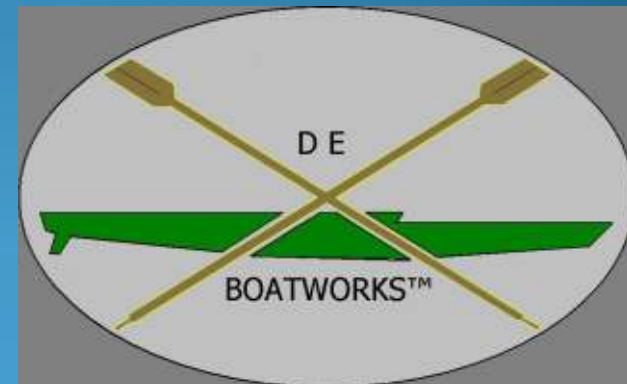


Cedar Lake Summerfest Committee and DE Boatworks Proudly Presents: How to Build Your Cardboard Boat



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How to Build Your Cardboard Boat



Forget that sinking feeling; It only takes a little effort and knowledge to get your paper boat to float!

A boatload of friends to help can be an advantage. A class project could be an interesting endeavor.



But don't discount a single dedicated individual; this person can be an unstoppable competitor.



Every Project Starts Off With A Plan

- Research to see what type of boats other people have built. Googling “Cardboard boats” or “Cardboard boat design” etc. can be enlightening.
(<http://www.google.com/search?hl=en&q=cardboard+boats+designs&aq=1&oq=Cardboard+boats>)
- Decide what type of boat you want to build
- Have a theme; be conservative, crazy, outrageous, unbelievable, out-of-this-world, conventional, or a little something from another *dimension*. Don't be afraid of the challenge.
- You might want to get a sponsor to help promote their business, or just have the sponsor be a part of your fun.
- Whatever you decide to do, *be creative and have fun!*

Prepare for your boat's construction

- It will be necessary to have some place to construct that winning vessel. Be aware that you will need a bit of ventilation to dissipate the fumes from the glue and paint that you will be using (if, in fact, that is the approach that you are using).
- Make sure you have enough room to build your vessel. How uncool would it be to build the perfect vessel and not be able to get it out of your basement, bedroom, or attic?
- Find somewhere that has easy access; maybe a garage or classroom (with appropriate permission).

Developing a Concept

- Be creative and develop a theme
- Decide which division, class, or category you are going to enter
- Put your creative ideas on paper; a picture is worth a thousand words
- Calculate length, width, height, draft, and balance
- Don't forget to consider the weight and quantity of crew members
- Building a scale model can help



Tools and material you may need

- Lots of corrugated cardboard (multiple layered would be stronger than single layer)
- Gluing 6" x 6" pieces of 1/4" plywood can be used for fastening your muscle or wind powered power propulsion system
- Utility knife, Exacto knife, and/or Scissors
- Creasing tool (the back side of a closed utility knife works great)
- Tape measure, rulers, and yard stick
- Straight edge, carpenter's squares, drafting tees, or string for making a straight line



Tools and materials cont.

- Compasses for making circles
- Paint brushes, foam brush, or roller & paint (non oil-based)
- Clamps of various styles and straps, rope, or bungee cord
- Hot glue gun with glue or acrylic caulk for seams
- Paper or masking tape
- DAP contact cement, rubber cement, wood glue, Liquid Nail adhesive
- Wax/paraffin for sealing the boat below the waterline



Lets Get Started!

Applying your boat model concept to the life-size boat project starts with transferring the lines to the full-size cardboard. Cutting the pieces require a bit of care. Don't cut yourself or anything else that you might not want damaged...**fingers and other body parts** should be avoided.

Also, it might be a good idea to place a piece of plywood down under the cardboard that is being cut to save the floor



Cutting flanges for joining sections

Make sure that you leave a couple of inches overlap on edges that will need to be glued to another piece of cardboard (these are called *flanges or tabs*)

If you forget to leave the extra space for *flanges or tabs*, you can make your own *flanges or tabs* by cutting 4" wide by the length of cardboard that you need then bend the piece along the long axis.

Flanges

Helper



Using a straight edge to cut cardboard

Bending the cardboard

This is accomplished by dragging, with enough force, to crease, but not break the cardboard with a dull, rounded object along the line where a bend is intended to be (be careful not to puncture the cardboard).

Apply contact cement or glue to the creased area and then bend the cardboard. You will have to hold the cardboard edges in the position that your plans require. Straps, rope, tape, or bungee cores are acceptable for this purpose.

Contact cement increases



Straps

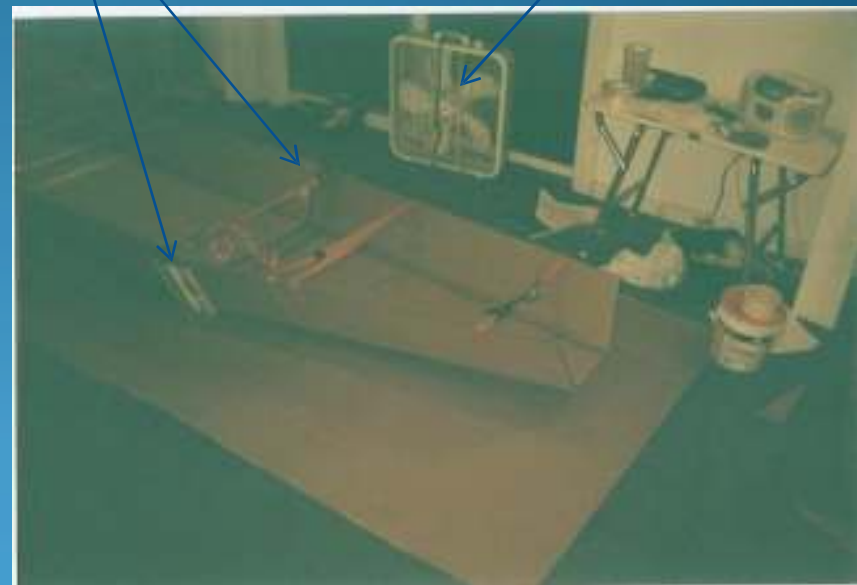
External flanges are used to join section of the boat together

External flanges

Fan for ventilation



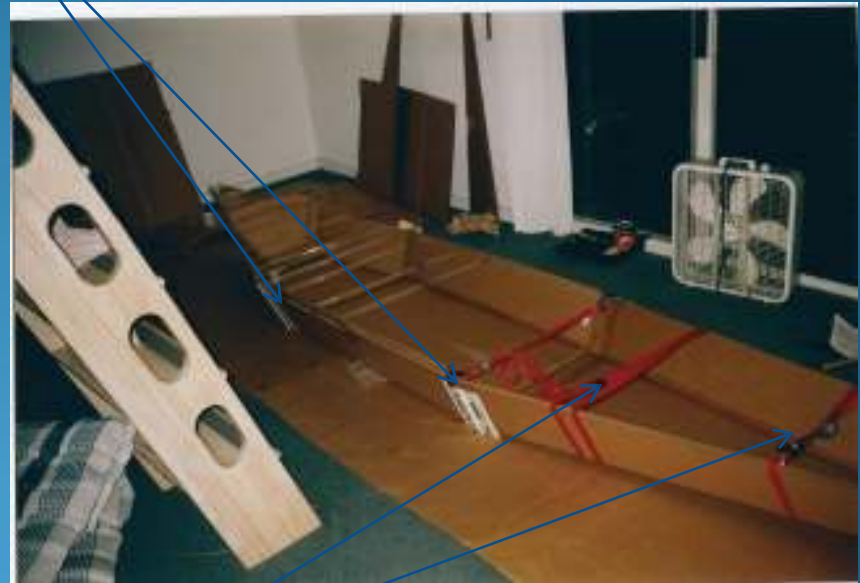
Tape for holding shape



Straps and tape for holding bent cardboard to design shape



Flanges



Tape & straps

Strengthen the vessel with bulkheads. Partitioning off air chambers help keep the boat afloat

Bulkheads

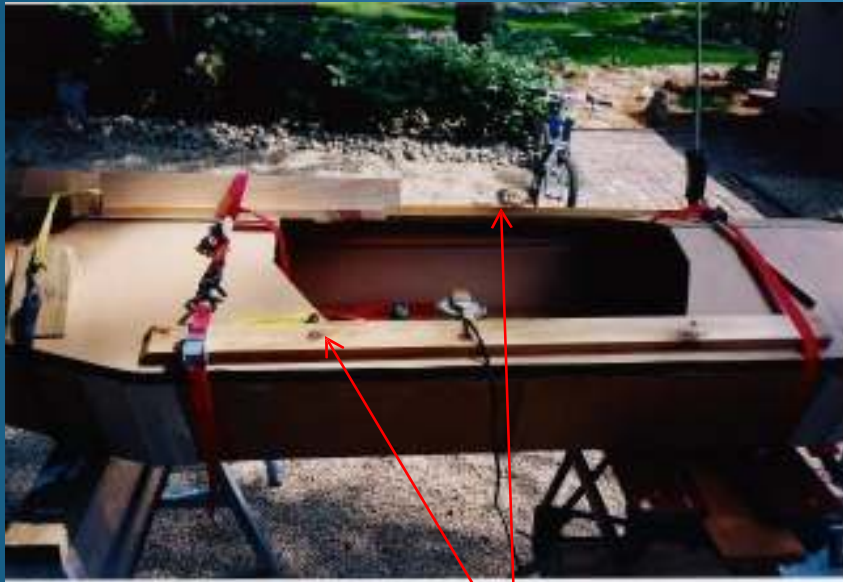
Air chambers

Apply contact
cement to
both surfaces
to be joined



Flanges

Finish decking and sealing seams



Wood strips to help hold down decking



Hot glue gun for sealing seams

Finding the waterline

Weigh the boat and all of the crew members. Divide that total number by 64.2 (this is pounds of water per cubic foot).

Calculate or approximate the volume in cubic feet that the total weight of boat and crew will displace.

Example: 2 crew plus boat is 400 pounds. This is 400 divided by 64.2 equals near $6\frac{1}{4}$ cubic feet of boat area that will be underwater.

The boat is 3 feet wide by 12 feet long by 2 feet high, then the total internal area can theoretically hold 72 cubic feet of water or 4622.4 pounds before water pours in over the sides.

If we divide the total theoretical weight (4622 lbs), by the actual weight you need to displace (400 lbs), you get a ratio of 11.555 . Divide the total height of the boat side 24 by 11.555, and you get a little more than 2. This means that the minimum side height to keep the boat afloat would be a little more that 2 inches. You can also divide the total volume of 72 cu .ft. by your displacement volume 6.25 cu ft. You get approximately the same ratio of 11.52.

Of course, your boat will not be a rectangular box and it may have a flat bottom. So you will have to break up the shape of the boat into more manageable three-dimensional shapes, add them together, and adjust the height to find the actual volume.

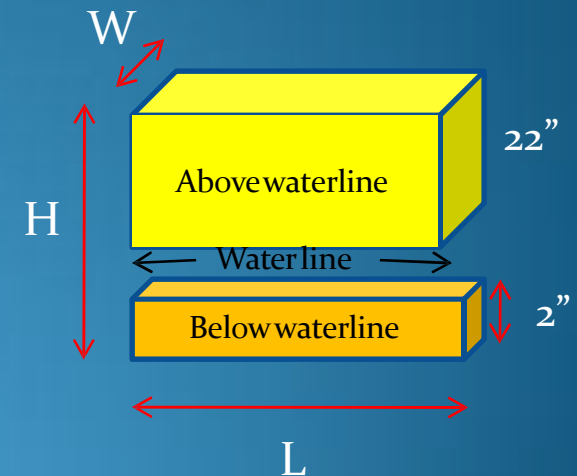
Two crew members + boat = 400 pounds

400 Divided by 64.2 = $6\frac{1}{4}$ cubicfeet (below waterline)

Height x width x length = total volume in cubic feet of boat

2 feet x 3 feet x 12 feet = 72 cubic

Approximately 2" below the waterline



Taping the water line & painting

After taping, place the boat upside down to paint to the waterline.



Painting cont.

Give your boat a good paint job to help ensure no leaks



Dressing up your boat

Stick to your planned theme



Waxing the bottom

Wax melted in a pan can then be brushed on to the bottom



Heatgun



More help

Using a heat gun will melt the wax further into the cardboard and create a great seal between paint and bottom waxcoat

The Rules

1. BOAT CONSTRUCTION MUST BE PRIMARILY OF CARDBOARD.
2. OTHER PERMISSIBLE MATERIALS INCLUDE TAPE, GLUE, WIRE, AND CLOTH. SMALL WOOD BLOCKING CAN BE USED TO SUPPORT PROPULSION SYSTEM, I.E. PADDLE WHEELS, SAIL MASTS & RIGGING.
3. MATERIALS THAT WILL DISQUALIFY THE BOAT INCLUDE WOOD AS A FLOATATION MATERIAL, STYROFOAM (of any type), FOAM RUBBER, RUBBER OR RUBBER COATINGS, CARDBOARD BARRELS, PLASTIC PIPE, PLASTIC COATINGS, BALOONS, INNERTUBES, WATER-PROOFING MATERIALS AND PAINT, OR ANY OTHER FLOATATION MATERIAL OR DEVICES, ETC. ALL BOATS WILL BE INSPECTED PRIOR TO THE RACE; VIOLATORS CAN COMPETE BUT WILL NOT BE ELEGIBLE FOR PRIZES.
4. BOATS CAN BE FOR A SINGLE PERSON OR MULTIPLE PERSONS, AND CAN BE PROPELLED BY OARS, SAILS, CANOE PADDLES, OR PADDLE WHEEL TYPE DRIVE SYSTEMS (NO MOTORS OF GAS, SOLAR, OR ELECTRIC).
5. LIFE JACKETS MUST BE SUPPLIED BY AND WORN BY ALL PARTICIPANTS ON THE BOAT WHILE IN THE WATER.
6. WAX AS A WATERPROOFING COATING IS PERMISSIBLE BELOW THE WATERLINE. PAINTING OF THE BOATS IS ALLOWABLE ABOVE THE WATERLINE.
7. ALL PARTICIPANTS ON THE BOAT IN THE RACE MUST BE AT LEAST 10 (TEN) YEARS OF AGE.

The Rules cont.

7. THE COURSE IS AN OVAL SHAPE AROUND TWO BUOYS SEPERATED BY APPROXIMATLY 250 FEET. ALL BOATS MUST COMPLETE TWO LAPS TO BE ELIGIBLE FOR AWARDS (ANCHOR AWARD EXCLUDED).
8. BOAT PARTICIPANTS ARE ENCOURAGED TO PARTICIPATE IN THE JULY 4th, PARADE IMMEDIATELY PRIOR TO THE RACE REGISTRATION:
 1. PARTICIPANTS NEED TO MAKE THEIR OWN ARRANGEMENTS TO ENTER THE PARADE (PLEASE CALL THE CHAMBER AT 374-6157). BOAT RACE REGISTRATION BEGINS AT 11:30 AM AT THE TOWN GROUNDS
 2. RACES ARE BY CATEGORY WITH THREE AGE CLASSES IN TWO DIVISIONS (SINGLE AND MULTI- PARTICIPANT)
 3. THE AGE CLASSES ARE (8 TO 12), (13 TO 17) AND 18 AND OVER
 4. THE RACES START AT 1:00 PM
 - 5.
9. THE FOLLOWING ARE THE JUDGED EVENTS FOR PRIZES:
 - FASTEST RACE TIME ON COURSE (ALL AGE CLASSES) Trophy and CASH PRIZE
 - BEST DESIGNED BOAT (**Most Professionally Built**) (ALL AGE CLASSES) Trophy and CASH PRIZE
 - BEST THEME (**Most Professionally Built**) (ALL AGE CLASSES) Trophy and CASH PRIZE
 - MOST PEOPLE ON BOAT Trophy and CASH PRIZE
 - ABOVE CLASSES MUST REMAIN FLOATING AND COMPLETE THE COURSE LAPS TO RECEIVE PRIZE
 - ANCHOR (FIRST TO SINK) Trophy
 - 1.
10. PARTICIPANTS MUST REMOVE ALL SUNKEN OR FLOATING MATERIALS AND DEBRIS AFTER EACH RACE OR PRIZES WILL BE FORFITED!

The Two Boats



Kayak



Rowing Scull

Remember; have fun!!! It will be a blast when you christen your vessel and determine it's seaworthiness and competitive properties.

Take pictures throughout your planning, building, and competitive experience. It is always uplifting to review the saved memories of a well planned and well executed project. You probably will be able to make a better PowerPoint presentation than this one.

If you have a vessel that takes the course with ease, you can think about a more elaborate design next year.

If your vessel doesn't perform as well as you expect this year, I'm sure you can use the information you've gathered to plan for a comeback that will astound your peers.

An Incomplete List of Local Suppliers:

- Cedar Lake True Value
9708 Lincoln Plaza
Cedar Lake
374-9711
- Home Depot
960 US Route 41
Schererville
322-6151
- Lake Shore True Value
7120 W. 133rd Ave.
Cedar Lake
374-5981
- Menards
1000 US Route 41
Schererville
864-2883
- Mid Town Hardware
302 E. Commercial Ave
Lowell
696-7421
- Target
9885 Wicker Ave.
St John
365-8162
- Tri-Creek Lumber and Hardware
1895 E. Commercial Ave
Lowell