Slick Lizard

A conceptual Design for a 39-foot Ocean Crossing couple's Cruiser/Racer

01 May 2019

Designed by: 1/c Stephen Bruno

For: LT Stephen Bruno (Ret.)

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New London, Connecticut

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Stephen Bruno
22 Wilford Rd
North Branford, CT 06471

30 April 2019

Dear Stephen,

It was a pleasure speaking with you about your dream boat. Sailing cruisers continues the grand tradition of ocean crossing set by the English, Spanish, and Portuguese during the golden age of sail power. The enclosed conceptual design contains all the functionality to fulfill your sailing dream. It draws inspiration from several classic cruisers of the last generation, such as Catalinas, Beneteaus, and Tartan cruisers. The design will be fiberglass construction so you can have less worry on maintance and keep your focus on cruising. Cutting edge technology was weaved within the design to limit is impact on the environment. At 39 feet in length, 12.5 feet in beam, 6.5 feet in draft, and a displacement of 7.7LT, the vessel is sturdy enough to take on the most challenging of seas while swift enough to be a contender for handicapped racing.

I hope as you review the proposed design you are filled with visions of the warm sun and a strong breeze comfortably sending you your way across the pacific.

If you have any concerns regarding the design, please reach out. I am excited to take this design to the next step and help you and your family acquire your dream boat.

Best Wishes,

Bruno Yachts, 15 Mohegan Ave., New London, CT 06320, (203) 868-9139, Stephen.j.bruno@uscga.edu

***Slick Lizard*: A 39 foot Ocean Cruiser/Racer for CDR Bruno, (Ret.)**

Mission Statement

Slick Lizard will be a Performance Cruiser sailing yacht for a small family or few couples. The vessel must have endurance and durability for extended ocean crossing and visiting island ports. The sail rigging should be easily controllable by minimal crew of 2. Superior stability for rough oceanic conditions is necessary. The vessel should have above average performance where possible without taking away from the above requirements.

Basic Requirements

- Berthing for a maximum of 4 people/2 couples.
- Ability to motor in and out of port off of battery and/or generator
- Amenities for extended overnighting- berth and enclosed head
- Food storage capacity for 30 days, minimum 2 burner stove, sink, freezer
- Settee berth- either pull out or pilot
- Easily controlled by minimum crew of 2
- Stable and quick- Primarily for cruising, but with occasional amateur racing
- Environmentally friendly- use of electric renewable energy sources, sufficient holding tank for port transits

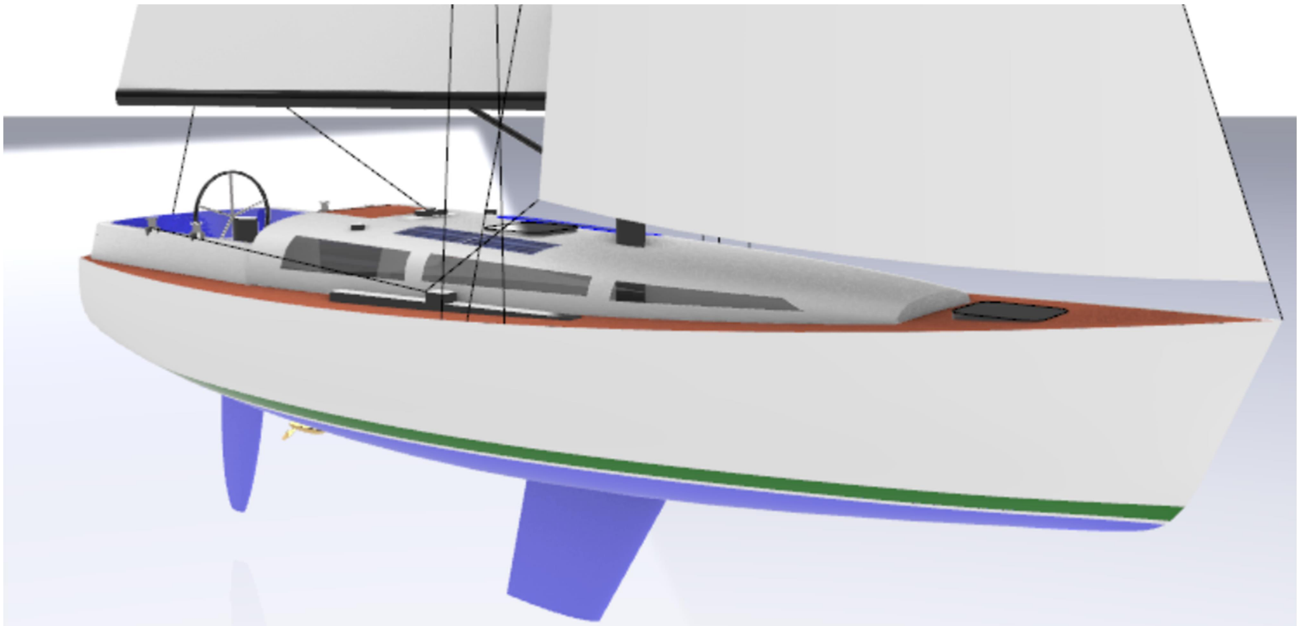


Figure 1 Conceptual Design of *Slick Lizard*

Principal Characteristics

LOA 39 ft 2 in – LWL 35 ft 6 in
Displacement 6.7 LT (light ship)
Displacement 7.7 LT (1/2 load – DWL)
Beam 12 ft 6 in – Draft 6 ft 4 in
Hull Depth (@MS) 5ft 5in
DLR 172 – SADR 17.7 – Ballast Ratio 37%
Sail Area 740 ft^2
Cp 0.55 – Cb 0.38 – Cm 0.68 – Cwp 0.71
LCB% 58% – LCF% 61%
Cruising Speed (Power) 7.5 kts

Similar Vessel Analysis: Modern and Classic Cruisers

Several popular open ocean cruisers ranging from 10-40 years old served as inspiration for *Slick Lizard.* The Catalina 38 is a vessel that heavily influenced the hull design above the waterline. This is a design was produced between the late 70s- early 90s, and was at one point the boat of choice for the Congressional Cup.

Figure 2 Catalina 38

More modern fin keel cruisers such as Beneteau Oceanis 34, Tartan 3400, and Catalina 400 mkII inspired the vessel's shape below the waterline, with a slight emphasis on a less deep canoe body draft. The Oceanis is a cruising yacht that is still viable in handicap racing.

Figure 3 Beneteau 34

Figure 4 Tartan 3400

Figure 5 Catalina 400 MKII

Data from a total of 19 sailboat cruisers was used to conduct a similar ships analysis. This analysis compared the various cruisers to determine trends among them to guide the design characteristics. Figure 6 below shows trends between vessel displacement and length overall. A displacement value below the trend was selected due to the desired semi-performance qualities. Having a reduced displacement will help both the displacement-length ratio (DLR) and sail area-displacement ratio (SADR) lean towards the performance category. The vessel's designed displacement is 7.7 LT.

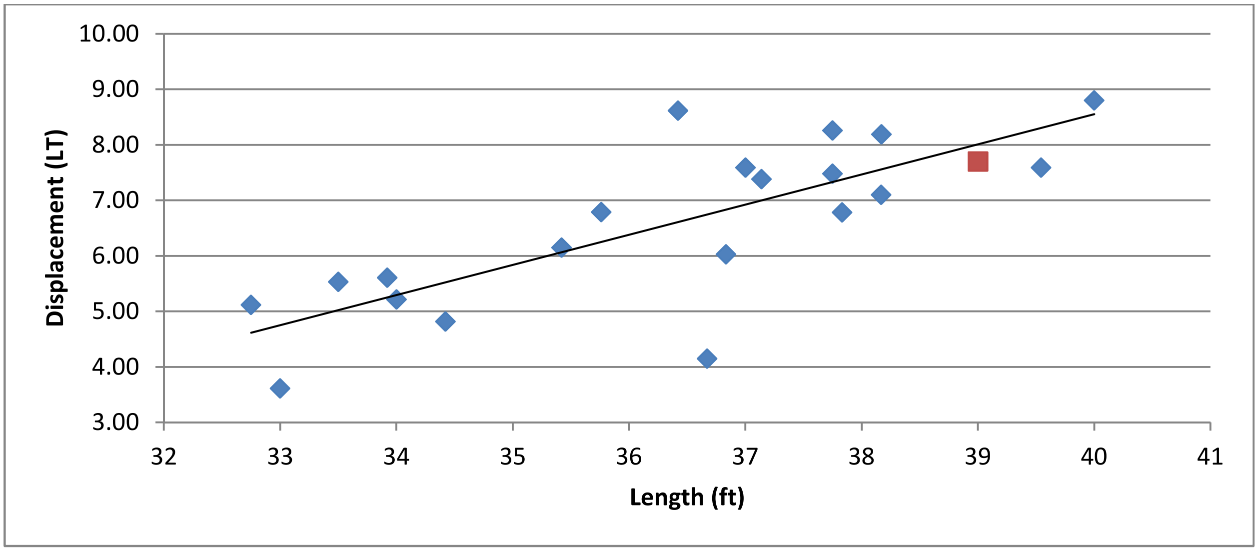


Figure 6 Displacement v. Length trend

The vessel's beam was chosen to be slightly wider than the trend. The extra beam width will allow for more space for general arrangements, as well as improve the stability characteristics of the vessel. The vessel's overall beam is 12.5 ft.

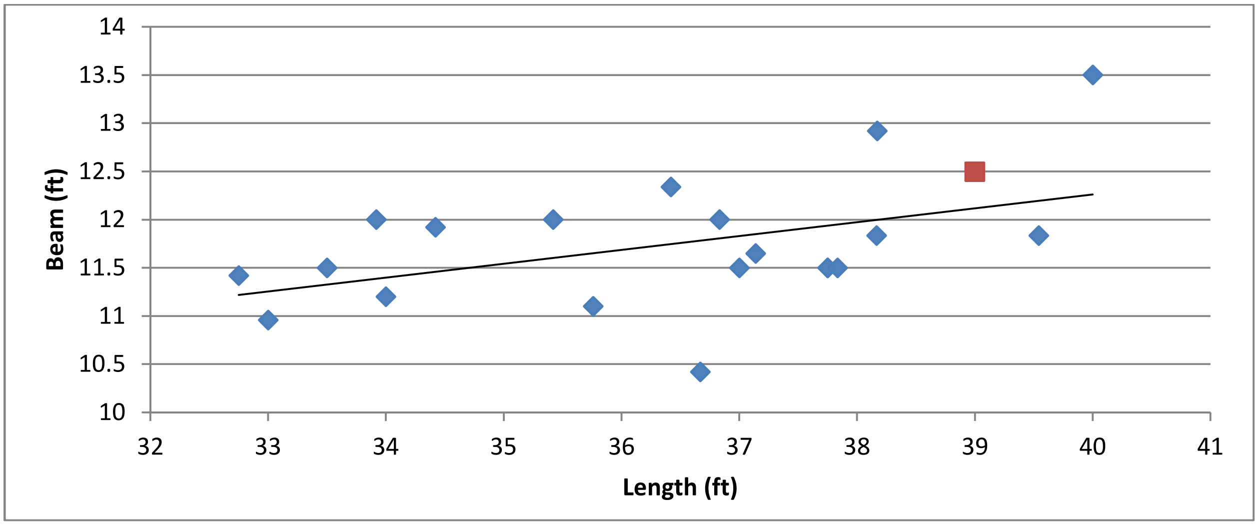


Figure 7 Beam v. Length trends

The vessel's canoe body draft is the depth of the vessel below the waterline, not accounting for the keel. The main component of resistance and lower Froude number speeds is frictional resistance due to the submerged surface area. As the submerged surface area is a function of the vessel's draft, a slightly lower value was chosen for some overall speed gains. The impact on general arrangements is limited as the cabin top was designed slightly higher in response. A value of 1.75 ft was chosen.

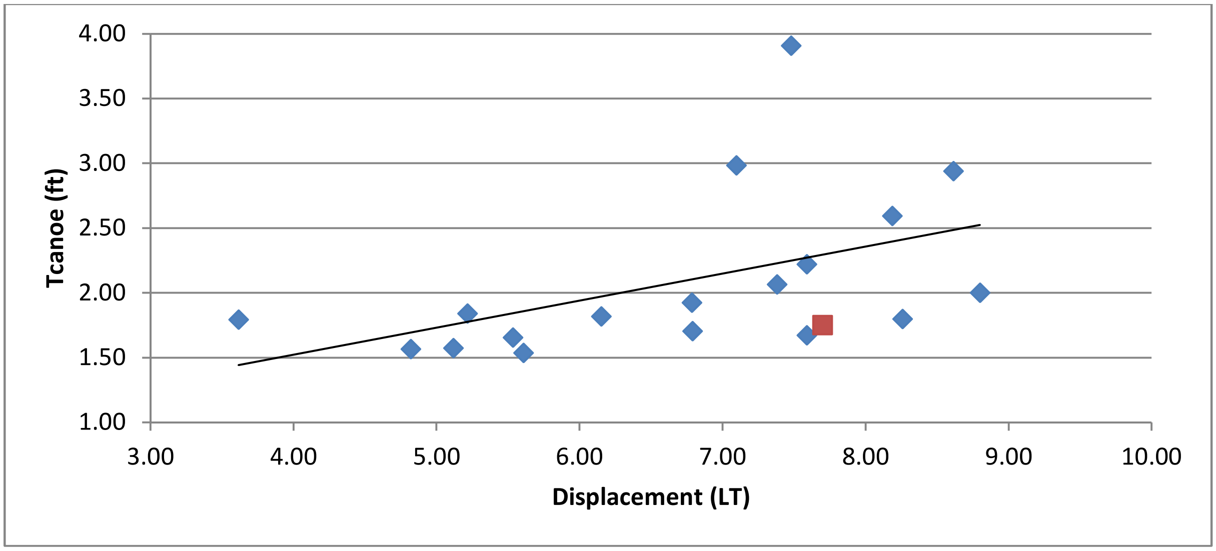


Figure 8 Canoe body Draft v. Length trend

Ballast in fin keel vessels serves to provide a righting moment when the vessel is heeled over by the wind. It also improves initial stability by keeping the center of gravity of the vessel low. However, it also slows the vessel down when downwind sailing. 2.5 LT of ballast was selected for the vessel.

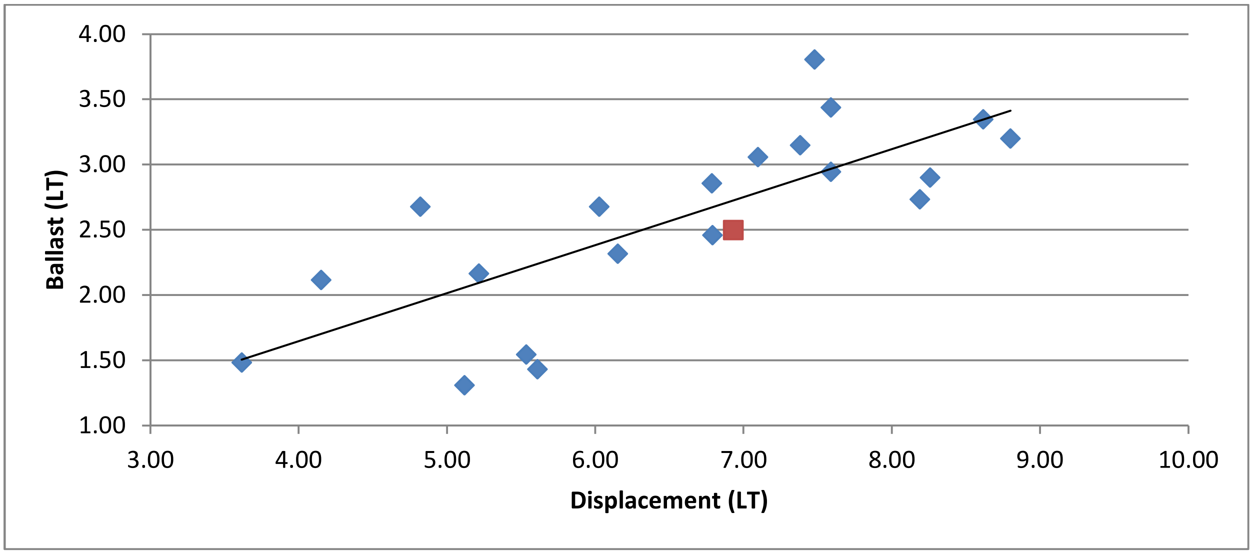


Figure 9 Ballast v. Displacement trend

Trends in installed HP were investigated. However, due to the desire to make this design electric and eco-friendly, the traditional propulsion set up of a diesel engine was not ideal for this design. Instead, a small diesel generator will charge a battery bank that powers the propulsion system. As regenerative technologies such as solar panels and hydro generators will be used, downsizing the generator size was justified.

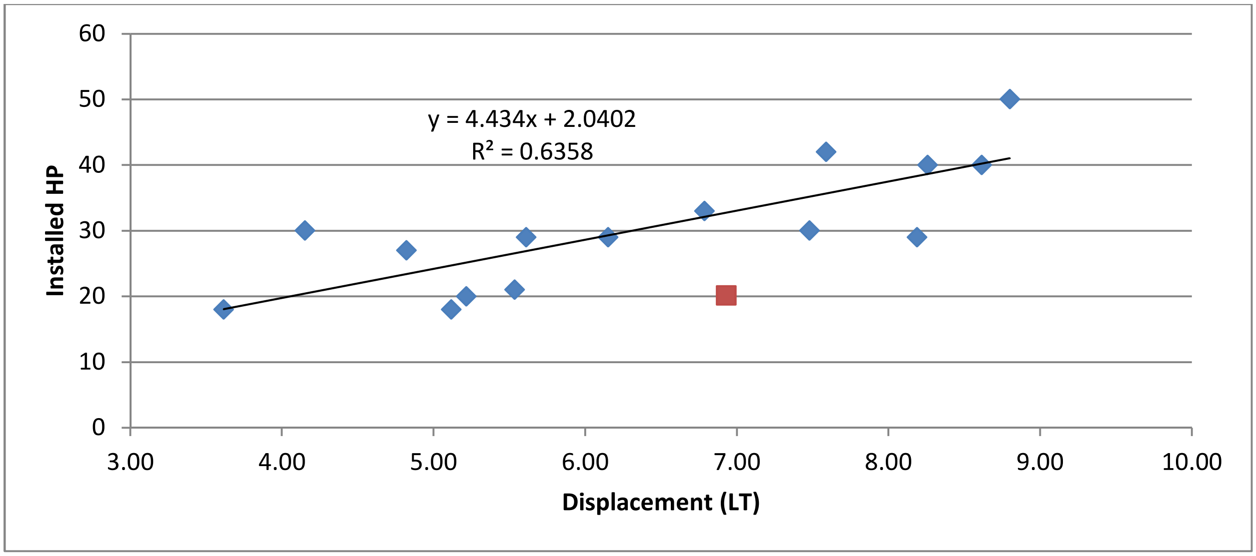


Figure 10 Installed HP v. Displacement trend

For sailing vessels, the sail area is more of an indication of power than engine size. More sail area than the trend was selected for better speed in light wind conditions, and it is always easier to reef than put up a spinnaker, especially for a minimal crew. The vessel's sail area is 750 ft^2.

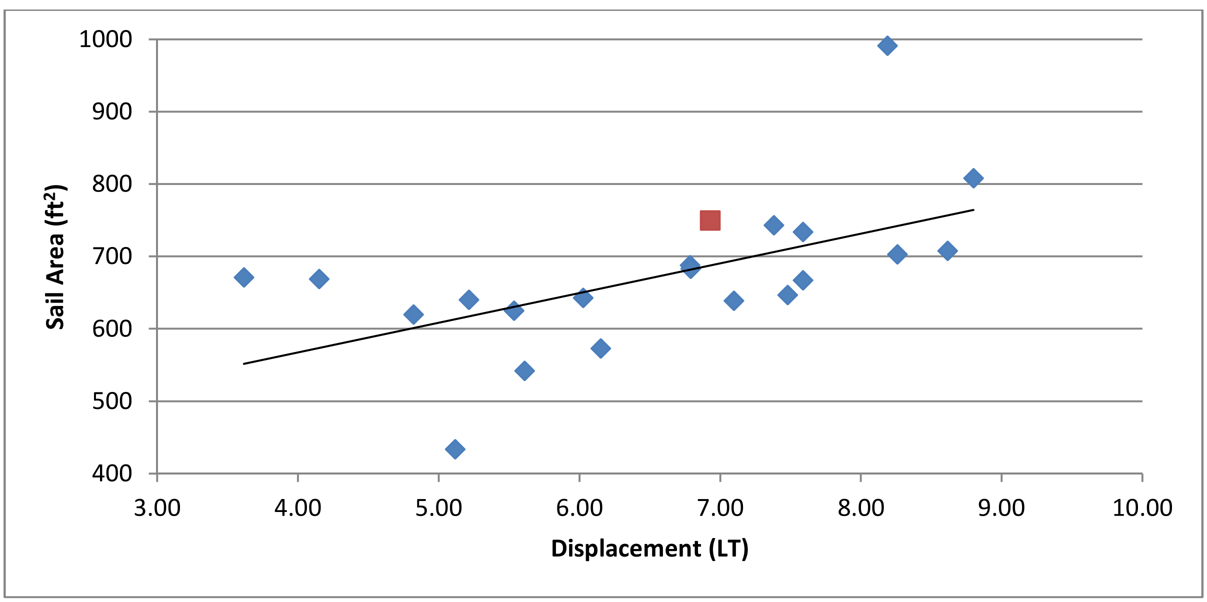


Figure 11 Sail Area v. Displacement trend

In addition to these parameters, freeboard of all the similar ships was investigated, and found to range from 4-5 feet forward and 3-4 feet aft. Above average freeboard was selected in order to deal with potentially large ocean waves. Freeboard forward and after were selected at 4.85 ft and 3.65 ft aft, respectively.

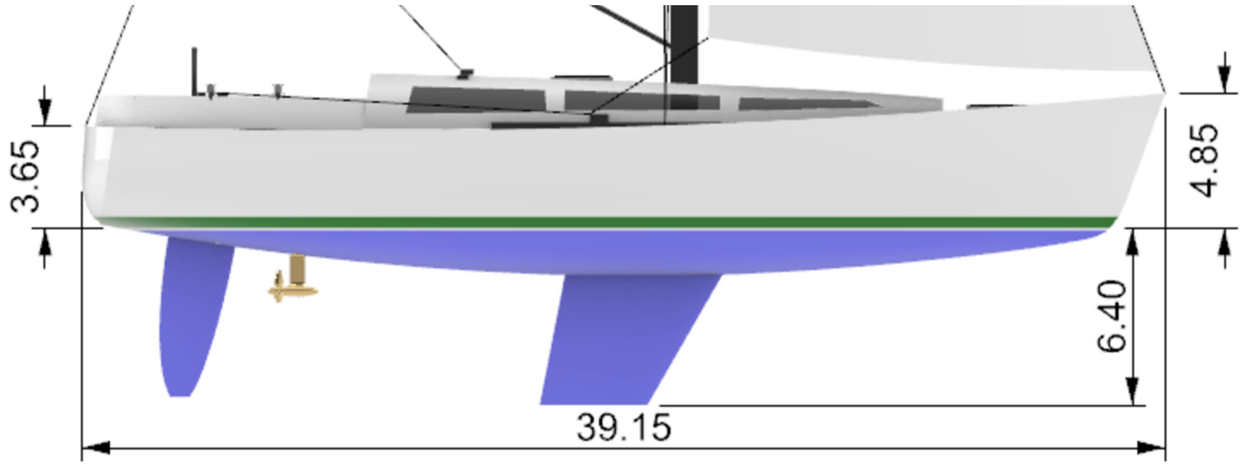


Figure 12 *Slick Lizard* profile view dimensions

Design History

The owner's requirements set forth were used to develop preliminary general arrangements inside and outside the cabin. From this the necessary overall length (39 ft) was obtained and used with similar ship trends to determine other parameters, such as beam (12.5 ft), canoe body draft (1.65 ft), and freeboard at the bow (4.85 ft) and stern (3.65 ft). An initial lines plan was developed with these parameters and desired performance in mind.

A sloop rig was selected due to its relative operational simplicity; with only two sails there are much less lines to operate, allowing quick adjustability with the minimal manning requested. The sloop rig is modeled off similar Catalina, Beaneauteu, and Hunter yachts, with an Aspect ratio of 5.3:1 for the main sail and 5:2:1 for the jib. The total sail area is 740 ft^2.

Carbon fiber/epoxy was chosen as the material for the boom and masts. This lighter weight material will increase stability compared to metal masts by lowering the center of gravity of the vessel. Though it comes with a higher acquisition cost, when looking at lifetime expenses the savings from this non corrosive material are a large positive justification.

As per the owner's request, an electric propulsion system was selected. An Oceanvolt 10kw saildrive motor should provide adequate motoring capacity. The system operates at 48v DC, but also has the ability to charge a 12v house battery. The system is approximately 220 lbs. Though the system costs 20-25% more than a comparable diesel system, Oceanvolt claims that lower maintenance and fuel consumption allows to cost to be recuperated in 2-3 years. Solar panels and a 10 kW electric generator will provide charge when not on shore tie. The Oceanvolt Servoprop sail drive system can act as a hydrogenerator, allowing recharging of the battery banks while cruising, reducing the need for fuel.

Both forward and aft cabin berths are included in the design. The settee will also function as sea berths when underway. While the initial design was 38 feet, the transom was converted from flat to round to afford more space to the cockpit. The raised cockpit allows the aft cabin sufficient room to be comfortable to sleep in. It is feasible that the design could be adjusted to allow for one more aft berth, but in the current design the starboard aft section of the cabin is available for stowage and the battery bank.

Weight Estimate

A preliminary weight estimate was completed using a 78' racer/cruiser as a parent hull. Weight centers were originally estimated utilizing a typical sailboat arrangement with the 38' stack up diagram, then updated once general arrangements were finalized. The heaviest item besides ballast was the hull and super structure. The next highest weight is electrical at 1 LT, a result of choosing an electrical propulsion system. The designed waterline (DWL) was for the vessel at half load, and matched the value determined from the similar ships trend of 7.7 LT.

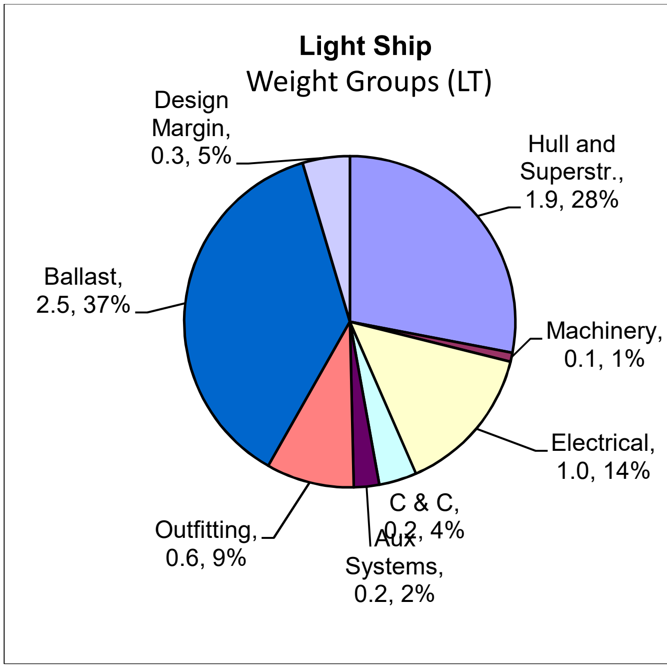
Table 1 *Slick Lizard* Weights and Centers

GROUP	TITLE	Weight (LT)	VCG (FT)	LCG (FT)
100	Hull and Superstr.	1.9	7	22
200	Machinery	0.1	4	33
300	Electrical	1.0	6.4	17.5
400	C & C	0.2	28	24
500	Aux Systems	0.2	6.4	20
600	Outfitting	0.6	8	24
700	Ballast	2.5	4	20
	Design Margin	0.3		
	Lighship	6.7	6.6	20.8
	Service Life 9%	0.6		
	Payload	1.4	7.6	26.5
	Full Load	8.7	6.8	21.8
	Half Load (DWL)	7.7	6.7	21.4

Variable loads accounted for included fuel, water, food, and weight of personnel and their belongings, and were all sized according to a 30 day endurance. In total 100 gallons of water, 400 lbs of food stores, and 36 gallons of fuel are accounted for. Crewmembers were assumed to be 300 lb per person when accounting for their miscellaneous clothing and gear.

Table 2 Payload- All Crew in Cockpit

TITLE	Weight (LT)	VCG (FT)	LCG (FT)
People & stuff	0.7	8.4	33
Stores & Prov	0.2	8.4	23
Fuel	0.0	5.1	23.8
Water	0.4	6.35	18.1
Misc & Ballast	0.1	6.3	20.7
TOTAL PAYLOAD	**1.35**	7.6	26.5



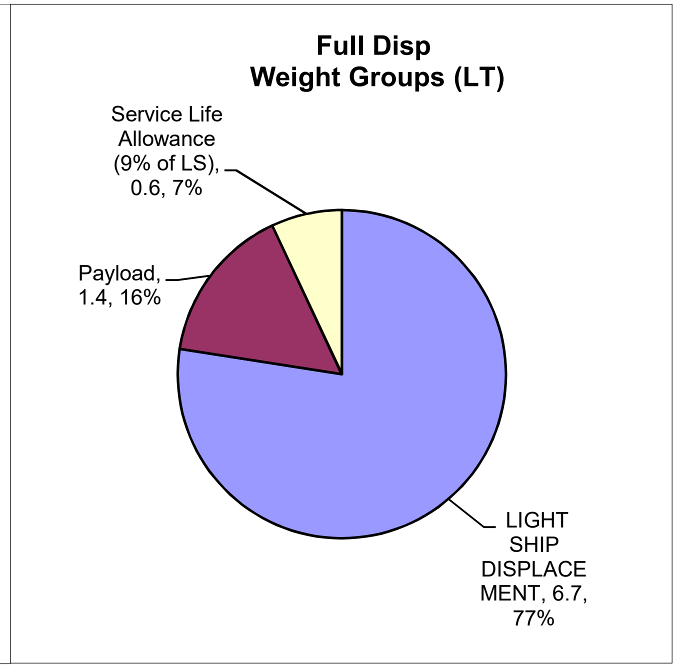


Figure 13 Light ship weight breakdown

Figure 14 Full Displacement

Determining the center of gravity allowed the vessel's metacentric height (GM) to be calculated. 46 CFR 170.170 requires that GM be atleast 2.1 ft; the vessel exceeds this by a factor of 3 with a value of 6.2 feet. With all 4 crew members in the cockpit, the maximum trim is about a half degree aft.

General Arrangements

The creation of the vessel layout began with a stack up diagram containing all the stated requirements. At the forward end of the vessel include a collision bulkhead, V berth, and double settee, while aft focused on the cockpit, navigation station, and propulsion equipment space. Overall length from this set the overall length at 38 feet. Headroom is 6 ft 6 in for the majority of the vessel, except in the forward v-berth and while in the master berth.

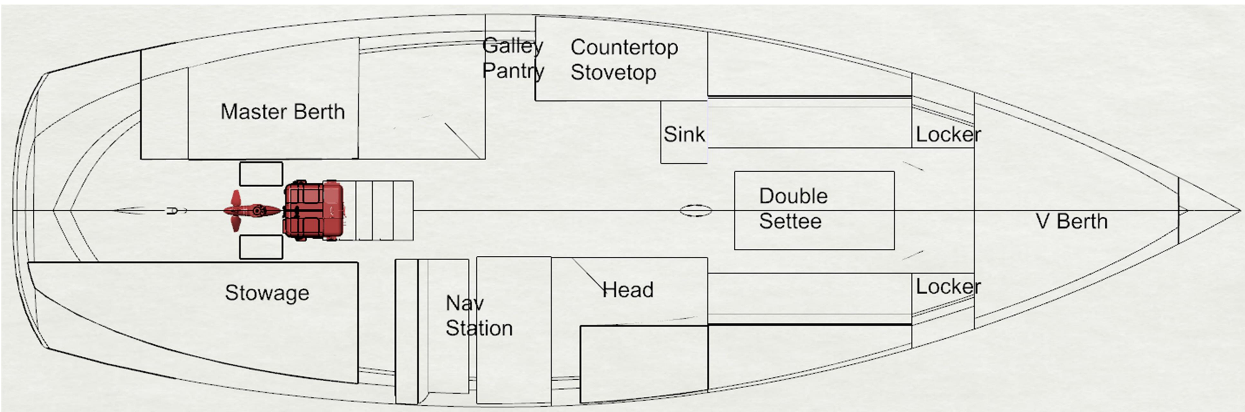


Figure 15 Interior Layout

Placing the settee and v berth forward has them much more impacted by vessel motions.. As the vessel will be sailed primarily by a couple to two couples, it was assumed that atleast one person would be on deck to steer, while the second person would either be navigating, cooking, or using the head, hence the placement of those areas amidships to minimize motion. The size of the navigation station would allow one crewmember to nap comfortably there, while the placement of the master berth provides a sleeping area with better resistance to ships motion than the forward areas due to the slightly wider stern giving a better ride.

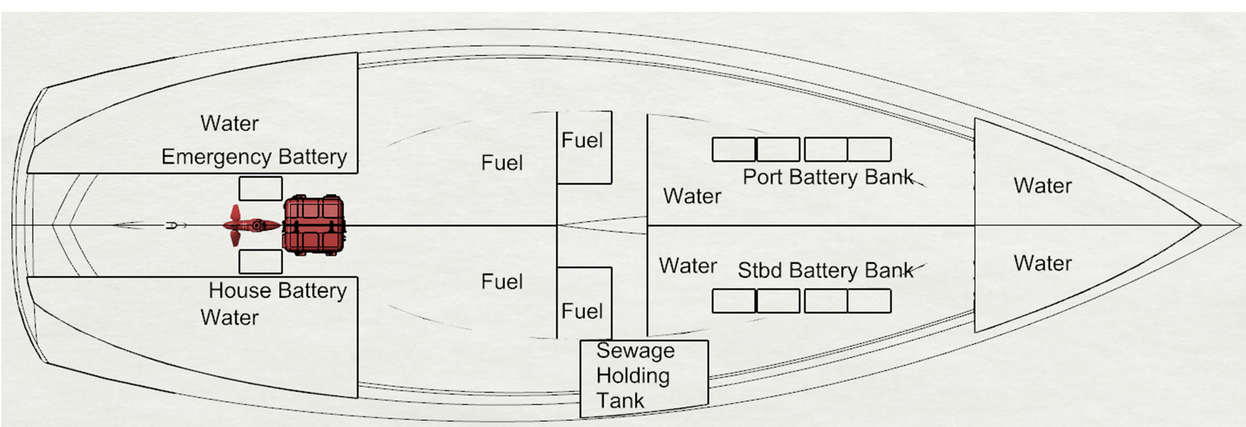


Figure 16 Vessel Tankage

The vessel's tankage was created for 30 day endurance. Water storage was pertinent due to the length of voyages, and thus takes up much of the tankage capacity. As the vessel has an electric propulsion system, a large battery bank was required to operate effectively. A battery bank resides beneath either settee seat. While a simpler wiring system would be required if the battery bank was further back, the batteries were placed forward maintain an even trim in the vessel, as their combined weight is nearly 600 lb. A Sewage Holding Tank rests on the starboard side of the vessel, where it can be pumped directly from the vessel's head.

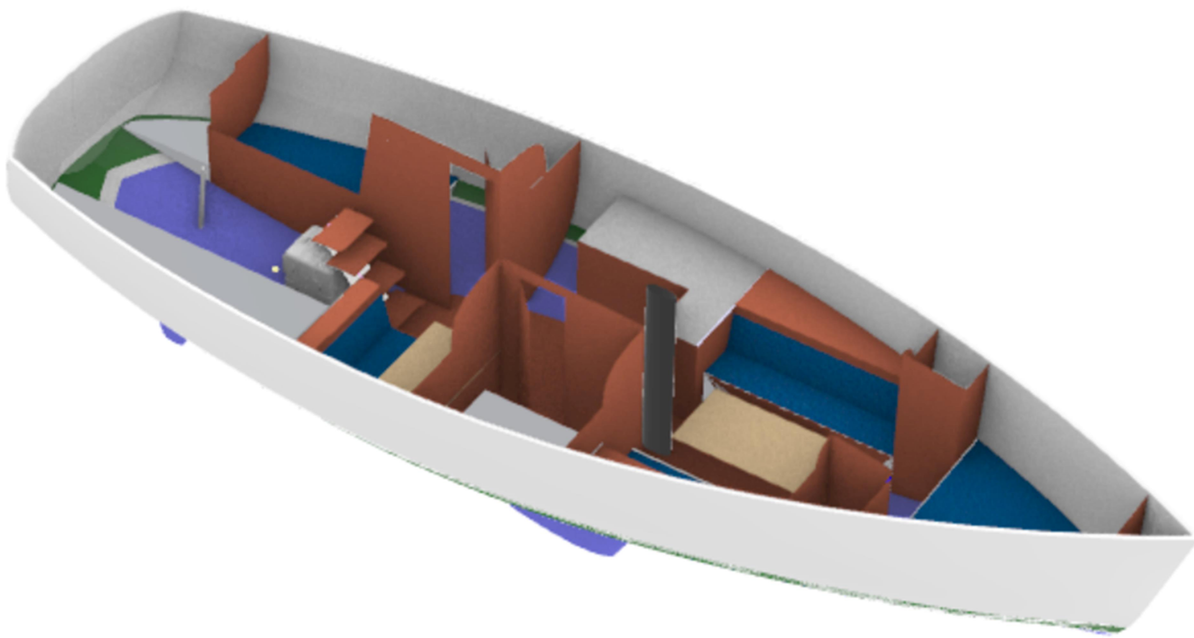


Figure 17 General Arrangements

The cockpit is 8 feet in length, providing plenty of room for lounging on either side. The surrounding seatbacks were angled at a gentle 15 degree slope for comfortable sitting, while the cabin was angled forward 9 degrees for comfortable napping. Two winches are on either side of the cockpit, with the aft most one easily in reach of the helmsman to help with single handed maneuvering. The Wheel is 38 inches in diameter, though a smaller wheel could be used if desired. There is 6 ft and 11 in of clearance from the cockpit deck to the boom. The starboard side cockpit seat will connect to the large storage space below, while on the portside seat resides above the master berth. The design is an enclosed cockpit that will have drains at the lowest points should any water make its way over the high freeboard. The raised sides of the seating should also work to direct water away from the cockpit. The companion way is designed for a slide in panel to prevent water in, as well as retain privacy. The traveler was placed just aft of the companionway to maintain space in the cockpit, and has pullies on either side to relay lines to the cockpit. Two hatches can let air into the main cabin and forward berth, but hopefully keep water out as they are designed to open aft. An anchor locker rest forward of the collision bulkhead with a motorized winching system. Long windows stripe the cabin to let in natural light.

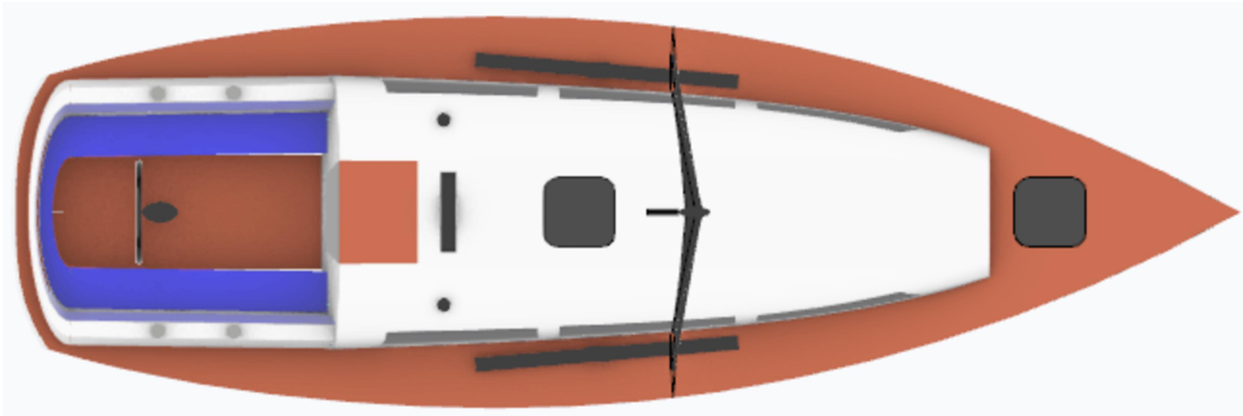


Figure 18 Deck Layout Rendering

Lines

When creating the principal dimensions, length overall was chosen based upon stack up requirements. The beam was made slightly wider than the similar ships trend line for increased stability and interior space. Canoe body draft was slightly below the trend to reduce wetted surface area for less resistance. Maximum beam occurs at 60% LOA. A length waterline of 35 feet 6 in was achieved. The bow of the vessel is distinctly V shaped for effectively breaking through waves. The bow has a rake angle of 20 degrees to provided 2 feet of anchor clearance. Bow freeboard was set at 4.75, 2 inches higher than similar ships to provide a bit more protection from bow waves, as well as more interior headroom in the forward berth. The bow knuckle was placed at the waterline to maximize vessel length in the water, a key ingredient to a vessel's max speed. 8 degrees of forward transom rake was initially added at the stern to increase waterline length, and later rounded for increased cabin space. 2.3 inches of clearance was given at the transom. Freeboard after was 3.75 feet, an inch above the average found from similar ships. Beam at the transom was set at 50% beam overall. The goal of the design was to blend modern aesthetics with the functionality of older designs. The narrower beam at the transom was done to reduce the forward trim of the vessel that wider stern vessels tend to experience while heeling. The lines were crafted with the intent for a fin keel. LCF and LCB occur at 61% and 58% waterline length, respectively.

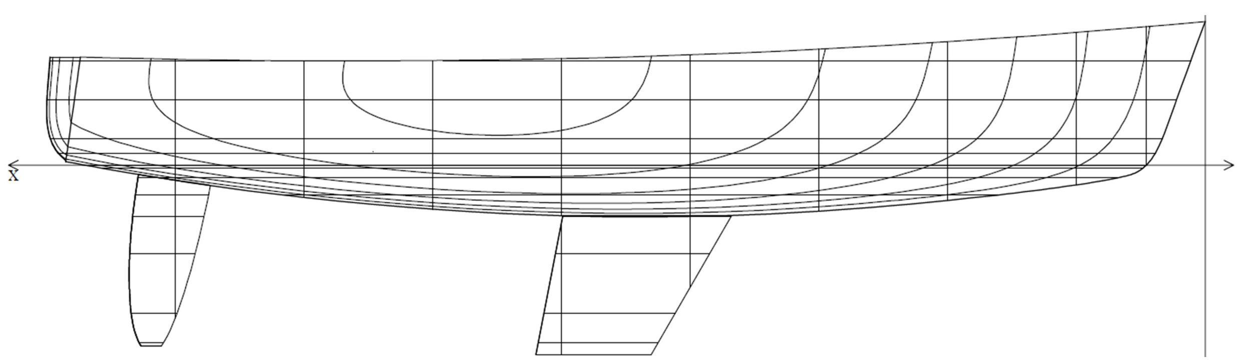


Figure 19 Profile

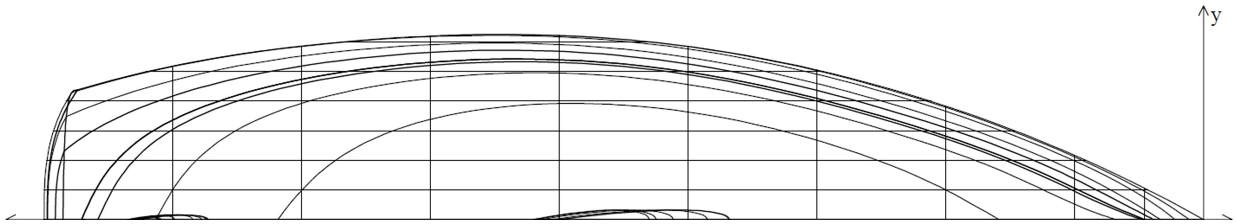


Figure 20 Half Breadth

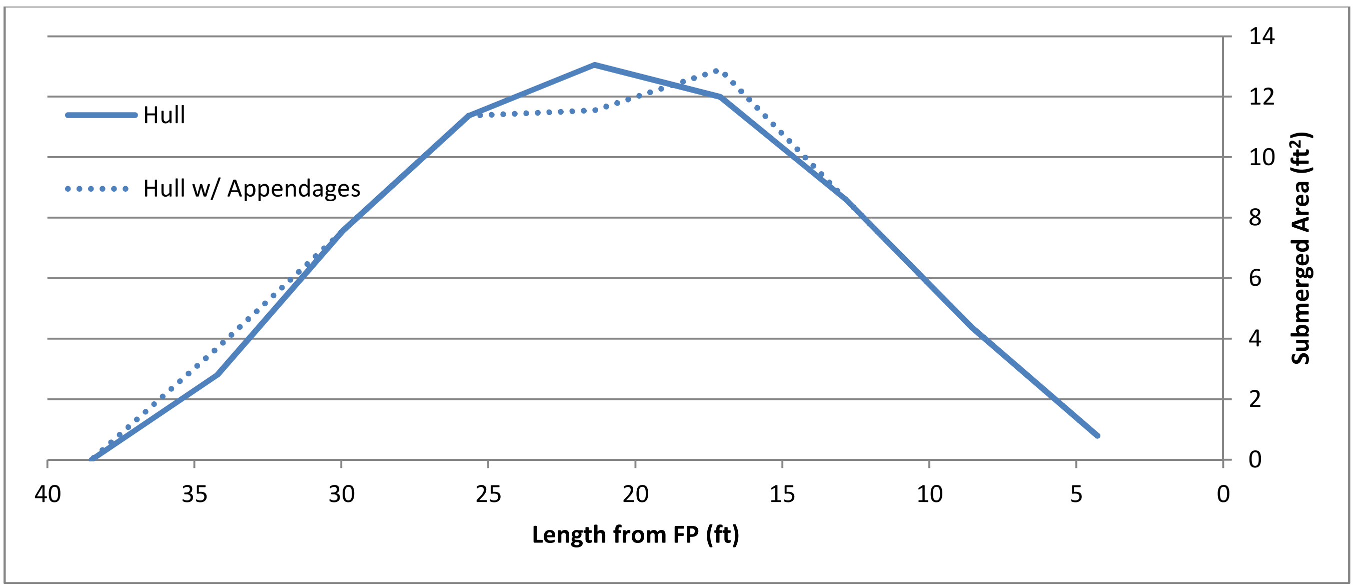


Figure 21 Sectional Area Curve

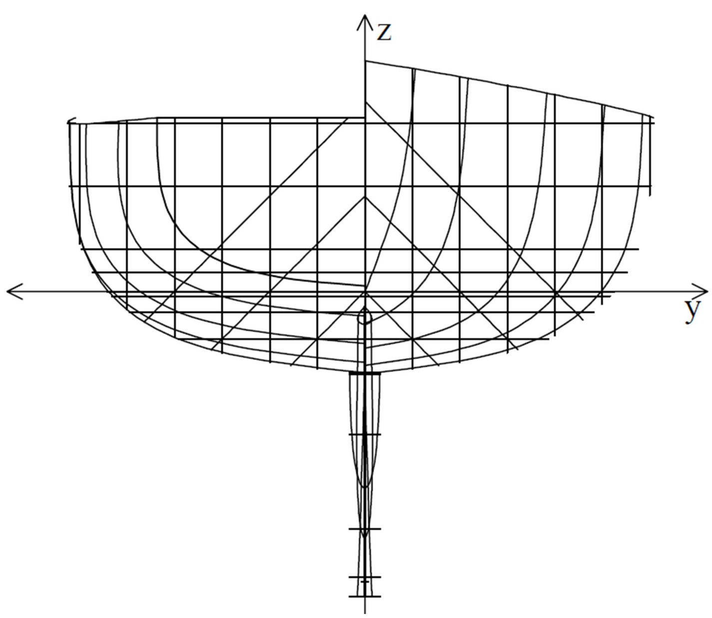


Figure 22 Body Plan

“Principles of Yacht Design” (PYD) by Larsson and Eliasson guided the creation of the keel and rudder. The keel was sized at 3.1% of total sail area while the rudder was 1.3%. A 0012 section was used for the rudder for increased maneuverability, as this foil works well at high angles of attack. The bottom 91% of the keel is lead ballast. The bottom of the rudder is 4 inches above the keel line in order to prevent keel turbulence from interfering with the rudder streamline, as well as protect the rudder from debris. As this is a fractional sloop, the mast-keel lead was set at 4% waterline length. The centers of effort of the rig and keel are shown in figure 23.

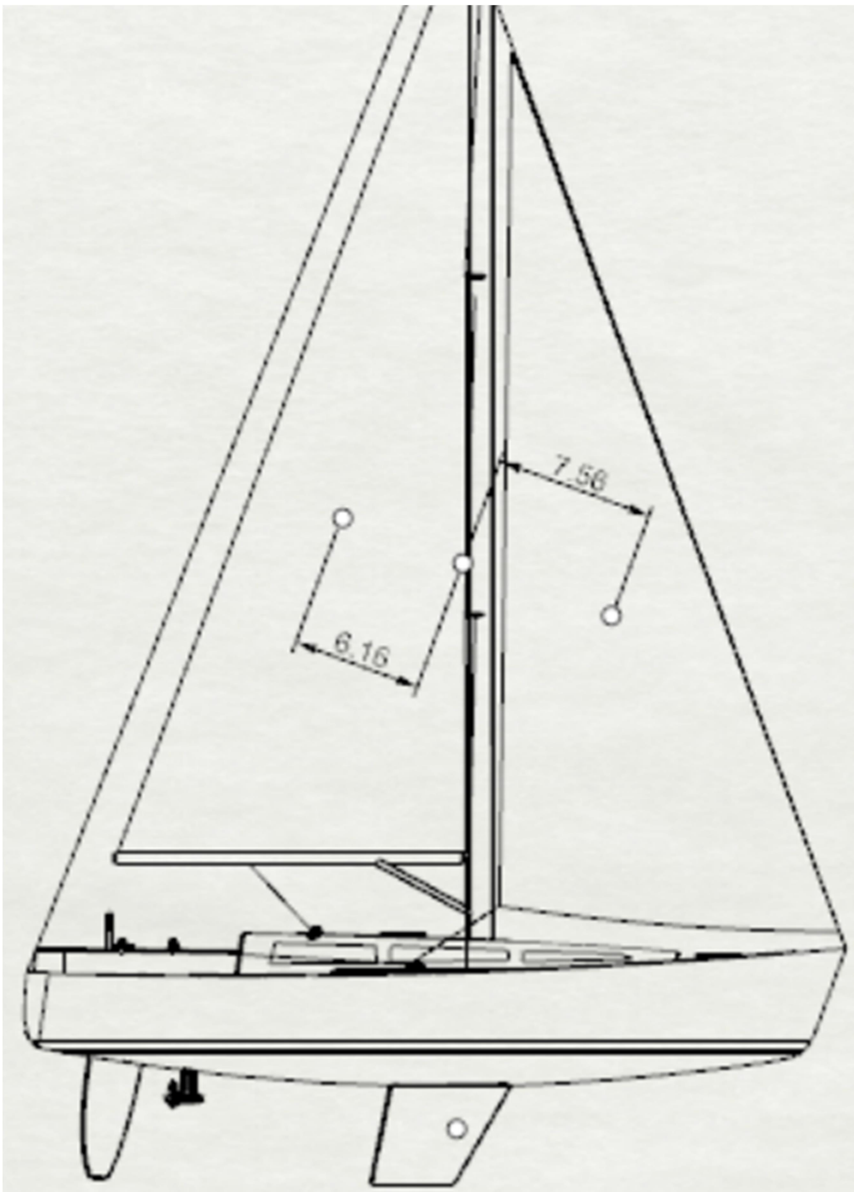


Figure 23 Sail and Keel centers of effort.

Sailing Performance Prediction

As a cruiser, speed was not a high priority for *Slick Lizard*; however the vessel does perform moderately well with a DLR of 171 and a SADR of 17.7, it is at the high end of a good all-around cruiser. Utilizing the Delft resistance series with PCSail2.53, a velocity prediction was conducted running the main and jib. The best relative wind direction will be at approximately 80 degrees from the bow. Reefing should begin after 16 knots.

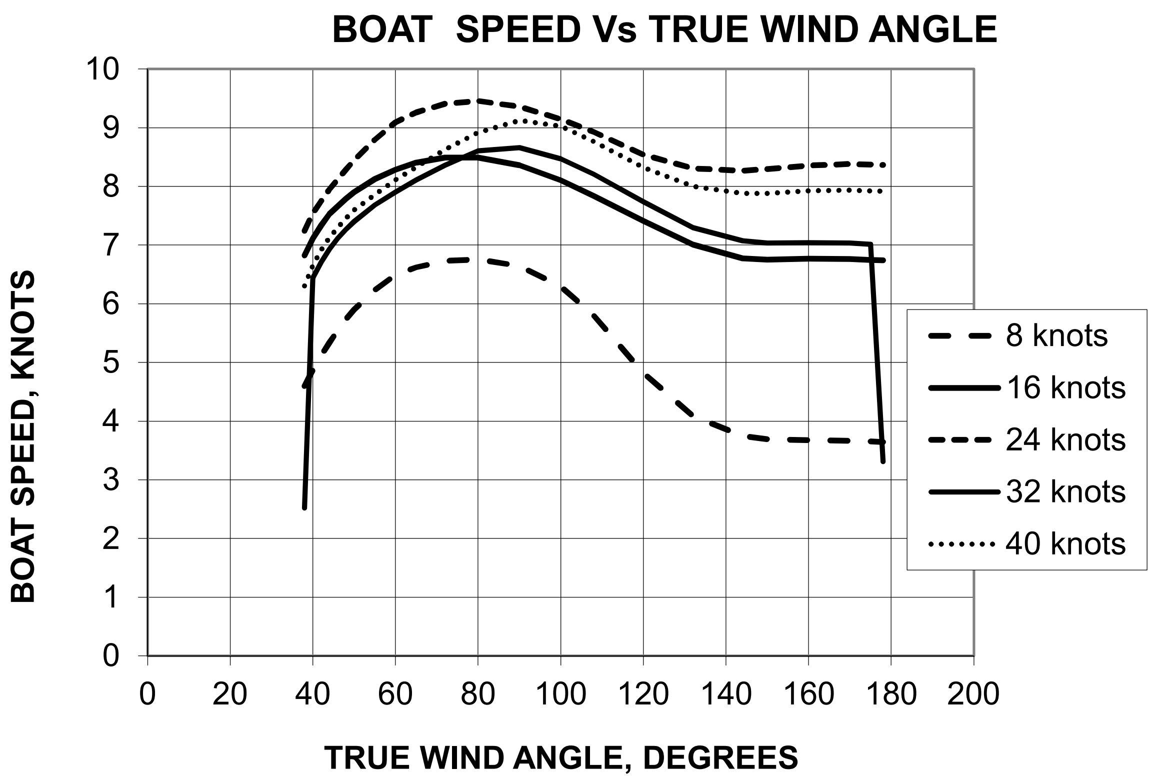


Figure 24 Velocity Prediction for *Slick Lizard*. Top speed is just shy of 10 knots at a beam reach.

Powering

The Delft 1-2-3 series was used to predict vessel resistance. Figure 25 displays the effective horsepower (EHP) and brake horsepower (BHP) required to move the vessel at different speeds. BHP was assumed to be twice as large as EHP. The resistance is nearly non-existent below 6 knots, but begins to rise rapidly afterwards when approaching the vessel's hull speed. At 10 knots the vessel's Froude number is 0.5, at which the vessel would begin entering the semi-displacement/semi-planning region. As a cruising yacht, the vessel will rarely approach this speed, tending instead to sit comfortably in the displacement speed zone.

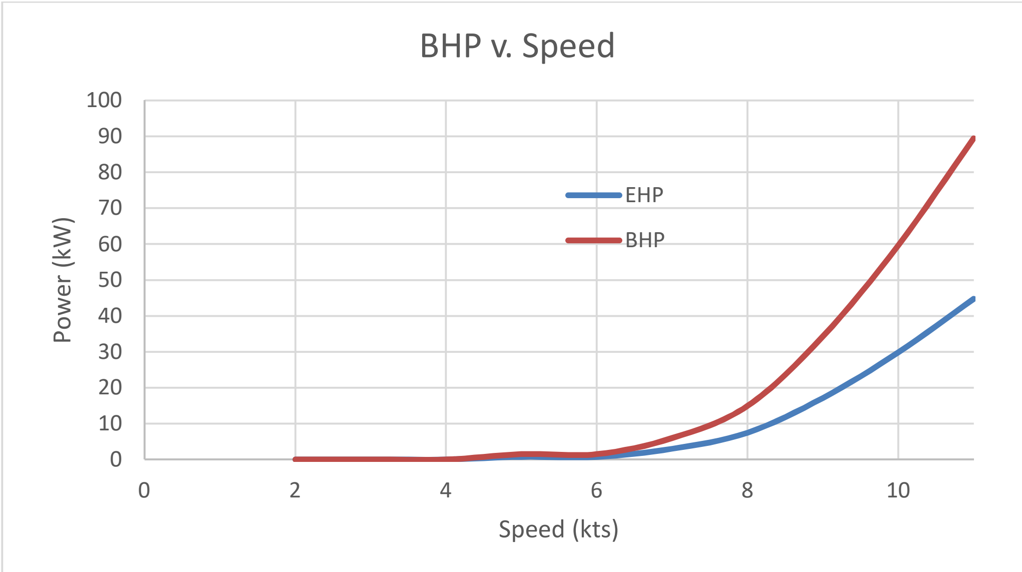


Figure 25 Delft Series Resistance Prediction.

While typically the BHP curve is used to size and select an engine, the electric propulsion requirement made choosing the propulsion system unique. An electric saildrive system does not need power constant generation, as it can run off battery banks. These batteries will also power the house load on the vessel. Several methods can be mixed and match to recharge these batteries, and allows these choices to be made separate of the propulsion system. Before looking at these options, the total energy capacity needed for the trip was calculated.

Some potential electric saildrive systems include Torqeedo and Oceanvolt. A 10 kW Oceanvolt sail drive (SD) weighs under 100 lbs and could push the vessel in the 7 knot range. It requires a 48 volt power source and has a nominal speed of 2200 rpm. For 8 hours of motoring, 80 kWh of energy will be needed. An electrical plant load analysis (EPLA) was conducted, and a daily energy use of 414 Ah will need to be accounted for. This adds up to a total of 171 kWh for the vessel's 30 day endurance. Based on weight and size availability, ten 12V batteries, with 2 banks of 4 in series for 48V with 2 house 12V batteries is the most viable option. Super B lithium ion batteries hold about 90% charge and weigh 60 lb each. With 10 Super B 12v batteries, 154 kWh must be provided during the transit.

Table 3 EPLA Summary with Green Power Generation Options

Electrical loads	load (kWh)	% Total
30 Day House load	91	53%
8 hours of transit	80	47%
Trip total	171	100%
Green Generation Options		
Super B batteries (10)	18.4	11%
Solar Panels	39	23%
Hydrogenerator	720	421%

Solar panels are one possibly option to reduce the power generation load. Accounting for daylight hours, a reasonable area of panels would be able to provide roughly 40% of the house load. Another option is more expensive but much more powerful; upgrading the Oceanvolt SD unit to an Oceanvolt Servoprop SD. Whereas the tradition SD feathers when not in use, the Servoprop SD is a variable pitch propeller which can rotate its blades 180 degrees. The controls for this system allow the blades to be turned so that the water over the blades efficiently turns the propeller, regenerating electricity. Sailing at 6-7 knots approximately 1kW can be generated, with charging capability rising exponentially past this speed range; assuming good winds for the duration of the trip, the upper region of power this unit could generate is 4x the trip load. Even if only 25% of the trip was sailed at the ideal speed range, this unit would still be able to power the entire trip.

Figure 26 Oceanvolt Servoprop Sail Drive

With the battery bank sizing of 18.4 kWh, a full charge could run the propulsion system for just under 2 hours before being fully discharged. Being on the short side for the port transits you may see while traveling the world, a suitable generator system should be included onboard for powering in these circumstances. A 11.5 kW Cummins ONAN would be able to power the propulsion system fully, at just over a gallon of diesel an hour for operations. A smaller generator could also be used to extend the life of the battery bank rather than fully supply the electric motor.

I believe the best combination of propulsion equipment would be the Oceanvolt Servoprop with a Cummins ONAN generator as a backup. While this is certainly a costlier option, I believe this is the system that fully realizes your dream of a self-sufficient electric boat.

Construction

The vessel will be of fiber glass construction with carbon fiber mast. Fiberglass construction will allow for easier repair than steel or aluminum. Corrosion will not be a concern with composite construction as compared with metal. Strength to weight ratio is superior metal construction, meaning less weight is needed for the same strength, which saves on displacement (and thus some resistance through the water). The light weight of a carbon fiber will also reduce pitching and heeling moments of the mast and boom as opposed to a heavier rig, increasing stability. The downside of using composite construction is cost; it can cost up to 10x as much as steel and 3-4 times as aluminum. However, the strength of carbon fiber means less volume of it will be needed as compared to aluminum, reducing this cost increase somewhat, though it is still not a one for one exchange. When taking into account lifetime savings on anti-corrosion measures for steel and aluminum this cost gap is even more justified.

The vessel's preliminary scantlings were determined referencing "The Elements of Boat Strength" by Dave Gerr and checked with PYD. The *Slick Lizard* had a SN of 2.41. The sizing of the shell and stringers are presented below in tables 4 and 5. The hull stringers were extended out to make it easier to apply laminate to them, as well as reduce sharp edges. Foam cores will be used 6 inches above the waterline upward to reduce weight and amount of laminate used. The interior as a mix of wood and white laminate should give a comfortable home feel with a sense of openness.

Table 4 Minimum Hull Thickness for Single Layer Laminate

FRP Shell t (lower top)	0.335	in
Hull bottom	0.385	in
Upper Topside	0.285	in
Keel Region	0.503	in
Deck & Cabin	0.285	in
Bot Laminate Height	7.54	in

Table 5 Hull Stringer Sizing

Number of Hull Stringers	10	
Deck Stringers	Same spacing	
Height/width core not at engine	3.18	in
Height of cores at engine	4.77	in
Laminate thickness not eng	0.26	in
Laminate at engine	0.36	in

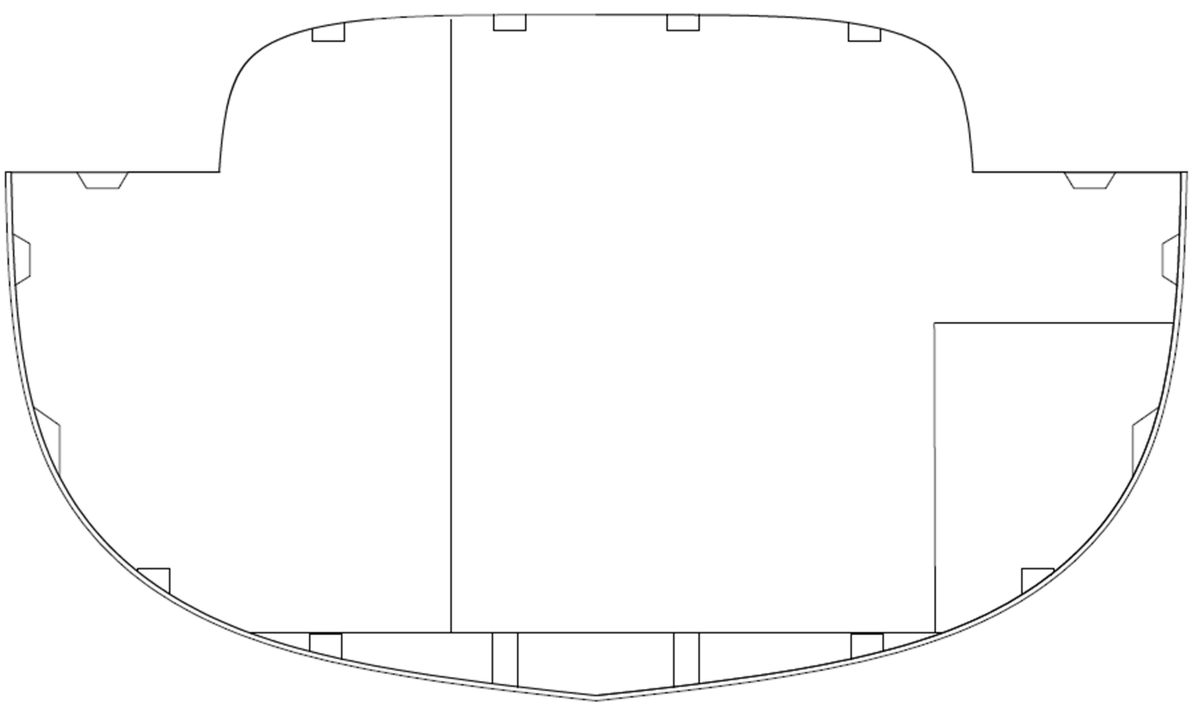


Figure 27 Mid-ship Scantlings

Tankage

The vessel's endurance of 30 days requires serious tankage to complete the journey. Water, fuel, and sewage were all accounted for it creating tanks.

Water required the most tankage space on the vessel. Cooking, drinking, and showering all draw on the vessel's water supply. The National Academy of Medicine recommends drinking just under a gallon of drinking water per day. Based on that, 100 gallons of tankage was created to stow water onboard. This is divided among 6 tanks, and will allow 25 gallons per person per trip for a 4 member crew. For trips where you may be using the full 30 day endurance, a few extra gallons jugs brought aboard should cover the excess need for brief showers.

Based on the fuel consumption of 1 gal/hour at full load for the Cummins ONAN 11.5 kW generator and a trip energy need of 154 kWh, 15 gallons would be needed. 36 gallons of tankage was created aboard the vessel, focused toward the stern to keep fuel line piping short.

A vacuum sewage tank is needed when in no discharging zones. As this vessel is to be making oceanic transits, the opportunity to unload sewage in the high seas should be fairly regular. That being said, many of the more foreign ports may not have discharge facilities. A 25 gal vacuum sewage tank should hold close to a week's worth of sewage, giving you enough time for to stop a few days in more remote locations without having to worry about discharging.

Basic Specifications & Equipment List

- Mainsail
- Jib
- spinaker
- 4x 40 inch winches
- 40 in wheel
- Oceanvolt Saildrive system
- 25 kw generator
- 4x batteries
- 2x sets of settee cushions
- Freshwater Tank (100 gals)
- Fuel Tank (36 gal)
- Holding Tank (25 gal)
- VHF radio
- UHF radio
- EPIRB
- Flare kit
- Life preservers x4 minimum
- Depth sounder
- GPS x2
- Radar dome & repeater
- Surround sound
- TV
- 12 volt lighting
- Mast Headlights
- Anchor motor
- Navkit (charts, weems, protractor)
- Heavy weather sails
- Water heater
- Electric winches
- Refrigerator
- Freezer
- Sail cover
- Companionway cover/windshield
- Air horn
- First aid kit
- HVAC system
- Electric jib furler
- Raymarine smart pilot
- Raymarine aenometer

Figure 28 Sunset on the Pacific

Summary and Next Steps

All requirements were met in the creation of *Slick Lizard*. The design is feasible: Similar ship parameters are met; estimated weight matches designed waterline; the vessel's interior volume sufficiently fits general arrangements. The vessel structure determined through "Elements of Boat Strength" should be more than sufficient for any conditions met on the high seas, although if you desired alternate materials such as wood or carbon fiber may be looked into. There are some drawbacks to this design. The electrical propulsion system, while unique and environmentally friendly, will bring serious upfront costs that will take some time to break even with a traditional system. The tankage onboard the vessel may be a limiting factor for your journeys; while effort was made to include as big of tanks as possible, the limits of space when coupled with general arrangements made it difficult to create tanks of adequate size, hence several different tanks through the ship. One of the larger drawbacks with the current design is the keel arrangement. The vessel ended up almost a foot deeper in draft than intended due to shifts in weight and keel area values that ultimately resulted in a deeper keel then intended. If having access to more shallow draft ports is a concern, some work could be done to rework the appendages into that of a long keel vessel. Moving forward more work should be done with the sail plan, such as the inclusion of spinnakers in velocity analysis.

While there are some drawbacks, they by no means take away from the feasibility of the vessel; *Slick Lizard* is a viable design for your desired requirements. I hope you can see yourself cruising the pacific in comfort in the boats cockpit, enjoying the tropical breeze and sun in your hair. If you have any concerns, please reach out; otherwise, it is time to move on to the preliminary design phase where the specifics can be worked out. Thank you for putting your trust in me to design your dream boat, I hope it is everything you imagined it'd be.