Heber Springs Area
Chamber of Commerce

What Floats Your Boat

Cardboard Boat Basics
Construction Rules
(Equal Opportunity)

• The ENTIRE BOAT must be built of CARDBOARD
  – Only exceptions are the paddles & decorations
  – Use Cardboard boxes, “blocks”, carpet tubes
  – NO pre-treated cardboard allowed
    • No SONA-TUBES, or waxed or ‘treated’ cardboard
  – NO wood, plastic or fiberglass
  – NO caulking compounds or two-part/mixed adhesives.
  – NO wrapping in duct tape, plastic or fiberglass
Construction Rules (continued)

• Waterproof the boat with Varnish, Paint or Polyurethane (1-part, paint-like substance)

• Decorations are allowed - as long as they don’t effect structural strength or buoyancy

• The crew compartment can NOT be ENCLOSED so as to interfere with escape

• Every crew member must wear a life jacket
# Construction Materials

## Permissible Materials
- Corrugated Cardboard
  - Appliance or Grocery Stores
- Cardboard “blocks”
  - Furniture stores
- Cardboard Tubes
  - Carpet/Linoleum stores
- Fastening material
  - Duct or masking tape
  - Liquid nails adhesive
  - Latex Paint, Varnish

## Materials NOT Allowed
- Wood, Styrofoam
- Plastic sheathing
- Fiberglass
- Sona-Tubes, coated cardboard
- Silicon, Wax, Tar
- Caulking compounds
- Metal
- Staples, clamps, screws
  - * Judges decide on the interpretation of the rules
Construction Materials
(continued)

Cardboard Block
(2-3” thick)

Carpet Tube
(about 4 ½” dia.)

Cardboard Box - cut open
Cardboard Boat Design

• Consider its Size - building & transporting
  – Big enough to hold crew, small enough to carry
  – Wider is better, but still be able to paddle
    • no surfboard style designs are allowed
    • Rafts ARE allowed
  – Consider total weight of all materials when wet
  – EVERYTHING must be removed from the lake

• Boat decorations & crew costumes are encouraged
  - use your imagination
Cardboard Boat ‘Physics’

• “How much will you sink? - Displacement

Weight of Water = 62.4 pounds/cubic-foot

Water Displaced (ft$^3$) = $\frac{\text{Weight-of-boat-}&-\text{people-lbs}}{62.4 \text{ lbs/ft}^3-\text{H20}}$

Depth (ft) boat sinks = $\frac{\text{Water Displaced (ft}^3)}{\text{Length X Width of boat (ft}^2\text{)}}$

Example:

Box boat, 3 ft X 6 ft, 1ft tall (high)
Boat volume = 3’ X 6’ X 1’ = 18 ft$^3$
Boat displacement = 18 ft$^3$ X 62.4 lbs/ft$^3$ = 1123.2 lbs
Which equates to 93.6 lbs per inch of boat height
Cardboard Boat ‘Physics’

- “Wider is Better” - Center of Buoyancy
Cardboard Boat ‘Physics’

- Movement Through the Water

- Simple Box
- Slanted Box
- V-Shaped Bow
- Outrigger Design
- Pontoon Design
- Raft Design
Cardboard Boat
Design Suggestions

• Set the Design Goal: FUN, Speed or looks
• Sketch out your design
  – build a scale model from manila paper:
    • estimate materials or plan how to use what you have
    • plan out what construction techniques will be used
• 1’x1’x3’ box: will float 187 lbs.
  – if it’ll hold you, it’s big enough to float
• Flat bottoms, sit-to-paddle - are the best/easiest
• Rudders help keep you straight but make turning difficult and adds complexity to your design.
Cardboard Boat Suggestions (cont’d)

• Long boats go fast - but are harder to turn
• Short boats (<10’) - are difficult to keep straight
• Best Length: 8-12 feet
• Best Height: 18 inches
  – allows room to sit/kneel & still paddle over the edge
• Best Width:
  – 18”-30” (max) for 1 person
  – 48” wide for 2 people side by side
• Kneeling is a “power” position but sitting is more comfortable
Construction Tips & Techniques

• Cover edges of cardboard - acts like siphon
• Cardboard Tubes make great frames
  – Cutting for joining & bending
  – Fastening tubes together
• Cardboard Hull
  – 1-2 layers, fasten & cover the seams
  – With 2 layers, overlap the seams
  – Decorate, paint & varnish
• Reinforce the area where you sit, kneel or stand
Construction Tips & Techniques

• Carpenter’s glue works well, liquid nails
  – hot-melt glues melts in the sun

• Duct tape only non-painted surfaces (tubes or frame that will be covered)
  – Duct tape shrinks when painted
  – Duct tape can be covered with masking tape if you need to paint it.
  – No Clear tape - it melts when painted
  – Masking tape for glued edges & seams
  – Kraft paper with spray adhesive also
Construction Tips & Techniques

- Solid Tube Frame
- Center/Cross Beam Frame
- CONNECTING TUBES
  - Cardboard Wrapper for Tubes End-to-End
  - Cardboard Wrapper for Tubes At Right-Angles

FRAMES
Construction Tips & Techniques

FRAME ANGLES

V-Shaped Cuts

Multiple Cuts for Sharper Angles

TUBE CUTTING TEMPLATE
Construction Tips & Techniques

FOLD & OVERLAP
CARDBOARD
AROUND CORNERS
Construction Tips & Techniques

Crease/Score a line for a nice STRAIGHT FOLD
Construction Tips & Techniques

Multiple cardboard layers "glued" together on the sides *strengthen the hull*

Multiple trapezoid-shaped pieces "glued" together to form a "support block"

A sheet of cardboard could be folded & "glued" together to form *tubes/beams*