



Project #14

Solar Race Car Model

Make a solar powered model car and have races! Learn about gear ratios, reducing friction, and how to make model cars that are lightweight and strong. This sample car uses a kit of wheels, motor and gears. The car body is made of wood, but all kinds of materials can be used including: foamboard, cardboard, plastic containers, parts from broken VCRs, etc. Cars have even been made from CDs and plastic soda bottles. Use your imagination! These are just guidelines.

NOTE: This project uses knives and hot glue, and should be done with the help of an adult!

Equipment Suppliers:

Solar World: www.solar-world.com (719) 635-5125 has:

- Axle gears, wheels, axles (Jr. Solar Sprint Accessory Bag JSS-ACC)
- DC mounting brackets and motor gears (Jr. Solar Sprint JSS-B/G)
- 3 watt modules (3 volt x 1 amp) Shell Solar Modules
- DC motors (solar world JSS-M)

Pitsco: www.shop-pitsco.com has:

- lightweight modules ("Ray Catcher")
- various gears and wheels

From local craft and hobby stores:

- small screweyes (for axles and car guides)
- velcro or rubber bands for attaching solar module to car
- 3/16" by 3/16" by 24" lengths of basswood (about 4 - 5 per car body)
- 1/8" by 4" by 24" lengths of basswood for motor base (about 3" x 4" per car, use 1 sheet for 7 cars)
- jumper wires with alligator clip ends to connect the motor to the module
- Fishing line for track guideline (30 to 60 lb. test)

Tools:

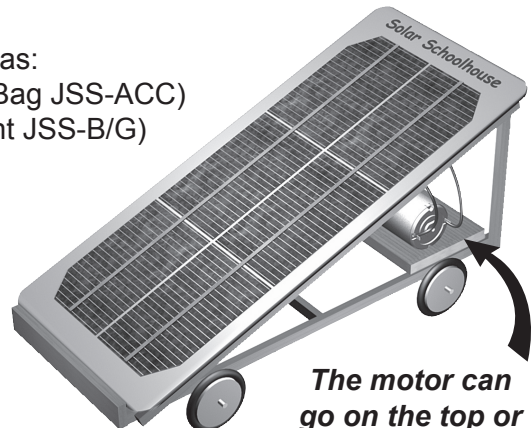
- Side cutters to cut basswood sticks
- Hot glue gun and glue sticks
- Tiny phillips screwdriver
- Wire cutter and stripper
- Small pliers
- Drill and 1/16" drill bits
- Small hobby saws and utility knives

Gearing

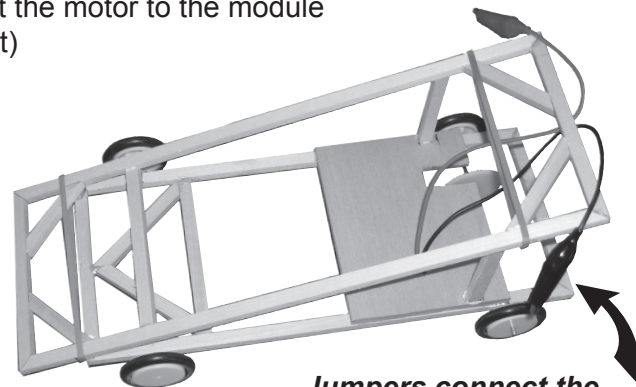
1. Decide which gears to use. The biggest gear goes on the axle. One of the smaller gears goes on the motor.

The more teeth the *motor gear* has, the faster the car will go, and the longer it will take to reach that speed. If you use the smallest gear on the motor, the car will accelerate quickly, but not reach as high a speed.

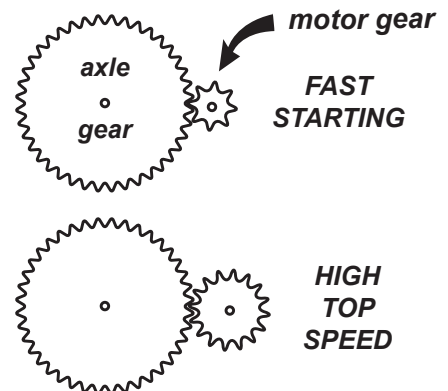
2. Slide the big gear onto the axle, holding the axle with pliers. Be careful not to bend the axle. If the gear is too tight to slide, drill the hole bigger with the 1/16" bit. If you drill the hole too big, and the gear slips on the axle, use hot glue in the hole.



The motor can go on the top or bottom of the frame.



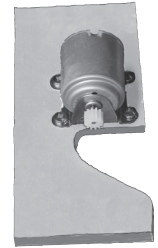
Jumpers connect the motor to the solar module.





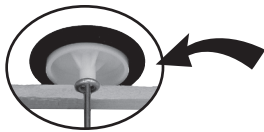
Mounting the Motor

1. Measure the width of the solar module. Cut a piece of the 4" basswood to be as long as the module is wide. Cut a notch to make room for the axle gear.
2. Put the motor bracket on the basswood, and mark the points where screws will go with a pencil. Drill 1/16" starter holes through the pencil marks.
3. Put the motor into the bracket, and slide the gear onto the motor shaft. Lock the motor with the set-screw, and screw the bracket to the basswood.



Making the Frame

1. Use the 3/16" sticks to make a box as wide as the solar module, and a little bit longer. Hot glue the joints, making sure the box is square.
2. Put the motor mount on the frame to mark its position. Remove the mount.
3. The axles will be held on with screw eyes. Mark points for the screw eye holes on the front and back of the frame. Keep the axles square with the frame so the car will drive straight (or be sure the axles are parallel to each other).
4. Drill 1/16" starter holes at the pencil marks, and screw in the screw eyes.
5. Put a wheel on an axle, slip the axle through a screw eye, and slide on the big gear. Slip the axle through the other screw eye. Slide the wheels close to the screw eyes, or the gears may slip out of position.

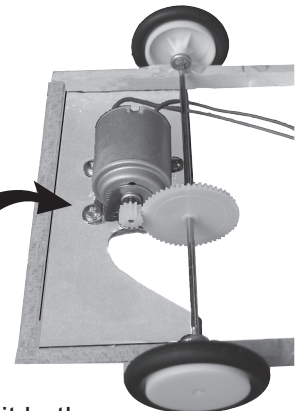


Keep the wheels close to the screw eyes or the gears may slip out of place. Leave enough room for the wheels to spin freely.

Attaching the Motor Mount

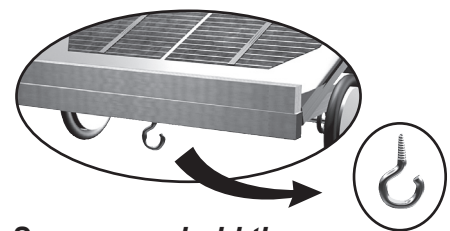
1. Put the motor mount on the frame, and make sure the gears line up snugly. Screw the mount to the frame.

Be sure the gears fit firmly.



Mounting the Solar Module

1. Use the 3/16" sticks to build a framework for the solar module. Try to make it both light and strong. It can be tilted to a certain sun angle, or kept low to cut wind resistance. Remember to put a bumper in front to hold and protect the module.
2. Screw a screw eye into the bottom of the frame at each end. These will hold the car to a fishing line guide on the racetrack. Before attaching the screw eyes, open them a little with pliers so you'll be able to slip the fishing line through.
3. Attach the module with big rubber bands, or glue velcro to the module and the frame.
4. Clip jumper wires from the motor terminals to the module leads. The clips can act as a switch.



Screw eyes hold the car to fishing line on the track.

Racing

1. For a track use a flat smooth surface, like a tennis court. Have two people for each car: one to release the car, and one to catch it.
2. Tie thick fishing line to heavy weights at each end of the track (cinder blocks work well). The line should be 1" to 3" above the ground. Slip the fishing line into the car's screw eyes.
3. To start the race: racers lift the cardboard shading the solar panel on each car.