

Project 1: Form Design of a PWC for Samudra Shipyard Ltd.



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DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ACKNOWLEDGEMENT

I would like to sincerely thank Mr. Unni Mohan, Dr. S. Jeevan (CEO of Samudra Shipyard) and Arun Sir of Samudra Shipyard Ltd., for their valuable guidance throughout the project.

I would also like to thank Professor Nishant Sharma, for helping out with the project assessment from the very beginning.

And last but not the least, I would like to give a big heads up to my classmates and Samudra Shipyard crew members for their unconditional support and crazy ideas throughout this journey.

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INTRODUCTION

PROJECT BACKGROUND

Samudra Shipyard (P) Ltd., located around the backwater Kollam-Kottapuram Waterways.

The project assigned was to design a new form for the deck of a water-scooter/micro-boat made by Samudra Shipyard. The project in its initial stage had three factors linked to it, namely - not altering the hull of the boat, changing the propulsion from the outboard engine with an inboard engine with jet propulsion and a sporty character sitting a pillion rider with adequate storage space for freebies and life jackets.

After going through and studying the water-scooter that Samudra Shipyard makes, a brief study on an existing Yamaha Jet-Ski was done. The Jet-Ski that was in the shipyard is a Yamaha SuperJet. It is categorized as a PWC (Personal Watercraft).

What is a PWC? Where does it stand in the market? And how does Samudra plan to implement it in the market?



A personal watercraft (PWC), also called water scooter, is a recreational watercraft that the rider sits or stands on, rather than inside of, as in a boat. PWCs have two style categories. The first and most popular being a "sit-down", where the rider uses the watercraft mainly sitting down

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and typically holds two or more people. The second style is a "*stand-up*", where the rider uses the watercraft standing up. The *stand-up* styles are built for one rider and is used more for doing tricks, racing, and are used in competitions. Both styles have an inboard engine driving a pump jet that has a screw-shaped impeller to create thrust for propulsion and steering. They are often referred by the trademarked brand names Jet Ski, WaveRunner, or Sea-Doo. Most are designed for two or three people, though four-passenger models exist.



The Jet-ski market is prominent in coastal regions of India. Some of the popular beaches such as Colva Beach, Goa; Candolim Beach, Goa; Alibaug, The Elephanta Caves, Ranagiri and Ganpatipule, Maharashtra, Kovalam Beach, Kerala house a wide range of Jet-skiing experiences through Tourism modes to the customers.

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The downside of the PWC in India; all the trusted brands are imported, which makes it expensive for the PWC to be brought to our shores. On average, a '*stand-up*' Yamaha Jet-Ski can cost the importer back by 14 lakhs including all legal duty charges.

This is where Samudra Shipyard plans to target the market. Through years of experience and research in watersport business, manufacturing of a Jet-Ski by Samudra Shipyard and bringing it to the mainstream market at a cost of around 5 lakhs is highly viable. Once the project receives the green signal, Samudra Shipyard plans to roll out batches of its PWC and depending on the demand, can vary the production accordingly.

BACK IN SAMUDRA WORKSHOP

The *SuperJet* is a stand-up PWC. Part of Yamaha's Waverunner line of watercrafts, it was introduced in 1990 and has become one of the most popular stand-up PWC in history.



Yamaha Waverunner SuperJet

Powering the SuperJet is an inline two-cylinder, two-stroke engine. The jet propulsion part is located at the bottom end of the hull and the

steering is cable connected. As it is jet driven with cable connection, the steering and maneuvering of the PWC is extremely easy and nimble, unlike Samudra's current Water-scooter which has an outboard engine, the steering needs an ample amount of physical energy to make quick turns. And for a newbie, it could even be termed staggering amount.



Samudra Shipyard's Water Scooter

Next, further study on various other PWC from around the globe – There are major automotive companies that produce PWC, among the highly notable ones are Seadoo, Kawasaki and Yamaha.

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As the project progressed, studying the hull dimensions, two key elements were noticed. Firstly, the ergonomics, i.e., the stance of the new form has to be comfortable yet sporty as it is a two seater, meant for moderate aggression/speed. Not an outright stunt performer like the available Yamaha SuperJet's character. Secondly, touch and feel elements for handlebar, floorboard and seating. But the status of the engine and the jet propulsion was still in a premature stage. Decision regarding whether to use a Hyundai i10 1.0 Lt engine or a Maruti Suzuki Esteem's 1.3 Lt engine be used in the water-scooter was undecided. This was a critical set-back as the engine dimension and the jet drive propulsion, together forming the drivetrain is an area of study and packaging which would play an important role in the form study of the PWC. There was another scope of using a high revving single cylinder engine to be imported on contractual basis. This would eliminate all legal issues such as engine number, batch number, manufacture date, etc. Also the size of the proposed engine would be smaller and lighter in weight, thereby consuming lesser space making it compact in packaging. Even though the inside of the Jet-Ski was in a premature stage, but a general idea on the form for the water-scooter could still be explored.

BENCHMARKING THE JET-SKI

As mentioned, Seadoo, Kawasaki and Yamaha hold the top spot in popularity ratings. So needless to say, in terms of styling and packaging, Samudra Shipyard's Jet-Ski had to be benchmarked among the aforementioned jet-ski manufacturers.



DESIGN BRIEF

Design the deck of water-scooter/Jet-ski for two seater mode by Samudra Shipyard Ltd.

Target Users

Aimed at the youth as well family, the Jet-Ski has to look sporty yet honest to its origins.

Genre

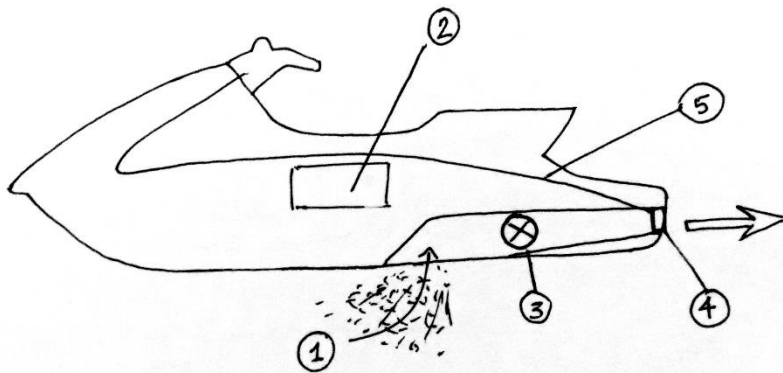
A 2-seater sporty character, with freedom for an aggressive posture. The new design should make a statement of its own.

Package

Must have storage compartments as customers often tend to take breaks and head for a snack or two.

TECHNICAL ASPECTS OF A JET SKI

PWC - Personal Water Craft



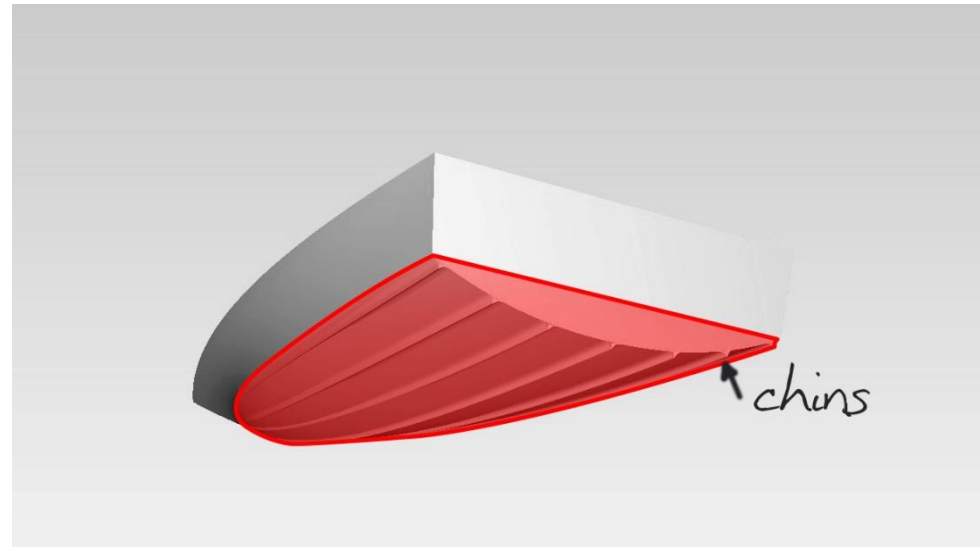
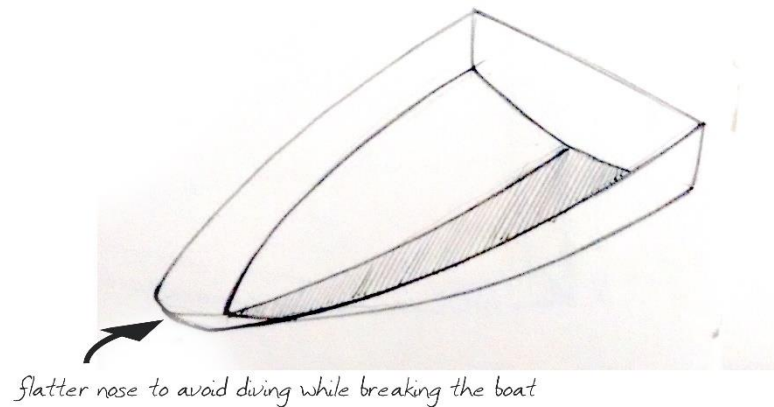
Schematic diagram of a basic Jet-ski (PWC)

1. Water is sucked in through a large intake grate on the bottom of the craft/hull.
2. Power is provided by a medium-sized gasoline engine.
3. The engine's job is to power the impeller (water pump). An impeller is like a propeller fitted completely within a pipe so it sucks water in at one end and blows it out of the other end as a high-speed jet.
4. The water exists through a steerable nozzle. It is somewhat smaller than the water intake – helps build up the water speed.
5. The steering swivels the water jet accordingly.

DESIGN CONSIDERATIONS

Design Constraints

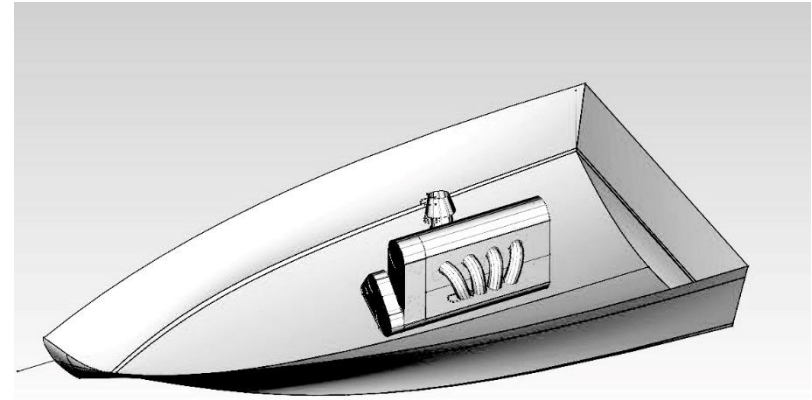
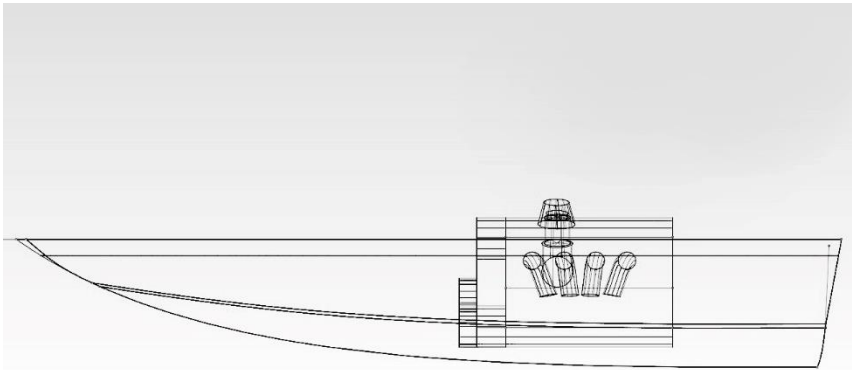
One of the factor which plays a vital role in designing the hull are the rail styled lines on the bottom of it, called as '*chins*'. Since the design was made by years of experience by trial and error test by Samudra Shipyard Ltd., it was decided to use the existing hull itself for this project. Henceforth, the design of the hull was a constraint. The deck has to be designed over the existing hull.



All the following forms were drawn keeping in mind the dimension and proportions of the hull. The constraint was to play around the chins of the hull without disturbing them.

Technical Considerations

As mentioned, weight has to be at the back of the boat so as to avoid diving. Any additional storage space must be thought over to not alter the weight distribution beyond the danger limit.



The engine is placed at the back of the hull in order to avoid diving of the boat.

Also, there needs to be a certain height of 150 mm between the engine sump area and the floor of the hull.

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Freedom in Ergonomics

Since this is to be used by both youth and family, freedom of ergonomics was an important and interesting area to consider.



As we can see, even in a single seating seat design, the rider refers to have different posture according to her/his mood.

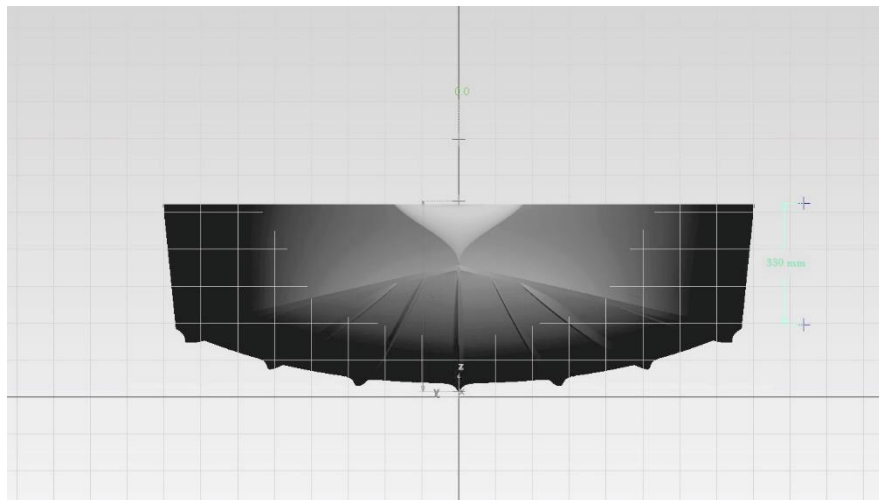
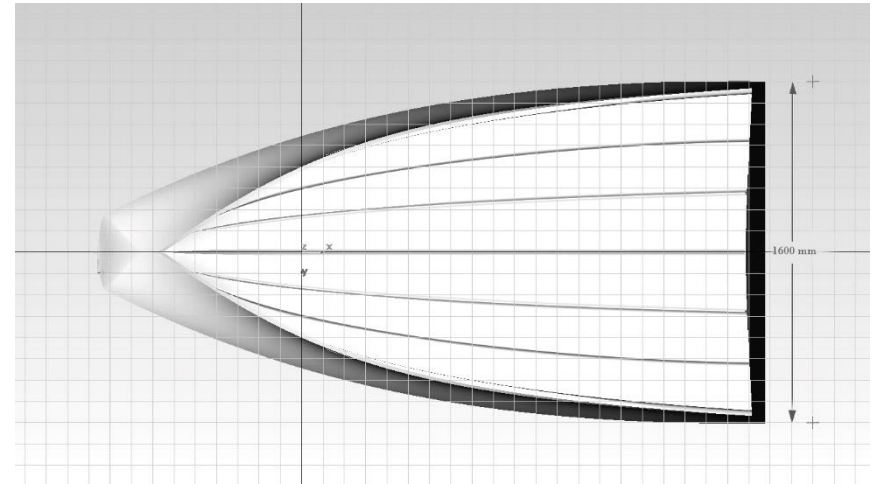
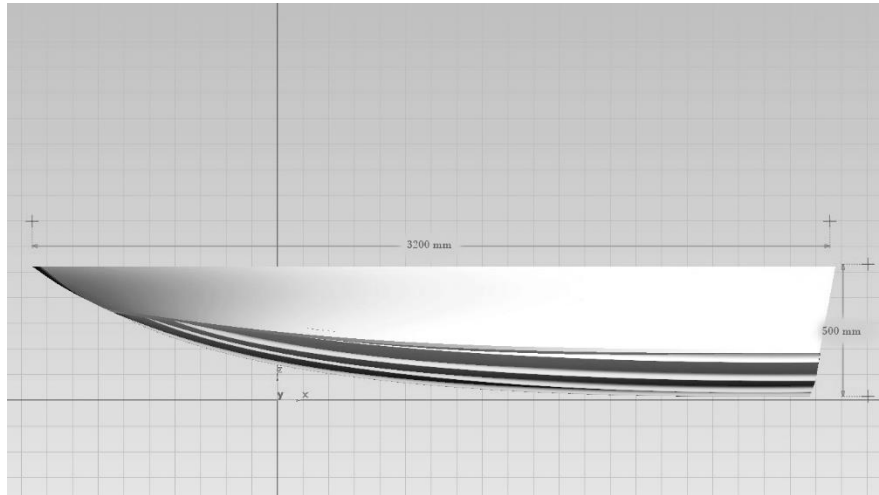
Some prefer aggressive stand-up stance, some prefer crouched low stance, while some like to cruise it comfy with legs stretched ahead on the footboard.

STUDYING THE EXISTING HULL



Stills from studying the hull in Samudra Shipyard Ltd.'s workshop.

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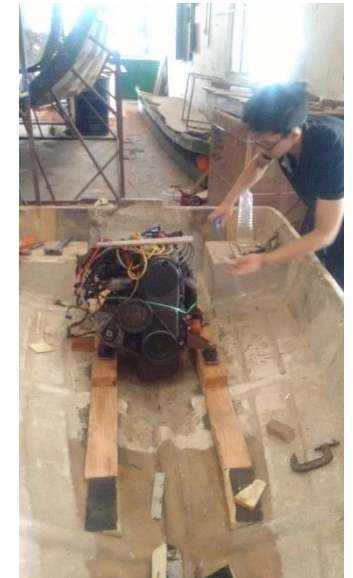
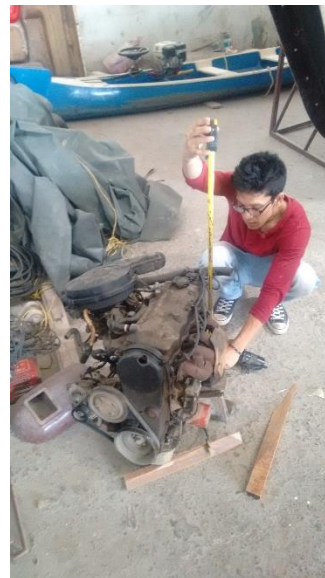


After studying thoroughly, the dimensions of the hull and chin area, it was found that the top half of the hull could still be altered without interfering the chins. This in turn results in better design of the hull, as it gives freedom in flattening the front-end of the hull for better dynamics.

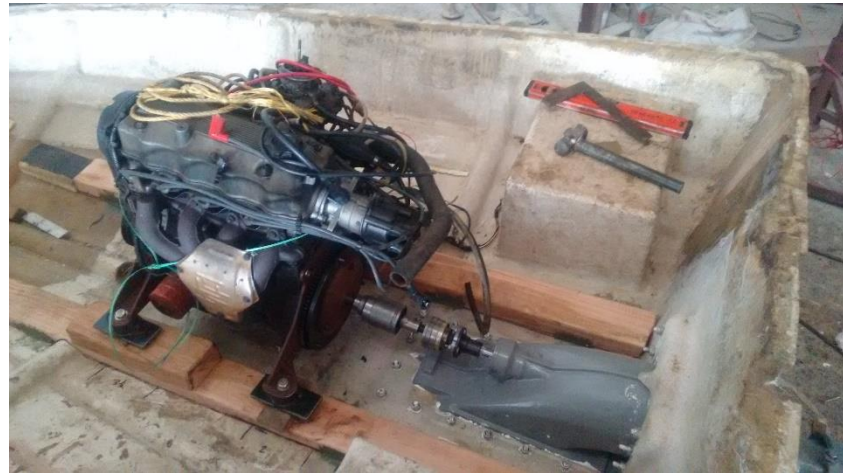
STUDYING THE ENGINE

After much discussion within the Samudra team, it was finalized that the firm would be using a second-hand 1300 cc 4-cylinder engine of a Maruti Esteem. The engine was a carbureted version, so it didn't have any MPFi, rather a carburetor block. To make the engine compact, the carburetor box was replaced by an open air-filter. This made it easier for the form to be compact and as a result, the pillion rider's comfort was not compromised.

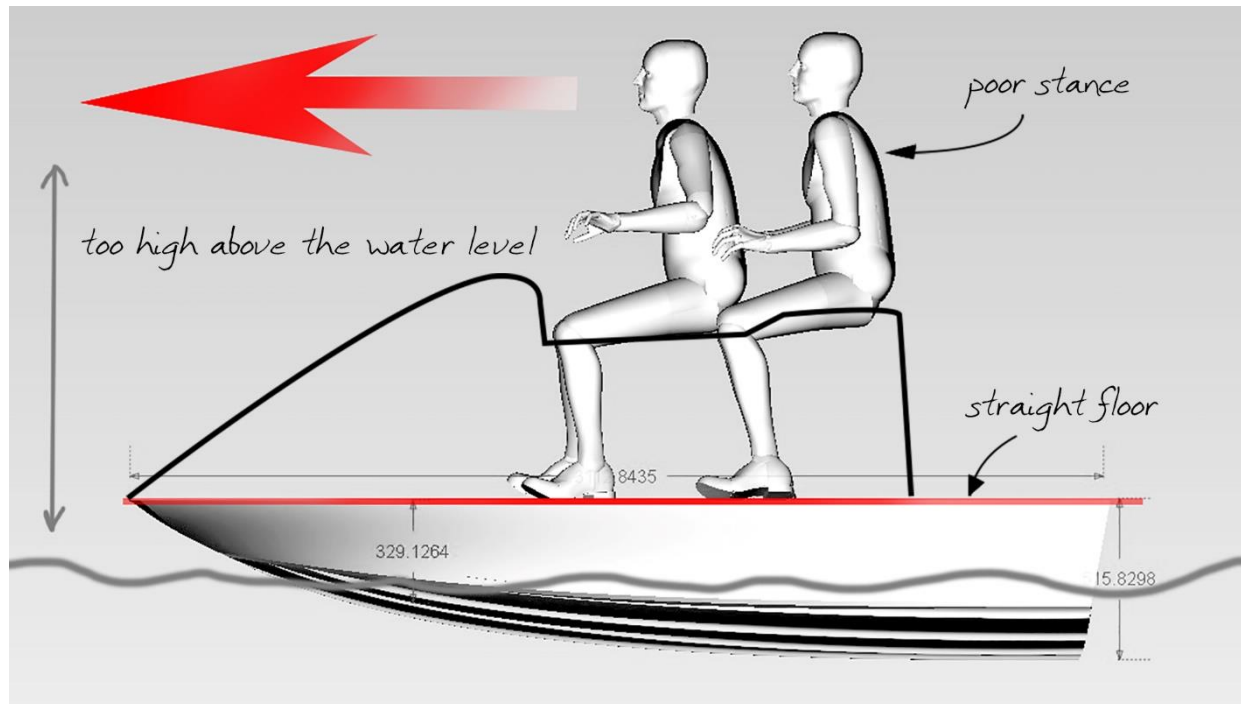
The engine was mounted on the hull and again proper dimensions were taken in order to proceed with the ideations and Alias 3D modelling simultaneously to get a better route map of the design progress.



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RIDING POSTURE AND PILLION RIDER CONSIDERATION



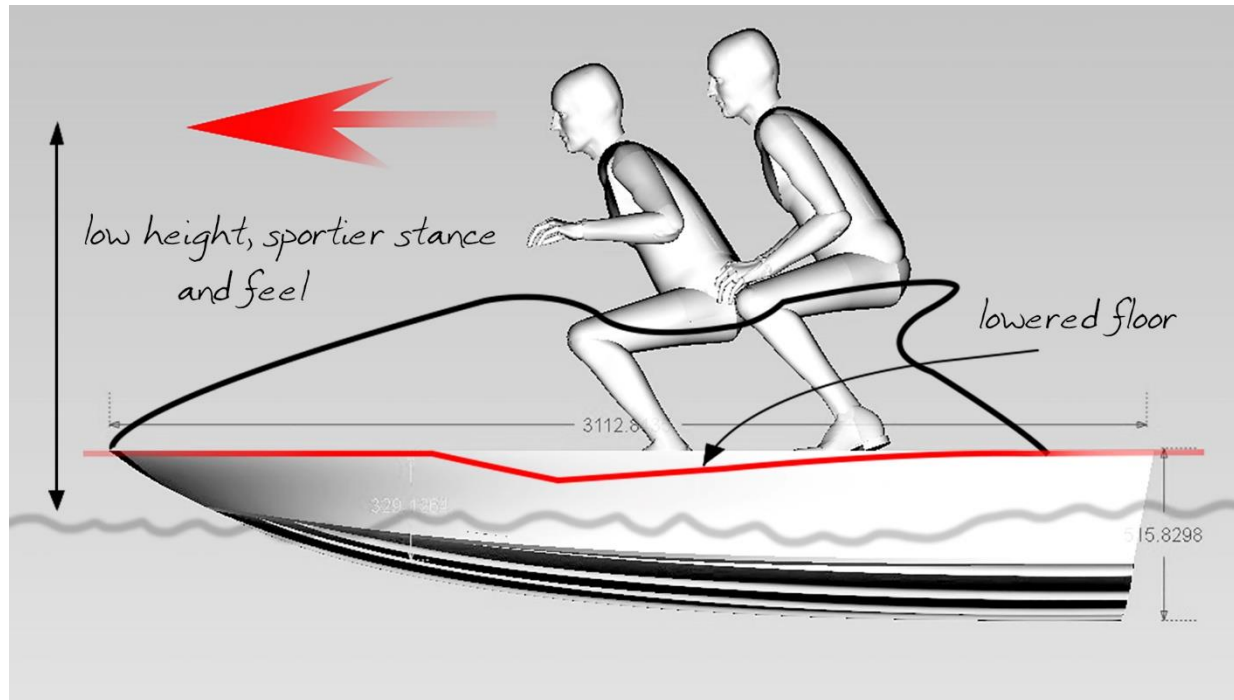
Old Hull/Water scooter riding and pillion stance

The present water scooter of Samudra Shipyard has a very upright stance that makes it poor for sports appeal.

The floor board of the hull is flat here, which in turn results in higher seating position for both the rider and the pillion.

This brings it even more higher than the water level, which effects the aggression in the riding nature of the jet-ski.

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New jet-ski hull riding and pillion stance

As one of the major factor in the design of the new jet-ski is an aggressive riding and pillion posture, the floor board (*red fading line*) has a new character, that goes under the outer walls of the hull.

This results in a lower seating position. A slight ingress of the floor goes a long way in changing the mood of riding, thereby giving an attacking aggressive stance to rider and pillion.

MOOD BOARD 1



Razor Sharp/Aero/Edge

This moodboard evokes a sense of aggression, speed; a thrill to create an adrenaline rush within. Also, red is the elemental theme here, enhancing the dynamic strength of it.

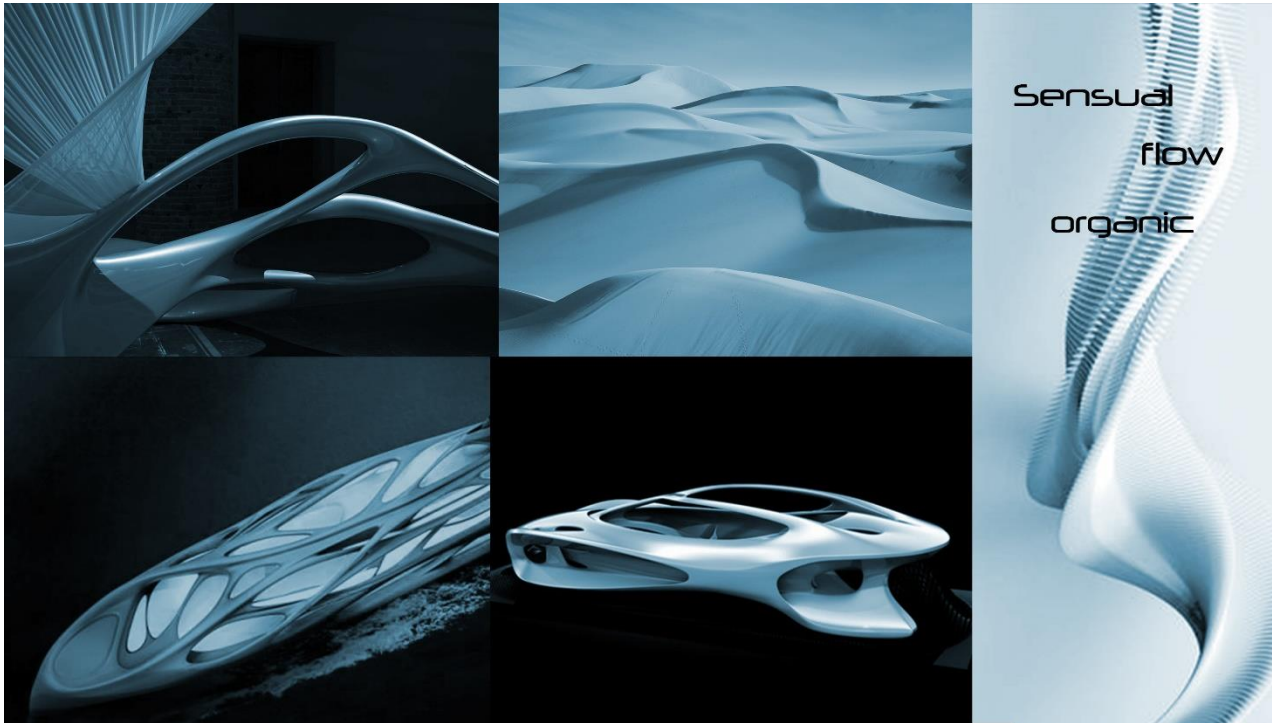
MOODBOARD 2



Quintessential/Classic/Crafted

This moodboard evokes luxury emotions. Inspired by handcrafted detailing into the form, this guarantees a sense of classic times.

MOODBOARD 3



Organic/flow/Sensual

An undeterred feel of celebration, connection through emotions; just the way mother nature unbound by any restriction, creates everything around it. A sense of naturalness and harmony.

INITIAL FORM EXPLORATION

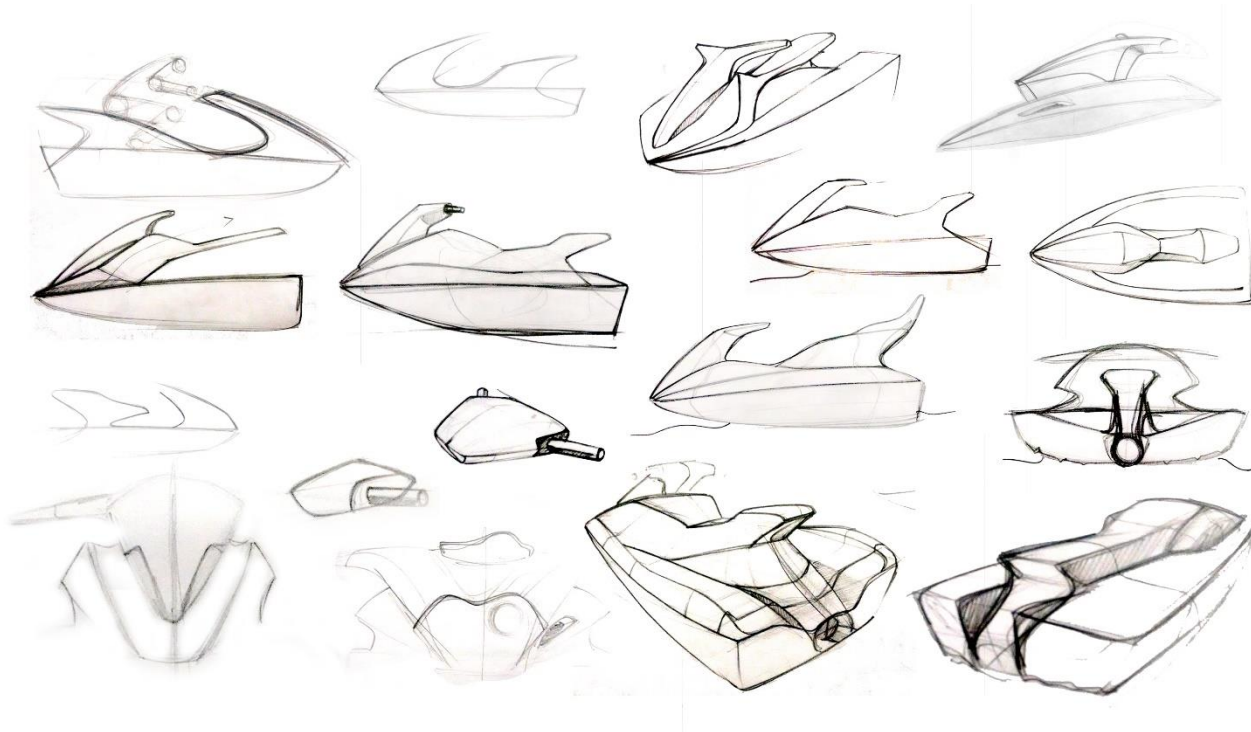
Based on the three varied moodboards and the design brief given, the following keywords were determined for form exploration on each moodboard.

Form Keywords

- Aggressive form
- Sporty stance
- Freedom
- Comfort

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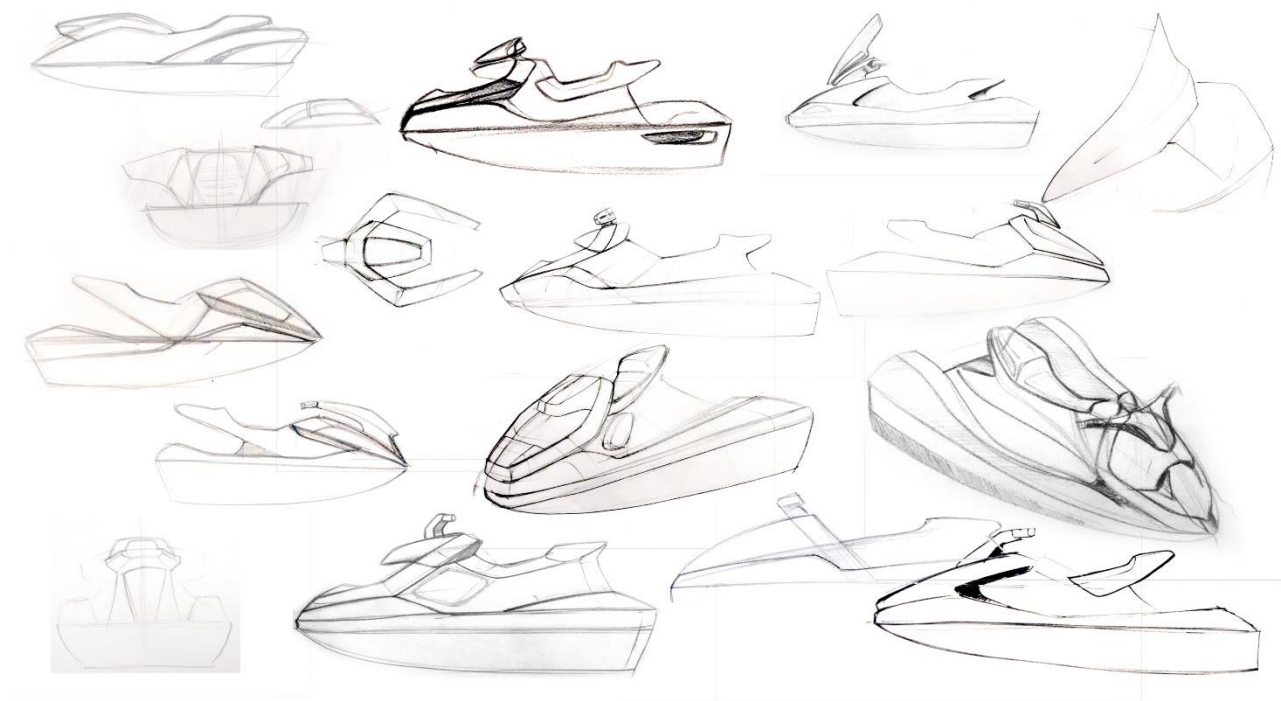
Organic/flow/sensual form ideations



The idea here is to find a form which depicts the ideated mood with continuous flow of lines without any sharp turn of events and emotions.

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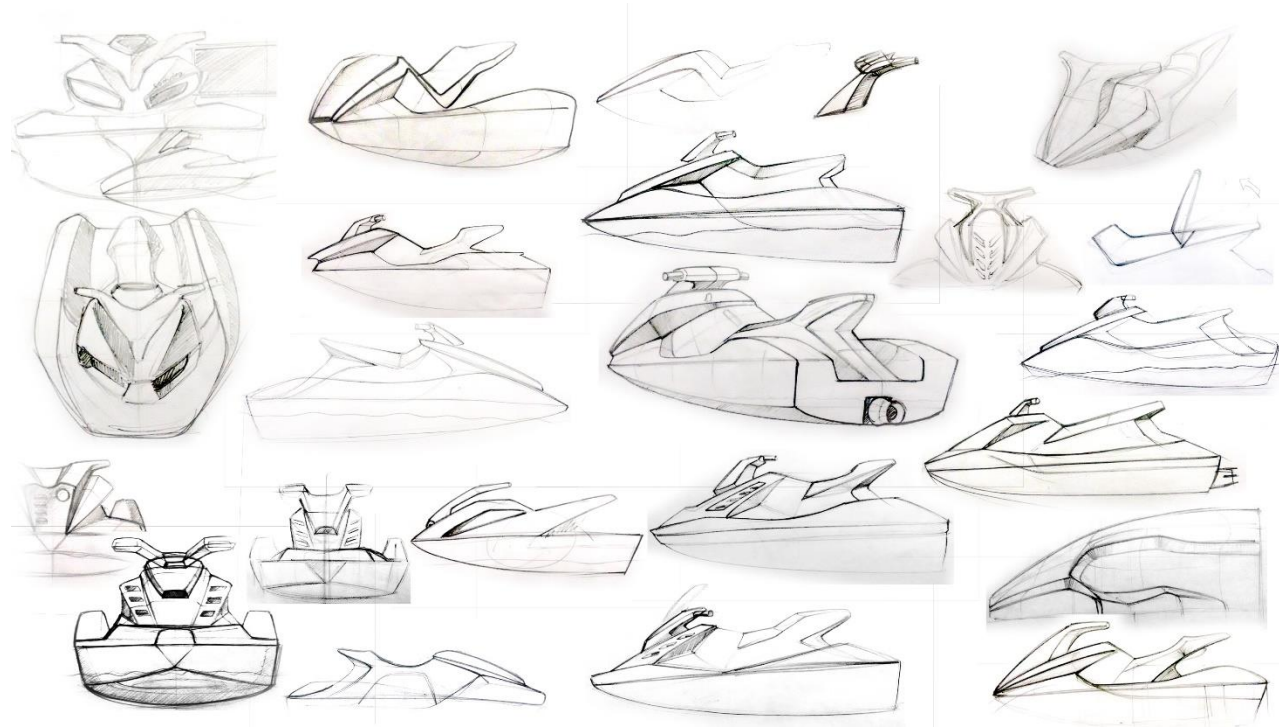
Quintessential/Classic/Crafted



To take influence and inspiration from crafted forms, to give the jet-ski a feel of richness and delicately crafted appeal.

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Razor Sharp/Aero/Edge

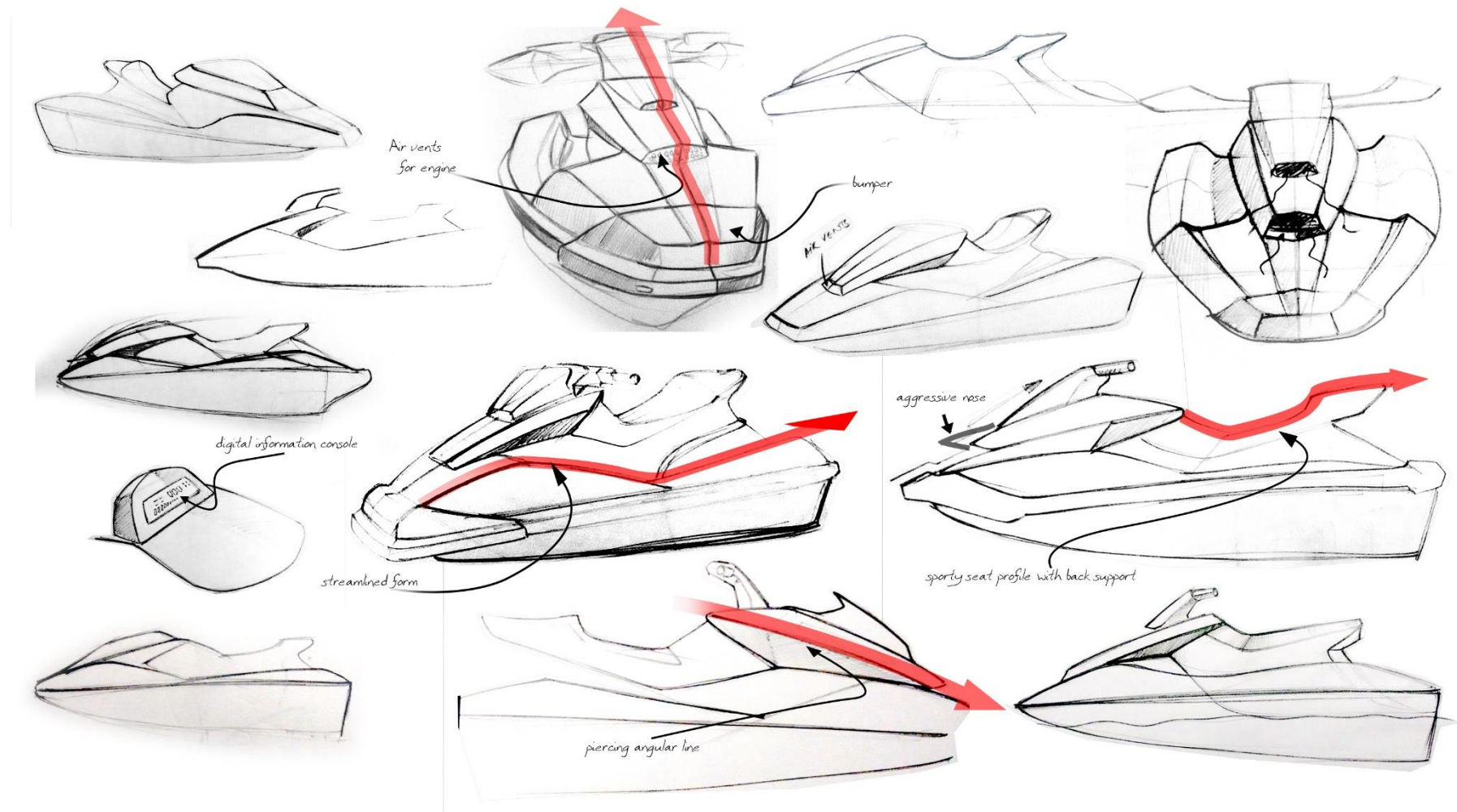


Three keywords; razor sharp, aero and edge is the main soul behind the ideations of this form exploration. A sync, blend between youth and sobriety.

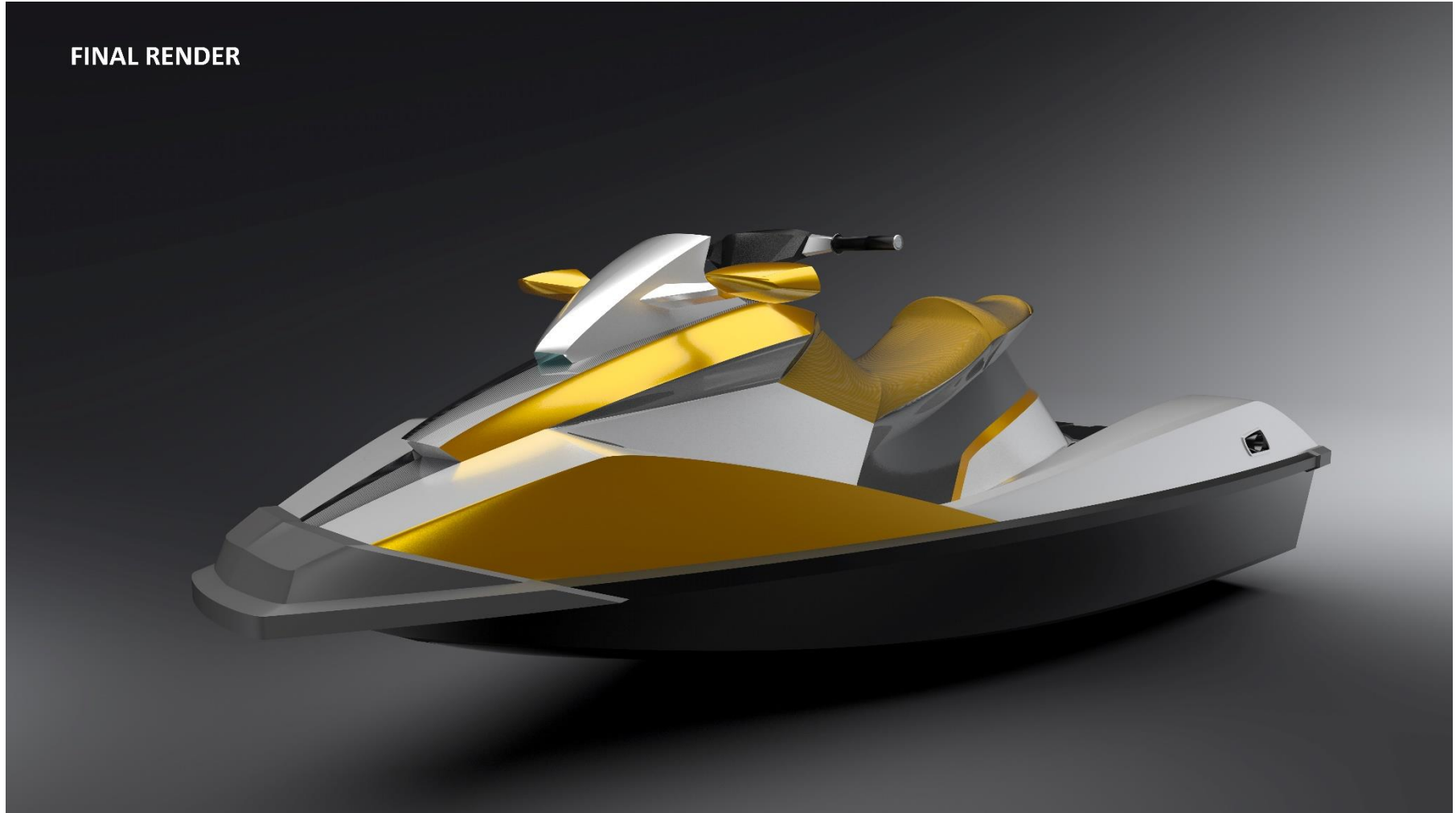
FINAL DIRECTION

Based on the three moodboard ideations presented to the Samudra Shipyard management team, it was fixed that the Razor sharp/Aero/Edge theme suited more according to their need. This form would appeal more to the prospective buyers as it has that edge of youth and sporty character to emote to the riders as well as the onlookers.

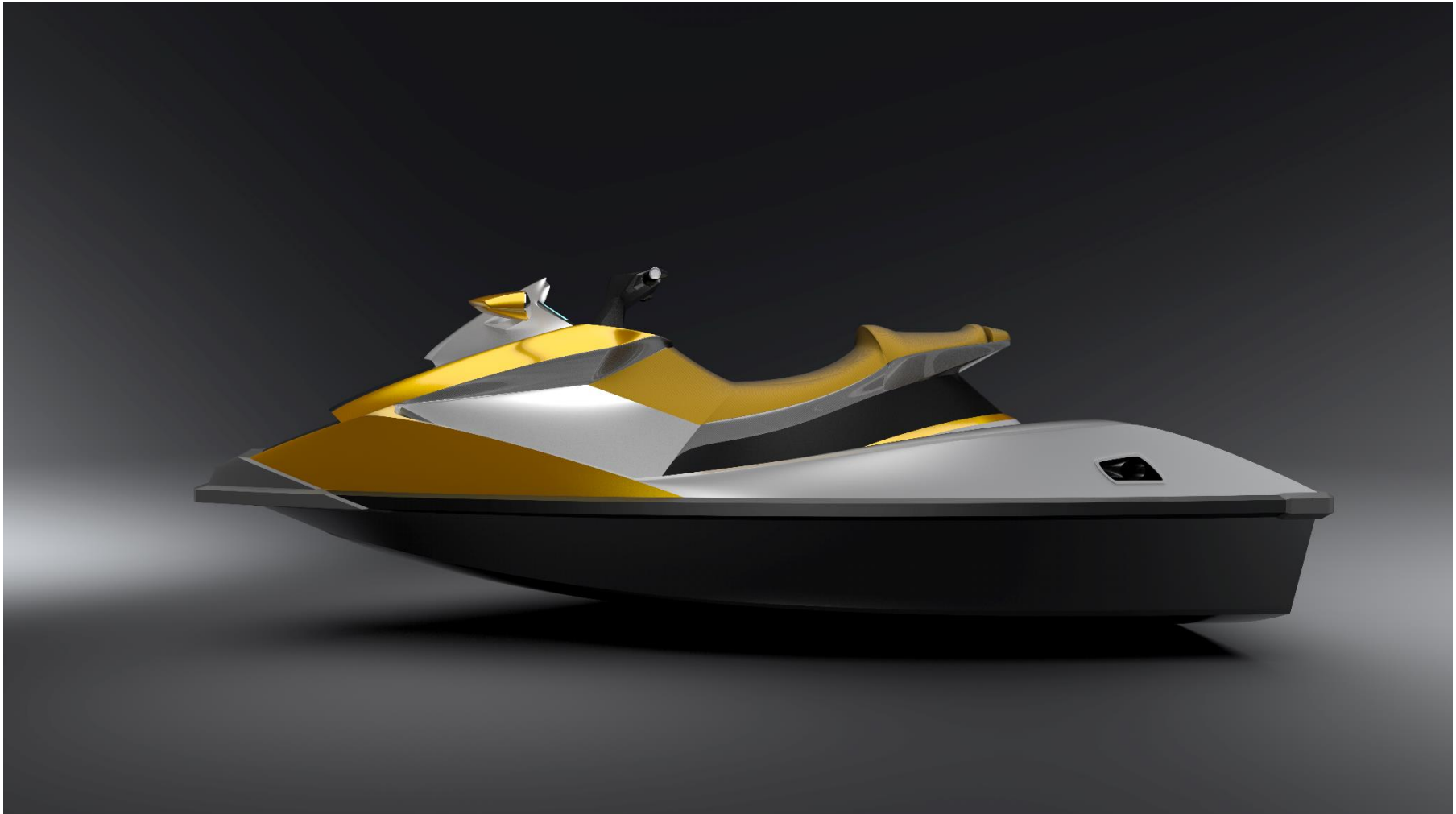
Final Ideations



FINAL RENDER



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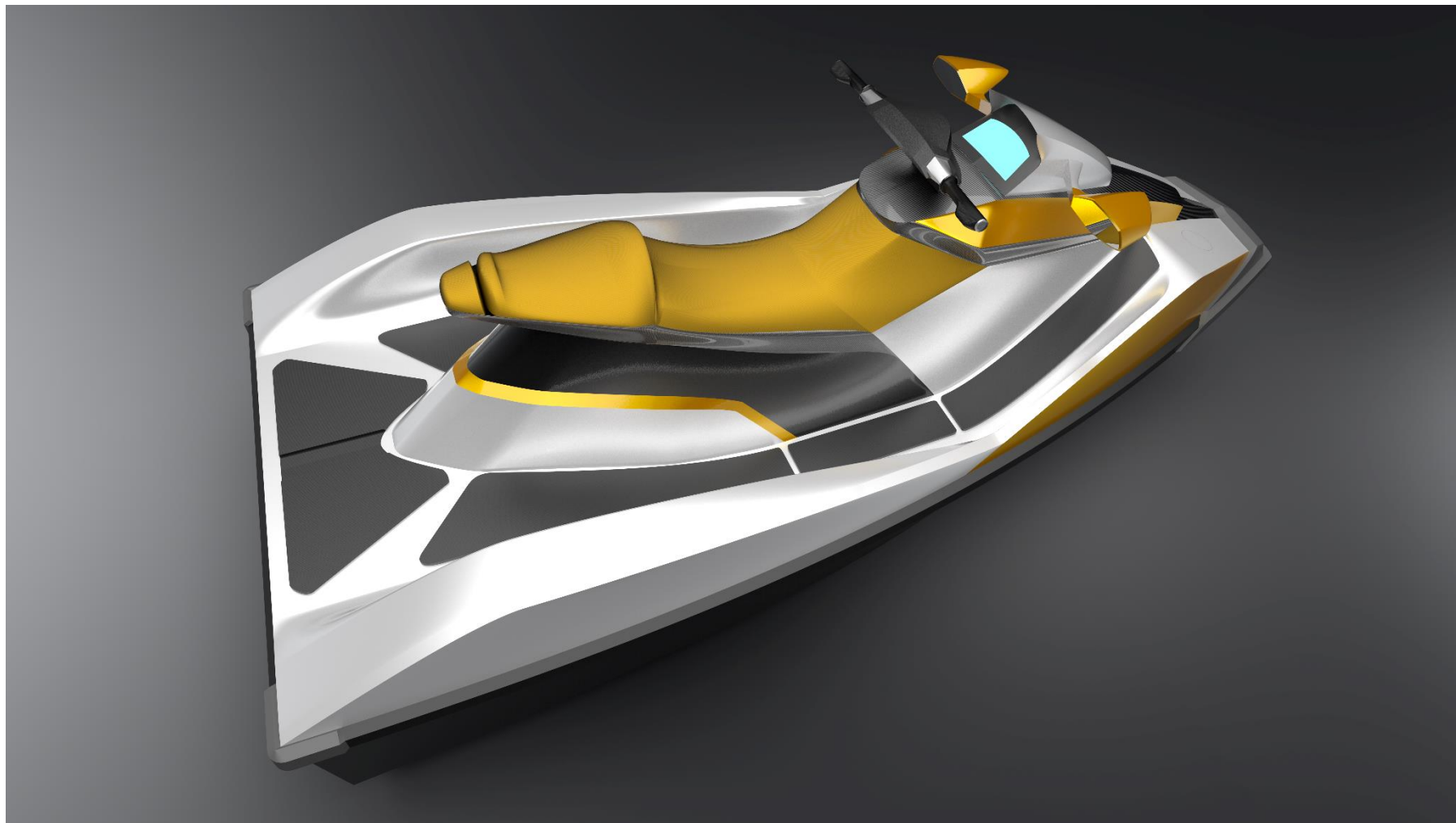
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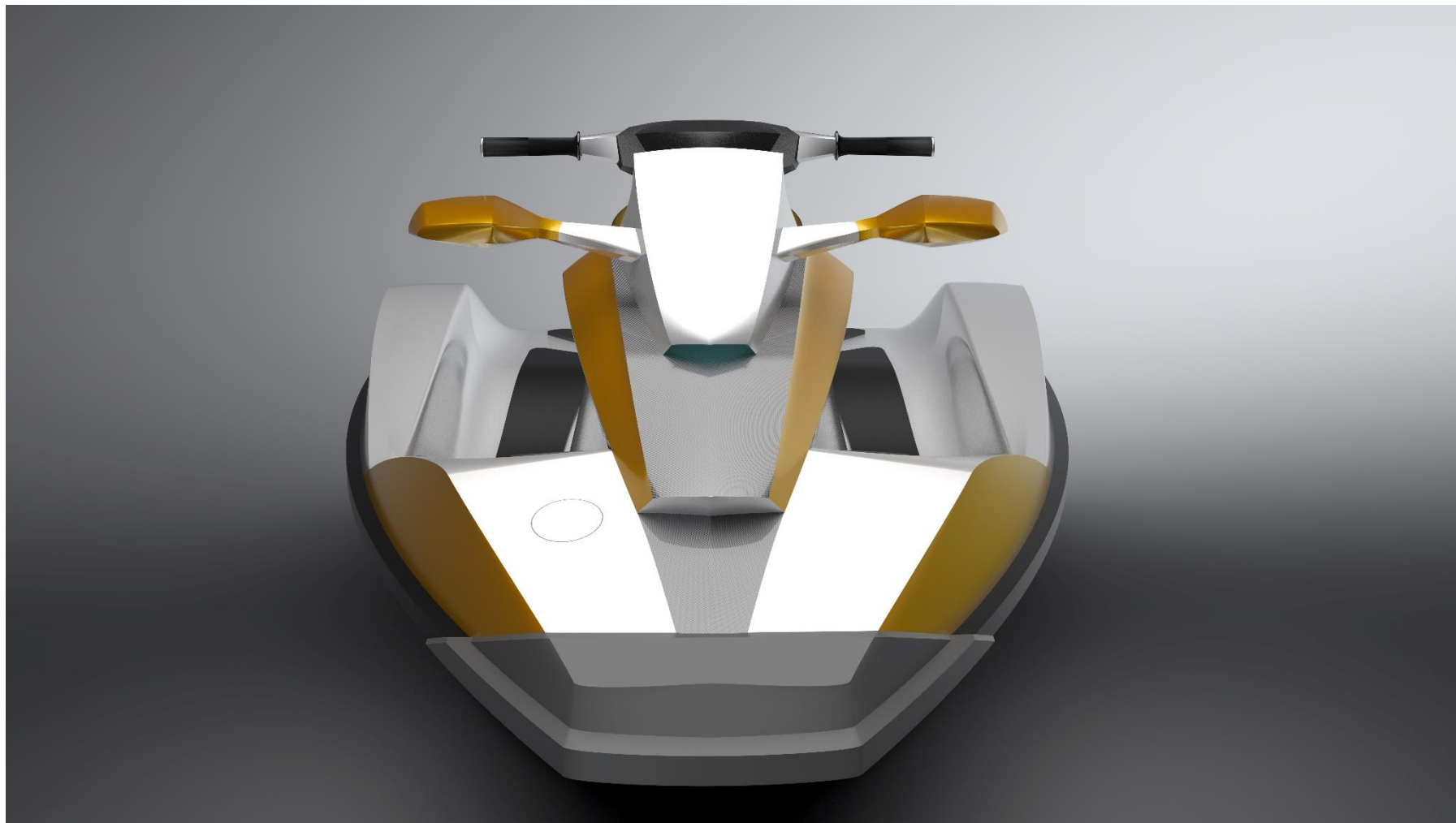


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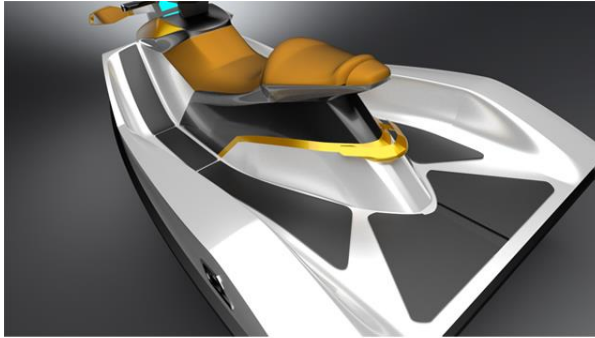


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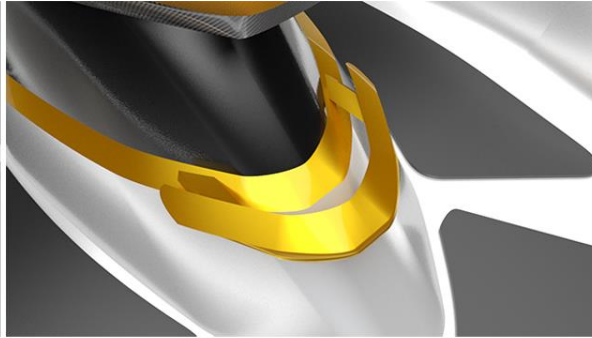
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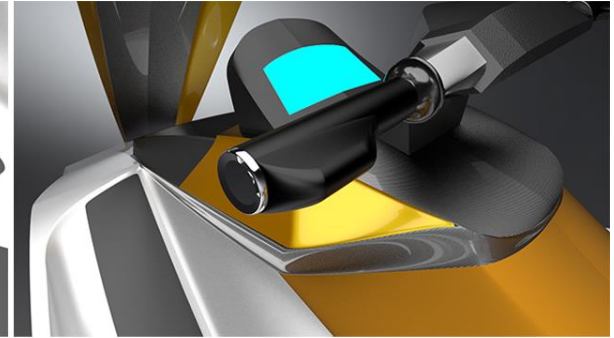
Concept Features



Modular Floor mat



Pop-out Grab Handle



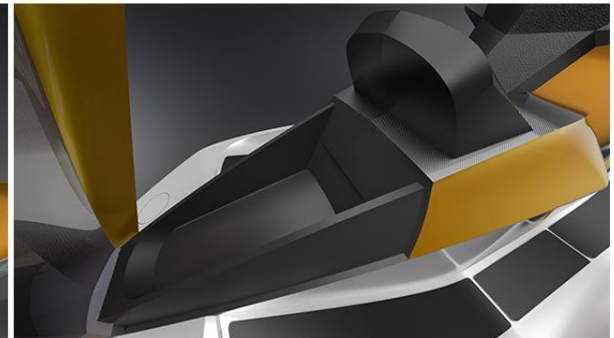
Digital console + palm rest for comfort



Dual rear view mirror



Convenient storage opening



Deep glovebox

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