



# Boat Building manual

Presented by  
Lake Lure Olympiad

Sponsored by



1st Annual Box Boat Challenge

Friday, August 10, 2018  
Rumbling Bald Resort

# Introduction



Welcome to the Lake Lure Olympiad's 1st annual Box Boat Challenge (BBC)!!!

We are here to have fun and to show what skills you have at building boats. You and your crew will embark on a 2hr tour. You have 1 1/2 hours to design and build your boats. You should've already received your supplies to build your boat. Now its time to get your crew, start designing and building your boats, and see how far you make it!

Supplies:

- 1 sheet of 48" x 96" piece of cardboard
- 1 yardstick (straight edge)
- 1 utility knife
- 1 roll of utility tape
- 1 writing utensil

We will be judging you on the overall boat design, the crew demonstrating the most Lake Lure Olympiad spirit, the most dramatic sinking of a vessel, and the crew that successfully docks their vessel back at the pier in the fastest time. If there isn't any vessel that makes it successfully afloat back to the pier, the award will be determined by the length of time your vessel stayed afloat. Lastly, if you and your crew don't win any awards and really want an award, please go and bribe the judge\$. All bribe \$\$\$ will benefit the benefactors of the Lake Lure Olympiad.



**Build Time: 4:00 - 5:30    Decorate Time: 5:30 - 5:45**

**Race Times:    Youth 5:50 - 6:20 pm            Adults 6:20 - 6:45 pm**

If there isn't enough participants in each category all race heats will start at 5:50.



# Challenge Rules



1. Each boat must have a designated Captain.
2. PFD's will be used by minors.
3. Teams consist of 2 - 6 crew members
4. Navigating crews must start the race out of the boat and time will start once hands/paddle hits the water.
5. Navigating crew will not be allowed any help getting pushed out.
6. Land crew will hold the vessel spot to allow navigating crew to board.
7. Propulsion of vessel will be by cardboard paddles or hands only.
8. Any boat not ready to race at the designated time will be disqualified.
9. Participants MUST retrieve their boat – or its remains – from the water.
10. Materials provided will be the only materials allowed in building the boats (except decorations)
11. Any boat or crew not within the rules will be disqualified.
12. BBC Coordinator will start all heats with whistle.
13. BBC Coordinator will provide materials to all teams.
14. Teams will wait for BBC to tell them to enter water.
15. The Captain of the boats are responsible for returning supplies (cutter, yardstick, etc) before race.

# Boat Building Basics

## **Developing a Concept**

Sketch your creative ideas on paper  
Calculate length, width, height, draft, balance  
Consider size and weight of crew

## **Preparing for Construction**

Secure adequate work and storage space  
Gather supplies

## **Supplies**

Corrugated cardboard  
Utility knife  
Utility Tape  
Yard Stick  
Writing utensil

## **Construction Steps**

Mark lines  
Cut cardboard  
Bend cardboard  
Tape

## **Being Creative**

Develop a theme

## **Paddling**

Types of paddles - cardboard or hands  
Consider whether you'll be rowing alone or with others

**Remember this is a fun event!**

**Sinkings are as much fun for spectators as award winning are for participants!**

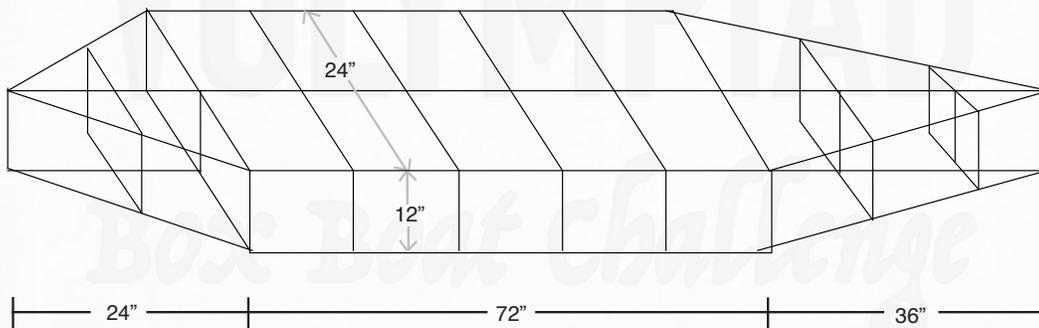
**Please share a registration form with a friend there might be availability!!!**

# Boat Design Fundamentals

Before you develop a concept, consider these fundamentals of boat design.

A boat floats in the water and displaces a quantity of water equal to the weight of the boat and the crew. If the weight you put into a boat is greater than the weight of the water the boat displaces, the boat sinks.

Water weighs approximately 60 pounds per one cubic foot (12" x 12" x 12" cube). For illustration, let's look at the smallest size boat, a guppy with a single crew member. Once you understand this example, it'll be easy to calculate for a larger boat.



The above boat sketch is 24" wide, 12" high and 72" long, with an additional 24" tail and 36" nose, which makes the overall length 132" or 11 feet. The inside volume of the boat is 17 cubic feet ( $L \times W \times H = 6' \times 2' \times 1' = 12'$ , plus 2' for the tail and 3' for the nose). As we stated earlier, water is 60 pounds per cubic foot; therefore, this boat's total displacement weight is 1,020 lbs (17' x 60 lbs.).

The side of the boat is 12" high; therefore, it takes 85 pounds to push the boat down into the water 1" (1,020 lbs divided by 12 = 85 lbs). If a single crew member weighs 170 lbs, the boat will be pushed down into the water 2" (a 2" draft or waterline). The weight of the boat was not included in these calculations, so the actual draft would be slightly higher. A 2" draft gives the boat approximately 10" before water enters the boat from a wave.

That's the basis of floating (designing) a boat with one crew member. If you put two crew members in this boat (add 175 lbs), the draft would be 4" and would leave only 8" to the top of the boat – maybe okay for smooth water, but a little wave action might sink the boat.

Therefore, more crew members require a larger boat, to displace more water and still keep the draft small relative to the side of the boat to protect from wave action and sinking.

Now, let's look at other aspects that influence the final design of the boat, such as:  
Hull and Prow Types, Stability, and Balance

# Boat Design Fundamentals cont.

## Type of Hulls



Hulls with flat surfaces are easier to build but are not as stable in the water as others.



**A**



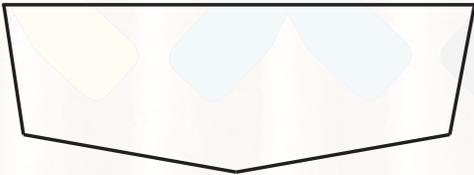
**B**



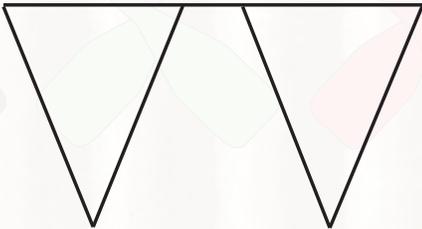
**C**



**D**



**E**



**F**

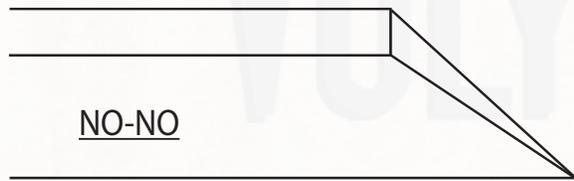
# Boat Design Fundamentals cont.

## Type of Prows



Some prow types deflect water better in wave action than others.  
Consider where the water line will be when your boat is loaded.

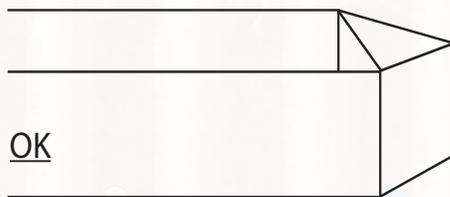
SUBMARINE NOSE



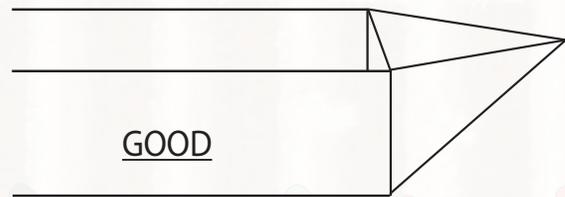
SURELY YOU JEST NOSE



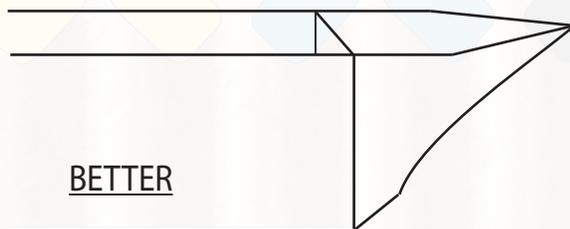
V-NOSED



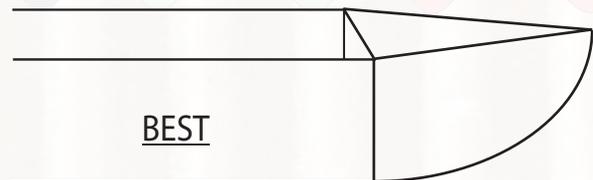
SLOPED NOSE



CLIPPER SHIP NOSE



BOAT NOSE



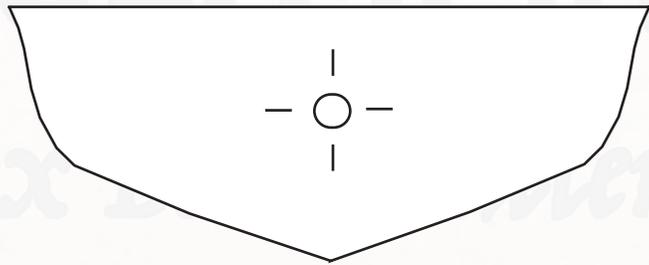
# Boat Design Fundamentals cont.

## Boat Stability



### Center of Gravity

The next area to consider is boat stability. The sketch below shows a cross section of a hull and the center of gravity (CG). As crew members position themselves in a boat, some of their body obviously sticks out of the boat. The lower the crew sits in the boat the lower the CG. Your goal might want to be to make the CG at or below the waterline. This makes the boat more stable.



### Balance

The balance of the boat forward and aft is also very important for proper performance. The center of the boat forward and aft is approximately in the middle of the boat. When positioning the crew, keep the most weight to the rear of the boat. By doing this, the prow will tend to stay up in rough water, keeping water from entering the boat from the front.

### Design Creativity

So far, we've only discussed the technical issues of boat design. The more creative part of your boat building project is the boats theme and decoration for both boat and crew. The sky's the limit as long as you follow basic construction and safety rules, which are listed on the next page of this packet.

**Now that you've read or skimmed through this packet you may have decided that you've wasted valuable time, so go get building!**

# Rules & Regulations

## Construction Rules & Supplies



### Cardboard:

Any thickness of corrugated cardboard is permitted - Layering is allowed.

Maximum width of boat will not exceed 4 feet.

### Tape:

Tape may only be used on structural seams/joints. The seams or tape width cannot exceed 3" wide.

The thickness of tape, anywhere on the boat, will be layered no more than 2 layers.

There is no restriction on decorative materials, as long as they do not aid in the flotation or propulsion of the boat and do not create a fire or safety hazard.

Boats may have more than one crew member.



## Safety Rules

All boat occupants under 14 must wear appropriately sized, properly fastened life jackets.

Boats must be free of sharp edges or anything that could pose a danger.

Children under 7 years of age will not be permitted to race.

Box cutters are only used by adults.

Spotters are needed when boarding your vessel

# Trophies



## Kay Dittmer Award

Best overall boat design.



## Most Spirited Award

Given to the crew that demonstrates the most Lake Lure Olympiad spirit.



## Survivor Award

Given to the crew that successfully docks their vessel back at the pier in the fastest time or longest time afloat.



## Titanic Award

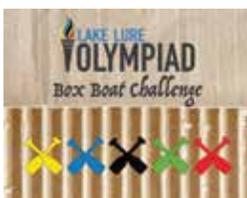
The Titanic Award is given to the crew of the boat that sinks in the most dramatic fashion.



## Judge\$ Award

To guarantee an award, \$imply chat with the judge\$  
Bribe\$ are gladly accepted and benefit the benefactors of The Lake Lure Olympiad





## 2018 GENERAL ENTRY FORM

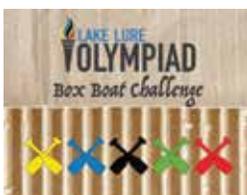
Name (please print) \_\_\_\_\_ E-mail \_\_\_\_\_

Sponsor/Group \_\_\_\_\_ Phone \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Boat name \_\_\_\_\_ How many crew mates? \_\_\_\_\_ Captain \_\_\_\_\_

Entry form must be turned in at "Build Time" at the Terrace



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