

CO₂ DRAGSTER DESIGN AND CONSTRUCTION – Notes for Students

EXAMPLES OF DRAGSTER SHAPES AND STYLES



1.

Shell Cars – the wheels hidden inside the body...



2. Rail Cars – the wheels outside the body...



3. Shell Reveal – the wheels inside body extension(s)



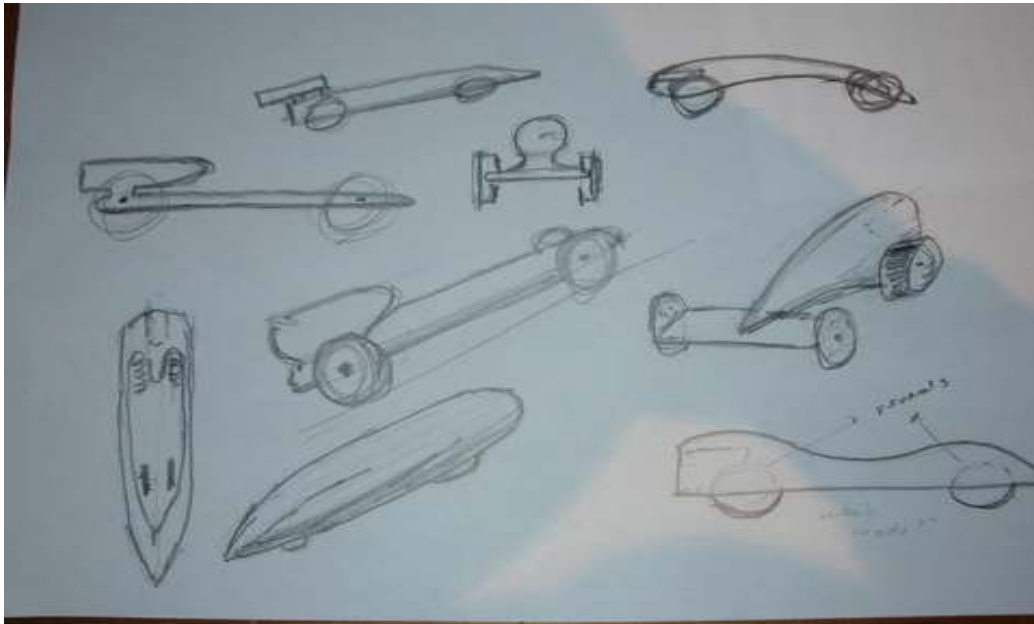
4. Hybrids – mixing Rail and Shell



THUMBNAIL SKETCHING

Now is the time to get some of those race-car design ideas — undoubtedly floating around in your head — on paper. The best way to start is with concept sketches, also known as thumbnail sketches. Thumbnails are small, quick sketches used by engineers and designers to rapidly communicate ideas. They should not be detailed or even carefully done.

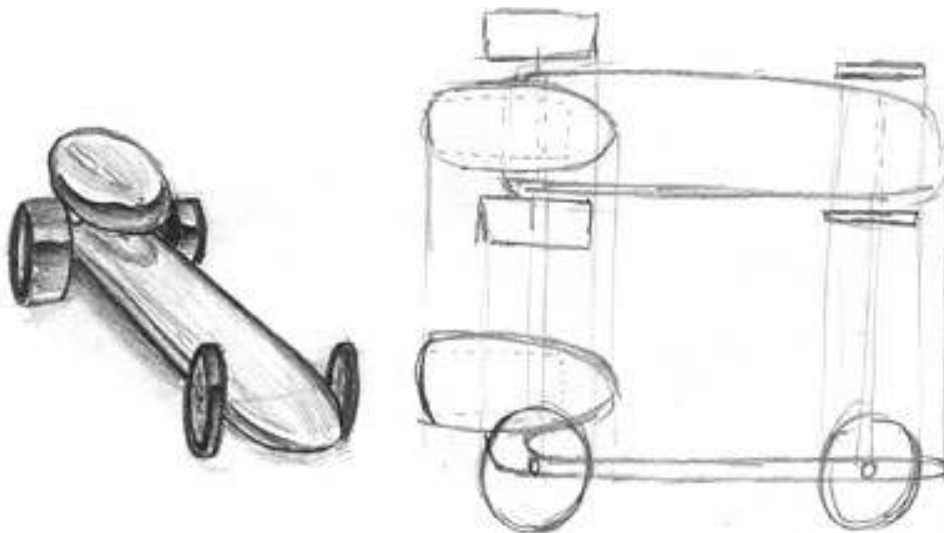
Be sure to experiment with different ideas and be as creative as possible.



DESIGN SKETCHING

On a clean sheet of paper, sketch your favourite design from the thumbnail sketches on a larger scale with more detail. Draw the top and side views.

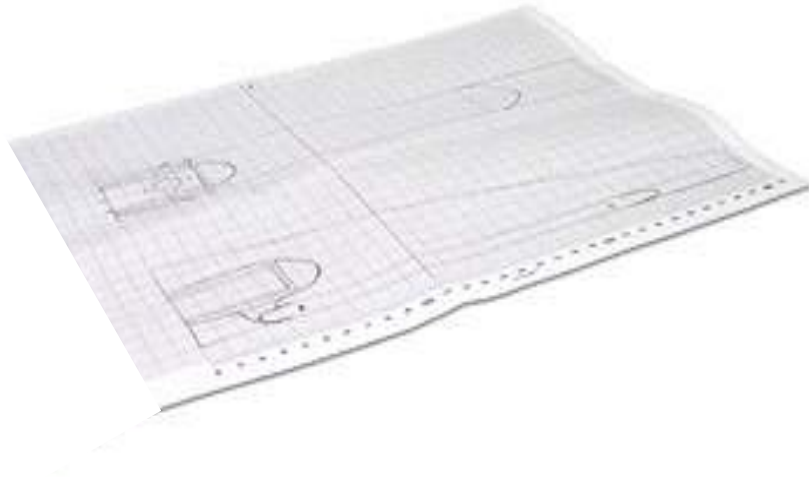
Make light projection lines from one view to the other to help you locate axle holes and other features of your design. Show the location of hidden details (such as the cartridge hole) by using dashed lines.



Check the specifications. Look at your design sketch to see how each spec applies to your design. You may find it necessary to take notes or even change your design.

WORKING DRAWINGS

The working drawing is a precise, 1:1 scale drawing that describes your car and its features. Working drawings should have top and side, or profile, views. An accurate working drawing is important for two reasons: 1) A copy of the working drawing serves as a template for rough-cutting your car blank. 2) You may be required to submit your working drawing. It could be part of your grade or even be scored for competition points (ask your teacher about this).



Be sure to refer to the specifications sheet as you go.

TRANSFERRING DESIGN TO BODY BLANK

Cut out the top and side (profile) views from a copy of your working drawing. Then, carefully trace the outline of the views onto the wood blank.



TIP

Use adhesive spray to attach your paper templates drawings to the top and a side of the blank. Drill and cut the blank using the templates as guides.

DRILLING AXLE HOLES

1. Transfer the axle hole locations onto the blank by using a sharp pointed tool such as an awl to puncture through the template and into the wood blank.

2. Lay the car blank on its side and drill 3mm axle pilot holes. The holes should be drilled perpendicular to the car's longitudinal axis in order for the car to roll freely and straight down the track. A drill press is highly recommended because it makes drilling perpendicular holes a cinch.
3. These pilot holes can be enlarged to the size you need later.

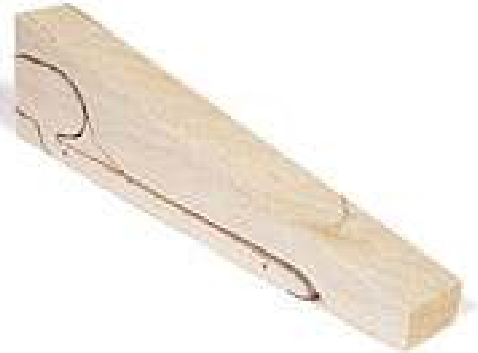


ROUGH SHAPING THE CAR BODY



TIP
Drill First: Axle holes in the body blank should be drilled **before** doing any shape cutting. Otherwise, it's difficult to drill straight.

1. Use a band saw to roughly shape the blank:
 - a. Turn the blank on its side and cut out the profile view first.
 - b. Fit the waste pieces and working piece back together and secure them by wrapping two bands of masking tape around the assembly.
 - c. Set the blank assembly upright and cut out the top view.
 - d. Remove the masking tape and discard all the waste pieces.



TIP
Waste Pieces: After cutting the profile view, fit the waste pieces and body back together and secure with masking tape. This simplifies the cutting of the top view.



2. Smooth the corners of your car body. Use a bench-mounted sander, sharp knife, wood rasp, files, or rough sandpaper (80 grit) to smooth the car to its basic rounded shape.



TIP
Haste Makes Waste: Take care when using power tools to shape your car body. With soft balsa wood, it's very easy to remove more material than you intended.



3. Periodically check your car against the spec sheet (especially weight) to make sure the car is still within tolerances. When weighing your car, put the wheels, axles, washers, screw eyes, and any other necessary hardware on the scale along with the body. Allow for the weight of paint coats too.

If your design calls for a hollowed-out body, a high-speed rotary multi-tool works nicely. A variety of milling and sanding bits are helpful for making cavities in the car body. When using power tools to shape the car body, go slowly and cautiously. It's very easy to remove too much wood and ruin your car!

FINE SHAPING THE CAR BODY

At this point, your car has assumed its basic shape. Now you're at the stage that separates the really fine cars from the mediocre cars. Extra time and effort spent during the fine shaping, or pre-painting, stage have a huge payoff in the kerbside appeal of the final product.

Use sandpaper to remove unwanted bumps and irregularities from the body. Use progressively finer grit paper as you go. For example, you might start with 80-grit paper (very course, removes a lot of material) and progress to 220-grit (fine paper for smoothing surfaces).



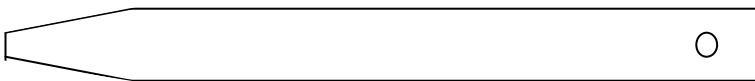
Check your car for symmetry, and sand the body as needed. Also, exposing your car to bright light can help reveal imperfections that need attention.

PAINTING YOUR CAR BODY

As in the fine shaping stage, extra patience and effort put into the finishing stage can pay big dividends.

Be aware that using several coats of paint can add weight to your car.

1. Make up a handle and hanger. Cut a 500mm length of flat cut (5mm X 18mm approx) timber. Slightly sand off the edges at one end and drill a hole in the other.



TIP
Fill 'er: To achieve a super smooth finish on porous balsa wood use a wood filler and sanding primer to fill problematic end-grain areas.

2. Insert the handle into the power plant housing of the car body so that the timber jams slightly against the sides of the power plant hole. Enough to hold it on the handle when it is hanging down. This makes a very convenient handle for turning the body to paint it from all angles and you can hang it from a nail over a drip container while the paint dries.
3. Apply undercoat and sand between coats. You can dip the car body into a deep tall vessel, such as an old vase, filled with the paint and let it hang to dry
4. Use a spray can or airbrush to apply paint to the body. Spray light coats and wait several minutes between coats to allow the paint to dry.

TIP
Painting Caution: Take care when painting inside the power plant housing. Excess paint can prevent the cartridge from fitting properly.

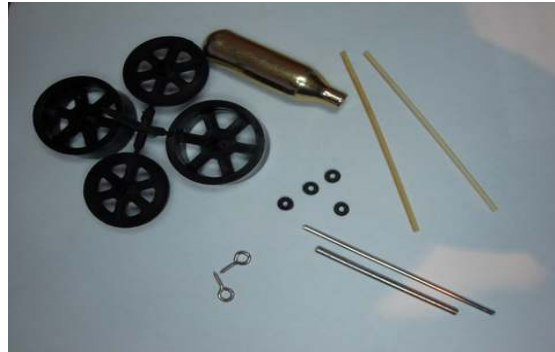


TIP
Paint Adds Weight: Applying several coats of paint can add some weight to your car. Remember to plan for this.

Final Assembly: Mounting Wheels and Hardware

Don't overlook the importance of this stage. A huge factor in race performance is how smoothly the car rolls down the track. Some meticulously shaped cars have failed to finish races because of improperly installed hardware!

1. Gather your hardware: two axles, two straw bearings, four wheels, four washers, and two screw eyes. Depending on the configuration of the car body, different hardware might be required. Shell cars (with internal wheels) often require wheel spacers and clips to affix the axles to the car body.



2. Check your spec sheet for rules about wheels, axles, washers, and spacers.
3. Check that the wheels have no plastic joining tabs on the rims. If they do, trim them off with a craft knife.
4. Carefully mount the wheels and axles as dictated by your design. Be careful not to damage the fragile car body during installation.

TIP

Custom Graphics: You can add decals and pinstripes using vinyl sign writing off-cuts. Visit your local signage company...



5. Roll test the car on a smooth, horizontal surface. The car should roll freely, and the wheels should spin without restriction. Make adjustments if necessary.

Install the screw eyes on the underside of the car body. **Important:** Plan the location of the screw eyes so the guideline does not rub against the car body or wheels.

TIP

Just a Dab: A drop of epoxy glue can help solidify screw eyelet mountings in soft balsa.



TIP

Screwy Eyes: Don't use screw eyelets that are partially open. Doing so can cause your car to detach from the guideline and slow or even damage your car.

TIP

Lube 4 Speed: Heard of dry powder graphite? It's a great lubricant for axles.