



RANGER

SURF YOUR WAY



LUND
UNIVERSITY

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RANGER

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Abstract

Electric surfboards are a fairly new innovation. They fuse the art of surfing into technology and deliver a fresh experience to their users. That feeling has made them want more. Also the reason why electric surfboards are gaining popularity.

How can you redesign an electric surfboard? What more do you want to experience when you are already cruising on the water at high speeds. The electrified surfboard experience is good enough but this project is about finding what it takes to add more to that experience.

Working in collaboration with Radinn, an electric surfboard company, I was able to get real close to the current electric surfboards and learn what makes them a great product. Following that, the project was focused more on understanding the related market place and customers. The research was done with the ambition of finding a meaningful focus for the product development. The goal was to broaden the customer base, to make electric surfing easy and for all no matter if they can surf or not. With this goal, the product evolved as I did the project.

The result was Ranger, a surfboard powered by electricity, which can let the users ride or surf the way they want. Meaning, Ranger is a transforming product that can be ridden in two ways. The classic surfing style with the user standing and the new seated surfing style. With the option of choosing how they want to ride the surfboard, now users can ease into the surfing world by having a seated experience with complete control over the machine, assisting by shortening the learning curve when it comes to electronic surfing.

What made this project meaningful and of value was when I understood the impacts such a product can have on nature, the marine fauna to be exact. With the view of sustainability in sight, the expectations of doing the right things when it comes to product development regarding everything from the raw materials to the decomposing of the expired product, Ranger was planned and developed to satisfy the demands of a sustainable future and most important, to satisfy myself as a Master in Industrial Design.

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MA Level Project

Advanced Watercraft Design for Radinn

Focus areas: Market research, trend analysis, usability, industrial design, styling/aesthetics, system/service design, technical innovation, manufacturing techniques, 3D CAD, prototyping



(Robert B. Goodman, 1963)

Background & Motivation

When I was 13, I tried surfing for the first time in my life in the western coasts of South India. All that I can remember from surfing that day was lying on the board and paddling all the time. Trying to catch a wave and riding it was tiring and it required practice. Regardless, I enjoyed lying on the surfboard and trying out on my own all the while watching regular surfers beautifully riding waves in the sea. Surfing is a fun sport, but it is exhaustive and mastering to surf is hard. I also remember leaving the beach that day with a new desire, to be able to surf one day.

I started this project with little knowledge coupled with a lot of curiosity regarding surfing and electric surfboards. I had the opportunity to work with Radinn, an electric surfboard company, to design and develop surfboards that runs on electricity. I was thrilled to see how my design knowledge can be put into use to design surfboards. An area I knew very little about but had a big desire to learn more about since a kid. I chose to learn along the way as I designed the surfboard. I felt energetic with no limits on my creativity when I knew I was going to develop electric surfboards. As much as I desired to learn and surf one day, I realized I wanted to design and develop advanced surfboards during this project.



Surfing is the sport of riding waves in an upright or prone position. Surfers catch ocean, river or man made waves and glide across the surface of the water until the wave breaks and loses its energy. In the ocean, wave riders stand up on surfboards and navigate the water nearly parallel to the beach toward the shore.

Surfing has multiple interpretations. For many, it is a recreational activity, physical activity, and a competitive sport, but for others, it is a religion, a lifestyle, an addiction, and a spiritual connection with Nature.

Evolution of Surfing



(Bishop Museum Archive)

12th century

Carvings of riding waves on wooden boards found in Polynesia dating back to the 12th century.



(Davey, F. 1898)

18th century

James Cook was the first European to witness surfing on 1778. It was an integral part of the Hawaiian culture, layered into society and religion.



(Duke with his surfboard, circa 1910-1915)

Early 1910s

The pioneer who brought surfing back to life is the Hawaiian beach boy Duke Kahanamoku.



(Skin Diver, January 1954, Vol. 3, No. 1, p. 21)

Early 1950s

Jack O'Neill invented the first wet-suit which protected the surfers from the cold Californian water.



(Balsa surfboard with glassed-in fin, SHACC Collection)

Late 1950s

Joe Quigg invented the round nose and laminated fins that are covered with fiberglass. These innovations made unbelievable maneuvers possible.



(Simon Anderson holding the 3-fin Triquiha, 1980)

Early 1970s

Simon Anderson invented today's 3-fin-system on the short-board. This was the last eminent step which led to the short-board as we know it today.



(Hydrofoiling, 2000)

Late 1970s
Hydrofoil surfboards are introduced in the surfing population.



(Electric Surfing, 2018)

2010s
Electric Motorized Surfboards are introduced to take surfing independent of waves

What is an Electric Surfboard?



(RAVIK Awake Boards, 2018)

Electric surfboards are traditional surfboards with an electric powered motor which are accelerated either by a jet engine or a propeller and controlled via wireless remote. This allows them to cruise along flat waters without any input from the surfer.

The breathtaking experience of freedom that a surfboard can give was infused with the electrifying adrenaline rush that all motor sports evokes.

Electric surfboards allow you to break the mould of traditional surfing. These boards can be loads of fun in different conditions, and can allow you to enjoy an endless season of great surfing!

Advantages of Electric Surfboard



No waves required



Runs on electricity



Powerful acceleration



Lower Noise pollution



(Radinn The Electric Jetboards, 2018)

The brand.

Radinn is an outdoor and sporting goods company, founded from a life-long dream of shredding across the water independently from the wind, waves, or boat. Original founder Philip Werner met with enthusiast Alexander Lind, who together created a team of extreme sport fanatics who also happened to be engineers, entrepreneurs, supply chain specialists and industrialists.

Radinn is one of the top electric surfboard makers in the world. They have been designing and developing electric surfboards since 2013. The Radinn board is a powerful jetboard designed to push the boundaries of the extreme sports industry.



Studying the brand.

Their mission at Radinn is to make jetboarding available to anyone who hungers for action water sports and to keep striving for faster, more radical and safer ways to catch that thrilling 'Radinn wave'.

With constant research and development, they have come a long way in producing electric surfboards. Currently there are 3 variants in their product.

The Radinn Family

Explore

Freeride

Carve



ICEBREAKER



SENTINEL



URBAN REBEL



ELEMENT



TARIFA



PHANTOM

The electric surfboard is the only product type in the brand and it is meant for recreational purpose alone. With the lack of variety in the product range and in its usage scenarios being the main research problem I intended conducting a thorough research in the related fields to find out the information that can lead to the design phase of the project.

The possible outcomes of the design phase are:

1. New design with a new purpose, expanding the range and usage of the product line, being the top result.
2. New design with same purpose but added utility can be a satisfying result.

Research 1.0

For this project I wanted to conceptualize and develop an entirely new product. The research portion was to test the viability of a potential product. To do that, I made a research proposal where I shifted my perspective from a broad to specific approach by contemplating on some fundamental questions about the general subject to observing specific products in the market.

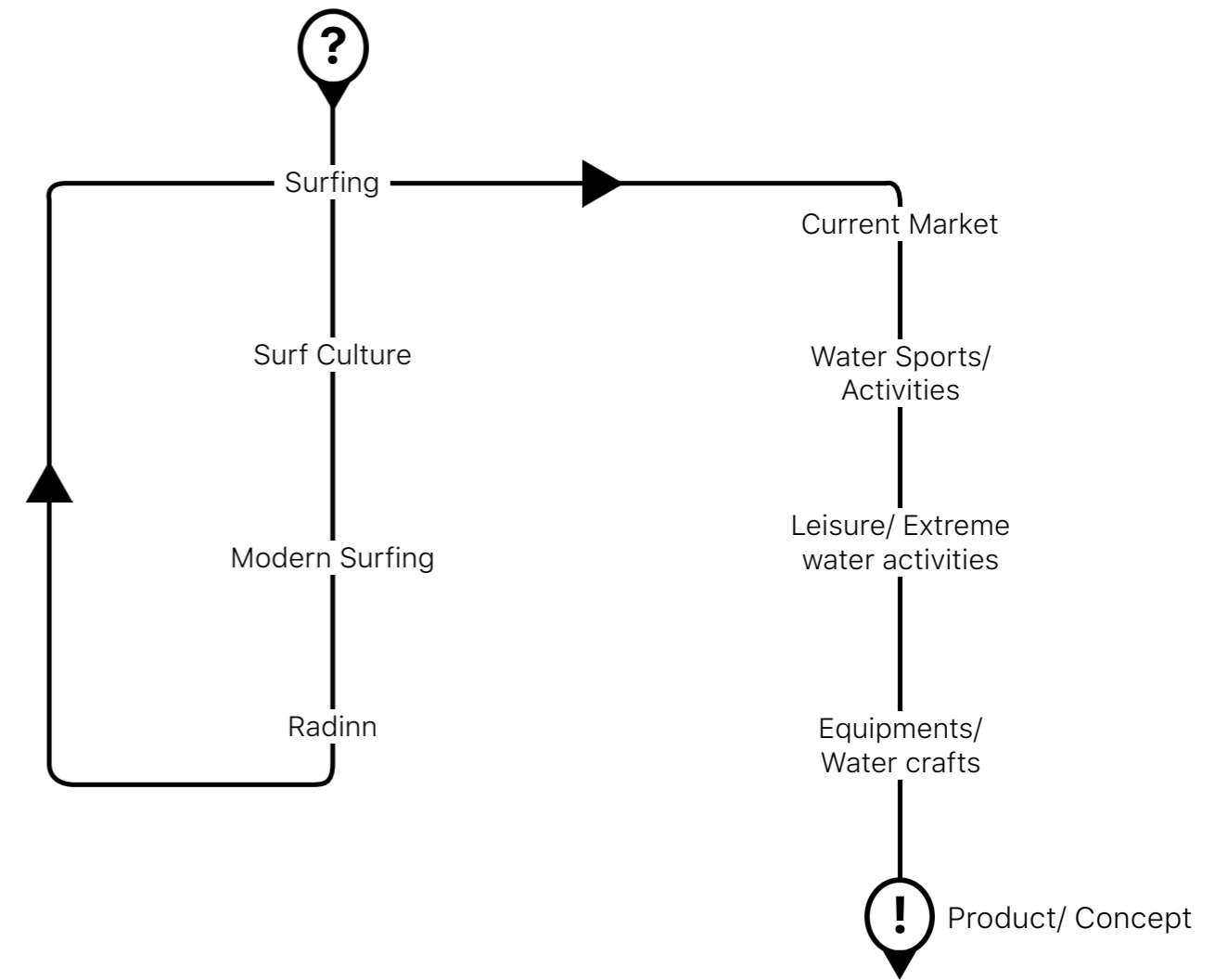
My research phase was mostly done through literature and media reviews along with personal interviews and conversing with people related to the potential product and learning about the existing product from the brand. There was also my intuitive approach where I simulate and speculate the mechanisms based on my understanding of engineering and general physics.



Research Objectives

1. To find the needs for a new watercraft design
2. To check if there are other reasons for an electric surfboard apart from sustainable fun.
3. To explore the possibilities of new scenarios for the act of surfing other than sport and recreation.

The study was to find needs and utility scenarios in the field of surfing and water bodies. To look for possibilities of new methods of performing tasks related to human interaction with beaches, rivers and lakes. To look for possibilities of new methods of the same using equipment. To find appropriate knowledge which can be used to generate ideas and to develop concepts.



The path shows the flow of my research areas to get an overview of water related sports ,surfing mainly.



(Radinn The Electric Jetboards, 2018)

Understanding the market

Electric surfing is still a developing and fairly uncharted sport. This means that these boards are still very much specialized products and can't just be found at your local surf shop.

Electric surfboards use pretty complex designs and consist of many parts. This means that they are often custom ordered and built for each rider's specific needs. Due to this, it is often best to buy electric surfboards directly from the manufacturers. The best products and brands mentioned above all have their boards available online.

Electric surfing is also an expensive sport. The reason is easy to explain. Riding without waves needs power. Heavier riders need more power and more power needs not only more battery cells, but also a much better heat management.

Comparing it with a jet-ski (aka personal watercraft), but not as a surfboard with a motor. It is an advanced machine with a lot of engineering.

The E-Surfing marketplace consists of 4 product categories.

- Electric SUP
- Electric surfboard
- Electric hydrofoil
- Petrol jetboard

Electric SUP

An electric SUP is a stand-up paddle surfboard with motor. There are complete electric SUP surfboards or extension kits which replace the fin of an existing SUP board. E-SUPs are not very fast.

(Figure 1. iSUP fishing electric SUP, 2019)



(Figure 2. iSUP electric Paddle Boards, 2019)



(Figure 3. Vaquita Electric SUP Motor, 2018)



(Figure 4. Aquamarina Blue Drive Power Fin, 2017)

Some extension kits can be also used for other uses such as scuba diving or to motorise a kayak. The electric SUP are not a good choice for adrenalin junkies as they are just not powerful enough with speeds less than 10 km/h.



Families or people who want to enjoy the nature at a low speed.



E-SUP can be found in the price range between 10,000 SEK/ 1,000 EUR and 40,000 SEK/ 4,000 EUR range.



Basic skill of balancing on a paddle board required.

Electric Surfboards

Electric surfboards do mainly use a jet engine like the Radinn jetboards, but there are exceptions which use propellers. Some people are looking for a relaxed surf and others prefer racing. The very powerful (and expensive) boards do even allow to tow a wake boarder or hydrofoil.

(Figure 5. Radinn Boards , 2019)



(Figure 6. Awake Boards , 2019)



(Figure 7. Electric fluorophore fin board, 2018)



(Figure 8. Radinn Explore Jetboard , 2017)

These boards can come in the form of foils, SUPs, regular surfboards, and more. Some are designed to make paddling out easier, some are designed to catch waves smoother, and some are just for riding around when there aren't any waves at all.



Occasional surfers and people who look for speed and adrenaline on a regular basis.



The price range of E-Surfboards is from 50,000 SEK / 5,000 EUR to 1,60,000 SEK / 16,000 EUR.



Skill of balancing on a smaller board required. Surfing skill is a bonus.

Electric Hydrofoils

Electric hydrofoils are getting very popular recently. Once they are flying they need much less power and are therefore easier / cheaper to build.

(Figure 9. Flite electric foilboard , 2017)



(Figure 10. Lift E-foil , 2017)



(Figure 11. Takuma E foilboard , 2018)

The major attraction of this electric board is the hydrofoil element. Unlike standard surfboards, this design lifts right out of the water. Cruising around in the air is a sensation like no other. Being lifted up like this allows to make deeper turns and really channel the energy of the water.



Occasional surfers and people who look for speed and extra adrenaline on a regular basis.



A high quality e-foil with good electronics comes above the 1,00,000 SEK / 10,000 EUR mark. The cheapest is at 60,000SEK / 6,000 EUR.



Surfing skill is required along with the ability to balance on an elevated board.

Petrol Jetboards

Petrol powered jetboards are out since many years and have a lot of experience with mass production. They are noisier and have to deal with petrol, but they are also reliable, still cheaper at high performance and can be brought on an airplane unlike the other electric surfing boards.

(Figure 12. Jetsurf Petrol, 2019)



(Figure 13. Jetsurf Petrol, 2019)



(Figure 14. Mako Jetboard, 2017)

The latter one (travelling by plane) is the biggest advantage compared to all the electric models. Electric surfboard batteries cannot be taken on a plane. Travelling with an e-surfboard requires the battery to be sent upfront to the destination using a special freight forwarder.



Surfers and people who look for speed and adrenaline on a regular basis. Extreme surf adrenaline seekers.



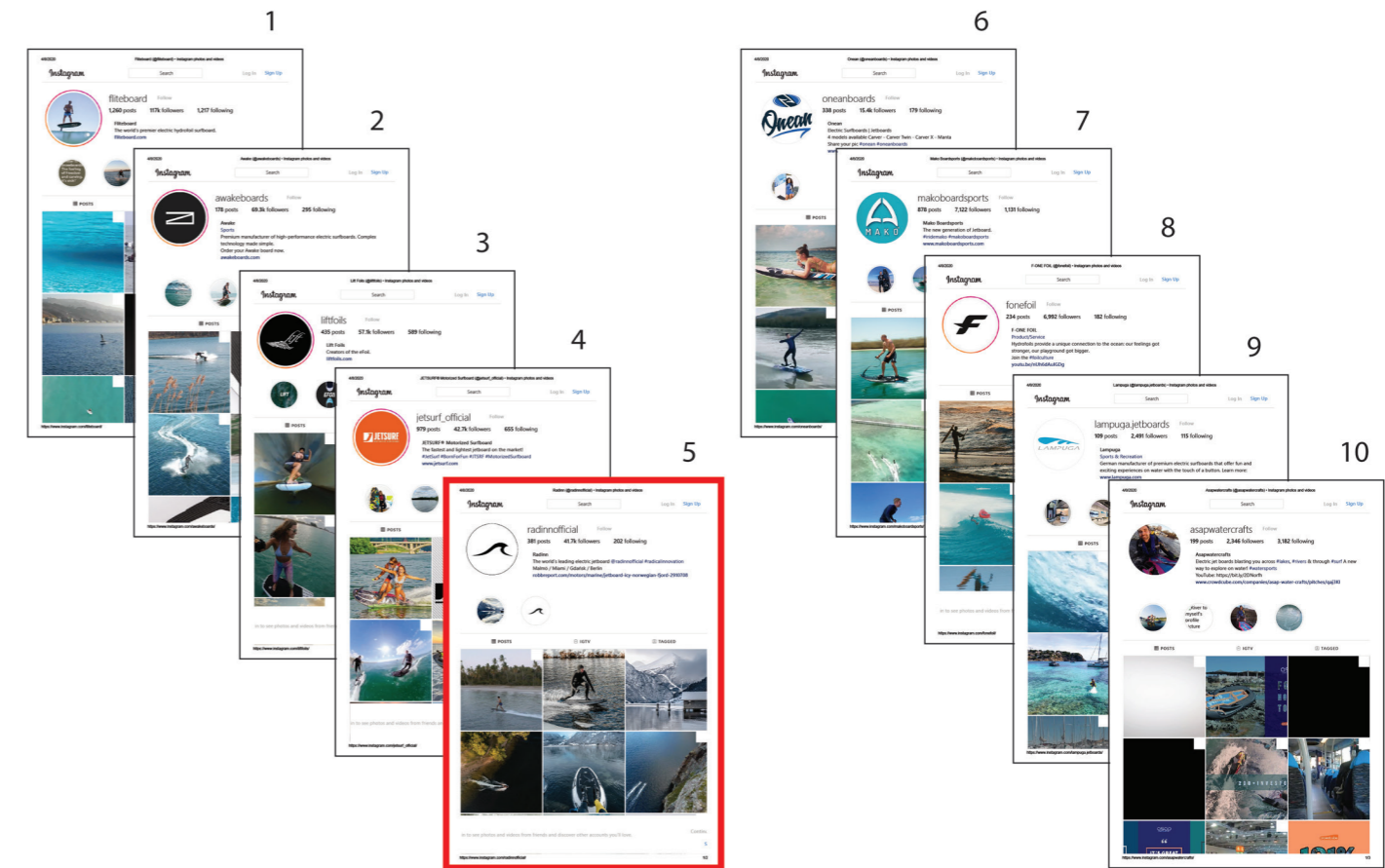
The pricing starts at 80,000 SEK/ 8000 EUR mark. The expensive one is 1,20,000 SEK / 12,000 EUR.



Skill of balancing on a smaller board required. Surfing skill is a bonus.

Analysing Competition

To find the right strategy for developing a concept product the competitors were analysed. They play a vital role and I used the information from understanding the competitors of Radinn to find the position of Radinn in the market and among the customer base.



I selected the top brands in the electric surf market and compared them on several aspects. Here I used the online platform Instagram and Facebook to find the popularity and reach of these 10 brands. Then located Radinn in the comparison to find the brands above and below it.

Radinn is a strong name in the market with a premium performing product line to compete with the other brands and their products in the market.

Analysis of the top E-Surfboards in the market based on their utility and performance.

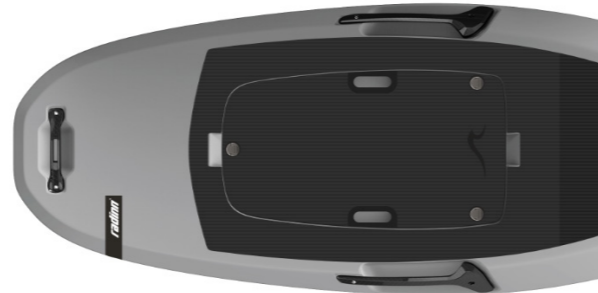


This electric jet board is designed for fast straights, sharp corners and superlative acceleration. Built in carbon fiber, the **Awake RÄVIK** can reach a top speed of 35mph and can go from 0-30mph in just four seconds. Weighs 35kg, and can run up to 40 minutes.



OLO One carbon fiber jet board is electric-powered with a swappable battery system that takes just 30 seconds to change over. A swallow tail allows for greater hold and traction, while twin fins let you carve through the water with ease. There's a bluetooth throttle control, LED battery level indicator and a glove compartment to store valuables.

Radinn's Explore jet board is a reliable board that's built to last with a durable undercoating, built-in bumper and a full-impact deck pad, perfect for rowdy charter guests. Powered by an ultra-quiet electric motor and controlled by a wireless, handheld remote, riders can blast across the water at up to 25mph.



The **Wave Jam** is designed for a thrilling ride on the water that requires relatively little balance or skill. This souped-up bodyboard has a top speed of 10mph and almost an hour of run time. A three-speed setting means you can set the pace, and to steer you simply lean in the direction you wish to go. It's 24 kg and compact for any super yacht toy box.



Jet Surf have introduced an all new electric option to its line up. Maintaining the same DNA as the rest of the Jet Surf, the Electric model has a full carbon fiber hull made for perfect maneuverability and speed, which has an eye-watering top speed of 40mph.



Onean's Manta model is perfect for those who prefer a slower pace to life, with a top speed of 6mph and up to six hours of battery life. The Manta is simple to use and controlled by a wireless remote. Press once to set the power to 50% and then again for full throttle. Measuring 230cm long and 90cm wide, the board is super stable and there is even room for you to pack a picnic.

Mertek's electric surfboard is inflatable so it's easy to move around and less prone to damage. Perfect for super yacht stowage, it folds down to a third of its full size. Controlled by a wireless remote with eight-speed settings, the board can run for an hour at a standard speed and can reach up to 16mph.



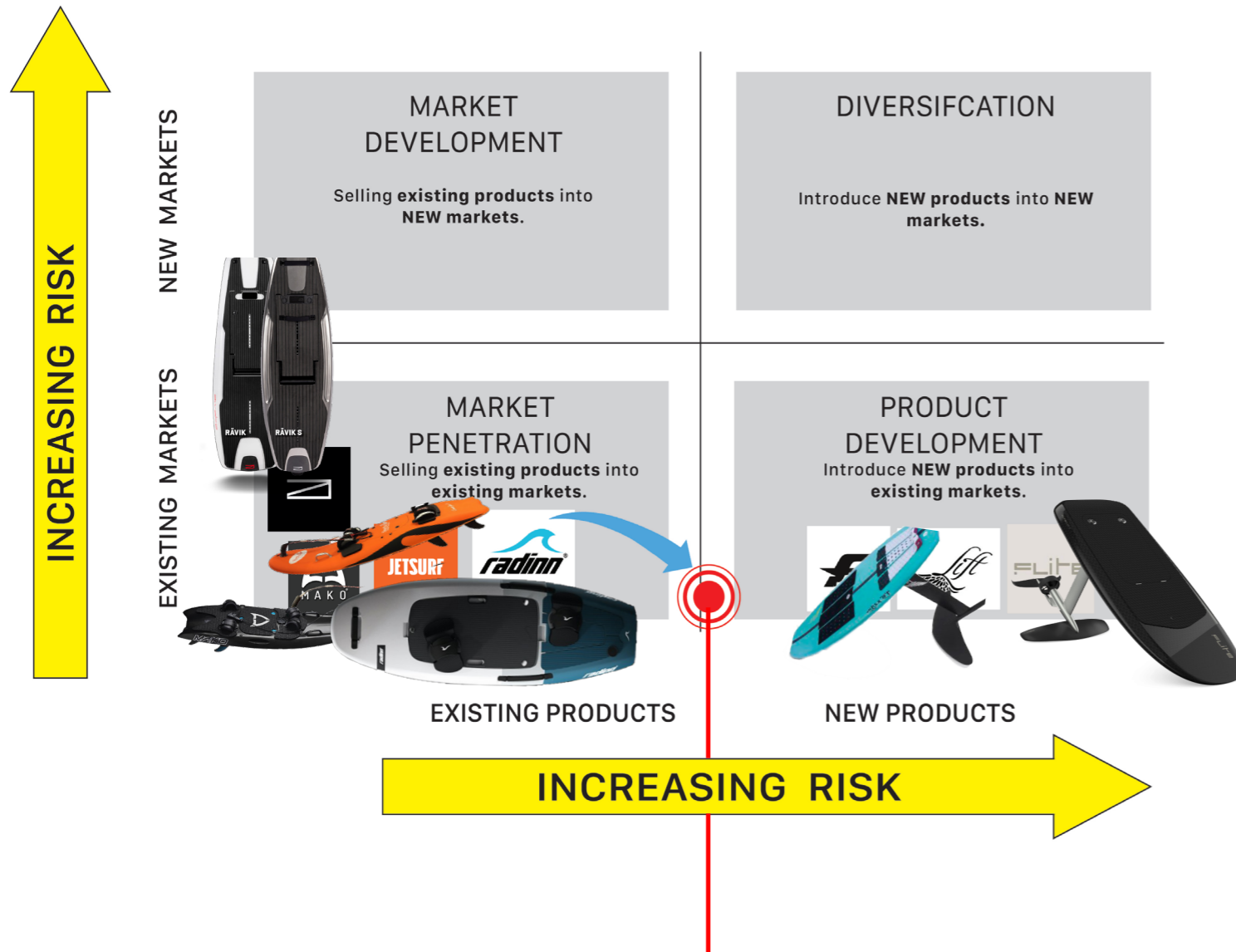
Power across the ocean for up to 90 minutes with the **Mako jet board**. A two-stroke engine offers a top speed of 55km/h while the board remains one of the lightest in the market at just 20kg due to its carbon fiber body. The engine is started at the touch of a button and a handheld throttle allows you to accelerate with ease.



Ansoff Matrix

Majority of Radinn's competitors are in the same market with the same product category. Few have developed new products in the existing market.

Using **Ansoff Matrix**, a marketing planning model that helps a business determine its product and market growth strategy, I determined Radinn's product and market growth strategy.



Introduce a new product that combines and makes a bond between existing and new products. Allowing to hit the sweet spot where the product can penetrate the current market and explore the new market.

The proposed strategy is to develop a new product that can very well be used to penetrate the existing market and also compete freely on its own without competing same products, thus existing in both sides with a wider opportunity in the market.

Introduce new product that combines and makes a bond between existing and new products. Allowing to hit the sweet spot, where the product can penetrate the current market and explore new market.

To develop such a product, more research on all water sports and activities were required. I observed for what they look like, what emotions they induce to the user, how hard is it to do it, what skills are needed, how is it technically feasible etc. I started with a wide view of all the water based activities humans do for fun, recreation, thrill and sports.

Surfing without water on land using wheels, snow, sand and even the sky was observed to figure the commonalities that they have in comparison with the act of surfing. To learn why surfing has been effective from a technical point.



Sand boarding



Snow boarding



Long boarding



Sky Surfing



Mountain boarding

Surfing has spread all over and outside water because of its ability to attain speed and control while giving adrenaline and style. By having a complete **mobility** range and even random movements at times to let user be **creative**, for ex, short air time by leaping to do stunts, surfing is a kind of sport that has evolved through time.

Fun / Recreational activities on water that people tend to do was looked at to find the common effects they have on their users.



Paddleboarding



Hammocraft



Seabob, underwater scooter



Subwing



Cudajet, 3d printed backpack underwater jet

There is a sense of relaxation, chilling and exciting feel while indulging in these activities. The fun/ recreational activities on water gives the user **no adrenaline** and a **lot of calmness**.

Professional sports / Fun sport activities on water which are performed by athletes and professionals. This area of the water sports was looked at understand the effects of high speed and dynamic movements on water on its users.



Waveskiing



Wakeboarding



Waterskiing



Windsurfing



Surfing

Sports on water is a wide range that gives a **lot of adrenaline** and a **feeling of superiority** to the user as it requires high levels of skill, focus and practice to master them.

Motorized fun activities on water is the tourist attraction that people want to do. It is also a fun sport area. This area helped in realizing how different the experience can be when an high powered motor is involved.



Jetovator



Flyboard



Automatic Jetpack



Dual Jetovator

Adding electric or motorized equipment in the **water sports areas bumps up all the levels of fun, excitement and adrenaline.**



Jetovator

Miscellaneous activities on water like the below showed the result of being innovative, creative, bold and a bit of craziness on water.



Red Bull Pipe Dream



Wokart sea car



Fissot fishing kayak



Manta 5 hydrofoil bike



Electric Hydrofoil

Examples of wide ranges of activities on water, sophisticated kayak fishing service or creative high tech fun like the Red Bull Pipe dream.

Hydrofoil is a result of science that changes the dynamics of water sport/ fun activities.

Overall it is **cool, advanced and futuristic.**

I tried to find ways to connect all the individual activities from Surfing without water, Recreational, Professional sports / Fun sport, Motorized fun and Miscellaneous activities on water.

I ended up with what each of this areas could provide to the users in terms of **how they feel** while performing them, and **how they work** from a technical and practical perspective based on literature and media reviews.

It helped me in my design process where the goal was to be **innovative** and to come up with a **new concept**. I used these as the hints and guides to achieve that goal during the design phase of this project.



There were 2 distinctive emotions that I wanted to carry on from this point and into my concept development. There were the feeling of adrenaline rushing through the veins and the contrary, the relaxing sensation.

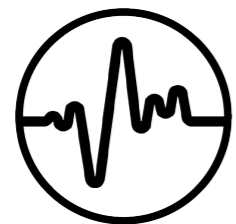


(Paralympics, Rio, 2016)



The Idea

I finally found the idea from sports for disabled people. Looking at the disabled people surf on water had the **feeling of extreme control over chaos**. It was sure adrenaline rushing, but it was more peaceful and under control as even disability couldn't stop people from surfing.



Adrenaline rushing

*



Calming

I looked at the **International Waterski and Wakeboard Federation Disabled Council**. They have an official sport for disabled athletes to compete on the water.



The Disabled Skiing and Wakeboarding



(Belinda Sidman, Disabled Water Ski Australia, 2015)



(Jerome Elbrycht, Disabled Sit down Wakeboarding, Catersnews, 2014)

Adaptive Snowboarding refers to a modified version of the sport, with changes in equipment, rules, and technical specifications that enable persons with physical disabilities to participate in both recreational and competitive activities.

The sport originally called Adaptive Snowboard is now practiced by hundreds of athletes around the world. **The International Paralympic Committee (IPC)** defines two classes: SB-LL for athletes with a physical impairment affecting one or both legs, and SB-UL for athletes with a physical impairment affecting one or both arms who compete standing.



SB-LL for athletes with a physical impairment affecting one or both legs was inspiring and relevant to my idea.



(Brandon Adam, The Hartford U.S. Disabled Ski Championships Day 5, Getty Images North America, 2009)



(Mono Skier X Final at Winter X Games, The Denver Post via Getty Images, 2016)

The Sit-down hydrofoil

The sit-down hydrofoil, first developed in the late 1980s, is a variation on water skiing, a popular water sport. When towed at speed by a powerful boat or some other device, the board of the hydrofoil 'flies' above the water surface and generally avoids contact with it, so the ride is largely unaffected by the wake or chop of the water and is relatively smooth.

I interpreted this sport and its design as a seated surfing method that I wanted to implement in my concept.



(Mike Murphy, co-inventor of the sit down hydrofoil, rides his Air Chair, version 3.0, Parker Strip of the Colorado River, 1996)



Ideation

The direction I chose to go with my project is to develop a product that can simultaneously induce

- adrenaline on par with the latest hydrofoil surfboards
- a peaceful and relaxed mood like the disabled sports
- sense of superiority by being an advanced product technically

I also wanted them to have the usability of being a **potentially service oriented machine** along with a basic **fun providing product**.

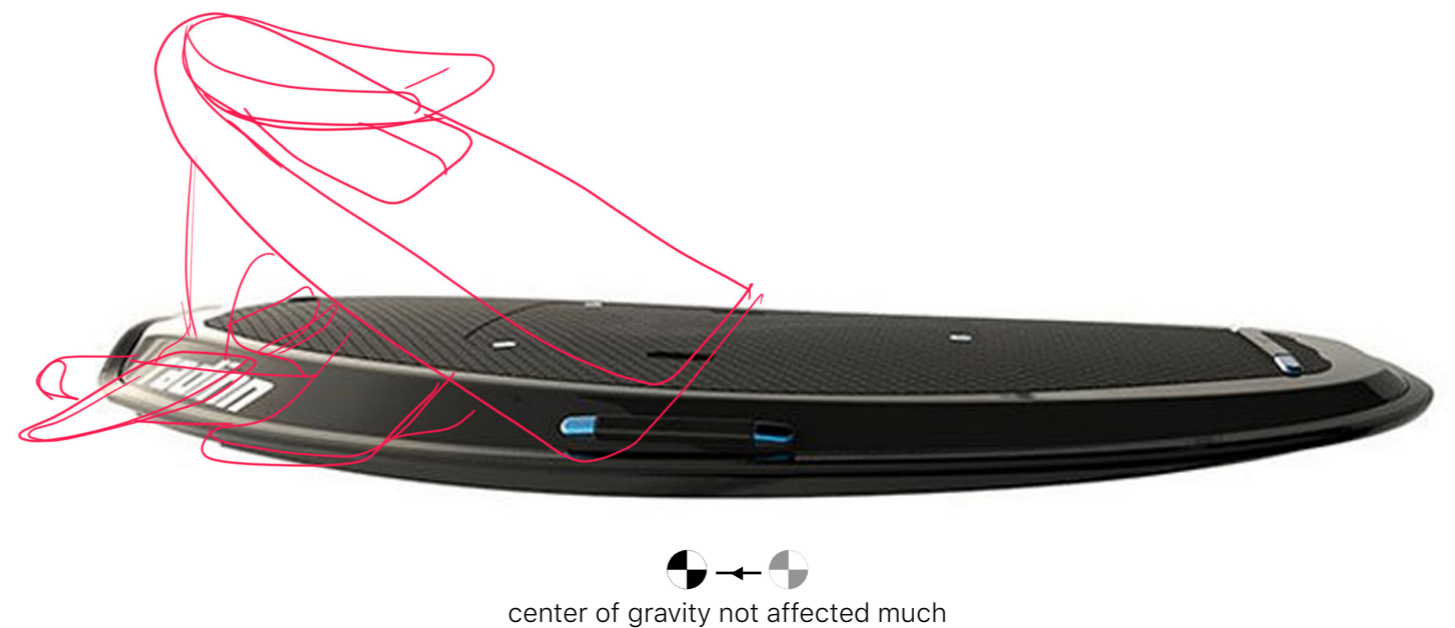
I started with sketches. Explored ideas on new concepts of redesigning electric surfboards. Tried combining the sense of feeling multiple things. Imagined ways to achieve that through a design.

The trip to Radinn's office in Malmö helped me acquire the fundamental knowledge about electric surfboards, their parts and working, balancing and buoyancy etc. I was able to talk to the senior industrial designer from Radinn about this and examined closely the surfboard from the brand.

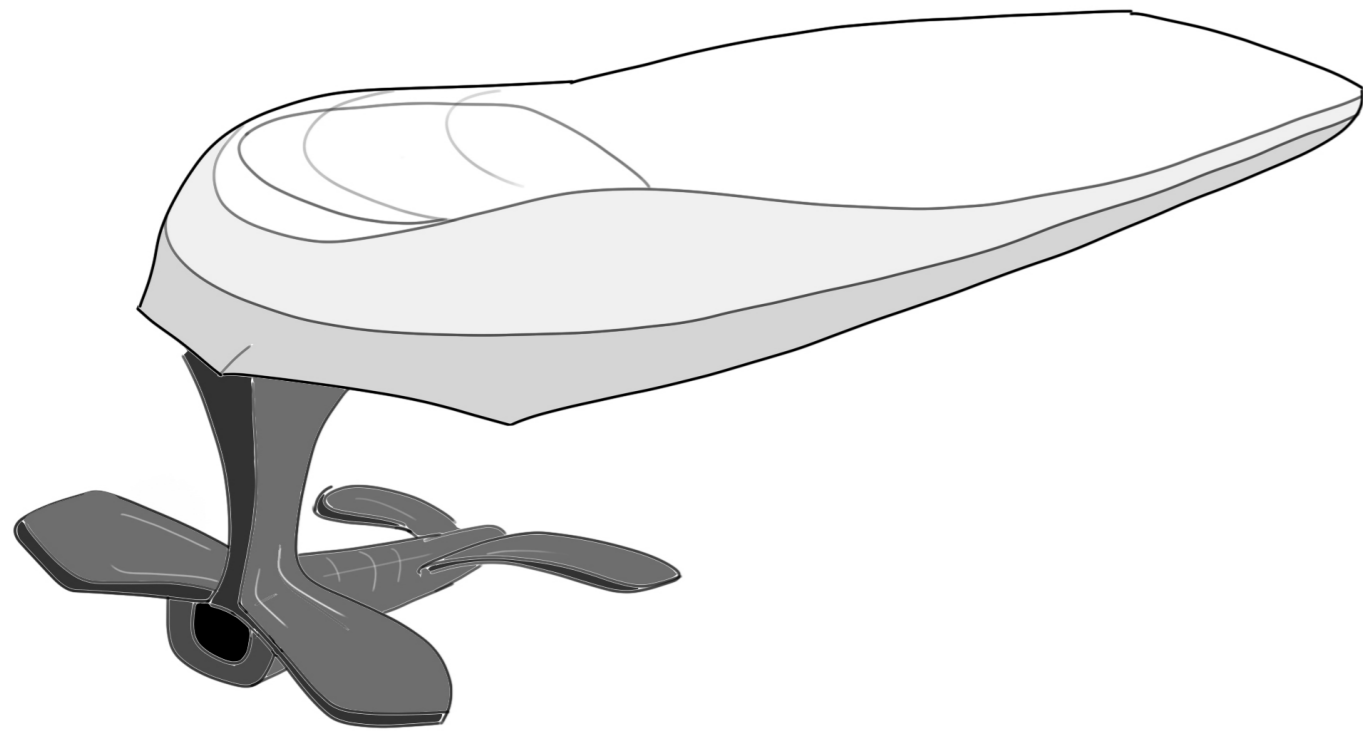
I used the existing surfboard from Radinn as the base and started to generate concepts from it. To have a seat and a wing as the hydrofoil in the surfboard was the aim. To design a dual usability surfboard.



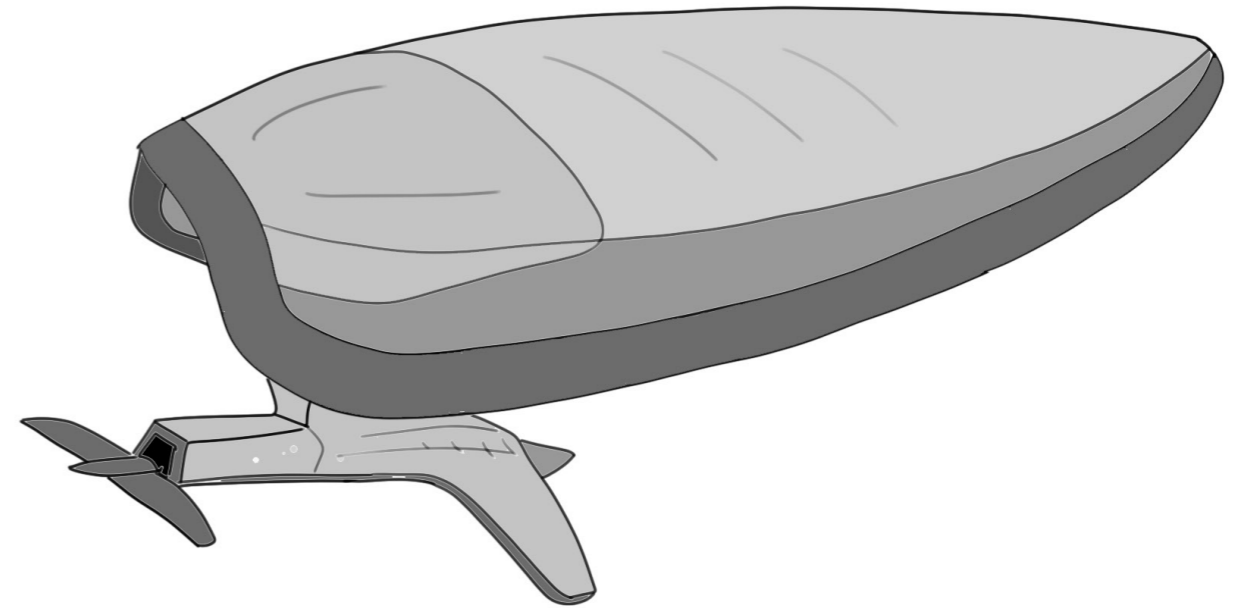
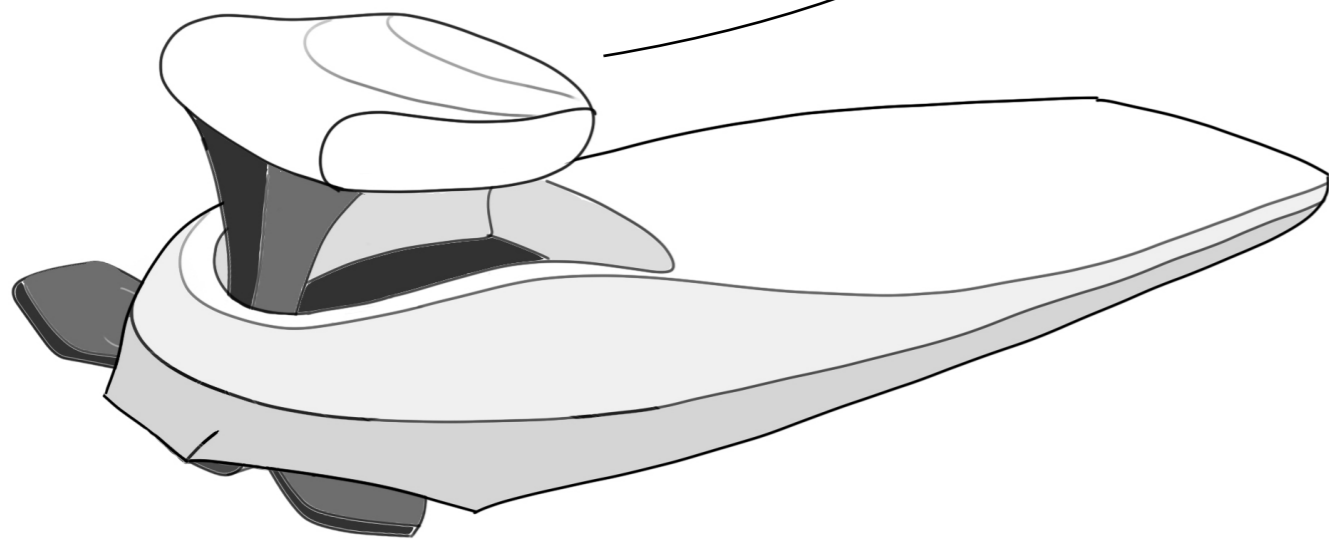
The hydrofoil wing and seat extending from the back of the surfboard, so they can be set up as the seat and down as the hydrofoil. But the center of gravity was shifting away from the ideal position.



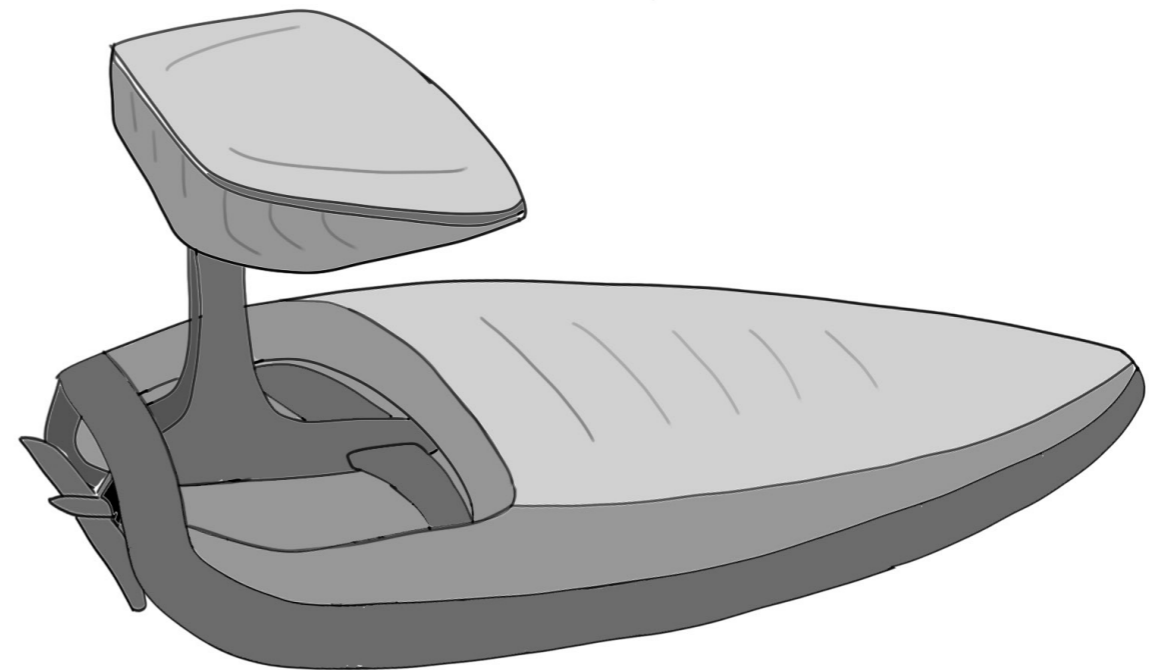
To have the setup unfold from the middle of the surfboard was the concept that I worked on as it was accounting for the center of gravity and was more stable.

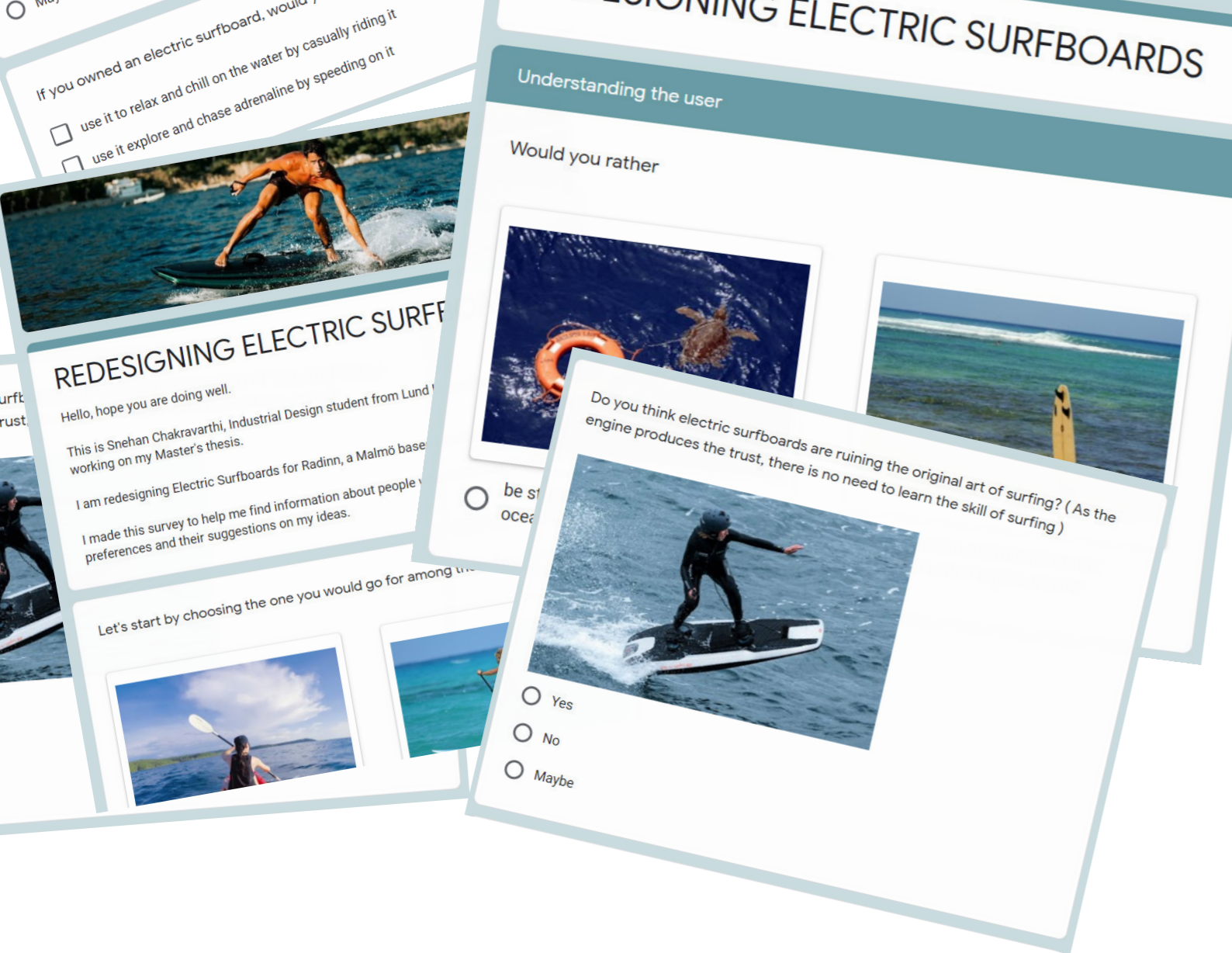


The **hydrofoil wing** under the surfboard can translate into the **seat**.



This way the surfboard can be used as a hydrofoil and as a seat down surfboard. Achieving the aim of being dual natured by providing excitement and also relaxation depending on the orientation of the surfboard.

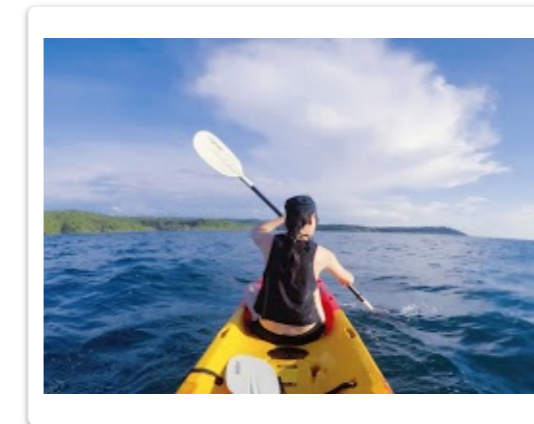




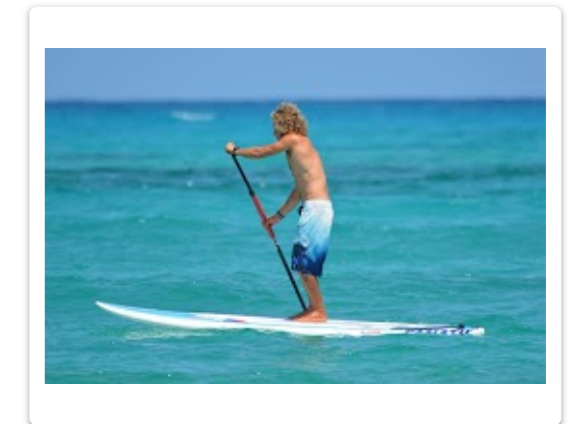
I asked questions to find the users preferences and mindset regarding the concept of a seated and standing surfboards variations.

Question:

Let's start by choosing the one you would go for among these two fun activities

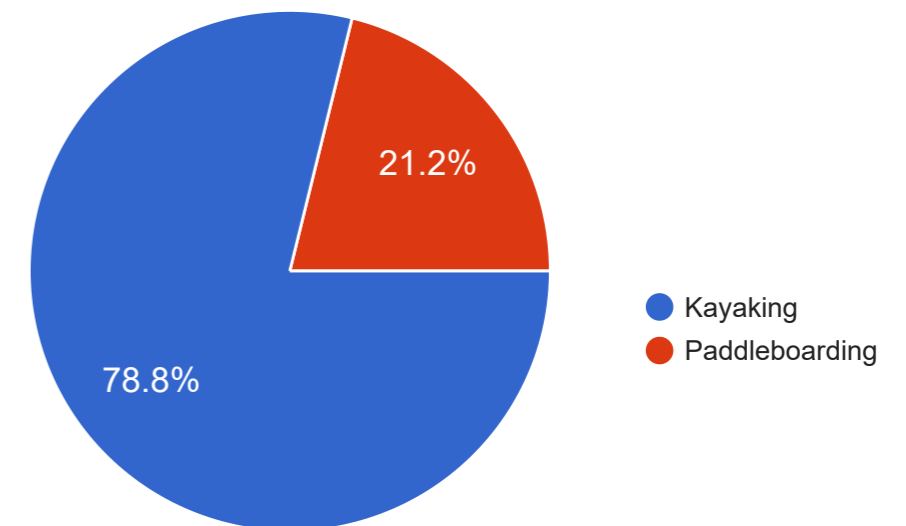


Kayaking



Paddleboarding

Answer:



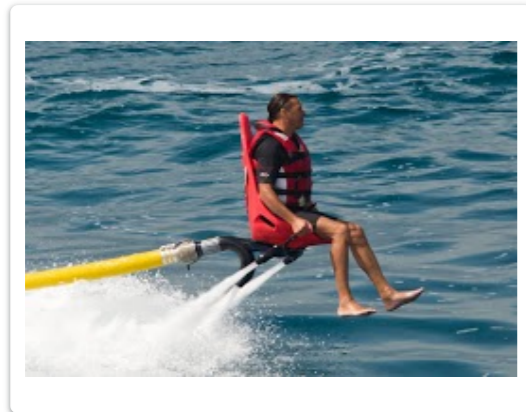
This question finds that most people feel comfortable and prefer a seated position more than the standing position when they want a relaxed and pleasant ride.

Research 2.0

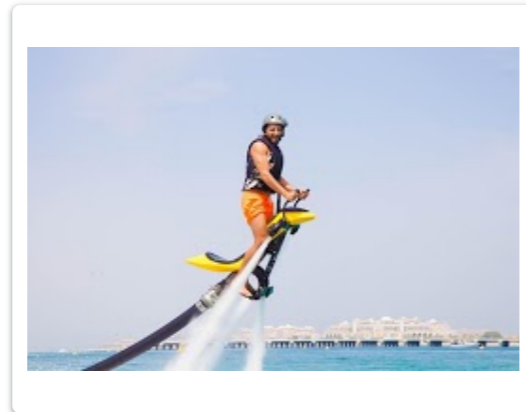
I conducted my second research phase after exploring some ideas. The initial research was about the market thus to find more about the users (including the potential ones) I did another research. I used an online survey to collect information from people. I set up the survey and posted it across all my social media platforms. It received more attention than I expected. The main goal of this survey was to use the information to learn the correct seating posture, the validity of the concept and to know if there could be a better concept.

Question:

Which do you prefer among the two?

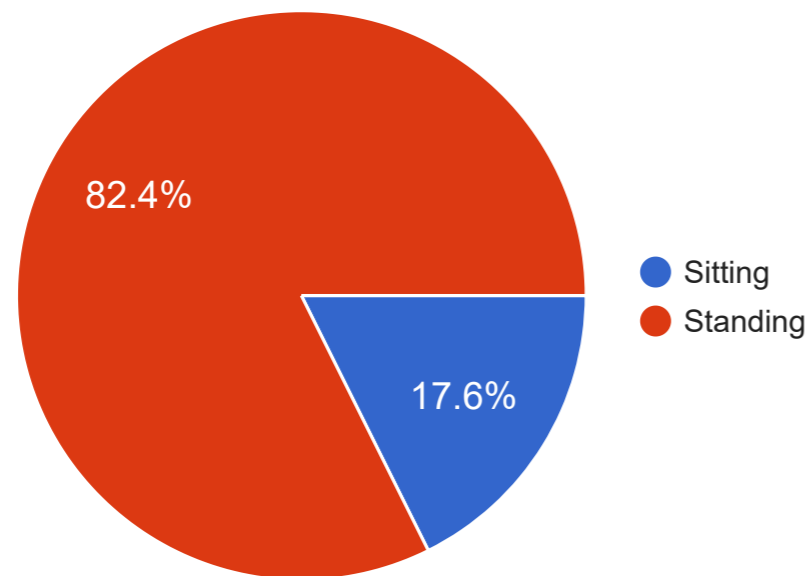


Sitting



Standing

Answer:



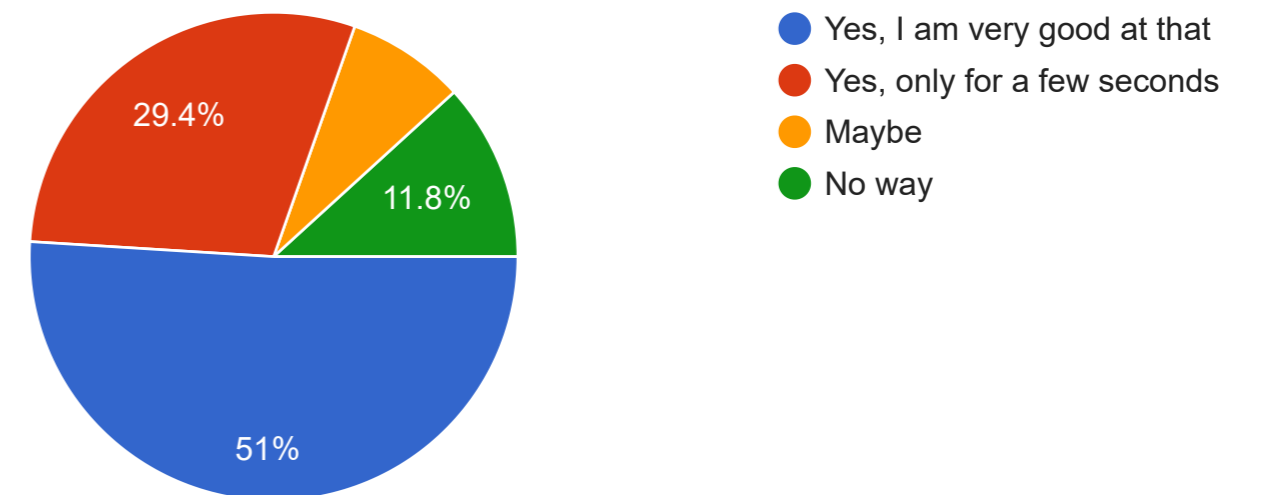
Here I find out that most people prefer to stand when they seek for more intensity and the feel of adrenaline rushing through them.

Question:

Can you ride a bicycle without using your hands?



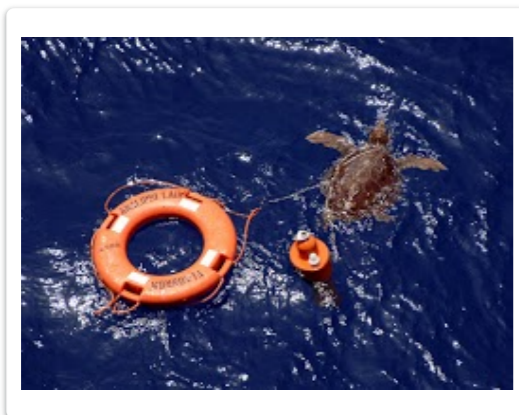
- Yes, I am very good at that
- Yes, only for a few seconds
- Maybe
- No way



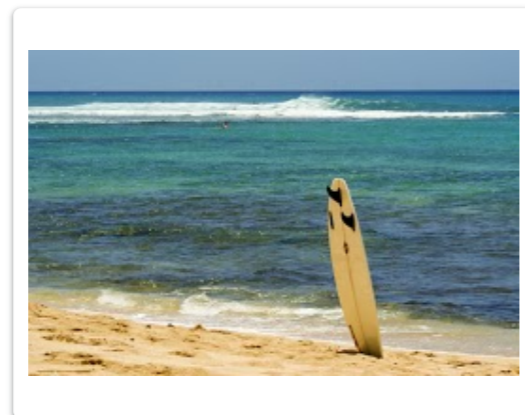
To understand what will be the right way to control the navigation while in a seated position, I asked people if they can balance and ride a bicycle not using their hands. The answers convinced me that I had to design to give control of the navigation to the users hands as more than half could not balance without their hands on the controls.

Question:

Would you rather

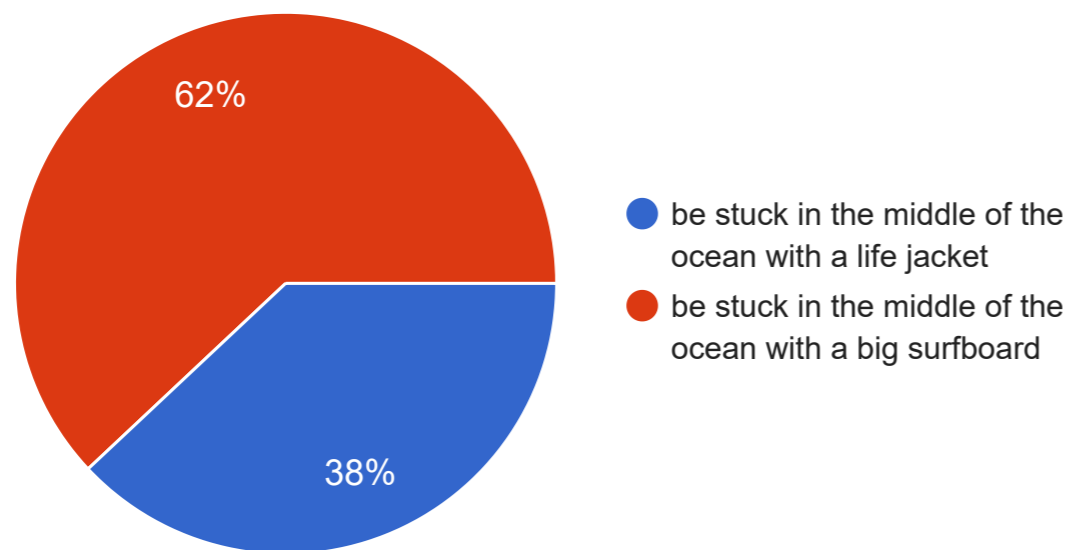


be stuck in the middle of the ocean with a life jacket



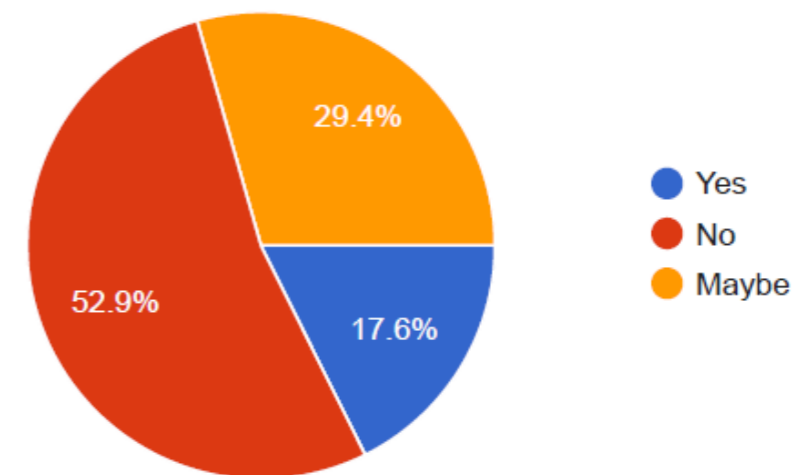
be stuck in the middle of the ocean with a big surfboard

Answer:

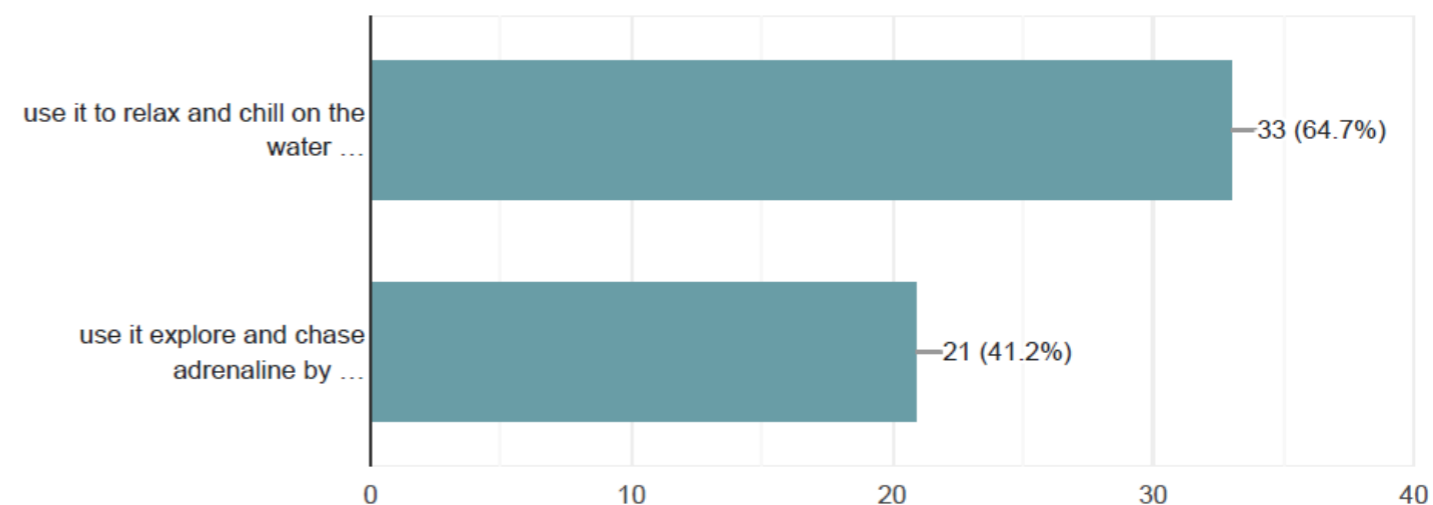


Through this question I realized that an average person will find it hard to stay on a surfboard. This also led me to design the transformation so that it is quick and easy in a single motion as an average person finds it hard on stay and do stuff on a surfboard.

Do you think electric surfboards are ruining the original art of surfing?
(As the engine produces the thrust, there is no need to learn to surf)



If you owned an Electric Surfboard, you would



Findings from the survey

- The survey taught me that most people feel comfortable and prefer a seated position more than the standing position when they want a relaxed and pleasant ride.
- They want to stand when they seek for more intensity and the feel of adrenaline rushing through them.
- People want to use hands to hold and control the navigation.
- An average person will find it hard to stay on a surfboard.
- Majority of the people like electronic surfboards and they would use it to relax and chill on the water.



Interview with Anna Kjell

Anna Kjell is an Open Water Scuba Instructor with more than 200 dives. She has been scuba diving since she was 11 years old. She is also pursuing education as an Environment Engineer in LTH, Lund University.

Anna was relevant to my project as she is in close contact with the sea and its biology. She is a marine enthusiast and I had the chance to interview her about my surfboard concept and the impacts it will have on the marine world. We talked about the marine life and ways to develop the concept so it does little harm to the marine world.

“Jetskis have gone popular, they can disturb the marine life a lot. In Sweden as we don't have a super big marine mega fauna, they don't hurt too much, maybe just the noise pollution. But in Costa Rica, we saw a dead Manta Ray that we suspected was hit by a jetski.”

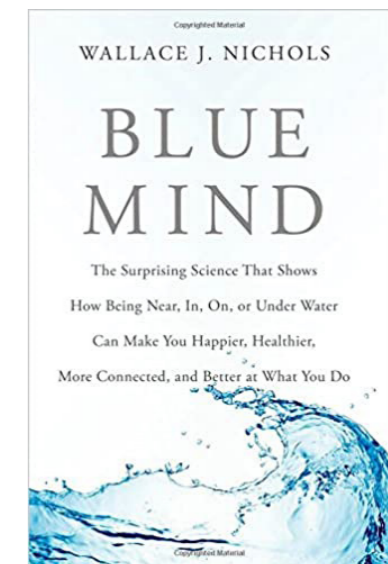
Anna informed me the effects of Jet skis and how engines can be a harm to sea life. But at the same time she thinks that getting people closer to water is a big step in preserving the sea. When people feel connected to the ocean they care about it too.

“Anything that brings people closer to water is great so people actually start caring about it”

Research has shown that being near, in, on or under water can provide a long list of benefits for our mind and body, including lowering stress and anxiety, increasing an overall sense of well-being and happiness, a lower heart and breathing rate, and safe, better workouts. Aquatic therapists are increasingly looking to the water to help treat and manage PTSD, addiction, anxiety disorders, autism and more. They found that being near water boosts creativity, can enhance the quality of conversations and provides a backdrop to important parts of living like play, romance and grieving. All of this depends on these waters being safe, clean and healthy, of course. (Wallace J. Nichols, 2019)

In experiments, images depicting water triggered a more positive response than those without water. Flip through any travel magazine and you'll see that editors and advertisers understand this very well.

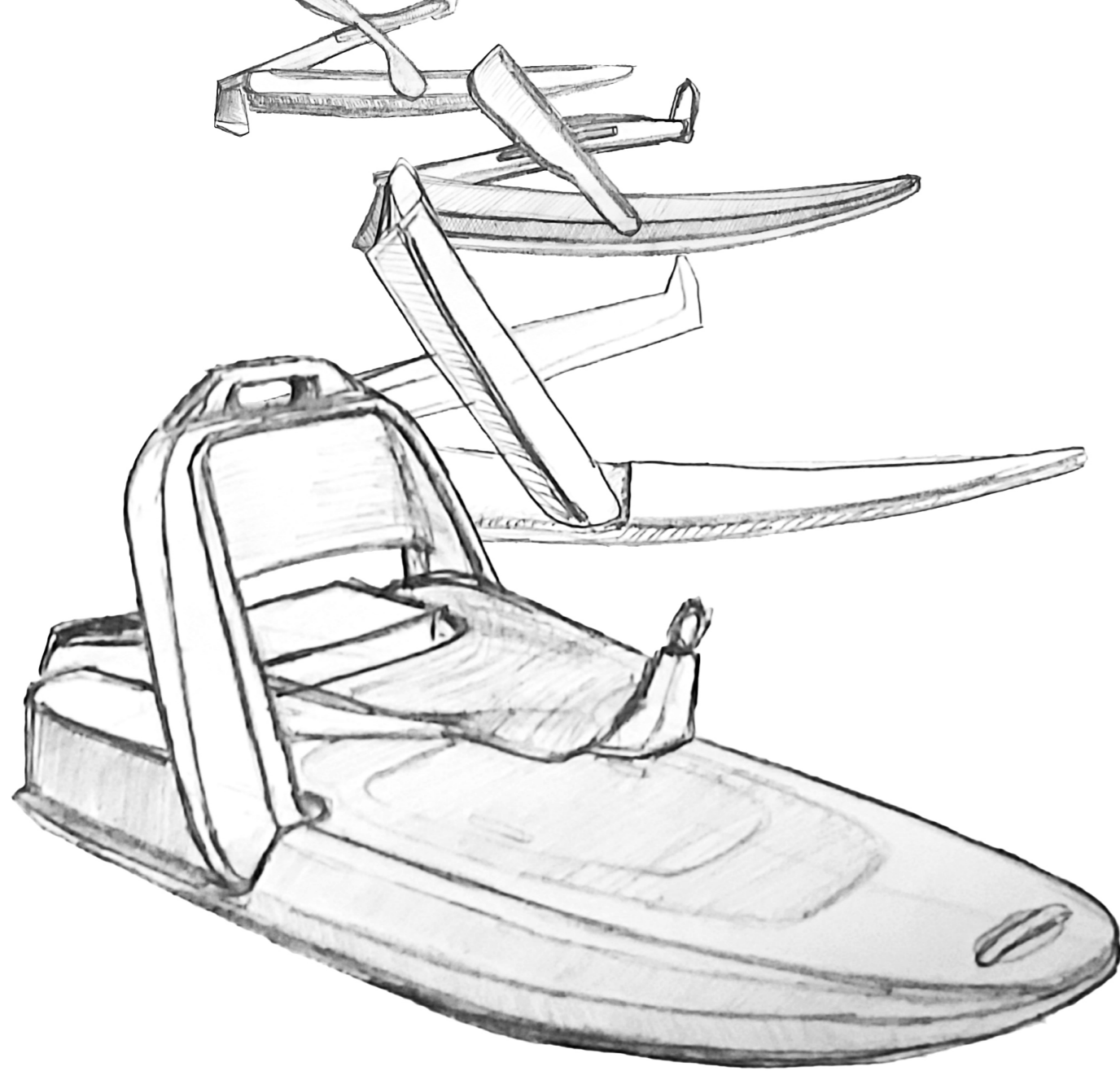
The bestselling book, **Blue Mind: The surprising science that shows how being near, in, on, or under water can make you happier, healthier, more connected, and better at what you do**, by marine biologist Wallace J. Nichols, focuses on the proven scientific evidence that being close to bodies of water promotes mental health and happiness.



“Water is both lover and mother, murderer and life-giver, source and sink ... Water unleashes the uninhibited child in all of us, unlocking our creativity and curiosity.”

The talk with Anna had me rethink how I would want the users to feel when they use the surfboard. On top of feeling excited and thrilled to ride an electric surfboard, they might also feel being very close to the water. A connection between them and the water is mutually benefiting to both the person and the water. The idea was to make the surfboards appealing to everyone, to invite any normal person that thinks surfing is hard to try surfing.

To redesign electric surfboards meant to extend its appeal as an extreme sport and also an easy and fun sport that anyone can do.



Concept Generation

The initial idea of have a transforming hydrofoil into a seat turned out to be less valid due to the limitations I had for this project. The hydrofoil wing can be possible only if the jet engine is also placed on the wing itself. This demanded a lot of time and know how of an engine, its mechanism and internal parts. I decided to drop some aspects and develop a more practical concept.

The new concept was to have a surfboard with a foldable seat so the users can decide between sitting and standing while riding the surfboard. The seated position portrays a more relaxed and inviting style to the surfboard. To get people interested in surfing.

Finding the right seating style

The seating in a car and motorbike is not the same in a seated surfboard but they are similar except there is no need for the user to place the foot outside for balancing unlike on a motorbike where the user places the foot on the ground for support when not riding.



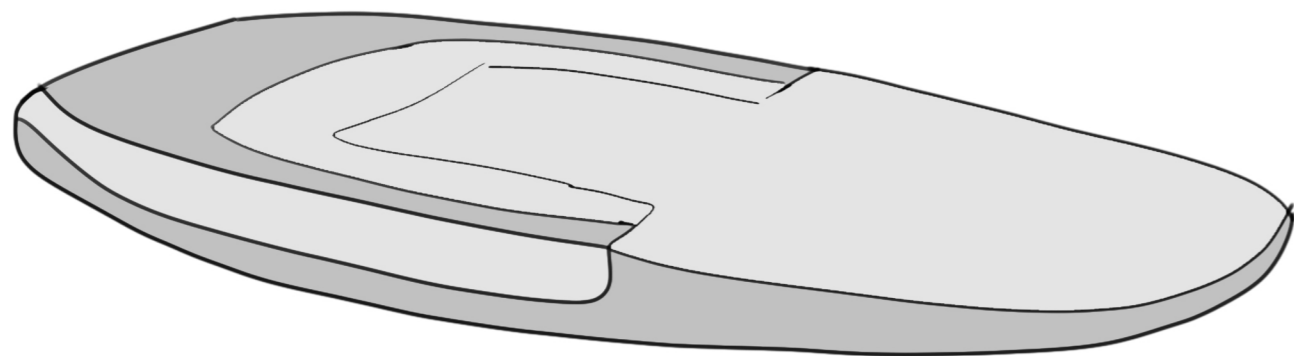
I looked at Formula One Racing for the seating posture. Since the F1 cars are high speed and need to provide seating inside a small area, it was relevant to my design.



To have a seating style that suits and provides better control, I looked at scooters as they are agile and provide extra control to the users.

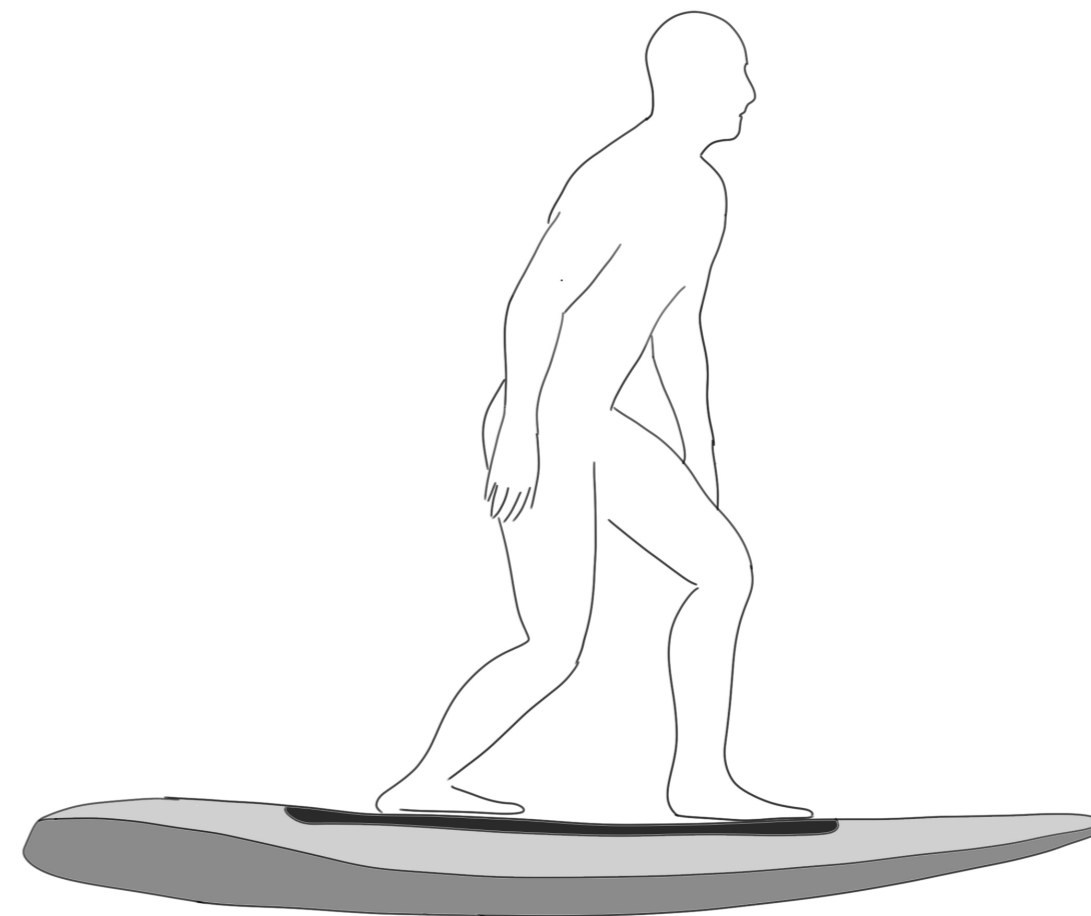
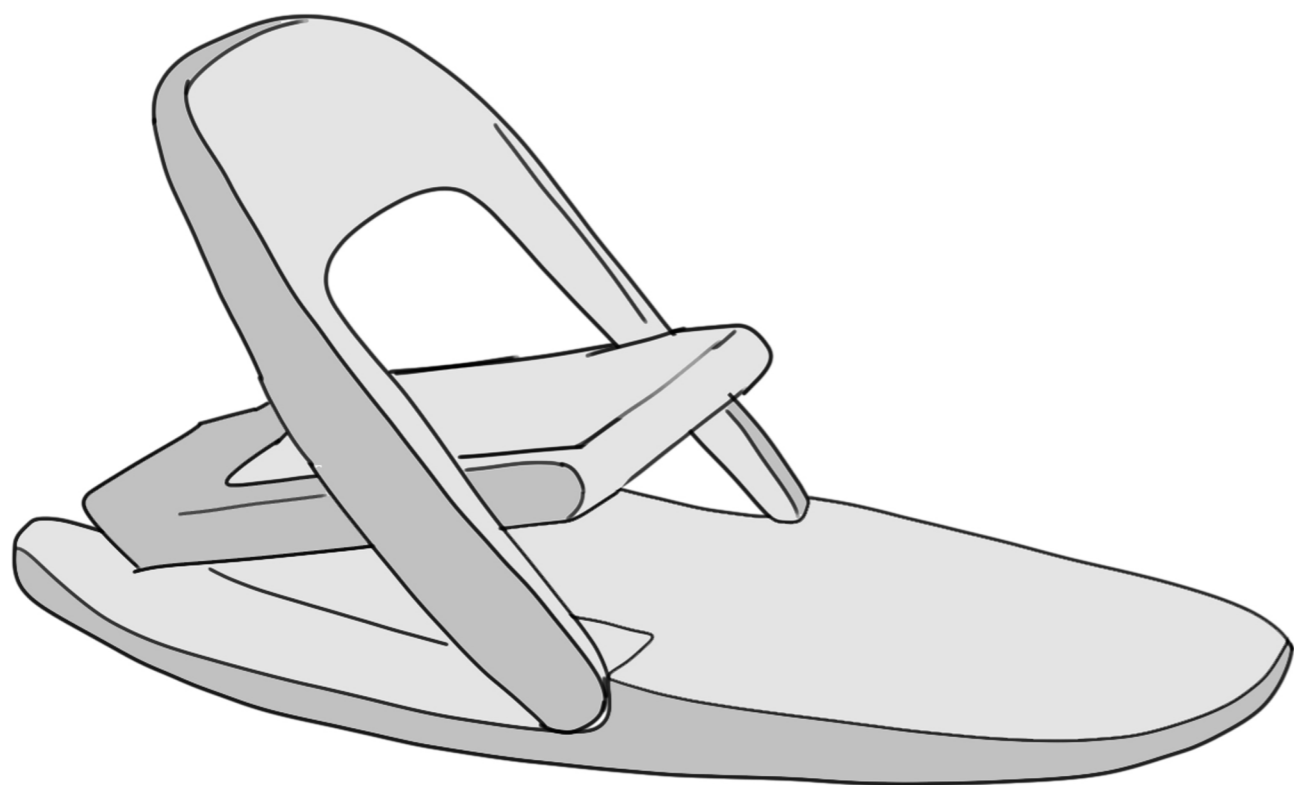


It was the low lying pushed back seating posture that was the most suitable for my concept. Similar to the one from the heavy long ride motorbikes, it is meant for a relaxed ease posture and a lot of control over the machine.

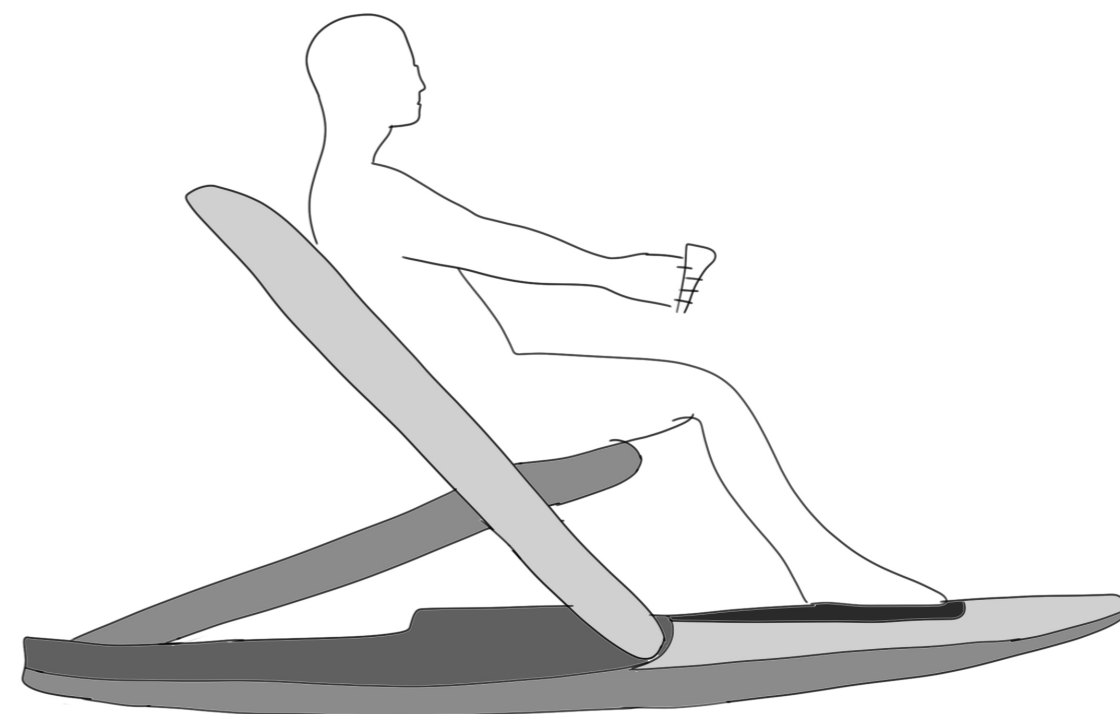


Final Concept

The final concept was a surfboard with fold-able seat. The seat neatly merges into the top face of the surfboard to form the platform for the rider. When unfolded, the user can ride the surfboard while in a seated position. The transformation of the seat is possible due to the mechanical design that allows for the unfolding and folding of the seat.



User riding the surfboard while standing



User riding the surfboard while seated.



(Radinn, Grimsbygatan 24 Malmö)

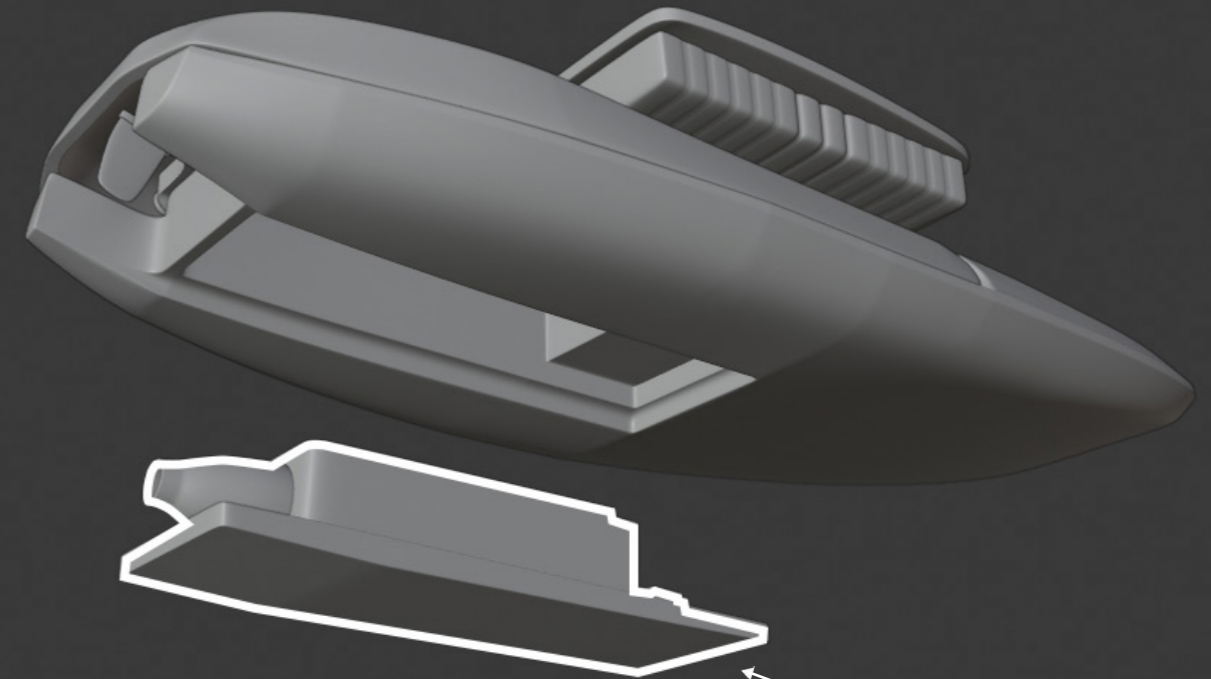
Brief

- To design an advanced water craft that merges into the lineup of Radinn electric surfboards.
- The target is the same market, customers of electric surfboards along with beginners to surfing and water sports.
- To design a product that can ease the learning curve of an electric surfboard.

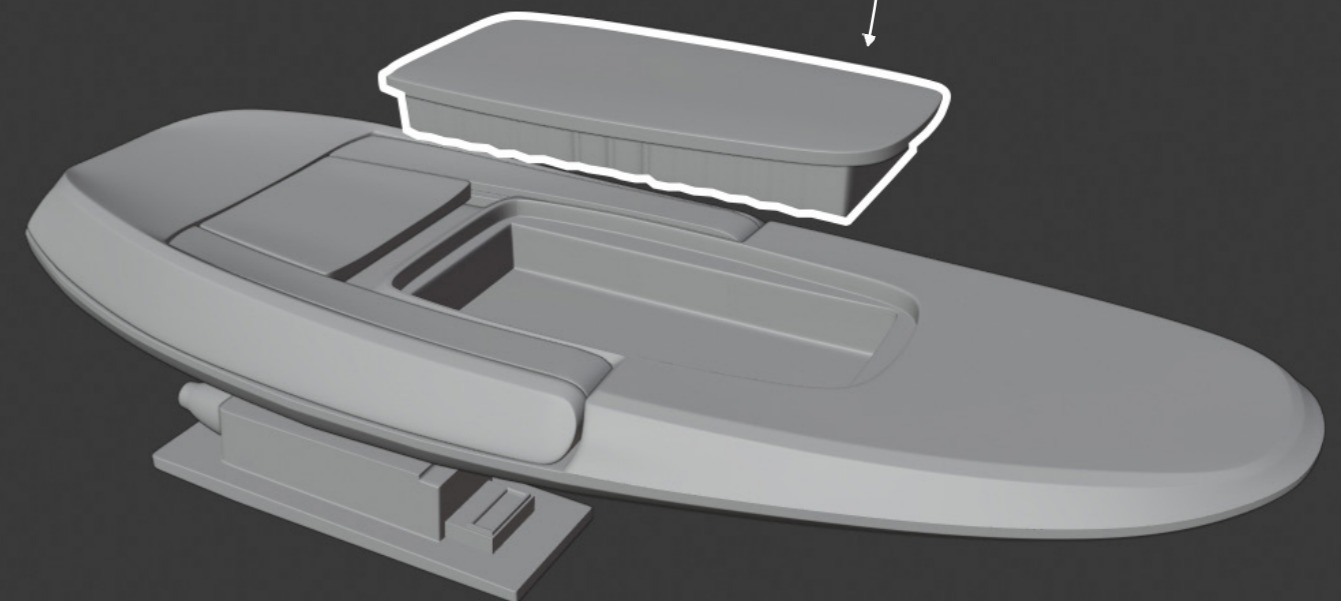
The design constraint: To design with the modularity of having the existing battery and jet pack from Radinn surfboards.



Developing in CAD



The surfboard was designed to fit the existing **battery** and the **jet pack**.

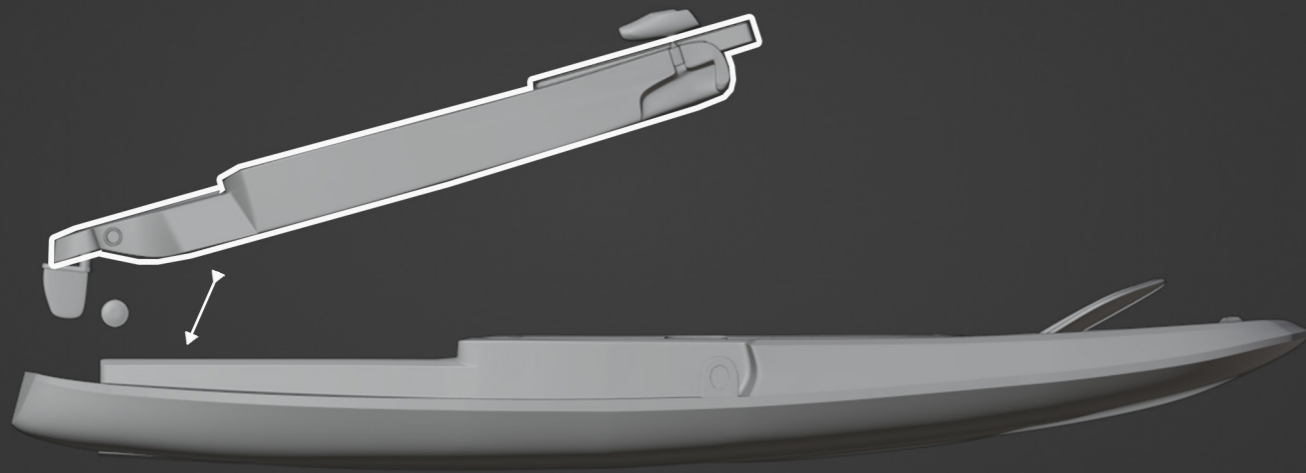


The surfboard is in its default orientation. Rider is standing up, the conventional style of surfing. Just like the other electric surfboards, in this mode the user rides the surfboard using his body balance.

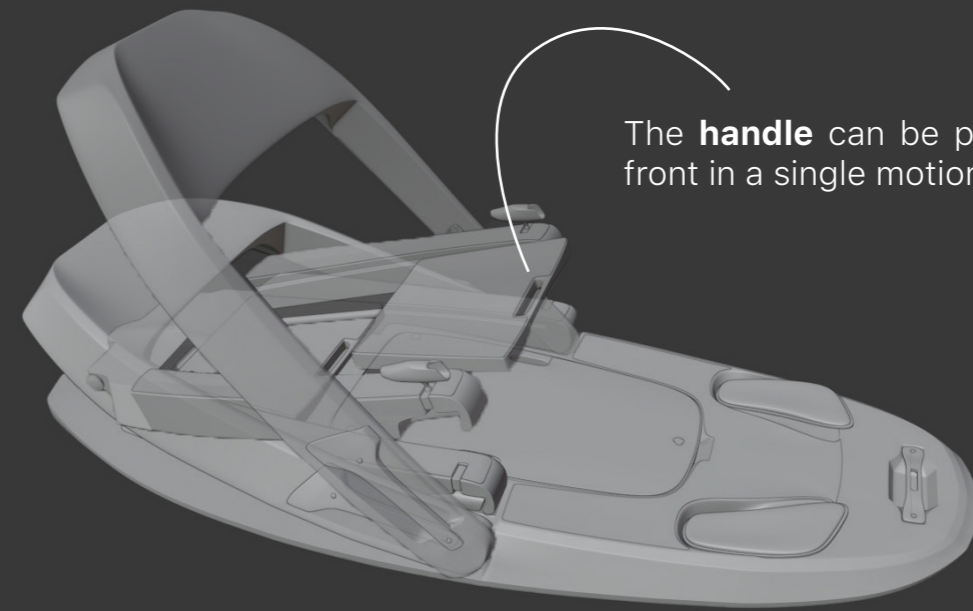


The rider rides the surfboard in a seated position in this orientation. The seat is a part of the surfboard that extends and unfolds. The transformation is between the default orientation and this orientation. Here the rider is in a relaxed position and rides the surfboard in a unique and relaxed manner. This position is found out to be the suitable one for a seated electrified surfing experience given the constraints of designing the surfboard with modularity. It is the most ideal for speed cruising as well because the inertia can have a lot of effect on the rider.

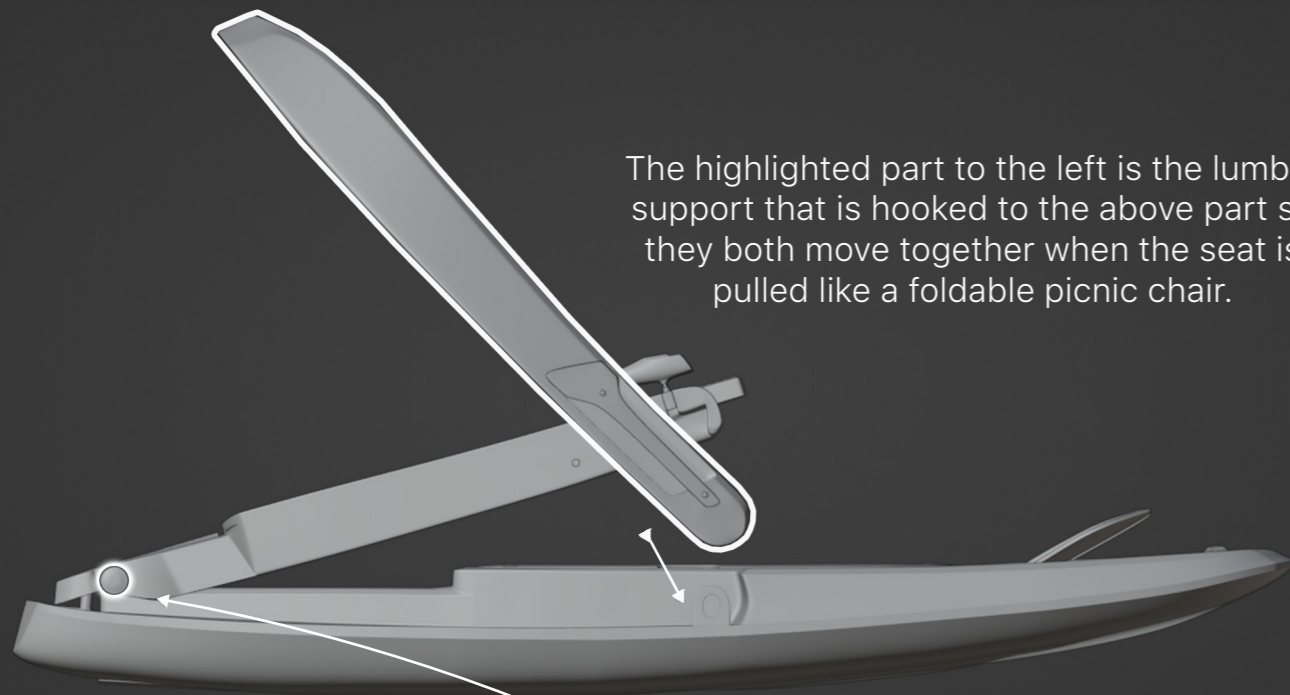




The highlighted part above is the seat that can be pulled up.

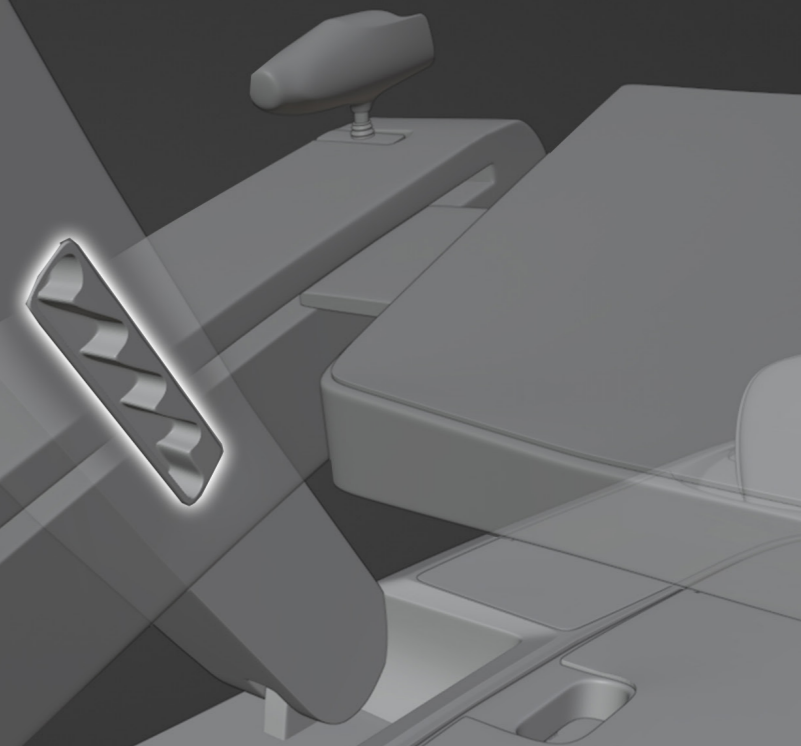


The **handle** can be pulled up and to the front in a single motion to unfold the seat.

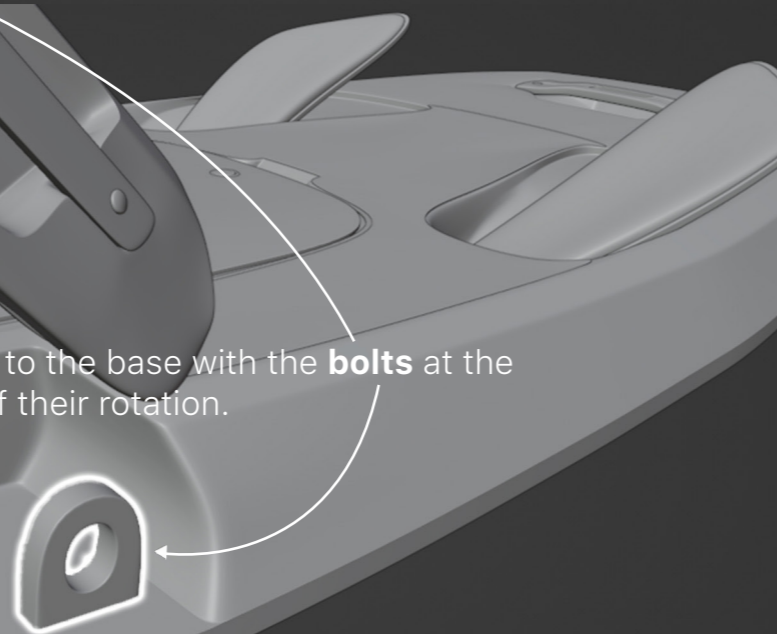


The highlighted part to the left is the lumbar support that is hooked to the above part so they both move together when the seat is pulled like a foldable picnic chair.

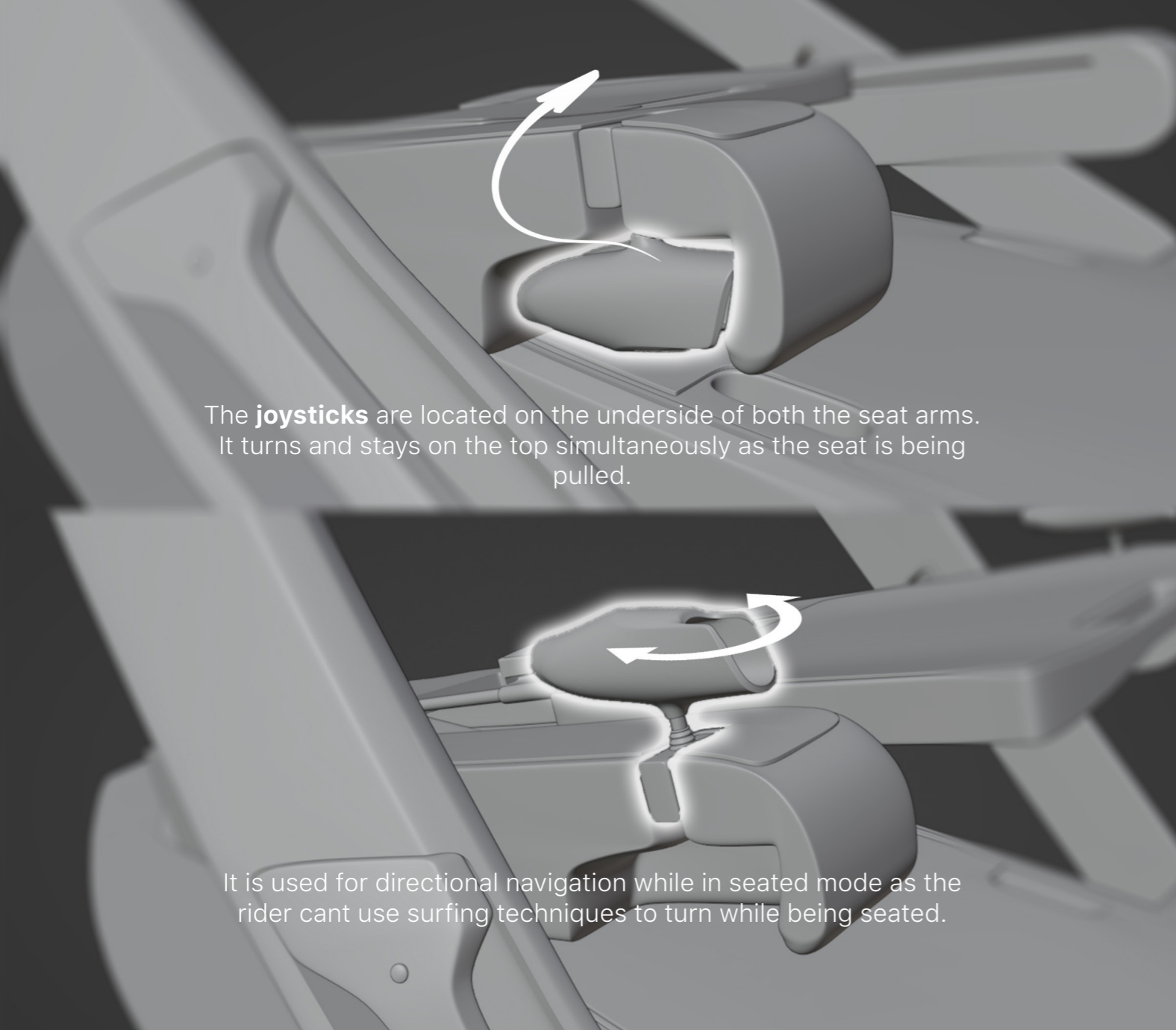
The incremental locking system on the leg part of the seat works to secure the position after the seat is unfolded.



Both the parts are connected to the base with the **bolts** at the axis point of their rotation.

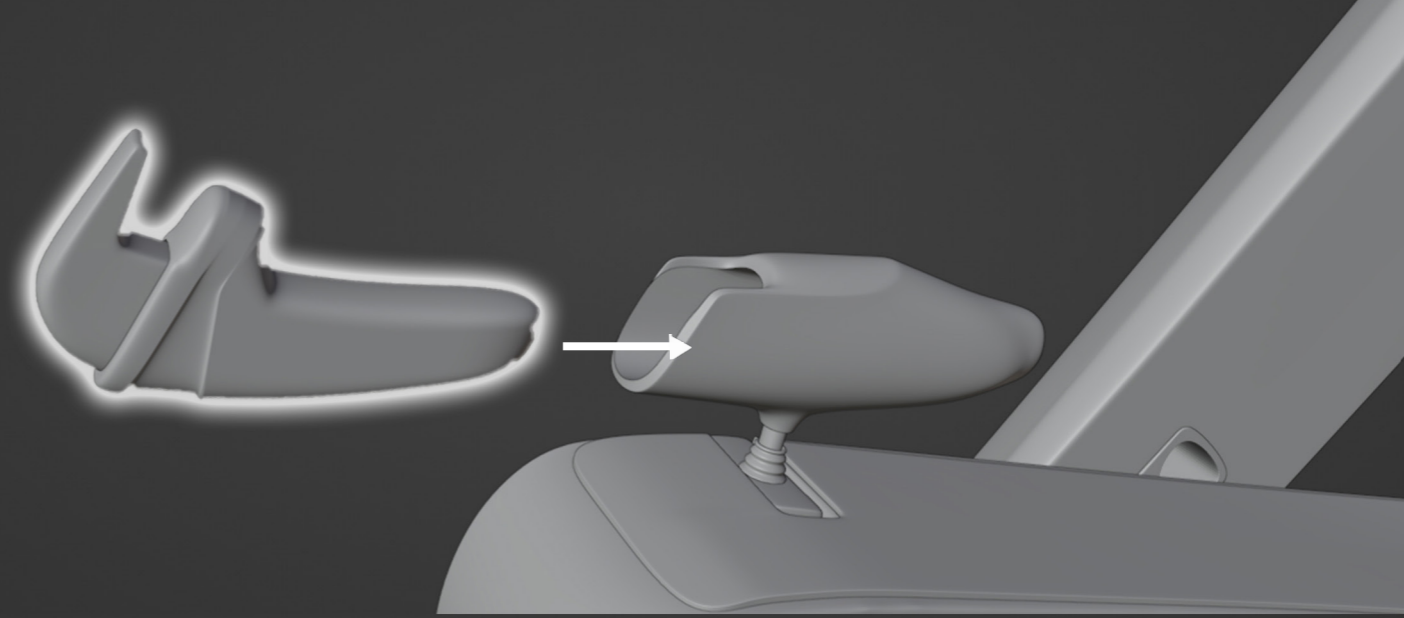


The seat locks into a secure position depending on the users preferred height with this simple lock system. Similar to the angle incremental lock system in the benches found in the gyms.



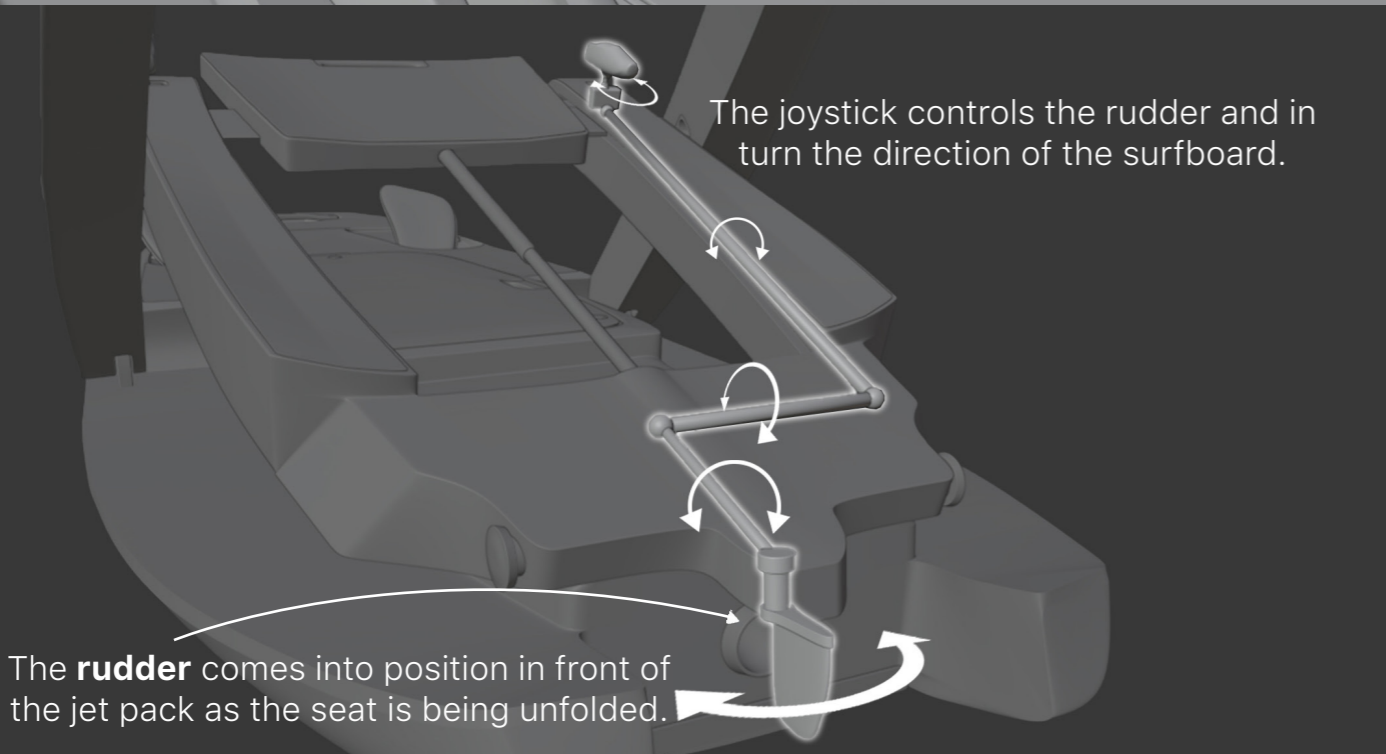
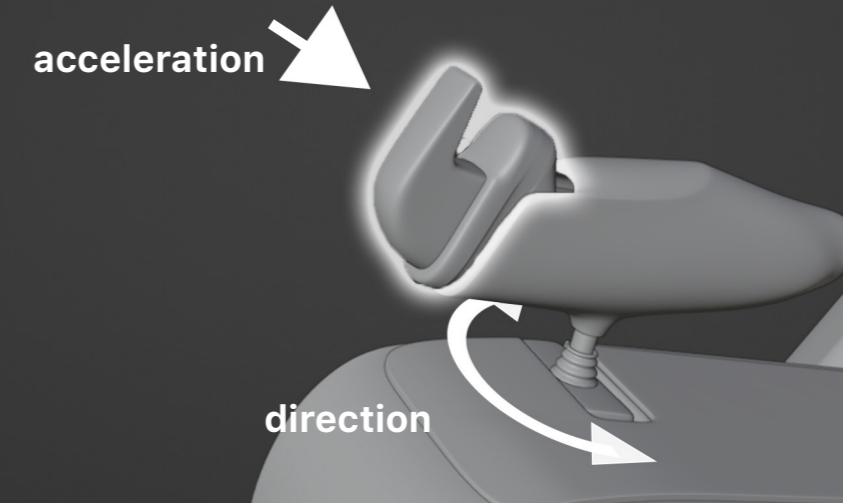
The **joysticks** are located on the underside of both the seat arms. It turns and stays on the top simultaneously as the seat is being pulled.

It is used for directional navigation while in seated mode as the rider cant use surfing techniques to turn while being seated.



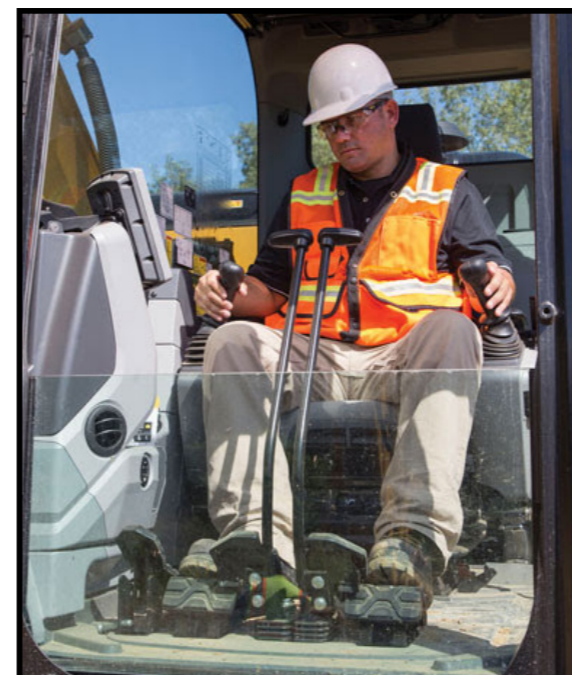
The **handheld remote** is designed for surfing while standing. The button is pushed down for acceleration.

The remote is slotted into the joystick making them function together as a complete controller for the surfboard in the seated mode.



The joystick controls the rudder and in turn the direction of the surfboard.

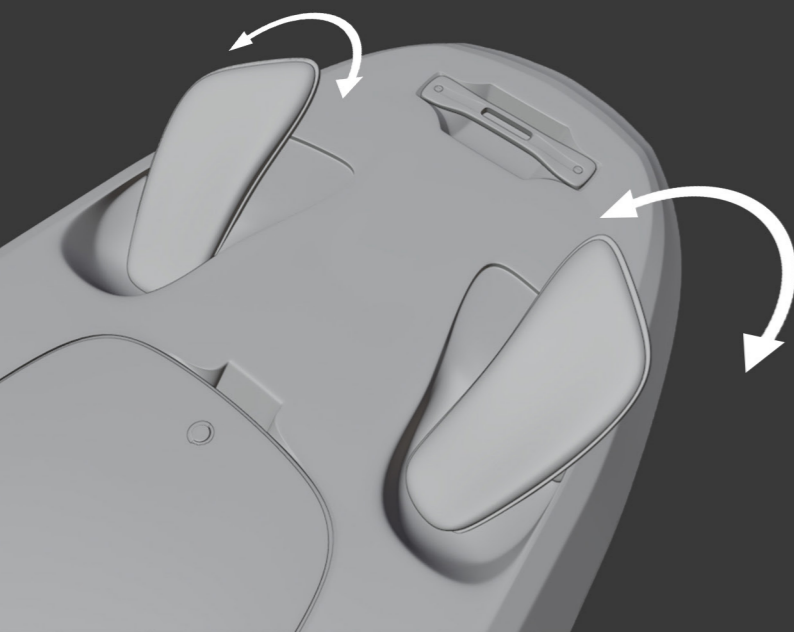
The **rudder** comes into position in front of the jet pack as the seat is being unfolded.



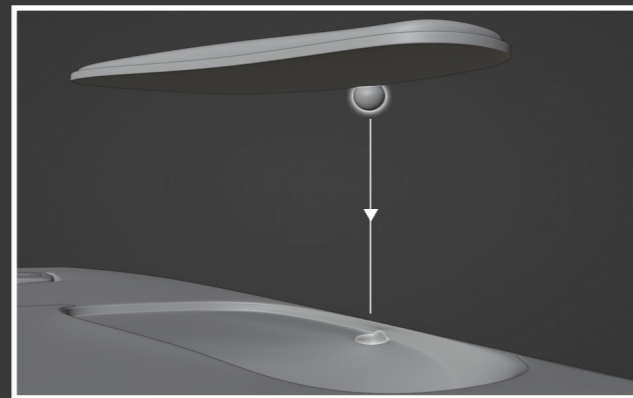
Heavy equipment operators have their controls on the either side of their seat which can be used with ease by their hands. It gives them complete control over complex machines. The idea was suggested by the senior designer from Radinn. It was a valid suggestion as it fit my design and its context.



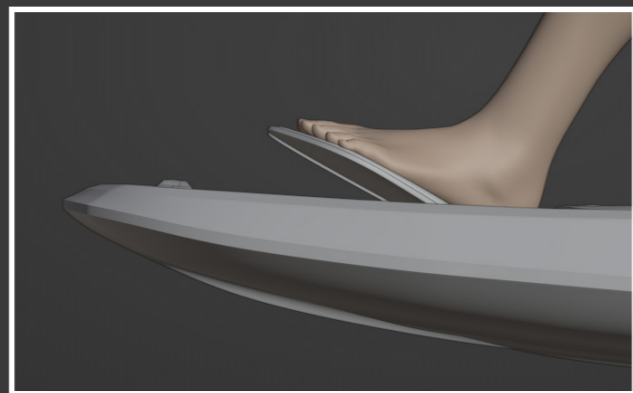
The **leg pads** on either side of the board can be spread and elevated at an angle to assist the user in the seated mode.



The pads are locked on the board using ball and socket hinge, allowing them to rotate around its limited axis



They ensure a secured seating posture by having the user's feet firmly placed as it allows for a supportive grip.



The surfboards face houses the **folded seating setup**. The surfboard transforms into a seated surfboard. The accurate design allows the transformation to be smooth.

The user can ride the surfboard standing just like a conventional electric surfboard. The user can also be seated and in full control of the surfboard in the unfolded mode. The handheld remote can be slotted onto the **joystick** for control in the seated mode.



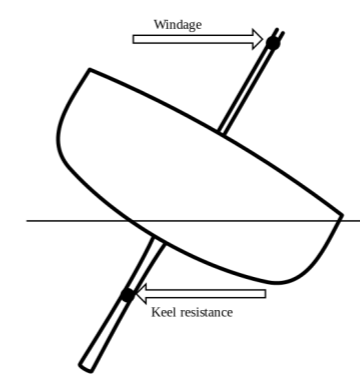


Interview with Mr. Björn Ohlson

Mr. Björn Ohlson is a 59 year old man living in Mönsterås, Kalmar, Sweden. He is a sailboat owner and has been sailing for most of his life. He is also an engineer with a lot of knowledge in repairing machines. I had the opportunity to talk to him about my ideas and even go for a ride in his sailboat. It helped me understand how floating on water works more clearly. I had better knowledge of navigation techniques and buoyancy of watercrafts after being behind the wheels for more than 5 hours.

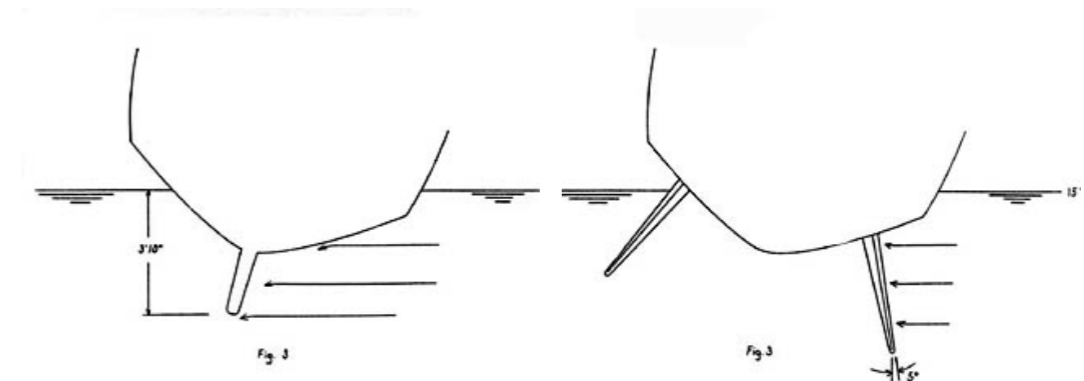


Coming to the surfboard concept, Mr. Björn convinced me the importance of using a keel.



Bilge keels to be exact. They are often fitted to smaller sailing yachts. Bilge keels minimise the draft of the vessel compared to a single fin keel thus enabling it to negotiate shallower water. Bilge keels on sailing yachts extend below the lowest point of the hull extending slightly outwards. Bilge keels are not as effective as central fin keels in preventing leeway (sideways slippage) caused by crosswinds but are preferred by many small craft owners due to their other advantages.

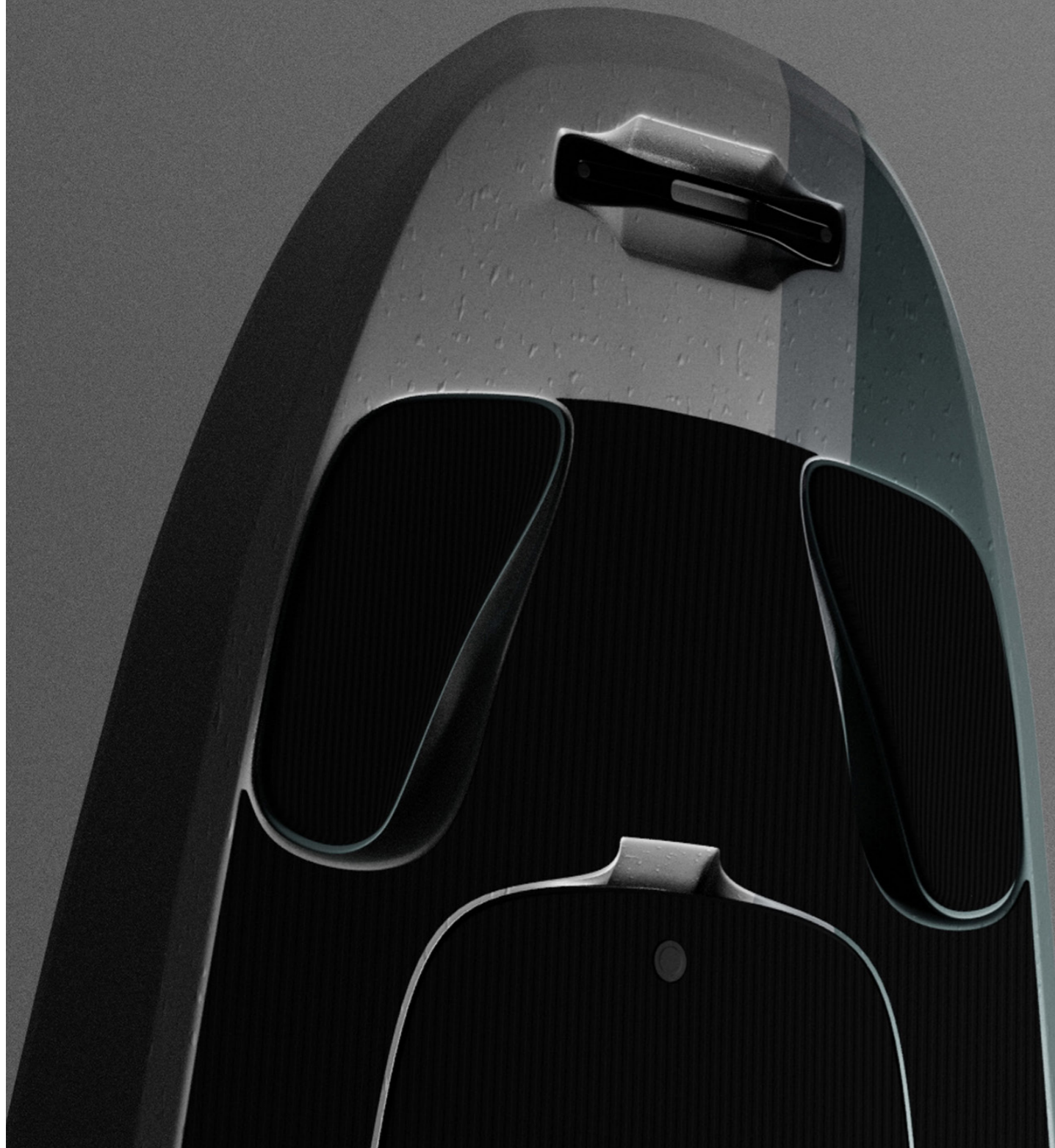
The effect of leeway on a bilge keel and a single keel boat. On the bilge keeler whose fin is still canted 5 degrees outboard of vertical, water is sliding at a sideways angle (leeway) being forced up to the root decreasing end tip loss. Also the full vertical area is being used to the best advantage in deep water. In the single keeler the effective area is lessened because of the angle of heel.



I learned that I have to adopt the usage of a bilge keel or dual fins on my surfboard design to make it stable on water. The trip to Kalmar and the time spent with Mr. Björn Ohlson proved to be vital for the development of the surfboard.

Final Model

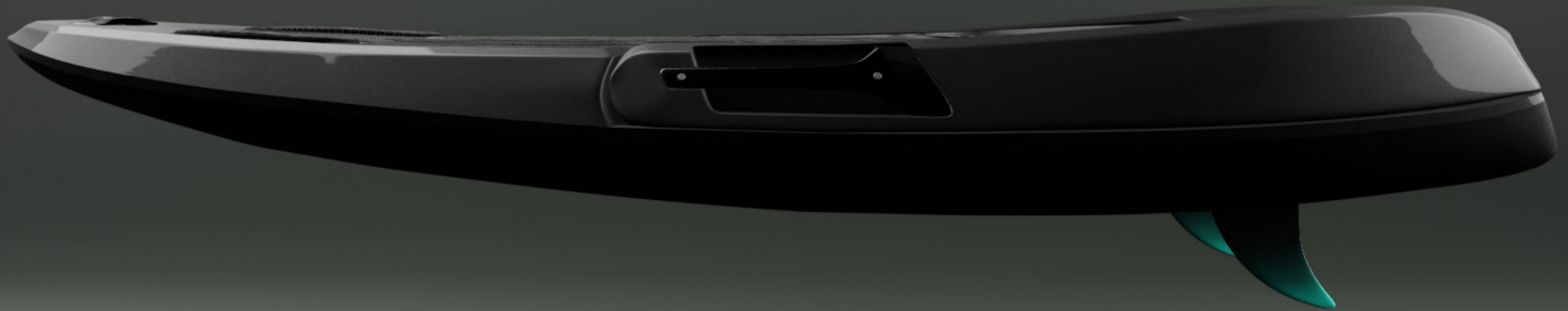
The concept was finally brought to life using CAD and renders. The goal was to explain the product and show how viable it is. To explain the technicalities and the working of the surfboard during the transformation. To show how the design of the concept follows the design language of the brand Radinn.



RANGER, next gen electric surfboards

Electric surfboards are expensive toys. They are wanted for their ability to provide unmatched fun in water. Ranger is an electric surfboard redesigned for thrill and comfort. Designed in collaboration with Radinn, a market leader in electric surfboards, the product has to offer superior service and style.

Electric surfboards are looked at as elite machines that professionals use. As sophisticated as they might look and perform, they are open and natural to use. Anybody can surf with electric surfboards.



With a durable rubber mat on the top side of the battery and the surfboard side facing up, the user can place their feet and feel the grip and control they have while standing on the surfboard. The mat is fixed on the surfboard over the foot placement area.


This thesis was mostly about getting to know the existing market for electric surfboards and predicting its future, to then be able to design a product that can assist the brand to push its boundaries and perform well in the market.




To redesign electric surfboards means to reassure its appeal as an easy and natural machine for anyone. Studying the habits and preferences of current and future riders, Ranger was designed to add more usage methods to the existing E-Surfboards. Now, the rider can choose between standing and sitting while riding these jetboards.

Ranger, the next generation electric surfboard that can be ridden in two ways on the same board. The user can stand and surf or sit and ride. The transition is smooth and the ride is fun. This encourages even the scared people to surf as now they can take it easy and ride it while sitting. The learning curve of surfing on a surfboard has been made easy with Ranger.





The user has complete control over the surfboard in the seated mode which gives them the feeling of being in control and being the one who decides what to do, which would have otherwise been an unrealistic expectation when surfing the untamed waves of the sea.



Ranger is designed for the current battery and jet-pack from Radinn. This makes Ranger a modular surfboard as it can be used along side the other surfboards from the brand.



Ranger brings people closer to water, it brings more people closer to water. Ranger is meant for everyone irrespective of their skill level.

Unfolding the seat


The goal was to make the transition between the two modes as easy as possible as it shouldn't be a trouble to do when the user wants to change. The intended situation to change the modes of the surfboard is before getting in the water. But in order to explain the easy unfolding, I used a user standing on the board to demonstrate it.



The rider locates the handle on the edge of the seat part on the face of the surfboard.



Holding the handle, the rider pulls the seat up and towards him or to the front of the surfboard to initiate the transformation.



As the seat is being pulled, the seat backrest and seat support part follows the movement. They rotate and start to form an X like shape where they are locked in the middle depending on the users height preference.




**The seat handle is used to hold and slide
the seat the front.**

The transformation is completed in a single pulling movement. To go back to the standing mode, the user simply lifts the seat and unlocks the folded seat and puts it back down.





The remote is slotted on to the joystick. The rider can now use the joystick to control the surfboard.



The cushioned foot padding is ready to help the rider feel secure in the seated mode. The rider has a comfortable position along with some support from the leg pads.

The rider is surfing, while seated!



A new way to scale the water bodies.
Ranger has its users surf their own way.





**Portability and Utility, the two key factors
behind Ranger.**



RANGER SURF YOUR WAY

RANGER NEXT-GEN E SURFBOARDS

FROST



CARBO



RANGER SURF YOUR WAY
THE NEXT-GEN E SURFBOARDS



THE RADINN FAMILY



Ranger, comes in two themes, fits the product line of Radinn as the beginner board. Frost is the bright colored Ranger and Carbo is the dark colored Ranger.

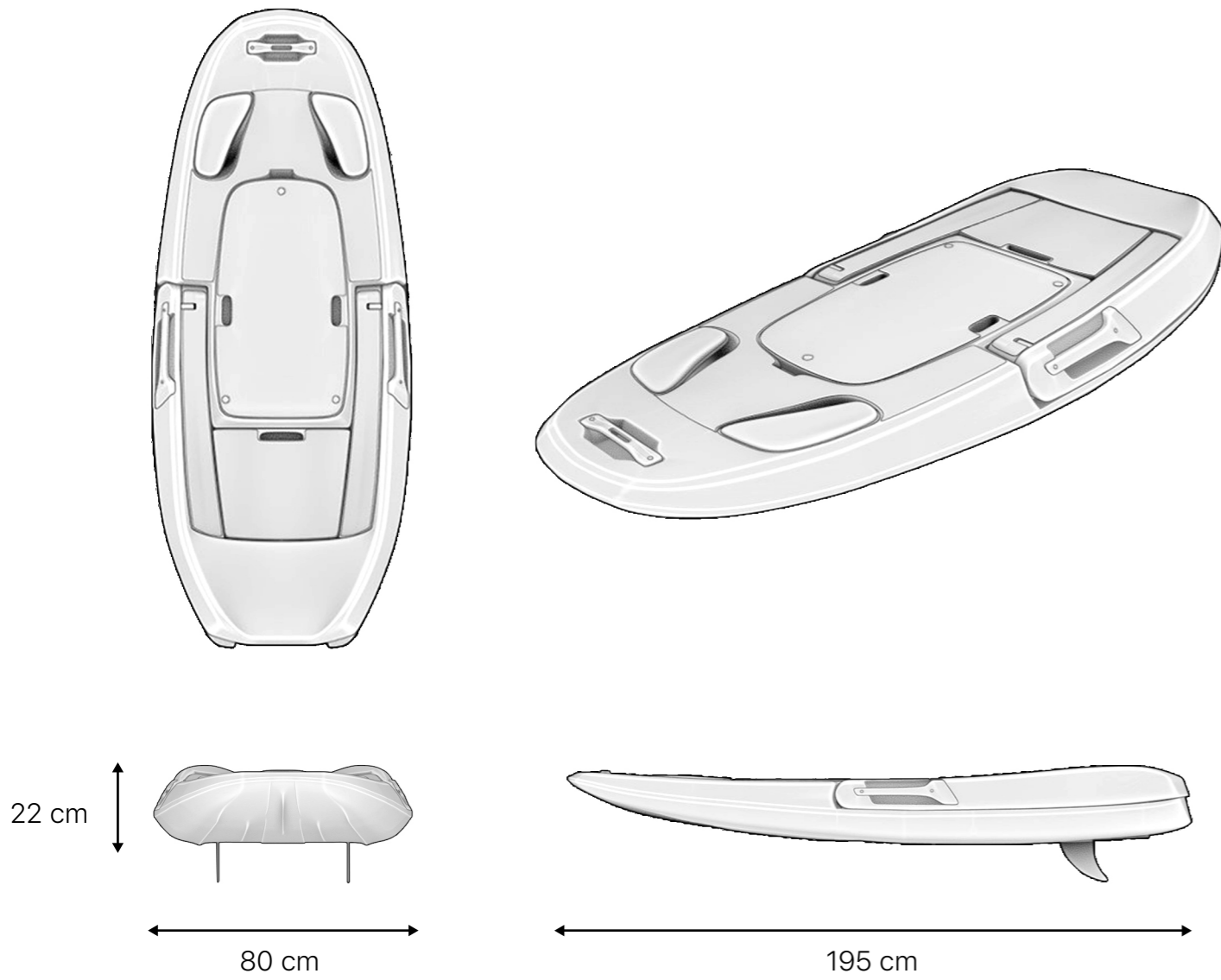
The rider becomes a ranger, they can patrol the waters with dominance as Ranger gives them the advantage.





Dimensions

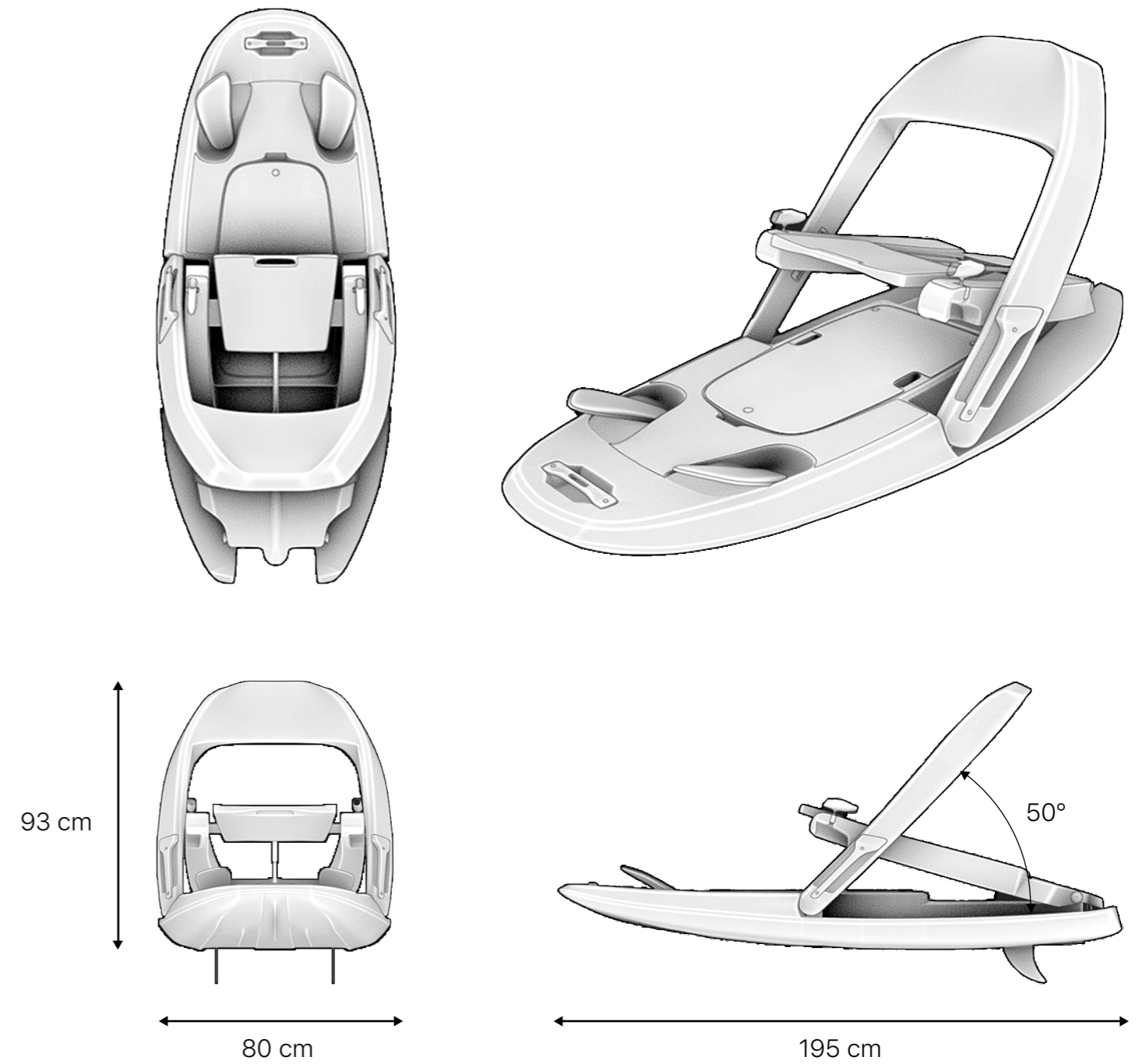
Ranger, default mode



*based on bounding box measurements excluding the fins

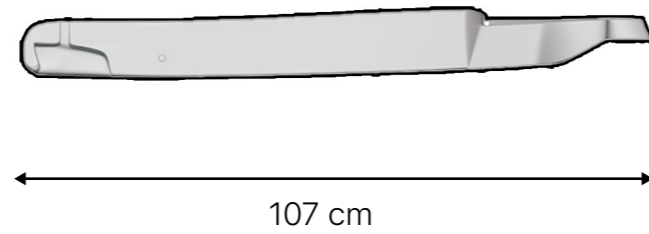
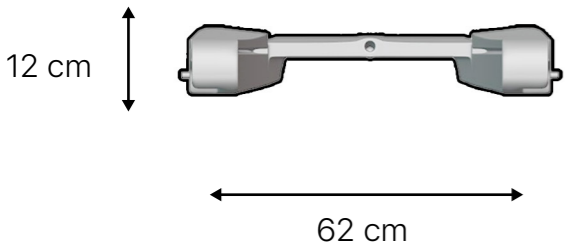
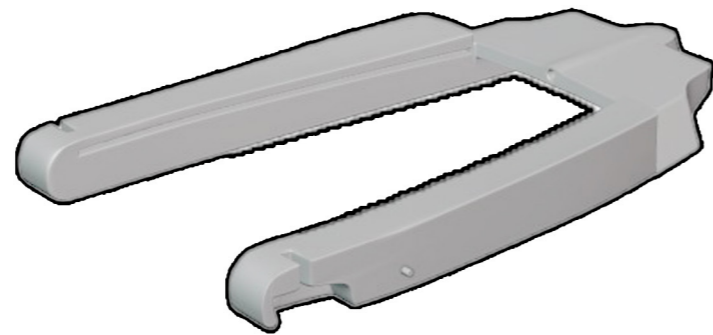
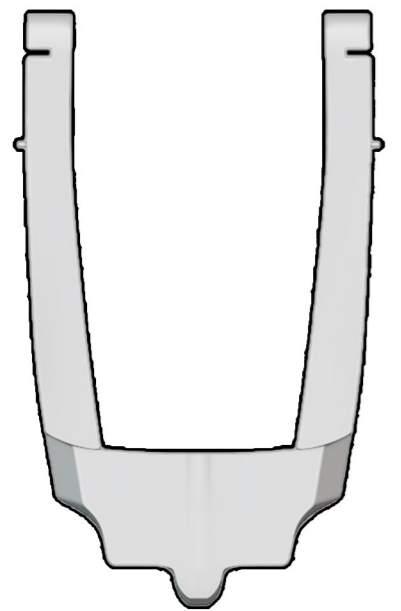
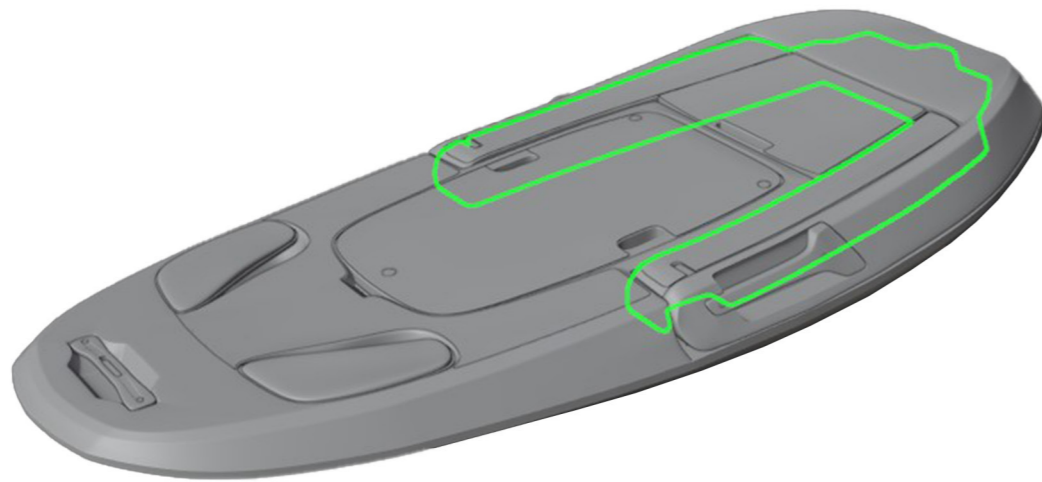
Dimensions

Ranger, seated mode

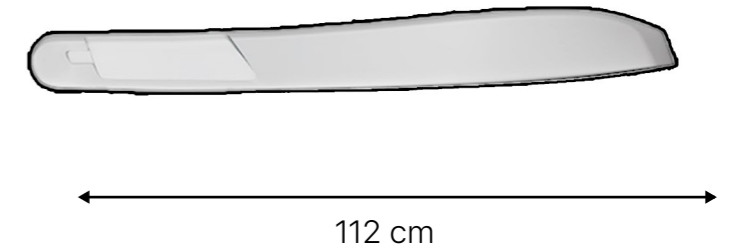
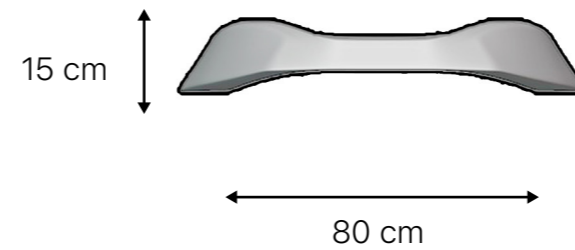
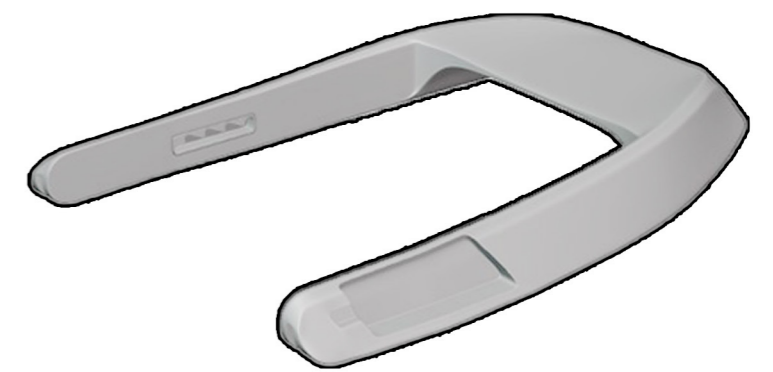
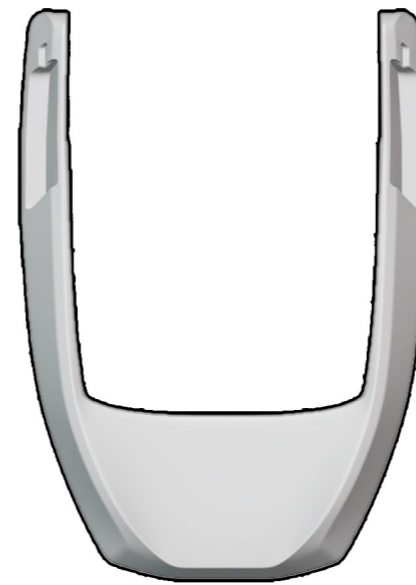
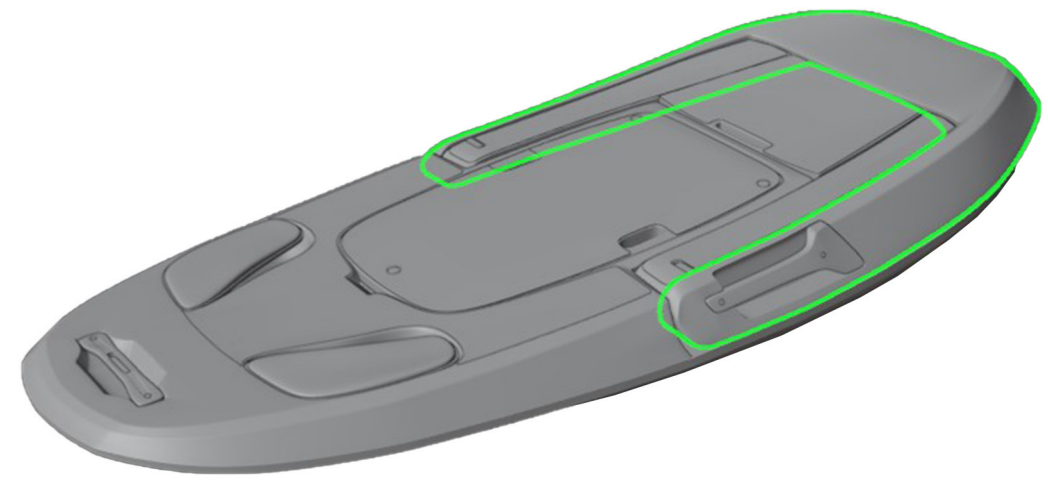


*based on bounding box measurements excluding the fins

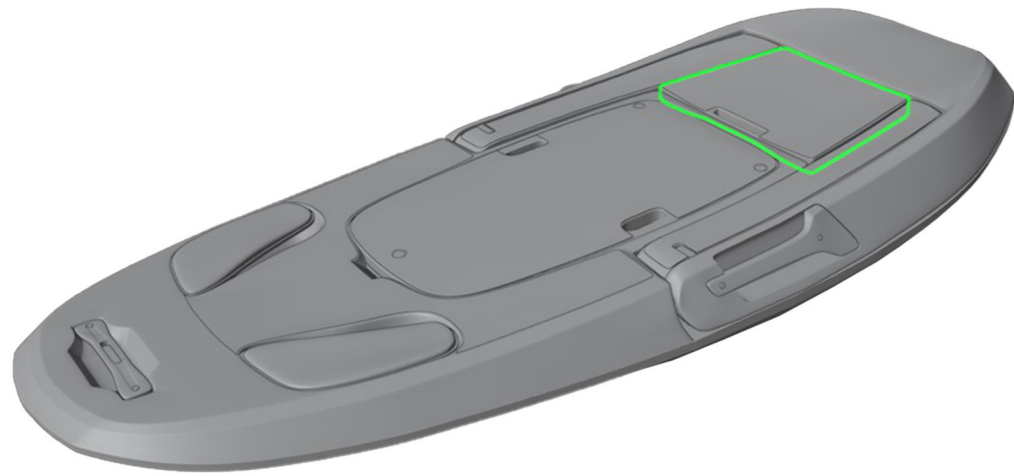
Dimensions of the bottom seat base part that is part of the seat setup.



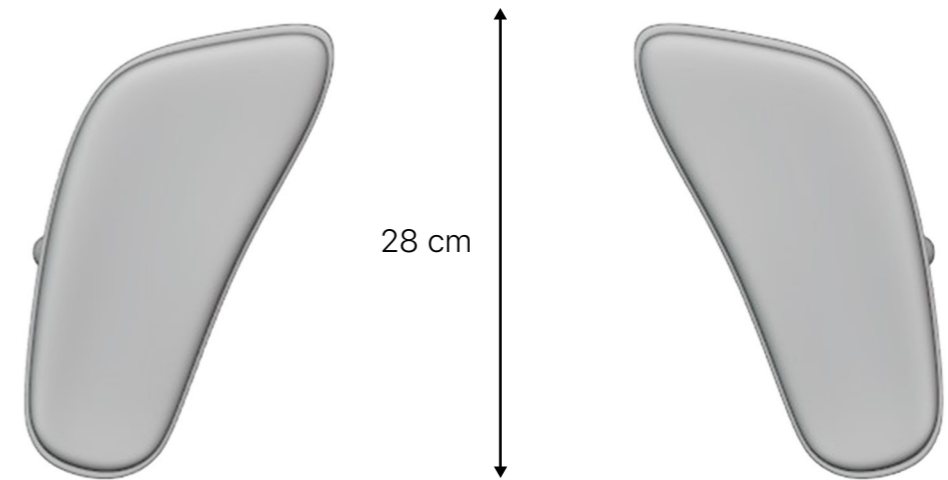
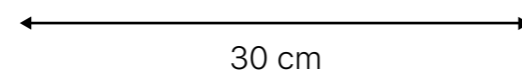
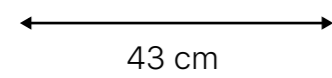
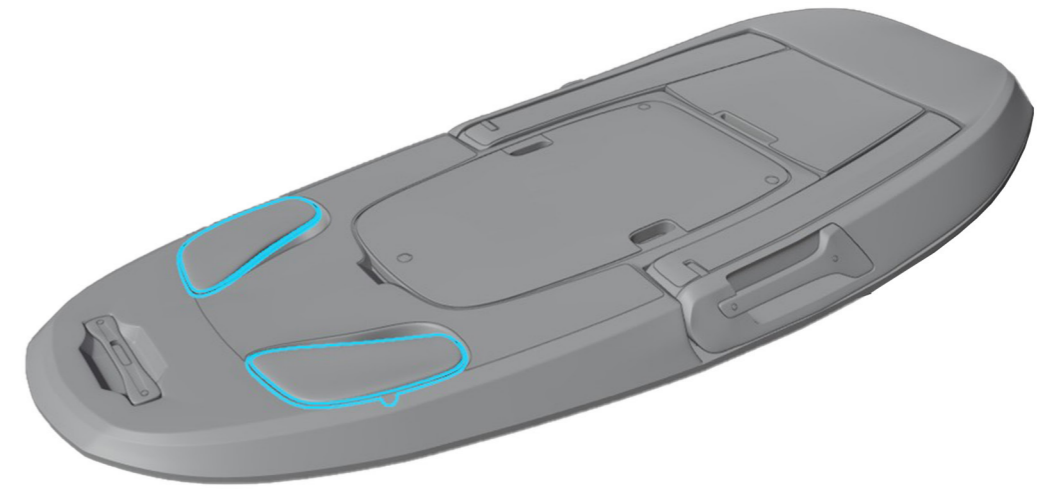
Dimensions of the backrest part that is part of the seat setup.



Dimensions of the seat.



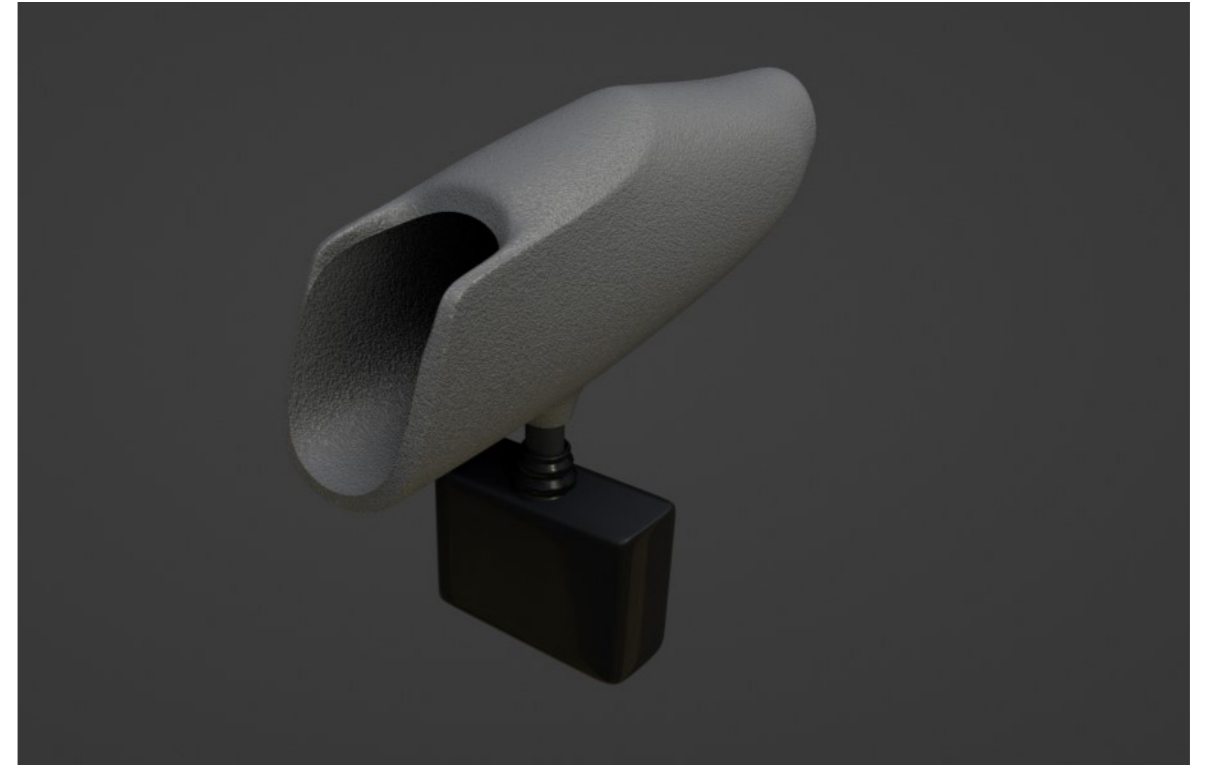
Dimensions of the foot pads.



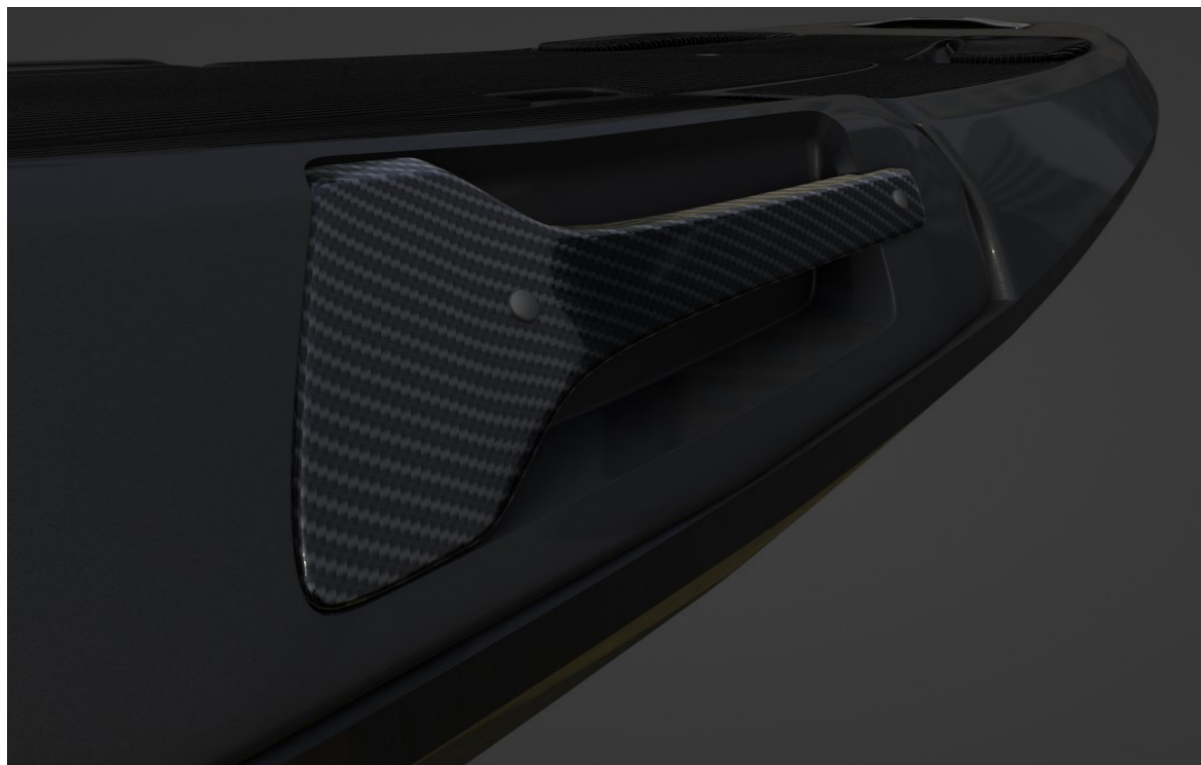


Handles made of Carbon fiber. Fixed using stainless screws.

They are mainly used for transportation of the surfboard, but they can also be used as a grip while surfing.



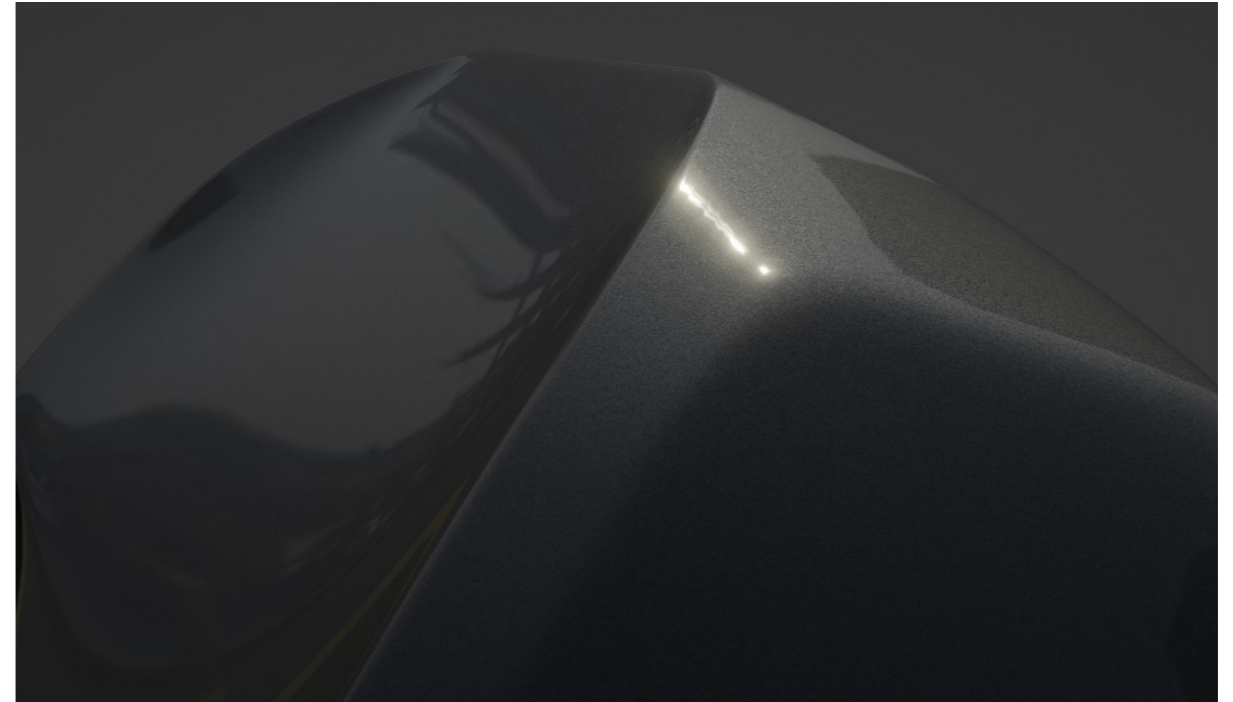
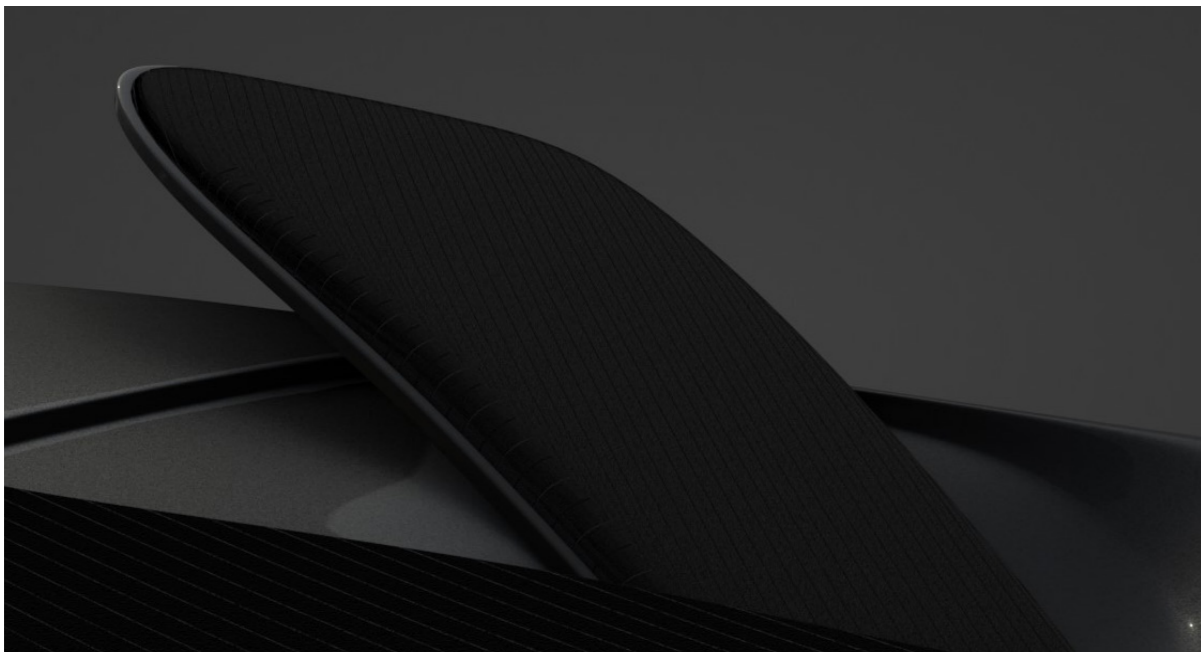
Ergonomic Joystick made of vinyl foam, these grips insulate and cushion vibration. They are grooved to conform to your fingers for a comfortable, secure grasp.





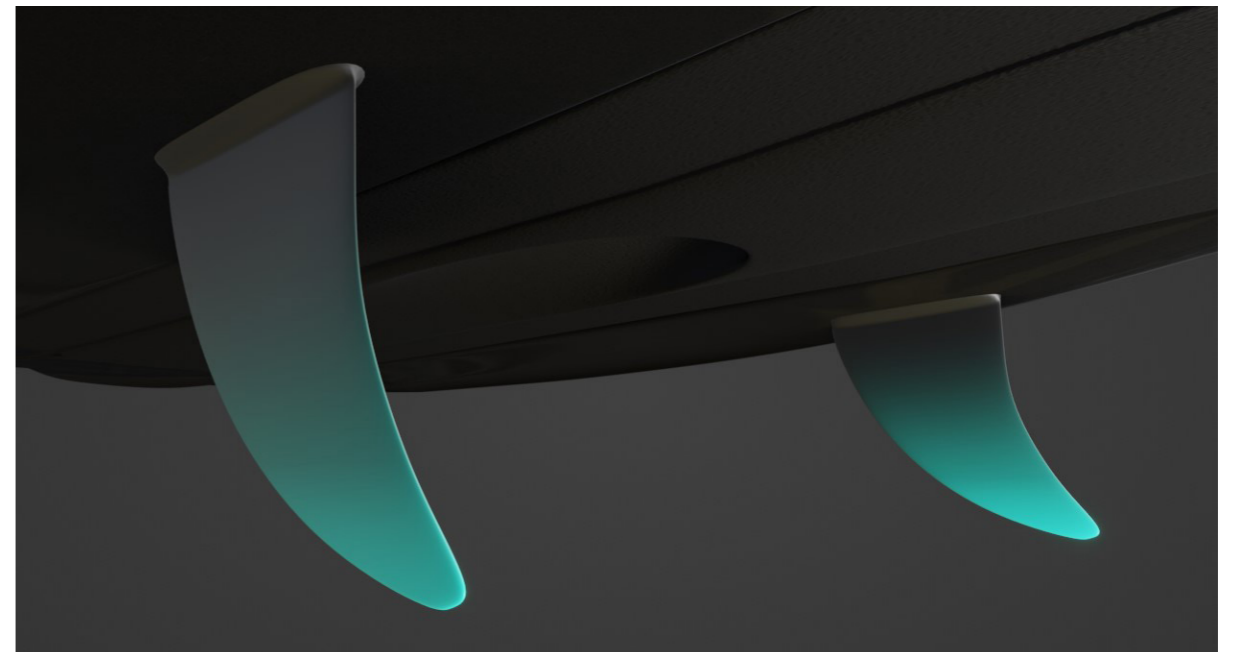
Water proof rubber mat made out of recycled rubber waste for extra grip and traction.

The foot pads are fitted with cushions inside for comfort.



The main body is ideally made using a polycarbonate material. However, recycled plastics are an interesting option.

The fins are made using fiberglass.





Interview with Alice Occhilupo

Alice Occhilupo is a Supply Chain Capacity Strengthening Officer of the United Nations World Food Program. She is pursuing a Master in Disaster Risk Management and Climate Change Adaptation (DRMCCA) at Lund University. She is also an occasional surfer. As a DRMCCA student she is concerned about the negative impact of any new product on the environment and how it affects human wellbeing and health.

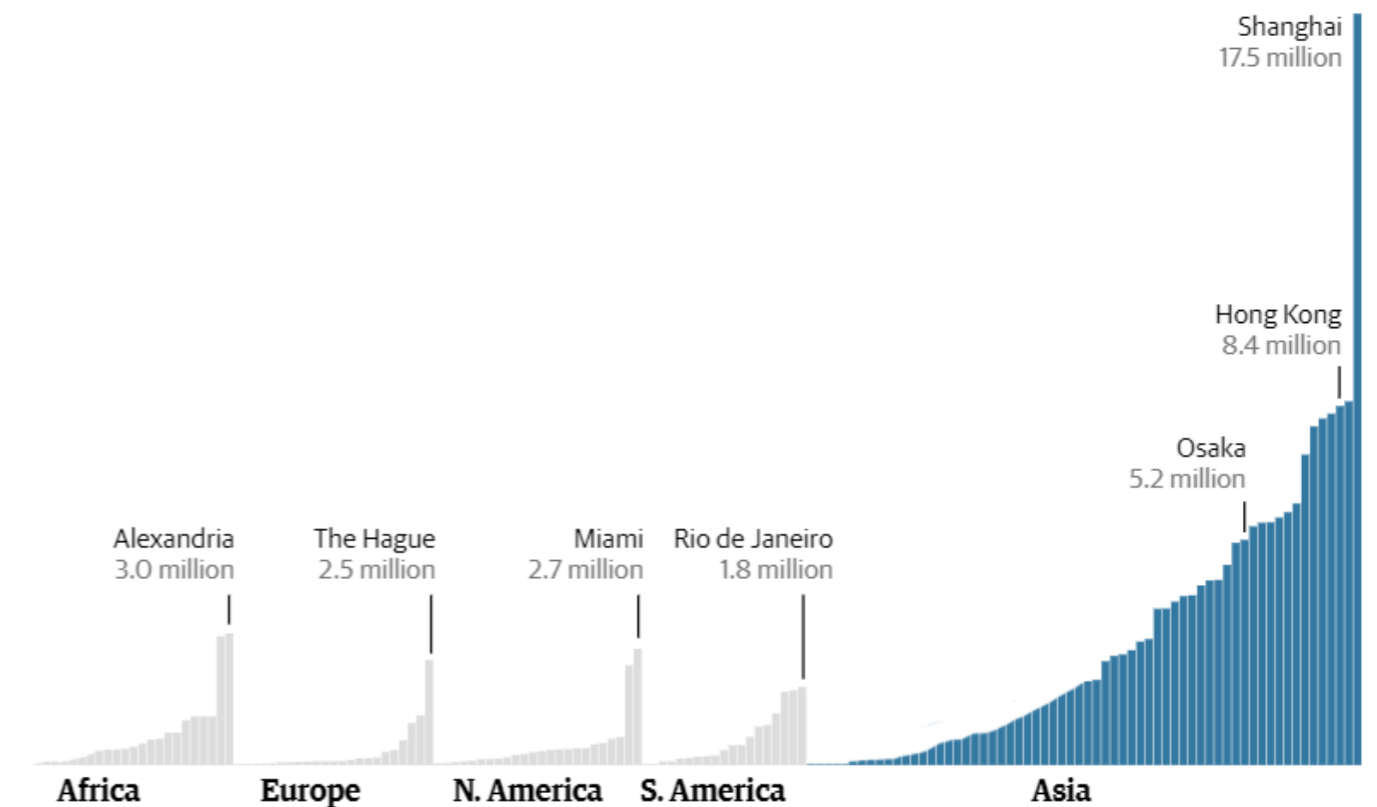
I had the opportunity to discuss with Alice about the surfboard project in depth. This meeting had a large impact on the outcome of my project as it made me look for ways to bring sustainability into the development of the concept in a realistic and practical way.

"I lived for four months in Venice but never used the gondolas. Walking through a tourist packed Venice is the most annoying"

Coming from Italy, having lived in Venice for four months, Alice was able to imagine and understand the impacts it would have in a city like Venice. The traditional rowing boats in Venice (gondola) is used only for tourism. Every other purpose depending on water based transportation is carried out by diesel engine boats causing pollution to the water.

She told me how hard it was for the local people to move for work or other daily activities as the city is filled with tourists. Thus the need for a better transportation system was what caught my attention. To use the electric surfboard in its seated mode can serve as a transportation unit in Venice. It is a sustainable and portable alternative.

With the increasing temperature and the resulting increase in the sea level poses a threat to all the coastal cities in the future. Future sea level rise could lead to potentially catastrophic difficulties for shore-based communities in the next centuries: for example, millions of people will be affected in cities such as Miami, Rio de Janeiro, Osaka and Shanghai if following the current trajectory of 3 °C at 2100. When the cities are flooded with shallow waters due to sea level rise, one of the ways to tackle it is by using water transportation. Being electric and portable is a bonus as it makes water transportation sustainable and effective.

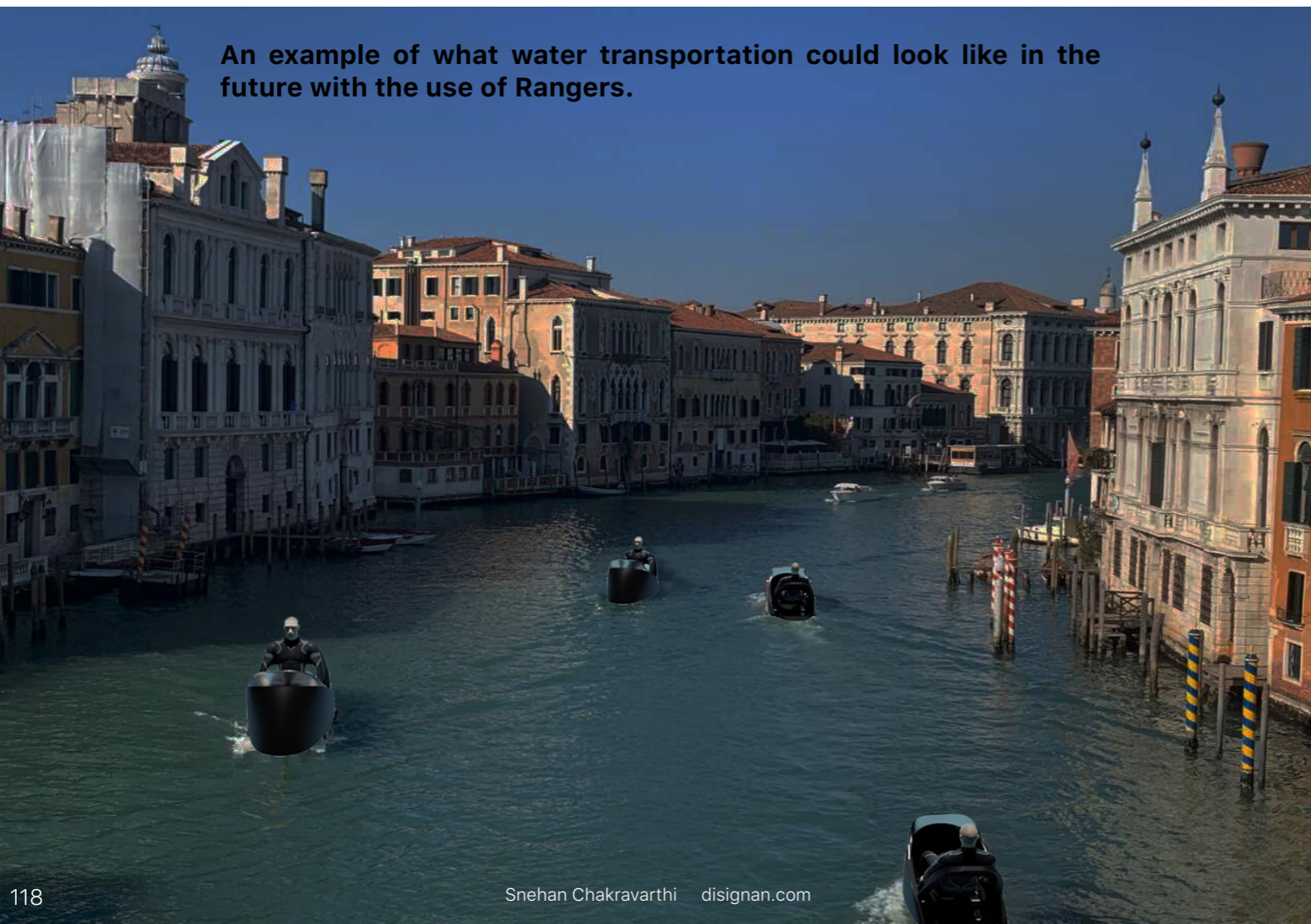


This graph shows about the three-degree world at 2100: the cities that will be drowned by global warming and the number of people that will be directly affected by the flooded cities due to global warming. (The Gaurdian, 2017)

Both the idea of using Ranger as a transportation unit in Venice and the fact that sea levels are rising led me to consider an iteration or development of the concept for the future.



For the future, Ranger can be designed to have a foldable water shade in the front to protect the rider from the splashing water during a ride. This can be used as a slower yet sustainable alternative to Jetskis.



An example of what water transportation could look like in the future with the use of Rangers.

Alice was aware of all the impacts a product like my proposal could do to the nature and she was also equipped with knowledge on how to make a product with less negative impacts. We talked about this and I learned new ways to be eco friendly.

Further into the discussion, I heard Alice saying about an environmentalist that built his own island from recycled plastic bottles. This inspired me to look up at plastic waste in the ocean. Recycled plastic from the ocean can be used to make the surfboard was the new idea.

From sunglasses to skateboards, the array of products being made from recycled ocean plastics is growing so rapidly.

Though the Ellen MacArthur Foundation and the World Economic Forum make claims suggesting that by 2050 there may be more plastic than fish in the sea, we can't exactly count all the fish in the sea. What we can roughly gather is how much plastic we continue to produce, which, according to a report by PlasticsEurope, totaled about 384 million tons in 2018 alone (up from about 369 million tons in 2017). (The New Plastics Economy: Rethinking the Future of Plastics, 2016).

The good news is that, with all that plastic afloat in the ocean, we can probably stop making more products. There are organisations that are working to collect and recycle the mounting number of plastics already in our waterways. This made me realize the potential a surfboard could have if it was made with recycled plastics from the ocean. This was the birth of the idea of using recycled plastics to make the surfboard.



(Corona raise awareness for marine plastic pollution, Business Wire, 2018)



Made using recycled plastic from the ocean,
Ranger is a statement to the world.

**To bring everyone closer to water.
To feel happy as they are close to water.
To show them how much they have polluted the water of our planet.
To help them rethink in a sustainable way.**



Reflection

When I started the two-year Master Program in Industrial Design, I was new to the field. I had a Bachelor Degree in Information Technology and I doubted if I had enough skills to be a part of this design program. It was exciting and at the same time it felt uncertain. I realized early that it only takes small and consistent efforts from my side to overcome that.

Since then, it has been two years and I have presented my final thesis. When I look back, I see that I have learned new things related to my career as a designer and also my life as a person of this world. When I was doing the master thesis project, I was in control of myself, the first time I felt like this. I was confident and knew I can deliver what was expected of me.

Designing a surfboard that works requires understanding of non-design related knowledge like fluid mechanics for example. Making them electric powered and remote controlled is complex. But with the task of just designing for the craft led me to be more creative. The result was a product with intricate engineering and mechanics, I could only implement them when the design was right. This was challenging, but now I can tell that an engineering mechanism can be simplified and made efficient with appropriate form and design, increasing the functionality of the product.

To work in collaboration with a company showed me that it is important to consider the opinions of other people involved in the project. I had to adapt to this new style. I feel more of a team player now than I was before and I believe it is good for my future as a designer. When I was questioned about the validity and impacts of my project by the jury I feel amazing as it had them filled with questions and suggestions, I could only see and cherish the interest they showed to my work. To gain the trust and approval from exceptional designer is a dream for any designer.

The thing that makes me most happy about this project is that I had developed the skill to learn fast. I wanted to work with a certain cad software and I sat down several nights learning it all by myself. It was the most fun and the memories that I will take from here. I was foolish to believe that at some point you can stop learning and I am thankful now to have found a new passion in wanting to learn new things. That is for me the biggest reflection from the project, and the Master Degree.

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