

An Introduction to Building a Model Solar Car

Student Guide for the Junior Solar Sprint Competition

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Introduction

Welcome to Junior Solar Sprint! By competing in Junior Solar Sprint, you will learn how to make your own modal solar car that will run entirely from the power of the sun.

Design

You will experience first-hand the process of design. When you design your car, you will start with some ideas in your head and turn them into real-life models that work. Design is different than normal problem-solving, because:

- You don't know what the problems are (you discover and solve problems as you go along – everyone's challenges will be different)
- There is never one right answer

Designers have to deal with tradeoffs. For example, when a car designer uses a larger engine for greater performance, this usually sacrifices fuel efficiency. In a sports car, fuel efficiency is more important. So its up to the designer to decide which are the most important goals.

Even though there is no one right answer, some answers may be better than others for a particular application. Obviously, in Junior Solar Sprint, the faster cars will win.

How to Get Started

You will receive short handouts on a variety of subjects from how to build the wheels to how the solar cells works. These handouts will cover the following topics:

- **Chassis:** how to build the frame of the car
- **Wheels and bearings:** how to make the wheels that turn
- **Power source:** how the solar panel and motor work
- **Transmission:** how to transfer power from the motor to the wheels
- **Body shell:** how the shell effects car performance

In general, when you design, it is good to keep the different parts in mind, but don't worry about the details of each component until you are ready for them.

Each handout will be composed of four parts:

- Purpose
- Ideas
- Concept
- Suggested materials

The concept section will raise issues that will help you decide how to make the right decisions and build the winning car.

Experiment as much as possible early on and don't worry about making mistakes. It is always the case with design that you don't know what the problems are until you encounter them. So get your hands dirty and get started! Good luck and have fun.

SAFE USE OF HAND TOOLS

Hand tools are easy and safe to use when they are used properly. Please inform yourself about safe use of hand tools by reading ahead, and by consulting your teacher or mentor. Below, we describe some commonly used hand tools and some dangerous situations that can result if they are not used properly.

Safety glasses, the most important safety aid, are inexpensive, and available at any hardware store, or from your shop teacher.

Hot glue gun

Very useful for quickly fastening different materials together with a reasonably strong bond, hot glue guns can cause **minor burns** if the gun nozzle or hot glue touches skin.

Soldering Iron

Useful for making electrical connections. Soldering irons can cause **minor burns** if the soldering tip, or hot solder, touches skin.

Wear safety glasses to protect against hot solder.

Electric hand drill

Hand drills are useful for placing holes in materials, and might be used in the fabrication of wheels, for example:

Wear safety glasses. If too much force is applied, drill bits can break, launching fragments into the air. Material removed by the drill bit can also become airborne. Students using hand drills should work a safe distance from students that are not wearing safety glasses.

Clamp work securely. A spinning drill bit can grab the work piece and yank it around if it is not properly clamped in place, resulting in hand injuries, especially if the work piece has sharp edges. A small vice or clamp is useful for this purpose.

Note what is underneath the piece being drilled. Be sure that drilling is done into a secure block of scrap wood or into a clear space.

Hacksaw

Hacksaws are useful for cutting a variety of materials.

Wear safety glasses. Removed material could become airborne.

Keep hands away from the cutting zone. The blade can jump and cause minor hand injuries.

Clamp work securely. This removes any inclination to hold the work piece near the cutting zone, and allows better control of the tool.

Wire Clippers

These tools are useful for cutting wire and thin shafts. If both sides of the piece are not securely held, they may shoot out.

Wear safety glasses, and:

Orient the tool so that the section being clipped is aimed at the floor or help in some other way.

Utility or “Exacto” Knives

Useful for cutting cardboard, foam core, etc.

Wear safety glasses. It is conceivable that a blade could break and fly upwards.

Cut away from yourself. (i.e. don't draw the blade towards your hand or any other part of your body)

Store tools safely. Avoid leaving exposed blades on table surfaces. Use a handle with a retractable blade if possible.