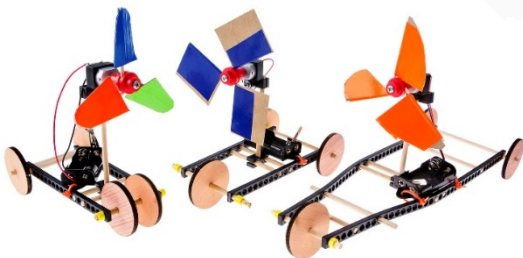
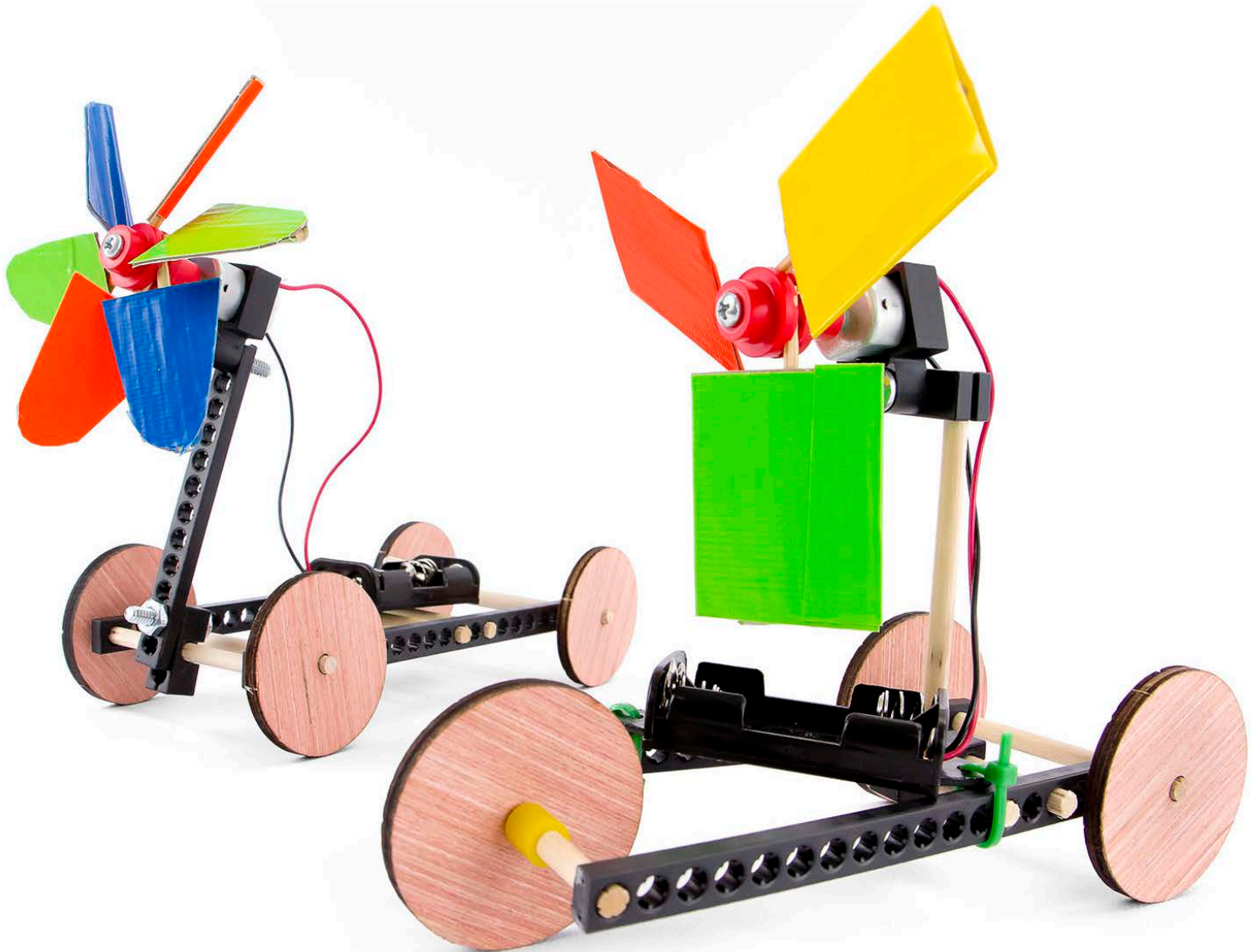
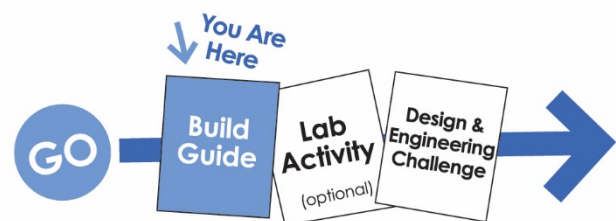


Air Racer Build Guide

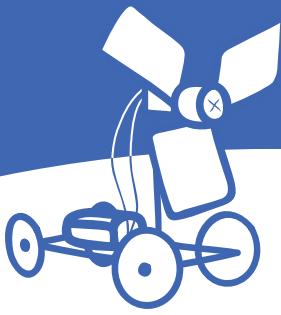


Start by building the example racer,
then turn it into your own unique design.



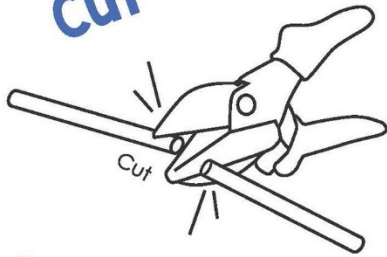
Download Documents at teachergeek.com/learn

For use with TeacherGeek Air Racer Activity Pack, or Maker Cart. Find documents and activity materials at teachergeek.com.

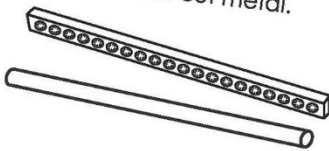


Air Racer Build Guide

Cut



Multi-Cutters cut wood & plastic (like **dowels** and **connector strips**). They do not cut metal.



Push, Wiggle,

Push, wiggle or tap **dowels** into holes.



Tap



Use a **hammer** and **slider block** to tap **dowels** farther through holes.

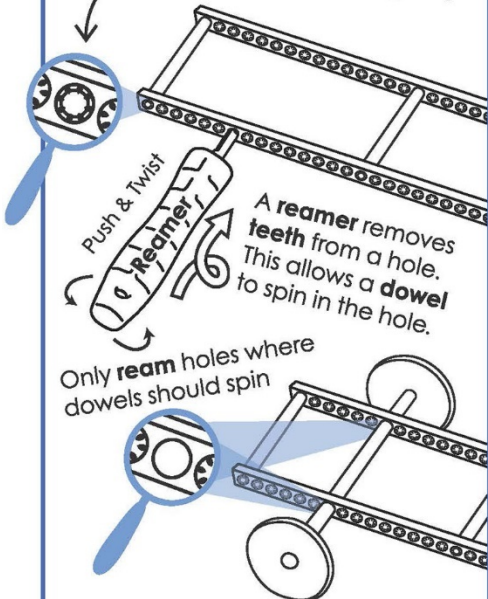
Quick Tip!



Use a **crayon**, or **soap** on the end of a **Dowel** to make building easier.

Ream

Most parts have holes with **teeth**. The **teeth** hold **dowels** (keep dowels from falling out).



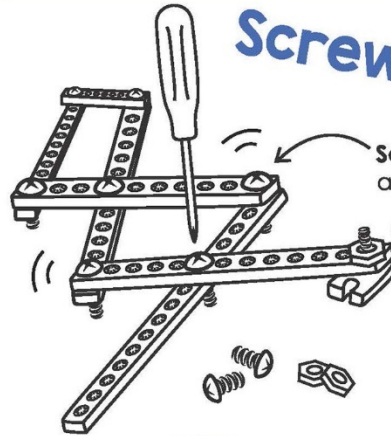
A **reamer** removes **teeth** from a hole. This allows a **dowel** to spin in the hole.

Only **ream** holes where dowels should spin

Never **ream** pulleys, gears, wheels, or any hole a **dowel** stays stuck into.

Screws & Nuts

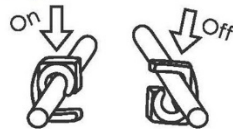
Do not **ream** holes you will put **screws** into.



Screws (without nuts) can connect parts, and allow them to rotate.

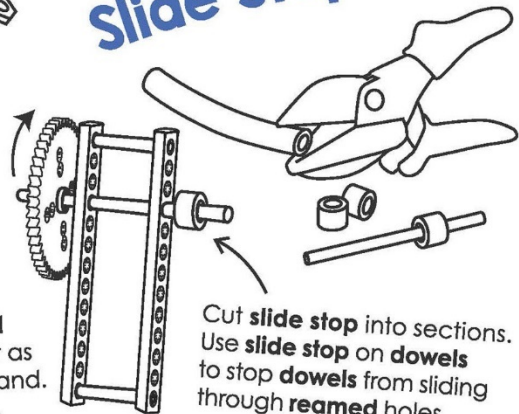
Screws (with a nut) can connect parts, and keep them from rotating.

Stop Clip

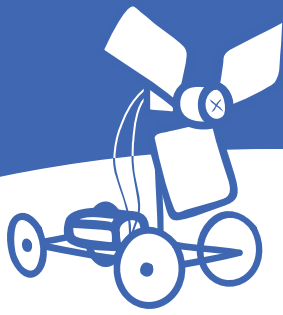


Press a **stop clip** onto a **dowel** to keep it from sliding or use it as a hook for a string / rubber band. It takes little force to get it on.

Slide Stop



Cut **slide stop** into sections. Use **slide stop** on **dowels** to stop **dowels** from sliding through **reamed** holes.



Air Racer Build Guide

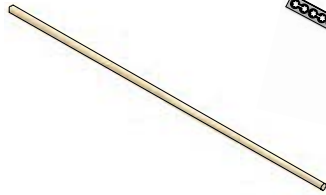
TeacherGeek Components

For One
Air Racer

These are the TeacherGeek components for the example Air Racer, and extras to turn it into your own unique design.



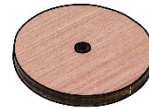
2 - Blocks



3 - Dowels
300mm (12")



3 - Connector
Strip



3 - Wood
Wheels



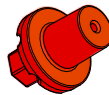
2 - Nuts
#10



10 - Skewers
(or toothpicks)



1 - Hub Cover



1 - Hub Base



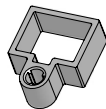
1 - Mini Hub
Screw
5/8" #6



2 - 25mm
Screws
25mm (1") #10



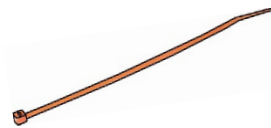
1 - Motor
1.5V-3V



1 - Motor
Mount



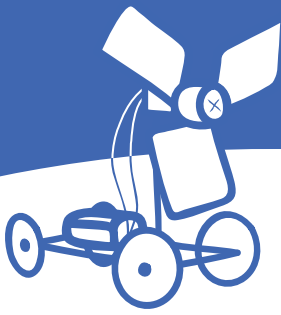
1 - Battery
Holder
w/ switch & leads



4 - Zip Ties



1 - Slide Stop
100mm (3")



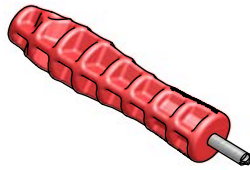
Air Racer Build Guide

TeacherGeek Tools You'll Need

Easy to Share
in Groups



Multi-Cutter



Reamer



Screwdriver



Hammer

Tools available at teachergeek.com

Materials You Supply

You will need these non-TeacherGeek supplies:



Tape

Masking, Painter's, Duct -
Any kind of tape will work.



Scissors

For cutting blade materials
out of recycling materials.



Safety Goggles

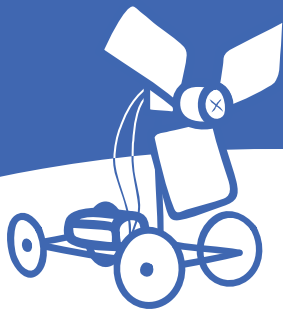
Should be worn during the activity.
Prop blades spin very fast.



Recycling Materials

Blades can be made from cardboard, chipboard,
clean food packaging, plastic, etc.

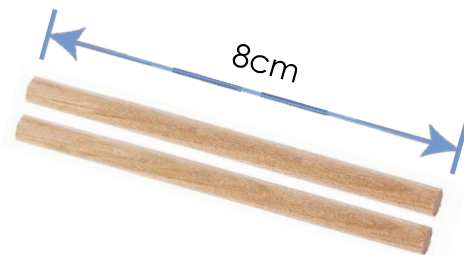
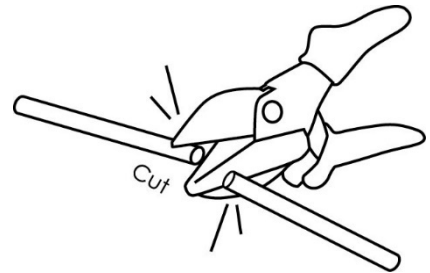
They should not be made from anything sharp or metal.



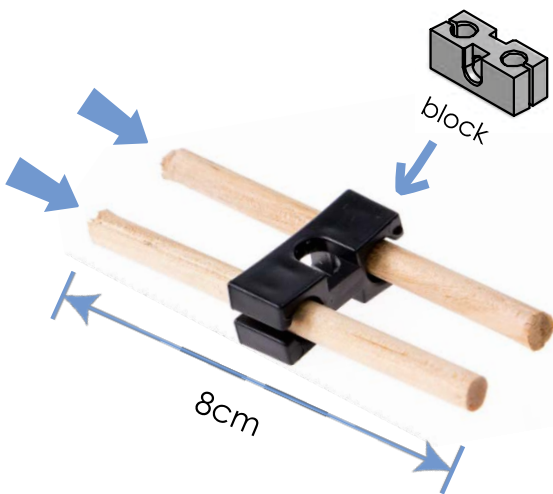
Air Racer Build Guide

Frame Build

1 Cut two 8cm (3") dowels.

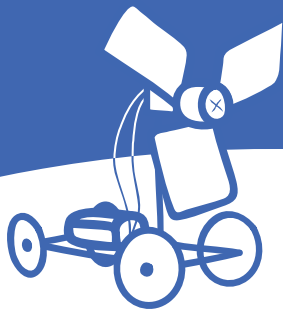


2 Push or tap the 8cm (3") dowels half-way through a block.



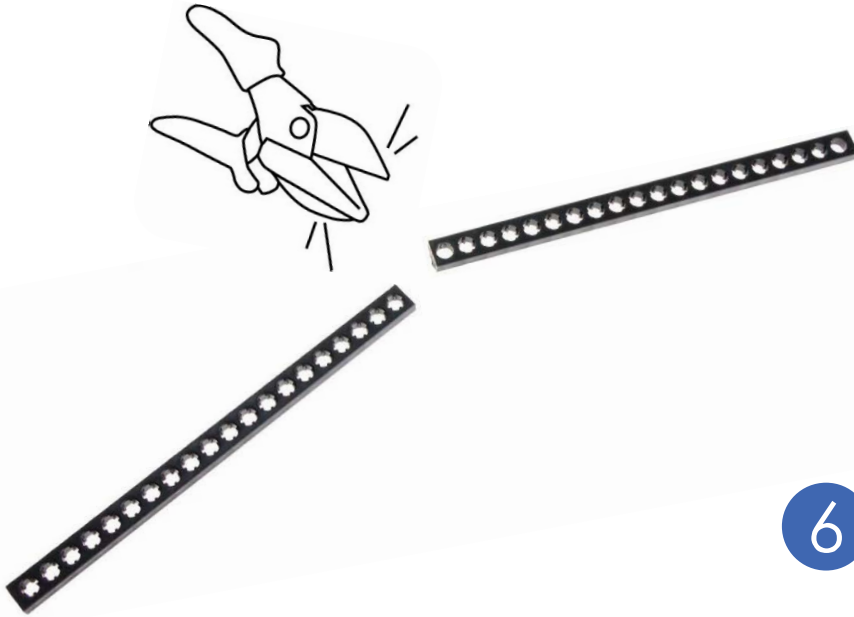
Quick Tip

Use a tapping block and hammer. Things will be much easier.

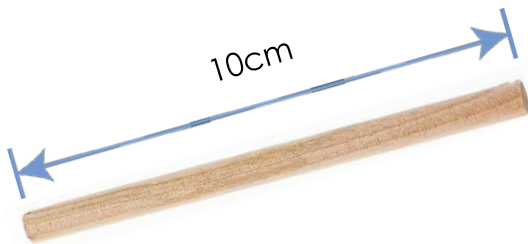


Air Racer Build Guide

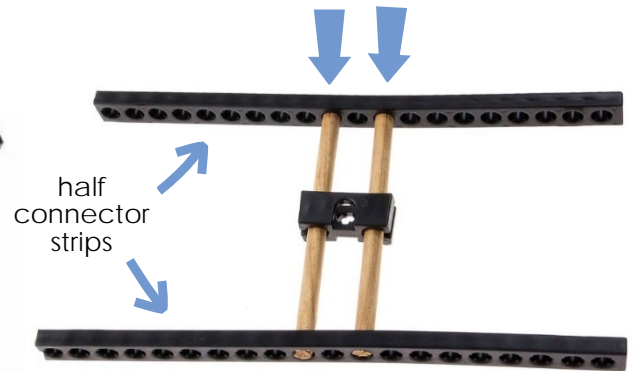
- 3** Cut a connector strip in half, 15cm (6").



- 5** Cut a 10cm (4") dowel.

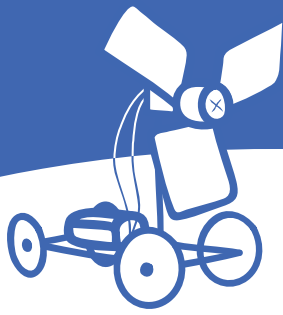


- 4** Push or tap the connector strip halves onto the dowels from Step 2.



- 6** Push or tap the 10cm dowel through the center hole of the block.

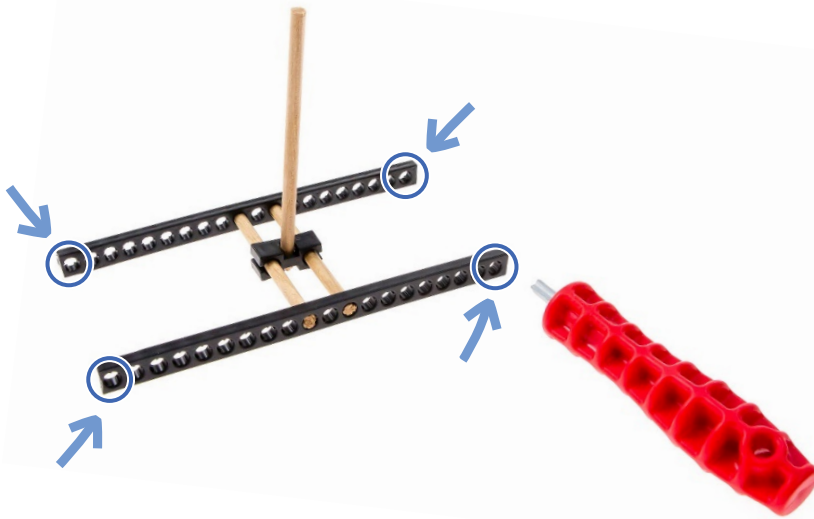




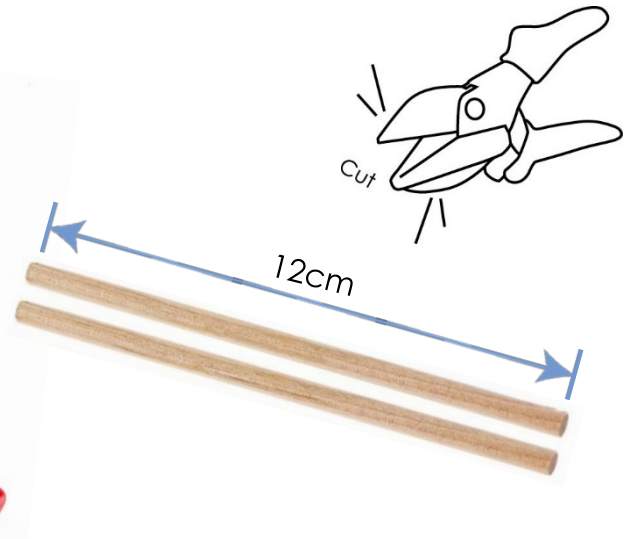
Air Racer Build Guide

Wheels On

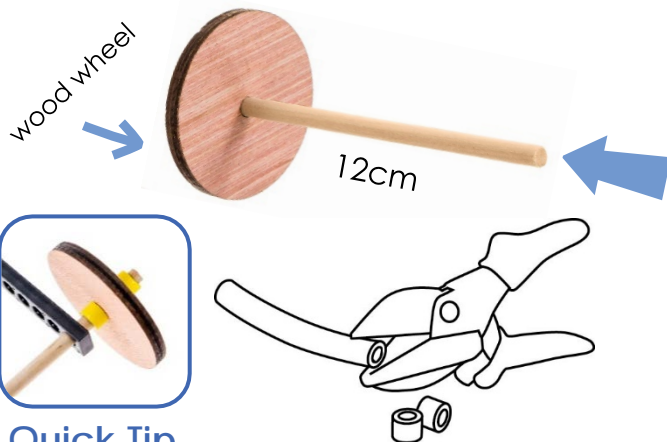
7 Ream the four **outside holes** on the **frame**. This will allow the **dowels** to spin.



8 Cut two 12cm **dowels**. These will become **axles** for the **wheels**.



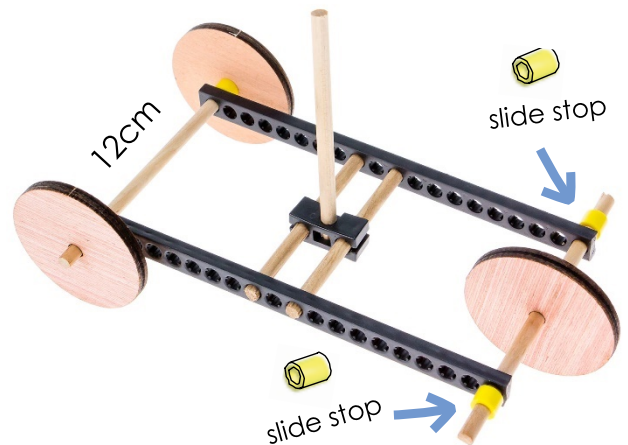
9 Tap or push one 12cm (4.7") **dowel** into a **wood wheel** to make an **axle**.



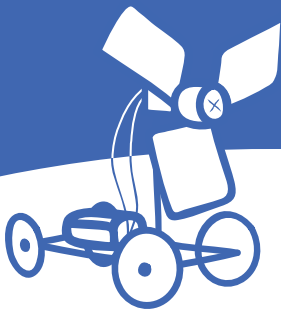
Quick Tip

Cut and use **slide stop** pieces as **spacers** or to keep **wheels** from falling off. Make sure there is still space to spin.

10 Slide the **axles** through the **reamed holes** and put on **wheels** as shown.



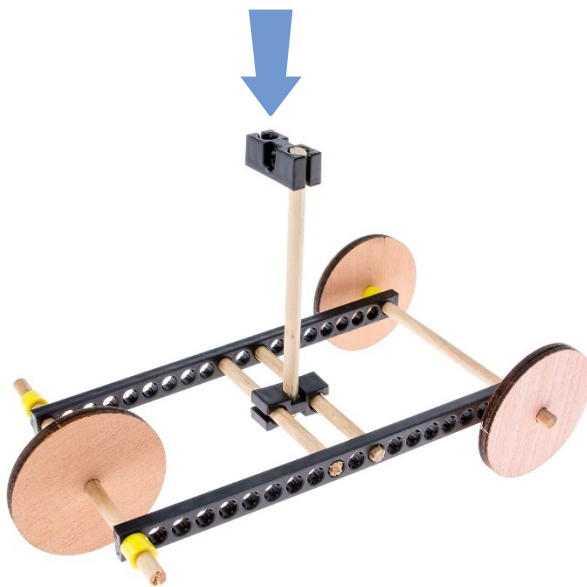
Use two **5mm** pieces of **slide stop** and **slide** on **axle** as shown.



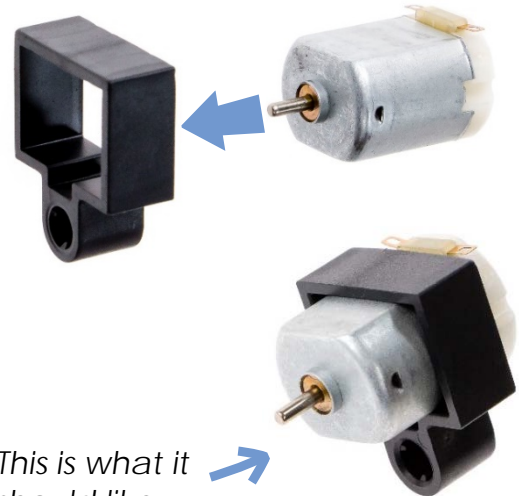
Air Racer Build Guide

Mount the Motor

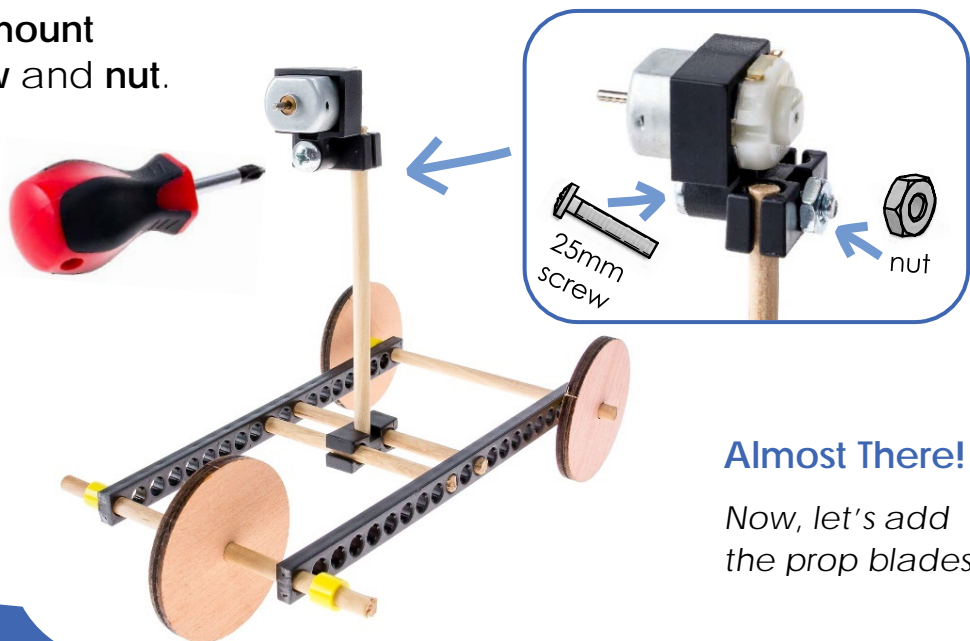
11 Push the **outside hole** of a block onto the **dowel**.

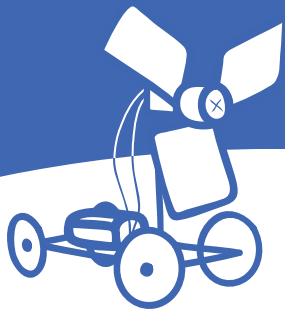


12 Push the **motor** into the **mount** as shown.



13 Attach the motor mount with a **25mm screw** and **nut**.



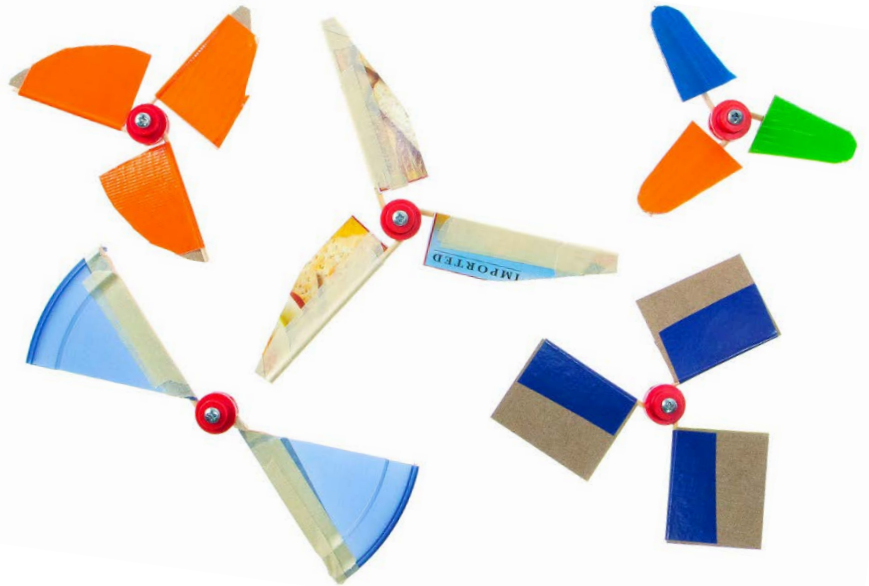


Air Racer Build Guide

Make the Propeller

For this part of the build guide, you will need:

- Tape (any kind will work)
- Recycling Materials
- Mini Motor Hub Base & Cover
- Hub Screw
- Skewers (Toothpicks)



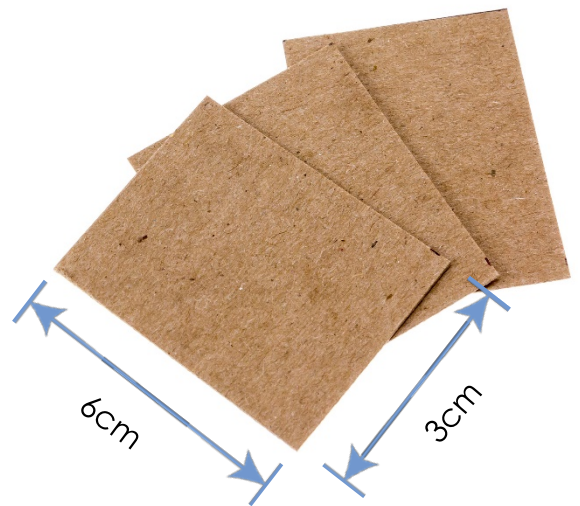
14 Cut both ends off the skewers



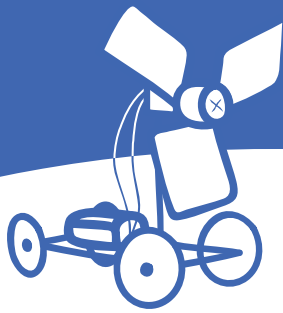
Skewers Option

Cut to size and cut off the pointed ends of **skewers** (or toothpicks).

15 Measure and cut three 3cm (1") x 6cm (2.5") strips of recycling materials.

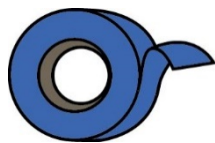


These will be your **blades**.



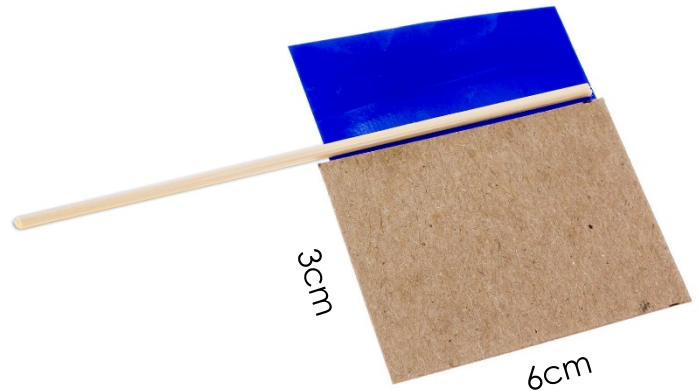
Air Racer Build Guide

- 16 Lay a piece of **tape** (sticky side up) and lay a **skewer (or toothpick)** in the **middle**.



sticky side up

- 17 Place the **blade** on one **half** of the **tape**.



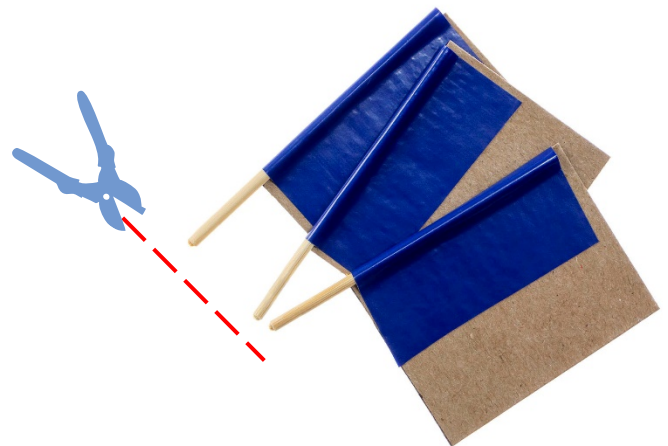
- 18 Fold over the **tape** (around the **skewer (or toothpick)** and **blade**).



Make sure the tape is creased tight around.

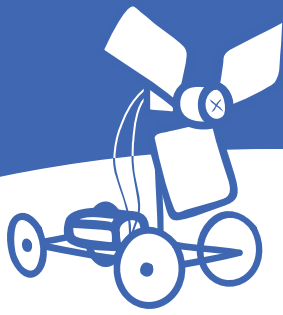


- 19 Measure 15mm from the **end** of **blade** to your **dowels** and **cut**.



Congratulations!

You made your first **prop blade**.
Now, make two more.

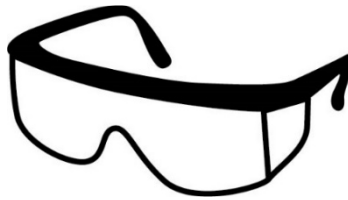


Air Racer Build Guide

You should have *three* when you are finished.

Safety First

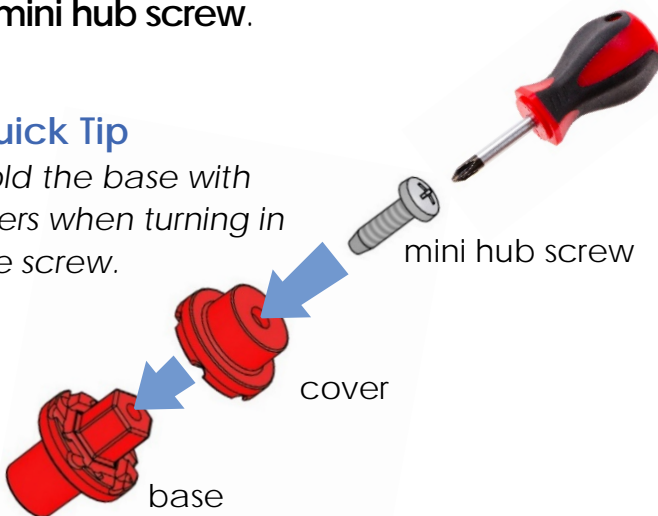
If you're not already, wear eye protection during these steps and when operating your Air Racer.



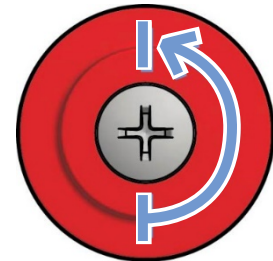
Screw the **cover** to the **base** using a **mini hub screw**.

Quick Tip

Hold the base with pliers when turning in the screw.

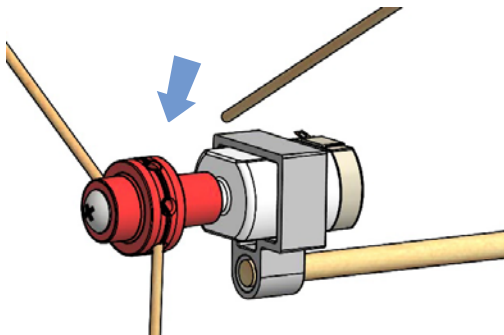


21 Loosen the **screw** ½ turn.

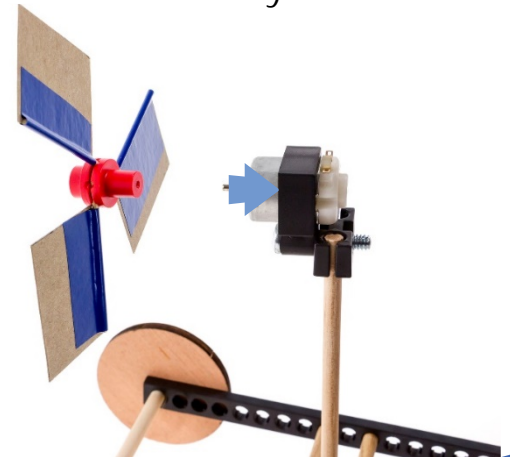


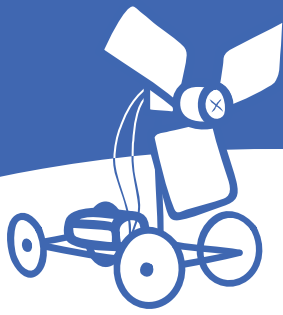
Front View

A Carefully **slide** the **skewers (toothpicks)** into **mini hub's** holes.



B When set, **retighten** the **screw**. **Push** the **hub** onto your **motor**.

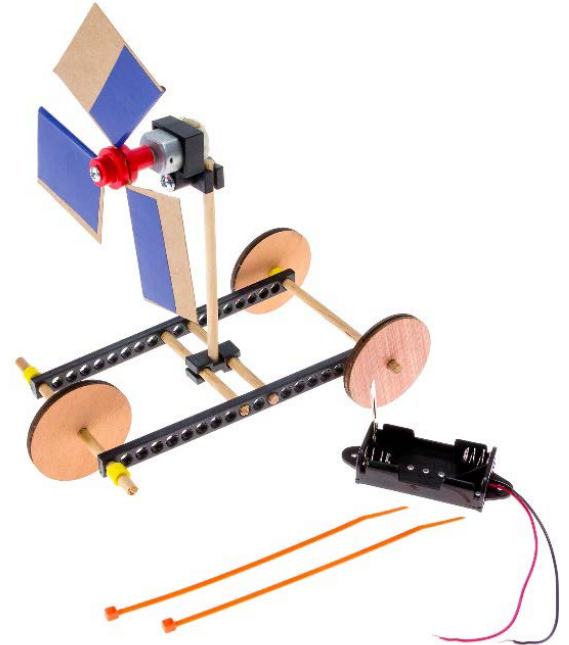
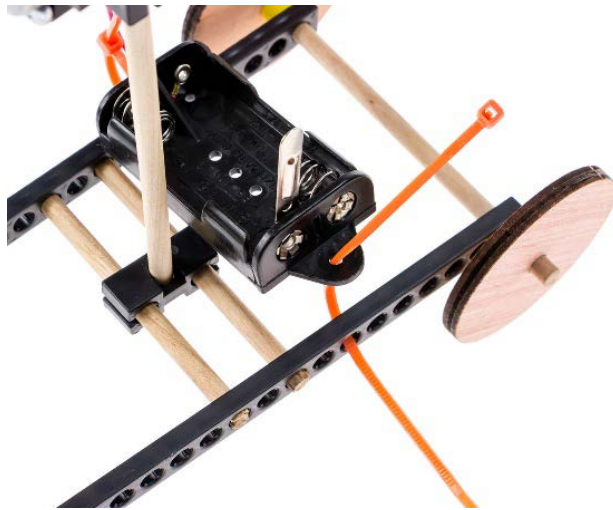




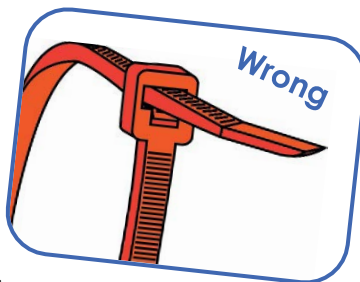
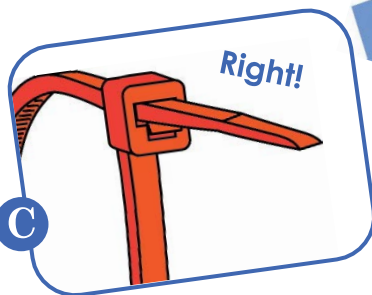
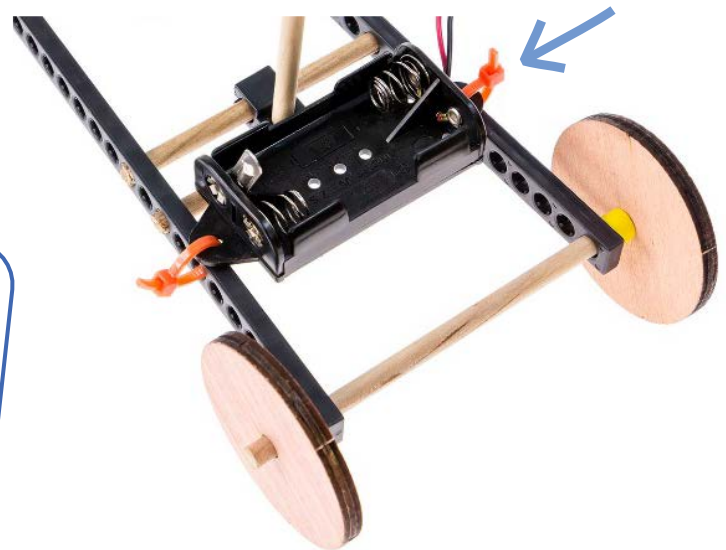
Air Racer Build Guide

Connect the Power

- 23 Put the **zip tie** through the **battery holder** and one of the **holes** on the **frame**.

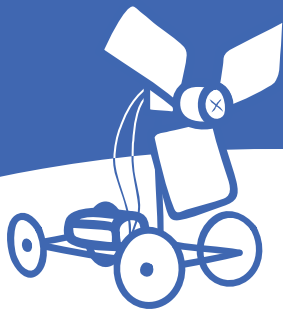


- 24 Tighten and trim zip ties.



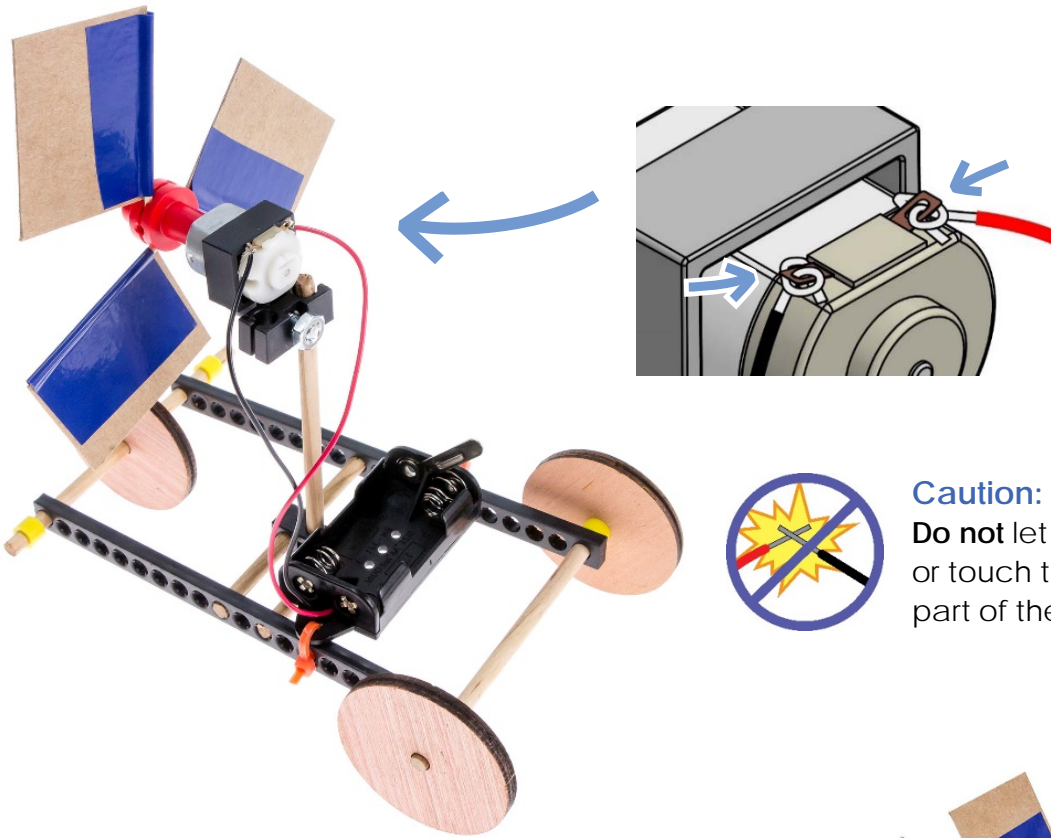
Quick Tip

Zip ties can be tricky.
Make sure you put
them on the right way.



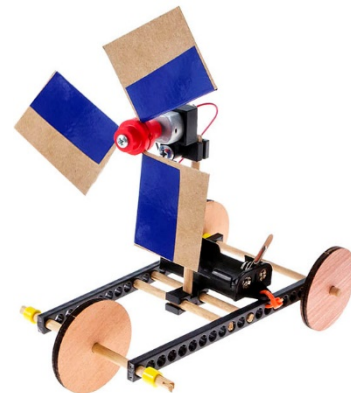
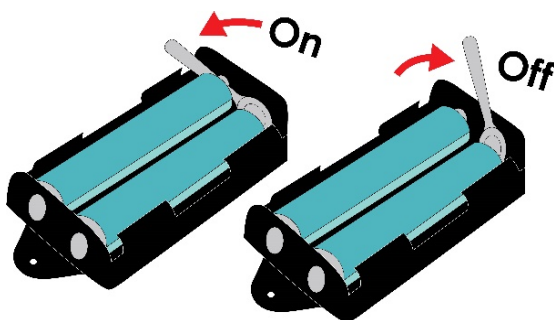
Air Racer Build Guide

- 25** Connect the **motor** to the **battery holder**. Put the **battery holder wires** through and **wrap** them around the **motor** terminals.



Caution: No Short Circuiting
Do not let the wires cross or touch the silver metal part of the motor.

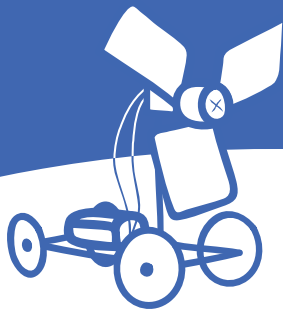
- 26** Insert two AA batteries in the **battery holder**. Use the **metal lever** to turn your Air Racer **on** and **off**.



Good News

Your example Air Racer is finished. Bad news, the example isn't the best design, you can make it better.

Find out how on the next page.



Air Racer Build Guide

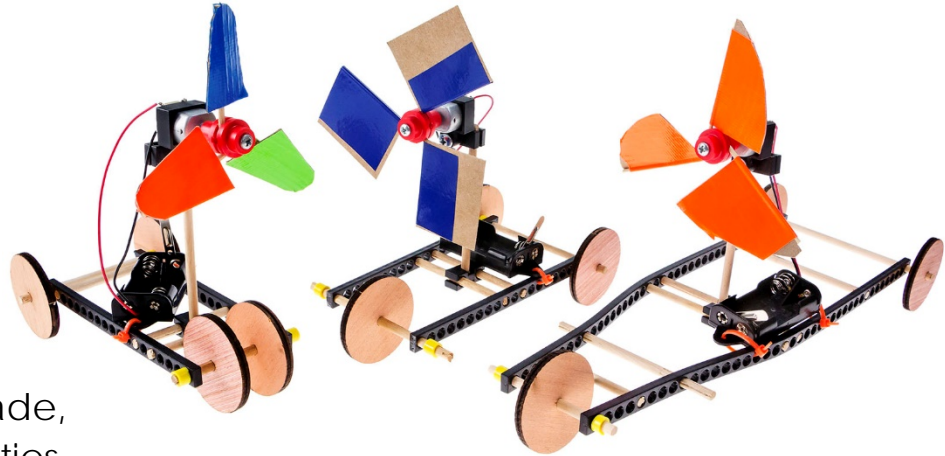
Make it Go

Make your Air Racer **go**.

Does it already move?

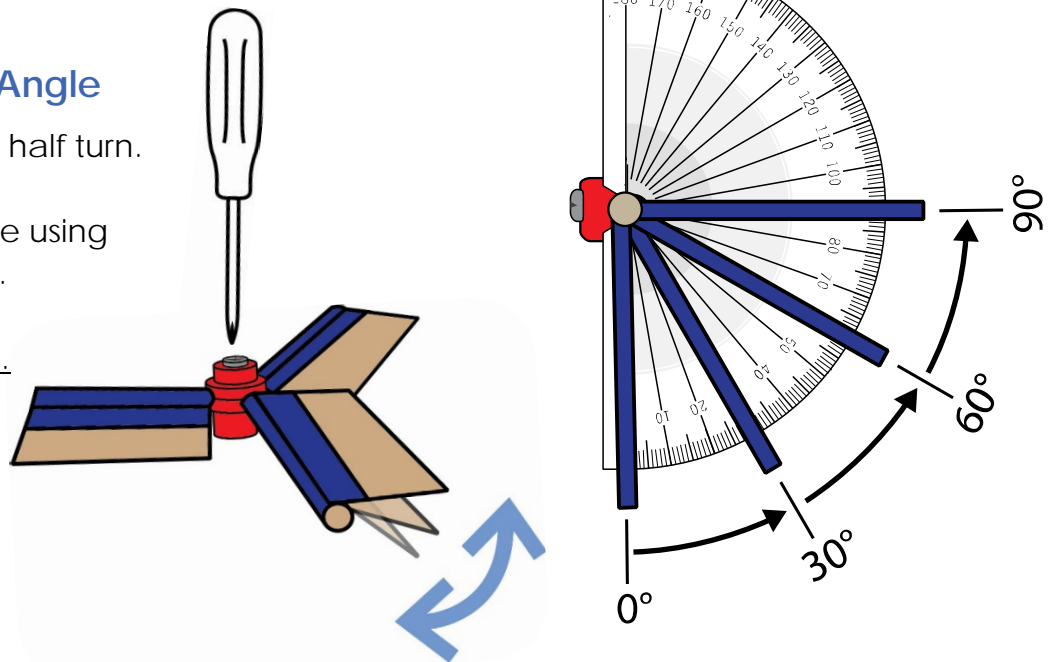
Make it go faster, go farther.

Make it better. Change the blade, change the frame, the possibilities are endless!



Try Changing Blade Angle

- A** Loosen the hub screw a half turn.
- B** Change the blade angle using the protractor as shown.
- C** Tighten the screw again.



Try Changing Blade Shape & Size

Blade designs come in all shapes and sizes. Try adding to your blades by taping on extra pieces or cutting them down into new shapes.

Or try using only two blades.

