Racecar 101

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Outline

Note

This first part is a very simplified breakdown

- It's not the most accurate
- It's not to insult anyone's intelligence

It's simply to not distract from the things that can be easily forgotten or muddied.

What makes a car go fast?

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To make a car **faster**, you must make the car **accelerate more**

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What famous equation involves acceleration?

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Newton's 2nd law!

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We care about acceleration, so rearange:

$$a = \frac{F}{m}$$

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- Make things lighter

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- Increase power output
- Increase braking torque

The latter two hold **only if the tires can transfer the torque**

Balancing ↑Force vs ↓Mass

Sometimes $\uparrow$ mass $+$ $\uparrow$ force $=$ $\uparrow$ acceleration

Balancing ↑Force vs ↓Mass

Sometimes ↑ mass + ↑ force = ↑ acceleration

Bigger Engine

Increases the total vehicle mass, but increases power output
Depending on the ratio, can lead to better acceleration.

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Smaller/Narrower Tires

Decreases total vehicle mass, but decreases total acceleration potential
Also reduces unsprung mass (improves vehcile handling and response)

Longitudinal Acceleration

Simplest acceleration to model:

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2. Power (positive)
   - Almost always limited by the power unit (ICE, electric motor, rubber band windup, etc.)

Lateral Acceleration

Turning causes *Lateral Acceleration*, which is not a change in speed, but of direction:

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$$F = m\frac{V^2}{r} \;\Rightarrow\; V = \sqrt{\frac{Fr}{m}}$$

Blocks in Beamer

Standard Block

This is a standard block.

Alert Message

This block presents alert message.

An example of typesetting tool

Example: MS Word, LaTeX