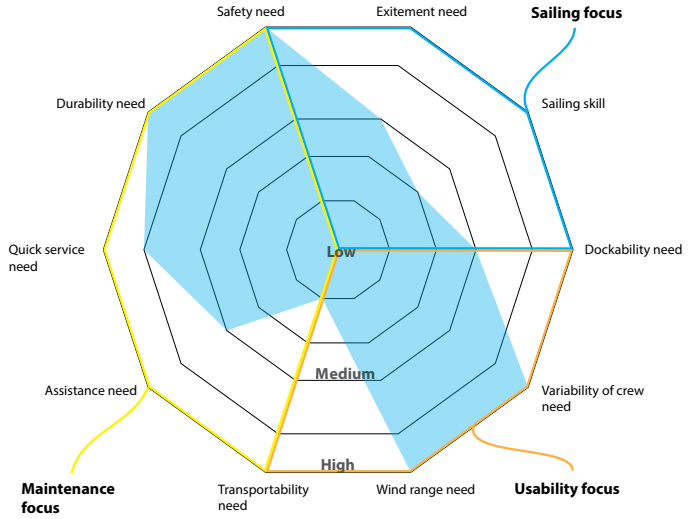


Fig.3.1 rental profile

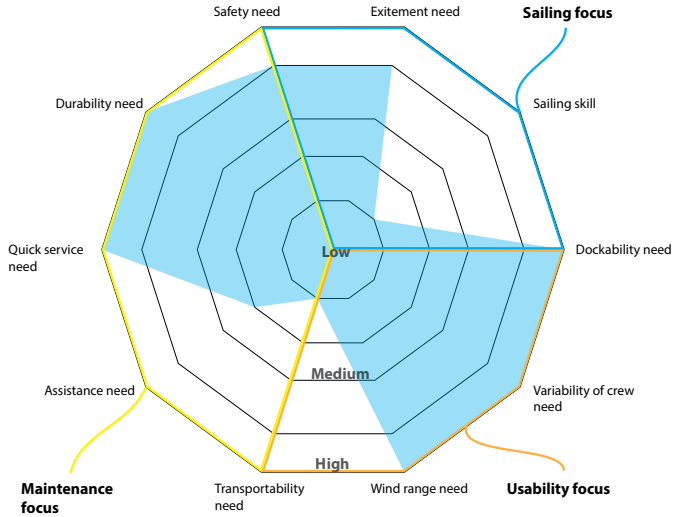


Fig.3.2 sailing school profile

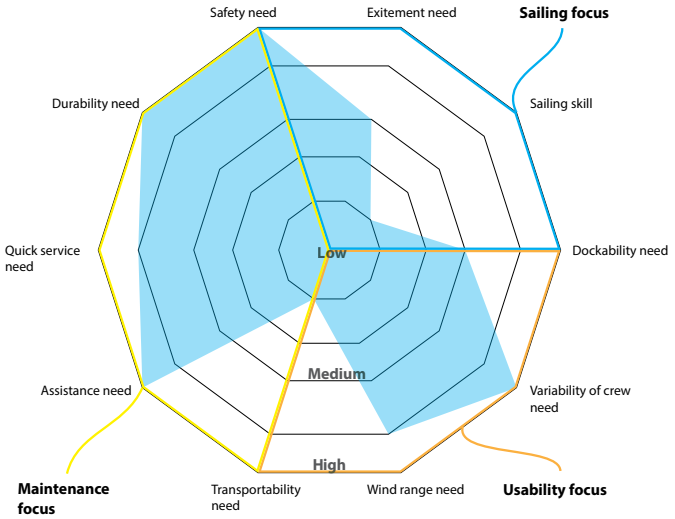


Fig.3.3 Resort profile

Method

The customer discovery subchapter profiles six different target groups. A qualitative interview with Nacra's sales director resulted in these target groups.
The profiles are a summary of conducted qualitative interviews with rentals, sailing schools, associations and dealers. Observations from associations, sailing schools, pretending to book a resort holiday supplement the interviews. The profiles features, levels of features and focus categories were determined by the designer based on the interviews.

Nacra divides the catamaran leisure market into six segments.

Rentals

Rentals use their boats as a money-making tool. They want their boats to signify an exciting experience or a chilled afternoon sail to reel customers in. They need boats that are accessible to many sailors while being durable and easy to maintain. Most rentals own their own boats and expect them to pay back within 5 years. Often rentals are combined with sailing schools.

Value: Giving their customers an exciting afternoon.
Need: low maintenance, high usability, beginner friendly catamarans.

Sailing schools

The goal of a sailing school is to teach beginners and therefore the material suffers a lot. To remain cost-effective catamarans must be very durable.

Value: Giving their customers an exciting week and learning experience
Need: quick maintenance, high usability, beginner-friendly catamarans.

Resorts

Resorts want boats as a banner. Catamarans are gimmicks to attract more customers to their main service: the hotel itself.

Value: Giving their customers the feeling of luxury and adventure.

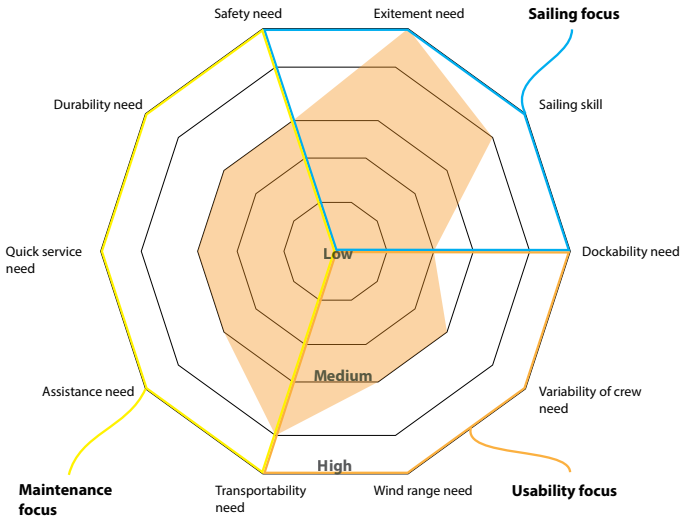


Fig.3.4 Association sailors profile

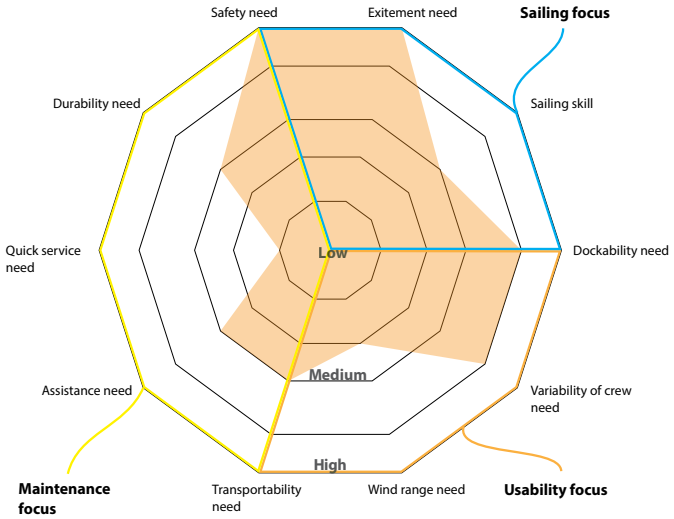


Fig.3.5 Holiday home owners profile

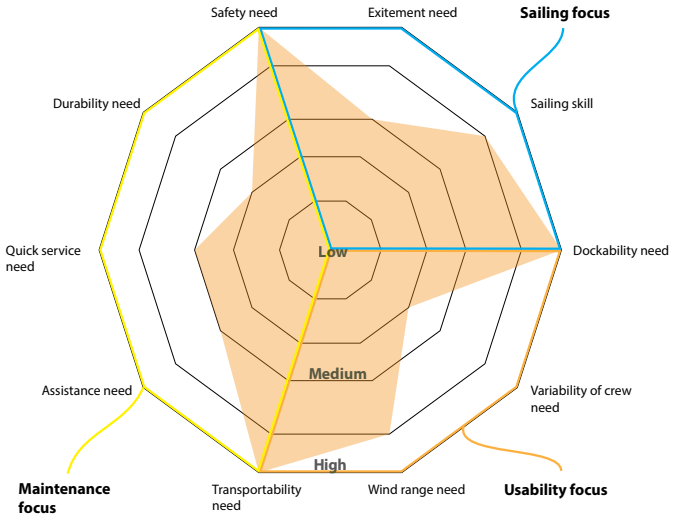


Fig.3.6 Travelers profile

Associations

Sailing association value having a good time on the water together. This group sails older catamarans. Only five percent sails a catamaran younger than five years. Only 33% sails with a spinnaker. You won't see any rotomolded catamarans at sea since they cannot withstand the forces of the waves they encounter. Furthermore they need a higher than average ease of transportation since some park their boat at home but all need to bring their catamaran to the waterfront over the beach.
Value: a good time on and off the water together.
Need: A quick to the water, accessible but challenging and above all exciting catamaran.

Holiday home owners

The goal of holiday home owners is to have a fun activity when on holiday. Mostly for parents teaching their kids to sail who will later on have an activity for themselves. This target group doesn't sail their catamaran often.
Value: a good time with their family on the water
Need: an easy to sail, safe and versatile catamaran

Travelers

Travelers want to discover new places with their catamaran. They love long distance sailing and going into unknown territory with their catamaran.

Value: Flexibility
Need: ease of transport, comfort, safety and ease of docking

Conclusion

Nacra divides its leisure customers into six segments. These segments can be categorized into two groups: Private owners and Business business. Business to business goals is the return on investment focussed. By focusing on ease of maintenance and usability. While private owners' focus is stronger on sailing experience. For businesses, fun is a means to an end. While for private owners fun is the end goal. Nacra's current focus is closest to association sailors and furthest away from a resort's needs.

3.2. New context

Trends

Due to Covid-19, the leisure market has seen growth (Interviews in appendices B, C, I, J). Sailing schools have profited from in-country holiday goers. Employees of Nacra see a shift from sole product ownership to shared ownership(Appendix N).
Furthermore, the speed and excitement of catamaran sailing have become better known due to the fame of America's Cup catamarans. This excitement attracts youth to sailing(appendices D-G). Grabbing the interest of young sailors has proven difficult for other dinghy classes(appendix J).
Meanwhile, the racing market has ground to a halt. (Appendices B and C)
Nacra needs to pivot as a company to keep up with the catamaran market. This moment can be seen as a now or never scenario to change the brand. Change later, and Nacra misses the opportunity. Too little change and customers will keep looking at Nacra as an Olympic brand that doesn't fit the leisure customer(Appendix N and O).

The entry-level catamaran market can be split into two, based on the hull manufacturing method. Nacra's price for their most entry-level N500 fun GRP catamaran is around 12.000 euros. Whereas catamaran competitor Dart sells its similar-sized rotomoulded Dart 16 for 8.600 euro.

View economic and environmental distress as an opportunity to give color to the brand and make a statement. Be the first well-known dinghy brand to embrace the clean image of sailing. Or at least the first dinghy brand that dares to emphasize and becomes a company with values.

Company vision

The company Nacra can be visualized as a character. Using a creative session all employees of Nacra designed a "to be" character representing the future of the company.

The "to be" character is a catamaran guru(Fig.3.7). As an ex-pro catamaran racer, he or she knows what it is like to be a pro racer but he has grown out of this individualistic world and wants to pass his/her expertise onto new sailors. Happily mentoring them to enjoy his/her passion. He/she is approachable. To pro racers, he is a knowledgeable coach who understands them. To new sailors, he is an experienced good-natured someone to look up to.

Nacra developed a new mission: onboarding sailors

Target group

Nacra intends to use its unique selling point, the sailing experience, as a vehicle to enter the leisure catamaran market. Nacra sees itself as more professional than their competition. The leisure market consists of two categories and six segments. The private category consisting of association or amateur sailors, holiday homeowners, and travelers. And the business to a business category consisting of rentals, sailing schools, and resorts. Nacra's current target group, the racing sailor, is closest to association sailors and furthest from the resort target group.

Catamaran sailors develop from novice to professional via the route pictured in Fig.3.8. The insight that beginning sailors get to know their first boat at a sailing school or resort, combined with Nacra's new mission: onboarding sailors and their current company focus; the racing sailor, leads to ***the recommendation for a sailing school catamaran..***

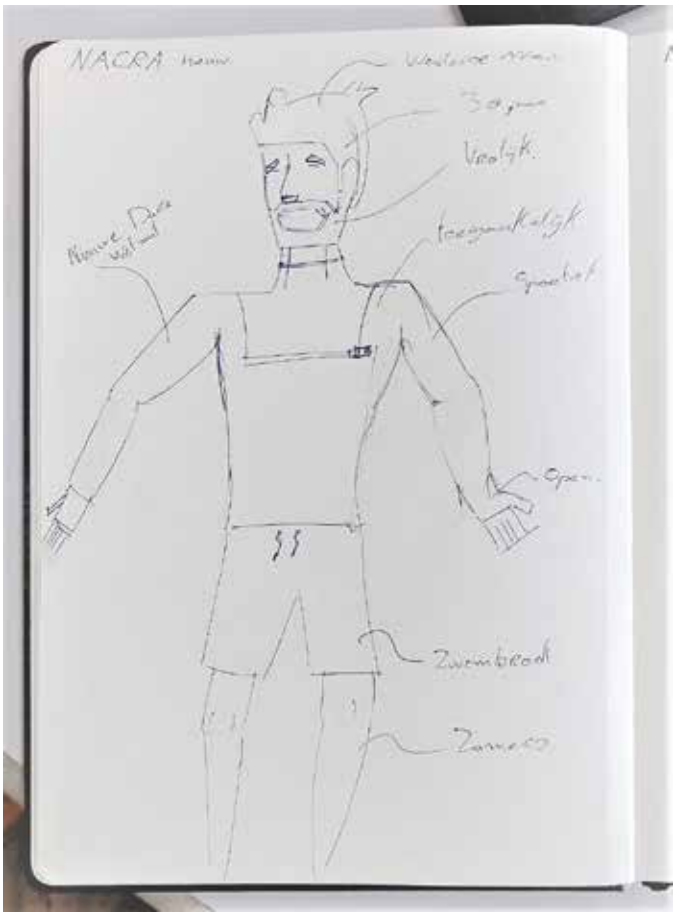


Fig.3.7 Catamaran guru character

Sailing schools

The goal of a sailing school is to teach beginner to intermediate catamaran sailors and deliver them an exciting experience.
The material suffers a lot. To remain cost-effective catamarans must be very durable(appendices D-G). However, the sailing experience is the top priority after durability.

The budget of sailing schools varies from 1000 to 12000 euro per catamaran. Nacra's dealers estimate a 10.000 euro catamaran is the needed price point. (appendices H-J)

The largest markets for Nacra are Europe and North America. There is potential in the Asia Pacific area. Mostly in in-shore waters.

Value: Giving their customers an exciting week and learning experience
Need: quick maintenance, high usability, beginner-friendly catamarans.

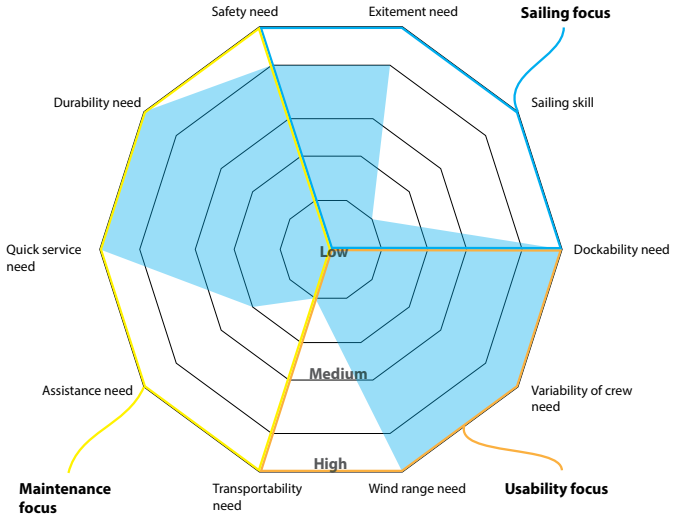


Fig.3.9 sailing school profile

Beginner to intermediate sailors

Beginner to intermediate sailors struggle with keeping control over a catamaran. This power struggle can result in the catamaran running off with you(scary) instead of you running off with the catamaran(exciting). This lack of control is a result of not interacting with the catamaran properly. Keeping control is more difficult with more wind, waves, or a smaller waterway. (Appendix D).

Value: Excitement, the feeling of flying, the feeling of freedom, flexibility of use
Need: The right amount of challenge, No hassle to go sailing

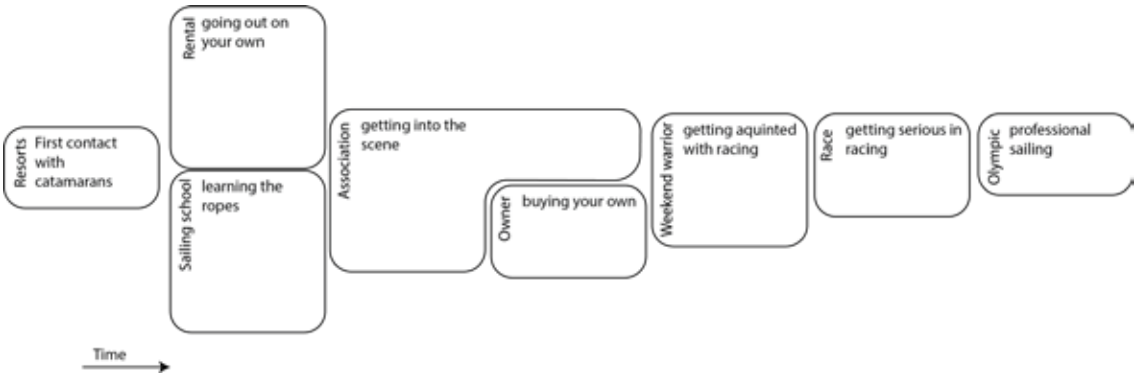


Fig.3.8 Catamaran sailor evolution. New sailors enter between resort to association sailor stages. Most don't evolve past association sailor.

3.3. Sailing schools

With sailing schools as primary target, a visit to a sailing school provides valueable insights.

Sailing school training day observations

This inland sailing school works with motorized dinghies to instruct from. The sailing school tows their catamarans behind these dinghies through a harbor towards the lake. The catamarans are rigged while in tow or moored to an anchor. After which instruction starts

A typical instruction scenario can be seen in Fig.3.10. The instructor is standing in a dinghy and giving instructions to the participants who have parked(heaving to) their boat. Instruction groups consist of up to seven participants per one instructor. With 3 boats maximum.

Instruction proceeds between wind speeds of 1-6 bft. With the will to sail every day during the summer holidays this means many days are spent in light wind(1-2bft) conditions.

About 8 times a day the participants dock their boats behind the dinghy. The participants climb aboard via the bow of the catamaran or, if the instructor is nice, he/she will pick the participants up. The participant then evaluates the last assignment, get a break, obtain new information and an assignment.

After a day of sailing the catamarans are derigged and towed back through the harbor. Boats are then dragged up a ramp and stored on grassland.

Onboard and offboard teaching
Instruction scenarios differ per location and sailors' level. The observed sailing school uses offboard teaching mainly.

At sea sailing schools the instructor sails with the participants on the catamaran. This means three people on the catamaran and a different teaching scenario.

Fig.3.12 Catamarans on grassland.

Fig.3.11 Catamarans are towed behind a dinghy.

Fig.3.10 Typical instruction scenario.

Sailing two sailing school catamarans

Fig.3.14 Jib gets caught behind mast and creases in the sail.

Sailing two sailing school catamarans

Two sailing school boats were taken for a sail. The two available catamarans were a Dart 16 and a Hobie 16.

Comparing sailing two catamarans gave insight into the determinants of catamaran feeling. Sailing these at higher wind speeds is quite intense, with many things to control while a lot is going on around you(wind, waves, other boats, land).

Fig.3.13 Jib trim options.

Between a Dart 16 and a Hoby 16 were many differences. You can feel that the Dart is heavier, more stable, and easier to sail due to limited complexity. But slower and less exciting.

The Hobie 16 felt lighter, more direct, and more powerful. However, it also felt like a rocking horse due to its round hull shape.

Other important differentiating factors were:
Weight, stiffness, cleat quality, ropes, play in the tiller to rudder assembly, trampoline hardness, trim complexity, and the way the hull cuts through the water.

Material quality

The quality of sailing school catamarans deteriorates over the years due to intensive use with beginners and often youthful instructors. Observations at the sailing school show several critical points of breakage.

Fig.3.16 loose and often restitched hiking strap

Fig.3.17 A bow repair to a rotomoulded catamaran

Fig.3.18 The reason why bow repairs are necessairy

Fig.3.19 helmsman trapeze wire is made defunct

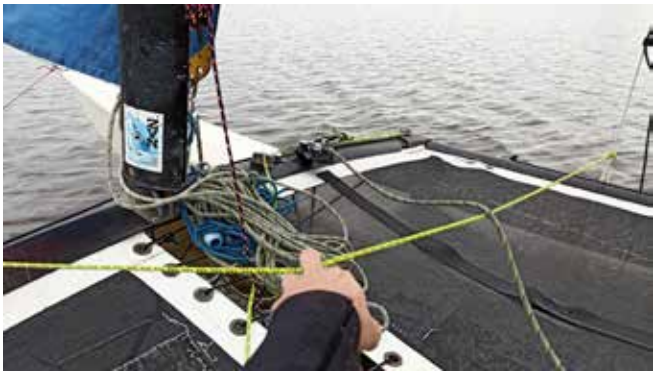


Fig.3.15 Amount of lines on the front of the trampolline.

3.4. Dry Test

Design benefits from deeper insight in behavior of beginning catamaran sailors. Dry testing creates a controlled situation in which movements of beginners and experts can be studied in detail.

Fig.3.20 Dry test setup, a cat on the dry.

Fig.3.21 A laptop was used to film the participants

To collect video footage we simulate a sailing experience. A fully rigged catamaran is bolted to the ground on a windless day. To accommodate steering, rudders are sawed shorter. Control lines for the daggerboards were taped over to inhibit usage since they would not be on an entry-level boat.

We record three participants without catamaran sailing experience and three experienced Nacra catamaran sailors. All participants are asked to perform several actions simulating tacks and jibes in light to heavy wind conditions. Moreover, we let the participants try two ideas from the orange concept in particular.
What would they do when the sheet came from the front?
And, If the trapeze was replaced by this bench how would you position it?

The three experienced catamaran sailors are used as a golden standard and compared to the first time cat sailors.

Afterward, we review the footage and observe the differences of the participants.

Fig.3.22 How would you position yourself in light wind? The first try to this question by participant 1, 2 and 3. Two participants compared the catamaran position with ealier sailing experience in different boats, resulting in more confusion. The black bar is called the outkicker.

Fig.3.23 How you need to sit in light wind.

Conclusion

Beginning catamaran users show confusion when positioning themselves on a catamaran. This confusion went away after an example of correct sitting. The following items on the boat are presumed to steer the sailor's positioning.

Tiller

The length of the tiller does force people to adopt a position where the tiller is used behind the user. This is confusing for experienced sailors used to other boats. Since the tiller is opposite of the position where the tiller is on most other boats.

Fig.3.24 Lifting the hiking strap with the hand to get the foot in.

Hiking straps

Hiking straps position users underbodies in an almost correct position.
Hiking straps are difficult to get in and are overlooked when first taking place on the cat

.Main and traveler sheet

The sheet which controls the main sail and traveler position has a twofold effect on the user. Users of the boat are turned backwards when trying to take control over the sheet. Likewise, users are confused which part of the line does what. Resulting in a backwards and inside focused position trying to figure out the mistery of this sheet. Experts avoid this confusion by grabbing the sheet at the start of the line.

Trapeze

The trapeze pulls the user forwards when hanging out on the back of the hull, which is where you need to be in strong wind. In this case, the user can stabilize him/herself by pulling the mainsheet which pulls towards the back of the boat.

Fig.3.25 Jibing and Tacking requires the sailor to sit backwards for a moment. Experts take this for granted, beginners would not know without a hint.

Discussion

Sensory input was missed due to the test being on land. The influence of wind, water, speed on the boat, and the user was not included in the test. This would otherwise introduce instability. It is expected that this instability influences the necessity of bracing when the boat heels over. This could influence the positioning of users significantly.

Takeaways:

- Beginning users require a small number of tips to start sitting properly.
- Experience from other sailing boats does transfer but not in handling and positioning.
- Outkickers were not used by beginners.
- Hiking straps are difficult to get in.
- Difficulties in operation cause looking inside the boat.
- Bench needs to be angled forwards facing and tilted backwards.

3.5. Design Vision

The vision is a result of all context factors combined with designer gut feeling. The design vision supports the coming design work and helps to create a novel concept.

> Like an accessible coach. Who shows you, in a happy way, what there is to learn and supports you in your learning process. He / she is an expert on the subject , “denkt met je mee”. Lets you find your own path. Helps to put failure into perspective and helps to find the fun in his or her passion. But never in a derogatory way.
>
> ***The subsequent interaction:***
> Happily-mentoring,

A coach can mentor a student with different styles. A pro racing coach can for example take a strict approach to training and giving feedback. A happy way of doing this would be less harsh. Having a laugh about errors instead of punishing them.

In a catamaran product sense, this means building in forgiveness, an easy way to start over, and nudging towards correct usage of the boat.

3.6. New product specification

Highly relevant for the “happily - mentoring vision” is the control area. This control area can be defined as: “the space where the users of the catamaran interact with the rudder and controlling lines.”
There is an opportunity here to support the users to adapt correct behavior on the catamaran, resulting in more control.

As two senior catamaran instructors describe: “Seating position and posture are at the basis of the feeling of control over a catamaran.” (C. Ligtenberg, A. Loven, 2020)

Parts of the catamaran are chosen to be out of scope due to knowledge gaps (hull and sail design), production constraints (beams, mast, cleats), or lack of design opportunity (rudder kick up system).

3.7. Product Design assignment

Nacra wants to strengthen its relatively small foothold in the market of recreational catamarans while staying true to its high-performance brand image but making it more open. There is a strong potential for their brand to have a carry-over effect from racing catamarans to recreational catamarans; but only if their image is made more approachable.

To make this step Nacra wants to update their Nacra 500 catamaran.

The catamaran will be designed for sailing schools. These schools need a robust boat that gives an excellent sailing experience.
The project sees the opportunity to target this group of recreational sailors with more modern and accessible catamaran designs. Nacra is advised to create a catamaran that fits a “happily-mentoring” vision.

The new vision directs focus towards design opportunity’s in the usability of the boat. With the control area as the main focus.

Goal
To design a “happily mentoring” Nacra catamaran control area that supports sailing school participants.

Main product design drivers
1. Improve the time of beginning catamaran sailors spend looking outside of the boat
2. The design should be interesting to sailing schools.
3. The design should fit Nacra’s new branding vision.

1. Improve the time spend looking outside of the boat by beginning catamaran sailors.
Sailors who look inside the boat, struggle with the interaction of the boat. Increasing the time people look forwards should increase their feeling of overview and control.

2. The design should be interesting to sailing schools.
Sailing schools are an interesting market for Nacra. They provide a contact point early in the sailing career of a catamaran sailor. Nacra is convinced that their boats will convince users of the quality of their boats through experiencing their catamarans. Sailing schools require robust boats but want to give their customers an exciting experience. Nacra can provide this experience. However, Nacra’s boats need to be adapted to beginning to intermediate sailors.

3. The design should fit Nacra’s new branding vision.
Nacra wants to make a branding shift to become more accessible for new sailors.
Therefore, the catamaran should be open to anyone who wants to try to sail. The catamaran should support the sailor and addapt to the skill level of the sailor.

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4. Design

With a clear goal in mind, the design work starts. This chapter shows how multiple ideas and concepts were created and evaluated with the company, users, and industry experts.

4.1. Ideation approach

The process from main drivers towards a design concept is cyclic. Ideation and feedback follow each other in rapid succession. The goal of this approach is to ensure acceptance of the design from the company and the customer. Therefore, an in-company design studio was set up in a prominent location. This design studio serves to make the project approachable, inviting everyone to pitch in and give feedback on designs. Making the project approachable was intentionally corresponding with the newly formulated company vision.

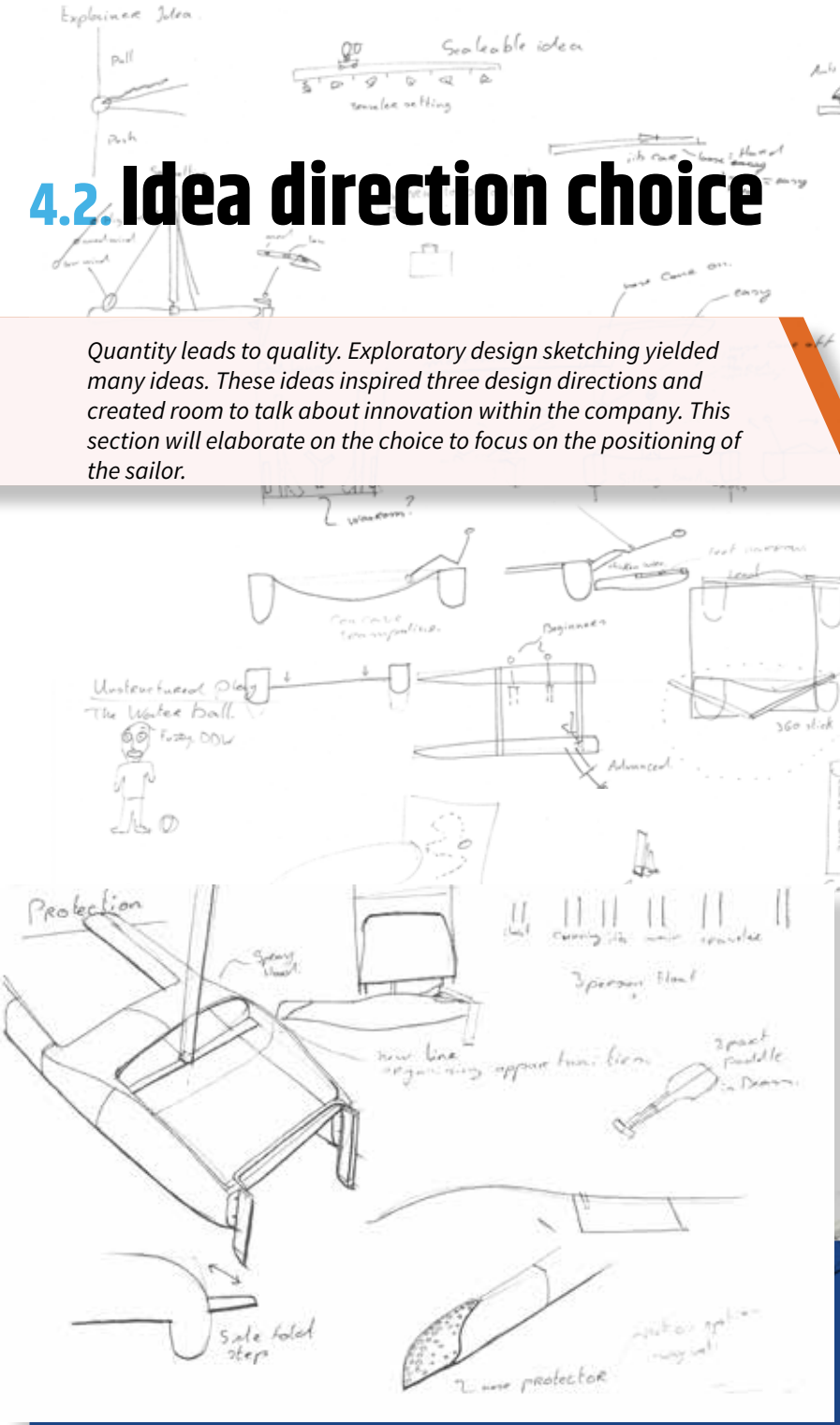
This approach proved useful. Resulting in not only an increase in acceptance from within the company. But also unexpected insights about how the catamaran could be used.

Fig.4.1 Design studio assignment explaination

Fig.4.2 Design studio with idea wall in the back

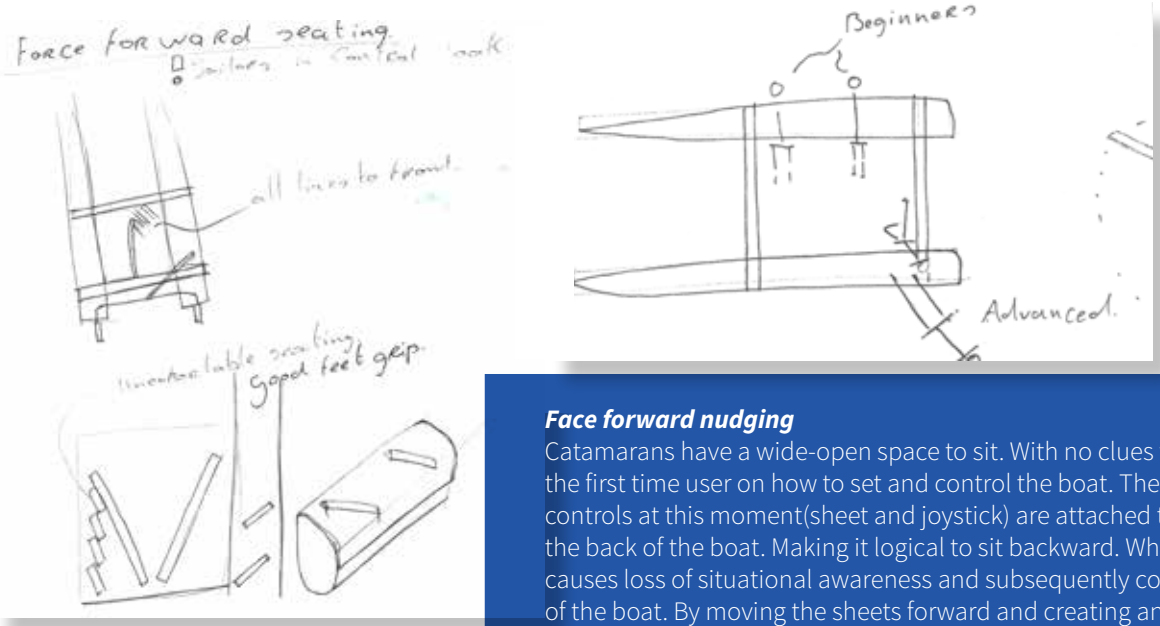
4.2. Idea direction choice

Quantity leads to quality. Exploratory design sketching yielded many ideas. These ideas inspired three design directions and created room to talk about innovation within the company. This section will elaborate on the choice to focus on the positioning of the sailor.

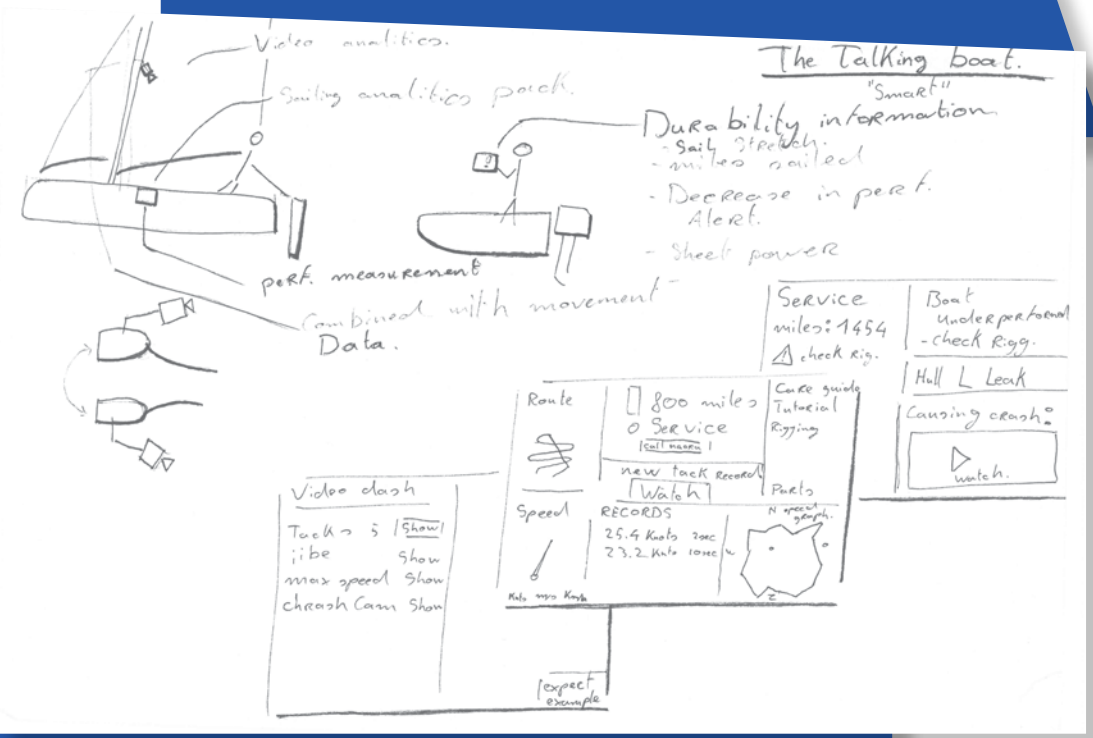


Protection

New users get overwhelmed with sensory input while sailing a catamaran. At higher speeds noise, water spray, bumpiness, and visual speed all need to be processed alongside controlling the catamaran. By protecting the user from these inputs and making the catamaran less fragile there is less to worry about and the focus can be on the sailing.



Face forward nudging
Catamarans have a wide-open space to sit. With no clues for the first time user on how to set and control the boat. The controls at this moment(sheet and joystick) are attached to the back of the boat. Making it logical to sit backward. Which causes loss of situational awareness and subsequently control of the boat. By moving the sheets forward and creating angled foot braces the boat should guide new users towards a proper forward-facing position.



The Talking boat
A boat that talks back directly. Equipped with a camera setup and an IMU(inertia measurement unit). These supply the instructor or the sailor with video analytics options, performance feedback, and service messages about the durability of the boat.

Company feedback: Empowering sailors
The talking boat idea direction requires knowledge of electronics and software development. Electronics and software knowledge is not available within Nacra making it an idea for the future of a concept that can be developed together with a business partner. Nudging the user towards a proper seating position fits best with the happily mentoring vision. Protecting the user does the opposite, it assumes the sailor is scared. Protecting the boat is however the main requirement from sailing schools. Therefore we develop the force forward seating idea further. Protecting the boat and making the boat more forgiving for a new user is developed parallel. This does have a secondary focus.

4.3. Orange concept

The orange boat concept drawing features many small ideas into a boat's design to check the reaction of Nacra's employees. The concept was printed and posted on the outside of the design studio. Anyone approaching the concept was asked for their opinion on the features.

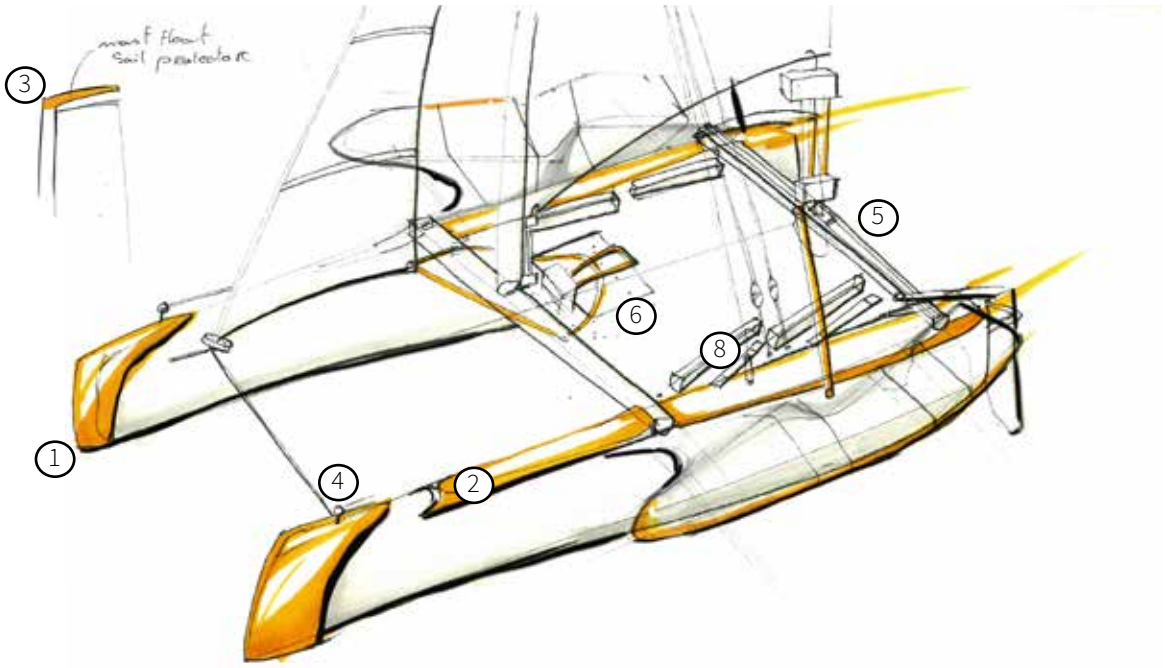


Fig.4.3 Orange concept total view

1 Nose protector

A changeable nose protector which can be used to alter the bow of the catamaran, influencing the sailing experience.

2 Foredeck pro grip

To enhance the grip when walking forwards, often done on sailing schools when docking the boat, placing the boat in a tow or to fix a stuck jib.

3 Mast float and protector

Current sailing school catamarans have mast floats to prevent the boat from flipping up side down when capsizing. This floating aid can be modernized and lengthened to protect the top of the sail from supporting dinghy's propellers.

4 Dragging line attachment points

Catamarans don't come with mooring lines, attaching one to the front of the boat would aid towing.

5 Rear beam cleat

To further aid towing a cleat is attached to the rear beam. Allowing for towing another boat.

6 Larger compartmented storage

To create space for teaching materials such as a small buoy, an anchor or drinks. Making longer sailing trips easier.

7 Canting grip

When righting the boat the inside of the hull must be strong enough to stand on. Adding grip to the inside is also a visual cue that the sailor can stand on it.

8 No option angled outkickers

Outkickers are bars of EVA foam attached to the trampoline to help racing sailors get into trapeze quicker. They can also be used to provide support and grip for the feet when the boat heels. It is assumed that angling these outkickers backwards angles the sailor towards the front. The Outkickers are now optional or not even available on Nacra's leisure catamarans but should be always included.

9 Forward sheet

The sheet and traveler should come from the front. This should twist the body forwards in the viewing direction.

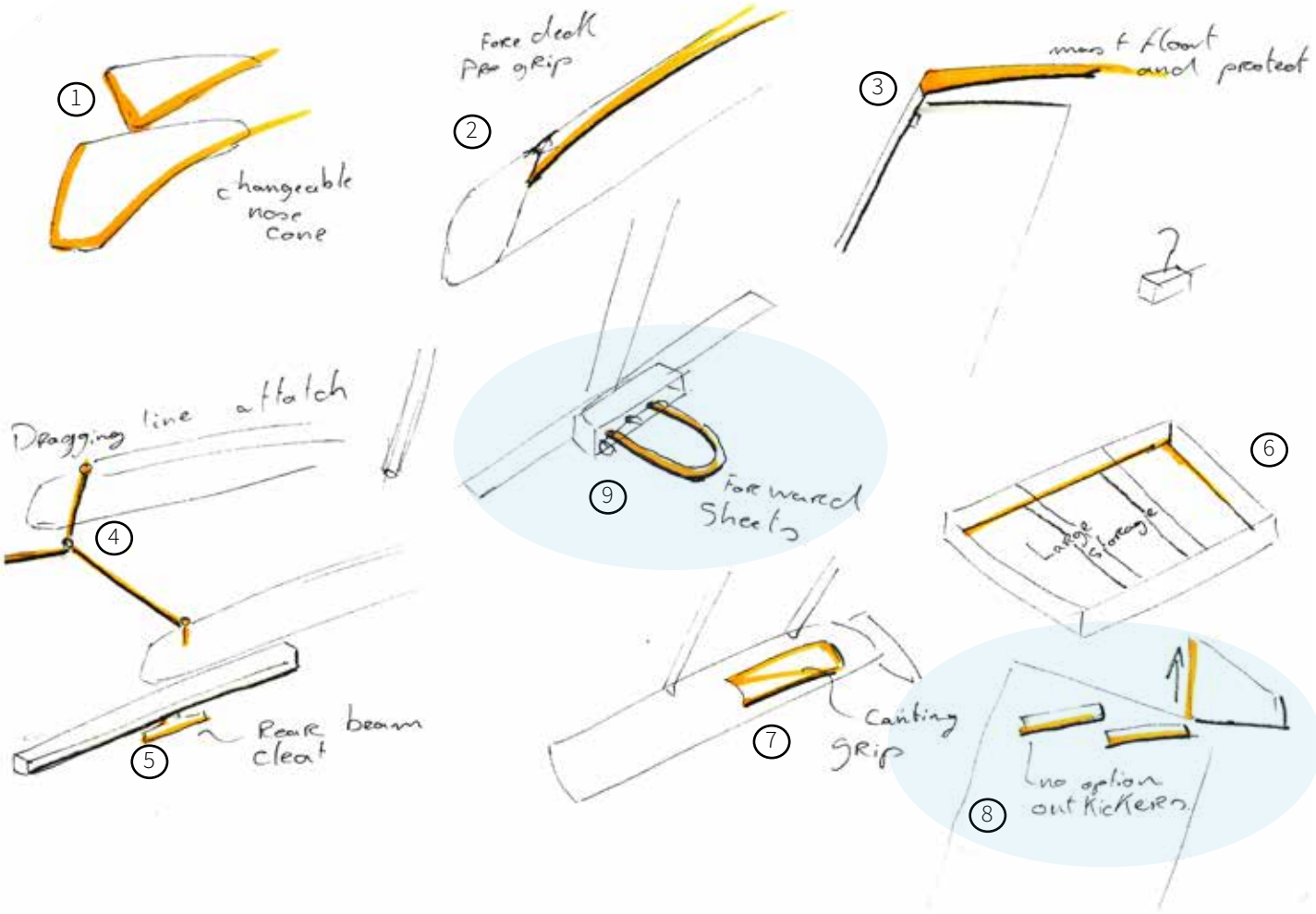


Fig.4.4 Orange concept features

Feedback:

"The nose protector looks cool!" (W. H, personal communication, 21 november, 2020)
"The tow line should indeed be in a V shape this helps to steer the boat behind the towing boat. The KNRM attaches tow lines to sides of the beams as they are the most sturdy points of the boat." (T. , personal communication, 21 november, 2020)
"Outkickers are only used by racers, and they like them in half of the occasions" (N. ,P. Vink., personal communication, 24 november, 2020)
"I don't think pro grip on the front will be necessary" (P. Vink., personal communication, 24 november, 2020)
"I doubt if the front sheeting is going to help" (N. , personal communication, 23 november, 2020)
"Grip on the inside of the hull wont be necessary but this part must indeed be strong" (P. Vink., personal communication, 24 november, 2020)

Conclusion:

The nose protector, foredeck pro grip, mast float, and rear beam cleat can be implemented in the next concept without adjustment. The tow line needs to be altered to make it stronger. Forward sheeting and outkickers need testing by beginning sailors.

4.4. Blue concepts

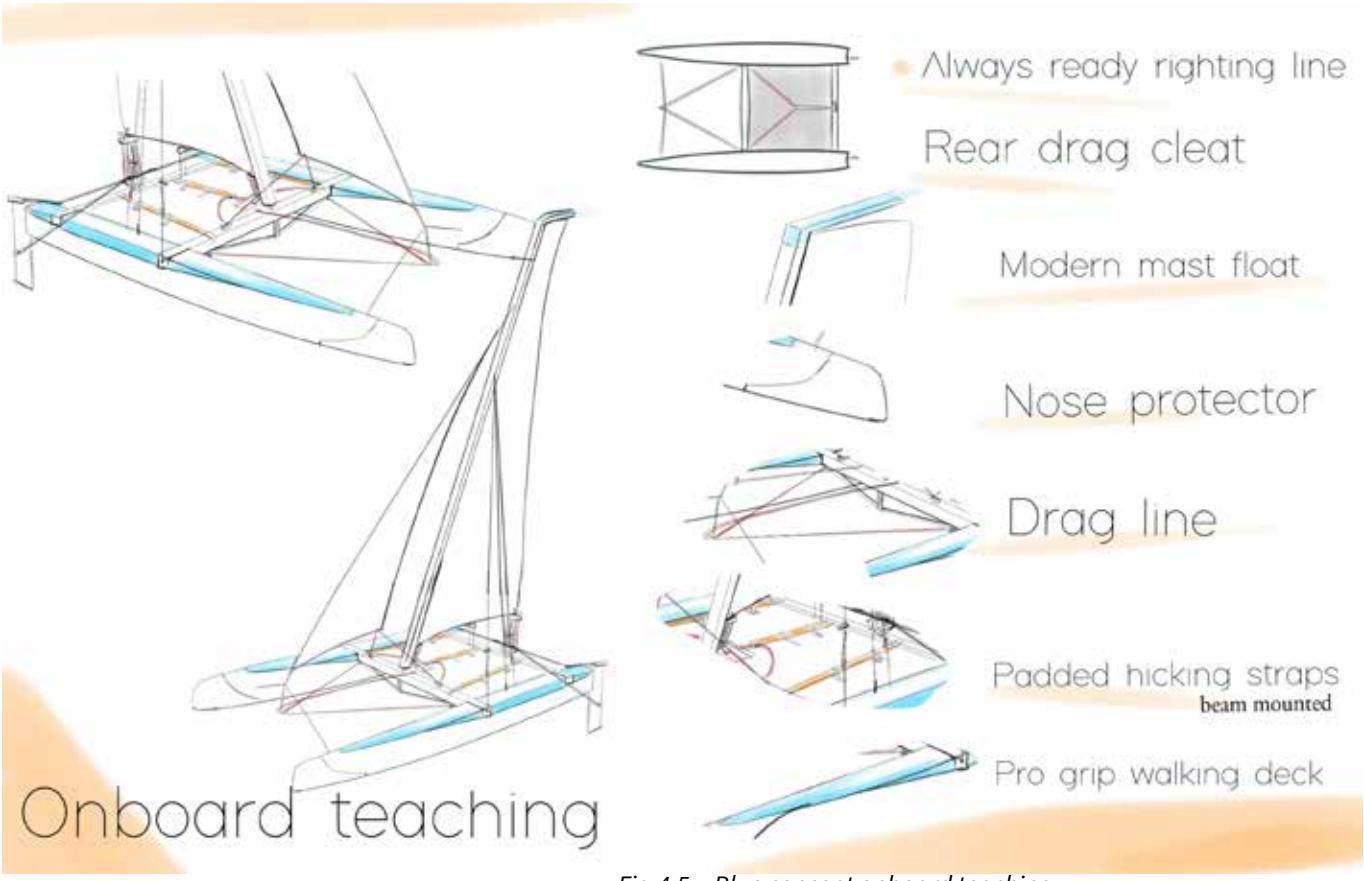


Fig.4.5 Blue concept onboard teaching

The next evolution of the recreational catamaran is the blue concept.

The concept consists of two editions Offboard teaching and Onboard teaching. In the offboard teaching scenario, a sailing school works with up to three catamarans per instructor. This instructor is in a motor dinghy. In the onboard scenario, the instructor sails with the participants on the catamaran. The two concept editions feature ideas that would apply to their teaching scenario.

The drawings shown in fig 4.5 and 4.6 are drawn such that they can provide an overview to the sailing schools that are interviewed to gain feedback, here the interviewer can clarify how different parts should be used.

Onboard teaching

From the orange concept the rear cleat, pro grip deck, and mast float remain unchanged. Changes from the orange concept are:

A righting line that is always ready for the user. The line is attached to the front beam and kept out of the water by an elastic string attached to the back beam. Nacra uses this system in their racing catamarans instead of the standard line. To right the boat, the sailor throws the standard righting line over the top of the hull, after which the crew can pull on it to right the catamaran.

The nose protector comes in two editions. One protects the underside of the hull better useful for pulling the catamaran up a boat ramp.

The outkickers are replaced by hiking straps. The hiking straps are padded and attached to the beams. Allowing for more comfort and easier foot access because they float above the trampoline. These foot straps are normally plain car seatbelt stitched to the trampoline, causing them to be hard to get into, and they often rip off the trampoline. The hiking strap also has three separate leg spaces. The subdivisions in the hiking straps limit the influence of multiple people pulling up the hiking strap.

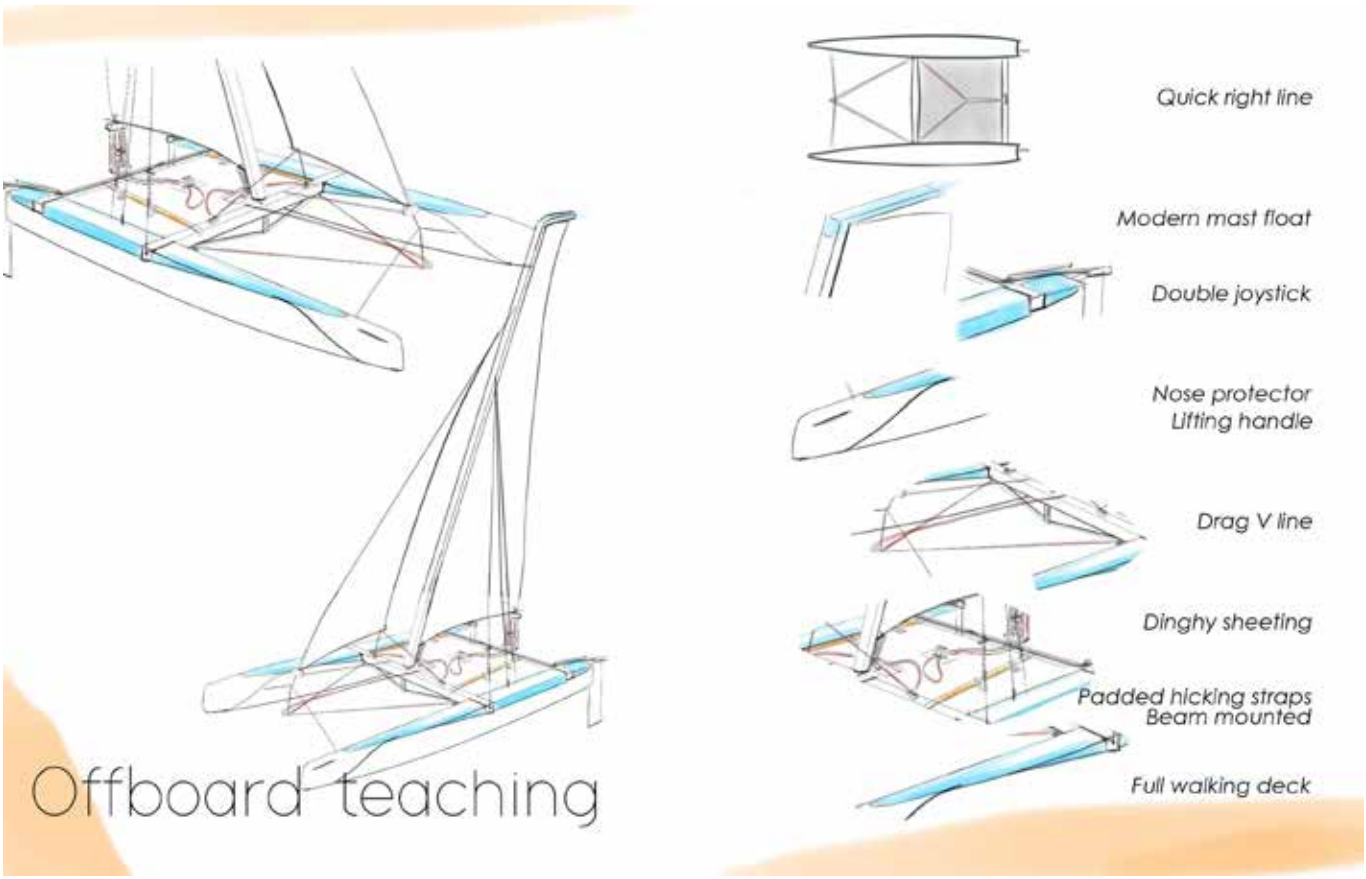


Fig.4.6 Blue concept off-board teaching

Moreover, an extra hiking strap is placed in the middle of the trampoline. To accommodate the instructor, who often sit in the middle.
Lastly, the tow line from the orange concept is now attached to the front beam.

Offboard teaching

The offboard teaching concept contains a quick-right line, modern mast float, padded hiking straps, the tow line, and a full pro grip deck. It differs from the onboard concept in the nose protector and sheeting setup.

The nose protector mostly protects the top side of the boat and now contains a grab handle. Useful for situations where the catamaran must be grabbed or pulled out of the water.

The most significant change is the forward sheet and double joystick setup. To make catamaran sailing easier for people transitioning from other dinghies. The mainsail and traveler sheet go towards a pully in the front of the boat. Connected to eighter the beam or the trampoline. The tiller is removed from the crossbar, and the crossbar is now in front of the mainsheet. With these changes, the users are pulled forwards by the main sheet and do not have to look backward to flip the tiller behind the mainsail but can keep their eyes on the water in front. This setup is already familiar to other sailing boat users and should therefore help users get used to the catamaran.
The sheet pulley can be detached and reattached at its usual place at the back beam whenever the user achieves a sufficient amount of familiarity with catamaran sailing. The crossbar also is reset to its normal configuration behind the main sheet. These options make the boat scalable to the level of sailor. The reconfiguration should take less than a minute, allowing a sailing school to adapt the catamaran to the user on the go.

4.5. Feedback on- and offboard teaching

The opinions of Nacra's employees helped to check and improve the concept. However, equally important is the customer.

Three sailing school professionals for their opinion on the concept and discuss each feature to note their reaction. The interviewer summarizes their answers. During the interview, we explain how the design features would work, and at the end, we ask each of the participants for their top three features.

There is a lot more information from these feedback sessions in appendix N. However, the focus here is on the control area. Therefore, this sub-chapter only shows the results of the hiking strap and forward sheet position features. As well as the top 3 features.

August Loven in green
Jeroen Staamer in red
Cas Ligtenberg in blue

Hiking strap:

AL
- Padding on the hiking strap is a good idea.
- A higher foot strap sounds good. "First thing I always teach my beginners is to sit properly with one foot above the hiking strap and one below, this would help"
- Adjusting the location of the strap for taller and shorter users is good, but only if it is failure-proof. The adjustment system shouldn't fail with some sand or mud.
- A hiking strap in the middle of the boat would be nice for grip.

J
- Likes the positions for instructor and two participants
- Likes the third strap in the middle. This could also be a Y strap. Something to put your feet up against.
- Higher placing and padding are a good idea.

CL
- it is so logical to place it on the beam.
- Three parts Is a good idea
- Hiking straps give security to the user
- Shouldn't be in the way during a fast gybe

Forward Sheet position:

- Would like it on a 14 feet boat, less on a 16
- It is an intriguing idea but can't oversee the consequences
- When teaching people where to sit in the boat, this could be an asset.
- Is interesting for the first two days of sailing.
- Sheeting is influenced by the traveler in this setup.
- Could be interesting, but I cannot imagine how this would work
- Cannot imagine it.

Crossbar in front of sheet:

- This will interfere with the correct seating position for a beginning sailor. It is too far backward

Double joystick:

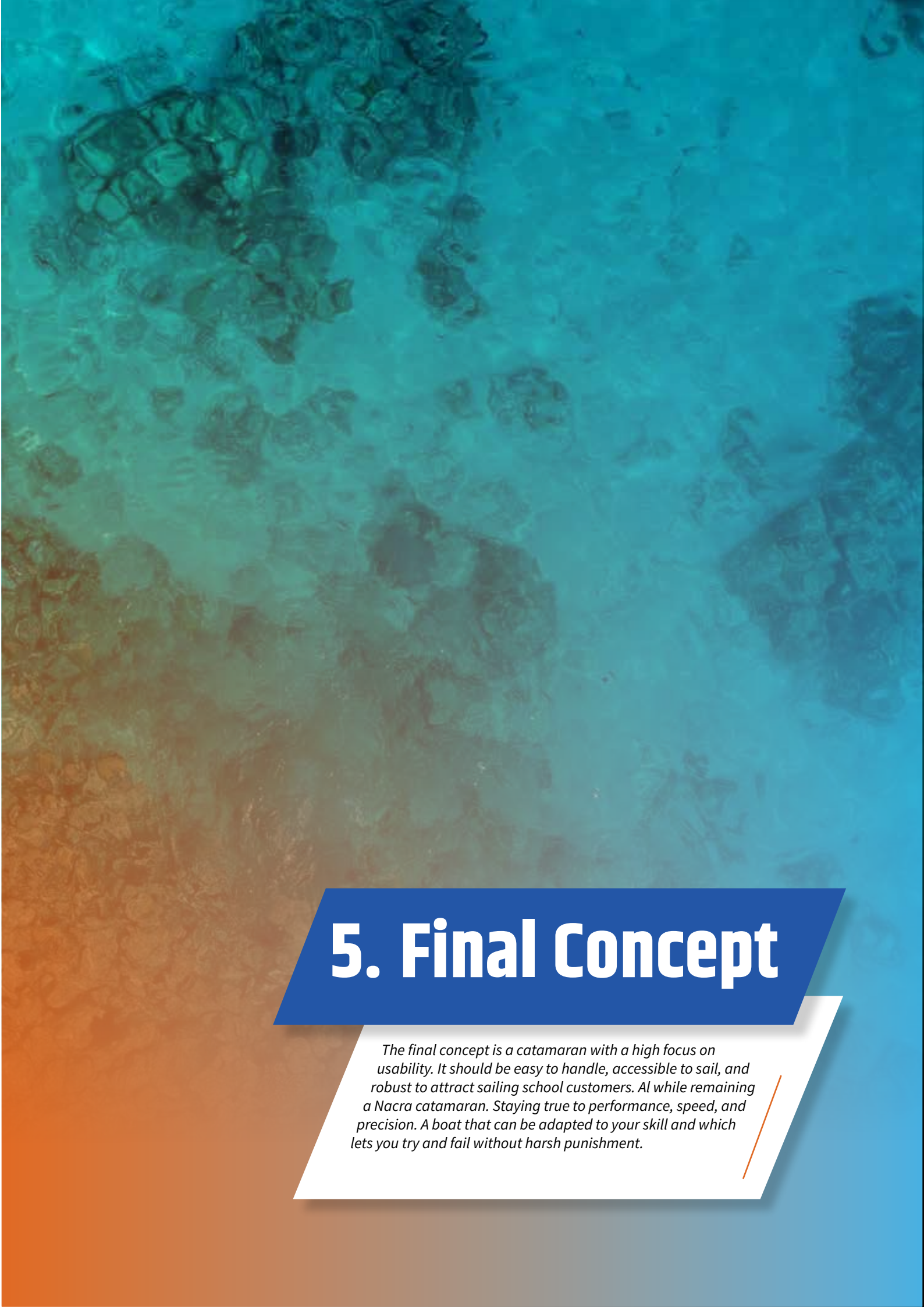
- Don't see this working since you have no leverage with the joystick sitting in the front of the boat.

The new hiking strap design attracted positive feedback. The heightened ease of getting into the strap and less tension on the trampoline caused a perception of added usability and durability respectively. The forward sheet position and crossbar adjustments were underdeveloped for this evaluation. The participants found it hard to give their opinion on something they could not envision the consequences of. Despite that, the idea did intrigue the interviewees. Therefore this feature needs further elaboration.

All non-control area features resulted in reactions such as:
"This concept makes me believe Nacra can indeed build a sailing school catamaran" Cas Ligtenberg, December 2020 and

"I like the combination and integration of full pro grip deck, mast float sail protector, and a nose protector. Because it precisely answers my fear of people breaking my boats and it fits the boat nicely." August Loven, December 2020

The only feature leading to consistent disbelief is the double joystick since it would not work in its current setup. The joystick is not providing leverage on the rudder when the helmsman is sitting further forwards.



5. Final Concept

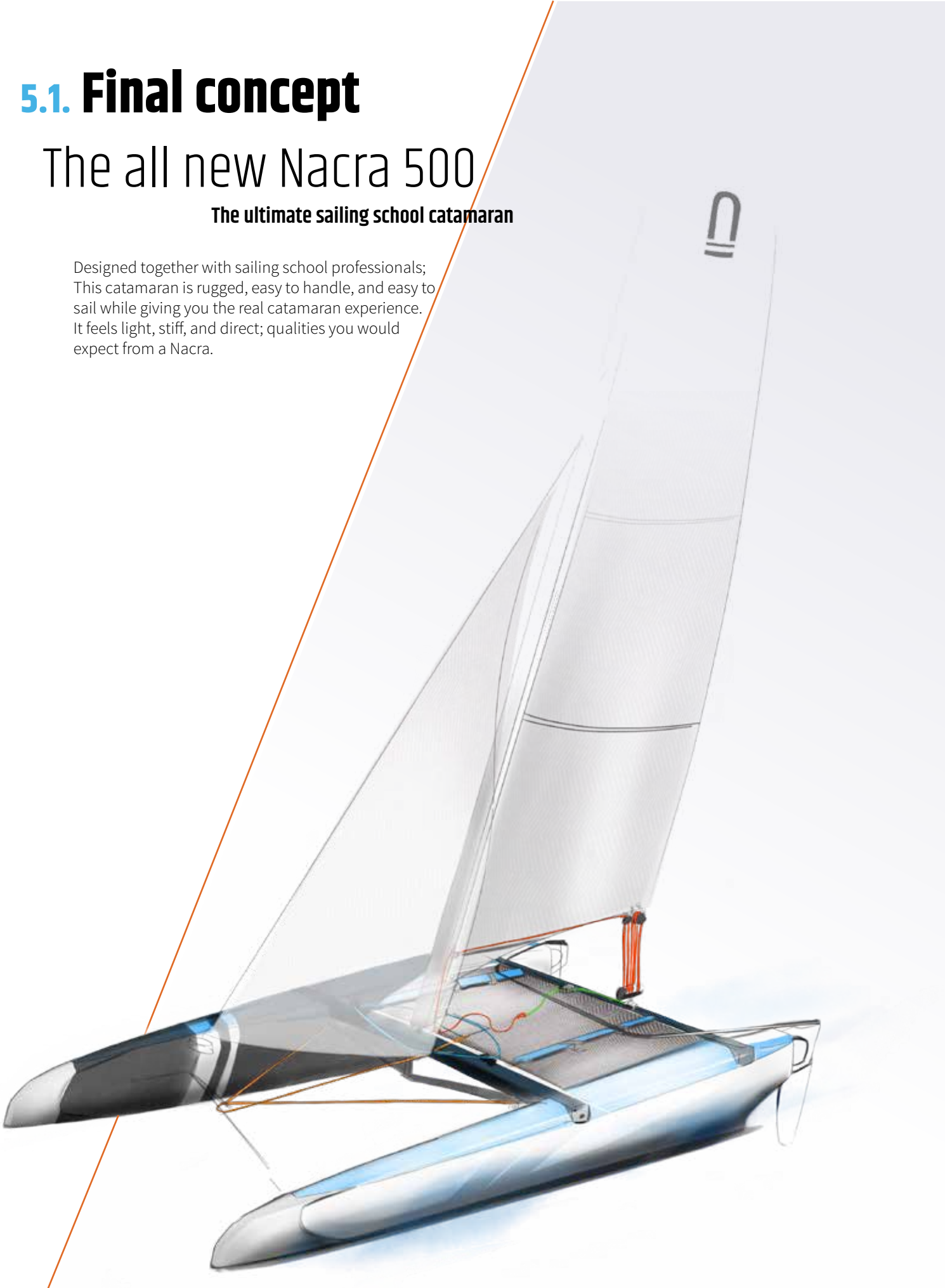
The final concept is a catamaran with a high focus on usability. It should be easy to handle, accessible to sail, and robust to attract sailing school customers. Al while remaining a Nacra catamaran. Staying true to performance, speed, and precision. A boat that can be adapted to your skill and which lets you try and fail without harsh punishment.

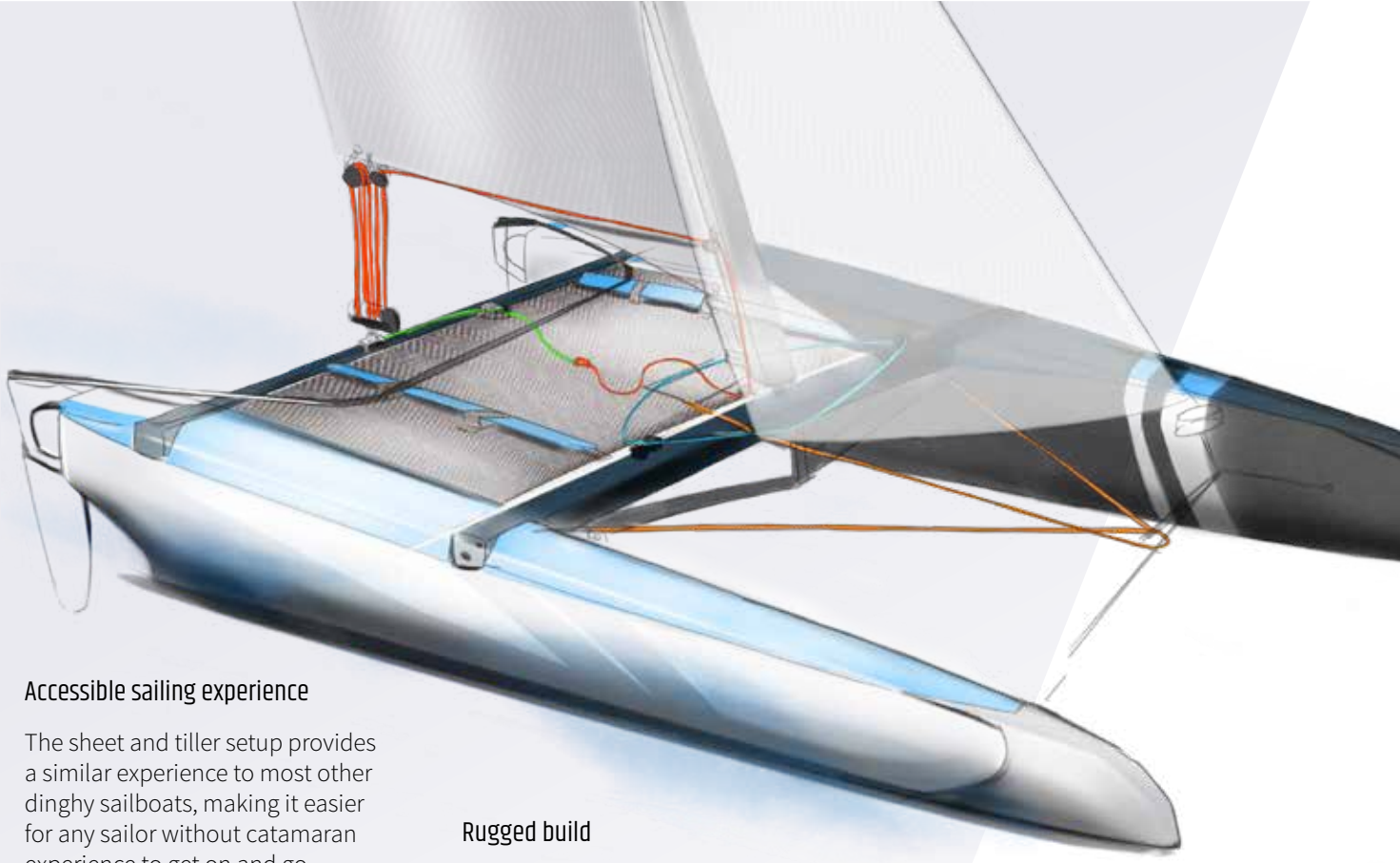
5.1. Final concept

The all new Nacra 500

The ultimate sailing school catamaran

Designed together with sailing school professionals; This catamaran is rugged, easy to handle, and easy to sail while giving you the real catamaran experience. It feels light, stiff, and direct; qualities you would expect from a Nacra.





Accessible sailing experience

The sheet and tiller setup provides a similar experience to most other dinghy sailboats, making it easier for any sailor without catamaran experience to get on and go.

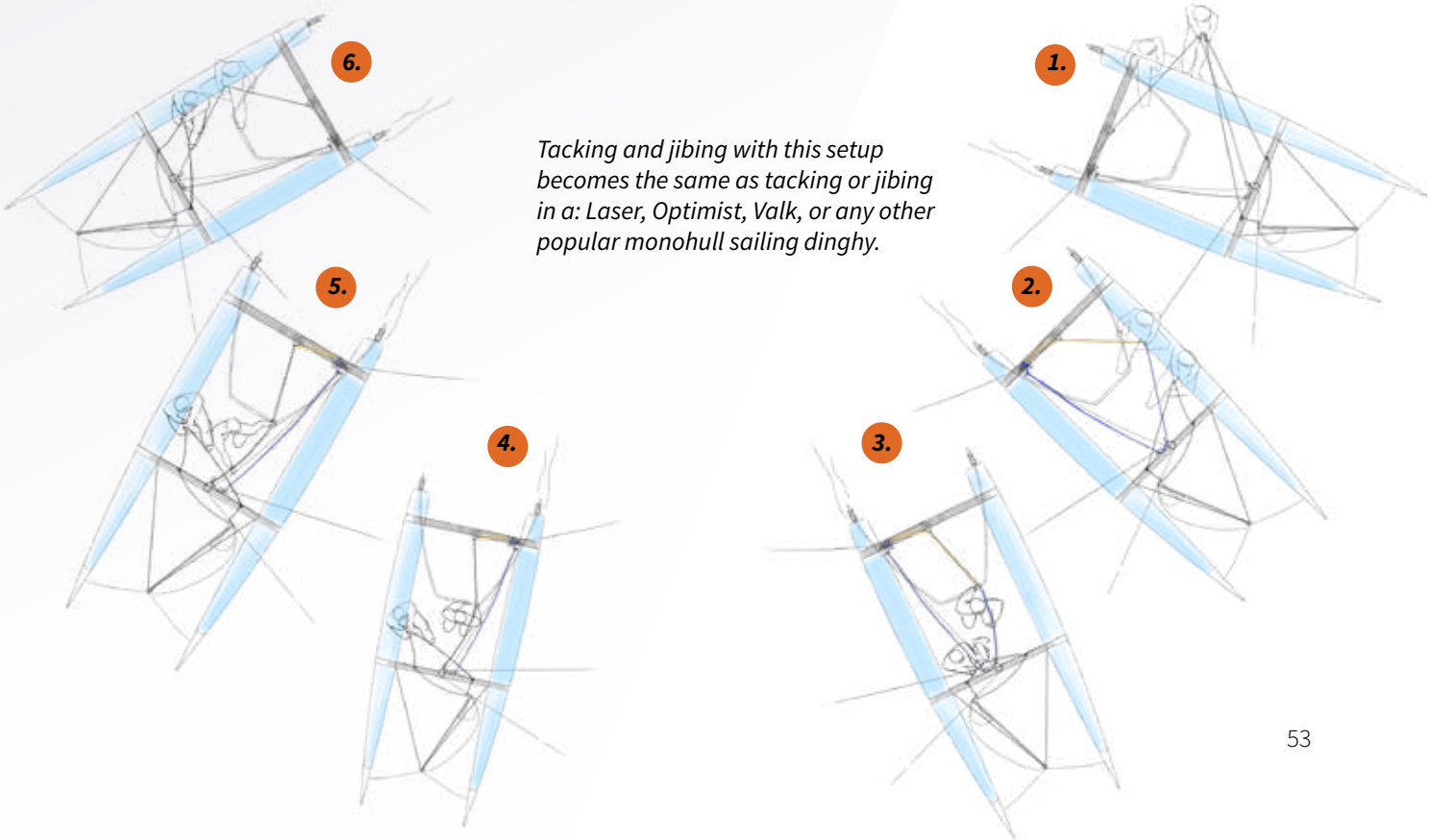
If you have grown out of this setup and want the original catamaran sheeting, you change the sheeting and steering layout back within a minute.

Rugged build

The design accounts for heavy use a sailing school would expect from its fleet. Exchangeable nose protectors protect the lightweight hulls from damage while the hicking straps are mounted to the beams to prevent strain unnecessary strain on the trampoline.

Ease of handling

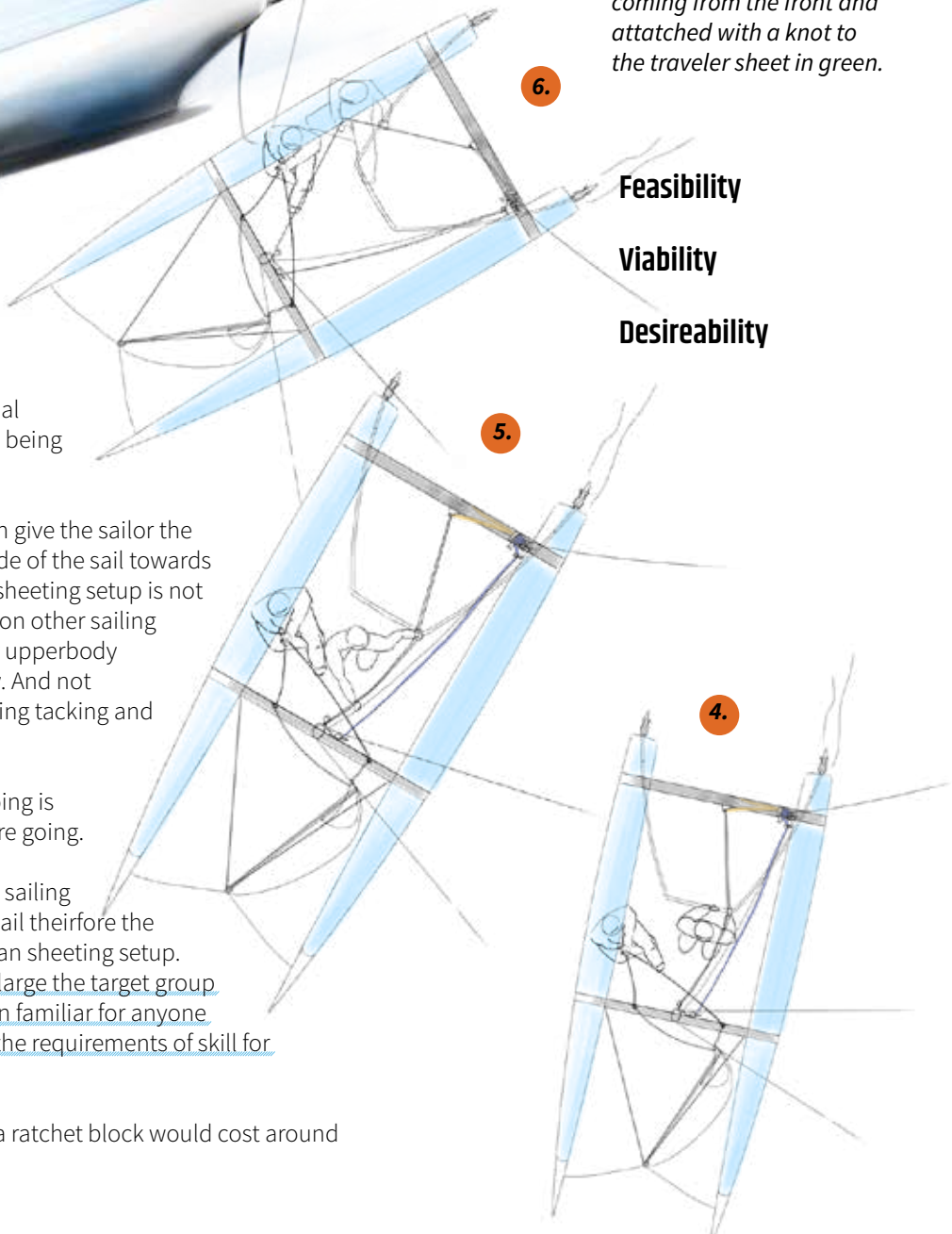
A dedicated towing line and a cleat under the rear beam make towing this boat easy. And with the pro grip layered on top of the full length of the hull, you will be able to get on board the catamaran no matter how you have docked it.



Tacking and jibing with this setup becomes the same as tacking or jibing in a: Laser, Optimist, Valk, or any other popular monohull sailing dinghy.

5.2. Features

Fig.5.1 Up: the normal setup for a main sheet. A continues loop of blue line controls the traveler and main sheet. Left: the new setup. With the mainsheet coming from the front and attatched with a knot to the traveler sheet in green.



Feasibility

Viability

Desireability

Forward sheet

The forward sheet setup differs from a normal catamaran setup because of the main sheet being led to the front of the catamaran.

The catamaran has three extra pulleys which give the sailor the option to run the mainsheet via the underside of the sail towards the mast and down to the front beam. This sheeting setup is not only similar to setups you would encounter on other sailing boats. But also allow the sailor to twist their upperbody towards the front of the boat more naturally. And not unimportantly face the front of the boat during tacking and gybing at high speeds.

Facing the direction of where the sailor is going is important to keep overview of where they are going.

A. Loven said, this system would be used on sailing schools for the first two days of learning to sail theirfore the system is reversable to the original catamaran sheeting setup. However the Forward sheet setup would enlarge the target group for rentals since it makes sailing a catamaran familiar for anyone who has ever sailed. This effectively lowers the requirements of skill for whoever wants to rent a catamaran.

The addition of the two Harken blocks and a ratchet block would cost around 80$ extra.

Fig.5.3 Pin and hole connection

Crossbar

The crossbar is placed forwards of the mainsheet. This allows the sailor to pass the helm behind his or her back when sailing while keeping an eye on the direction of the boat. The crossbar is moved to halfway the trampoline to allow for light wind helm positions(see position 2 below.

Fig.5.2 Two detatchable S shaped tubes are added to place the crossbar forward of the main sheet. The joystick can be removed with the already existing clip system.

S shaped tubes can be mounted inbetween the crossbar and the tillerarm using a pin and lockring system. This type of connection is a proven connector on catamarans which have to endure salt, sand and uv light constantly.
The two S bars would cost approximately .. and tillerarm needs to be cut and drilled.

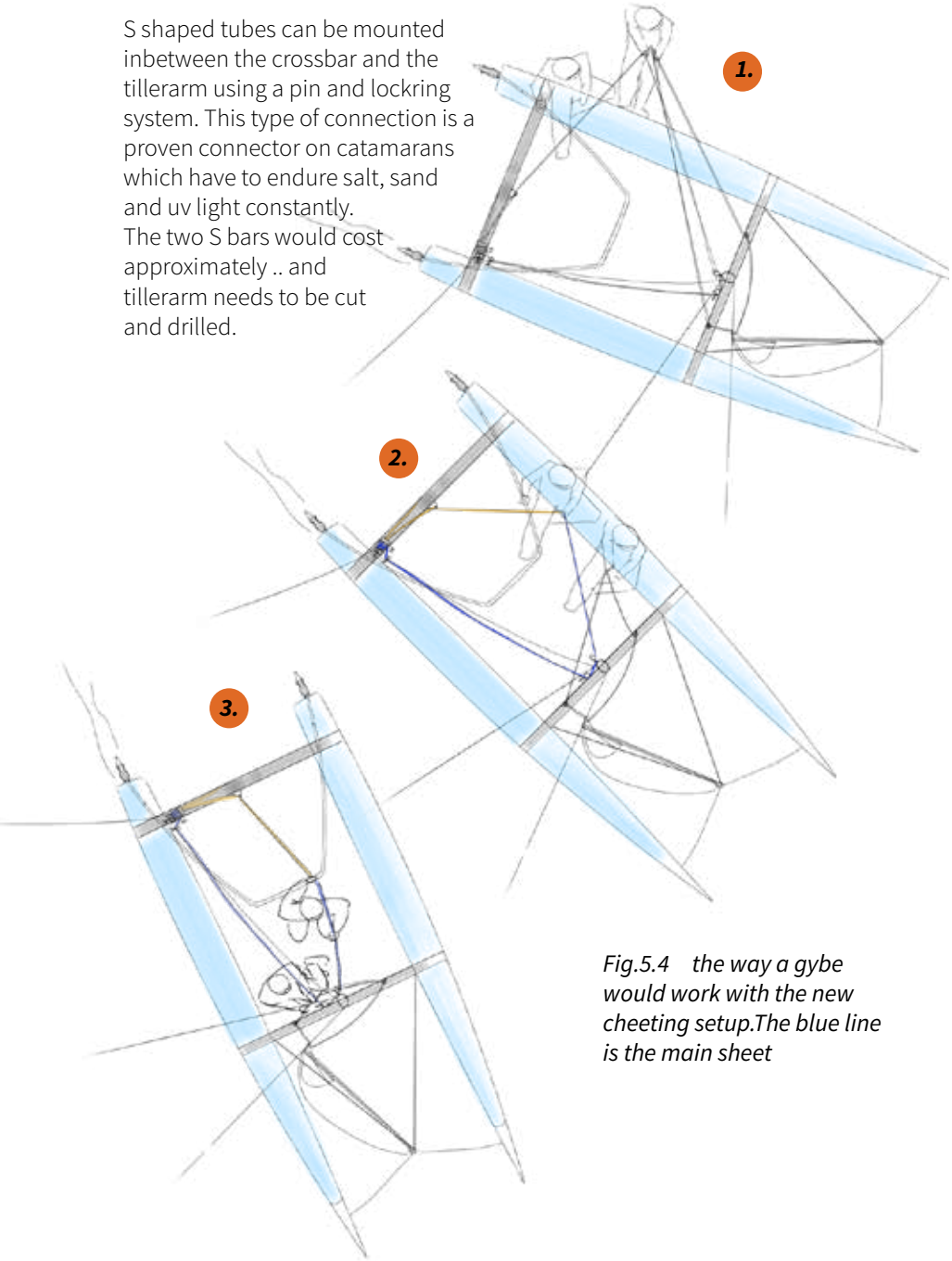


Fig.5.4 the way a gybe would work with the new cheeting setup.The blue line is the main sheet

Gybing and Tacking

The new control area setup will change the way manouvres on the catamaran will work. Fig.5.4 shows how a gybe would work. With the wind coming from the top of the page.
1. The helmsman at the helm and the crew on the outside of the boat in trapeze. The crew holds the mainsheet, traveler and jibsheet.
2. In lighter wind, the crew hand helmsman sit further to the front of the boat. The helmsman controls the traveler and mainsheet. The mainsheet is adjusted most often and since the sheet is now coming from the front the upper body of the helmsman can be twisted towards the front more naturally.
3. Before the sail flips to the other side of the boat, the crew crosses the boat to the other side. The helmsman rolls on his/her knees facing forward instead of backwards and passes the rudder behind his/her back to the other hand.
4. The crew can sit down in a normal seating position again. The helmsman has passed the crossbar to the other hand.
5. The sail flips to the other side. The helmsman twists the upper body and grabs the mainsheet with his former crossbar hand.
6. The helmsman slides the crossbar through his/her new crossbar hand. And simultaniously rolls from his/her knees to a seating position on the opposite side of where he/she first sat.

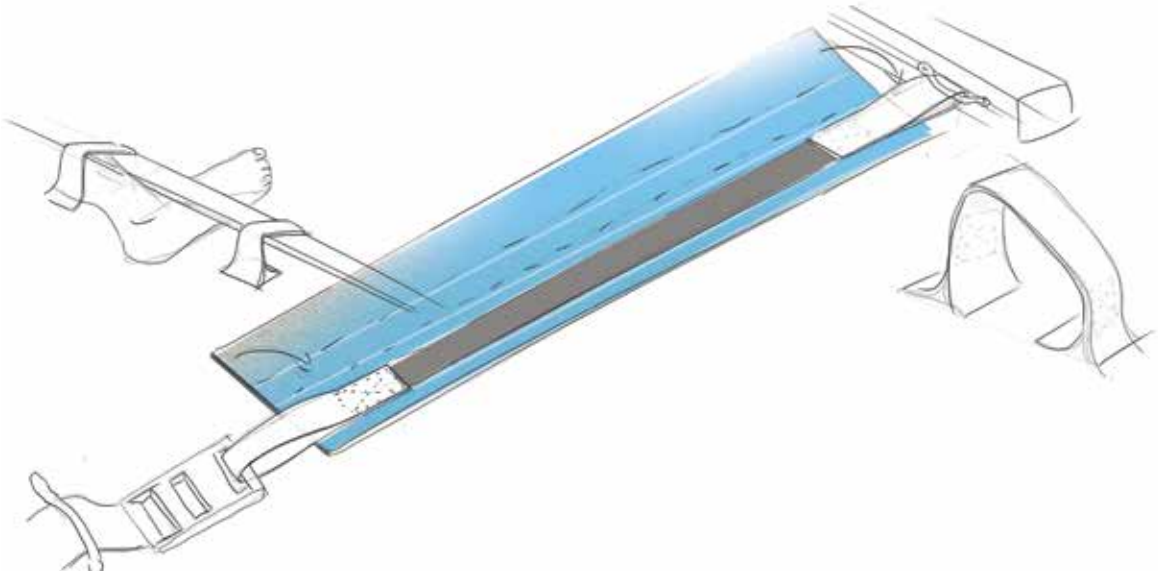


Fig.5.5 Hicking straps

Hiking straps

The hiking staps have been reworked to decrease the load on the trampoline and to make them easier to use. Since the dry tests showed users had to look inside the boat and help with their hands to get their feet under the strap. The visit to a sailing school ended up with many pictures of ripped off straps.

The straps are mounted on the front and rear beam instead of on the trampoline. This adjustment allows the straps to be tightend further without ripping the trampoline. Furthermore the straps are positioned under an angle and 2cm above the trampoline deck. This makes it more convinient to slide your feet under. The straps are padded with foam to make them more comfortable.

Instructors pointed out that they needed room for three users in the strap. Therefore, two cloth bridges are set up over the strap. These bridges limit the effect of pulling up on the strap each sailor feels from the other.

Sowing work for the hicking strap can be outsourced. The hicking straps can be made for all of Nacra's catamarans.

Fig.5.6 Left: participant of the dry test lifting up a hicking strap. Right: ripped off and often restitched hicking strap

Nose protector

A nose protector is neccessairy to limit damage when sailors fail to dock their boat gently. Or when bumping into other boats. Situations which would occur often at sailing schools.

A protector could be manufactured by vacuum forming an ABS sheet and attatching this to the front of the catamaran using PU foam.
The ABS outer layer will protect against punctures and the foam will dampen the impact.
The feasiblitity of this approach needs to be further investigated since it falls outside of the scope.
Estimated costprice: 80$ see the bill of materials in appendix P for a more detailed cost price calculation per part.

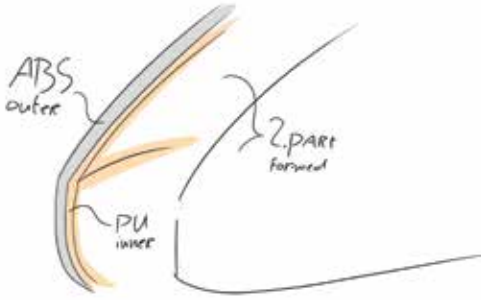


Fig.5.7 Nose protector

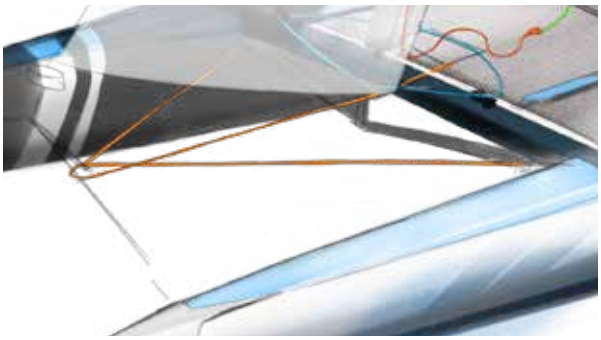


Fig.5.8 Tow line in orange, forward pro grip in blue.

Tow line

A tow line is installed by replacing the dolphin striker bolts with eye bolts and attatching a line in a V shape to the front of the catamaran, through a loop and back. With this line it becomes more convenient to drag and dock a catamaran.

Pro grip

The grip on the deck is lenghtend towards the front of the boat. This makes it more convenient for sailors to walk to the front of the boat when docking or ,if multiple catamarans are attachted behind eachother, to walk from the front catamaran, to the last catamaran in tow.

6. Roundup

In this chapter you will find the evaluation of the final concept, recommendations for further development, the conclusion and a reflection on the project. Thus, does the final concept fit the requirements of the project? How does Nacra need to develop the concept further? What can Nacra and the author learn from this project?

6.1. Evaluation: concept vs. drivers

The concept needs to be compared to the main concept drivers to draw any conclusions about the quality of the solutions delivered.

1. Improve the time beginning catamaran sailors spend looking outside of the boat

The dry test showed that everything which causes difficulty for a user on a boat results in users looking towards the cause of this difficulty. Causes of problems were: the continuous sheet and traveler, the hiking strap, and the joystick. All three of these causes have been taken away by the proposed concept. Users are given a frame of reference by introducing similarity to the setup of other sailing craft. Although the new setup still needs testing to validate these claims(see chapter 6.2), the new setup will most probably increase the time spent looking outside the boat.

2. The design should be interesting for sailing schools.

Interviews provided the insight that sailing schools will be interested if the boat gets damaged less while giving its users a great experience. The proposed concept aims to increase the control of sailors while sailing and handling the catamaran manually. This increase in control over the boat should lead to fewer accidents. Also, the concept aims to reinforce the critical surfaces of the boat. Meanwhile, the complexity of the proposed concept is kept low by using a minimal amount of parts.

Equally important, proposed solutions remain lightweight and do not change Nacra's boat feel qualities such as speed and precision of the steering, which should keep their unique selling point: the experience intact.

3. The design should fit Nacra's new branding vision.

Nacra's new branding is all about a company with the expertise of making quality high-performance catamarans and supporting sailors on their sailing level. By focusing the concept on sailing schools, the product has to become more accessible for novice sailors. Moreover, intermediates can progress in their sailing level due to the ability to quickly turn the boat back to an original catamaran setup.

Nacra also wants to portrait speed and excitement. The concept's solutions are simple and do blend in with Nacra's visual style. These minimally visible solutions should preserve Nacra's original style and prevent their catamaran from starting to look like a kids toy.

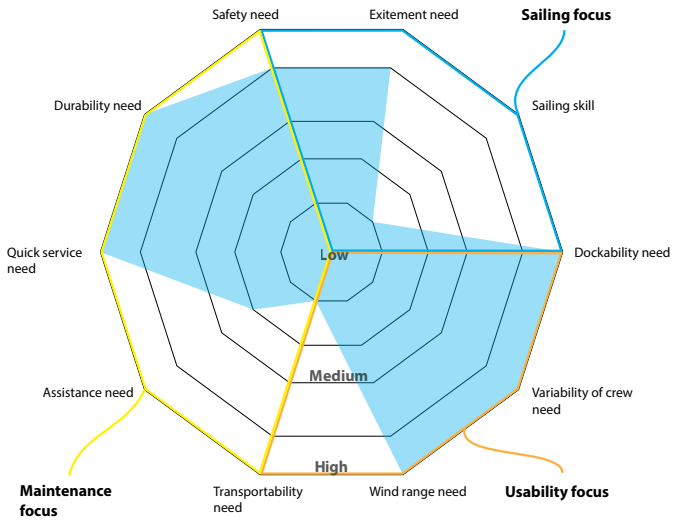


Fig.6.1 sailing school profile

6.2. Recommendations for further development

The solutions in the final concept need development before they are market-ready. In this subchapter, you will find recommendations for the product, the company, and the watersports sector in general.

Product level:

Product development process recommendations

The presented concept is at the end of the design phase. The implementation phase still needs completion. Rapid prototyping and testing the solution will give more insight into how novice users behave with this new setup. Detailing the solutions and training staff to use the solutions are needed to produce and maintain the product.

Rapid prototyping and testing
Nacra needs to gather more customer input to prove the actual effect of the solutions. For the main solutions: the forward sheet and crossbar, the prototypes and tests in Table.6.1 are recommended.

Detailing the solutions and training staff
Each test will result in consequences for the design. Thus further detailing the design. It is the right moment to review the customer journey once again. The staff needs training to manufacture the solution.

Limitation of the brand-driven innovation approach

The BDI approach does not focus on implications for the environment. Out of TU Delfts focus areas: people, profit, and the planet, it completely neglects the planet. The presented solution still needs evaluation for environmental impact. So it is strongly recommended to do this by reviewing the full life cycle of the product.

Product recommendations

Customer Journey
The customer journey shows that the final concept only accounts for two phases: the sailing phase, and part of the rigging phase. Therefore attention needs to be put into the full usage cycle. Here are questions that need answering in further development:

Pre-engagement: How can the product be changed to increase word of mouth advertisement? How can we make it more accessible for recreational users to get in contact with Nacra?
Engagement: How can we give recreational sailors access to the Nacra experience?
Receive: How can we give the customers a welcome when they receive their catamaran?
Rigging: How can Nacra support the customer to rig the boat optimally to ensure the Nacra experience on the water?
Store: Catamaran parts that are not in use should be stored, preferably on the boat. How can part storage be integrated?
Troubleshoot and maintenance: If anything breaks, how can the catamaran be repaired within one day?
End of life: When the boat goes to a new owner, how does Nacra ensure a good experience for the new owner? How can Nacra handle the waste of a catamaran?

Known issues
Two specific product shortcomings are still in existence:
Tripping over hiking straps
Some sailing school managers pointed out that it would be possible to trip over the heightened hiking straps when crossing the boat. How big this tripping problem is, remains to be tested.
Not convinced about the possibilities of the new setup.
Since the forward sheet setup is novel, some resistance for integration in the company emerged. Later it became clear that this was partly due to a lack of visualization of the concept. It was hard for people to envision how the system would work and what its implications would be. This envisioning problem can enlarge with customers who need to make a buying decision. Therefore it becomes crucial to communicate the concept clearly. Nacra can use visuals, but it will be better to show customers the benefits it brings to beginners through video footage or to let them experience.

Risk and impact

Fig.6.2 shows the different solutions integrated into the final concept. The graph shows solutions on a scale of risk and potential impact. On the left side are the unspoken wants of the customers. Solutions they expect to be in the product without explicitly asking for them. The omission of these solutions can be dealbreakers. The wow factor solutions are there to set the product apart from the competition. These solutions heighten the customer satisfaction a point of word of mouth advertisement.

Stage:	What prototype:	Test goal:
4 technology validated in lab	Dry mock up in shop	Can we build it?
5 validated in relevant environment	Sea test by company	Can it withstand a relevant environment?
6 demonstrated in relevant environment	Sea test with real user	Can it withstand a real user?
7 demonstrated in real environment	Wet test at sailing school	Can it withstand the real environment?

Table.6.1 Prototype and test recommendation

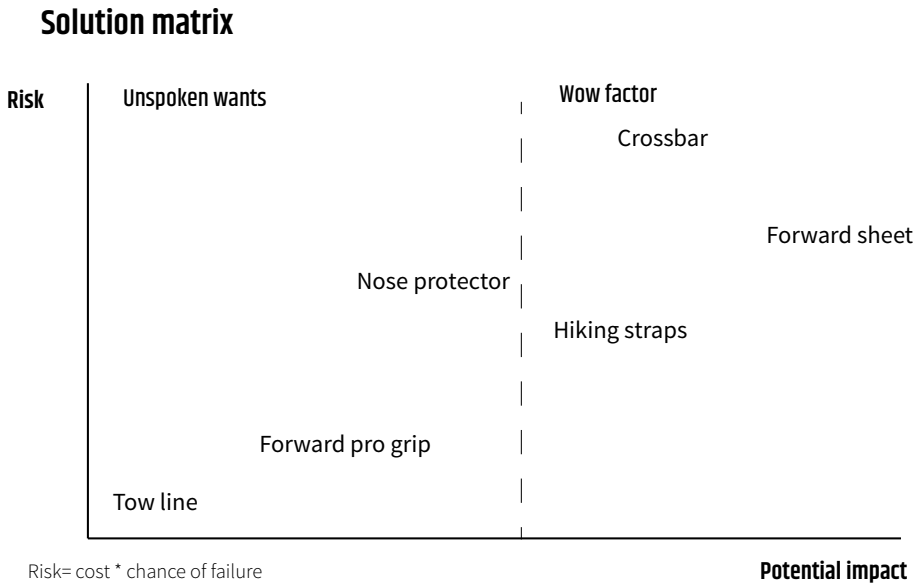


Fig.6.2 Solution matrix

Company level:

Observations during the project lead to recommendations for the company.

Customer-oriented

Nacra always has known its target market well since employees are catamaran racers themselves. However, since the focus is widening to include the recreational market, it will become paramount to know the new target group. At the start of this project, little knowledge was available about this target group.

Furthermore, there is another difference between racers and recreational sailors. Racers are satisfied when their boat performs. Focus on the product on its own will be enough to satisfy their needs. Recreational sailors will require a much broader focus. Not only must their boat perform, but it should also be combined with good service and experience from beginning to end, from orienting, to buying, to using, and finally end of life of the catamaran.

Fig.6.3 EU technology readiness levels(TWI global, 2021)

Therefore, investing in customer research and focussing on understanding the new customer is recommended. After which, the obtained can inform the development of a better customer experience throughout the entire customer journey.

Innovation

Minimize development risk
The boats are complex and project numerous, that it would be beneficial to see which project is in what stage of development. Subsequently, one can couple the right kind of test to the project.

For testing, implementation of Technology Readiness Levels(TRL) is recommended. Fig.6.3 sshows the different phases of these TRL levels as defined by the EU. This method ensures minimal risk on market entry. On top of that, the TRL levels require little implementation and maintenance time. Table.6.1 shows TRL steps 4 to 7 for this project.

Sustainablility

More emphasis can be put on environmental impact from the company. Nacra is a small company. The small amount of employees makes it difficult to free up resources to make sustainability a top priority. However, introducing the planet as a stakeholder in development projects can save costs, and customer experience can be heightened, especially in the transport and end of life stages.

Sector level:

Neighboring watersports sectors such as kiting and windsurfing have proven to be inspiring sectors during this project. These sectors work in the same physical environment with similar materials and customers with similar values. Due to the larger market size, lessons can be learned from the more professional companies in this market. On topics such as customer experience, targeting recreational customers, and sustainability.

6.3. Conclusion

The final concept solves the initial problem. The developed catamaran control area makes Nacra's catamaran more accessible for novice sailors and more experienced sailors who have never sailed a catamaran before.

The brand-driven innovation approach of Abbing(2010) structure the findings of this assignment.
The brand image of Nacra is similar to car brand Ferrari but in catamarans, fast but fragile. Nacra's company values are high performance and innovation. They believe Nacra's quality catamarans persuade customers through experiencing their catamarans on the water. Nacra wants to become more accessible for its customers. However, the current interaction between product and user defines as sensitively-intense. These catamarans are sensitive in their steering and controls. Plus, intense for the amount of input the body receives. Consequently, their catamarans are too much to handle for a beginner.
Interviews disclose the potential customer group values. Recreational customers put longevity on the top of their list of what they value in a catamaran. The idea that Nacra's catamarans are fragile prevents recreational users from considering a Nacra as an option. Furthermore, for sailing schools, rentals and association sailors deem the experience on the water important.

Sailing schools are the selected target group for this project. These schools require a robust boat that gives an excellent sailing experience to beginners and advanced sailors alike. These sailing schools are a strong first touchpoint for Nacra to let catamaran sailors experience a Nacra. The created design solutions allow recreational sailors to sail a Nacra. The vision of the new design is happily-mentoring. To make a catamaran that supports catamaran sailors of all levels to enjoy catamaran sailing.

The project results in a more accessible catamaran for novice sailors and sailors without prior experience on a catamaran without tampering with the catamaran's performance.
By moving the mainsheet and crossbar forward, sailing the catamaran resembles most other entry-level sailboats. This setup makes the transition to a catamaran easier for the novice catamaran sailor. Who now has a feeling of control over the boat earlier.
The boat is made more robust by adding a nose guard.
The ease of use of the boat increases by several solutions: by applying the pro grip further forward, it is now easier to get on board. Towing the catamaran becomes straightforward due to the towing line. Plus, the catamaran can be righted faster by mounting the righting line to the underside of the trampoline.

The catamaran concept still needs development. Rigorous testing with the target group is required to minimize risk on implementation.
Using technology readiness levels and a focus on the customer journey can structure this process.

The design's main implication is a reduced threshold for learning to sail a catamaran without prior catamaran sailing experience. Therefore it serves as a tool to enlarge the catamaran market. Hence, the concept targets a new customer for Nacra. Sailors who want the speed of a catamaran without the hassle of learning new controls. Furthermore, Nacra now has a catamaran design that can provide the Nacra experience at the beginning of a catamaran sailors sailing career. This experience with the Nacra feeling and consequent early brand awareness could influence buying decisions later on in customers sailing careers.

Concluding, the resulting catamaran concept solves the stated design problem. To develop a solution that makes Nacra's recreational catamarans accessible but looks and feels high performance. The solution is feasible to implement in the coming half year. The relatively low implementation cost and unique product placement in the recreational market make the concept viable. Moreover, sailing school owners verified the desirability of the concept. "It precisely answers my fear of people breaking my boats, and it fits the boat nicely." A.Loven(2020).

6.4. Reflection

This subchapter serves as a general reflection on this project to facilitate learning.

Approach

This project started with the intention to quantify the experience of catamaran sailing. After which, this quantification would be overlayed with both Nacra's catamaran feeling and the customer's needs. To come up with the optimized version of this feeling for recreational catamaran sailors. This approach was hopelessly scientific in its setup and proved too slow and abstract for practical implementation.

The brand-driven innovation approach proved to be a better framework to address the design assignment. It neatly combined the brand with the customer values. The additional idea to explicitly combine the designer's values in the approach provided much-needed flexibility in making design choices.

The brand-driven innovation approach was supplemented by many methods to fill in the gaps. The drawback of this approach was a slight push towards a linear approach. Consequently, this can take away creativity. This two-tiered approach did, however, consistently keep the focus on the goal of the project. This goal focus helped to keep the speed in the project. The result is a project finished in time, with little planning difficulties.

Acceptance

Throughout the whole process, the final concept's acceptance was kept in mind. No stakeholder wants to walk away after a project with a solution unbefitting to their context. The project includes interviews with the company, customers, and end-users. As well as feedback from these parties on ideation results. Also, employees joined in on the design after an invitation.

Still, this process taught a valuable lesson about stakeholder feedback. Even when all stakeholders are invited to pitch in on the design some design ideas can be too far-fetched. Especially communicating the design unclearly can create resistance. Therefore it is paramount to question the feedback from stakeholders on their validity. Questions such as: did the stakeholder understand the concept fully when he/she gave this particular answer? Or did the stakeholder have to design a part of the solution to evaluate the idea? This effect was notably more evident when the ideas presented to stakeholders are unconventional.

The forward sheet and crossbar were met with this resistance by the company. However, the further the communicating visuals progressed, the more people started to believe in this concept.

Communication

Communication with stakeholders throughout the project was good. Contact with Nacra went smoothly, company supervisor P. Vink was kept in the loop, and the rest of the company was involved in the project. Communication with the university only had some hiccups in contact during the writing of this report. Communication with customers was excellent. There was no trouble finding test subjects, expert opinions, and customer opinions in general. I'm happy to say that emphasis on finding the viewpoint of customers and company paid off in the form of a fitting concept.

Personal

Confidence

The resistance to the forward sheet unfolded an adverse effect of a character trait for me. As I am quite conflict-avoidant, I prioritize keeping all stakeholders happy and skip over my vision. As a designer, this trait helps me to empathize with stakeholders. This empathy aids me in coming up with fitting solutions. Spearheading innovation takes a lot of confidence in ones' design solution, however. Thus, when repeatedly faced with resistance against the acceptance of the novel forward sheeting concept, I dropped the idea. While it only took a clarified visualization of the concept to increase the acceptance of the idea.

On the other hand, my intention to confidently take the lead of my project in meetings with the supervisory team worked. This mindset helped me tremendously to gain acceptance and especially freedom within the company. I had the feeling it created trust.

Involvement

Often I found that I did not need much help. Therefore I only scheduled a meeting to inform relevant parties of the progress. When planning these meetings it often felt like the interest in the progress was one-sided. I was aware this could happen. The solution was already advised by A. Jansen at

the beginning of the project and kept in mind throughut. That it is imperative to make yourself, and the project, important to your supervisors to make sure that they keep on contributing. However, it still did not feel right.

Strategy

This project boarded on strategic design in the Understand phase. Something which I would know would intrigue me. I've found that I enjoy figuring out what kind of strategy and accompanying products a company needs to target a specific market. Subsequently applying these findings in my design project and subtly helping a company adopting this strategy was great. I believe the project not only resulted in a catamaran concept, but it also increased the capability to design accessible products.

Resources

How to leverage the resources of a company? I find it hard to leverage the resources of a company. Monetarily and physically. I try to do as much as possible with as little of the available resources as possible. Yet, I see potential in being more thorough in asking for and obtaining resources to help during research or testing and prototyping designs. During this project, it would have been beneficial to organize an on the water test with beginners. But this test required quite a lot of resources(catamaran, motorized dinghy, personnel, camera, and time), and therefore, it did not happen.

6.5. Acknowledgments

As a final note I would like to thank an number of people. First of all my supervisory team who have given me the freedom and confidence to take my own path during this project. Arjen, Martien and Peter, thank you for your kind help.
Second, Nacra. Nacra has been an amazing company to work for the past 20 weeks. The open culture and driven people made me feel right at home.
Third, Thanks to all participants of interviews and tests. These have certainly helped elevate the project.
Last but not least, thanks to my housemates and my lovely girlfriend your support and company has helped tremendously in keeping balance throughout the project and even my entire Master.

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6.6. Appendices

TU Delft Delft University of Technology

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Beeris
initials: C.F. given name: Casper
student number: 4975421
street & no.:
zipcode & city:
country:
phone:
email:

Your master programme (only select the options that apply to you):

IDE master(s): ★ IPD ☐ DfI ☐ SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ☐ Honours Programme Master
specialisation / annotation: ☐ Medisign ☐ Tech. in Sustainable Design ☐ Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Arjen Jansen dept. / section: SDE
** mentor: Martien Bakker dept. / section: SDE
2nd mentor: Peter Vink
organisation: Nacra Sailing
city: Den Haag country: Netherlands

comments (optional): The choice for Arjen Jansen relies on his background with sailing and sports innovation-related projects. Martien Bakker was selected because of my positive earlier experience with him as my mentor.

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Arjen Jansen date - - signature

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: _____ EC

Of which, taking the conditional requirements into account, can be part of the exam programme _____ EC

List of electives obtained before the third semester without approval of the BoE

YES all 1st year master courses passed

NO missing 1st year master courses are:

name date - - signature

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: APPROVED NOT APPROVED

Procedure: APPROVED NOT APPROVED

comments

name date - - signature

Development of a recreational high performance catamaran — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 02 - 09 - 2020 — 29 - 01 - 2021 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Nacra Sailing is a major player in the field of high-performance catamaran production. Being the head supplier of the Olympic multihull(catamaran) class F18, their brand has international appeal on a professional level.
Nacra's brand image bases itself on characteristics of performance and innovation. This claim is supported by being amongst the first brands using hydro-foils for consumer model catamarans(for example the F20 carbon visible in figure 1). The company has a lot of technical knowledge and a strong network within the industry. Furthermore, Nacra does In-house manufacturing and testing on-site, enabling direct communication between manufacturing, design, and testing departments. The company sees itself as the only catamaran producer that is using modern sales tools, being the only catamaran vendor with a webshop.

With the strong brand name, Nacra wants to strengthen its relatively small foothold in the market of recreational catamarans while staying true to its high-performance brand image. How strong the carry-over effect from their performance brand name is to the recreational market is not clear.
To make this step Nacra wants to update their three leisure line catamarans.

Nacra expects buyers in the recreational market to be good sailors, but less athletic than their current target group of Olympic and other competitive sailors. Nacra wants to target large resorts since Nacra thinks these resorts aim to increase their luxurious appearance using top brand catamarans. Nacra sees the opportunity to target this group of recreational sailors with more modern and accessible catamaran designs.

Nacra has thought of adding wings (see figure 2). But these do not fit their brand image and might not suit what the target group needs but do serve as an fitting example of what the result should not be.

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: Nacra's F20 carbon racing catamarans

image / figure 2: Hobie getaway with wings(the bench on the side) and the image Nacra needs to avoid

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

Nacra's wants to expand its foothold in the recreational catamaran market. They want a solution to make their boats more accessible for beginners and older sailors.

Nacra's brand image is built around high performance catamarans which are made to sail on the limit of what the boat can handle. There is little margin for errors, and errors will often lead to dangerous situation in high winds. This sailing on the limit is what makes the boats quick and exciting to sail. A more accessible boat needs a larger margin of error since beginners and olders sailors will make more mistakes. Current solutions are unfavorable since they trade away boat speed and handeling, and make the boats look and feel less exciting(compare figure 1 and figure 2).

Nacra's current recreational boats do not attract a large enough market share. By simplifying the boats Nacra neglects their "high performance" brand image which they aim to use to expand their foothold in the recrational catamaran market. The design problem is to develop a solution which makes Nacra's recreational catamarans accessible but look and feel high performance.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Develop a set of parameters that describe the experience of the catamaran sailor and use these parameters to design the optimum experience for a recreational Nacra catamaran user. Deliver a suggestion for implementation in Nacra's catamarans.

I aim to develop a set of parameters that describe the experience of catamaran sailors in general, the specific parameters that result in the optimum experience for recreational catamaran sailors. Furthermore, a proposed design of adjustments to a catamaran implementing these parameters will be delivered.

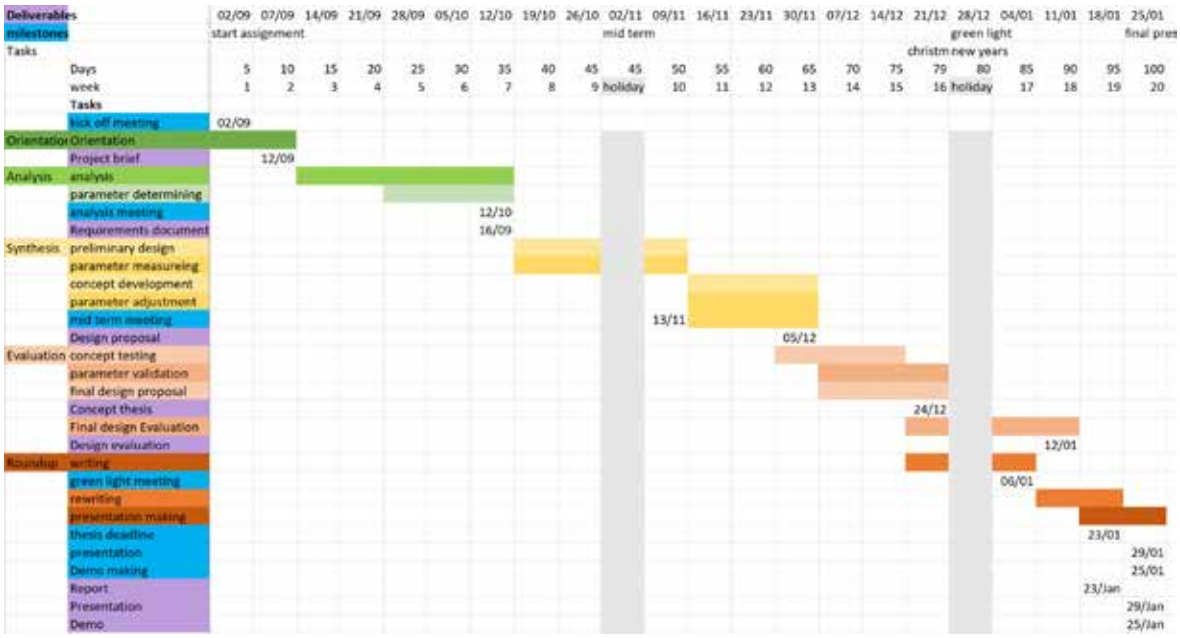
I need to find out:
What makes a catamaran attractive for sailing schools and resorts, and what experience do their customers need?
What parameters describe the experience a sailor has on a Nacra catamaran in general?
How can we measure the determining experience parameters?
How can we influence the determined experience parameters?
What parameters are needed to create the ideal experience for the intended target group?
How can Nacra implement this set of parameters in their new catamaran?

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 2 - 9 - 2020

29 - 1 - 2021 end date



The full planning bases upon fulltime work with two weeks of holiday.
The planning divides into orientation, analysis, synthesis, evaluation, and roundup phases, and all result in their deliverables.

The orientation phase takes two weeks and ends with a refined project brief.

The analysis phase takes five weeks and aims to answer the questions: What makes a catamaran attractive for sailing schools and resorts and what experience do their customers need?
What parameters describe the experience a sailor has on a Nacra catamaran in general?
How can we measure the determining experience parameters?
This phase concludes with a requirements document and a meeting with the coaching team.

The synthesis takes six weeks and is interrupted by a week of holiday.
How can we influence the determined experience parameters?
The midterm meeting takes place halfway this phase.
The phase will conclude with a Design proposal.

The evaluation phase takes six weeks. It overlaps one week with the synthesis phase and three with the roundup phase. It tries to answer: What parameters are necessary to create the ideal experience for the intended target group?
How can Nacra implement this set of parameters in their new catamaran?
During this phase, a concept report is delivered, as well as a concluding piece on the design evaluation.
The green light meeting is planned on 06 Januari.

The roundup phase takes five weeks with overlap from the prior stage, ending with the final thesis, presentation, and demo of the findings.

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

The big why:
I set up this project since I am interested in working in the sailing-related industry and product innovation. I want to validate that I and product designers, in general, have a role in the world of sailing.

I want to prove:
- Full ownership of the design process(confidence)
- Integration of market, business, and technology research.
- Overcoming assumptions and making a well-founded design

I want to learn (academic):
- How does strategic product positioning work?
- How does product realization and development work in a real environment?
- How do you translate product feel to tangible requirements?
- Using a data-centered approach to design.

My learning ambitions (soft skills):
- How do you reliably find users for user studies?
- Getting to know innovation in the sailing industry
- How to balance the opinions of the client, university, and own vision.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

A. Interviews P. Vink Technical Director and Owner

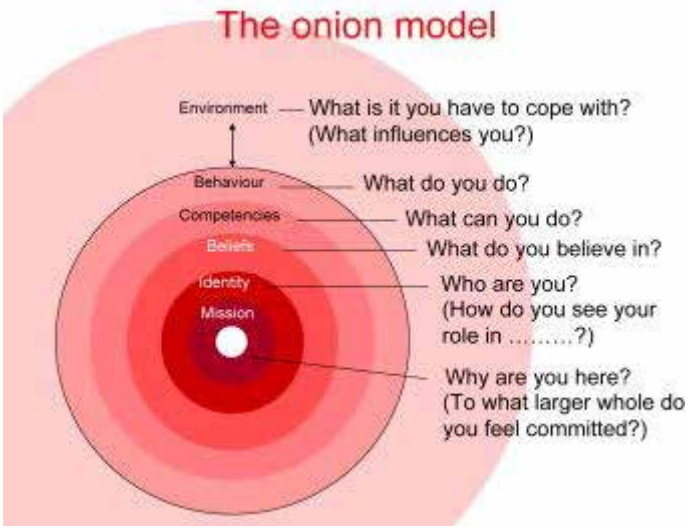
Vision Nacra:

Nacra is competitive sailing. The company has always been focused on performance and has gained extensive knowledge about the racing scene and how to make boats quicker. Nacra has acquired their own Olympic class by designing a boat specifically on the rules of the class. We have always aimed to leverage our performance and quality of our brand to enter other markets and have thus acquired a majority share in the catamaran racing world. We want to step into the leisure market as Nacra using our name as an A brand towards resorts, sailing schools, rentals and private owners. Using it as a statement of quality and performance. We want our boats to be something you can show off to your friends.

Note Casper:

It is not clear how Nacra wants to position themselves in the leisure market. There exists a danger of **dumbing down** the brand if not positioned correctly. This will give reason of doubt to competitive sailors. On the other hand could Nacra's brand be perceived as **dangerous or too exiting** for recreational purposes. It is recommended to look into other brands that have gone through a similar pattern.

1. Core ideology
    a. Core values
    b. Core purpose
2. Envisioned future



Conversation 07/09/2020
A talk about Nacra's Vision:

Mission

Nacra's old mission was to empower competitive sailors. Nacra obtained this goal by attaining the 17 Olympic class and is now protecting this market. The new focus on the leisure market asks of them to switch missions. Which now comes down to onboarding watersports-minded people into the catamaran scene.

Identity

Nacra fences with Nacra DNA. Peter describes Nacra DNA as Performance, Quality, and Innovativeness. Nacra sees itself as an A-brand. When compared to car brands, he places Nacra between BMW and Mercedes. However, Tesla seems to be more fitting for the market entry of the leisure segment. The two premier brands resemble trusted build quality and high performance. Not a low-cost price, but make a big statement in the drivers' experience. Innovativeness of the old BMW and the newer Mercedes cars. Tesla was chosen for its quick market takeover with innovative performance cars that thrive on its simplicity. Tesla's route of starting with a performance car and following mass-market cars resembles the strategy Nacra wants to take.

Beliefs

Peter believes that customers are convinced of Nacra through sailing experience. The catamarans build by Nacra perform better than the rest of the field, which gives users the experience of being the first of the pack and fastest on the water.

Competencies

Nacra knows how to build fast boats, which tack easily and won't fail when sailed at their limits. Nacra's in-house involvement with performance sails and dedicated r&d team makes them able to integrate boat and sail design. They are up to date with innovations in the competitive scene and can constantly improve.

Behaviour

Nacra still behaves as a competition brand. All of their sales outings are focused on racing. Their innovation focusses on making the boats even quicker and better fitting to international sailing competition class rules.

In the future Nacra wants to bring boats to their leisure customers. Make sure sailing schools, resorts, and rentals experience the Nacra catamarans since they see this as their unique selling point. Therefore Nacra wants to set up onboarding events such as test days. To improve their image and customer support, they wish to train dealers. Most importantly they want to increase the accessibility of going sailing by shortening the time to the water.

Environment

Nacra has to deal with two types of dealers. Some dealers are professionals who have a shop set up. But there are also a lot of "lone cowboys" who are old competition sailors who became dealers for the sake of the price reduction. These are often less professional but do influence the image of Nacra.

In the competitive scene, Nacra has to deal with class rules. These are rules that try to level the playing field between racing boats. Pitting similar catamarans against each other. In the competitive scene, this means Nacra needs to adhere to these rules and design within the confines of the classes they want to participate in.

Peter thinks that old competitor Hobie and their Hobie way of life will fade in five years. Hobie and their Hobie 16 catamaran benefit from a group of sailors who were confronted with this boat in their youth and who still use this boat as their reference when starting to sail again.

The cheaper Topper and Topcat boats dominate the leisure segment. These boats are produced from polypropylene and are rotomolded. This production process makes them lower in cost price but less stiff and slower than the laminated polyethylene boats the other segment of the market uses. There is also the belief that polypropylene boats are more durable. However, they are hard to repair. Nacra has no experience with rotomolded catamarans.

Nacra has a dealer in Australia who can use the brand name and produce and maintain older versions of the Nacra catamarans. As well as produce a self-designed catamaran, the Nacra 350. Their marketing statements are polar opposite from Nacra sailing by focussing mainly on leisure and resorts. The image between Europe and North-American markets and the Asia Australia market therefore differs.

Leisure line project	Company	Customer
Value	Better sailing boats Passion Innovation	
Needs	New mold needed Design of 500 is gone A more sustainable income model	
Functions	Diversification stability	

B. Interview B. Hensen – sales director

07/09/2020

Sales figures:
30% of boats go towards bigger parties and federations
50% of boats go sell via dealers
20% of boats go to individuals

Which customer segments do you have?

Competition:

Professional competition sailors

Description: Have a really high focus on their own team and their own performance. Expect the same focus on quality from a company.
Satisfiers:

- Performance
- Winning
- Personal attention

Dissatisfiers:

- Lacking behind in innovation
- Not being taken seriously

Weekend competition sailors

Description: Like competitive sailing as a sport.
Satisfiers:

- Time on the water
- Performance
- Class racing

Dissatisfiers:

- Being outperformed

Leisure

Leisure boats are used for unburdened fun and excitement. They are lower in complexity versus competition catamarans.

Owners

Amateur sailors / association sailors
Description: amateur sailors and association sailors are seen as one customer segment. These sailors own a catamaran and use it occasionally. They race within their association. Or just like to go out on the water in the weekends.
Satisfiers:

1. Ease of use to get on the water
2. Quick service
3. Faster than their friends

Dissatisfiers:

1. High price point
2. Long rigging time

Holiday home owners

Description: own a holiday home at a waterfront. They place their catamaran at the home as an activity when on holiday. To be used to play, freely learn how to sail with the family and day trips.
Satisfiers:

1. Easy rigging

2. Low maintenance
3. Family sailing

Dissatisfiers:

1. Long rigging times
2. Not kid friendly

Travelers

Description: Take their catamaran with them on holiday.
Satisfiers:

1. High transport ease
2. Easy total rigging

Dissatisfiers:

1. Large size
2. Low range of use cases

Business to business

Sailing schools

Description: Boats are used to teach youth and adults catamaran sailing. Sail from one location and need to make as many hours on the water as possible. Owners should have a high knowledge about the boats the users however, don't. Sailing schools work under federations, the Dutch Watersport Verbond and CWO is not linked to any catamaran brand. However, German VDWS is linked to Topcat, the French FF voile forces the use of a catamaran they specify and the British RYA is gives discount to RS's Topper. Gaining trust of one of these federations would force a full country of sailing schools to use Nacra's catamarans

Satisfiers:

1. Broad range of use
2. Durable
3. Riggable on the water
4. Brand visibility
5. Scalable

Dissatisfiers:

1. Frequent breakages
2. High price vs active hours
3. Poor service
4. Unsafe

Rental/water sports centre

Description: waterfront rental services rent out watersports activities. Sometimes combined with sailing schools but rentals without knowledge of the boats do also exist. Exist to give people an afternoon of pure fun.
Satisfiers:

1. Easy to use
2. Broad range of use
3. Brand visibility

Dissatisfiers:

1. Too expensive to maintain
2. Attract to little customers

Resorts (0%)

Description: use catamarans at their waterfront to attract customers for their hotel services. Catamarans are a

marketing tool. Often have low knowledge about the boats.
Satisfiers:

1. Brand visibility
2. Safe to use
3. Low in maintenance

Dissatisfiers:

1. Too expensive to maintain

What are frequently asked questions?
Within leisure:
What colour are the sails?
How long is the warranty?
What do I pay for it?
How easy is it to rig?
How easy is it to right?

What are the annoyances of the Nacra leisure boats?

- Missing parts at delivery
- Rudder canting system not working when beaching the catamaran
- Delaminating of the hull
- Difficult to hoist the sails
- Too much power for the crew
- Hard to reef the sail
- Trapeze is tiering on long distance racing
- Fragile hull, quick to dent
- Hatch leaking due to sitting on them
- Water in the hull
- Rigging the beams(a bolt within the beam which is hard to reach)
- Wear on the hull due to dragging the cat on the beach
- Kelp sticking on anti-hull wear shoe
- Adjusting spreaders to which setting? Too complex for most users
- Dropping the spinnaker is difficult
- Mast diamond trim, which setting when?
- Don’t want a daggerboard
- Mast doesn’t fit in a 20 ft container
- Long trailer due to mast
- Can I fit an engine on it?
- Boat is heavy compared to polypropylene.

General comments

People orient themselves online or through word of mouth.
People don’t buy a Nacra on its sailing qualities. They often(99%) skip testing the boat.
The Nacra 460 does not have any advantages over the Nacra 500 and is thus not being sold much.

Note Casper

All this information is tacit knowledge in Bob's mind no documented information is present, there is low focus on customer groups and little knowledge about customer profiles. Customer journey needs to be investigated.
Edit: high focus on customer through product

C. Interview Sailing school Instructor NL

Cat zeilschool: (Doel: achter needs en values komen, plus visie op nacra van buitenaf
Cas, zeil instructeur catamaran(CWO I4, zeilschool de Viking. 8 jaar ervaring:
Als instructeur
Waar heb je het meeste op gezeild
twixxies hobie, Nacra 15(echt op leren zeilen), hobie 16 , verschillende hobies,

Waarom vind je cats zo mooi.
Die snelheid. Knetterhard op 1 romp gaan.
Leukste wat vriendelijke competitie. Lache potjes
Hoe lang zeil je al
10 jaar,
Welke cats heb je nu liggen en waarom? What is the ideal sailing school boat?
Dart 16, twixxie, hobie 14 nieuwe boten. Verschil tussen t1 en hobie 14 en snel. Binnen een maand gekocht. Waren nieuw.
Haha romp dondert uit cat. vrachtwagen chauffeur.
Topaz 14 is kinderboot
Stevige romp. Dart altijd kapot met botsen. Twixxies polyethyleen. Hobie 14 log.
Simpel. Dart is simpel. Bridle spreader gaat snel kapot. Hoe simpeler hoe langer het mee gaat. T1 als voorbeeld. Puur vanwege de duurzaamheid.
Topaz 14. Wel wat interessants met trim en twist. Wat moeilijker maar wel beter voor meer. Cwo 3.
Cwo 3 dart of twixxie.. trim beter te zien in h14. Geen zwaarden nodig.
Tacken zit niet in, zou super leuk zijn maar wordt niet verwacht.
Waarbij is een catamaran onhandig.
Joystick te lang. Die krijgen klappen. Buigen en kunnen terugbuigen.
Landvasten, vastmaken aan boot en slepen. Sleeplijntje, en voorwaards. Zelfde lijn voor oprichten.
Bijliggen is top. Paar keer per dag.
Gen erbij, wordt nooit gebruikt. Is te moeilijk. Boom kwetsbaar. Niet te slepen. Rol gen wel geniaal. Kan veel toevoegen. T opzetten is moeilijk.
Chill om makkelijk naar voren te lopen. Veel aanleggen. Balans act.
Wel het hard gaan. Trapeze. 1 trapeze is te weinig. Joelen en hard gaan. Hard genoeg met zwaardere rompen. Niet het zelfde gevoel als lichtere rompen. Duiken van de boten zit in de weg. Dichttrekken is tegennatuurlijk voor overstappers.
Polyester, is lichter aan de voorkant. Spoiler van de topaz 14.
Aanleggen is het moeilijkste, bij het vlot. Zwaardboot naar catamaran. Jz naar zb naar cat vroeger regel om eerst zb te zeilen.
Wat vind jij belangrijk in een boot.
Can you describe the experience of sailing a cat?
Nauwkeuriger, veel beter druk opbouwen, afstraffen stuurfout. Minder op zeilschool boten. Voor cwo4 nuttig voor de rest minder nuttig. Schootdruk en bootsnelheid. Mist het gevoel van een stukje harder gaat. Trapeze staan. Geluid van zoemen maakt t episch en spannend. En schreeuwen van de boot. Omslaan is best wel eng, engste moment. Met duiken wordt je alle kanten op geslingerd. Best hoog vallen. Lelijk naar beneden vallen. Door hangbanden. Zonder giek minder raken.
Customer journey: hoe lang duurt t, wat verwacht je, hoe voel je je in deze phase. is dit een belangrijke phase voor jou?
Optuigen. Lekker simpel, gewoon direct t water op en stabiel bent. Mast zwaar en lang. Mast rechtzetten moet altijd met zn tweeen. Alleen mast erop bij. Mast tweedelig. Daardoor past t op een trailer. Ik zie er niet tegenop. Mooi om t op te bouwen en te trimmen. Altijd netjes ermee om gaan. 30-40 min. Eerste keer 1.5u. strand gewoon erin.
Slepen is wel moeilijk. Sleep is zwaarder dan je zelf bent. En je kan weggestuurd worden door je kids. Met je motorboot je cat kunnen draaien.
Wat denk je van Nacra als merk?
Vaart tering dik. Nooit in een andere snelle boot gevaren dan een nacra. H16: Bananen boot, gaat ook wel hard.
Snelheid, en zo veel nauwkeuriger. Zo meer cat varen als je boot lichter is.

De snelle boten. Ferrari, snel. Flashy. Breekbaar, nacra sloop je altijd. Klauwen viesmaken met polyester plakken. Niet bijzonder voor hoe duur binnen cat wereld.

En als leisure merk?

Kijkt afkeurend, zou ik niet bij nacra kijken. 100% als ze er wel een zouden maken? Omdat er veel verbeterd kan worden. Ik verwacht wel dat zij dat kunnen.

Eerste boot die klaar is met aftuigen dus dat is top. Relatief langst varen. Dikke bonus. 5 min naar het water en 5 min met aftuigen. Belangrijk voor een zeil

Internet en andere zeilscholen gebruiken. Vragen wat anderen doen. 3-4 jaar van duurzaamheid. Twixxie was de zeilschool catamaran. Onverwoestbaar en simpel. 8-9-10 jaar oud.

Kan ik je nog vaker vragen

Zeker!

D. Interview Sailing school product manager NL

Cat zeilschool:
Doel: achter needs en values komen, plus visie op nacra van buitenaf
August, catamaran trainer(CWO O*) and product manager five sailing schools Vinea.
Hoe koop jij een catamaran?

1. Even kijken bij grote merken en leveranciers gelijk meer
2. Welke zeiloppervlakten per
3. Minder losse onderdelen
4. Hufterproof
5. Hoe werkt deze contactpersoon. Puur lange termijn.
6. Geen enkelen
7. Lage aansch af sites
8. Persoonlijk gesprek
9. 1 maand snel contact.
10. Test varen graag!
11. Breekt dit af. Zwaar af
12. Goedkoop vervangen onderdelen liefst van Optiparts.

Waar let je op bij aanschaf?

1. **Duurzaam**
2. **Repareerbaar polyester**
3. **Service**
4. **Afschrijving**
5. **Opvaren of doorverkopen**

Allemans:
Simpel:
Hoe zet ik m in elkaar
opslaan
Welke cats heb je nu liggen en waarom? What is the ideal sailing school boat?
Twixies, dart, topper 14, hobie t1, h16.
Nog niet. Polyethylene zwaar. Prindle esc. Polyesther. Meer stabile eindsnel meer cat zeilen.
Steeds verder down. Gaat niet. Eind sneleid snel bereikt.
Hufter. meer beleving. Asym rompen. Verder de lucht. Duiken als trigger. Veiligheid. Veel spay minder goed. Veilig falen. Mast goed vast. Lijnen achter hangen. Niet hangen achter schoten.
Customer journey: hoe lang duurt t, wat verwacht je, hoe voel je je in deze phase. is dit een belangrijke phase voor jou?Can you describe the experience of sailing a cat?
Wat denk je van Nacra als merk?
Niet tesla niet gebruiksvriendelijk, topsport
Duur maar logisch w
En als leisure merk?
Prive nacra en ouder. Zuinig op zijn. Zie ik nog niet. Dan op niveau. Net gebruik.
kan ik je nog vaker vragen?
Zeker! Ik kom graag testen

E. Interview rental - Owner NL

Rental interview: (texel, sailtoday)
Doel: achter needs en values komen, plus visie op nacra van buitenaf
Roeland Touwen, sailtoday
Who are you and what do you do?
2007, 300 cats. Muiderzand. Kindkampen, kitesurfen. Windsurfen. Ook een sociale functie. Clubgevoel. Onbeperkt kaart, 600,--1000,- draait goed.

What do you look out for when buying a boat?
Waar kijk je naar als je een boot koopt?
Duurzame boot, die iets toevoegt aan het assortiment.
Spinaker te ingewikkeld.

What kind of cats do you have and why?
Wat voor catamarans heb je en waarom?
Range, dart 16 meest verhuurd toegankelijk. **Robuust**, **makkelijk** op te tuigen, geen haak in de mast. Toegankelijk, weinig **poespas**. Polyethyleen, tegen de rotsen kunnen. Grootste verdiener. **Trend:** Steeds meer naar polyester. **Duikt langzaam**, maakt m weer toegankelijk.
Dart 18, **klasse** boot. Enkele keer wedstrijden, maar wel het **aanzien**. Trekt mensen aan. **Praten** er over. **Redelijke** rest waarde. **Makkelijk onderdelen** krijgen. **Makkelijk onderhouden**.
2x Hobie 16. Kleine boot maar wel moeilijk. Past goed naast de dart 16. Fijn om op de zelfde boot varen. Vaart lekker bij sterke wind**. Bananen rompen** maken positie op de boot **moeilijker**. Meer uitdaging. Dart 16 soms te saai.
570 erg populair, voor de **onbeperkt** kaart. Ligt **hoog** op het water, stuurt **Licht**, nog **geen zwaarden**. Is met zn **2 overeind** te krijgen. Wat moderner. Was **soepeler** allemaal. Mooiere **cunningham** en **blok**. Traveler komt beter over**. Roertjes breken** bij het strand op varen. Blad uitgebroken. Een **lekt**. Bij de **spiegel**. Zeilschool technisch liever **dart 16 systeem**. Hobie werkt ook niet. Nacra beter dan de hobie. Door het dooie punt heen.
2 f18 tigers liggen. Puur **om top end** ook wat te bieden. Net niet want toch wel huurboten. **Uitdaging**, **zwaarden, spi, cunningham**, veel mogelijkheden. Moeilijk om in te schatten, **klanten inschatten.** Controlerende vragen: wat doe je in deze situatie? Vroeger een boot gehad is goede raadgever.

Customer journey: how long does this take? What do you expect? how do you feel? Is this an important phase for you?
Koop vaak **tweede hands, scherpere tarieven**. Via het **strand** en **marktplaats** en af en toe via bnr. Af en toe parts via Nacra
Nieuw heeft geen zin. **Ligt binnen een week op de rotsen**
Zelf kunnen goed **klussen**.
Can you describe the experience of sailing a cat?
Hoe zou je het zeilen op een catamaran beschrijven?
Vrijheid even weg van alles. Bezig zijn met iets ander. Belangrijk dat ie doet wat **jij wil**, **licht** stuurt, je trim, je voorbereiding hoe heb je het afgesteld. Heb je **nieuwe zeilen**. Dart 16 saai want:Te **loefgierig**, **stijfheid** is laag, komt **niet snel op snelheid**. Eenmaal op een 570 of f18**. Beleving is key**. Merkt het in je snelheid en trim en reageert beter.

How often do you get people that come to test a boat?
Komen er wel eens mensen langs om een boot te testen?
Ja gebeurt wel eens, **niet vaak**. Hoe vaart een **f18** wil ik dat. Cursus groep, vast proberen te houden, als ze **in hun hoofd hebben** dat ze en boot willen kopen dan **doen** ze dat uiteindelijk wel. Als je echt verder wil dan ben je bij het huren uitgekeken. **Je boot eigen maken.**
How do you see the public image of Nacra?
Hoe zie je het merk Nacra?
Goed merk, gedoe met olympische boten, negatieve associatie. Negatieve associatie met carbon dat schade. Minder schade van. cijfer: 8.
And as leisure cat brand?
Prima als leisure catamaran merk
Topcat k1 klinkt nu als interessant. Op **Makkum** voor zeilscholen. Vorm van infusion. Breed onderschip achter. Contra neus. Dat hebben zij in de verhuur. Heeft roeren die naar boven en beneden kunnen. Polyethyleen boot die groter is dan een dart 16 met stevige roertjes, 570 achtig met. Infusion qua neus. En planneer oppervlak. klapzwaard? H18 ’90. Beugels aan de zijkant. Is lachen!
Nacra blast, kleine 570, beugels aan de zijkt. Met harde wind verder naar buiten is mooi. Voor lange afstand en minder mobiele zeilers.
Open tot 1 oktober.

F. Interview rental - Owner NL

Texel, Jeroen Staamer
Wie ben je en wat doe je?
Owner catamaran verhuur en zeilschool de Eilander. al 19 jaar op texel. Daarvoor 5jr. in zfrankrijk.
What do you look out for when buying a boat?
Waar kijk je naar als je een boot koopt?
Loyaliteit van nacra. Uitwisselbaar, snel kunnen repareren. Ruime cleane deck. Twee of met drie man. Uitstraling is key, is de marketing die je op het strand hebt staan. “Rijden door voor de qualiteit.” Geen scherpe dingen waar achter mensen kunnen blijven hangen. Stijfheid is geniaal geweest bij nacra. Hoe minder slijtage op de bovenkant van een rompen. Gaat wel eens stuk maar wel te repareren. Beam bout verbindingen. Pro grip 2015, ziet er nog mooi uit. Veel gebruikt.
What kind of cats do you have and why?
Wat voor catamarans heb je en waarom?
Ze zijn wel race ready, ze gaan gewoon kneiter hard, ziet er agressief uit. Vertik het om een drijver in de mast te zetten. Mast breekt soms. Ziet er gelijk uit als een zeilschool. Moet er high end uitzien. Geen spiegels naar het water. Agressief uitzien. Vorig jaar over op dacron. Echte catamarans geen speelgoedbootjes. 5 jaar geleden hoby cat eruit. Bruut. Stoerste zeilklasse en van 60.

How often do you get people that come to test a boat?
Komen er wel eens mensen langs om een boot te testen?
5 per seizoen. Vaker die zo enthousiast worden en ad hoc een boot willen hebben. Meestal gestuurd. Je verkoopt een gevoel. Je onthoudt de eerste waar je op hebt gezeten. Lesboten moeten toch gaan shoppen. Sturen wel eens een mailtje. De rest kopt hoe het er uitziet. Budget dingetje.
“Altijd 570 gevaren wil iets meer en wil misschien een inter 18. 2000 en 2500. Gaat in de papieren lopen als je een nieuw zeil wilt” uiteindelijk een f18 infusion gekocht, mk2 hoe lang iets beschikbaar blijft en reserve onderdelen beschikbaar zijn.
How do you see the public image of Nacra?
Hoe zie je het merk Nacra?
Loyaal. High end performance boten.
And as leisure cat brand?
Leisure niet in de ferraris en de porsches. Maar het performed nog steeds. Geven ze niet weg ook. annecdote: vader:“ga je dan hierop meer met berber varen?” dochter:”ja” vader: “waar zet ik een krabbel”.

- Omslaan oefening, binnenkant tussen de beams romp hard. Sta vlak bij omslaan op de binnenkant mag sterk!.
- Die deksel achter de voorbeam is een zwak punt.
- Afstand van de trampoline te groot aan de achterkant. Zit vlak daarzo omdat ze zich daar veiliger voelen.
- Trapeze draadjes wegwerken. In de romp zoals bij inter 18. Trapeze verder naar buiten.
- Geen stern supports nodig omdat de roertjes anders kapot gaan.
- Uitwisselbare systemen. Roerwangen uitwisselbaar houden.
- Lagere bredere sterkere roertjes, ouder. Korter, hoe langer hoe gevaarlijker i.v.m. sterkte. Roercasting werkte perfect.
- Kwa zeil performance, de 500 met nieuwste zeil is waanzinnig.
- Kiss. Lekker simpel houden. Race look en race feel wel hebben.
- Voorlijkstrekker mooi high end touwtje op maar gebruiken het toch niet.
- Zeil doorzichtig venster, mensen schrapen over het onderlijk heen. Liever geen raam. Vallen dwars door het venster heen.
- Achterkant van de fok moet tegen klapperen kunnen.
- Gevoelsmatig, mag de fok en het drukpunt iets naar beneden. Onderbuik gevoel. Blaast nu te hoog in het

grootzeil.

– Die 500 en 570 gaan gewoon door de wind. Grootzeil trekt m zo door de wind heen. Usp van Nacra.

– Dan moet het er vooral niet uitzien als een zeilschool boot. Zag eruit als een zeilschool boot, in de veilige modus. niet ondertuigt. Franse boten ook.

– Romp nu werkt als een malle. En sleet gewoon af. Maakt boot lomp en zwaar en verder naar achter. Slijtvast wel. Maar niet lomp. Dan gaan ze er ook mee om. Lomp doet lomp doen. Nieuwe boten gaat iedereen voorzichtiger mee om.

– Geen gedoe. Gewoon lekker zeilen.

Tiger gebruiker verhaal: Op de basis uitvoering van een catamaran les, onderschat het niet. Wel een racemonster. “weet je wat ik doe, ik kom een halve dag extra. Je vertelt me nu zoveel. Ik vaar zelf altijd op race getuigde cats, puurder wordt dit niet” over de Nacra 500.

G. Dealer interview: Dealer USA

Hardy peters, east coast sailboats

Can you describe the experience of sailing a cat?
21knts
Leisure/resort cat buyers who are they?
Older sailer, disposable income, had a Nacra before, or from Hobie. Want storage, simplicity but performance. 99% private. Verry summer but no dagger boards. H18 no daggerboards. 570
What are the most asked questions by this group?
How easy to put together, is there a newer manual? Ease of sailing, righting, roller furler, upgrade cost. Roller furler spi. Can I single handedly handle the boat. Can you finance it?.
What are their satisfiers?
Straight line speed, responsive. Deck real estate. Not having a boom. Better control.
What are they most frustrated about?
The manual
Do people test boats?
Demo, try before you buy program. Pleased with the performance compared to older not to the topper 16. Packages, 2 colours tops. Spi colours.
How do you see the public image of Nacra?
Known as a good race boat, love the boats are fast boats. Nacra's are expensive. Do they exist for the recreational market.
And as leisure cat brand?
It's too much. Cost and power wise.

General notes

Hobie not supporting sailing anymore
Nacra 500, 570 faster simple, no daggerboard 5.0
Recreational boat.
Prindle good name in US. Not many left. Brand equity in the Nacra brand. It needs a more modern boat. You can race but cheaper.
Price point in place of the old hoby 16. Low price point.

H. Dealer interview: Dealer Switzerland

Who are you?
Jean- Richard Minardi, Nacra and topper Dealer Swiss market
Can you describe the experience of sailing a cat?
None, who cares, you. Just enjoy. Watertight. Safe. For resorts or beaches anywhere. No hook. F16 size of sails.
The missing Nacra is a 16ft.
Should be:

- 230 or 240 wide
- Road trailer without unmounting the full cat
- More narrow than 250, more fun, Up on one hul quicker
- Quick time to the water
- Boltless, like dart 18, clipped beams
- Clam cleats for trampoline, no knots.
- No sliders
- No lashing
- Fun fastly build,
- Beachable, no wavepiercer, easy and safe to get off. Not chrashing into the beach, like a H16 boat bow
- Super strong
- 2 person maximum, reduced volume, reduced weight, better on the beach and trailer
- 135kg 140kg with spi
- 10 -12k € complete no option except for spi kit.
- One design maybe/eventually. Clubracers. Not a racing machine
- Not named Nacra, Nacra means racing,
- Fibreglass, super strong, reefable, stupid easy.
- Boom mandatory, for trimming taking the power out.
- No daggerboards.
- Not big, no tools. No knots. Straight simple fun.

Target group: Family, parents who want to go sailing with little trouble, kids friendly, without worry.
Durable, also towards increasing demands of humanity, keep the world as clean as possible.
Green idea of sailing. H16 still sailing still beaches full. Hassle and maintenance feel.
Hobie 16. But lighter.

Leisure/resort cat buyers who are they?
5-10 percent of current swiss customers. I also sell Topper and did 200 leisure boats(dinghy's and catamarans) in 10 years.
French, Italian, Spanish markets are larger in quantity in the leisure market. Quality assured before the launch.
What are the most asked questions by this group?
Durable? Easy right able? Is it simple in use? How long to rig? Hassle free?

Do people test boats?
20-30 percent comes in for a test. If I have no demo boat I don't sell the boat. No experience. When testing they try if it steers correctly, is the volume enough, how complex or simple are the systems, what is the speed. How does it accelerate. Is it really easy to build as you say? Like dart 18. Other 70% has experience from earlier boats. If they don't sends them to a rental(which is a problem with new boats).

How do you see the public image of Nacra?
As Nacra racing, Racing is even in the name. (*red: Nacra racing, is the class organisation, Nacra sailing is Nacra.)

And as leisure cat brand?
Nacra is perceived: Not considered as good customer service, answer times no good,
Most customers have the idea that they are used as prototype sailors. To modify the boat later.
Customers talk, without doubt.
Italian car, speed but it breaks down. Ferrari, you can expect oil on your driveway.
Prindle brand: Helps you to have fun. Surfable cat. Still has a good name in Europe.

I. Dealer interview: Dealer UK

Dealer interview: Nacra UK
Lee Harrison - runs the Nacra 15 UK class association, long time cat sailor and much knowledge and experience of junior cat sailing through his work on developing junior sailors.
Grant Piggott - my business partner at Nacra UK, sailmaker in his own right (GP Sails) and top UK catamaran helm.
Carl Jones – Dealer Nacra UK.

Can you describe the leisure experience of sailing a cat?
Feel like it's going fast, simple. No thinking. Masses of spray, so you had the idea you were going really fast. Obvious how to use it. Easy to sail. Don't want to struggle, no 3 point turns. Lots of boats in the leisure market sail kind of bad. Stop the tacking frustration. You want to point the boat in a direction and go quick. 500 is quite good. Well developed over the years.

What are the most asked questions by the leisure group?
No boats sold to leisure cat users(meaning no sales of N470,N500,N570).

- Is it indestructible? Can I sail it into a pontoon?
- Is it simple to rig? Dart 18 and dart/15 simple. Dart 18 ease of rigging. The boom is a bit of rope. No bolts. Just one shackle. No spreaders.

What are their satisfiers?
Simple to rig and sail. No hassle

What are they most frustrated about?

- Too complicated to choose the right boat. Too many options
- Rudders easy to use. Will be sailed onto the beach. Probably not smart to use current Nacra rudders.
- If there is choice in picking a cat to sail on a beach. You pick the easiest one. Won't bother to rig a harder one.
- The jib hoisting, and no hoisting hooks. Completely intuitive. All easy.

Do people test boats?
I can imagine they want to do. Even more so in the leisure segment of the market. Three demo sails coming up. We want them to leave with a big grin on their face. Is it a convincer? Yes! Sail it against a dinghy and compare the differences.

How do you see the public image of Nacra?
Rest is a bit toy, and happy Nacra is more serious. Nacra is expensive.
Quality reputation is getting better and improving no problems with hulls anymore. Hobie day of life was to demeaning to competition sailors so that is something to look out for.
Nacra 15 is for the rich kids.
First time a catamaran was on the beach at holiday. But that was cheap so now I want something else.

How would you describe the needed boat within your market?
How to bring the youngsters to transition into catamaran. Resorts and camping's often use: Dragoon and H15. We need an entry level racing boat, however that never amounts to mass production which makes them expensive. So sailing schools first is a good idea.

– Flexible: single handed, 2 handed sailing. Grows with them, without having to change their boat. Like the RSAero, 3 or 4 riggs. Like the RS feva a wide usage range(age, weight, skill).
As long as you know where you are regarding to your sailing level you can adapt the boat to it.

– Ability of righting. 85 -90 kg. no more than 14 ft.
No cheap low power Dacron stretchy only one rig.

– Indestructible

– Styling that is part of the family of Nacra's.

– Price is the key. 5000 pounds if you want to directly compete with dinghies and 10000 pounds if you make them from GRP and really durable. 4500 pounds was the base price of the topper 16 in 2015. The topper topaz 14 is currently 6000 pounds base edition.

Any wild idea's?
A detachable skeg that provides opportunity to daggerboard sailing.
Foiling as an upgrade of the skeg boats. Skeeter, foiling rotomold. Quant boats.

Would like to stay in touch
Please keep up updated!

Catamaran as a system

system and subsystems:

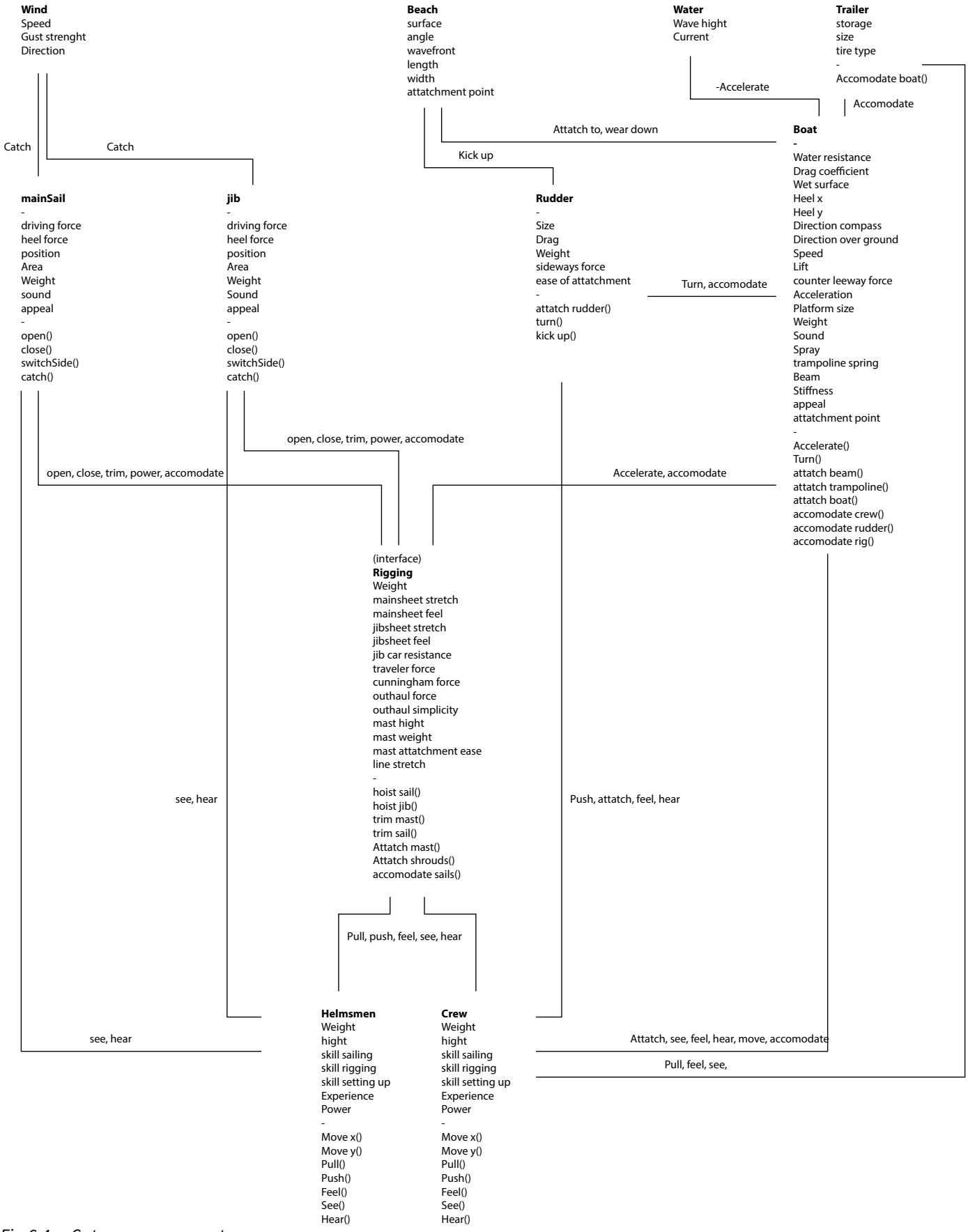


Fig.6.4 Catamaran as a system

J. System of a catamaran

If we look at a catamaran as a system we can subdevide the catamaran into different subsystems. These subsystems have characteristics, functions and interactions with other subsystems and the environment. Mapping the system provides and overview of interactions which is valuable since you can now see what the effect of changing one subsystem has on other subsystems.

Subsystems can also be viewed as stand alone systems of parts which have set inputs and outputs. Which makes it possible to design and improve parts without changing the whole system.

Using this method is commonplace in software development and known as a class diagram and in systems engineering where it is known as a system diagram. In both cases to create an overview of a complex system. See Fig.6.4

Conclusion
The system can be used to find a beneficial trade-off to increase performance, experience, costs or any other optimization criteria. These criteria can be found by investigating customer and company needs and wishes.

The rigging is the sailing main interface. The user doesn't manipulate the state of the sails directly but though the rig.

K. Requirements list

Table 1: provisional requirements list

Needs

CA	***Control Area***
CA. 1.	User must be directed towards a correct seating position
CA. 2.	Control area must support correct line management
CA. 3.	User must be able to control main sheet
CA. 4.	User must be able to control rudder

NF	***Nacra feel***
NF. 1.	The control area must support precision
NF. 2.	The control area must increase the feeling of control compared to the Nacra 500
NF. 3.	The control area must be usable for usable for beginners, intermediates and advanced sailors
NF. 4.	The control area must not decrease the feeling of speed
NF. 5.	The control area must not decrease the feeling of freedom
NF. 6.	The control area must not decrease the feeling of flying
NF. 7.	The control area must make the catamaran easier to sail
NF. 8.	The control area must look like an integral part of the boat

L.	**Life in service**
L.1.	The control area should require minimal maintenance
L.2.	The control area should be repairable within 1 day
L.3.	The control area should be resistant to UV light for the same length of time as the trampoline.

S.	**Safety**
S. 1.	Failure of the control area must not result in loss of steering

Wishes

NF. 9.	The control area must increase the feeling of flying
NF. 10.	The control area must increase the feeling of freedom
NF. 11.	The control area must increase the feeling of speed
CA. 4.	Backwards compatible with older N500
S. 2.	Failure of the control area should not result in loss of boat function(steering, controlling speed, controlling heel)

L. Experience parameters

In a qualitative interview catamaran users were asked to share their experience when setting up and sailing their catamaran. Described feelings where extracted and coupled to probable causing factors. Note that any parameter can have a positive as well as a negative influence on product experience.

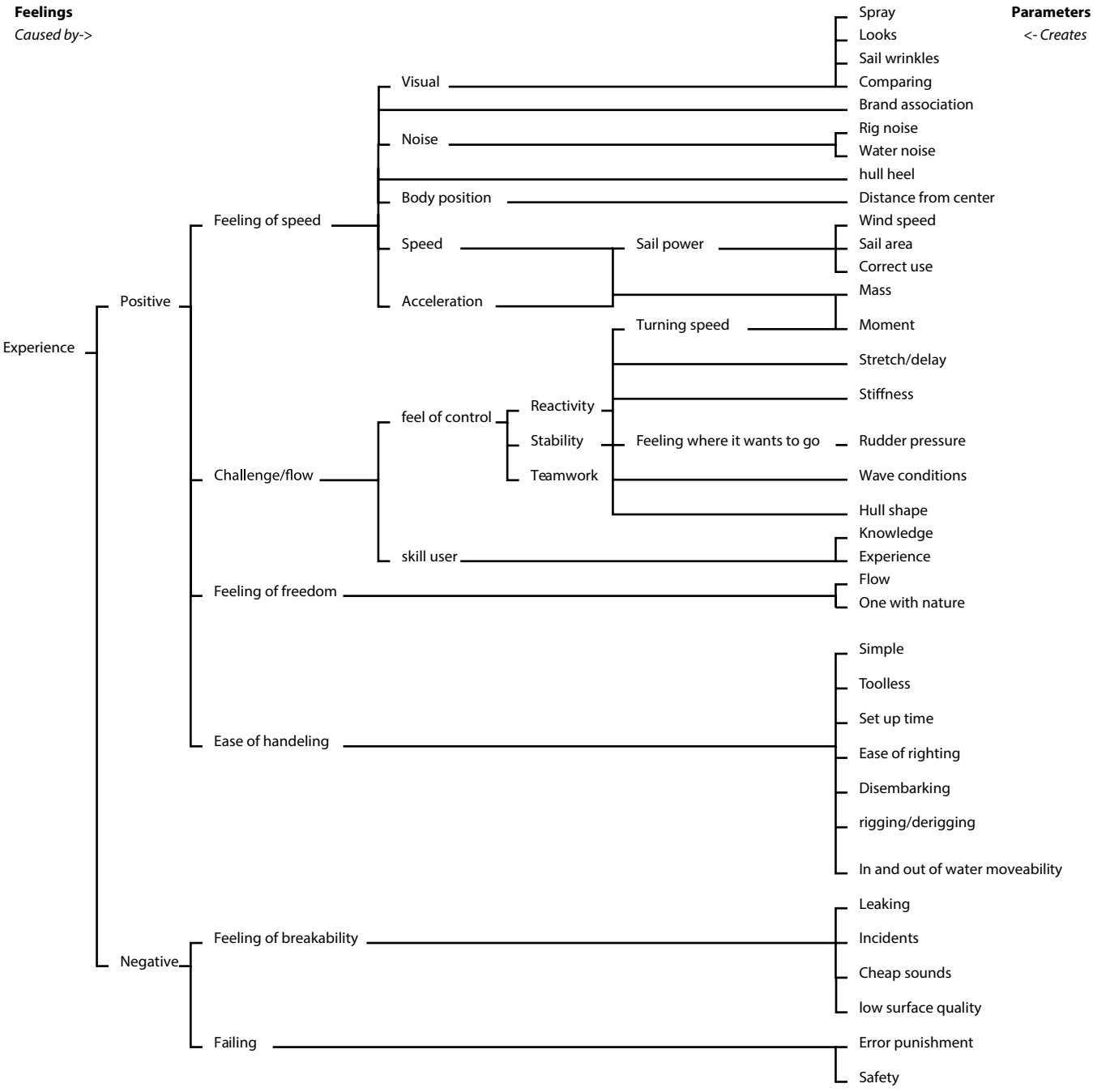
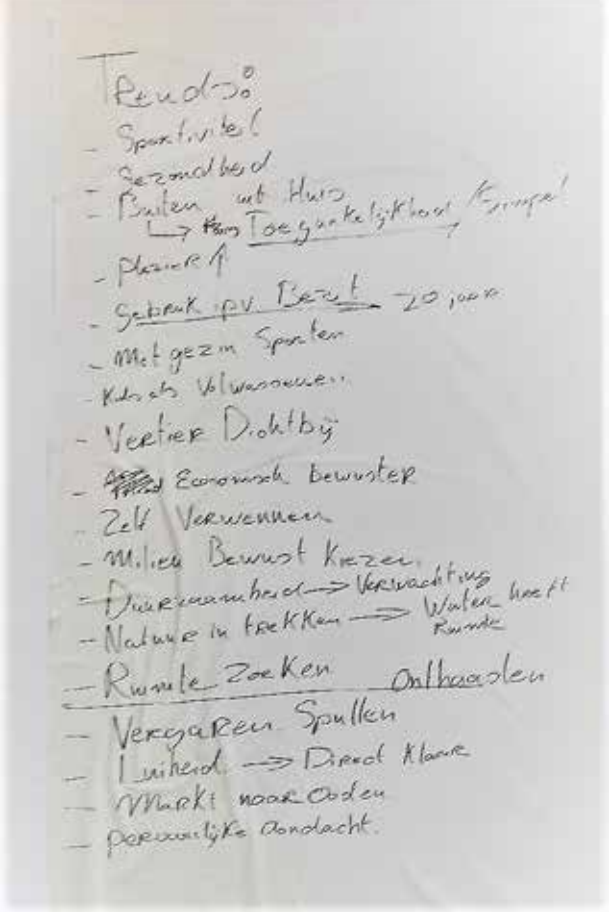
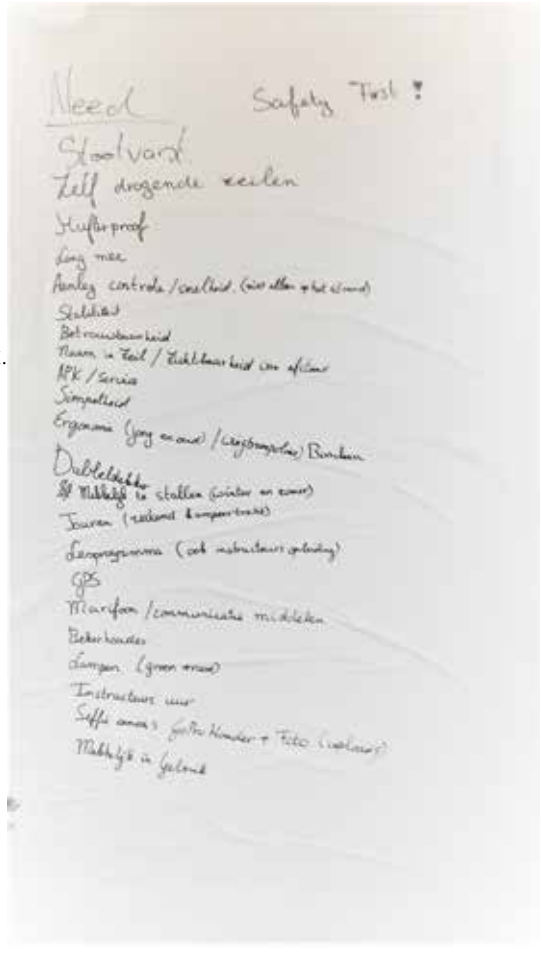


Fig.6.5 Experience parameters

M. Creative session



A creative session lead to participation of the full company. Envolvement and excitement about the new catamaran project. Resulting in Trends(left) and sailing school needs(right). But also a vision for the company.



N. Evaluation interviews onboard and offboard teaching

August Loven in green
Jeroen Staamer in Red
Cas Ligtenberg in Blue

Always ready righting line:
- No comment, seems nice
- Hard for lighter people, since you do not create the same arm away from the boat
- Is good to have a righting and a drag line separately. Happens that the instructor holds the drag line to stay with the boat when users the right the boat.

Mastfloat:
- Pay attention to wind intake at the front of the sail, so I wouldn't like something parallel to the mast.
- It shouldn't break when lifted from the tip.
- Really like that the top of the sail is protected from propellors.
- Does look better, but would still like to have it as an option.
- It indeed needed an update
- I like the idea

Drag cleat:
- Does not apply for our sailing school
- Sailing schools now always attatch lines to everything themselves, this would be a welcome solution

Nose protector:
- Nice that it is longer on the underside, works nicely with dragging the boat up ramps
- Good to make it replaceable for if it brakes
- Less enthusiastic about fitting different bow shapes. "I would like less loose parts."
- I like the protection of the underside. Just like the HPS
- Don't have that many damages to the hull anyway
- Brilliant, no brainer
- Repairing by replacing after 5 years would be a nice option
- Switching nose shapes is a to wild idea
- 95% of all damages is to the front of the boat.

Drag V line:
- Like the division of the power over two points. Would be ideal if shocks get taken out when dragging.
- Drag cleat on the rear beam is also nice if it isn't in the way of the sheet.
- No comment
- Yes, no cat has a good mooring line attached.
- Making it a v shape is a good idea, dragging 4 catamarans happens a lot. So it needs to be strong

Hiking strap:
- Padding on the hiking strap is a good idea
- A higher footstrap sounds really good. "First thing I always teach my beginners is to sit properly with one foot above the hiking strap and one below, this would help"
- Adjusting for taller and shorter users is good but only if it is failure proof. Shouldn't fail with some sand or mud.
- A hiking strap in the middle of the boat would be nice for grip.
- Likes the positions for instructor and two participants
- Likes the third strap in the middle, could also be a Y strap. Something to put your feet against.
- Higher placing and padding are a good idea.
- So logical to place it on the beam.
- Three parts Is a good idea
- Hiking straps give security to the user
- Shouldnt be in the way during a fast gybe

Pro grip to the front:
- This is real convenience, you often have to go to the front of the catamaran.
- Also usefull for docking
- More safe this way, since people don't slip and fall when going to the front.

Extra wishes:

- Trampoline in a dark color so you can draw on it with chalk when teaching.
- Large trampoline pocket for longer sails. To take a bottle of water among others.
- Stable heaving to with limited loss of hight for instruction scenarios
- Strengthening the inside of the hull for righting movements
- A furling genacker would be nice!
- Height between the trampoline and the sail should accommodate for communication when the crew is on the opposite side of the boat.
- Furling gennaker is great fun. I think the CWO is going to implement gennaker sailing into new regulations in the near future.
- Trim: settings for mast rake should be clear and especially the front shroud tension should have an easy system.

Doubts:

Rudder: is it strong enough, easy to lift up? Also easy for kids?
Does it have a properly lifting rudder?

Forward Sheet position:

- Would like it on a 14 feet boat, less on a 16
- It is an interesting idea but can't oversee the consequences
- When teaching people where to sit in the boat this could be and asset.
- Is interesting for the first two days of sailing.
- Sheeting is influenced by the traveler in this set up.
- Could be interesting but I cannot imagine how this would work
- I cannot really imagine it.

Crossbar in front of sheet:

- This will interfere with the correct seating position for a beginning sailor.(to far backwards

Double joystick:

- Don't see this working since you have no leverage with the joystick sitting in the front of the boat.

Lifting handle:

- It is nice, but if the bridle is strong enough and you would package it in some wrapping it would do the same job
- Would be nice to have on front and back side. For lifting out of the water and lifting it on top of a trailer

Top 3 features

August's top 3 features:

1. "The combination and integration of full pro grip deck, mast float sail protector and nose protector. Because it precisely answers my fear of people breaking my boats and it fits the boat nicely."
2. The idea of usage cues in the form of stickers for standard settings. Sailors tend to forget the day after I have explained how sail trim works.
3. Sheet to the front, it intrigues. Not the crossbar to the front but just leading the sheet to the front would be interesting on longer stretches to teach beginners and intermediates correct stance.

Jeroen top 3 features:

1. Nose protector
2. Deck layout(extra strap in the middle, heightened hiking strap)
3. Mast float

Cas top 3 features:

1. Grip over the full length of the hull
2. Dragging line V
3. Hiking straps attached to the beams

Author's note:

There is much to be gained in explaining how to use the boat, calibrating rudders as an example is easy but is never done. It is clear that durability is the main priority and that the difficulty is not in sailing the boat but instead in handling and properly taking care of it. Again there is incomplete knowledge on how to use the boat or adjust rudder settings. Manuals are said to be never used. Since they are all around outdated.

0. Bill of materials

Based on designers estimations, a cost price calculation was made.

			boats per year	100		
Part	Subparts	Quantity per boat	Manufacturing method	Parts per year	Cost per part	Impact (0-5
Forward sheet	65mm block	2	sourced	200	€ 20,00	
	65mm ratchet block	1	sourced	100	€ 20,00	
	shackle	2	sourced	200	€ 1,00	
	hook	2	sourced	200	€ 0,50	
	strap	1	stiched	100	€ 4,00	
	rivet	4	sourced	400	€ 0,20	
	Assembly time	0,1			€ 4,00	
	Total	1	bolted and rivited	100	€ 71,80	5
Crossbar	s-tube	2	sourced	200	€ 30,00	
	pin	4	sourced	400	€ 0,20	
	lockring	4	sourced	400	€ 0,10	
	Total	1	cut and mounted	100	€ 30,30	4
Hiking strap	padding	1	sourced	200	€ 8,00	
	car belt	1	sourced	200	€ 4,00	
	adjustable slider buckle	1	sourced	200	€ 2,00	
	hook	2	sourced	400	€ 1,00	
	cloth bridge	2	stiched	400	€ 2,00	
	rivet	4	sourced	400	€ 0,10	
	Assembly time	0,3	stiched		€ 12,00	
	Total		Mounted	200	€ 29,10	3
Nose protector	ABS under	2	vacuum formed	200	€ 15,00	
	ABS upper	2	vacuum formed	200	€ 15,00	
	PU foam	1	sourced		€ 1,00	
	Assembly time	0,4	cut and finished		€ 16,00	
	Total			200	€ 67,40	3
Forward pro grip	EVA grip foam	2m	sourced		€ 4,00	
	Assembly time	0,1	cut and applied		€ 4,00	
	Total				€ 8,00	2
Towline	eye bolt	2	sourced	200	€ 2,00	
	line	4m	sourced		€ 6,00	
	Total				€ 12,00	2