Global Solar
Power the possibilities

Automotive Suspension Geometry

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Everyone Awake??

- Don’t get too cute, basic designs are more reliable and safer!
- https://www.youtube.com/watch?v=HSV7Dq6kk2o (Racing The Sun 2017)
- https://www.youtube.com/watch?v=kDjsxZgi5VXU (dragster)
- https://www.youtube.com/watch?v=rrtVHXBrPtw (wipeout)
Force = mass * acceleration

- Force is measured in Newtons, N = (kg \times m/s^2)
  - The force is the energy we feel when potential energy is transferred to kinetic energy.
- Mass is measured in kilograms, kg = 1000 grams
  - The mass is the weight of the object moving
- Acceleration is measured in meters per second squared, m/s^2
  - The acceleration is the rate of change in velocity. Example: If a car can go 0 to 60 in 4 seconds, that is a change in velocity from 0mph to 60mph
Quickest Acceleration on the Planet!!

- Top Fuel Dragsters
Automotive Suspension Geometry

Topics Covered:

- Camber
- Caster
- Steering Axis Inclination and Scrub Radius
- Toe In vs. Toe Out
- Ackerman Steering
- Rolling Resistance
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Camber

- Reduces tire scrub during suspension travel
- Maintains tire contact patch with surface
- Recommend keeping camber near 0 degree for solar cart
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Caster

- Controls vehicles stability at higher speeds
- Controls steering self correcting to a center position
- Recommend keeping caster angle between 3-7 degrees for solar cart
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Steering Axis Inclination (SAI)

- Changes wheel camber throughout steering motion
- Too much SAI makes steering difficult

Scrub Radius

- Distance between tire center line and SAI intersection with surface
- Keep to a minimum to reduce difficult steering
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Toe In vs. Toe Out

- Reduces loose feeling of steering by preloading steering components
- Too much can affect tire wear and increase rolling resistance
- Recommend 1/32” to 1/16” toe in for solar cart
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Ackerman Steering

- Inside tire follows a smaller turning radius than outside tire
- Extremely important in reducing drag when vehicle is turning
- Controlled by tie rod location on spindle steering arm
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Rolling Resistance

\[ c = \text{Rolling resistance coefficient} \]
\[ c = 0.001 \text{ steel wheel on steel track} \]
\[ c = 0.004 \text{ bicycle tire on asphalt} \]
\[ c = 0.03 \text{ car tire on asphalt} \]

\[ R = c \, W \]

Rolling resistance coefficient (c) and weight (W) directly affect power required to move car.
Standard Cart

The Standard Kart uses a pre-fabricated steel frame chassis. It bolts together without the need for welding. It comes with standard wheels, a seat, a safety belt, mirrors, and a solar panel mount. This kart is great for first-year teams, schools with less technical expertise, or those lacking specialized facilities and equipment. The standard kart chassis is not meant to be modified.
Do’s and Don’t’s...

**Do(s)**
- Be Safe
- Be Kind & Respectful
- Collaborate
- Observe Rules
- Have Fun

**Don’t(s)**
- Don’t Rush
- Don’t cut corners
- Don’t change the Plan