# Go Guide

## Basic Sail Car

**Follow this guide to build your sail car body & masts, which you can use to complete labs and engineering challenges!**

Sail car bodies should be built with adult assistance and supervision. Once built, the cars can be reused while kids design and test new sails!

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PRODUCT OF EXCELLENCE

**You Are Here**

Choose how you would like to complete this activity.
Download documents & videos at **teachergeek.com/sailcar**

**Go Guide**

Start here! Build your example racer, learn sailing basics, and begin the tailwind challenge!

**Optional Labs**

- -Push Pull (Ages 3-6)
- -Wind (Ages 3-8)
- -Balanced Forces (Ages 8-11)
- -Forces & Motion (Ages 12+)
- -Inertia (Ages 12+)

**Optional Challenges**

- -Crosswind Challenge*
- -Headwind Challenge*

*See Page 5

Check out our **build video** and **immersive challenge videos** by scanning the QR Code or going to **teachergeek.com/sailcar**

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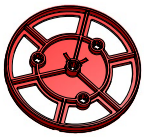
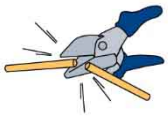
## Supplies

**These are the parts you need to build one sail car.**

### SAIL CAR PARTS

| NAME | QTY | PICTURE |
|---|---|---|
| **Wheels** SKU 1821-30 | 4 |  |
| **Hole Plates** SKU 1821-32 | 2 |  |
| **Slide Stop** 8 cm (3 in) SKU 1821-49 | 1 |  |
| **Screws** 25 mm (1 in) SKU 1821-22 | 4 |  |
| **Dowels** various sizes SKU 1821-20 | 5 |  Dowel Sizes<br>2x 30 cm (12")<br>3x 10 cm (4") |

Have a Maker Cart?
Use Multi-Cutters to cut your own dowels.



**Do you have more parts than pictured?**
You may have the Advanced Sail Car kit.
Download the Advanced Go Guide at
teachergeek.com/sailcar

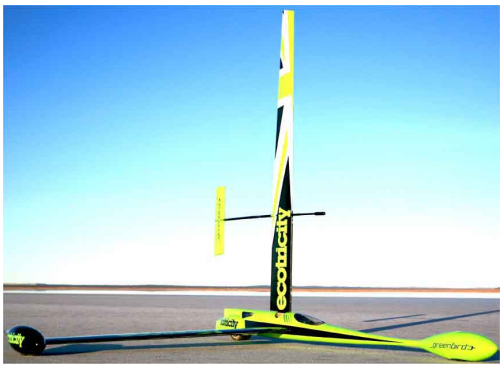
### MATERIALS YOU SUPPLY

- **Screw Driver**
- **Scissors**
- **Fan**
- **Tape**
- **Paper** (sail material)
- **Recycling Bin Materials** (what else can you use as a sail)

### OPTIONAL TOOLS

Modify materials to make even more creative designs with the **TeacherGeek / Maker Tool Set**
SKU 1823-84

## Can You Beat the Record?




In 2009, Richard Jenkins set the world record of 126.2 mph (202.9 km/h) for a wind-powered land vehicle. His sail car went over twice as fast as the speed of the wind, which was fluctuating between 30 and 50 mph (50 – 80 km/h).

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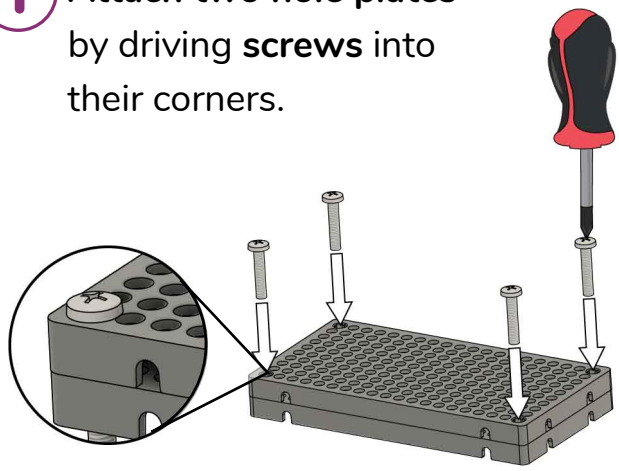
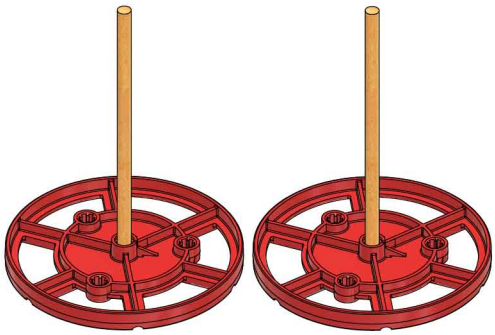
## Build the Body

Check out our **build video** scanning the QR Code or going to **teachergeek.com/sailcar**

**1** **Attach two hole plates** by driving **screws** into their corners.

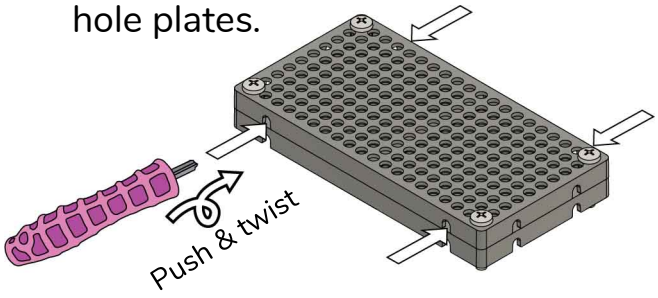


**2** **Wiggle** or tap the 10 cm (4 in) **dowels into wheels.**

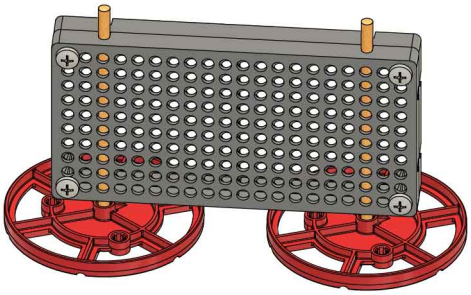


**3** SKIP IF YOU'RE USING A SINGLE KIT (this step has been done for you).

**Ream the holes** between the hole plates.

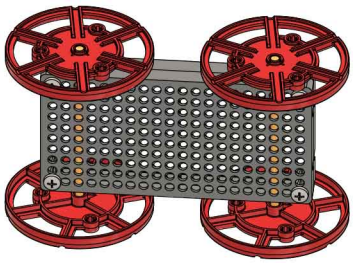


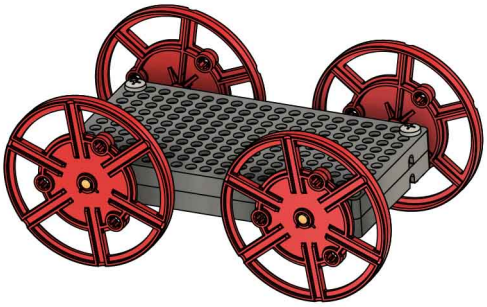

**4** **Slide** the **wheels** with dowels **into the holes** between the hole plates.



The wheels should spin freely. If they don't, repeat Step 3.

**5** **Add wheels** to the other side to finish your body.





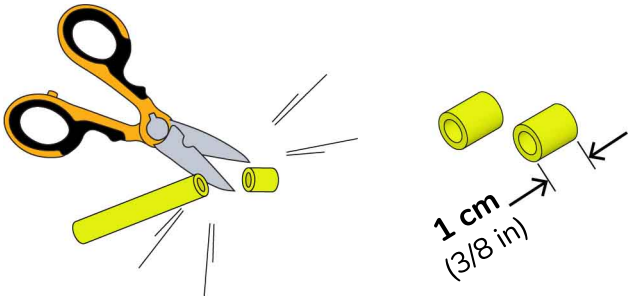

**Want to learn more about forces using your Sail Car?**

Download the **Push/Pull Lab** at **teachergeek.com/sailcar**

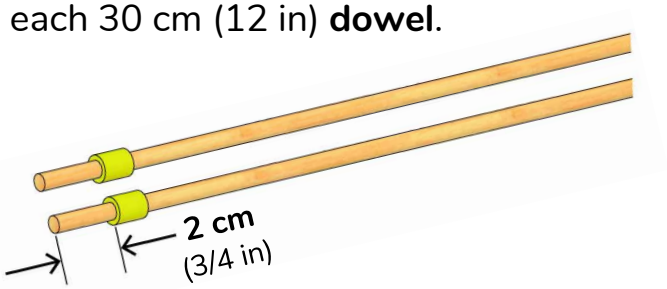
**Ages 3+**

## Add the Masts

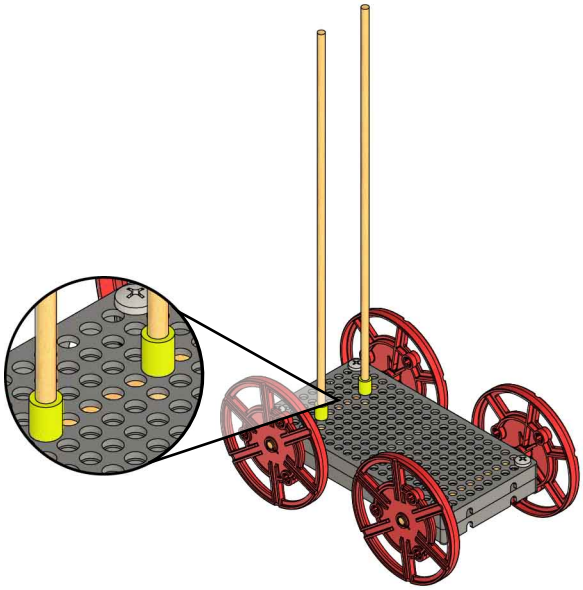
**6** **Cut** two 1 cm (3/8 in) sections of **slide stop**.

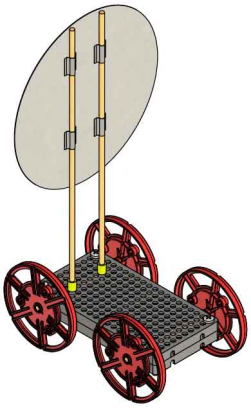



**7** Slide each **slide stop** section approximately 2 cm (3/4 in) **onto** each 30 cm (12 in) **dowel**.




**8** Place the **masts into** the Sail Car **body**. The masts will be used to attach the sails.





To finish the sail car, tape a sail to the masts.

Use paper, card stock, recycling bin materials... there are endless sail options. Test them all!

**9** **It's time for labs and/or challenges!** Complete one of the optional labs below or continue on to set up for the engineering challenge!

### Optional Labs:

**Push/Pull Lab**
(Ages 3-6)
Versions: Pre-K | K-1

**Wind Lab**
(Ages 3-8)
Versions: Pre-K | K-1 | Gr 2-3

**Forces & Motion Lab**
(Ages 12+)

**Balanced Forces Lab**
(Ages 8-11)

**Inertia Lab**
(Ages 12+)

Download these labs at
**teachergeek.com/sailcar**

## Tailwind Challenge

Check out **Tailwind Challenge Scenario Video** by scanning the QR Code or going to **teachergeek.com/sailcar**

### How far can you make your sail car go?

Follow the instructions below to set up your track. Then design and refine sails your sail car, seeing which sail can go the farthest!

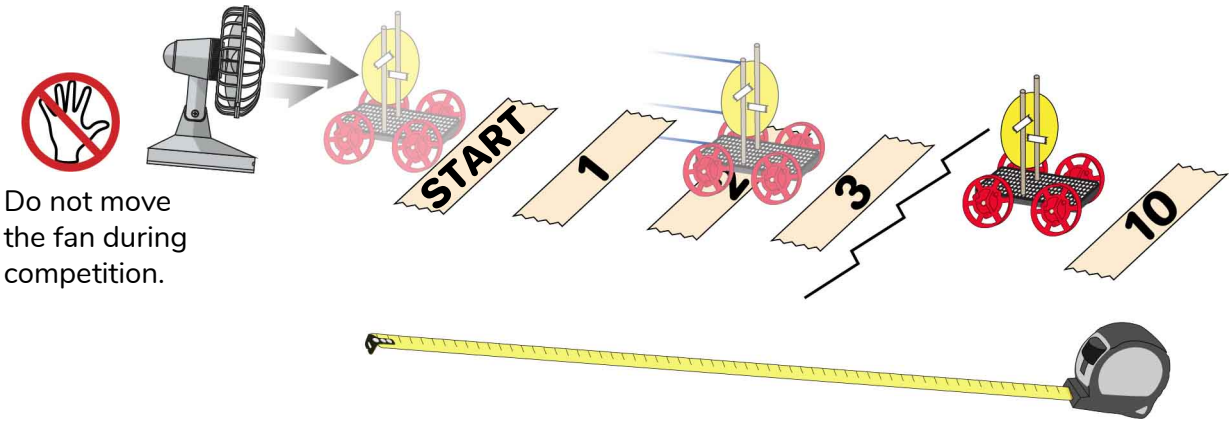
**Keep track of your designs in an Engineering Notebook.**

Download it at **teachergeek.com/sailcar**

### Track Setup

Sail cars can go 10 m (30 ft) on uncarpeted floors (less on carpeting). Long, uncarpeted areas are preferred for tracks, but you can sail your car almost anywhere! Set down your fan, then set up your measuring system.

**Option 1:** Place numbered pieces of tape every meter (3 ft). Use these to measure how far the sail car travelled.




Do not move the fan during competition.

**Option 2:** Use a measuring tape, meter stick, etc. to measure the distance sail cars travel.

Optionally increase the challenge by carrying weights or passengers.

## Crosswind Challenge

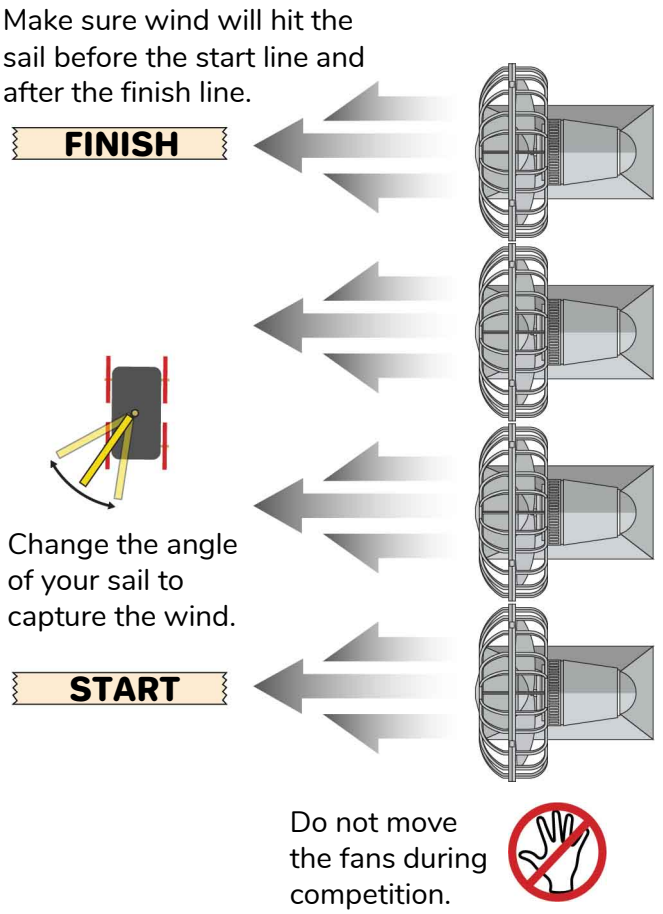
### Sail across the wind!

Place fans along each side of your track, so that they blow across it.

Your sail car must travel down the track in the shortest time.

The fans must be the only power source for your car.

Check out the **Crosswind Challenge Scenario Video** by scanning the QR Code or going to **teachergeek.com/sailcar**




## Headwind Challenge

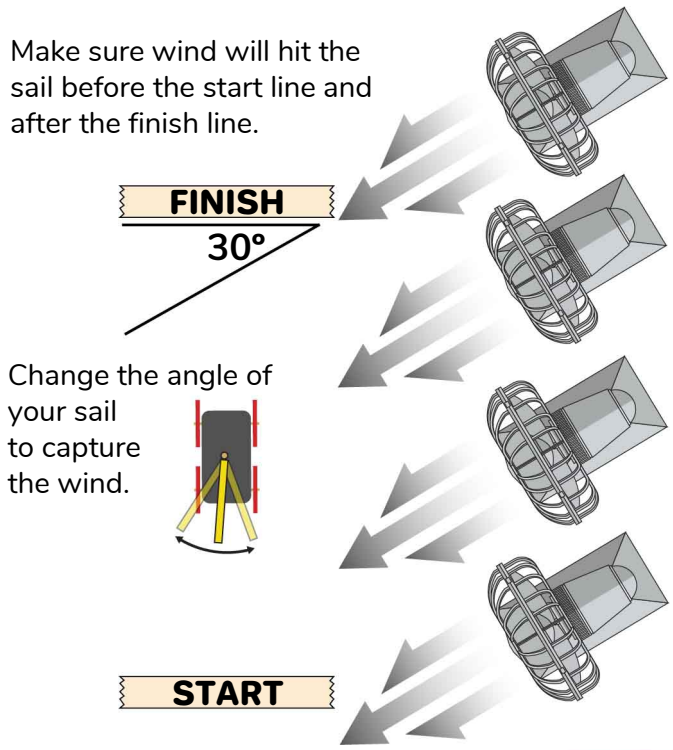
### Sail "into" the wind!

Place fans along each side of your track, so that they blow at a 30° angle to the finish line.

Your sail car must travel down the track in the shortest time.

The fans must be the only power source for your car.

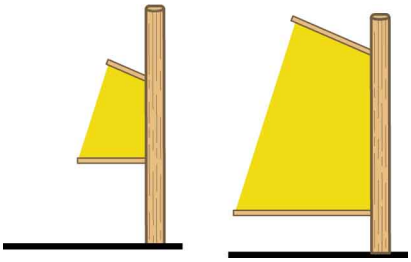
Check out the **Headwind Challenge Scenario Video** by scanning the QR Code or going to **teachergeek.com/sailcar**



## Change the Design

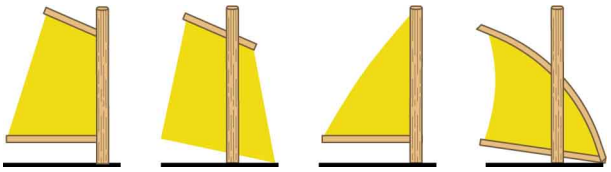
### Sail Size

Will a bigger or smaller sail make your car go farther?



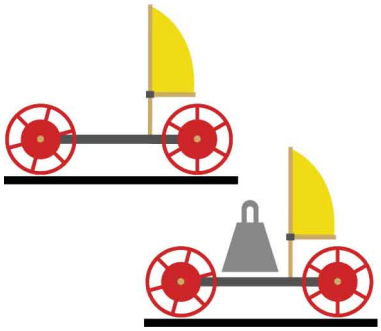
### Sail Shape & Location

Try different sail shapes to see which works best, then try moving it to a new spot on the car's body.



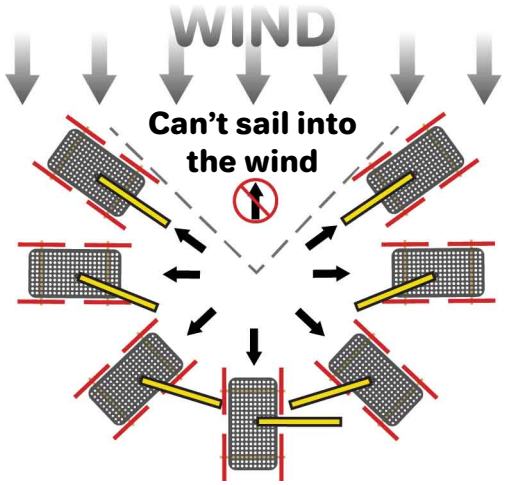
### Mass

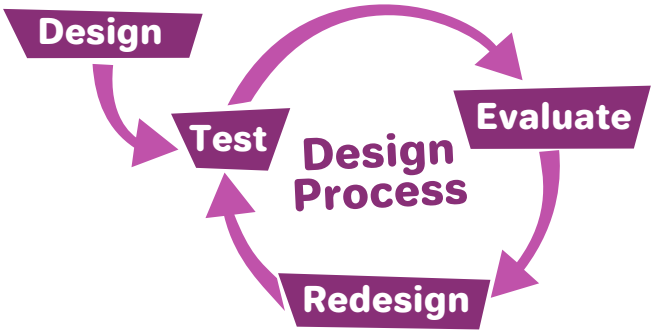
Does a heavy or light car go the farthest?



### Sail Angle

If the wind isn't coming from behind your car, change the angle of the sail!

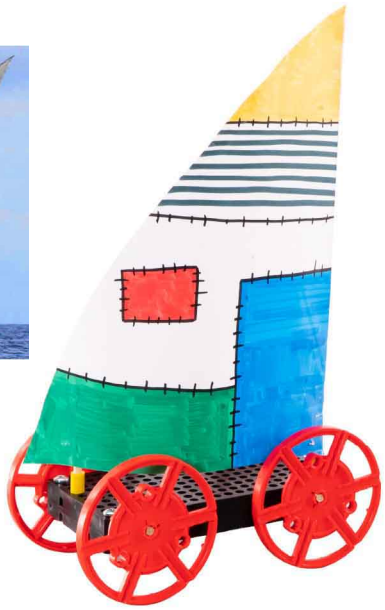



**The Design Process never ends! There is no perfect design.**

## Historical Vessels

**Dhows** have been used for thousands of years as trading vessels along the coasts of Arabia, East Africa, and India, where they are believed to have originated.



**Outrigger Canoes** are fast and maneuverable. Developed in the islands of South East Asia, Pacific Islanders used them to settle the islands of Oceana as far as Hawaii.

**Brigs** were popular among Europeans in the 18th & 19th centuries due to their speed and maneuverability. They were often used by pirates, merchants, and navies.

### Sail into the Future

**The Zephyr Venus Landsailer** was designed by NASA to explore Venus. Its main source of propulsion is its sail, which is covered in solar panels to power the steering systems and scientific equipment. The vessel folds into a protective shell for landing.