

# MacGyver Wind Lift Design Challenge

## Building Tips & Troubleshooting



After building background knowledge and introducing the design challenge process, it is now time to construct the wind lift.

View the [MacGyver Wind Lift Building Tips & Tricks Video](#)

### Materials in your MacGyver Wind Lift Supplies:

*Supplies are provided for 50 wind lifts (enough for 100-150 students). OEP recommends working in groups of 2-3 students.*

### Materials Supplied:

- Hub: Pool Noodle, Glue Gun
- Blades: Bamboo Skewers (2 lengths: 8" and 10". Skewers can be cut with a good pair of scissors.)
- Driveshaft: Dowel Rod, Plastic Straw
- Lift: String, Cup, Wooden Spool

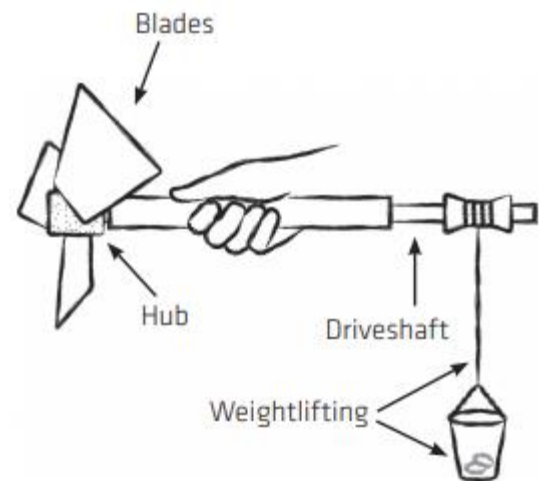
### Materials Not Supplied:

- Box Fan
- Materials for blades-index cards, plastic bottles, manilla folder, cardboard etc.
- Pennies (consistent weight for lift so balance is not needed)
- Meter stick for measuring string
- Tape, scissors, hole punch

### Teacher Materials Prep:

- Pre-cut the pool noodle into 1" sections (one for each group.) A serrated or bread knife will easily cut the noodle.
- Pre-cut students string at .6 meters (60 centimeters) to save time. The challenge is for the wind lift to raise the cup .5 meters. By pre-cutting lengths of .6 meters, you allow enough string to attach to the cup and spool.
- It might be helpful to have each item in a bin or box. Then groups can easily gather the supplies they need.

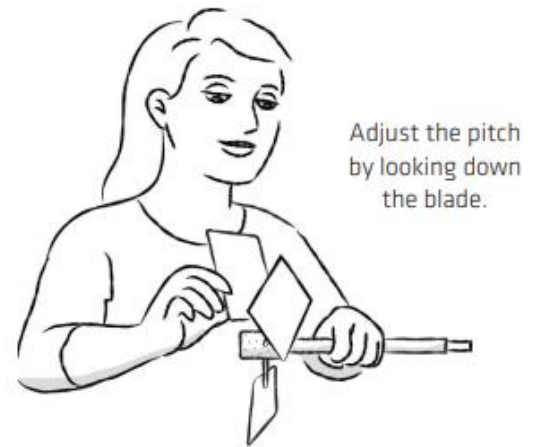
Watch the following video demonstrating [how to build the MacGyver Wind Lift](#). You may choose to show this to students or watch to support your own class demonstration.



Students should follow the MacGyver Wind Lift Student Worksheet to explore wind energy and create their own wind turbine. They will follow the engineering design process to see which design is most powerful.

### Building Tips:

- If the dowel is slipping, tape or hot glue the driveshaft into the pool noodle. If using hot glue, allow the glue to dry before placing straw over the dowel. You do not want the straw glued to the hub.
- Do not glue the blades into the pool noodle, students will be adding and removing these as they redesign their lift in the engineering process.
- Do not make the blades bigger than the fan you have. Students may make very long blades thinking bigger is better. However, blades longer than the fan have no wind to catch. This can also add drag so consider the blade size before constructing.
- Help students think about changing pitch using the diagram.



### Common Problems for Troubleshooting:

- The straw rubs on the pool noodle (hub). *Place a washer on dowel rod between hub and straw.*
- String keeps slipping on spool. *Tie string tightly in CENTER of spool. Tape the short end to spool.*
- Turbine won't spin. *Adjust the angle of the blades and be sure the blades are all at the same angle.*

### Testing, Data Collection, & Additional Trials:

Students should answer improvement and conclusion questions on the MacGyver Wind Lift Student Worksheet to make improvements before retesting and to reflect on their design process overall.

- Set up a testing area in your classroom. If you have access to more than one box fan, set up a second test site in your room. This will allow testing, data collection, redesign and retesting to proceed more quickly.
- Have students test their design without any weight to ensure the blades are spinning and the string is wrapping around the spool.
- Keep the fan setting the same for all testing. You may want to test your own turbine first to see which setting is best.

- Test all the wind lifts at the same distance from the fan. A piece of tape on the floor or table can ensure students are in the correct position for testing.
- You may need to position the fan on a table or box. For safety, make sure the fan is secure and will not tip over.
- Start the first trial with 5 pennies. Add additional pennies in increments of 5, 10 or more, depending on the ease the pennies were lifted.

**Note:** If you choose to enter your student's data on the KidWind portal, the form will ask for the weight of the lift. If you used pennies as your weight, every penny is 2 grams. To get the lift weight, students will multiply the number of pennies x 2 grams. If you don't have a balance, here is the weight of other common objects.

Penny	2 grams
Large Paper Clip	1 gram
Nickel	4 grams
Quarter	5 grams