

CO₂ Dragster Cars

Technology Education



CO₂ Dragsters




CO₂ Dragsters




Overview

- Engineering Principles
- Types of Design
- Student examples



Engineering Principles

- Newton's Laws of Motion
- Mass
- Drag
- Friction



2nd Law of Motion

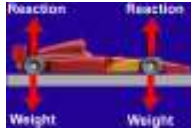
F = ma F = force
 m = mass
 a = acceleration

Acceleration is dependent upon the mass and force of the car.

- For a fast car, you need:
 - Big force
 - Light car

Newton's 3rd Law of Motion

- The driving principle behind these cars
"For every action, there is an equal and opposite reaction."



Mass

- Does it take more or less force to push 40g than it does to push 130g?
- **The Balancing Act:**
 - **Advantages:**
Cars with less mass go much faster.
 - **Disadvantages:**
Cars with less mass are less stable and less durable.

Drag

- *Take a piece of wood, slap wheels on it, shoot it down a track at 80 MPH and the air rushing over the body and wheels will try to slow it down.*
- Scientifically this is called **drag**: the resistance of wind moving over an object.

Drag

- **The Balancing Act:**
 - **Advantages:**
Aerodynamically shaped cars have less drag so they go faster.
 - **Disadvantages:**
Aerodynamically "clean" cars are more difficult to build.

Friction

- Thanks to our friend gravity, everything has friction.
- On a CO2 car, friction occurs primarily in three places:
 - between the wheels and the ground,
 - between the axles and the car body,
 - between the eye-hook and the fish line track.

Friction

- So how do you eliminate friction?
- You can't. You can only reduce friction.
- So how can we do that?




Reducing Friction

- Make sure the axle & tires are free to rotate.
- Make sure the wheels are not rubbing on the car body.
- Be sure to install your eye-hooks properly. Poorly aligned eye-hooks are often the cause of a slow car.


Types of CO₂ Cars

- Rail Cars
- Shell Cars
- Show Cars
- Normal Cars




Rail Cars

- **General Characteristics:**
 - A narrow "rail" that connects the front axle to the back of the car.
 - Typically use external wheels (wheels on the outside of the body).
 - The body of the car is usually lower to the ground in the front and middle and then rises up abruptly to hold the CO₂ cartridge.



Rail Cars


- **Pros:**
 - Easiest to build and design.
 - Thin rails reduce weight of the car, increasing speed.
 - Can be built with normal wood working tools by most normal students.
- **Cons:**
 - The thinner the rail, the greater chance of structural failure (breaking).
 - Exterior wheels are bad for aerodynamics.
 - Body shape tends to encourage drag and hamper good aerodynamics.



Shell Cars

General Characteristics:

- Internal wheels.
- Clean aerodynamic "bullet" shape.
- Hollow underside forming a thin "shell" body.



Shell Cars


- **Pros:**
 - Very low drag aerodynamic shape.
 - Usually capable of high speeds by design.
- **Cons:**
 - Requires special wheels, axles and attachment clips
 - More difficult to build
 - Shell cars tend to all look similar reducing individual creative expression.
 - Often requires special tools such as a CNC lathe and CAD program.



Show Cars

General Characteristics:


- Stunning design.
- High degree of creativity in the design.
- Usually very intricate and delicate in their construction.
- Very showy paint jobs with glass like finishes.




Normal Cars

General Characteristics:

- Normal cars are built to race.
- Normal cars may use characteristics of other car styles.
- Although the wheels are usually external, Normal Cars sometimes have internal front wheels.




Normal Cars

Pros:


- Totally reflects the skills, abilities and creativity of the designer/builder.
- Always gets to race, and often does well at the school level.
- Can be built by the average student with average ability and normal tools.
- Doesn't require any special parts or materials.

Cons:


- May or may not be competitive on a national level.



Student Examples



Aaron Williams and Lane Forney



Wesley Ferrell



Design Requirements

Body Length:
10-12"

Top View

<p>Body</p> <p>Length: 12" max, 8" min</p> <p>Height: 3" max, 2-1/4" min</p> <p>Width at axles: 1-5/8" max, 1-3/8" min</p> <p>Width all other: 1/2" minimum</p>	<p>Safety:</p> <p>Thickness at CO2 insert: 1/8" minimum</p> <p>Screw eye separation 10-1/2" max, 6" min</p> <p>Mass: 45g min to 170 max</p>
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