



## Georgia Gravity Games 2018 Rules

1) Check the [Georgia Gravity Games FAQs](#) frequently! This is where clarification will be posted for specific Official Rules (“**Rules**”) questions received from teams.

2) **TO ALL RACERS: Protective wear.** Although all racers will be required to have helmets and closed-toe shoes only as foot-wear, don't forget appropriate clothing as well. The Rules state "**no loose-fitting or dangerous attire will be permitted,**" but you might also want to consider protective clothing as well, such as a leather jacket and knee/elbow pads.

### Scope

Description: With funding from Google Inc. (“**Google**”) and in cooperation with Georgia Institute of Technology, (also referred to hereafter as “**Georgia Tech**” or “**GT**”) and the City of Douglasville (also referred to hereafter as “**The City**”) this 2018 Georgia Gravity Games, (the “**Competition**”) will provide students from the local schools, college/university, and employees from companies, an opportunity to design and construct cars powered by gravity and electrical energy sources, and to compete against other participants and teams for the fastest time. To the extent adults (18 or older) register to participate in the Competition they will compete only against other adult participants (who are 18 or older) in the Competition.

The event will be held on **Saturday, November 3, 2018 from 9 a.m. to approximately 2 p.m.**

### Objectives

- To have a fun, educational, inspirational, and competitive event that allows hands-on engineering
- To enable students and professionals to interact
- To unite members of the community in an environment of fair competition and celebration
- To develop an engaging competition and event that can be replicated for the future

### Mission Statement

The 2018 Georgia Gravity Games strive to promote STEM (Science, Technology, Engineering, and Mathematics) with real-life application through construction and competition of a downhill gravity-powered car race. The Competition focuses on the design, construction, and racing of a gravity powered vehicle, on a downhill course.

### Overview

The Judging Committee will be comprised of representatives potentially from Google, Georgia Tech, and public officials from the City of Douglasville. No judge will be able to participate in judging any race in which the judge's family member is a participant. The Judging Committee will be responsible for inspecting each car, participant, and race track for adequate safety and security. The Judging Committee has the final say on whether one may participate in the Competition and will have final determination regarding the Rules and any violation thereof.

## Official Rules

The Judging Committee has sole discretion as to whether a violation of these Rules will result in disqualification of a participant and/or team.

## Divisions

There are three (3) major divisions of racing based on different methods of construction:

1. **Kit Cars Division** – A race for kit cars powered by gravity. Students ages 8 to 17 is welcome to participate in this division of the Competition. Cars in this division will be based on either the All-American Soap Box Derby (“**AASBD**”) Stock, Super Stock or Scottie Masters kits, using Z-Glass wheels. *Please note, this is not an AASBD sanctioned event. The AASBD does, however, produce excellent, safe kits.* Please ensure that all rules for each kit regarding safety are carefully adhered to. These are available with your kit, but also available online on the AASBD website. Returning teams should focus on making improvements to the car for safety and performance. Those teams should be prepared to discuss those improvements with the technical inspection team.

### Kits Cars Guidelines:

- Stock, Super Stock and Scottie cars will race in separate sub-classes and will not race one another.
- Maximum weights including driver will be:
  - i. Stock - 200 lb
  - ii. Super Stock - 240 lb
  - iii. Scottie - 255 lb
- 1 lb error will be allowed
- No wheel swap is required
- No limit on front/rear weight bias
- Steering control cables must be BANJO tight and not deflect steering when brakes are applied
- There will be a **maximum of sixty (60) teams** in the Kit Cars division. Registration is first come, first serve.

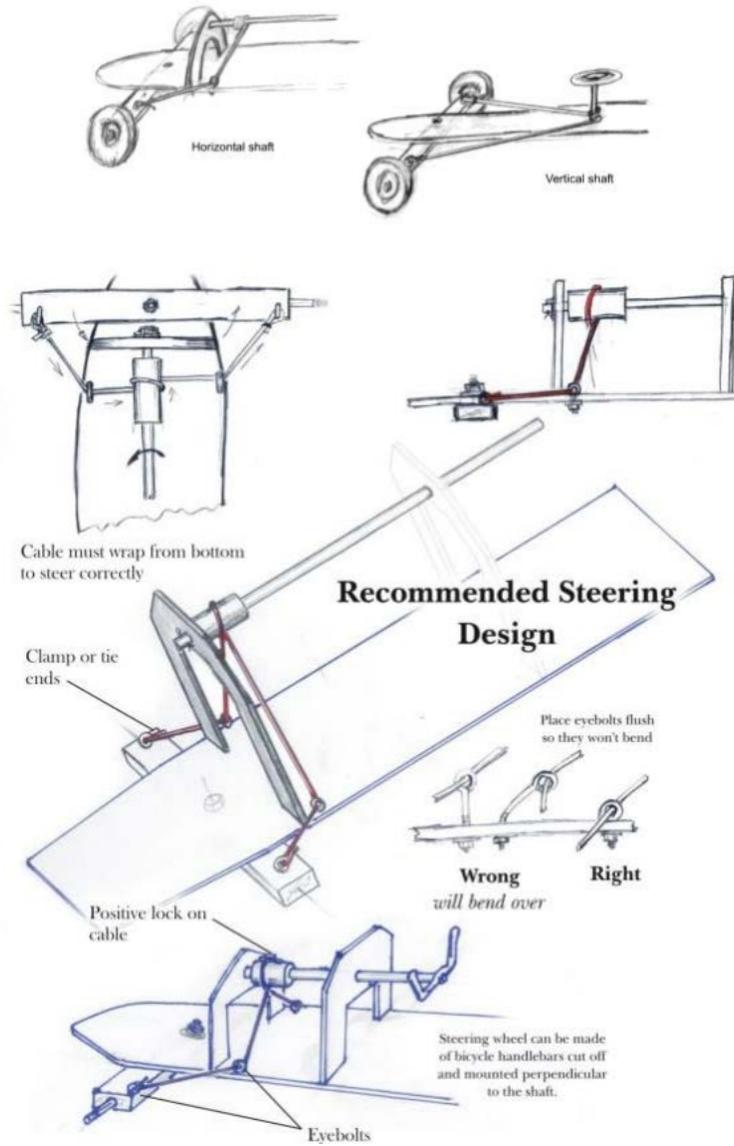
2. **Engineered Cars Division** – A race for "scratch-built" cars, or heavily modified kits powered by gravity. Heavily modified kits would include kits cars with altered wheelbases, significantly altered bodies, etc. Team members must be at least ten (10) years of age to participate in this division of the Competition.

**Engineered Cars Guidelines:**

*Please note: the sketches below are from <http://leany.com/derby/archive.html> and excellent examples of safe construction of these cars.*

- **General:**
  - i. For the safety of the participants, "head first" designs (designs where the participant travels down the track with their head at the front of the vehicle and their feet at the rear) **will not be allowed.**
  - ii. Size Limitation - 6 feet wide x 7 feet long x 7 feet high Maximum
  - iii. Maximum weight of the vehicle is 400lb, not including the driver. There is not a limit on the weight of the driver. **Please note**, that for modified kits, the weight limitation for the kit *cannot* be exceeded for safety reasons. For example, if your altered kit started life as a Super Stock car, it will be limited to 240 lb as a max safe weight.
  - iv. Cars cannot have any objects or devices in the driver area that poses a threat to the driver.
  - v. Cars cannot pose a hazard to those around it.
- **Driver Position:**
  - i. Maximum height of the driver's seat will be 12 inches above the ground. Keep the driver as close to ground as possible for improved stability of the vehicle and safety of the driver.
  - ii. Outer Frame and Shell/Body An outer frame and shell/body is required for driver protection. The frame should protect the driver in the case of a collision or the vehicle turning on its side. The body of the vehicle should help prevent abrasion of the driver or entry of external objects in case of a collision. Speeds in excess of 25 MPH are possible on the course.
- **Steering:**
  - i. Be able to maintain their lane via appropriate steering
  - ii. Steering must be positive control in both directions. No tension (rope/wire) steering that is not balanced and tight. Cable routing that is circular and maintains constant tension like a kit car is acceptable.

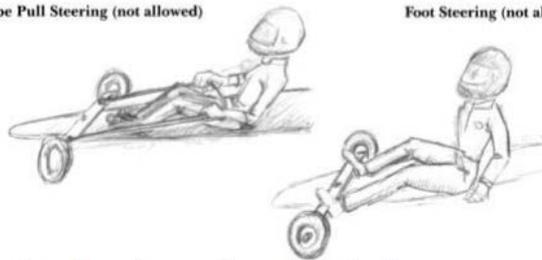
**Cable Wind Steering (recommended)**



- iii. Car must be able to be steered with one hand if necessary.
- iv. Steering may not be performed via the feet.

**Rope Pull Steering (not allowed)**

**Foot Steering (not allowed)**

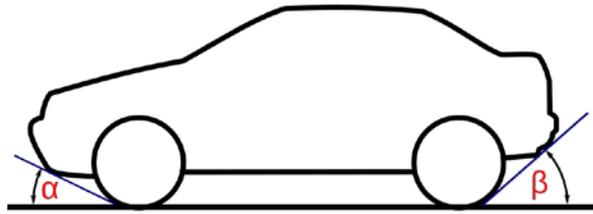


- v. Tiller steering is not allowed.

Tiller Steering (not allowed)



- vi. Rope or wire-based steering held in the hands, feet, or in direct contact with the driver's body or clothing may not be used.
- Brakes
  - i. Be able to stop in a reasonable distance as determined by the Judging Committee. Braking tests will be conducted during inspection to ensure that they are sufficient. Cars without sufficient stopping power will not be allowed to race.
  - ii. All brakes must be symmetrical (i.e. either centered in the car or balanced on both sides). Single brakes (brakes on only one side of the car) will not be allowed. Ideally, brakes should contact the road in the center of the vehicle when applied to ensure stopping in a straight line.
  - iii. Brakes must be able to be actuated without letting go of steering controls. Hand brakes are discouraged and if used, they must be fully operated using a single hand. Two-handed independent brakes are not allowed.
  - iv. Consideration will be made for those with physical limitations.
- Wheels
  - i. Wheels must be guarded so that no body part of the driver may come in contact with them. Also, brakes that require hand operation near the wheels will be allowed.
    - 1. Either enclosed body or enclosed wheels must be incorporated to help prevent the driver from contacting the wheels or moving parts.
  - ii. All three-wheeled vehicles must be reverse trikes (i.e. the third wheel in the back, not the front).
  - iii. Wobbly wheels will not be accepted. If wheels are wobbly the camber must be fixed as visible wobbly wheels will negatively affect the driver's control.
- Approach Angle of the Ramp
  - i. Since the ramp is approximately 37 inches high and 12 feet long, all cars must have <15 Degree approach and departure angle on the front and rear to allow the cars not to scrape when transitioning from the ramp to the roadway.



- **Photos of Engineered cars MUST be submitted to the [contact@gagravitygames.com](mailto:contact@gagravitygames.com) 2 weeks prior to the race for evaluation, and MUST be approved by race officials prior to the race. Please note that cars that have not been pre-approved will NOT be allowed to race.** This is a key safety requirement. We want to help resolve any and all safety issues before race day.
- There will be a maximum of **ten (10) teams** in this Engineered Cars division. Registration is first come, first serve.

### 3. **Autonomous Division**

A race for “scratch built” driverless, auto, self-driving, robotic cars.

Autonomous Guidelines:

- **General:**
  - i. No humans are allowed to ride on the vehicle.
  - ii. Size Limitation - 6 feet wide x 7 feet long x 7 feet high maximum. The car should be big enough to carry a person.
  - iii. Maximum weight of the vehicle 200 lb. weight limit.
  - iv. Chassis may be based on a kit car, adapted from another type of vehicle, or built from scratch.
  - v. Any type of sensors, active or passive, may be used on the vehicle as long as it is safe for all bystanders.
- **Steering:**
  - i. Must have a remote wireless failsafe brake to stop vehicle anywhere on the course.
  - ii. Vehicle must steer completely without human control of any type during all races. Any remote steering controllers will be impounded at start line during a race.
  - iii. Nothing external to the vehicle, passive or active, may be added to the environment to assist in guiding or controlling the vehicle; i.e. wireless networks, reflectors, light sources, etc. GPS may be used.
- **Brakes:**
  - i. Vehicles should stop by themselves after crossing the finish line. (10 second penalty if remote used to stop at the finish line.)
  - ii. No tethers or external connections of any kind are allowed.

- **Photos of Autonomous cars must be submitted to the [contact@gagravitygames.com](mailto:contact@gagravitygames.com) 2 weeks prior to the race for evaluation.**
- There will be a maximum of **six (6) teams** in this Autonomous Cars division. Registration is first come, first serve.

## Registration

Registration information will be posted online at [www.gagravitygames.com](http://www.gagravitygames.com).

**Registration to participate in the Competition closes on October 19, 2018 at 11:59 p.m.;** thus, in order for a person to be eligible to participate in the Competition their completed and properly signed application must be received at [contact@gagravitygames.com](mailto:contact@gagravitygames.com) by 11:59 p.m. on October 19, 2018. Because there are limits on the number of participants in each of the divisions, registration in each division is on a first come, first serve basis.

There is no registration fee to participate.

## Parental Consent/Participation Agreement

Each participant in the Competition between the ages of 8 and 17 (on the day of the Competition) is required to complete and sign **and** have a parent or legal guardian over the age of 18 sign a **Participation Agreement** on the participant minor's behalf in the form attached to these Rules as **Attachment 1**. This Participation Agreement must be signed by both the minor participant and the minor participant's parent or legal guardian over the age of 18 to be valid and accepted. This properly completed and signed Participant Agreement must be provided to the Safety Committee no later than prior to the start of the participant's race on Saturday, November 3, 2018 (either by hand delivery to a member in person or sent via email ([contact@gagravitygames.com](mailto:contact@gagravitygames.com))). The Safety Committee is comprised of individuals from Georgia Tech, Google and/or appropriate public safety authorities who will make final determinations relating to any safety issues. The Safety Committee may be contacted ([contact@gagravitygames.com](mailto:contact@gagravitygames.com)).

Each participant in the Competition age 18 and older (on the day of the Competition) is required to complete and sign a **Participation Agreement** in the form attached to these Rules as **Attachment 1**. This properly completed and signed Participant Agreement must be provided to the Safety Committee no later than prior to the start of the participant's race on November 3, 2018 either by hand delivery to a member in person or sent via email ([contact@gagravitygames.com](mailto:contact@gagravitygames.com)).

## Attire

Participants must wear closed toe shoes only, covering sole, toe, and heel while racing.

Participants must wear certified protective helmets in their proper position on the head while racing. Head wear of each participant while racing must be inspected and cleared by the Safety Committee. Helmets approved for bicycle, derby, or motorcycle use is required.

Participants must wear adequate and appropriate clothing. Specifically, no shorts, bathing suits, dresses, skirts, capes or long flowing scarves or other attire may be worn by participants during their race for safety and visibility reasons. No loose fitting or dangerous attire will be permitted for safety and visibility reasons. The Safety Committee will make all final decisions about what attire is permissible to be worn by a participant during the race (clothing, shoes and helmets).

## **Conduct**

Participants must not use, possess, or distribute alcohol, tobacco, or drugs, with the exception of those prescribed by a physician specifically for that person.

Verbal or physical abuse and/or unsportsmanlike conduct will not be permitted, whether directed toward another participant, competition, school or public official, and/or spectator. Friendly encouragement and cheering, however, are encouraged.

No firearms will be permitted on the field of conduct or anywhere at the Competition.

No participant will attempt to gain an unfair advantage over another participant.

## **Materials**

All cars and material components are subject to inspection and subsequent disqualification by the Safety Committee if deemed harmful or potentially dangerous.

Please feel free to contact the Safety Committee, comprised of adults from Georgia Tech, Google and public safety officials, at [contact@gagravitygames.com](mailto:contact@gagravitygames.com) if you have any questions.

No chemical or nuclear engines allowed.

No potential energy sources allowed (other than gravity).

## **Car Eligibility**

Gravity may be the only propulsion source in all divisions. No human-powered cars or engines will be permitted.

**For Purposes of Clarity – the following is a list of forbidden propulsion systems:**

- Chemical engines (gasoline, diesel, etc.)
- Any electrical power source besides the specified battery
- Potential energy systems (besides gravity)

- Nuclear (fission or fusion)
- Any combustion-based motor
- Pedals (human-powered)
- Animal powered (mules, dogs, hamsters)

For all divisions, each participant and team member must have taken part in the construction and/or setup of his or her car. An adult mentor of a minor participant team member is permitted only to provide hands-off guidance and light or minimal assistance in the actual construction of the minor participant's car; the overwhelming majority of the work in constructing the minor participant or team member's car should be completed by the minor participant or team members and not the adult mentors. Returning teams should focus on making improvements to their car for safety and performance. Those teams should be prepared to discuss those improvements with the technical inspection team.

The Judging Committee will have sole discretion to evaluate and disqualify cars and/or teams based on violations of this rule.

A minimum of three wheels of each car are required to remain in contact with the ground at all times during the race.

Each car needs to be able to steer and stop in a reasonable distance (whether a car meets these criteria will be determined by the Safety Committee).

The car may be decorated and painted as long as this does not break any of the Rules nor interfere with the safety of the participants or other competitors.

Modification, alteration, or tampering with the car after inspection by the Safety Committee is only allowed with the approval and the supervision of the Safety Committee.

Each car and driver must be inspected and approved by the Safety Committee before racing. The Safety Committee, in its sole discretion, may postpone, restrict, or disqualify any participant or car deemed to be unsafe to race. The Safety Committee does not need to provide explanation for disqualification and has the final say in eligibility of all cars, participants and teams competing in the Competition.

## **Racing**

Each car must accelerate from a standstill by gravity without the aid of external propulsion devices including human power.

Participants must remain in the car until all cars have crossed the finish line.

Participants may not interfere with other cars or drivers.

If the car is not drivable at the time of the race, the round for that car will be considered a forfeit.

Any car crossing the centerline (as judged by the race committee) will automatically lose that round. If both cars cross the center line, the first car to cross is the one deemed to be disqualified.

Any car and/or driver that is involved in an on-track incident or failure, or that appears to have difficulty maintaining safe control while on track (as determined by the race committee) for the safety of the driver and the other drivers, both the car and driver will be returned to the Safety Inspection Team for inspection/certification prior to returning to the race. If the car/driver cannot safely pass the re-inspection, they will be disqualified.

## Heats

### “Kits” Car Division:

- The “**Kits**” **Car Division** will be run using a bracket system with initial time trial.
- The first round will be a time trial. The competitors will then be ranked, paired and placed into a tournament bracket.
- The second round will be a two-car head-to-head race, determined by the time trial (first) round. The victor will move on to face another second-round competitor.
- The Competition will progress in a double-elimination style bracket until the final two cars remain. **Please note: If more than 40 cars sign up, the Judging Committee reserves the right to use a single-elimination style bracket, in order to allow the event to be completed in the allotted street closure time frame.**
- Cars will start at approximate 4-minute intervals during the Competition. Teams that are not in place at the start of their heat will receive a loss for that heat.
- NOTE: Depending on the number of participants and teams, the first round may be eliminated and the pairings determined by random drawing. Teams will be notified of this decision soon after the registration is closed.

### “Engineered” Division:

- The “**Engineered**” **Car Division** will be run using a bracket system with initial time trial.
- The first round will be a time trial. The competitors will then be ranked, paired, and placed into a tournament bracket.
- The second round will be a two-car head-to-head race, determined by the time trial (first) round. The victor will move on to face another second-round competitor.
- The Competition will progress in a single-elimination style bracket until the final two cars remain.
- The final round will be a best two-out-of-three competition run head-to-head.
- Cars will start at approximately 5 minute intervals during the Competition. Teams that are not in place at the start of their heat will receive a loss for that heat.

- NOTE: Depending on the number of participants and teams, the first round may be eliminated and the pairings determined by random drawing. Teams will be notified of this decision soon after the registration is closed.

#### **“Autonomous” Division:**

- The **“Autonomous” Car Division** will be run using a bracket system with initial time trial.
- The first round will be a time trial. The competitors will then be ranked, paired, and placed into a tournament bracket.
- The second round will be a two-car head-to-head race, determined by the time trial (first) round. The victor will move on to face another second-round competitor.
- The Competition will progress in a single-elimination style bracket until the final two cars remain.
- The final round will be a best two-out-of-three competition run head-to-head.
- Cars will start at approximately 5-minute intervals during the Competition. Teams that are not in place at the start of their heat will receive a loss for that heat.
- NOTE: Depending on the number of participants and teams, the first round may be eliminated and the pairings determined by random drawing. Teams will be notified of this decision soon after the registration is closed.

#### **Race Track**

The “Kits” Car Division, “Engineered” Car Division and “Autonomous” Car Division races will run down Church Street in Douglasville, Georgia, starting at Pray Street, heading West toward Rose.

#### **Start and Finish**

Electronic sensors will provide precision for start and finish timing. In the event of timing system malfunction, the Judging Committee may choose to use visual observation of Event Staff to determine winners or may choose to re-run heats if visual observation of the winner cannot be determined.

#### **Competition Timeline**

**Check in for the race starts at 7:30 a.m. on Saturday, November 3, 2018.**

The overall division racing timelines and the individual start times for each participant’s races/heat for each division will be distributed to all teams and participants one week before the Competition and will be dependent on the number of teams and participants competing.

Awards to follow completion of all races on Saturday, November 3, 2018.