

Ride the Wind

Updated – 1/22/10

- LEVEL:** Middle/High School
- DESIGN TYPE:** Impromptu
- DESIGN TEAM COMPOSITION:** 2-4 students per design team

DESIGN CHALLENGE:

Blade and sail design and engineering is one of the most complicated and important aspects of current wind technology. Today engineers need to design components that extract as much energy from the wind as possible throughout a range of wind speeds and be durable, quiet and cheap. Your challenge is to design and build a sail using a variety of materials, shapes and sizes that maximize the natural energy of the wind. Sails will be attached to a foam raft and powered by a box fan (the wind). A successful sail design is measured by the distance traveled along the track, design efficiency and stability of the raft while in motion.

MATERIALS:

The following impromptu materials are provided by Colorado MESA:

- 1 craft stick
- 1 coffee stirrer
- 1 index card (3" x 5")
- 1 standard sheet of paper (8.5" X 11")
- 1 sheet of aluminum foil (8.5" X 11")
- 1 plastic grocery bag
- Ruler
- 4 straws
- 12" masking tape
- 2 paper cups
- 1 piece of felt
- 1 box fan

CHALLENGE RULES:

The sail must be free standing, built using only the materials provided (listed above) and attach to the raft provided by Colorado MESA. The sail must meet the following design requirements:

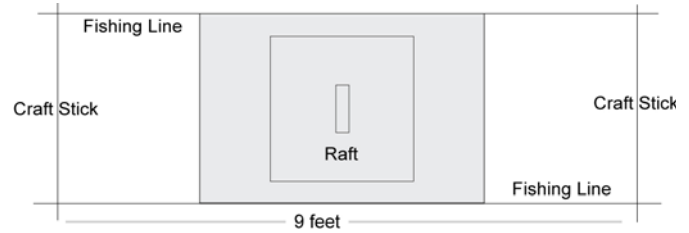
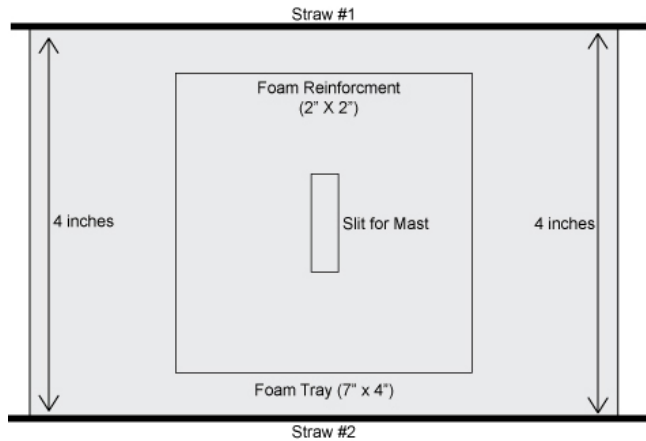
- The sail may not exceed 6" X 7" in size.
- Design teams will have 3 trials. The longest length completed will count as the final distance score in inches.
- One minute between each trial is allowed for design teams to make any adjustments to their sail design.

Raft Construction Materials and Guidelines

The raft will be provided by Colorado MESA and is designed and constructed using the following guidelines.

Materials

- 1 piece of foam (4" X 7")
- 2 pieces of foam (2" X 2")
- 2 straws
- Cellophane tape
- 2 6" craft sticks
- 2 pieces of 20-lb gauge fishing line 9 feet in length



Instructions

1. Cut a one 4" X 7" and two 2" X 2" pieces of foam for foam tray base and reinforcement.
2. Attach the straws to the edge of the foam tray with cellophane tape. One piece of tape at each of the corners.
3. Tape the one piece of 2" X 2" reinforcement foam to the middle of each side of the tray.
4. Cut a slit in the center of the raft just large enough for the sail mast (craft stick)
5. Insert the craft stick into the slit to a depth of approximately 1 inch.
6. Cut 2 pieces of 20-lb gauge fishing line 9 feet in length.
7. Attach 1 craft stick to the end of each strip of fishing line 4 inches in width apart from one another.
8. Thread the other end of each piece of fishing line through the each straw on the raft.
9. Attach the 2nd craft stick to the other end of the fishing line 4 inches in width apart from one another.
10. Firmly attach one craft stick to the edge of a table. Attach the other craft stick to the other end of a table 9 feet way.

SCORING:

Each team will have 3 trials. Design scores are based on the average distance across all trials and the following formula:

$$\text{Score} = \frac{\text{Distance (inches)}}{\text{Weight (ounces)}}$$

Awards will be given for 1st, 2nd and 3rd place design teams.