

ThinkFloat

by

Kent Rasmussen

A Terminal Project

Presented to the Faculty of

The College of Architecture at the University of Nebraska

In Partial Fulfillment of Requirements

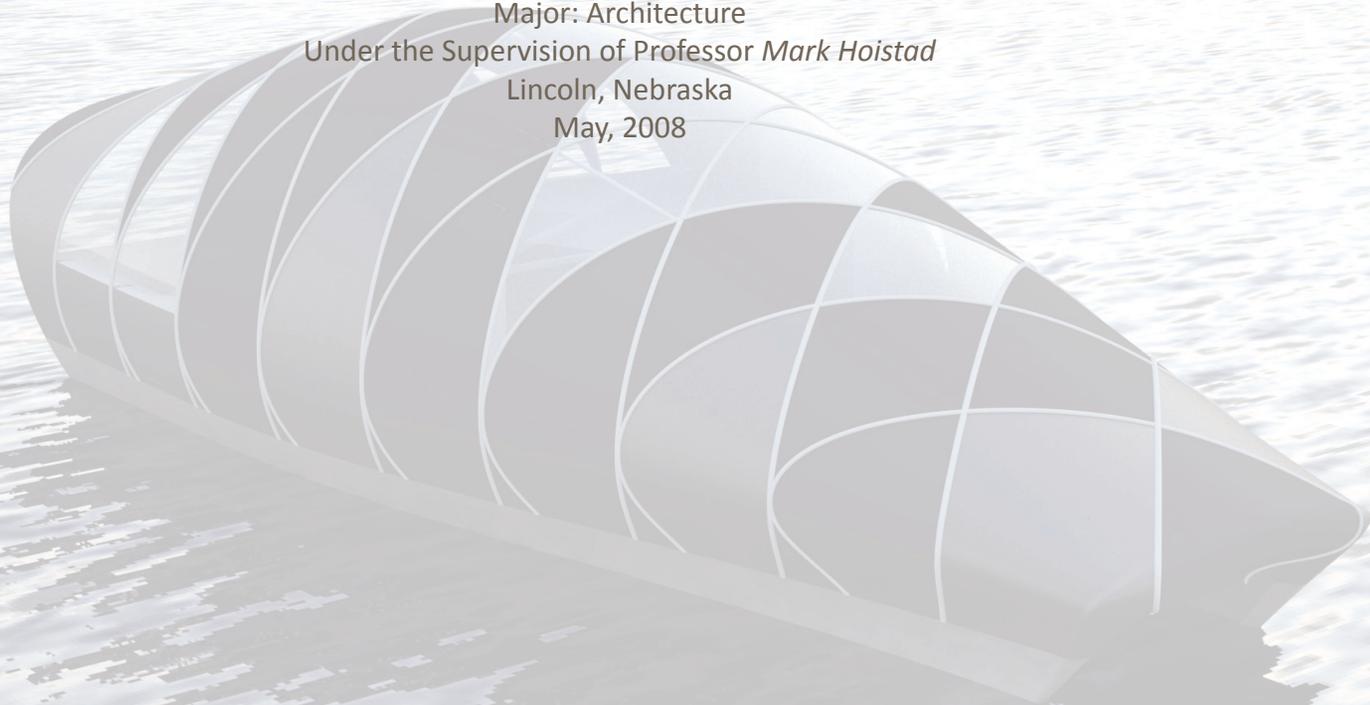
For the Degree of Master of Architecture

Major: Architecture

Under the Supervision of Professor *Mark Hoistad*

Lincoln, Nebraska

May, 2008



<PROJECT ABSTRACT>

Today's Communication Age has provided people more ability to share and process information. This has much to do with the technological advancements in the latter of the last century such as the telephone, the computer, and the internet. These technologies are a brilliant resource for discovering knowledge about anything, at anytime. Therefore, with all of this information accessible, it whets our appetite for the exploration of the unknown. We are standing at a new threshold of curiosity and movement which is poised for more than idea-sharing over vast distances; we are ready physically to actualize these explorations.

As inquisitive social beings we naturally have an urge to explore and that exploration brings about a new lifestyle; a transient lifestyle. The transient lifestyle has a value system that is not based upon trumped goods, but rather upon experiences of one's own satisfaction while being mindful of the environment. This lifestyle has people that are driven by experiences, by discovery, by fighting boredom, by finding belief, and by freeing themselves the status quo. The transient lifestyle shifts towards something less influenced by aspiration to consume material products, and instead is more influenced by finding value and satisfaction in peace with the inner-self and the environment then obtaining this by spending more time with oneself, one's family, or one's new forms of spirituality.

This transient lifestyle is the dawn of Mobile Architecture, where dwelling applications and uses are limitless and have no borders. Mobile Architecture can be defined not merely as a movable structure but rather as a way to intelligently inhabit a specific environment at a specific time and place in a way that better reacts to



“We no longer believe in a monumental, the heavy and static, and have enriched our sensibilities with a taste for lightness, transience, and practicality.”

-Sant Elia Futurist Manifesto

The desire for an active, mobile, and dynamic lifestyle; has to lend itself to stronger possibilities other than the stable ground. The dynamic water has always been a hypnotizing place to be and now more people are discovering how it also intensifies the adventure of opportunities and explorations from the static land. On water, the phenomenon of daily life becomes ceremonial. A sunrise or sunset is routinely extraordinary, amplified by the glow of sky on water. Rain, the sound of water on water, becomes mesmerizing. The vast, bright expanses of uncluttered space gives water residents a rare sort of relationship with light. A floating dwelling is the solution for a transient lifestyle that values life experience and their personal peace of mind while being conscious of the environment.

The goal is to create a sustainable self-sufficient hybrid parcel of mobile architecture on water that is off-grid and un-restrictive to the possibilities of explorations. This transient lifestyle affords serenity to oneself and family while experiencing the adventures of the unknown. We are at the time and place where architecture rolls, flows, inflates, breathes, expands, multiplies, and contracts, finally hoisting itself up, as Archigram predicted at the end of the 1960's, to go in search of its next user.

Mobile Architecture, for the purpose of this project, is defined as a hybrid space dwelling, and is broken down into two applications: dwelling and mobile. Fusing these two different programs allows for creative possibilities of exploration and personal freedom. A dwelling, a shelter from the natural elements as well as a community among its inhabitants, is the static component which allows comfort and security. Mobility, the capability of moving or being moved readily, is dynamic and responds quickly to impulses, emotions, expression, or mood. The hybridization of dwelling with mobility provides a freedom of movement and exploration.



<TABLE OF CONTENTS>

RESEARCH/ANALYSIS

>2

INTENT NARRATIVE/

>15

CONCEPTUAL DESIGN

>23

*FINAL DESIGN
DOCUMENTATION*

>47

>4

BIBLIOGRAPHY

>77

ACKNOWLEDGE- MENTS AND DEDICATIONS

>78

<RESEARCH/ANALYSIS>

My goal for the thesis is to provide an opportunity to explore a counterculture lifestyle of living and moving. A lifestyle that surpasses the shortcomings of the expensive contemporary home and moves past its compliant ideas of being stationary and content. I was most interested in resolving this problem and finding existing mobile ves-

*sels that fused two programic issues of **mobility and***

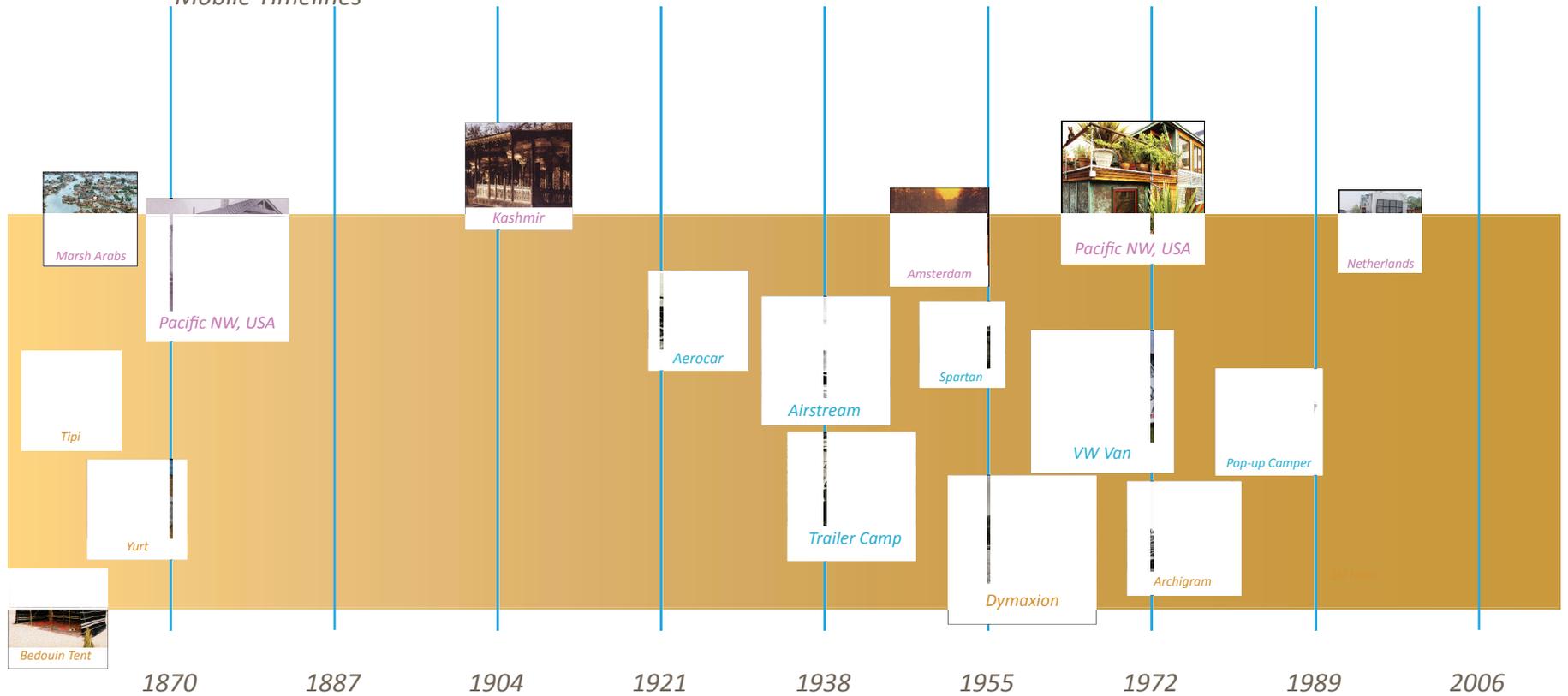
***dwelling** together to create a lifestyle which promotes: community, freethinking, and exploration. The first thought was HOW and WHY do people engage in a lifestyle that is more transient? The study began with precedent research of three vehicles, Houseboats, RVs, and Mobile Architecture, which combines these two issues of mobility and dwelling. Each vehicle brings validity to a transient lifestyle category but they also evolve themselves toward a larger sub group of the overall design.*

HOUSEBOAT<lifestyle>

RECREATIONAL VEHICLES<mobility>

MOBILE ARCHITECTURE<dwelling>

Mobile Timelines





Marsh Arabs (Madan)
3,000 B.C.

Reason on Water: A complex ecosystem created by the annual flooding of the Euphrates and Tigris rivers. Iraq's marshes have sustained human civilization for more than 5,000 years. Some of the earliest settlements of Mesopotamia were built on floating reed islands in these very wetlands.

The Boat: Were an all-grass floating infrastructure. Reeds were tied together to form thick columns, and used as structural ribs to form grand, arched spaces. The dwellings, made of the same material, rested on floating islands which served as farmyards and moorage for their working boats.

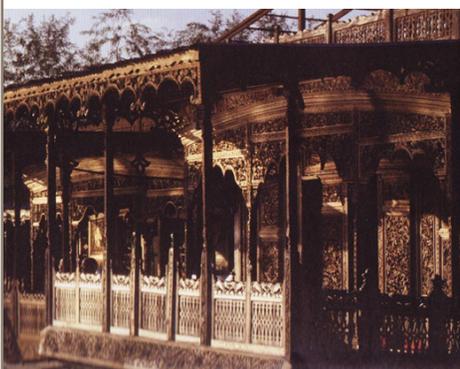
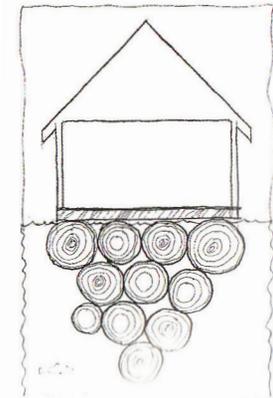
The Madan were *self-sufficient, and self-sustaining*, in ways that render their primitive floating life sophisticated by progressive standards.



Pacific Northwest, USA
1850

Reason on Water: During the mid-1880s, In the Pacific Northwest of North America, timber companies built floating logging camps to move loggers along the shorelines, where they could cut trees and move them directly into the water, where they would then be tied into log rafts and towed to lumber mills. People started living on the boats to get the family together in a traveling trade for *economy and convenience*.

The Boat: Relied on an inverted pyramid of logs and other materials, four or five courses deep. The House itself was regular stick construction that would sit above.



Kashmir, India
1880

Reason on Water: Created in 1880 out of *political dispute*, the British wanted to build houses in a cool climate, but the local Maharja denied them land ownership. In response, the colonist built on the water.

The Boat: These cargo houseboats shaped like long, shingled cabins were known for their carved woodwork and ornate textiles inside and out. The elaborate bargemansions - 15 to 20 feet wide and 60 to 150 feet long - are made of teaklike Indian hardwood, carved in intricate patterns, and furnished in India/Victorian decor.

Reason on Water: After World War II, when *housing was scarce* and retired tjalk were plentiful, Amsterdam officials encouraged the renovation of barges and allowed them to moor along the canals.

The Boat: The barges share the water with two other types of floating houses: A “house vessel” is a hybrid - basically a dwelling using an old boat hull as flotation. An “ark” is a long shoebox - shaped house sitting on a rectangular floating foundation, concrete or steel, shaped to fit.



Amsterdam, Netherlands
After WWII

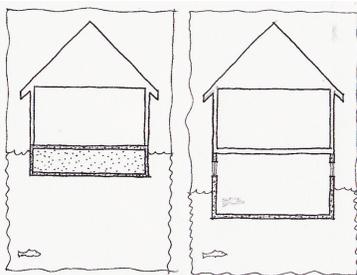
Reason on Water: Finding affordable housing in an urban dwelling has never been easy and when houseboats were relatively cheap and unregulated, people turned their resourcefulness into an *anti-establishment art form*. Owners assembled homes without land costs, building permits, utility hook-ups or ideally, store-bought building materials.

The Boat: From the local shipyards, they salvaged old hulls and topped them with millwork and hardware rescued from demolition sites: old windows, doors, stained glass, brass hinges and porcelain fixtures. On the waterfront, they maintained communal lumber piles. They inspired each other to reach new heights of funkiness - an almost college educated primitivism combining self-denial with self-expression.



Pacific Northwest, USA
1970

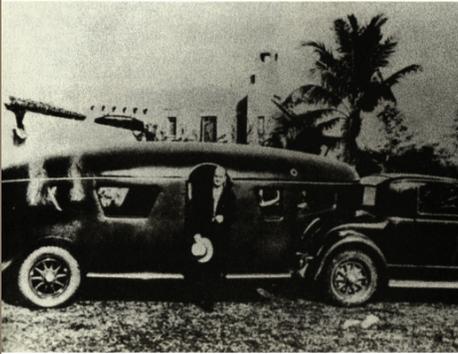
Reason on Water: Reclaiming land from the sea has been a national mission in the Netherlands. Lately, the Dutch are finding that there is too much cost in pumping the water out of the canals. So rather using there dikes they have *reversed their thinking* and are building right on the water that they had been fighting. The government is exploring, and actually mandating, creative construction of floating homes.



The Boat: The house is designed for its time with new materials, vibrant colors, flexible floor plans, pre-fab structure, pre-fab baths, and configuration that make creative use of water and docks. Most “Floating Homes” rest of a platform of concrete or styrofoam for stability in the water.



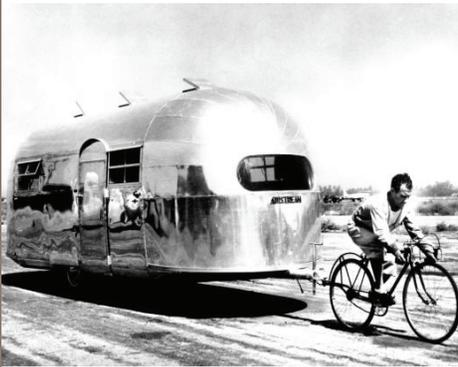
Netherlands
2002



Aerocar
1922.

Reason of Existing: The Aerocar embodied a new synthesis between the ideal of camping as a rustic, natural activity, and the romantic vision of technology winging mankind into a comfortable but adventure some future. Also the idea that once outside the structured society of cities and in the open countryside, people could enjoy each other as equals.

The Trailer: The Aerocar featured rounded edges and a goosenecked section fitting over the trunk of the tow car. It was described as “neat as a yacht and beautifully streamlined. Inside were four Pullman type berths, a spotless galley and an airplane type observatory cockpit forward with a glass roof. There were wardrobes and running water and a telephone to the car ahead.”¹



Airstream Trailer
1935

Reason of Existing: As gas prices went up, the need for a more streamline trailer ocured. The idea of the Airstream trailer was to make more wind resistance negligible and light to insure drivers longer distances to travel with one gallon of gasoline.

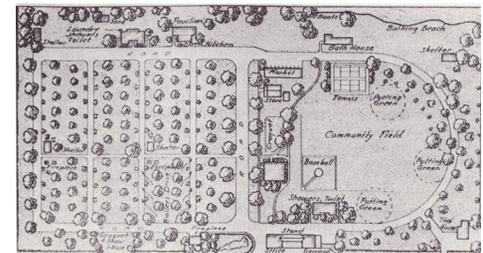
The Trailer: The shape and structural design of the Airstream has changed little to this day. Its shell of aluminum sheets and ribs featured rounded edges forming a giant teardrop. Wally Byam explained the principle of its design based on aerodynamic considerations: “[...][the front was rounded to present an easy edge into the wind, vertically and horizontally. The tail was tapered off to eliminate suction in the rear. It was streamlined underneath as well as on top][...][and planned to give an extremely low center of gravity.]”²



Typical Trailer Camp
1936

Reason of Existing: The first auto campgrounds, constructed in early 1920s, were municipal facilities. Their development was encouraged by local businesses who saw autocampers as potential customers. The campgrounds were a source of community pride and an object of rivalry between neighboring towns.

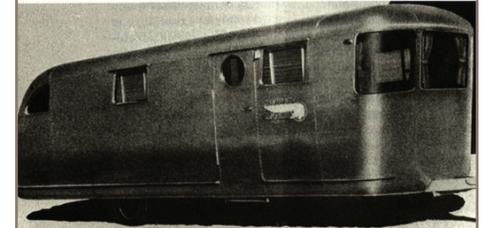
The Camps: Ten to fifteen acre sites, usually near the center of town, were made available free to the public. They were supplied with portable water, toilets, electric lights, showers, laundry, and even a central kitchen with stoves and eating areas.



1. Automobile and Trailer Travel, 1:1 (Jan.-Feb. 1936), 26.
2. Automobile and Trailer Travel, 1:2 (February 1936) 20.

Reason of Existing: The Spartan design ed for a house trailer population. Like most of the house trailers of the postwar period, bathrooms were included. Since the trailer would still have to be towed by car, lightness remained an issue, but new emphasis was placed on interior accommodations, particularly those that provided more privacy for [year-round family living](#).

The Trailer: The models Spartan offered incorporated the structural technology of aircraft. They were constructed of aluminum sheets riveted to deformed ribs, forming a structural membrane. The front window wrapped around the sides like a windshield, and was held in place by a rubber gasket. The edges of the trailer were rounded both to reduce wind resistance and help shed water.



Spartan Manor
After WWII

Reason of Existing: The van become an icon of [counterculture lifestyle](#) for a couple of reasons. First, the van could carry a number of people plus camping gear and cooking supplies, extra clothing, do-it-yourself carpenter's tools, secondly as a "statement", its boxy, utilitarian shape made the van everything the American cars of the day were not.

The Van: The early versions were often called the T1a or "Barndoor", owing to the enormous rear engine cover, while the later versions with a slightly modified body (the roofline above the windshield extended), and smaller engine bay. The cargo van provided large interior space, which allow groups of people to travel together.



VW Van
1960

Reason of Existing: Smaller travel trailers and pop-ups were made with touring in mind. By design, they are lightweight and quick to set up or to prepare for travel. Most can be towed with a large car or small truck depending upon its towing capacity. [Lightweight](#) pop-up trailers weighing less than 700 lbs, can even be towed by small economy cars and small SUVs. Some exceptionally light travel trailers can be pulled by motorcycle.

The Camper: The camper allows for a [transformation](#) between stationary and moving positions. While the trailer is moving it is in its compact form and is lightweight and wind resistant. After is in static position, the trailer can transform into a camper which provides all living necessities.



Pop-up Camper
1980



Bedouin Tent
Pre-Civilization

Reason of Existing: The Bedouin people are a desert-dwelling Arab nomadic pastoralist. The individual family unit typically consisted of three or four adults (a married couple plus siblings or parents) and any number of children. Their lives focus on semi-nomadic pastoralism, migrating throughout the year following water and plant resources.

The Tent: The Bedouin tents were designed to excel in **foul weather**, and were made of hand spun and woven goat hair, for the desert conditions. This material was perfect for the North American climates. The canvas was also used to make sails for boats which must withstand the rigours of salt, sun, wind, and harsh ocean weather conditions. This canvas is superior for durability, water shedding, and is mildew resistant.



Yurt
Pre-Civilization

Reason of Existing: The wooden lattice crown of the yurt, the Kazakh, is itself emblematic in many Central Asian cultures. In old Kazakh communities, the yurt itself would often be repaired and rebuilt, but the shangrak would remain intact, passed from father to son upon the father's death. A family's length of heritage could be measured by the accumulation of stains on the shangrak from generations of smoke passing through it.

The Yurt: Yurts consist of a circular wooden frame carrying a felt cover. The felt is made from the wool of the flocks of sheep that accompany the pastoralists. The frame consists of one or more lattice wall-sections, a door-frame, roof poles and a crown. It was designed to be dismantled and the parts carried on camels or yaks to be rebuilt on another site, and are highly engineered and built for extreme weather conditions.



Tipi
Pre-Civilization

Reason of Existing: The tipi was durable, provided warmth and comfort in winter, was dry during heavy rains, and was cool in the heat of summer. Tipis could be disassembled and packed away quickly when a tribe decided to move, and could be reconstructed quickly when the tribe settled in a new area. This portability was important to those Plains Indians who had a **nomadic lifestyle**.

The Tipi: Tipis consist of the following four elements: a set of ten to twenty sapling poles, a canvas or hide cover, an optional inner canvas or skin lining, and a canvas or skin door. There may also be an optional partial ceiling. This opening at the top and the smoke flaps, which allow the dweller to cook and heat themselves with an open fire, and the lining that is primarily used in the winter, which insulates while providing a source of fresh air to fire and dwellers.

Reason of Existing: The Dymaxion House was developed to address several perceived **shortcomings with existing homebuilding techniques**. Buckminster Fuller's designed several different versions of the house at different times, but they were all factory manufactured kits, assembled on site, intended to be suitable for any site or environment and to use resources efficiently. One important design consideration was ease of shipment and assembly.

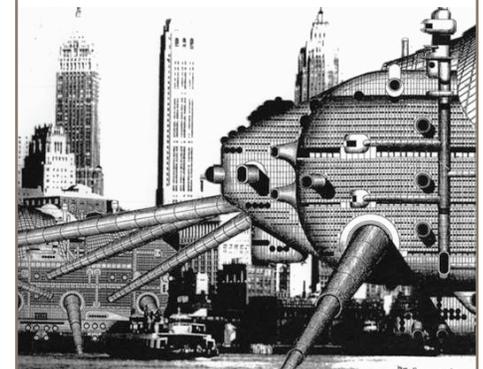
The House: The Dymaxion house used a central vertical stainless-steel strut on a single foundation. Structures similar to the spokes of a bicycle-wheel hung down from this supporting the roof, while beams radiating out supported the floor. Wedge-shaped fans of sheet metal aluminum formed the roof, ceiling and floor. Each structure was assembled at ground level and then winched up the strut. The Dymaxion house represented the first conscious effort at building an autonomous building.



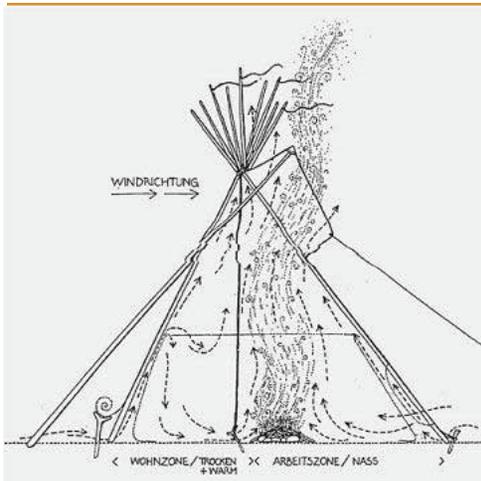
Dymaxion House
1948

Ideas of Archigram: "It [Archigram] provides a new agenda where nomadism is the dominant social force; where time, exchange and metamorphosis replace stasis; where consumption, lifestyle and transience become the programme; and where the public realm is an electronic surface enclosing the globe."¹

The Dream: The Walking City is constituted by intelligent buildings or robots that are in the form of giant, self contained living pods that could roam the cities. The pods were independent, yet parasitic as they could 'plug in' to way stations to exchange occupants or replenish resources. The citizen is therefore a serviced nomad not totally dissimilar from today's executive cars.



Archigram (Walking City)
1962



1. Crompton, Dennis (ed.) (1999). Concerning Archigram... London: Archigram Archives; prologue

<ANALYSIS>
of
PRECEDENT STUDIES

The research of all precedent studies drove my project to the meaning of mobile lifestyle. A lifestyle that does not cherish the values of the status quo, but actually realizes its own. Values that have a foundation in the communal environment. A value system that can be in reach through exploration.

The precedent studies also gave me insight into the expression of houseboat people in the Pacific Northwest. Their lifestyle is the ideal of the American cultural want to explore, and the true meaning of shelter.

<mobility>

Frederick Turner's essay, "The Frontier in American History", solidifies the idea of the frontier and the ideals of what was mobile in 1896. The conception of frontier includes the, "wild country," without which the idea of pioneering would be meaningless. Turner stated that, "Out of his wilderness experience of the freedom of his opportunities, [the pioneer] fashioned a formula for social regeneration-the freedom of the individual to seek his own." In Turner's formulation, mobility was equated with individuality. Wilderness provided the challenge, but it was Americans' willingness to move to meet the challenge that allowed the wilderness to have its regenerative effect.



<lifestyle>

My project incorporates reviving the expression of the houseboat people in the Pacific Northwest who were relatively cheap and unregulated. Today, instead of ethos, we have lifestyle-compulsion to use our hard earned income to pay for home decor that spells "success." Bohemians scaled down the size and expense of daily life in order to buy time to follow their spiritual pursuits. Instead of hating the job that paid for the things that they loved, they first loved their work and winged it from there.

This lifestyle maintains a very minimalistic trend while it moves from one place to another. Driven by the experiences instead of the fixed, they value the intangible rather than the material, but also they must stay light and compact to be most efficient while moving.

This lifestyle of houseboaters on the west coast has always been about creating and controlling their own environment. The Design of the dwelling is the expression of one's own self and voluntarily simplifying one's own life. Their homes are not a museum of past lives and future aspirations, but an expression of who they are, pure and simple.

This lifestyle of self expression and self respect, brings a stronger respect for other cultures and the neighbor's one acquires. Sharing one's own experiences with the community becomes the most valuable treasure and the roots of being a subgroup or community. Within this transient lifestyle, some neighbors could last a life time and others could come and go fairly quick.



<BOAT TECHNOLOGIES>

The houseboat gives the best opportunity for this lifestyle;

a lifestyle which is concerned about cheap cost of living, social endeavors, and environment. This is a lifestyle that values experiences, not material goods, which allows a minimalistic approach of existing. The houseboat becomes the perfect vehicle for mobility and dwelling because of its ability to tie into the urban context as well as detach itself from the status quo of travel. This way of traveling can be the best for the environment, with existing technologies of propulsion and storing energy. Having a vehicle that is self sufficient lends the opportunity for the user to be free from most limitations.

Researching boat technologies has brought me to these three vessels that provide a way of moving that is clean from any emissions.

Reason of Existing: The Sun21 serves as example of clean energy applications in practice. This **solar boat** is a vessel with electric engines that are powered by photovoltaic cells. No other vehicle is better suited to transforming photovoltaic energy into mobility. This technology is quite advanced and has demonstrated its potential in practice.

The Boat: The Sun21, is a 14-meter-long catamaran designed to sleep 5 or 6 persons. The solar-powered boat will completed a 7,000 mile journey at a speed of 5-6 knots using photovoltaic cells and without spending a single gallon of fuel.



Sun21
Summer of 2006

Reason of Existing: The Ross Barlow has been created by converting a standard maintenance boat which was donated to the University by British Waterways. Professor Rex Harris, project leader from the School of Engineering's Department of Metallurgy and Materials Science at the University, says, 'It is widely recognised that the world has no more than twenty years to meet the urgent challenges of climate change and oil depletion. Much can be gained from the operation of hydrogen-based demonstrators and the canal boat project represents one step in the journey towards a hydrogen society.'

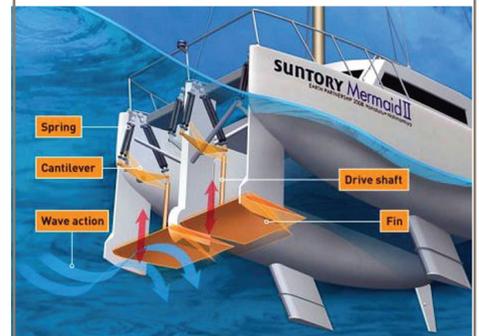
The Boat: A zero-emission hydrogen hybrid canal demonstrates how a combination of magnet and **fuel cell technologies** could be used to power inland waterways craft. The hydrogen is stored on board in a large scale metal hydride storage system. This provides an effective means of storing large amounts of hydrogen at room temperature.



Ross Barlow
September 2007

Reason of Existing: The lone researcher of wave powered boats, Professor Hiroshi Terao of Tokai University's oceanography department, assisted in the construction of a vessel to bring Kenichi Horie's dream of wave powered sailing to life.

The Boat: The world's first wave powered boat. **Wave powered** boats feature fins at the front of the craft, which generate thrust force by moving up and down like the tails of dolphins and whales and absorbing the energy of the waves. The fins absorb energy from the pitching motion of the boat, the pitching decreases and the boat's stability is improved. Under normal use the sole power source is wave energy, but the boat can also use sails or an outboard motor when entering or leaving harbor, or in case of emergencies. The body uses recycled aluminum material, which is more durable and corrosion resistant than other recycled aluminum, an important consideration given the duration and rigors of the voyage.



Suntory Mermaid II
2008

<BOAT TECHNOLOGIES>

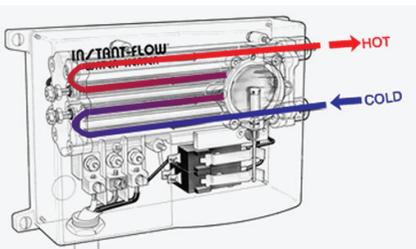
Other sustainable technologies system that allow the plausibilities of the houseboat.

Sun-Mar Mobile Family



The original composting toilet for Mobile and Marine applications, no changing containers, no pouring out liquids. The toilet is able to handle violent motion meant that the finishing drawer had to be gasketed so that no liquid could escape from the evaporating chamber.

Tankless Water heater

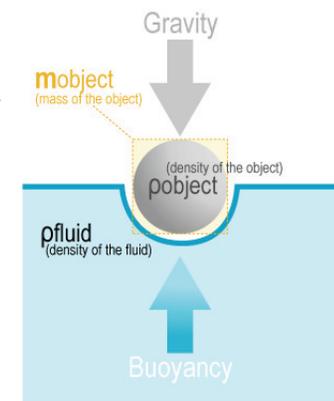


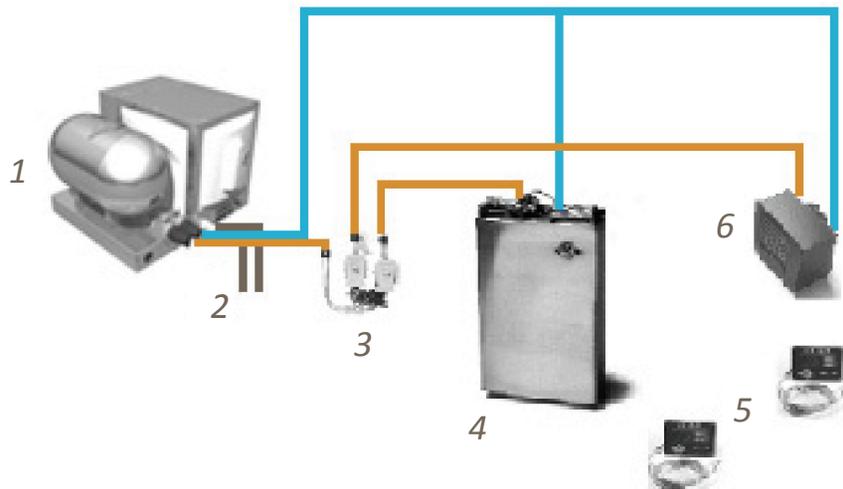
- >98% Energy Efficient
- >Compact Size
- >Unlimited Hot Water
- >Solid Copper heat exchanger
- >Maximum flow rate at given temperature

Buoyancy

_Buoyancy acts against the force of gravity and so makes objects seem lighter with respect to gravity. To represent this effect it is common to define a buoyant mass m_b that represents the effective mass of the object with respect to gravity where M_{object} is the true (vacuum) mass of the object, whereas P_{object} and P_{fluid} are the average densities of the object and the surround fluid, respectively.

Thus, if the two densities are equal, $P{object} = P_{fluid}$, the object appears to be weightless.





>Micro Hybrid Plate Refrigeration System

1. Micro HPS Compressor Unit
2. Sea Water Pump
3. Control "T" Valve Assembly
4. Trimline Hybrid Plate
5. Thermostat & ECM
6. Arctic Air A/C Blower

1. Micro HPS Compressor Unit

Micro HPS blurs the line between small, hermetically sealed DC constant-cycle units and large, high-powered DC holding plate systems. The result is a clean, compact, reliable system of unprecedented power and performance. This unit allows you to cool your refrigerator, freezer and even air condition.

- >Powerful - 7x more cooling power than any other hermetically sealed DC compressor.
- >Efficient - The first 100% hermetically sealed system to offer the energy efficiency to the open-shaft compressor systems.
- >Quiet
- >Compact - 12" deep, 13" wide and 9" high there has never been system this powerful and this small.
- >Lightweight - The fully charged condensing unit weighs in at under 38 lbs.



4. Trimline Hybrid Plate

These "spider coils" quickly and evenly remove heat from the system. These new proprietary solutions in the holding plates provide up to four times more usable heat absorption capacity, than other marine coils.



6. Arctic Air A/C Blower

This refrigeration system generally needs to run only about 1/2 to 2 hours per day to handle a boat's refrigeration needs. This means that the compressor and other major components of the system are "off" up to 96% of the day. It is during this "off" time that the ARCTIC AIR option automatically puts the refrigeration system back to work to provide air conditioning for the cabin.



<INTENT NARRATIVE>

As the research was gathered and analysis the intent of the project began to change. The change occurred with the realization that people really value the “experience,” and the worth of a story.

>Cultural Shifts

Today, a realization of a cultural shift is happening, and the idea of status is changing. The ‘old’, material-era status symbol, of owning high price material goods is not every consumer’s fantasy. A more mature generation is emerging from our teachings and is realizing that experiences, personal interaction, and memories hold true worth.

A recent study from Unity Marketing shows, “the consumers are spending more, in many cases lots more, on life-changing experiences, while their need for luxury goods is waning. Spending on luxury experience in the US, including travel, dining, entertainment, spas and beauty services and home services, nearly doubled, from an average of USD 11,632 in 2004 to USD 22,746 in 2005: a 95.5 percent increase.”

This lifestyle is driven by experiences instead of fixed by entertainment, by discovery, or by one’s own satisfaction. The fixed ideologies are thus replaced by an obsession with the here and now, an ever-shorter satisfaction span, and a want to collect as many experiences and stories as possible. This cultural change shifts toward something less influenced by aspiration to consume material products, in which the focus moves toward a value and satisfaction in travel, exploration, detachment and freedom. This freedom will provide a new depth of one’s self existence, new personal relationships, and an opportunity for foreign cultures

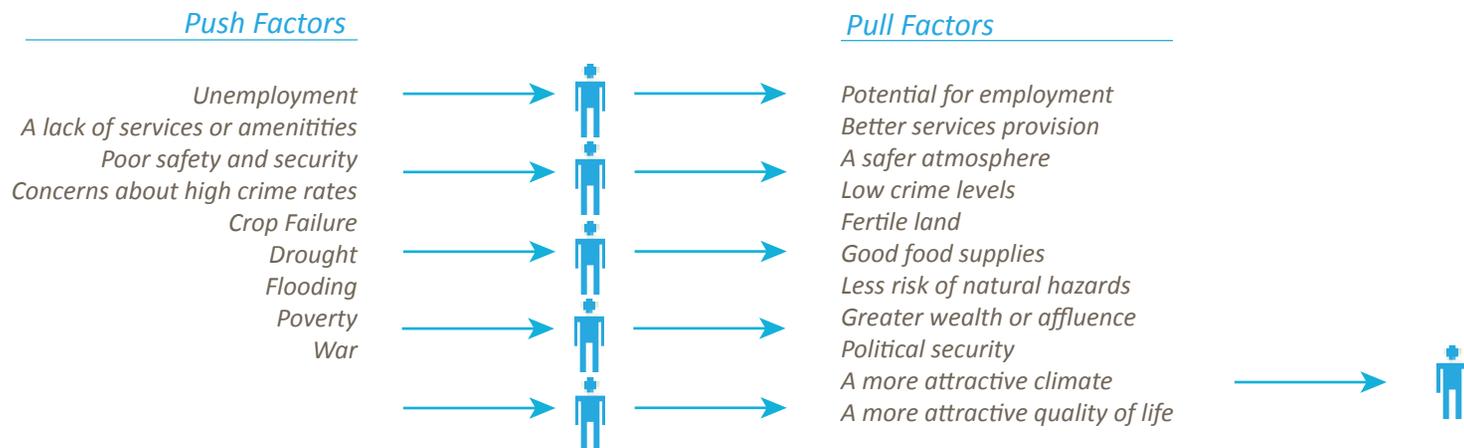
The Communication Age has brought the capabilities of a culture shift as well, and the possibility for many of us who are still immersed in the world of work to seek out a mobile life. The wireless cell phone, the computer, and the internet are all technologies that have the abilities to keep us connected, from the home or anywhere, and a part of a productive modern mobile life. We are standing at a new threshold of curiosity and movement that is poised for more than idea-sharing over vast distances; we are ready to physically actualize these explorations and encounter new people and visit old friends.

This cultural shift is the dawn of mobile architecture, where dwelling applications and uses are limitless and have no borders. Mobile architecture can be defined not merely as a movable structure but rather as a way to intelligently inhabit a specific environment at a specific time and place in a way that better reacts to increasingly frequent social environments. Mobile architecture has to lend itself to stronger possibilities, other than stable ground, in which the dynamic water is where being footprint free is an emission free floating home.

<MIGRATION>

The want to gain experiences and be free from society's values is the undertow of this project, but the following are four other push/pull factors that indicate why individuals migrate in general:

- >**Economic**: Find work, follow career path, or current status lifestyle is too expensive
- >**Social**: Find better quality of life, or be closer to loved ones.
- >**Political**: Escape political persecution.
- >**Environmental**: Natural disasters, inhabit other cultures, or climate change.



migratation on **WATER:**

>ECONOMICAL:

- a) Dwelling: The cost of living in the metropolitan area is very high. LA is 56.6% above the nationwide average in Cost of Living for the Second Quarter 2007.
- b) Traveling: The cost of traveling, air fare and/or hotel, is very high.

>SOCIAL:

- a) Being a part of a subgroup and/or community.
- b) To detach from the society.
- c) More opportunities to be a part of foreign social and cultural endeavors.
- d) Discover and learning from other cities or cultures.
- e) Visit loved ones.

>ECOLOGICAL:

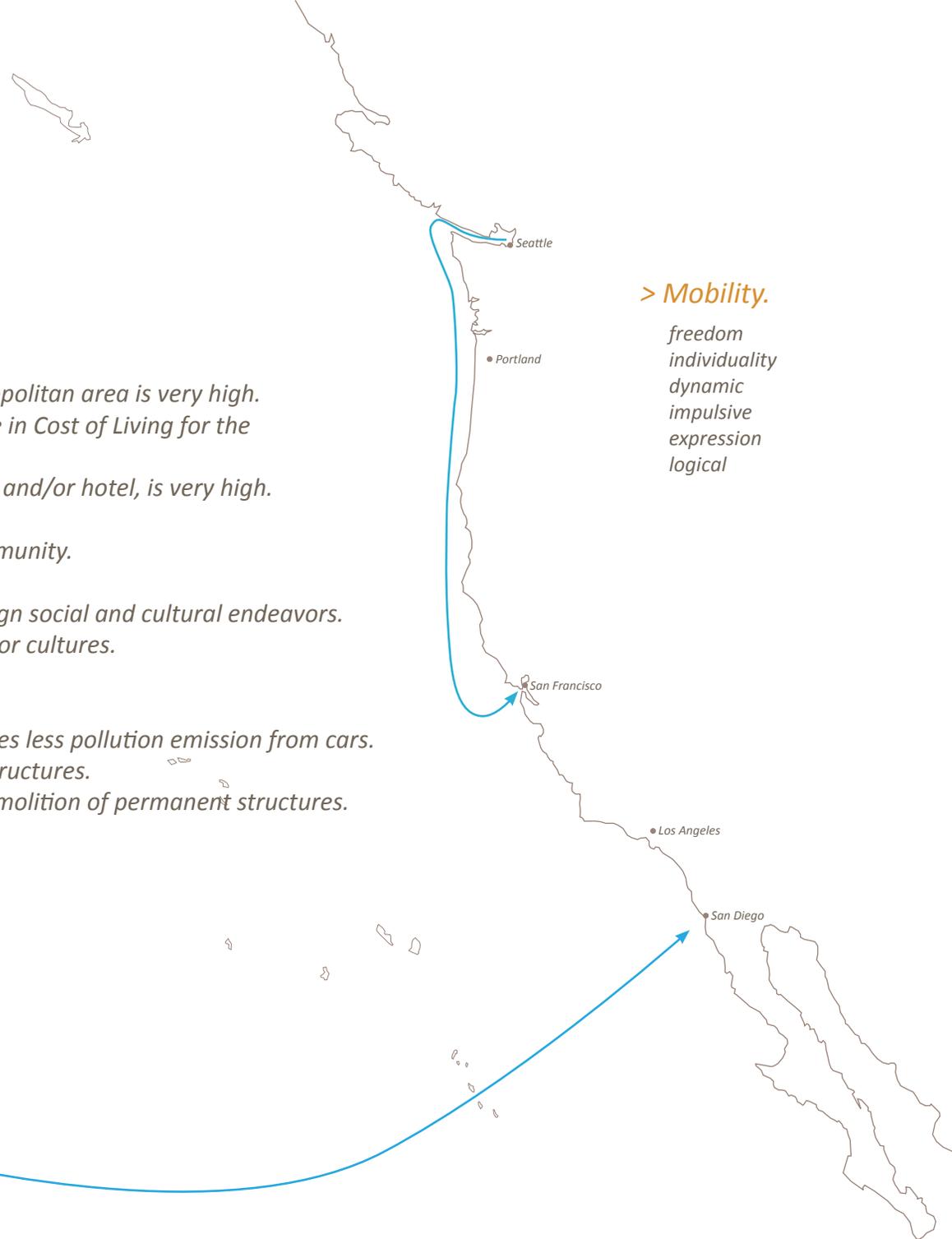
- a) Misdirects the urban sprawl and provides less pollution emission from cars.
- b) An alternative solution to permanent structures.
- c) Creating no wasteful materials after demolition of permanent structures.
- d) Acting less land resources and wildlife.
- e) Less energy dependant dwellings.

>ENVIRONMENT:

- a) People like to live on or by water.
- b) Ambiance.
- c) Cleaner air.
- d) Different relationship with light.
- e) Reign over water.

> Mobility.

- freedom
- individuality
- dynamic
- impulsive
- expression
- logical



<CONTEXT/USER>

The lifestyle today, has more responsibility to society and the environment, than ever before. **This counter-culture lifestyle is not abandoning society, but rather engaging it in a different way by staying within the urban context of the region.** This allows these individuals to make a living outsourcing themselves or searching for the best opportunity to do their job.

The general site chosen was the United States West Coast because of its strong history of **existing houseboats in the Pacific Northwest and also the multitude of large progressive cities that are connected by this waterway.** The freedom of the houseboat is desirable; but also important is the access to replenish basic needs of interaction, food, and hygiene at existing marinas.

>potential users/clients



Nurse: "I am a Nurse from San Diego, and I work for MSI, a company that out sources a staffing service that places nursing professionals in hospitals around North America. In the healthcare industry there is such a high demand for my qualified work that medical facilities around the country offer me 13- week contracts, which pay \$45-50 per hour. I love working in Portland during the summer and San Diego during the winter."



Construction Worker: "I am a Construction worker from Seattle. I love Seattle and working with my hands, but the winters are sometimes too long. I have found if I stay flexible, I can get great paying jobs in the south some of the time and great paying jobs in Seattle other times."



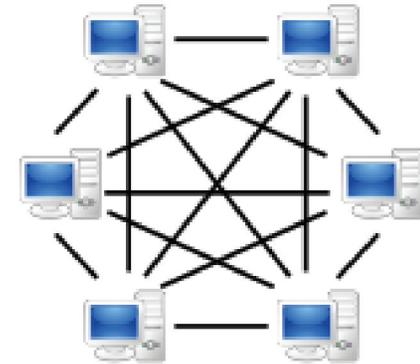
Marine Biologist: "I am a Marine Biologist, divemaster, and scuba instructor. I study the marine biology up and down the west coast of the United States trying to find ways to protect our ocean's resources and using those resources responsibly."



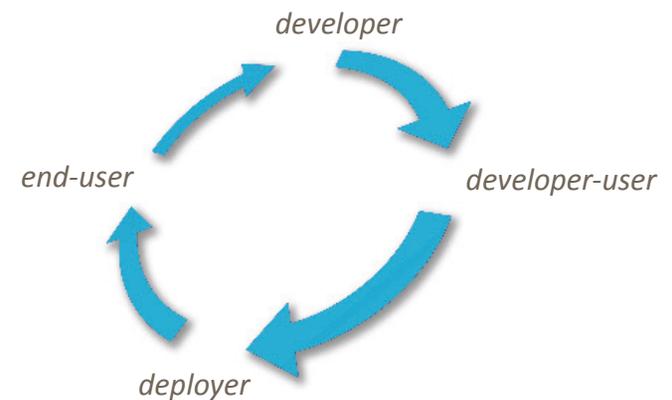
Retired Couple: "We are a retired couple from Portland, who love traveling. We spend the winters in the southern California and the rest of the year exploring as much as we can."



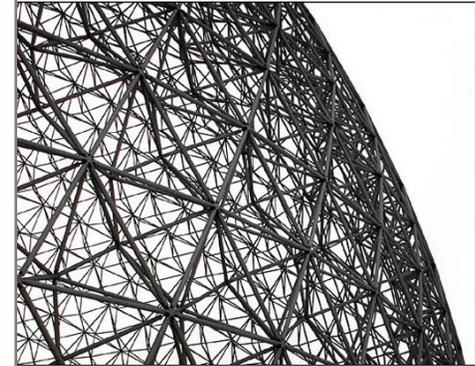
<CONTEXT/COMMUNITY>



As the houseboat fits into the Urban Context of the Pacific West Coast, it also fits into a tighter region of the **community** in the marina. *The environment community becomes an dynamic independent group that is different from harbor to harbor.* To get a better understanding of how this all could work, I researched modern day communities that are based on a equal system where the participants develop the rules and ways to modify themselves.



- > A Peer-to-Peer (or P2P) computer network is any network that does not have fixed clients and servers, but a number of peer nodes that function as both clients and servers to the other nodes on the network.
- > Rather the P2P community is created by people who are willing to *share an end goal*.
- > Peer nodes may differ in local conguration, processing speed, network bandwidth, and storage quantity.
- > One of the first uses of the phrase “peer to peer” is in 1984, with the development of the “Advanced Peer to Peer Networking” architecture at IBM.
- > It is something we can do between computers, *without needing centralized servers*.
- > Sharing music files has been the most successful application of this model.
- > Individuals working together as they please, without needing hierarchical control.



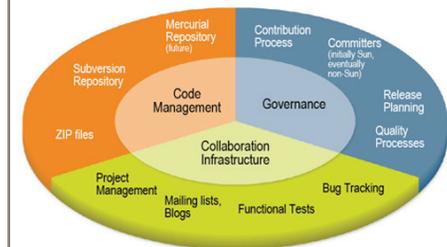
Peer to Peer Network

- > People make a journey to the Black Rock Desert for one week out of the year to be part of an experimental community which challenges it members to express themselves and rely on themselves to a degree that is not normally encountered in one’s day-to-day life.
- > There are no rules about how one must behave or express oneself at this event. Rules only apply that serve to protect the health, safety, and experience of the community at large.
- > *It is up to each participant to decide how they will contribute and what they will give to this community.*
- > Art is an unavoidable part of this experience.



Burning Man

- > Free/open source software (F/OSS) is software for which the human-readable source code is made available to the user of the software, *who can then modify the code in order to fit the software to the user’s needs*.
- > The source code is the set of written instructions that define a program in its original form, and when it’s made fully accessible programmers can read it, modify it, and redistribute it, thereby improving and adapting the software.
- > Examples of Open Source Community: Wikipedia.org, YouTube.com, and Mozilla Firefox.
- > In architecture: *the user can anticipate the changing needs of the building and make upgrades, replacements, and enhancements on location.*
- > This individual home system expands to the community level and creates a higher level of efficiency for the desire a group. Whether that be shelter, activities, transportation, or the production of food.



Open Source Community

<CONCEPTUAL DESIGN>

Initially, the project was based on these following design principles:

- >1 Self Sufficiency.*
- >2 Being unsinkable.*
- >3 Ability to weave the interior/exterior together.*
- >4 Establishing an open source community.*
- >5 Ability to change environments.*

> *Self Sufficiency.*

Having the vehicle that is self sufficient lends the opportunity for the user to be free from most limitations. For example entering into an urban context to plug-in for fuel or energy.

>1

> *Being unsinkable.*

Reassures the user that the houseboat is safe under any circumstances.

>2

> *Ability to weave the interior/external together.*

Within a lifestyle that highly values experiences, designing an opportunity to share stories with their community neighbors is important. The goal was to arrange the houseboat so that the community is brought inside and the houseboat is taken outside. To bring the inside out and the outside in.

>3

> *Establishing an open source community.*

To allow an opportunity for the users to anticipate the changing needs of the building and make upgrades, replacements, and enhancements on location. This individual home system expands to the community level and creates a higher level of efficiency for the desire a group. Whether that be shelter, activities, transportation, or the production of food.

>4

> *Ability to change environments.*

The ability to change environments would include both the idea of physically moving to another environment or the ability to change the interior environment.

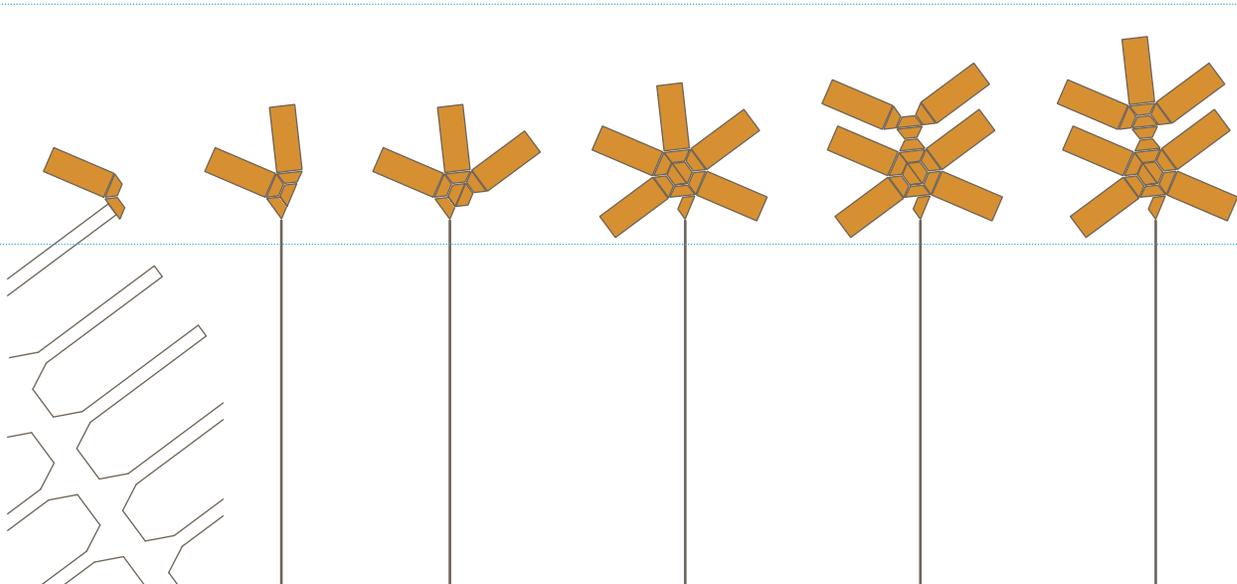
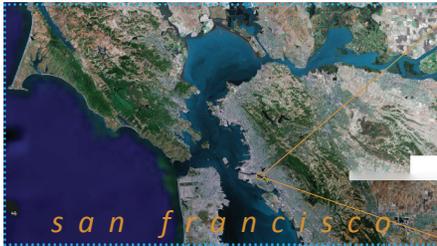
>5

>24

<CONCEPTUAL DESIGN>

community

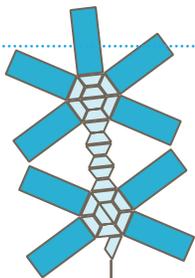
The community design becomes the platform for human interaction and personal relationships. The houseboat plugs into a marina dock which will, over a period of time-given it has additional users, form a nesting community. The community is designed to create a centralized space where persons can meet, socialize, and dine together while being plugged into the urban context.



<CONCEPTUAL DESIGN>

catamarans

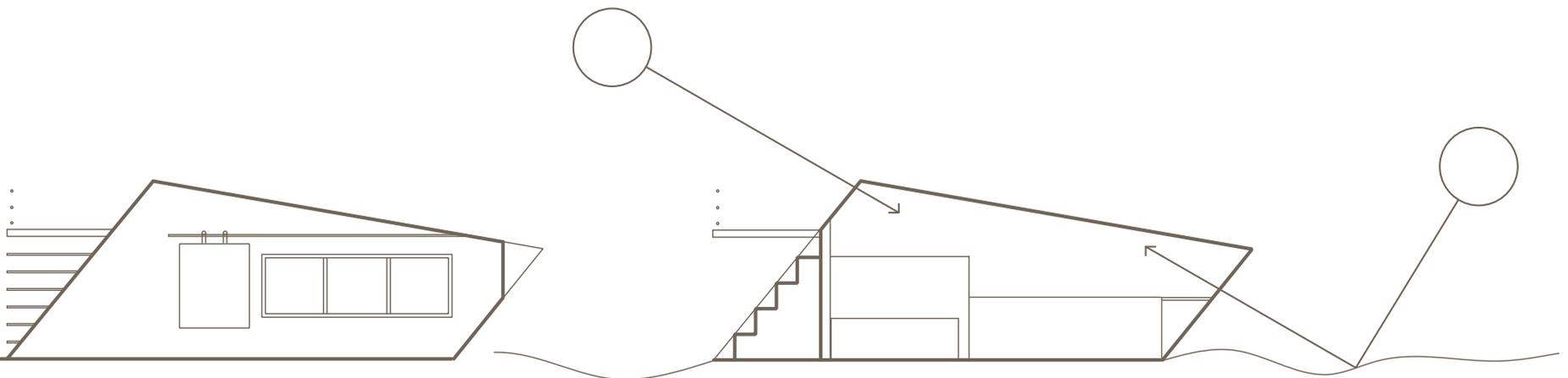
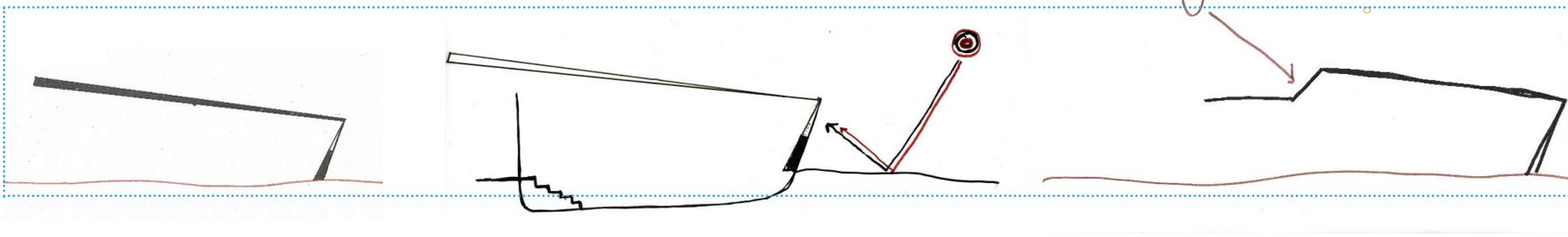
A boat consisting of two hulls joined by a frame. Catamarans can be sail-or engine-powered. They travel at a high speed, and also have less motion when stationary than a single hull boat. The design decision to go with a catamaran system was because it is more stable on water for dwelling and moving.

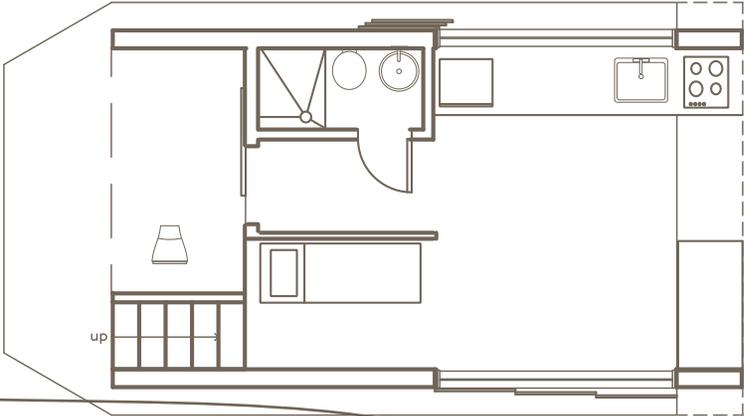
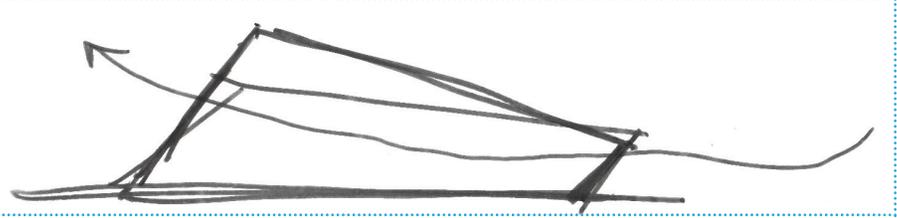
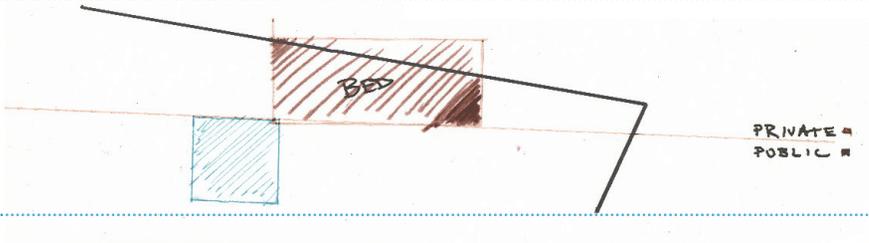
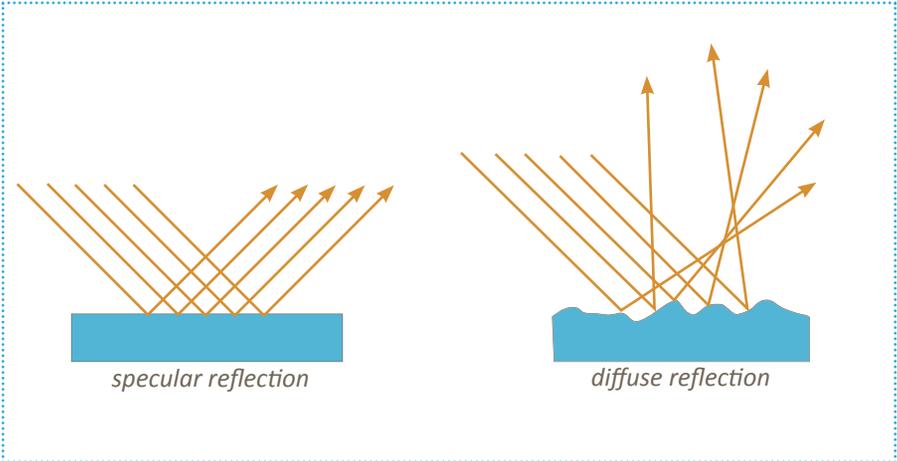


<CONCEPTUAL DESIGN>

light

The initial design efforts were based on the ambience of the water and how light bounces off of it. A strong focus of these initial designs was finding ways to bring light inside.

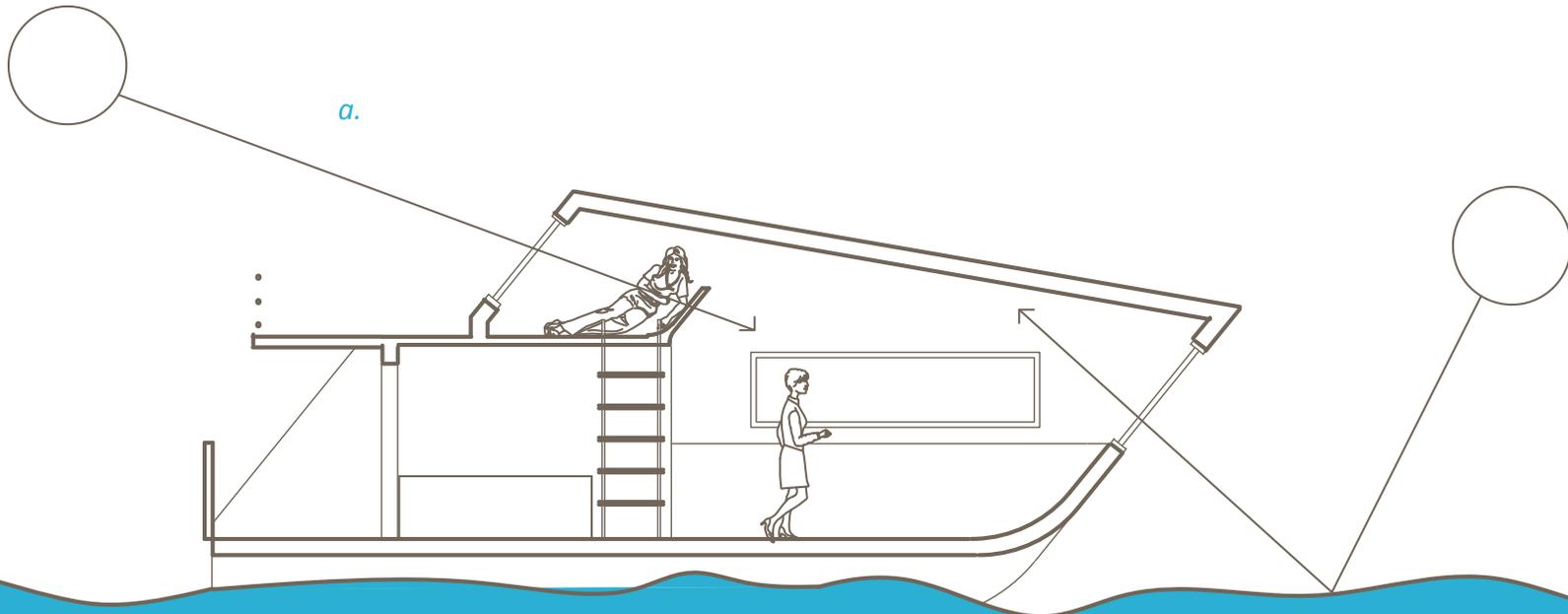
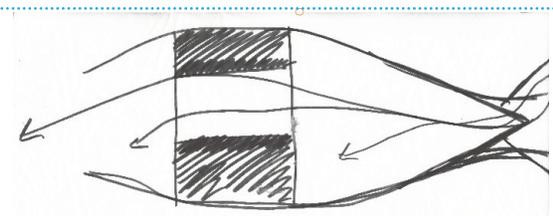


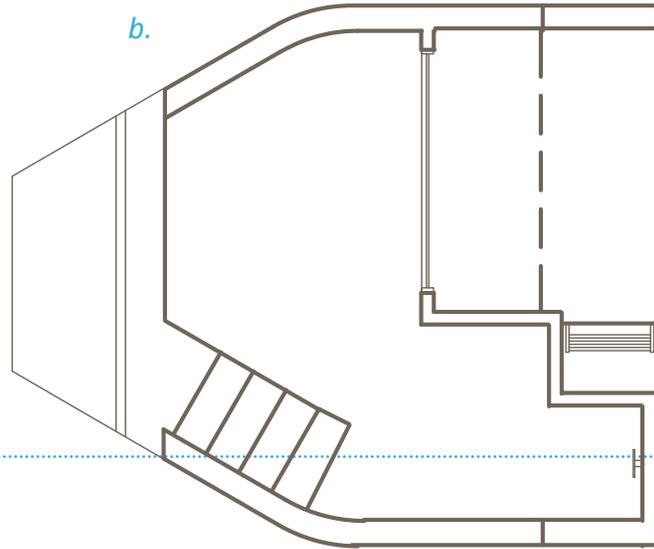


<CONCEPTUAL DESIGN>

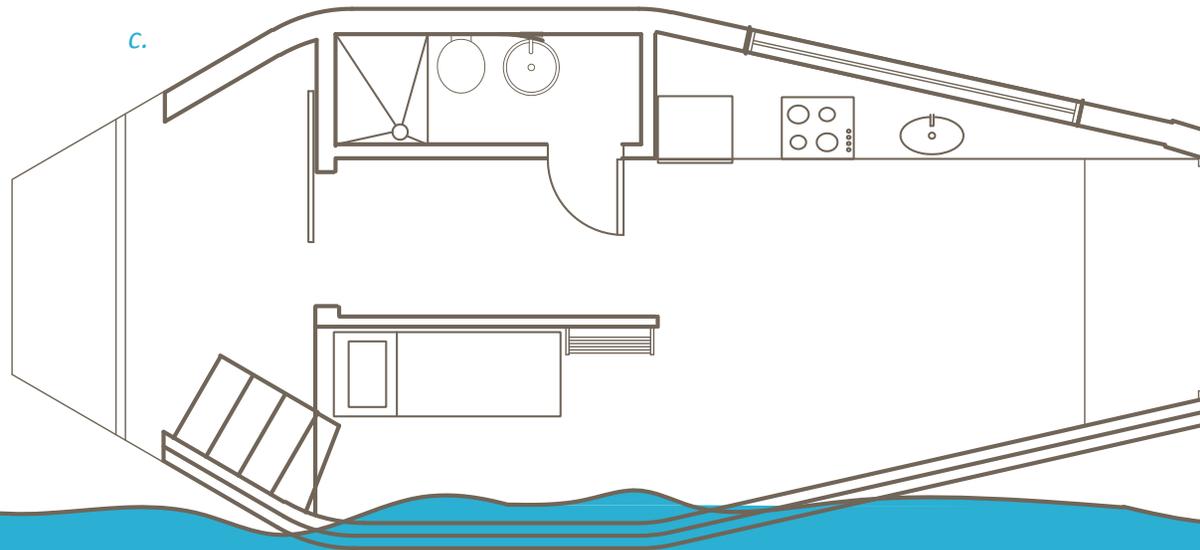
light

The design then progressed into a more aerodynamic design. The idea behind plan design, was to have my boat knife through the wind and water.





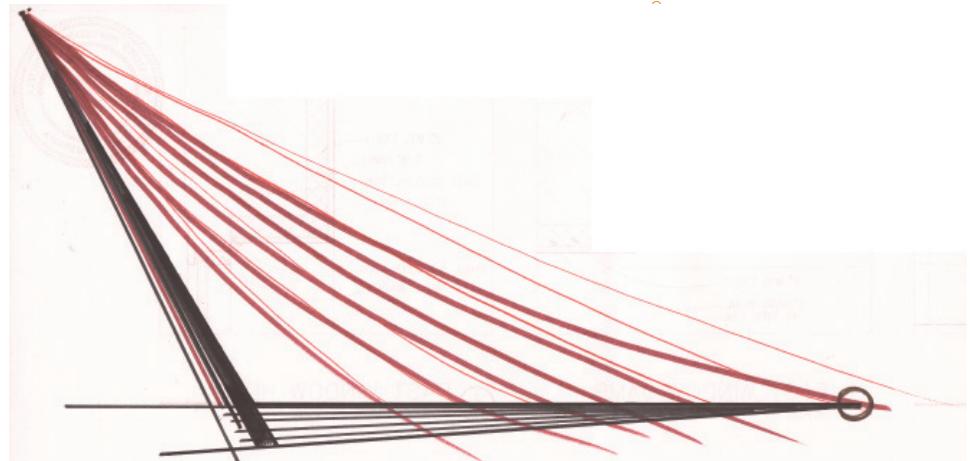
a. longitudinal section b. second floor c. first floor



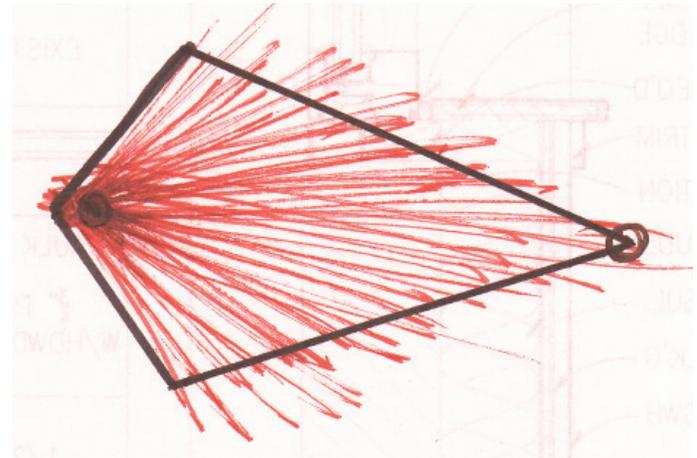
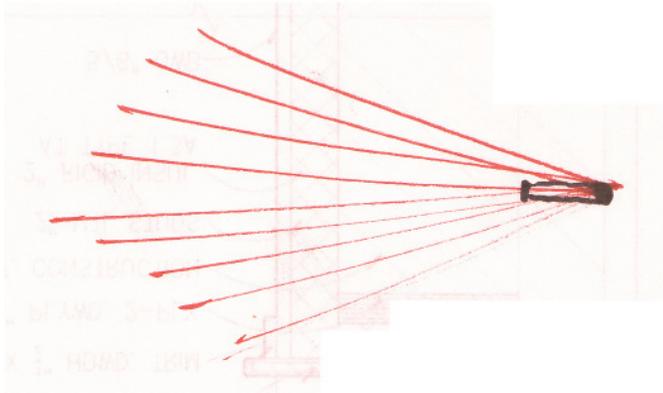
<CONCEPTUAL DESIGN>

form

Again, forms and curves were considered to try to make the design more aesthetically pleasing.



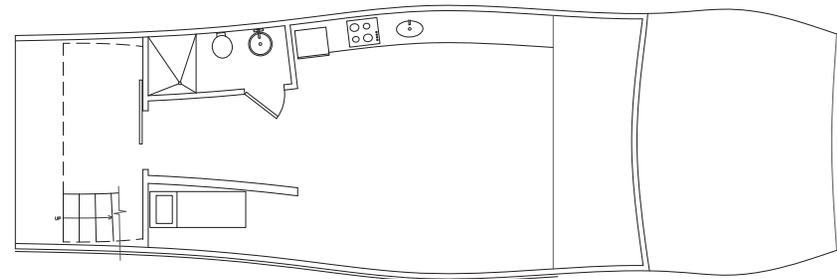
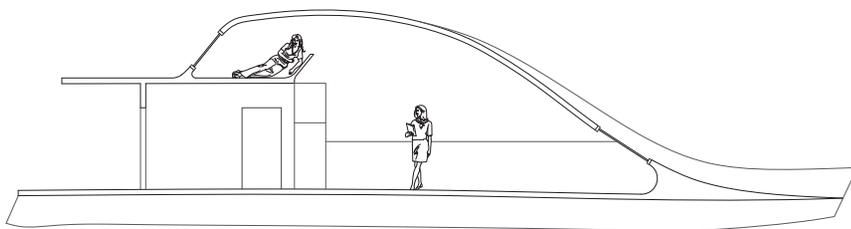
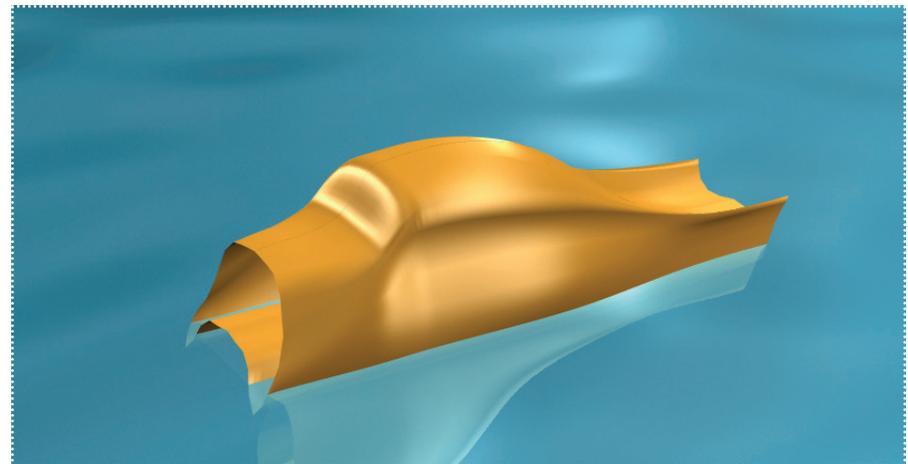
b.

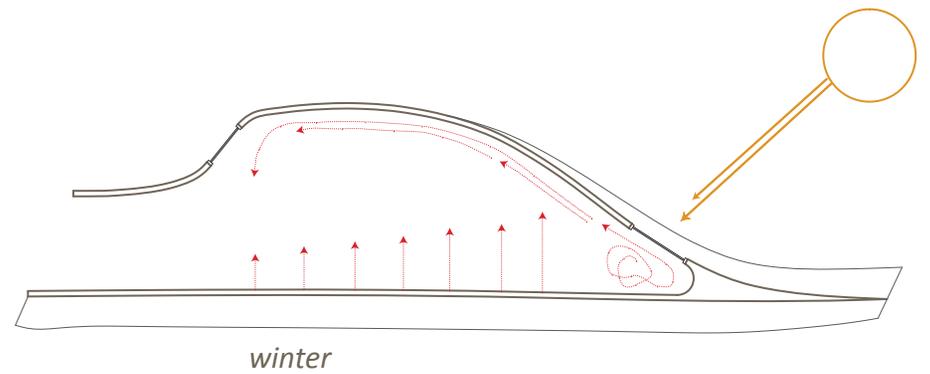
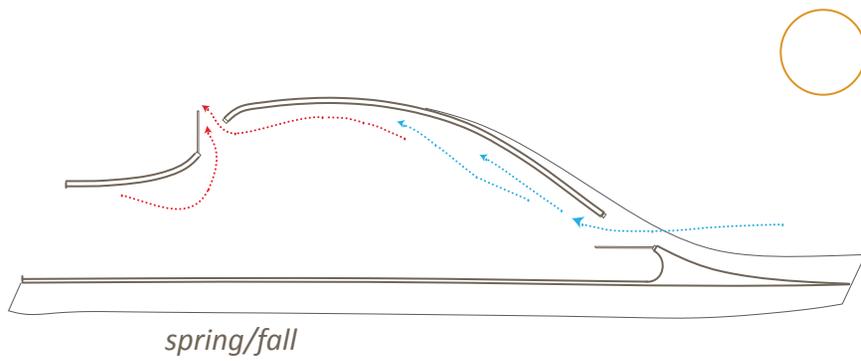
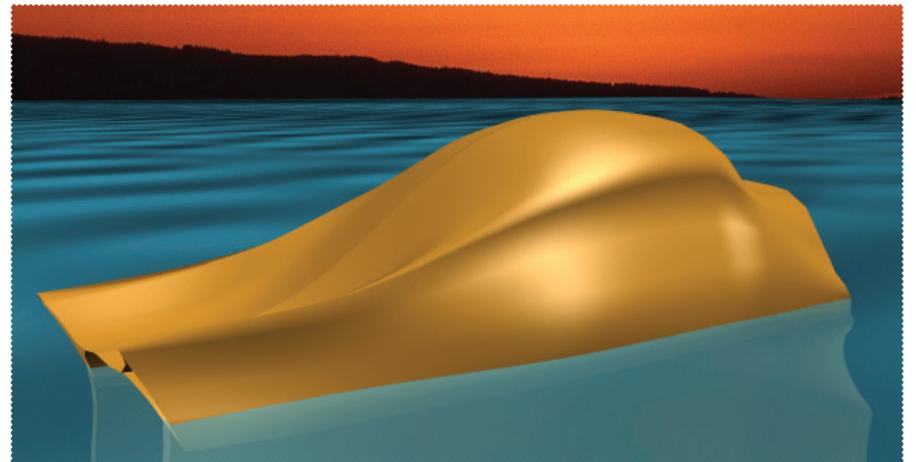
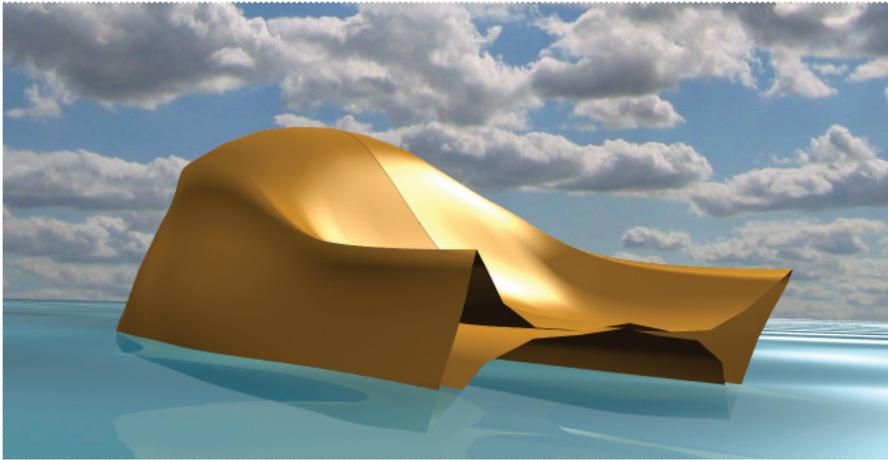


<CONCEPTUAL DESIGN>

form

Yet again, forms and curves were considered to try to make the design more aesthetically pleasing.





<COMMENTS/CRITICISMS>

WEEK12

Review Board: Steven Ginn, Tim Hemsath, Peter Hind, Mark Hoistad, Hyun Tae Jung

Comments were given about researching boats: Paul Allen designs, greek boats, the freedom ship, and how they move in different wave conditions. To get a better understanding of space, how they are built and how do they move.

The strong comments were about the struggle of the design being either a home or a boat. There was a long discussion about how the houseboat needs to be both mobile and a dwelling and this could occur by transformation. A recommendation was that when the houseboat is moving it is compact and aerodynamic and is more like a "boat" whereas when it is stationary it is open and bulky and is more like a "house." I was asked to think about when a boat should change form. Some examples that I was referred to were: when do RV's transform and why do turtles go into their shell.

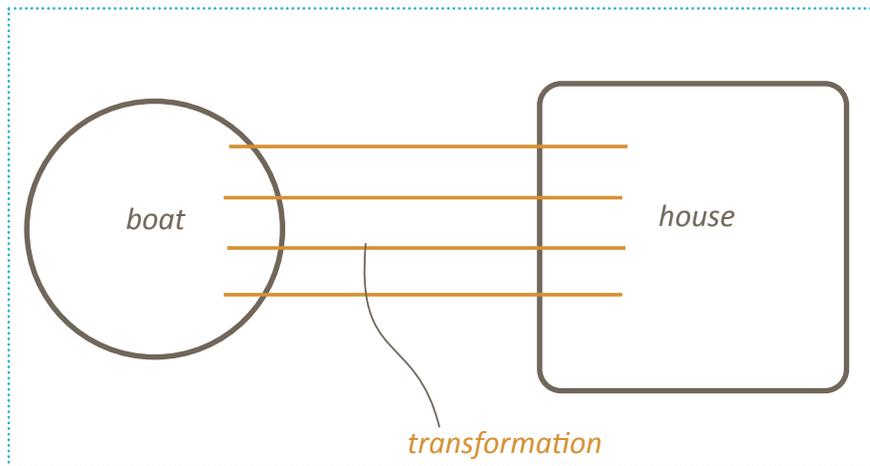
boat ————— *house*

mobile ————— *stationary*

streamline ————— *clunky*

After this critique the **concept** of the houseboat design shifted

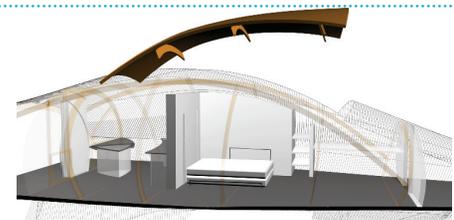
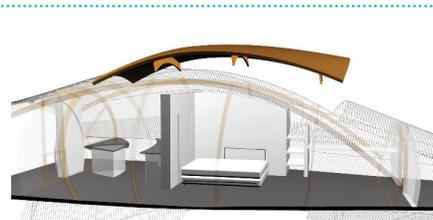
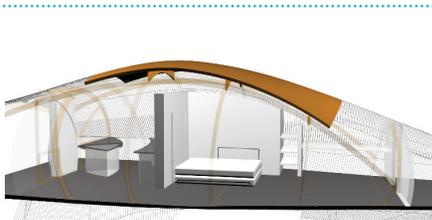
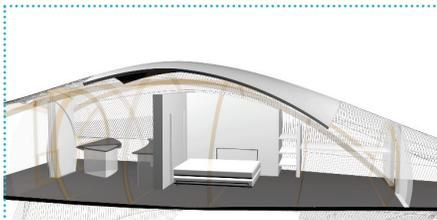
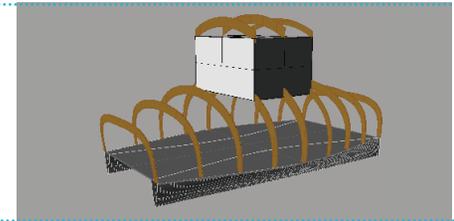
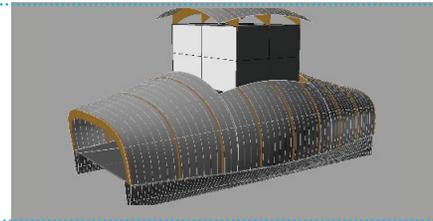
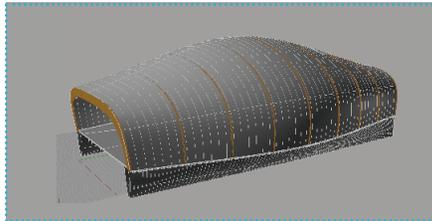
more to **transformability**. This hybrid condition (house and boat), has two different applications. The boat aspect needs to be mobile and light, compact, aerodynamic, and interoperable to plug into urban context. The house portion is stable and is open, spacious, and inviting. Combining the two programs creates a transformation.



<CONCEPTUAL DESIGN>

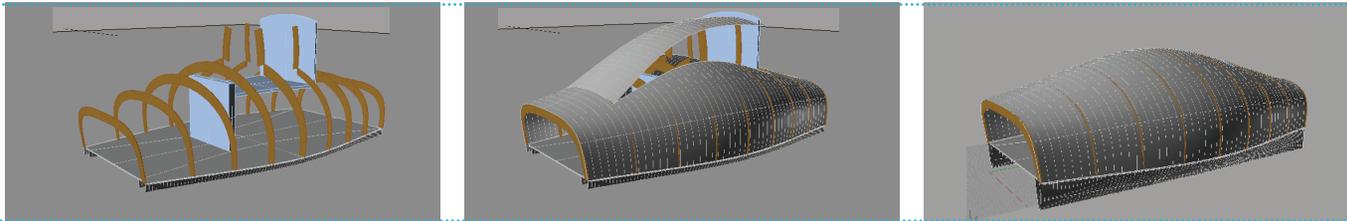
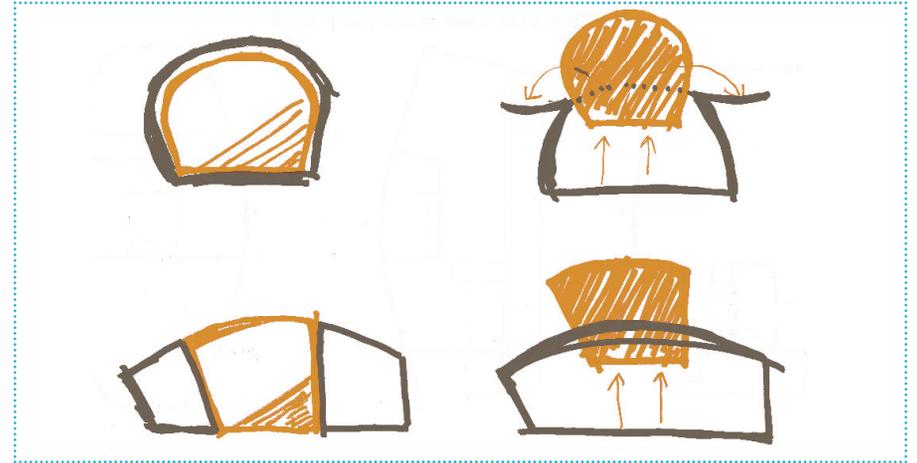
transformation

After the review, the goal was to find to a programical event that could be shifted to enhance the spatial quality. I began playing with the idea, that the sleeping unit moves up or down to facilitate the want and space. This movement allows different functions to be possible when moving and stationary; when it is stationary the dwelling is more spacious.

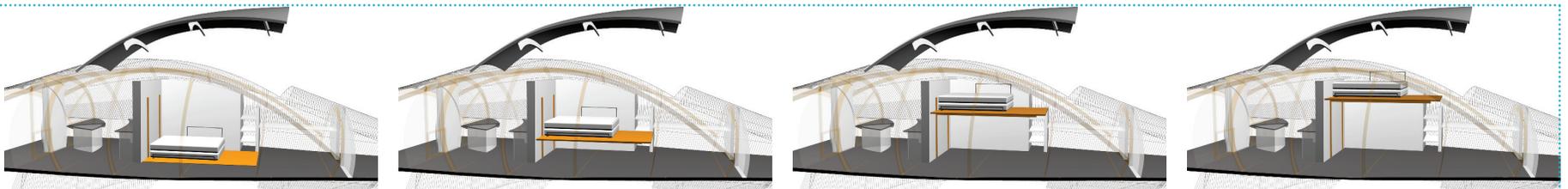


The loft transformation allows the compact boat to expand into a more spacious space. The bedroom is raised through the expanded roof to provide more square footage on the first floor and to provide a beautiful scenic view out on the water.

*-initial section sketch of the houseboat opening up;
playing with the idea of transformation*



-process renderings of the opening

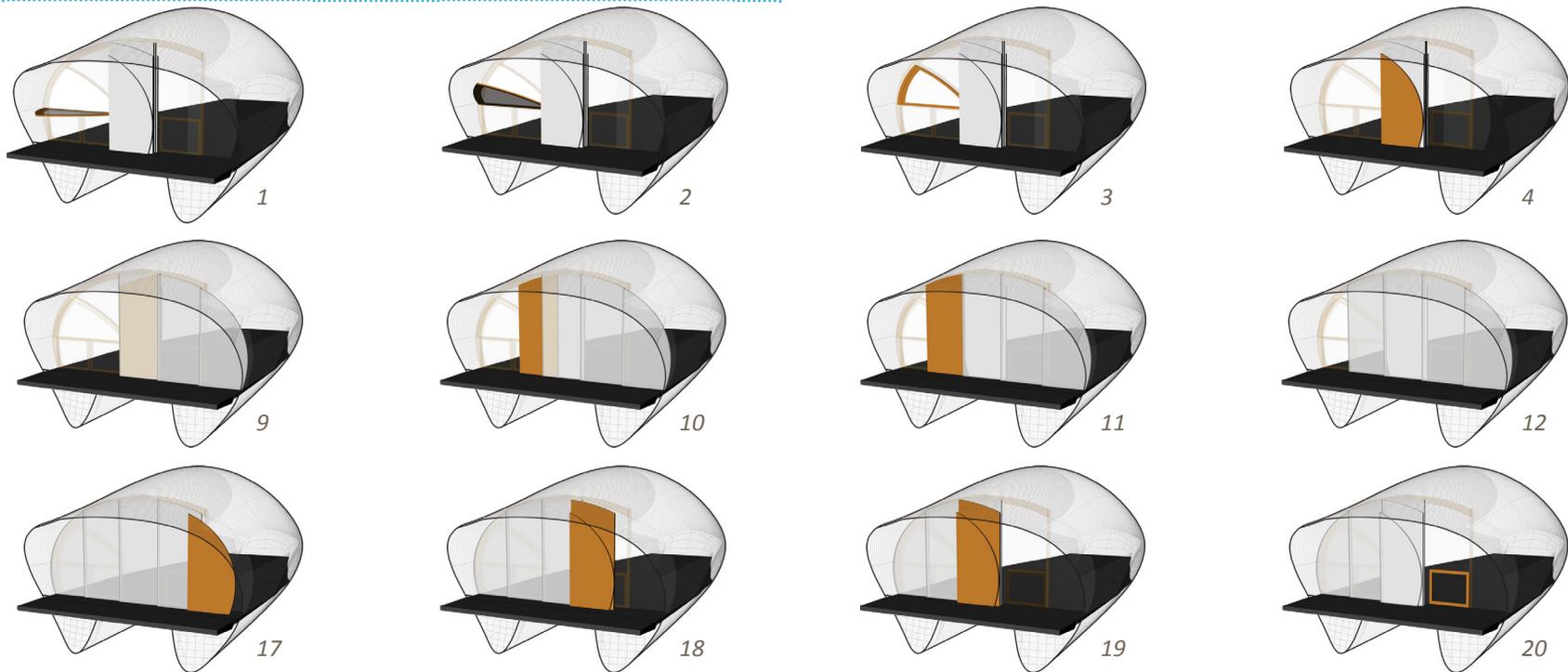


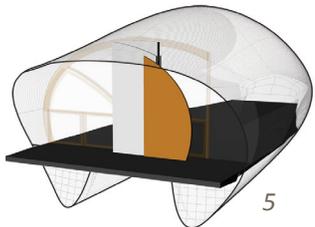
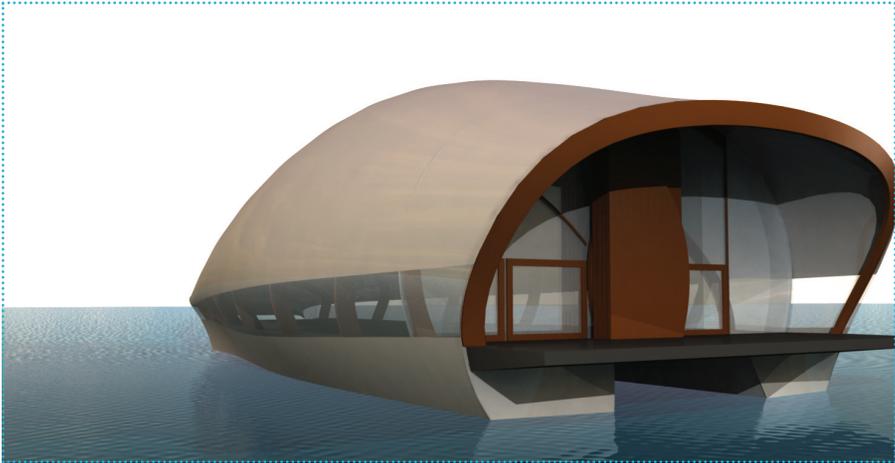
-solution for the week 15 review

<CONCEPTUAL DESIGN>

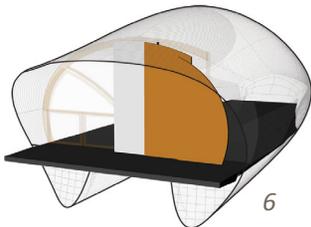
transformation

The facade that faces the community can be transformed to be either open and inviting or it can be closed and locked. The curtain wall becomes an important part of the houseboat because it provides privacy from the nested community, or a solid arm of protection for the glass wall beyond it in moments of dangerous storms. The central protection wall is based of six individual components that slide out from each other. The glass wall beyond is also operable with small ventilation windows on the bottom and a glass drop down table and lines flush with the interior table.

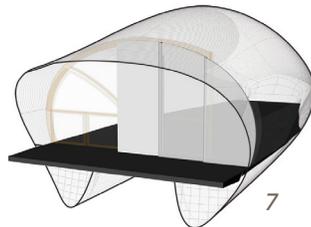




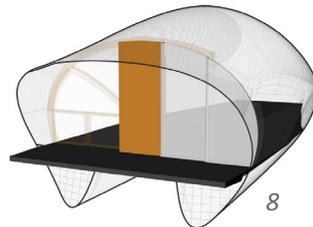
5



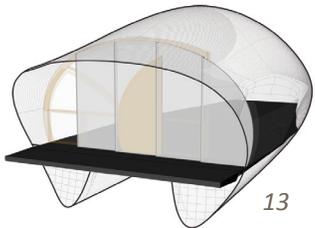
6



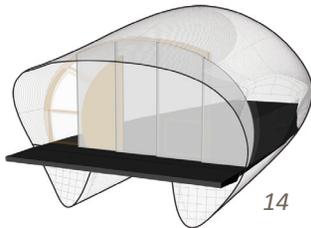
7



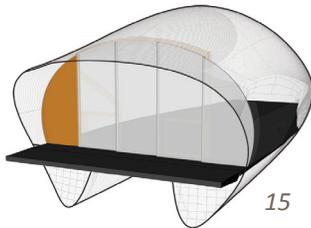
8



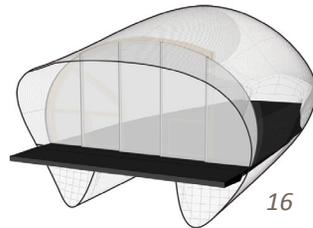
13



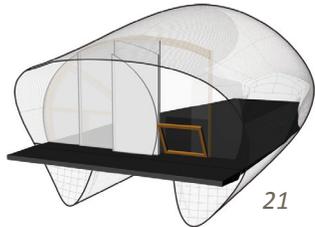
14



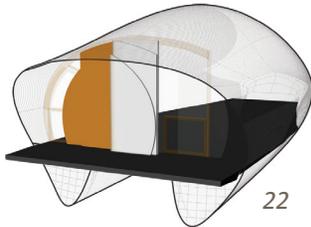
15



16



21



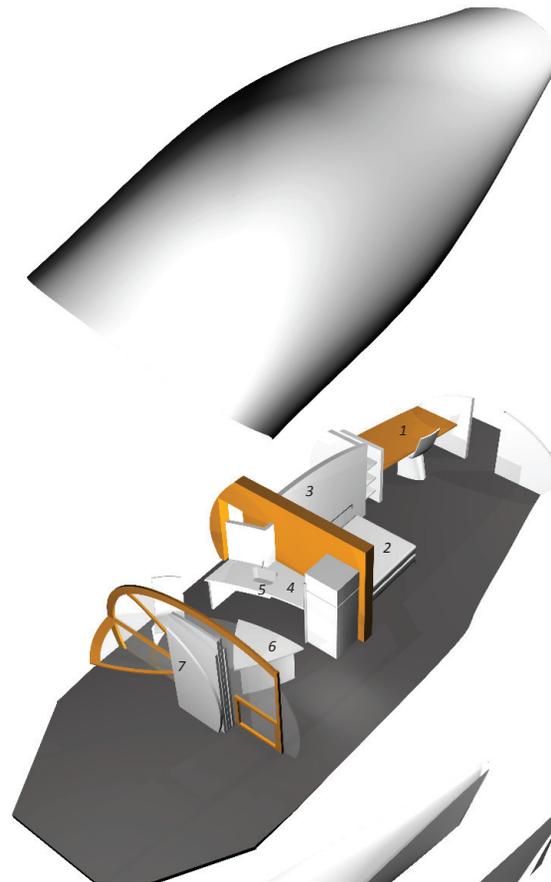
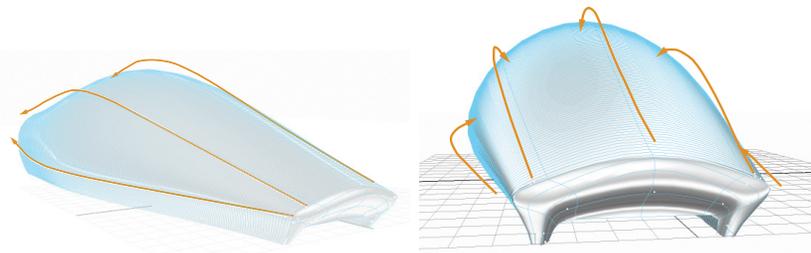
22



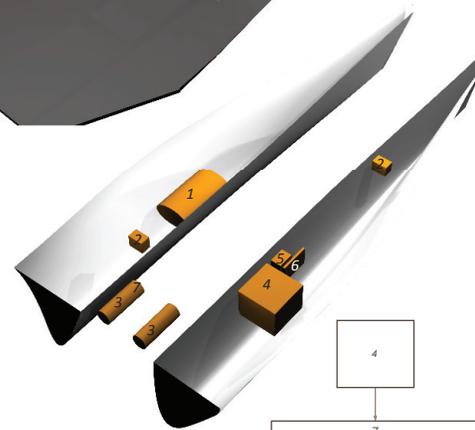
23

<CONCEPTUAL DESIGN>

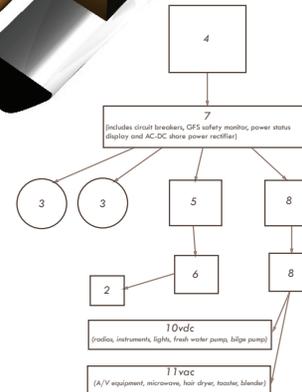
As the project moved forward, the design of the houseboat became more and more streamline. This streamline design was a product of both wind and water.

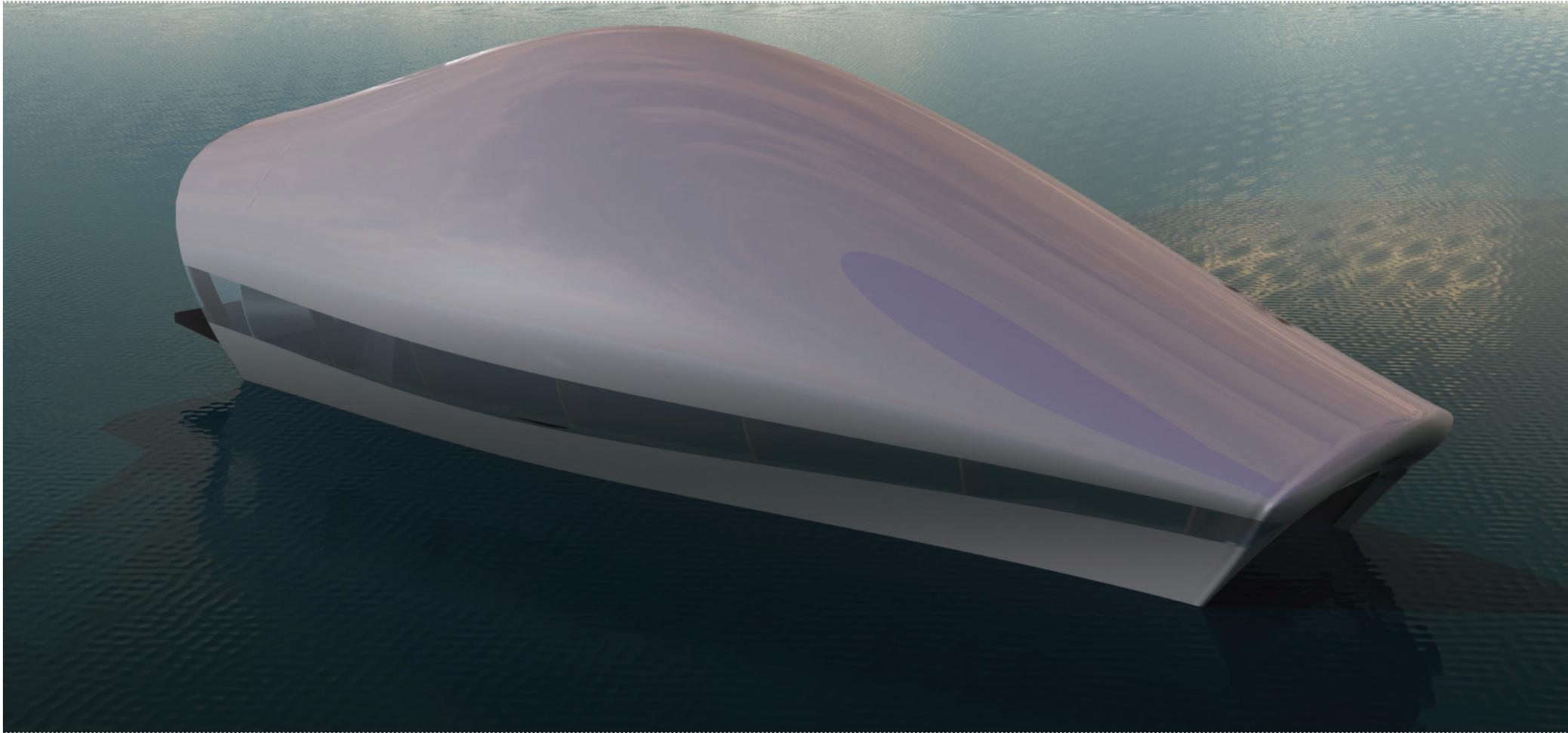


- >1 work station
- >2. loft bed
- >3 sun-mar composites toilet
- >4 kitchen
- >5 tankless waterheater
- >6 counter top/dinning table
- >7 transformable protection walls



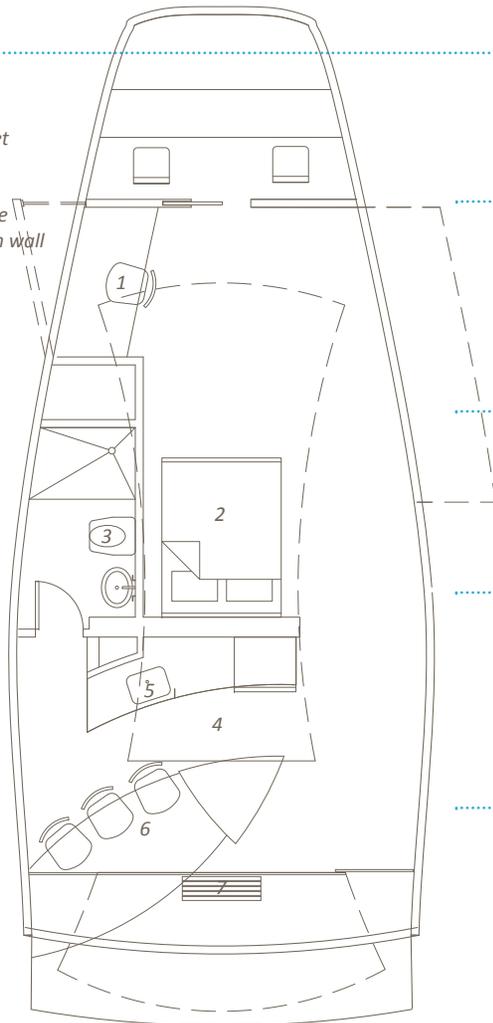
- >1 150 gallon water tank
- >2 arctic air - air conditioning option
- >3 propulsion motor
- >4 generator
- >5 hybrid condensing unit
- >6 hybrid plate evaporators
- >7 power distribution box
- >8 battery charger
- >9 batter bank
- >10 ac house loads
- >11 dc house loads





<CONCEPTUAL DESIGN>

- >1 work station
- >2 loft bed
- >3 sun-mar composting toilet
- >4 kitchen
- >5 tankless waterheater
- >6 counter top/dinning table
- >7 transformable protection wall



>43

closed

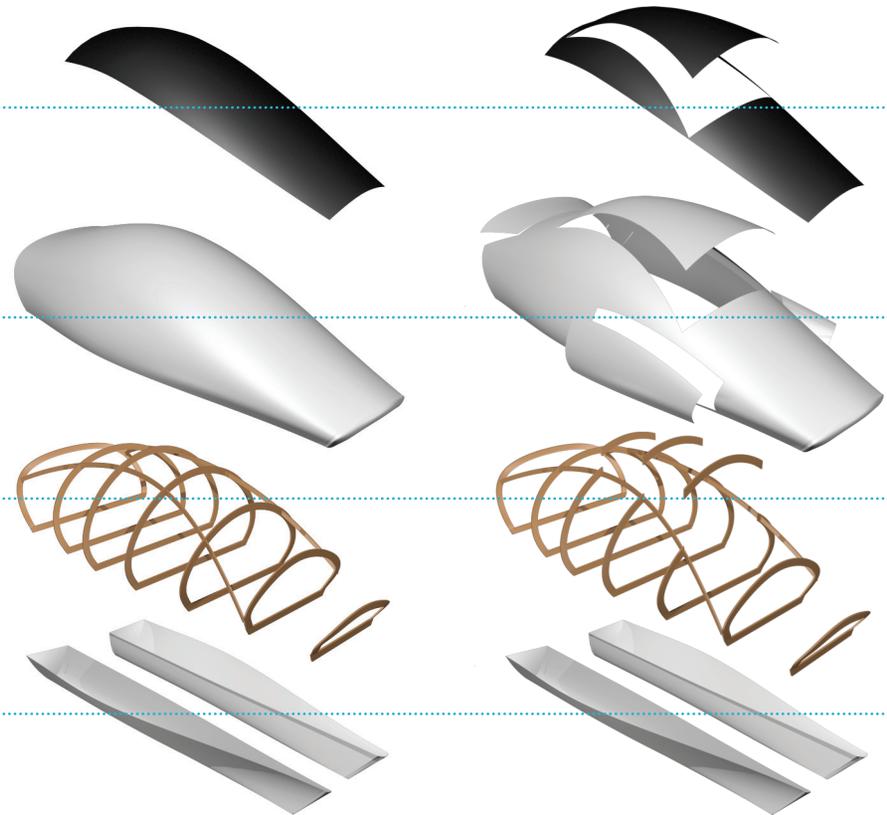
open

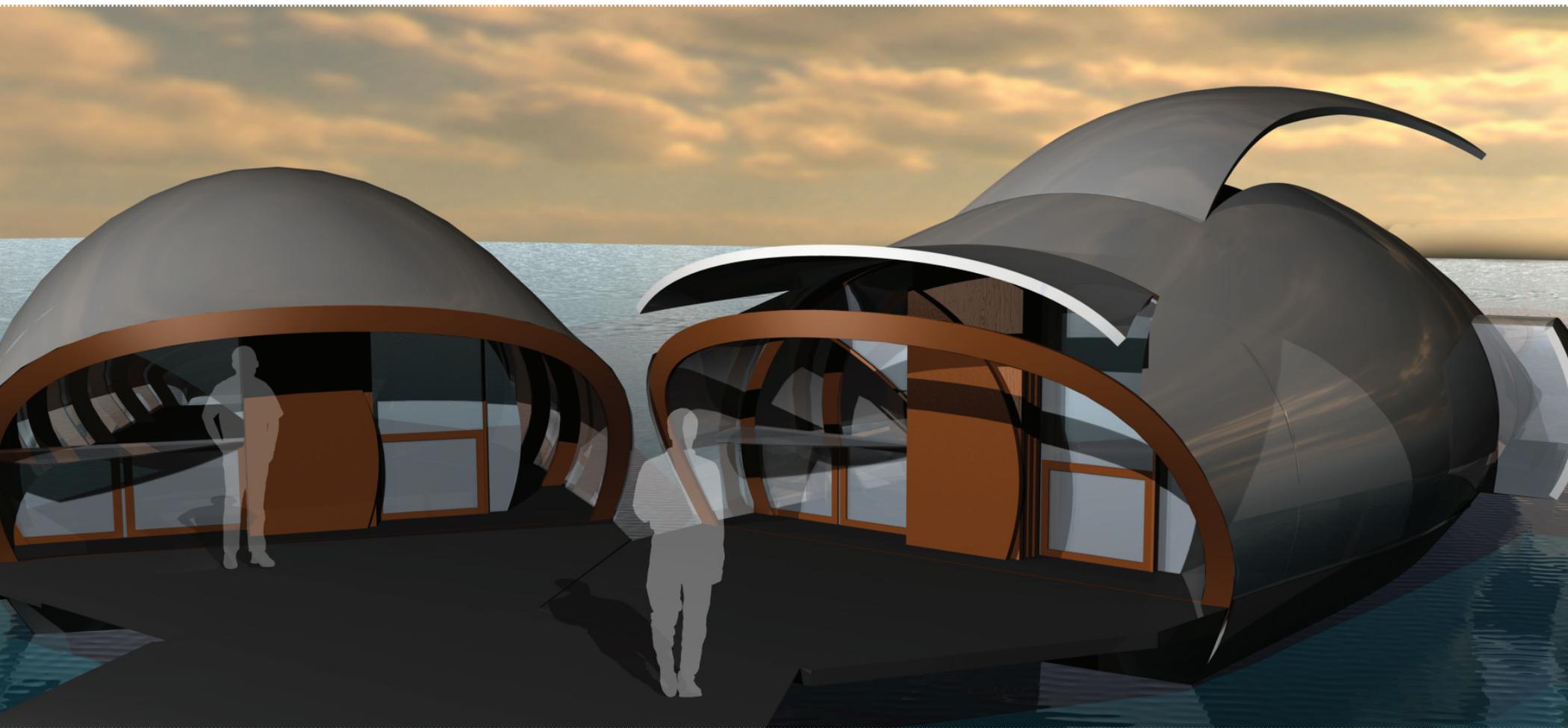
photovoltaic

shell

structure

hulls





<COMMENTS/CRITICISMS>

WEEK15

Review Board: Wayne Drummond, Peter Hind, Nate Krug, Jim Potter.

Comments on the project as a whole, but mostly on the design itself. The all seemed to agree that the plan, at that moment, is not plausible and has many problems of structure, layout, and flow. Other problems disclosed were how is it steered and although there was mention of substantial detail however when looking closely ther is multiple missed opportunitites.

<SEMESTER TWO>

<FINAL DESIGN>

layout/flow

Comments in the mid-year review really made me reconsider my spatial layout. At this moment in the process, my houseboat still lacked efficiency, symmetrical (balance), a boat friendly aspect without sharp corners and a place to steer. I went back to the drawing board to find some ideas about small spaces through precedent studies.



Reason for Existing: *This prototype house is essentially a kit-of-parts that would take a single person the length of a summer to assemble. Nordic men were all expected to build their own house, thus this homes wants to return to that practice.*

The Home: *This 205 sq ft Boxhome has a master bedroom, kitchen, and living room. The Boxhome has a [anti-consumerist philosophy](#), therefore the residence would not be able to accumulate many possessions. Inside, they have incorporated many traditions from other cultures. The residents eat and entertain in the Japanese style on a platform at a low table; the two hot plates and sink in the surface of the table are nods to the [Korean way of eating](#).*

Boxhome
2007

>Korean style of eating

Guest are given the raw materials which they cook themselves. It is sociable and guarantees that the food is hot and prepared exactly to each person's requirements.



<FINAL DESIGN>

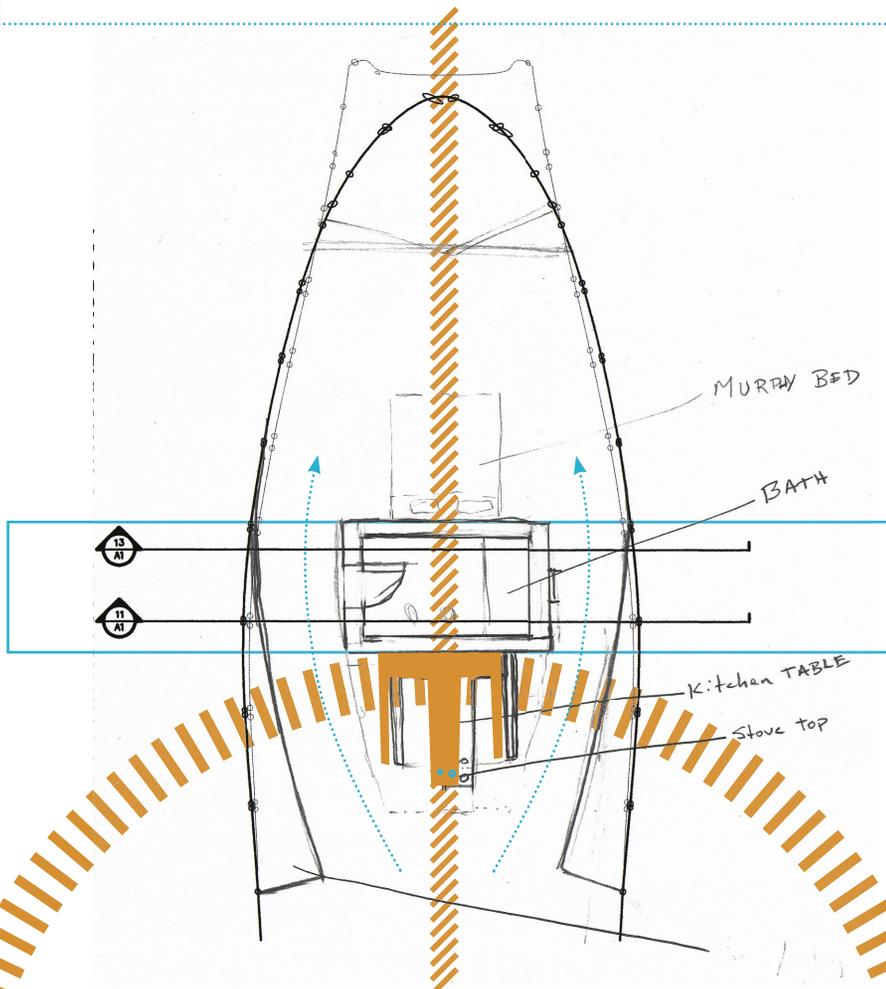
layout/flow

Researching the Korean style of eating, steered me toward a new approach to my design. This serving/dining/entertain place became a great space saver. Allowing for all of these opportunities to happen in one place, generates a focal point of the interior space.

> **symmetrical design:** allows the boat to be balance on the water.

> **public vs public:** This lends opportunities for segregation of the space into public, transitional, or private. Where public space is located at the back of the boat closest to the shared community space.

> **communal opportunities:** The dining table is aligned at the perimeter of the community circle. The dining table also becomes the farthest point from the center and the "event" to the community.



<FINAL DESIGN>

structure

Comments from the mid-year review also caused me to reconsider my structure. The structure presented earlier was ribbed and not as sturdy as it should have been. A particular focus for myself went into finding the right solution to this problem. Again I went on a precedent studies research to find the right inspiration for my houseboat.



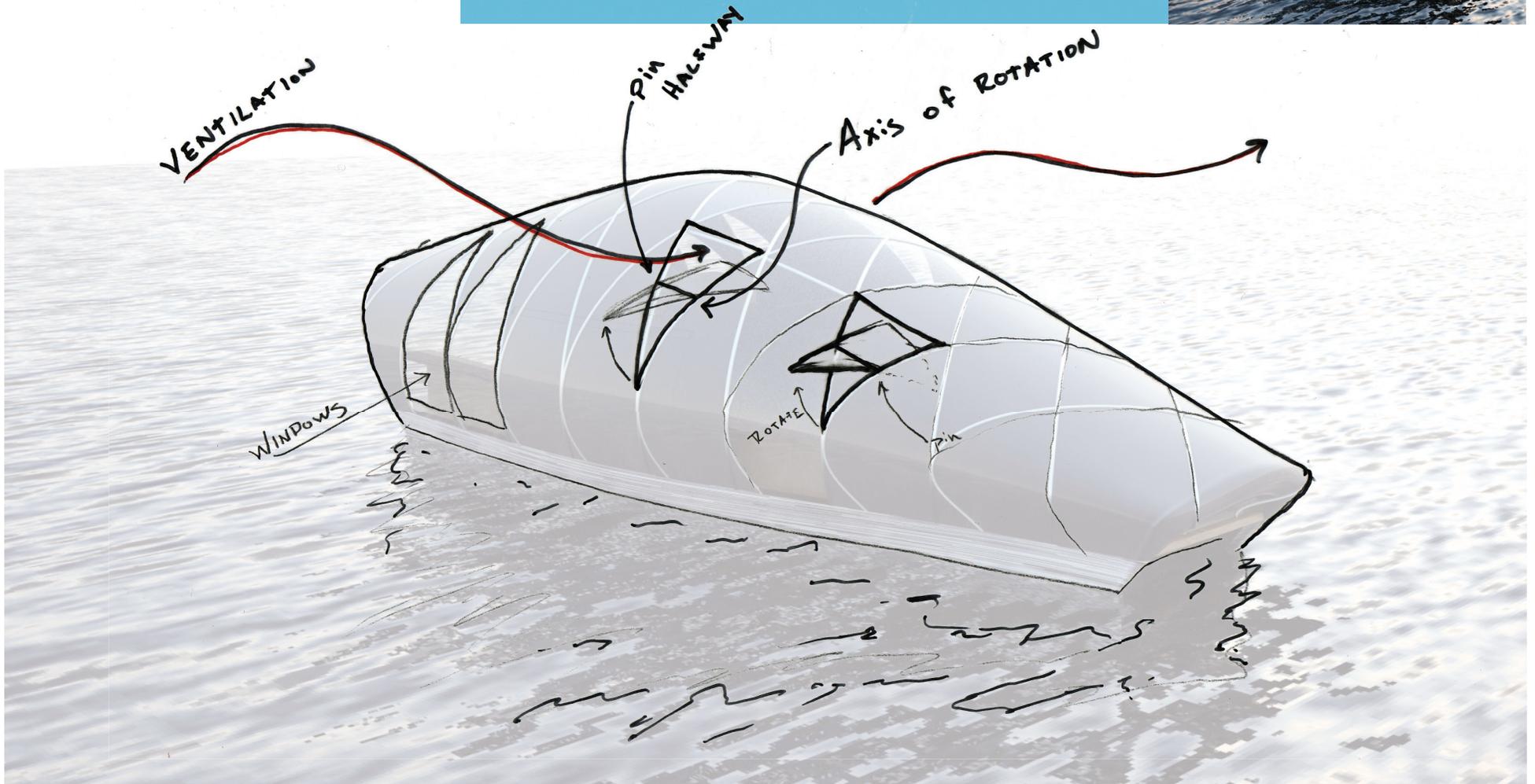
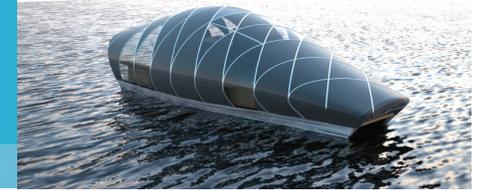
Reason for Existing: *These boats are made to transport passengers through freshwater where the pollution of conventional diesel or petro boats is damaging to water quality. The low operating costs and positive environmental impacts could popularize it in urban areas served by waterways and in ecologically sensitive areas.*

The Home: *The RA66 is a zero-emissions solar powered boat, it can operate for up to eight hours from the bank of twenty-four batteries without needing a recharge from the photovoltaic panels. Built to a high specification using Burmese teak and stainless steel, it contains raw materials that are extremely durable.*

RA82
2007

the lattice structural system creates opportunity for transformation to provide:

- > ventilation
- > daylighting
- > openness



<FINAL DESIGN>

structure

From the interior, when can see the lattice work and how the operable system provides openness to the space. You can also see the design for the entertainment dining table.





<FINAL DESIGN> materials

To truly understand the structure and how it all needed to work together between with the hulls and skin; I needed to research materi-

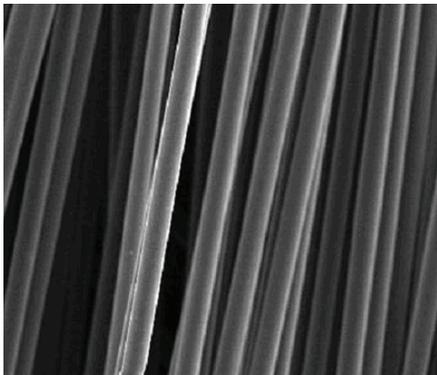


Aluminum
[audi A8]

Key Features:

- _ Light weight
- _ High Strength
- _ Durability
- _ High strength-to-weight ratio - thus an ability to span great distances
- _ Excellent corrosion-resistance.
- _ Recyclable

The audi: The Audi A8 model offers a substantial weight reduction compared with similar cars. The space frame weights only 215 kg. almost half the weight of an equivalent frame in steel.



Carbon Fiber

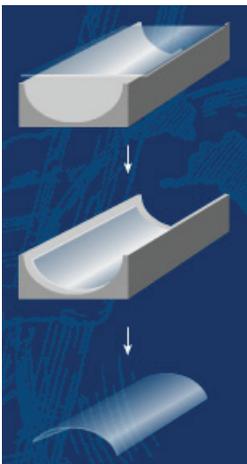
Key Features: A carbon fiber is a long, thin strand of material. The carbon atoms are bonded together in microscopic crystals which makes it incredibly strong for its size. Several thousand carbon fibers are twisted together to form a yarn, which may be used by itself or woven into a fabric. These fibers contain about 85% carbon and have excellent flexural strength.

The Problem: After carbonizing, the fibers have a surface that does not bond well with the epoxies and other materials used in composite materials. To give the fibers better bonding properties, their surface is slightly oxidized. *Oxidation can be achieved by immersing the fibers in various gases such as air, carbon dioxide, or ozone: or in various liquids such as sodium hypochlorite or nitric acid.*¹ **The inhabitants of these houseboats promote and live in an environmentally clean lifestyle.**

Key Features: “The solar cells are produced by a solar printing press of sorts rolling out these aptly named PowerSheets rapidly and cheaply. The machines apply a layer of solar-absorbing nano-ink onto metal sheets as thin as aluminum foil reducing production costs to a mere tenth of current solar panels and at a rate of several hundred feet per minute.”¹ Cost has always been the burdening factor weighing down the mass application of solar technology at nearly \$3 per watt. To compete with coal, that figure has to shrink down to \$1 per watt.

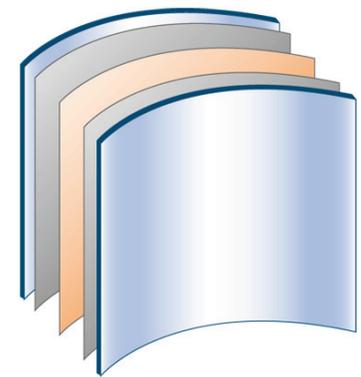


Nano Solar Technologies



Key Features: *Curisunid California is a high technology laminated glass with a solar control film that is placed between two inter layers of PVB. Its main feature is the way it selectively controls infrared solar energy, while giving high visible light transmission.*

- _ Over 70% light transmission.
- _ Over 50% solar heat reflection.
- _ 99% ultraviolet protection.
- _ Soundproofing properties.
- _ Safety and impact resistance.



Curved Glass
Curisunid California

Key Features:

- _ *Fills:* ideal for filling cracks, gaps, voids and blind cavities. The expanding foam is effective in sealing areas to reduce thermal transfer.
- _ *Floats:* It provides excellent flotation performance: 60 lbs./cft. Works on building docks, pontoons and rafts.
- _ *Insulates:* It offers excellent thermal and sound dampening insulation performance.



Marina Foam

1. Environmental News Network (ed.) (2007). Nanosolar: Power to the people.

<FINAL DESIGN>

materials



Aluminum
[audi A8]



Curved Glass
Crisunid California



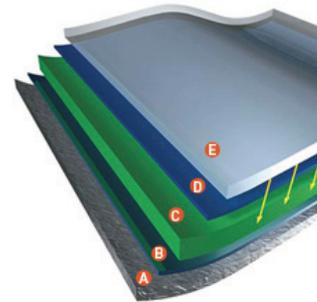
Nano Solar Technologies

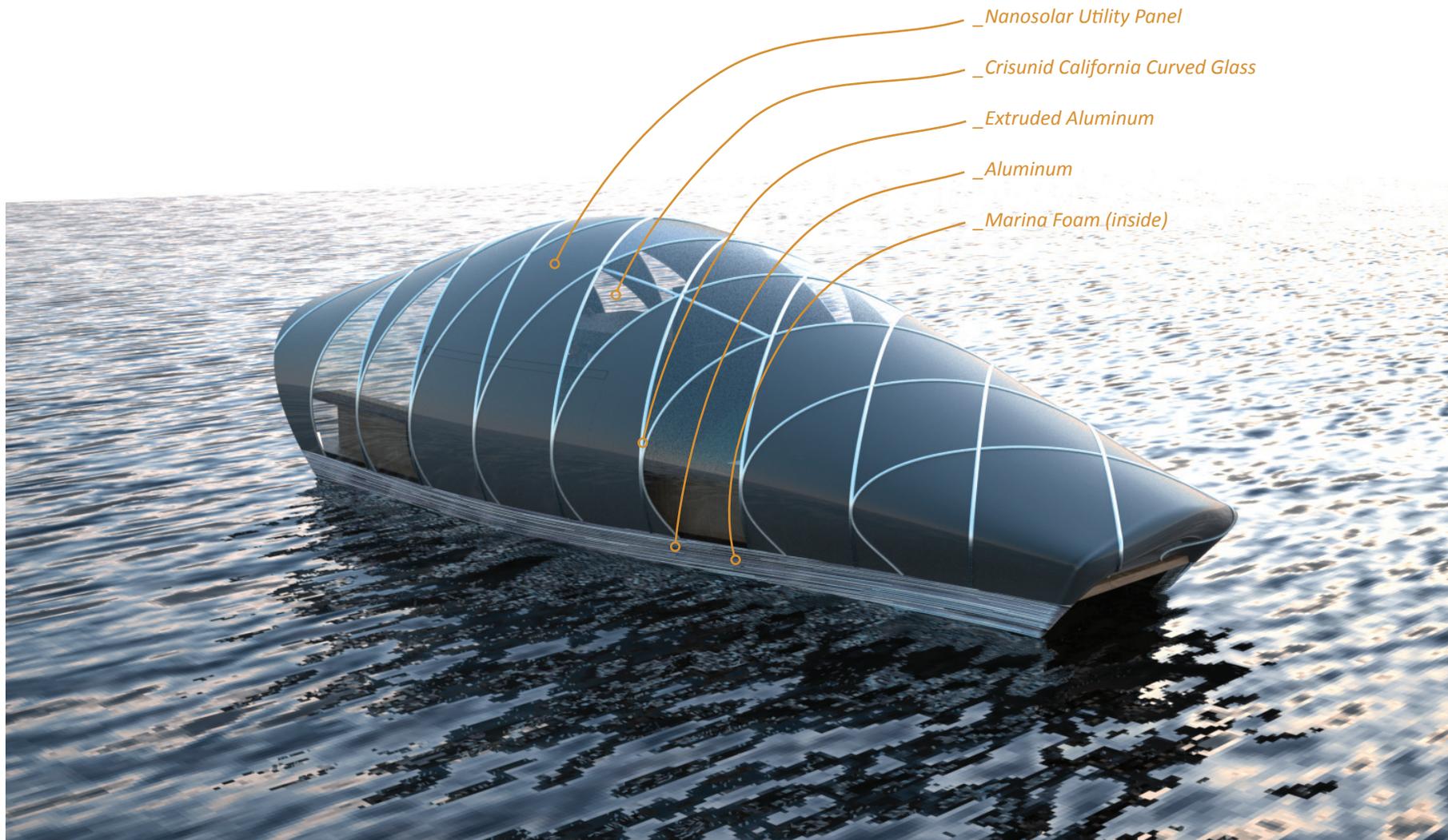


Marina Foam



HOW IT WORKS a solar cell is basically a sandwich of semiconductor-which converts the sun's photons to electrons-surrounded by layers of electrodes. In Nanosolar's Power-Sheet, an aluminum base layer <A> supports the first of these electrodes, a coating of molybdenum . Lights hits the semiconductor <C>, kicking electrons loose. the P/N junction layer <D> passes the electrons onto the clear zinc oxide electrode <E>, which sends them off to power your Xbox before they come back to the first electrode, completing the circuit. Nanosolar created the perfect recipe for the semiconducting ink, a mix of copper, indium, gallium and selenium nano-particles that, when printed, self assemble onto the foil in a uniform layer that is one hundredth the thickness of the absorber layer in traditional cells.





<COMMENTS/CRITICISMS>

WEEK22

Review Board: Steven Ginn, Peter Hind, Mark Hoistad

Some positive feedback that I received was that the material palette I chose was plausible and well thought over. The criticism suggested that my exterior shell seemed sophisticated with its precess curves, but the interior did not match that design. A suggestion was given to use the same design sophistication as the entertainment dining table with the exterior shell.

Other comments were given about the area that steers the boat on the second floor. A suggestion was given about the idea of transformation and how it could be applied to this area of the boat, allowing the driver a better vision and line-of-sight.

All comments were considered, but with five weeks left before the final review I decided to design the interior dining table because I felt it was a strong element for the houseboat and community. That piece was the corner stone of my thought process of how to bring the community inside the home and how to create an avenue for social endeavours.

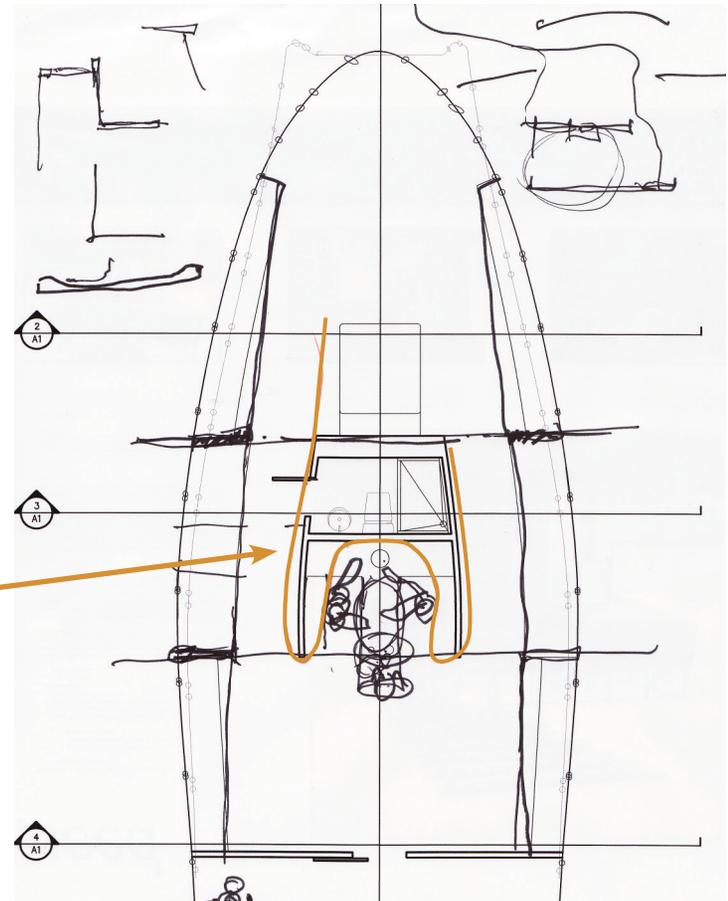
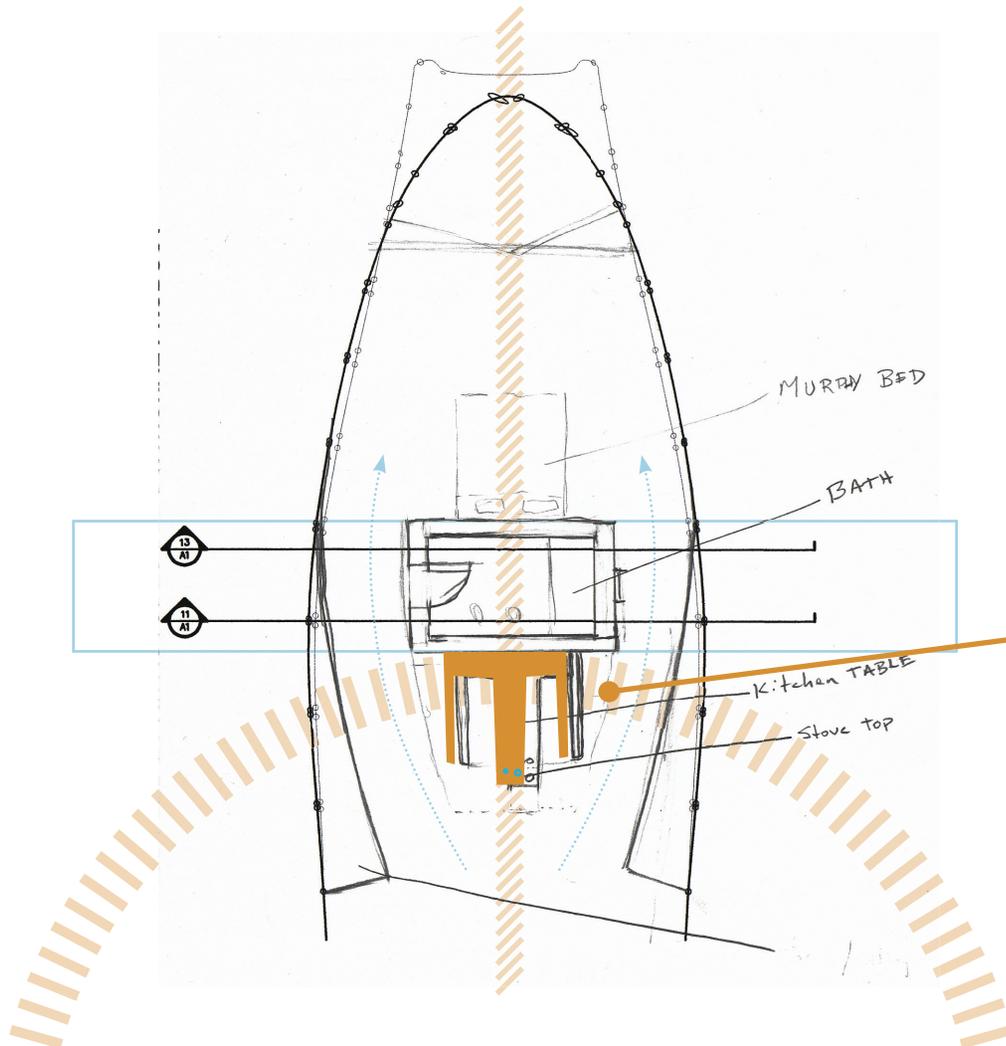


Curvilinear



"Bulky"

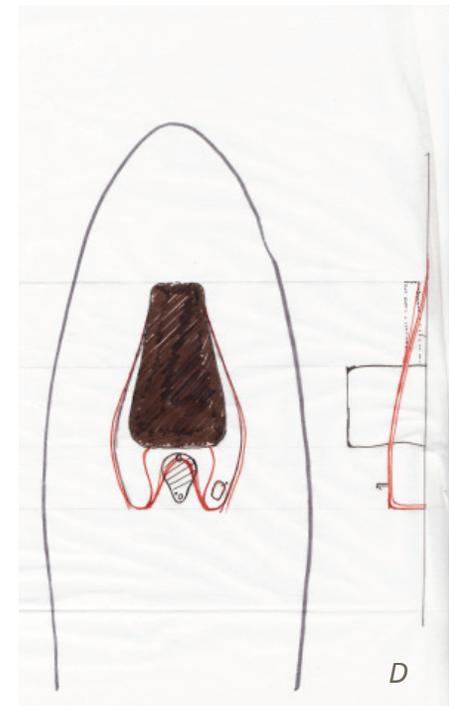
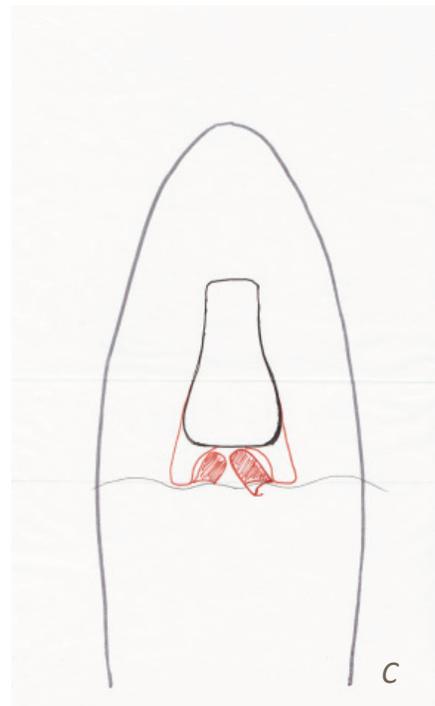
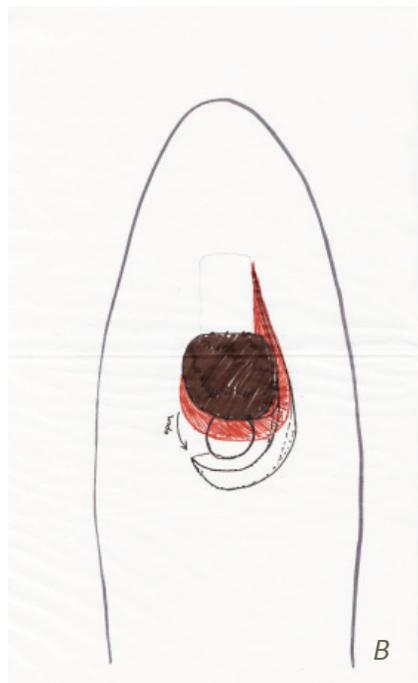
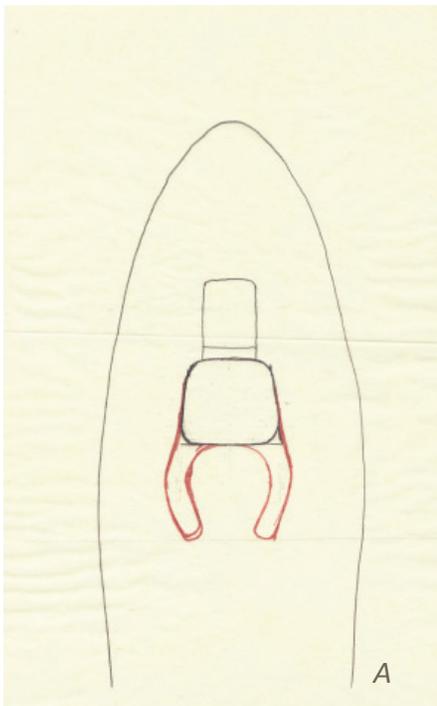
At this point the goal was to design a more sophisticated entertainment dining table. I would execute this by creating a more curvilinear surface that would fit four guests.



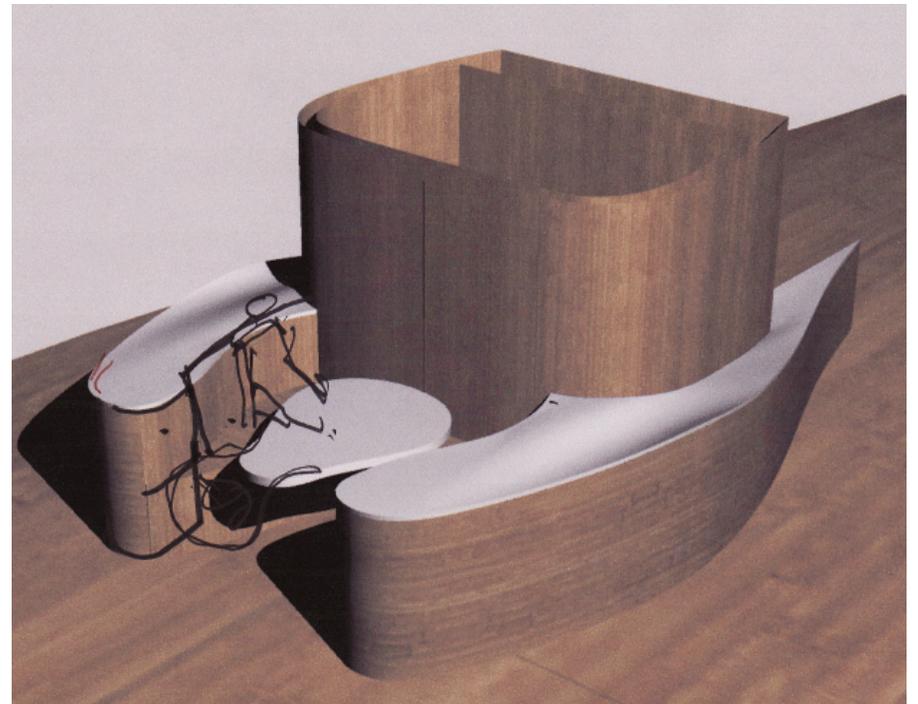
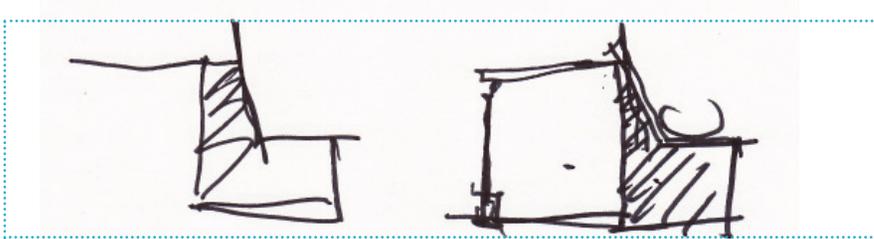
>60

<FINAL DESIGN>
dining table

The process of new design began with the intent of focusing seating on the inside and countertop space in the back.



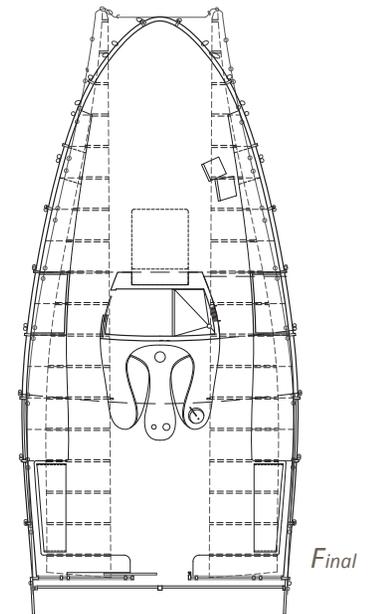
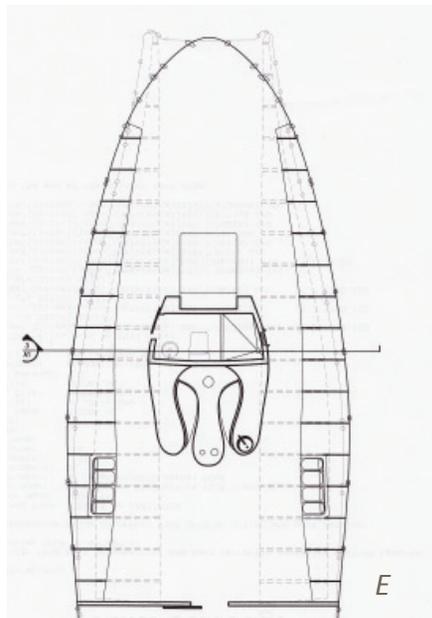
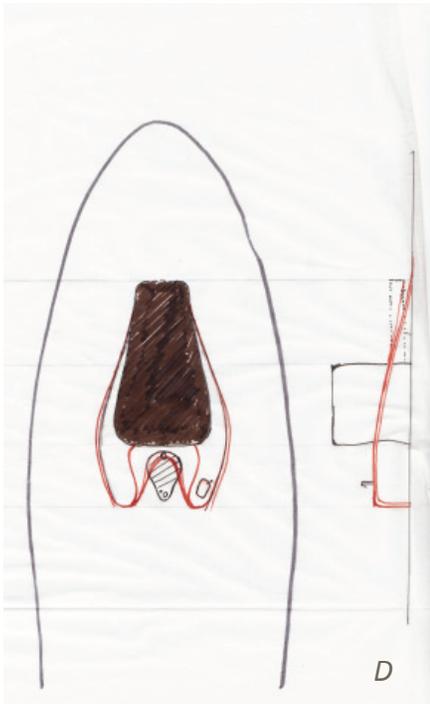
D



<FINAL DESIGN>

dining table

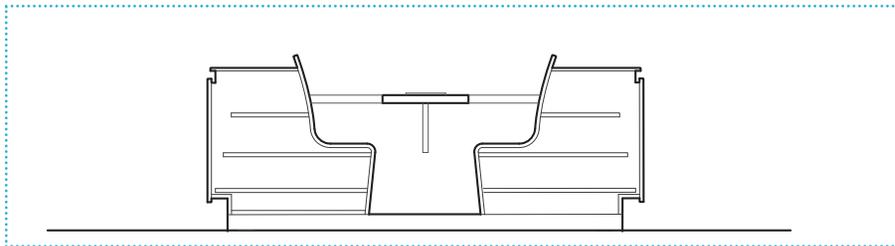
The process of new design began with the intent of focusing seating on the inside and countertop space in the back.





E

F



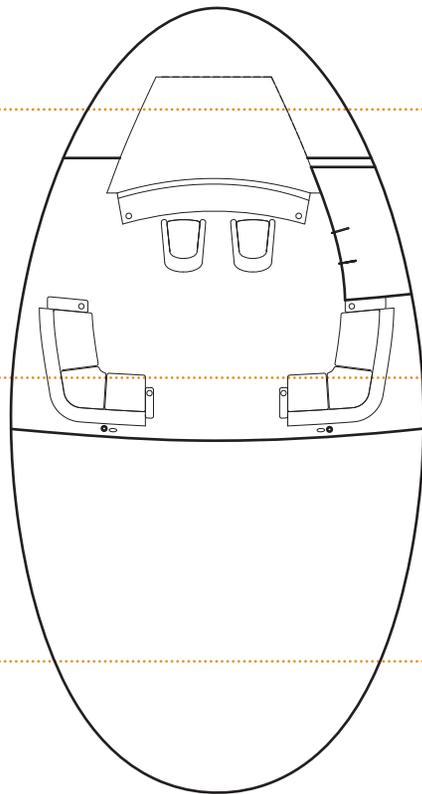
<FINAL DESIGN>
dining table



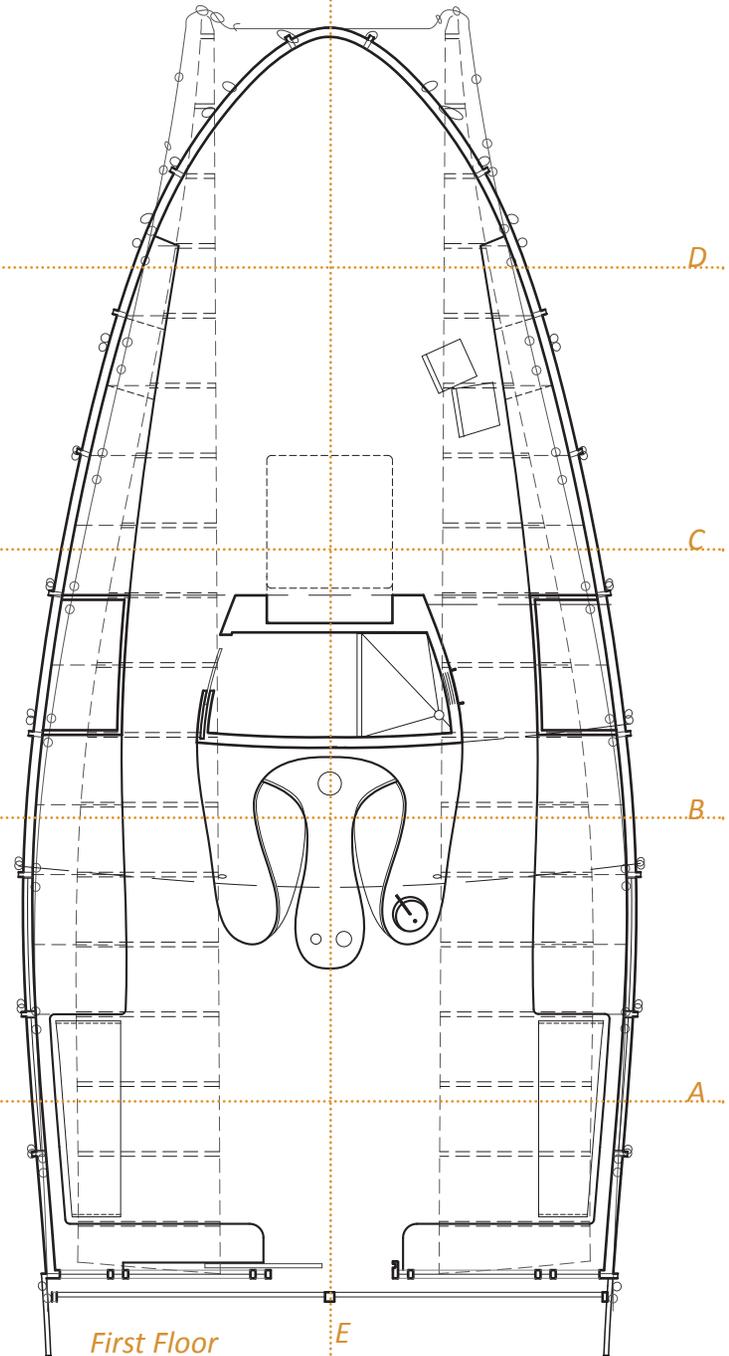


<FINAL DESIGN>

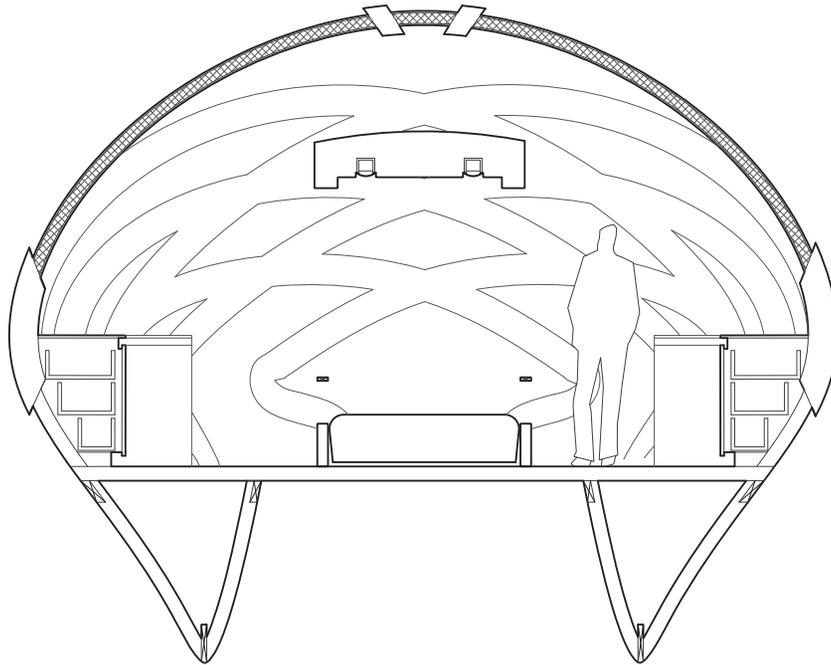
2d



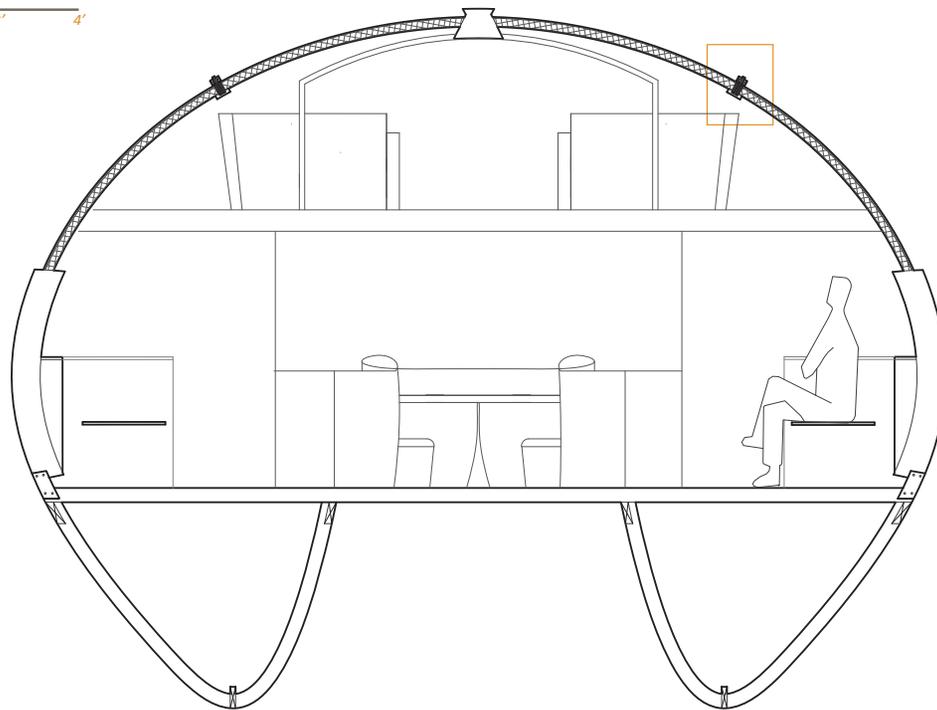
Second Floor



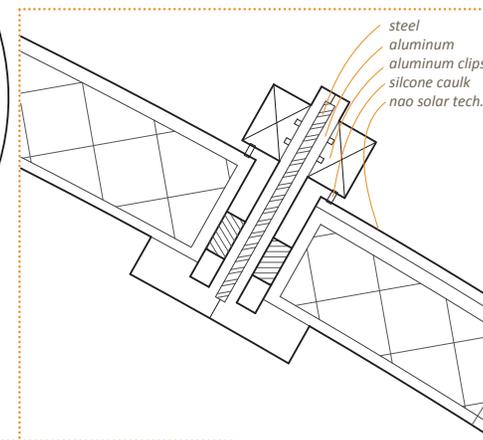
First Floor



B
 0 1' 2' 4'

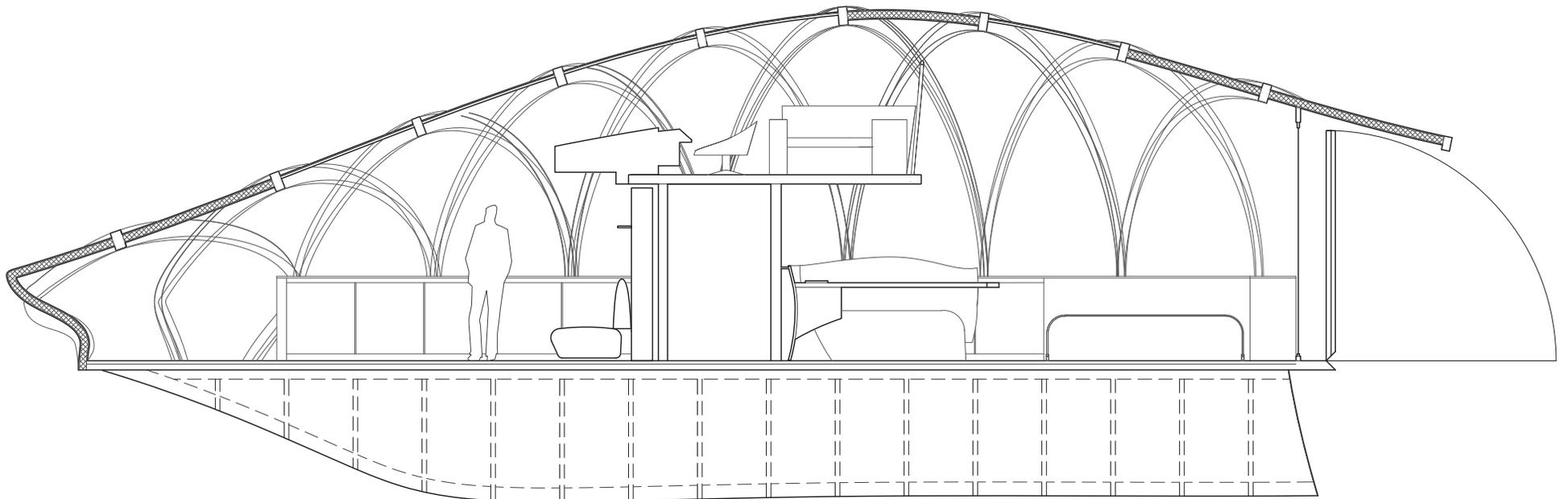


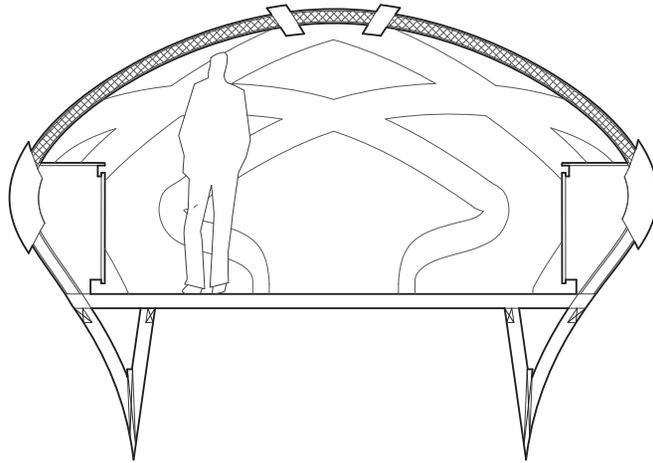
A
 0 1' 2' 4'



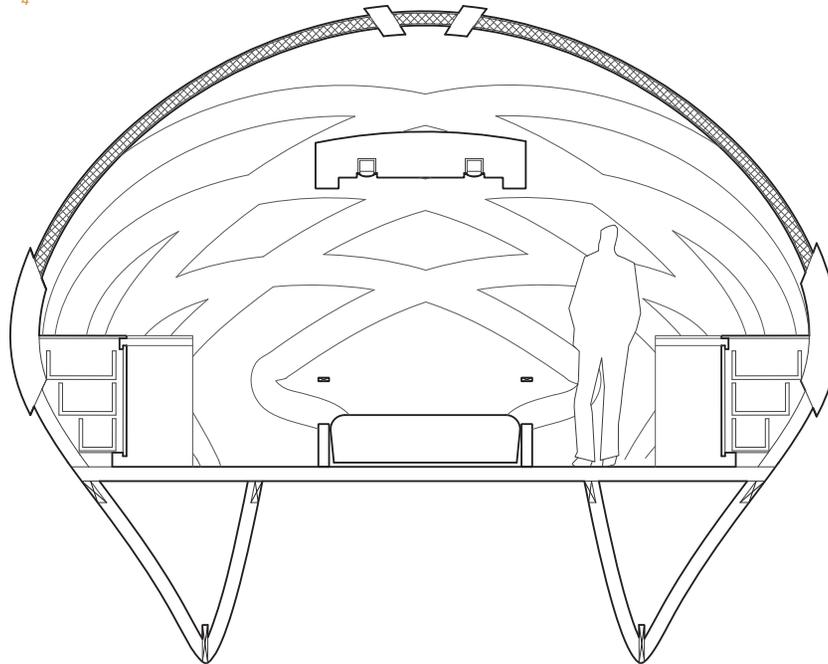
steel
 aluminum
 aluminum clips
 silicone caulk
 nao solar tech.

<FINAL DESIGN>
2d



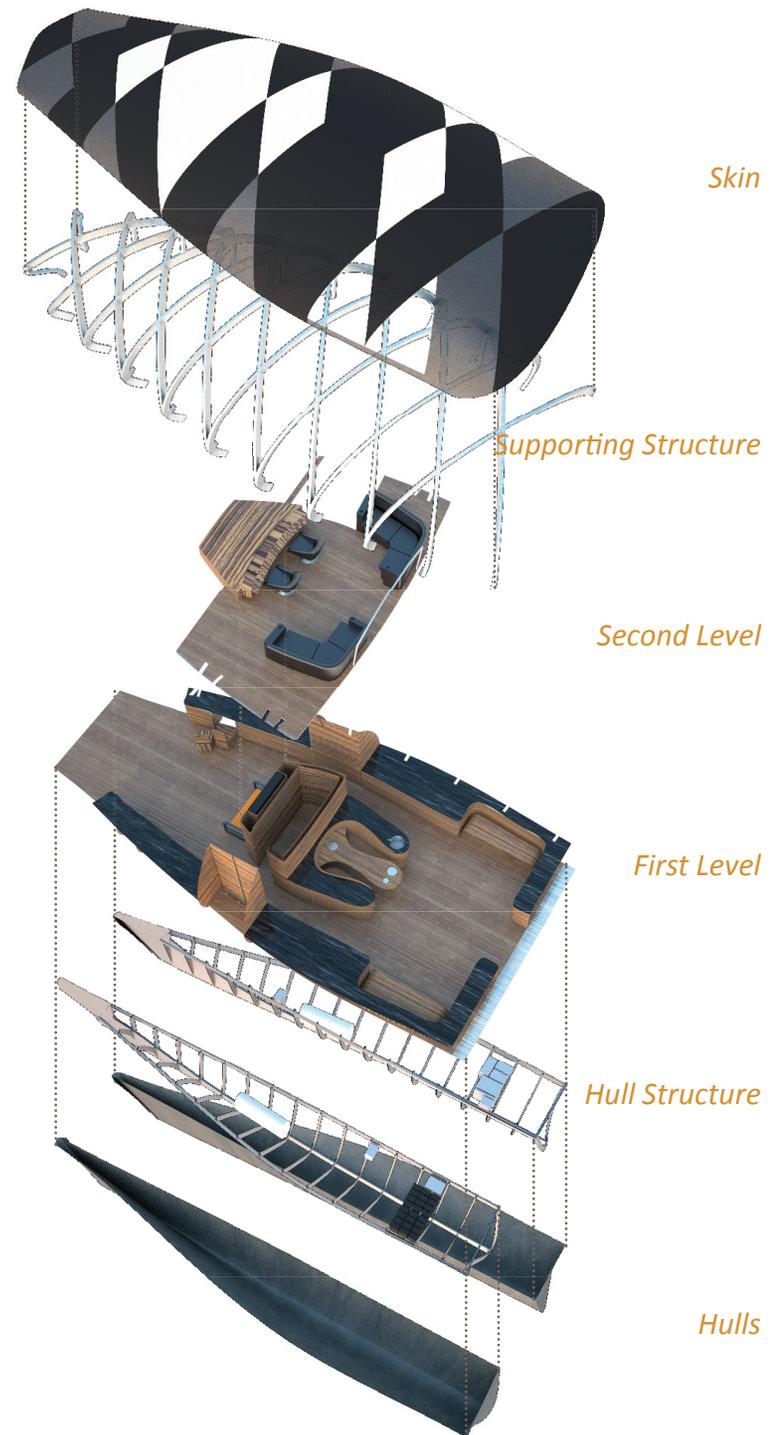


D
0 1' 2' 4'



C
0 1' 2' 4'

<FINAL DESIGN>



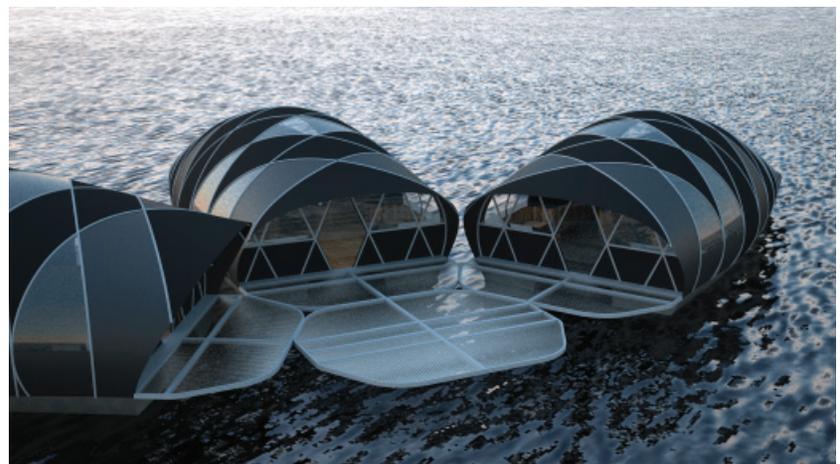


<FINAL DESIGN>





<FINAL DESIGN>





<COMMENTS/CRITICISMS> *final*

Review Board: Steven Ginn, Tim Hemsath, Peter Hind, Mark Hoistad

The main constructive criticisms at my final review consisted of the following three questions:

- How cost efficient is this boat at completion? For example, did I really consider the lifestyle and income of the population I had initially made this houseboat for by the time I completed my final design.*
- Thus, how did the social lifestyle and precedent studies ultimately affect the design?*
- How well was space used? The panel felt that I had too much excess space, especially around the interior by the walls and they had wondered how realistic that would be in a real boat setting.*



<BIBLIOGRAPHY>

- American Micro Industries*. "Handi Spray-in Foam." 2007. *Marinefoam.com*. 5 Feb. 2008. www.marinefoam.com/handi-foam.html?page_type=floatation-...
- Callahan, Jeri. *Staying Afloat: Life Aboard Houseboats, Barges and Liveaboards*. Seattle, WA: Peanut Butter Publishing, 2004.
- Conductive Substrate*. "Conductive Substrate." 2002-08. Nanosolar. 8 Feb. 2008. www.nanosolar.com/conductivesubstrate.html.
- Crisunid California*. Cricursa. 8 Feb. 2008. www.cricursa.com.
- Dudman, Clare. "Nice Box." *Dwell*. March 2008: 114-19.
- Environmental News Network*. "Nanosolar: Power to the People." 13 Nov. 2007. 23 April 2008. www.enn.com/energy/article/24430/print.
- Flanagan, Barbara. *The Houseboat Book*. Universe Publishing: New York, NY, 2003.
- Fuad-Luke, Alastair. *Eco-design: The Sourcebook*. 2nd ed. San Francisco: Chronicle Books, 2006.
- Hart, J. F., Rhodes, M. J., & Morgan, J. T. *The Unknown World of the Mobile Home*. Baltimore/London: Johns Hopkins University Press, 2002.
- Kronenburg, Robert. *Flexible: Architecture that Responds to Change*. London: Laurence King, 2007.
- Madehow.com*. "Aluminum Foil." 2007. 5 Feb. 2008. www.madehow.com/Volume-1/Aluminum-Foil.html.
- Madehow.com*. "Carbon Fiber." 20 June 2006. 4 Feb. 2008. www.madehow.com/Volume-4/Carbon-Fiber.html.
- Nanosolar-Products*. "7 Areas of Innovation." 2002-08. Nanosolar. 8 Feb. 2008. www.nanosolar.com/7areasofinnovation.html.
- Nanoparticle Ink*. "Nanoparticle Ink." 2002-08. Nanosolar. 8 Feb. 2008. www.nanosolar.com/nanoink.html.
- Nanosolar-Products*. "Products." 2002-08. Nanosolar. 8 Feb. 2008. www.nanosolar.com/products.html.
- Schaecher, Steve. *Mobile Homes by Famous Architects*. San Francisco: Pomegranate, 2002.
- Semiconductor Printing*. "Semiconductor Printing." 2002-08. Nanosolar. 8 Feb. 2008. www.nanosolar.com/printsemi.html.
- Wallas, Allan. *Wheel Estate: The Rise and Decline of Mobile Homes*. Johns Hopkins Baltimore/London: University Press, 1991.
- West Marine. *Annual Catalog 2008*. West Marine Products, 2008.

This book is dictated to my lover, Faith. Without your constant love, support, beauty, and understanding I could not be as happy as I am. You understand, that although I have another love in my life, I cherish your time the most. I could have never accomplished this much without you. You are my Faith.

<ACKNOWLEDGEMENTS>

I want to also thank Mark Hoistad, for being a mentor I respect. Your know how to push students and we really do appreciate it. It has been a privilege to work with, and I can only hope that it has rewarding for you too.

I want to give a public thank you to Steven Ginn, Tim Hemsath, Peter Hind, and Hyun Tae Jung for given plenty of your valuable time to help me better understand architecture as well as life. Your guidance throughout this project has been most grateful and I have the up most respect for all of you.

I also wanted to acknowledge all my friends for the understanding that I might be around on a weekend or weeknight. Thank you for respecting me and what I do.