



TRA Visions 2018

Final Project Template – This template is to be used for submitting the final version of the project. The final deliverable should be submitted by the 31st of October 2017

Idea Number: **L1-29**

PILLAR / TRANSPORT MODE	
ROAD ☐	RAIL ☐ WATERBORNE ☒ CROSS MODAL ☐
Project Related to:	☐ RA1: Environment and Energy Efficiency ☒ RA2: Vehicles & Vessels – Design, Development and Production ☐ RA3: Advanced Propulsion Systems ☐ RA4: Smart Urban Mobility & Logistics ☐ RA5: People Mobility – Systems and Services ☐ RA6: Freight Transport and Logistics ☐ RA7: Transport Infrastructure ☐ RA8: Connected and Automated Transport ☐ RA9: Digital Technologies for Transport ☐ RA10: Safe, Secure and Resilient Transport Systems ☐ RA11: Human Dimension in Transport ☐ RA12: Socio-Economics, Innovation and Policy

Project Title:

SEATY



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1. Introduction

75% of our planet is covered with water. But still, human being is dependent to the lands. We use oceans for transportation and luxury pleasure. There are also some ideas of building huge ships where people can live while sailing around world. But again it will be very expensive and with a better definition people are not living, they are having vacation in such ships. But what if we can use oceans for housing and working, in shot; for living.

Main idea of the project is having small cities in the sea which are comprised of individual modules. There is no need for a huge and expensive structures. People can just join with their own module. That kind of stations around world would serve for scientific, commercial, emergency aid, pleasure and sheltering purposes.

City like structures would be made out of modules. Modules would have same structure, but different purposes. So it would be easy to go for mass production. One module may serve as a pleasure yacht, three of them can be defined as a big hotel. If twenty of those dock each other, there would be an island.

For modules team has decided to use stabilized SWATH technology. This would give the modules perfect seakeeping and low resistance. Each module would have its own propulsion system in order to achieve maximum mobility.

Seaty would not provide basic needs only but luxurious content also. Limitless living spaces can be built and size of the vessel will be limited by the number of modules.

Another contribution of Seaty module is changing perception of vessel. These modules are not ships, this is SWATH vessel. Only reason that current SWATH vessels look like ships is because social construct of vessels. Term vessel is still closely connected to ships. The same case was with cars, first cars were looking like chariots. Since people couldn't easily jump from concept of chariot to car immediately, intermediate shape was needed to fit the void.



Figure 1 - First Design of a Car

Time was needed to bring new concept to people, but only when car become car and not horseless chariot, it started improving rapidly. This is one of goals of this project, cutting connections with ships, in order to start rapid improve and growth of technology.

All in all seaty can be called as a small village in the sea which can move as well. So it can be used as holiday resorts, stations for sailors and any kind of aid vessels in emergency situations as ambulance or supply vessels for food, medicines, fresh water and even energy. Besides the capacity of the station can be adjusted to specific needs by only changing the number of the modules used.

2. Selection of research area

Population of world increasing every second with rising speed. According to United Nation Population Projection, the population is expected to be 12 Billion in 2050. In other words we will need more space to live. Astronautical engineers are searching in space, civil engineers and architects are increasing the height of buildings and as a team of naval architects and we decided to search that space in oceans which is 75% of our planet.

It is sad but true as well that all over the world there are wars and sending help is always a big problem. Likewise natural disasters are very common where there is a massive need to aid. In both situations hospitals, food and energy are huge necessities.

Sailing or living next to sea is very expensive and luxury for a considerable part of the world. Also sailors who have commercial and pleasure purposes are having numerous issues because of rarity of safe ports in a substantial part of our planet.

Our team is made of people who have work experience in naval sector. Members worked in different companies, areas and corners of world. Nevertheless, after studying together and sharing experiences they noticed that there are common problems in different areas of world. Furthermore team decided that a simple idea can be suitable and economical solution for some of these common problems.

3. Literature Survey

Actually the idea of having small cities at sea is very common. There are a lot of artificial islands which made by sea embankment. This phenomena also shows one part of luxurious necessity to our project.

Also there are some projects which aims to create movable living spaces at sea, for instance 'Blueseed Project' or 'Oceania-Atlantis Project'. Both of this projects have close purposes to our idea. But it is clear that the methods would be very different, especially because of modular design.

As an example for the modular design Arctic Halley VI can be given. Halley research is going on since 1956 in Antarctica. In order to satisfy the housing necessity of the scientists, 6 different villages has built. And the last one has modular design which was built in 2012 and still in use. A photo of Halley VI will be a good example for understanding the benefits of modular design which can be seen below.



Figure 2- Halley VI - An Example of Modular Design

4. Proposed Solution-Description of Idea

Idea is to make simple modules, those will be fast to produce and use them to make complex structures according to need. Modules could be made in order to create grid of connected cities over the world.

The modules will be designed with SWATH. Thanks to that design resistance and energy consumption will be less and seakeeping abilities of the modules will be higher. After docking vessels will take ballast and sink until hulls are submerged. Therefore stability will be much higher in docking condition.

THE SEATY STATIONS

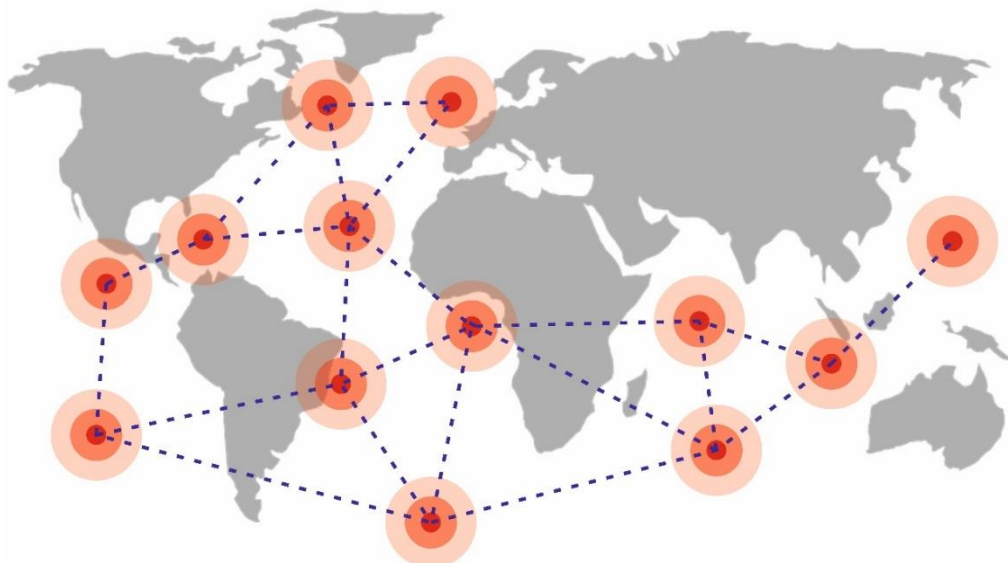


Figure 3 – Visionary Seaty Stations

One of the primary purposes of the Seaty will be letting people to live in a city at sea. Everybody can have their own module which designed according to their needs and enjoyment. It sounds like same with having a yacht but it is not. Because of mass production, the hull will be much cheaper and designing the living area will be easier and cheaper as well because of the shape of the module which is not far from a small field on land.

Authors already talked about problems that come with overpopulating earth, mostly housing problems, but there is another factor, food. Modules could be joined in to farms, but not only agricultural, but fish farms as well. Ocean fish farms already exist, basically they are big cages that float in ocean. Biggest problem is accommodation for workers, and storage for fish food and fish. This problem could easily be solved with modules, where not only accommodation and storage space could be arranged, but processing fish in to consumable product could be done at sea as well.

Thanks to Seaty all the people who has his own module will dock to city with their vessel. This may be because of commercial reasons, work, pleasure or even for the scientific reasons. A representative drawing can be seen below.



Figure 4 - A Visionary Arrangement

Those cities will be not only neighborhood for habitant but also shelter and markets for sailors and commercial ships. Around the world there are many ports and harbors where sailors can stop and get everything they need. Problem is that these spots are not equally distributed around the globe. There are many reasons for this uneven layout, sometimes particular place does not have good infrastructure or it is far away from other centers, so it cannot be considered as a safe port. But most often, there is simply no land, our planet is mostly covered with water so it is impossible to establish harbor anywhere we want. Thanks to these small cities, boat sharing applications and web sites will become popular and cities will host 'hitch sailors' as well.



Figure 5 - Hypothetical Visual, Moored Sailing Boats to a Seaty

Moreover in case of natural disasters like earthquakes or even war conditions, people will need emergency aid, shelter, food and so on. By the help of these seaty modules it will be very easy to send help to people who is at a low ebb.

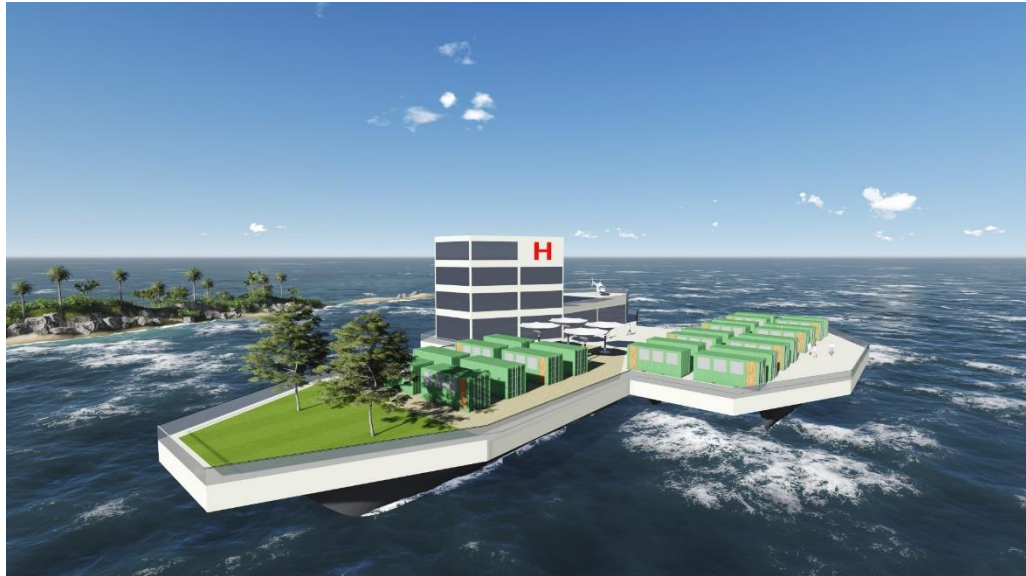


Figure 6 - Seaty can be used as Marine Hospital

Another field where this concept could be applied is luxury yachts and pleasure crafts industry. Instead of buying one expensive vessel, which is unchangeable for the rest of its lifespan, owner could get modules that could be changed later.



Figure 7 - Hypothetical Luxury Design

Owner could get pleasure “island” that could be modified to fit any purpose. Modules could be organized in a big structure or reduced to one unit. When you go to Arctic Circle, you don’t need same gear as when you go to Amazon River. This way vessel could be adapted to any condition.

Also, if there is some new technologies in the field, new modules could be easy added. Or if owner is simply bored of old design and wants some new spaces with different atmospheres, he can just purchase few new modules, there is no need to replace entire vessel.

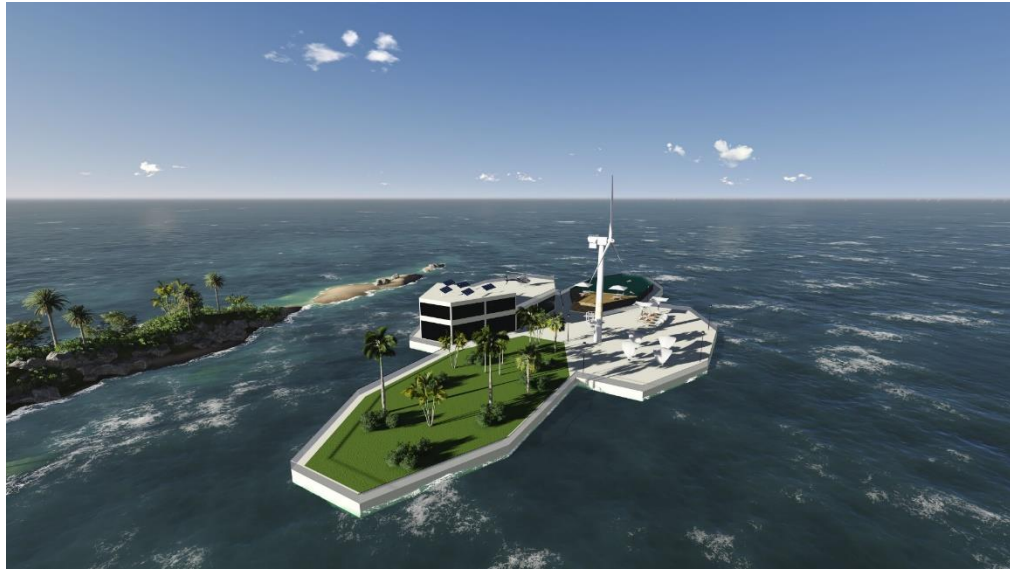


Figure 8 – Hypothetical Design with Additional Modules

Now we could remember the question that Greek philosopher Plutarch asked himself, is it still the same ship?

The ship where in Theseus and the youth of Athens returned from Crete had thirty oars, and was preserved by the Athenians down even to the time of Demetrius Phalereus, for they took away the old planks as they decayed, putting in new and stronger timber in their places, in so much that this ship became a standing example among the philosophers, for the logical question of things that grow; one side holding that the ship remained the same, and the other contending that it was not the same.

Actual answer is not really important, only thing important is humans thirst for exploration and this project is dedicated to that.

Seaty will also be eco-friendly, solar panels and wind turbines could easily be mounted on these modules.

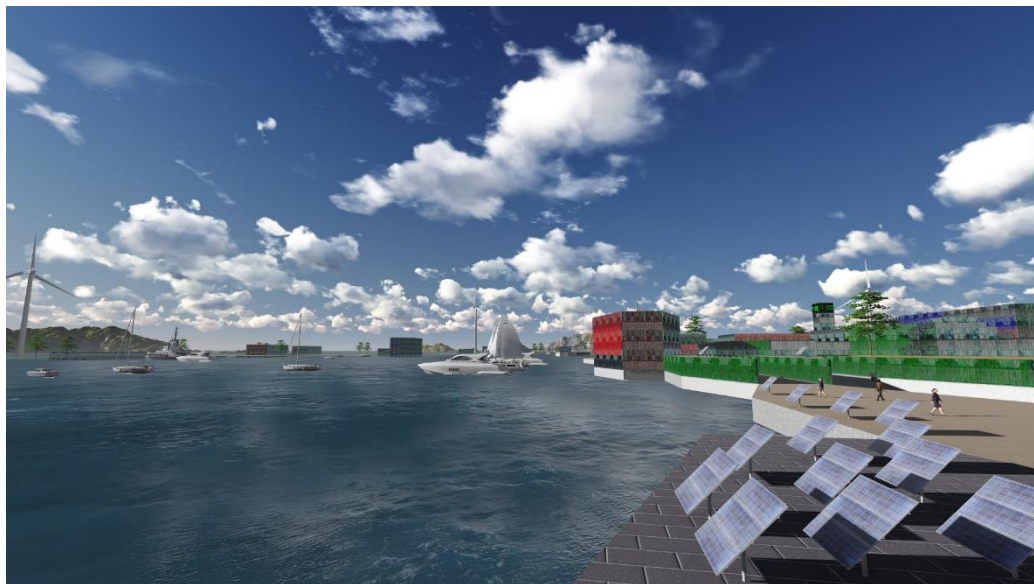


Figure 9 - Solar Panels and Wind Turbines on a Seaty

Structures could take any shape or size that is necessary at particular moment. According to purpose, number of modules, total area and even the weather conditions; belaying in different orientation may give new advantages to Seaty. For instance, in an emergency condition, attaching modules like and honeycomb will help the healthcare

personnel to carry injured people faster. Or under different conditions, attaching modules in complex shapes will create more area to dock more boats.

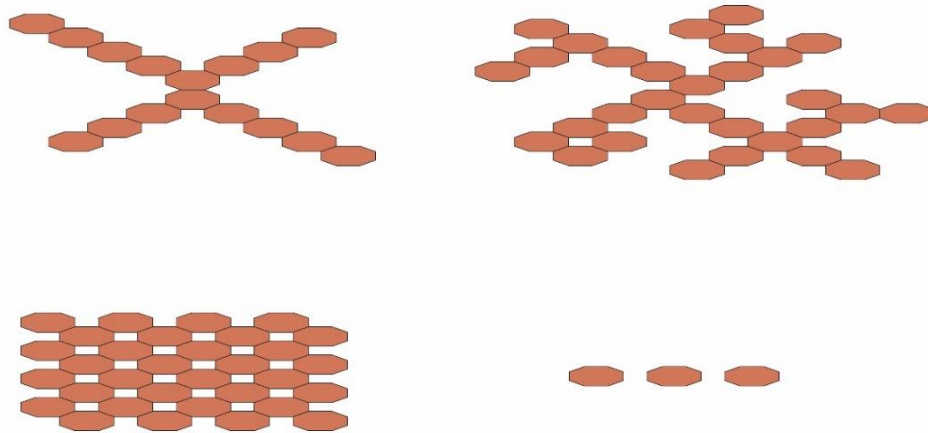


Figure 10 – Modules can be attached in different orientation for different purposes

Until now generally personal usage of the modules were emphasized. But as mentioned above; thanks to mass production, small artificial islands can be created in a fast and economic way.

Even structures are complex, modules are simple. So it is easy to manufacture and even more important, it is easy to adjust them for any purpose.

Hull shape of the modules would be identical and superstructures may be prefabricated. Structure that is showed in renders is composed only with this elements:

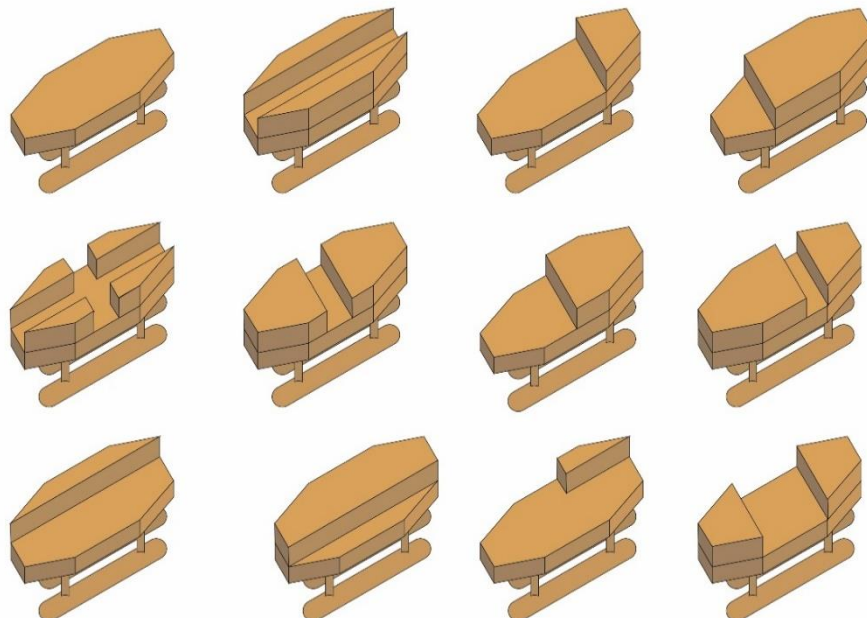


Figure 11 - Prefabricated Superstructure Figures

Main problem of this idea was monotony. In order to overcome this team searched for esthetical and practical solution. All of the modules will be made from same materials and with same logic, but they will get shades made from different materials. So only by changing shades, module gets new character.

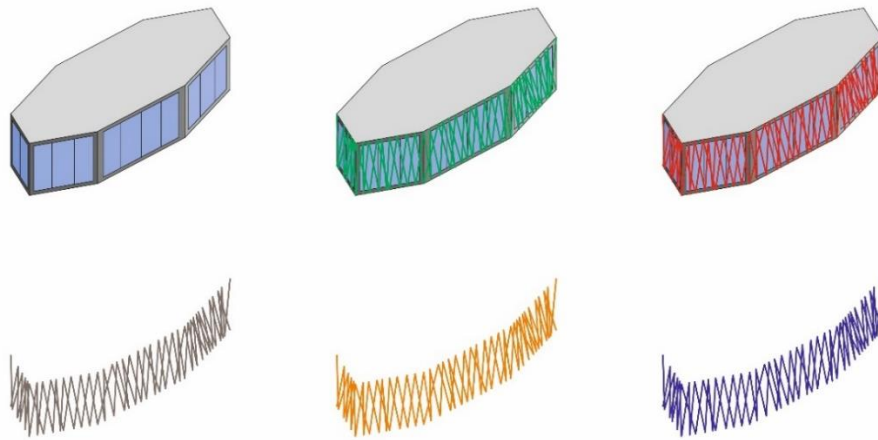


Figure 12 - An Example Solution to Monotony Problem in Mass Production

As explained above with prefabrication and mass production, just in a couple of days an island can be created.



Figure 13 – A Hypothetical Prefabricated Seaty

That kind of small islands will create an immense attention especially as holiday resorts. Interest to touristic places always concentrates on particular seasons. And in those seasons it necessitates a considerable effort to find a place to have vacation. However Seaty can change place according to season and it is very easy to increase the capacity of the resort.

Likewise there are a lot of natural wonders which authorities do not let people to stay there like Galapagos Islands. Those wonders should be protected. Seaty can easily host numerous scientists who wants to make researches about nature and animal species and also allowable numbers of tourists.



Figure 14 - A view of Hypothetical Seaty

Besides even there is no more extra modules to rent from the island, people will be encouraged to buy or rent their own module and dock to island. The system even may be the marine version of holiday with a caravan. People can travel by sailing modules from island to island.

Heretofore we have generally mentioned these modules as swimming caravans. But the modules can be used for technical professions also.

Offshore industry is growing tremendously. Instead of having single-minded supply vessels, these convertible modules will be very useful. They may be used as permanent stations or temporary construction or repair units.



Figure 15 - Seaty Modules as Movable Work Yards

Likewise, even it seems to be hard now, why not to have ship repair work yards in the sea, which can be disassembled and moved as well.

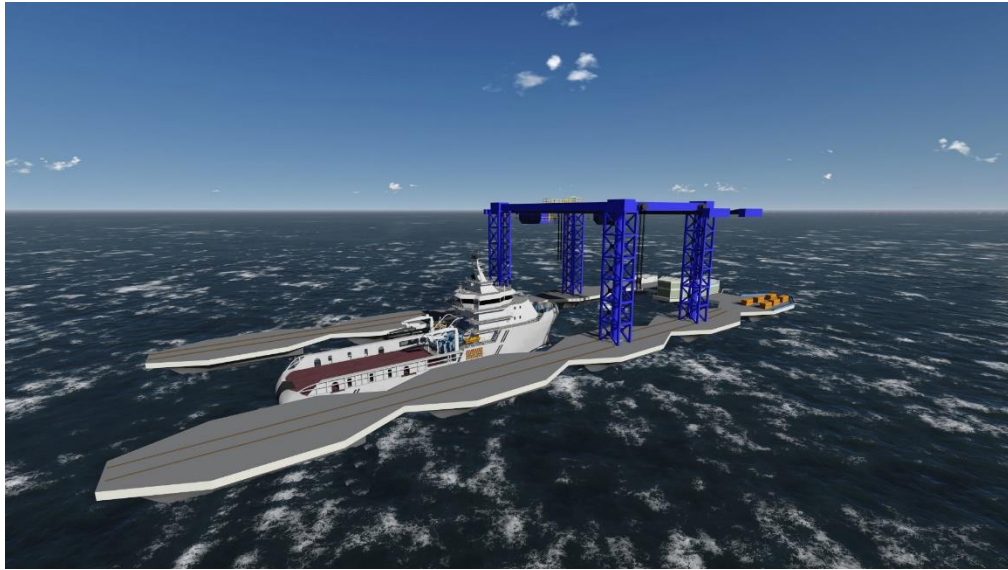


Figure 16 - Hypothetical Usage of Seaty Units

It is sure that on the commonly used routes some work yards will be very helpful for commercial sailors and also sailing boats.

Another option that would be eco-friendly, and wouldn't require much fuel is providing sails to modules. There are types of sails that don't need big and well trained crew, systems where all the winches are electric. This way it's easy to manipulate with sails and vessel. Sails would be good for long voyages, where speed is not the most crucial parameter.



Figure 17 - Seaty Hull with Wind Sails

5. Address potential technology gaps

There is no many gaps, since team worked based on practicality and experience, but one fact need to be addressed, structures will need to have smart software that will coordinate and manage all the modules. Because there will be low water surface area in no-ballast condition, modules will be very sensitive to loading condition. Vessel will show a tendency to trimming and heeling. Also in ballasted condition, a software is necessary to deal with the balance of the fixed loads on the deck.

Likewise modules will be mobile. For luxury usage, sometimes modules will need to move when they are attached. Even if all of them have not their own propulsion system, there must be one center of coordination. That would be smart software that will keep vessels together like group of birds.

Unified software for control of the modules was already mentioned, when this system is used not all of the modules need to have autonomy's propulsion. Modules with no propulsion could be connected to those that have one. This way, single module wit proportion could be used to push few non-autonyms modules. It would be good way to bring down the cost of production and consumption of fuel. Also, production would be faster and easier to program.

Second problem will be attaching. System should be quick in connecting and disconnecting, with great flexibility and strength will be needed. Team has come up the idea of cylindrical rubber air balloons. Modules will have inflatable balloons on each side of the vessel. These balloons will be automatically inflatable and deflatable. In the same time all vessels will have suitable nests for these balloons. When a module wants to be attached the other one, they will deflate the balloons and approach each other. And inflated balloons will be used as pins for docking the modules to each other. Upper and lower sides of the nests will be opened. Thanks to that, modules can make small moves with the waves. But they will not detach from each other. This mooring will be flexible, fast and secured enough. In the same time it will be easy and cheap to change rubber balloons in any case of malfunction. On the unmoored sides of the modules these rubber balloons will serve as fenders.

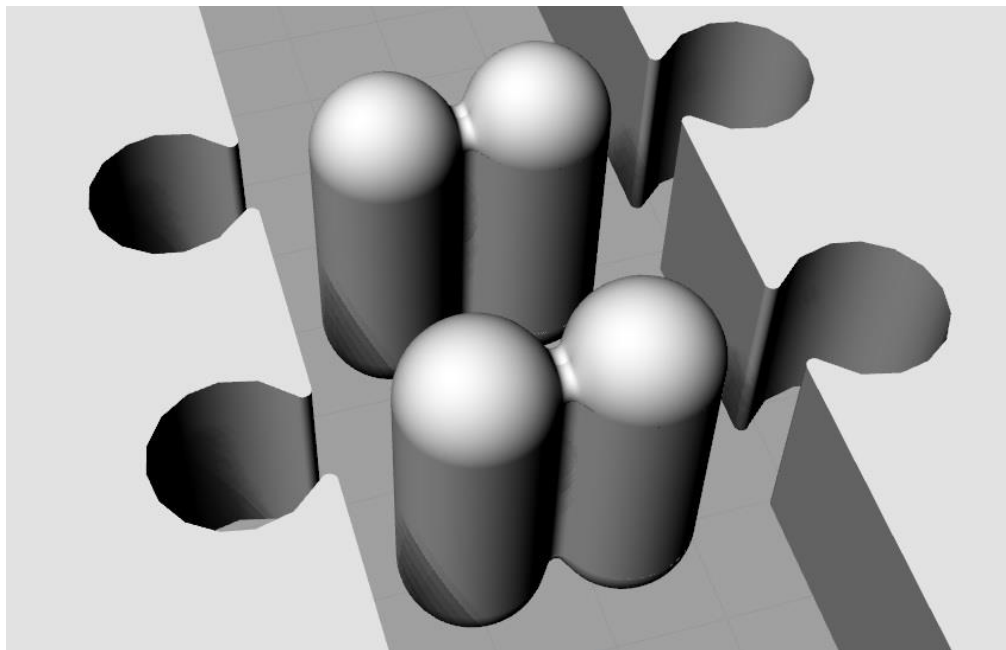


Figure 18 - A Method for Attaching the Modules

It is obvious that idea cannot be used always especially in rough sea conditions. But for now, attachment of Seaty modules is planned for calm waters. This issue needs further studies and possible direction for solution may probably be guided by bridge joints that are in use.

6. Detailed design description

As mentioned above modules will be SWATH and when they dock, they will take ballast and sink until the planning hulls are submerged. Thanks to that stability will increase, general drawing of a module can be seen below.

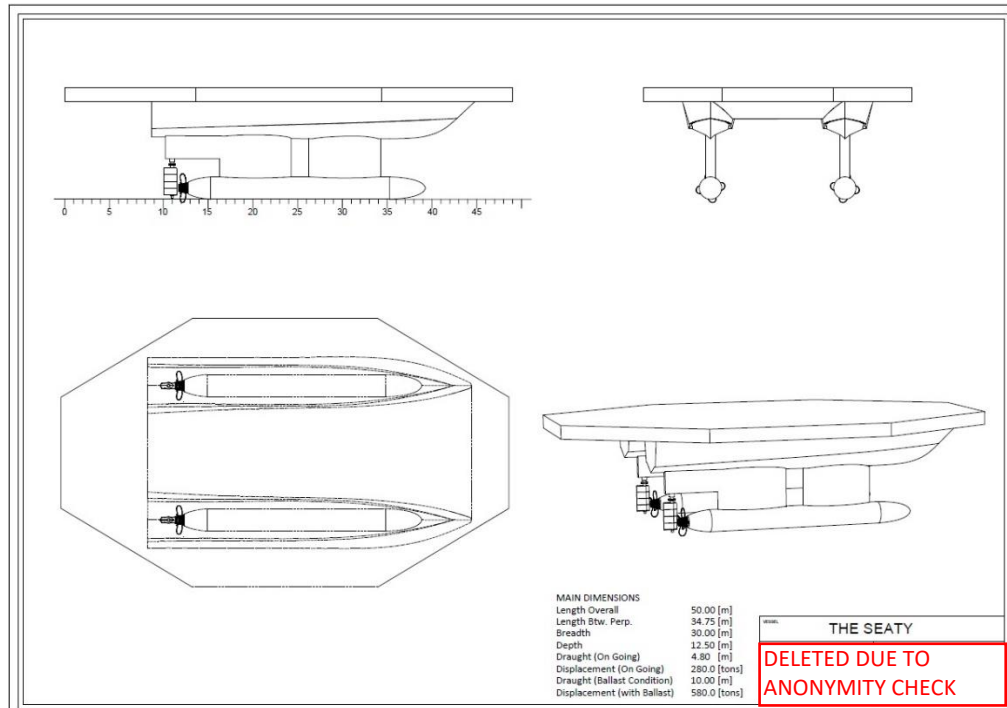


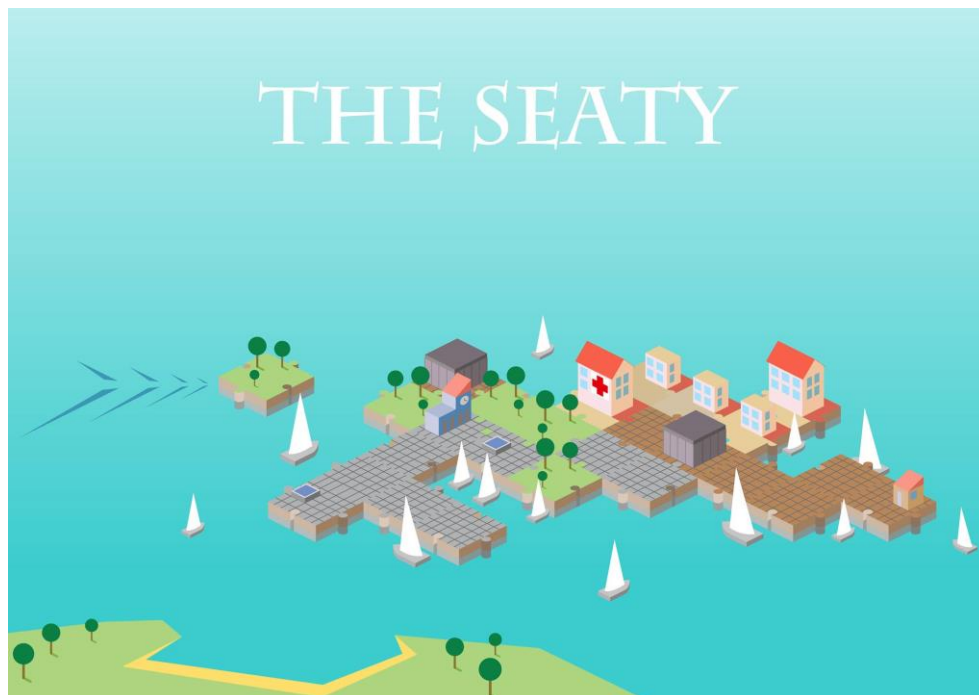
Figure 19 - General Arrangement

As explained before modular design has numerous advantages such as easy replacement, mass production, convertibility, being storable. Therefore team has decided to design in modules.



Figure 20 - Modules Can Move Separately

7. Source of additional information used & Appendices



THE SEATY STATIONS

