

Gravity Vehicle - 2020

NCSO Coach's Clinic - October 5th, 2019

Nathan Hiser

What is Gravity Vehicle?



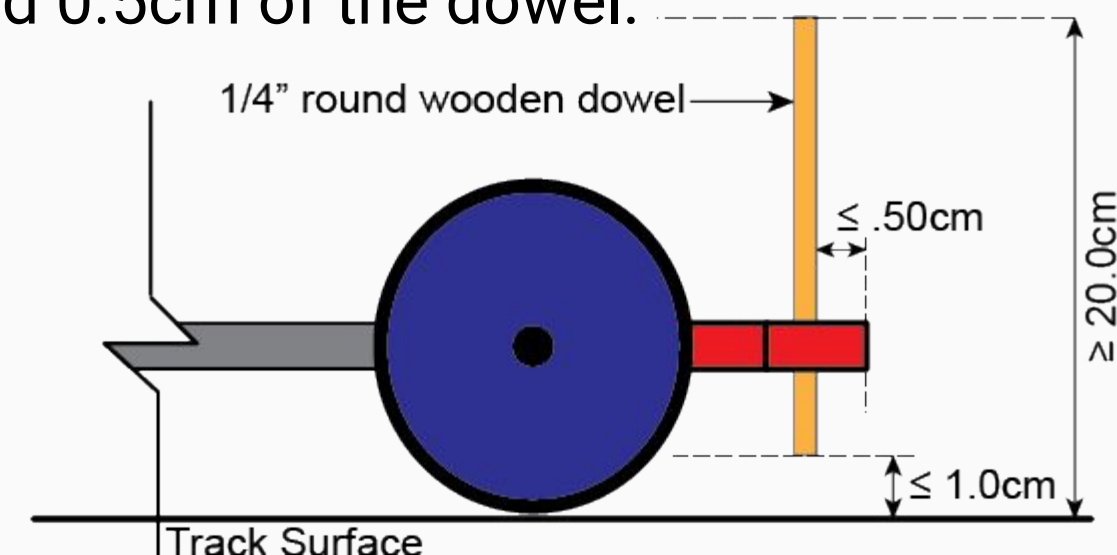
- Description: Teams will design, build, and test one Vehicle and Ramp that uses the Vehicle's gravitational potential energy as its sole means of propulsion to reach a target as quickly and accurately as possible.
- Team Size: 1 or 2
- Event Time: 8 min to perform up to two runs
- Impound:
 - A single vehicle, a single ramp
 - Alignment Devices (if used)
 - Additional/spare parts
 - Counterweights used to secure the ramp
 - Practice log
 - Check tournament schedules for times of impound!!!
- Not needed to impound but can bring:
 - Tools, measuring devices, stand-alone calculator, **SAFETY GLASSES!!!!**
- Do not bring or impound: Any electric or electronic tools



Vehicle Construction Parameters

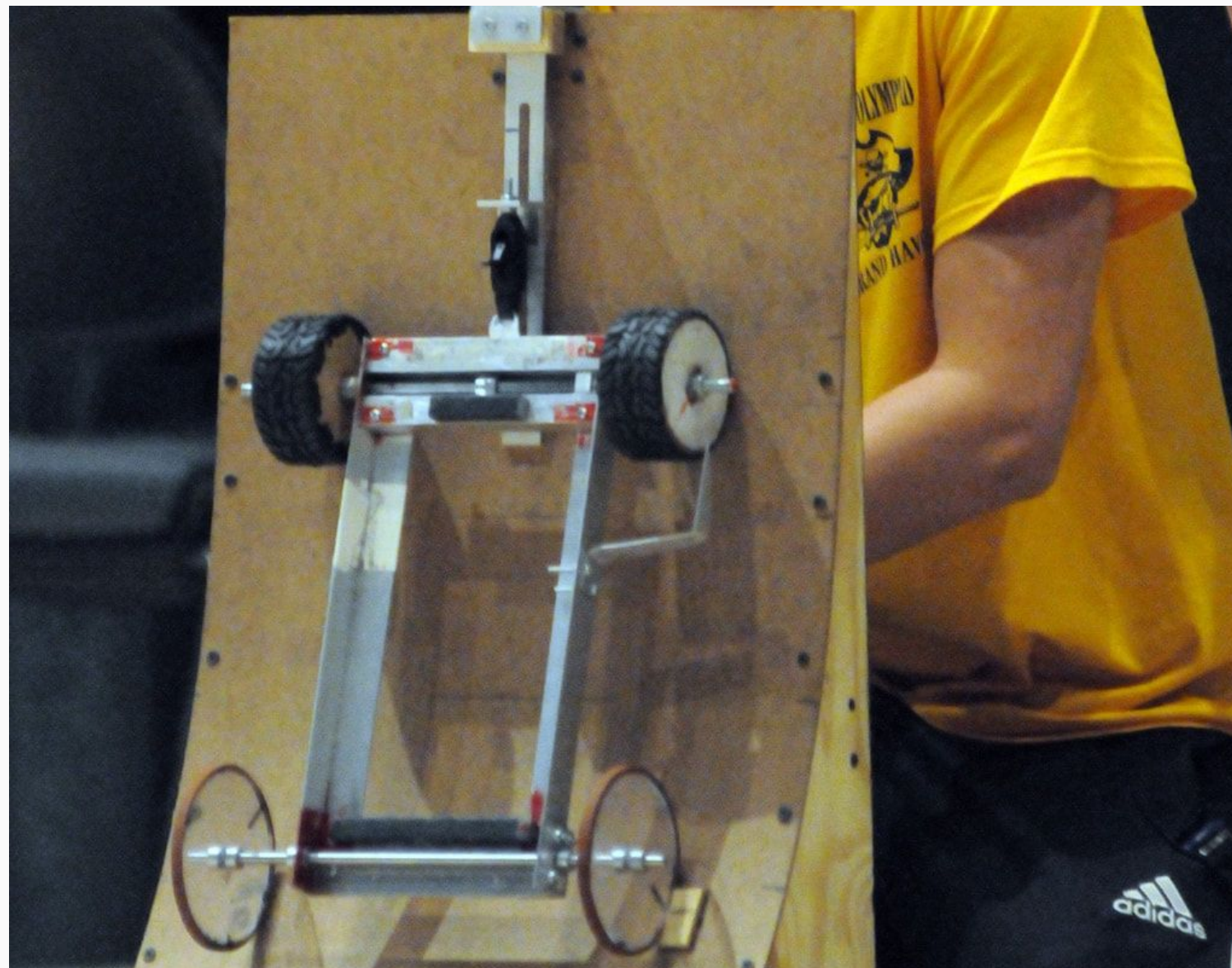


- The Vehicle and the Ramp, together, in the ready to run configuration must fit within a rectangular box with a 50cm x 50cm base and 100cm height. (this includes floor protection!)
- The Vehicle's mass may not exceed 2.000 kg.
- A release mechanism must be included as part of the ramp to hold the vehicle in the ready to run configuration until triggered by the team.
- 1/4" wooden dowel
 - Must be approximately perpendicular to the floor, extend down to within 1cm of the track, extend at least 20cm above the track surface, and be easily accessible by the Event Supervisor
 - No part of the vehicle except the wheels may extend beyond 0.5cm of the dowel.



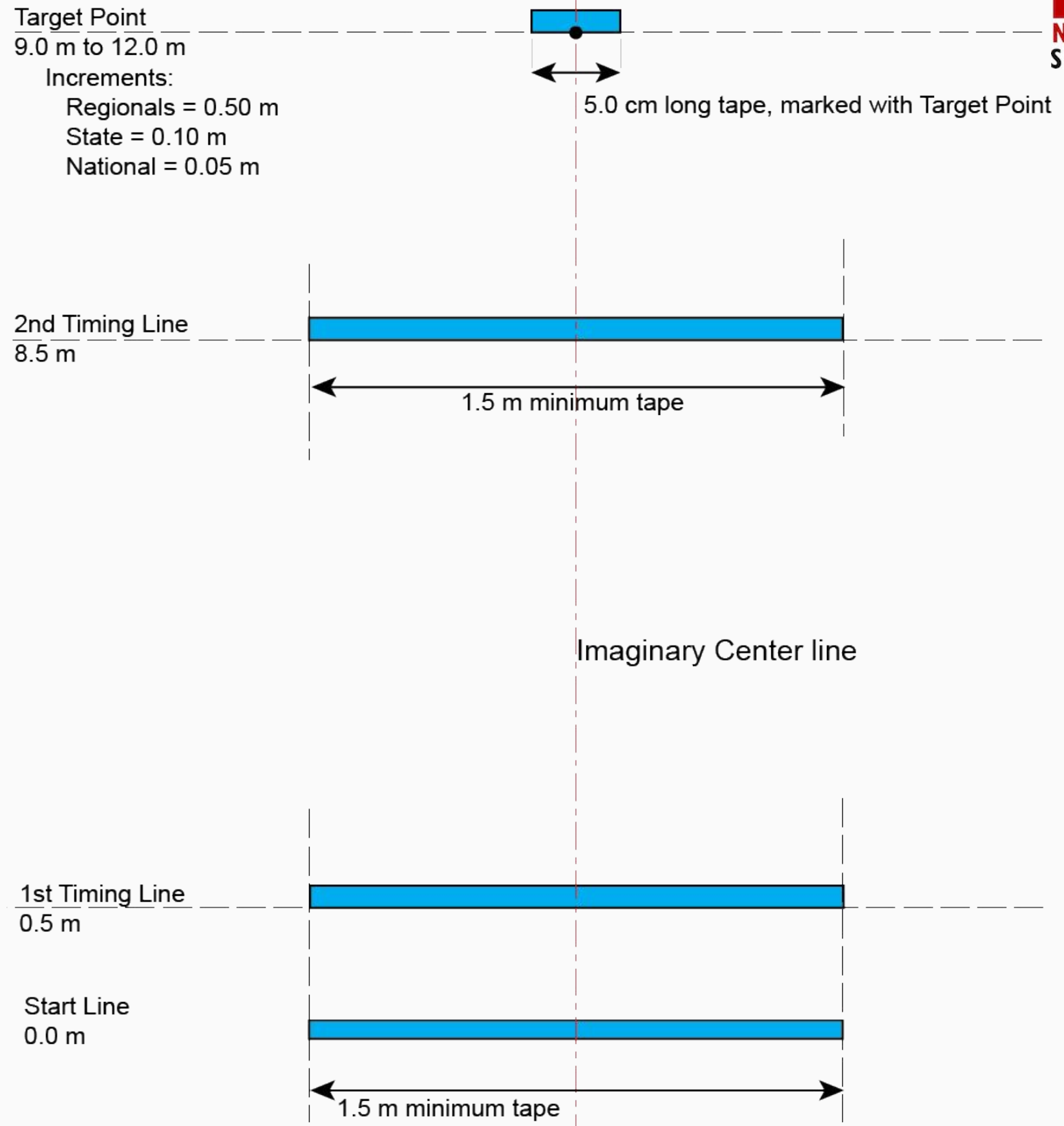
What can I use in my vehicle?

- Wheels: CDs, roller wheels, plastic
- Chassis: Wood, metal, aluminum, 3D print, laser cut, etc



Track layout

- Track will be on a smooth, level, and hard surface.
 - Typically this is on a basketball court
- The Target Point will be between 9.0 and 12.0 m from the Start Point.
 - The Target Distance (chosen after impound) will be chosen in the following intervals:
 - Regionals: 0.5m
 - State: 0.25m
 - Nationals: 0.05m
- Two timing lines will be marked with tape at 0.5m and 8.5m from the Starting Point



Scoring - Tier System

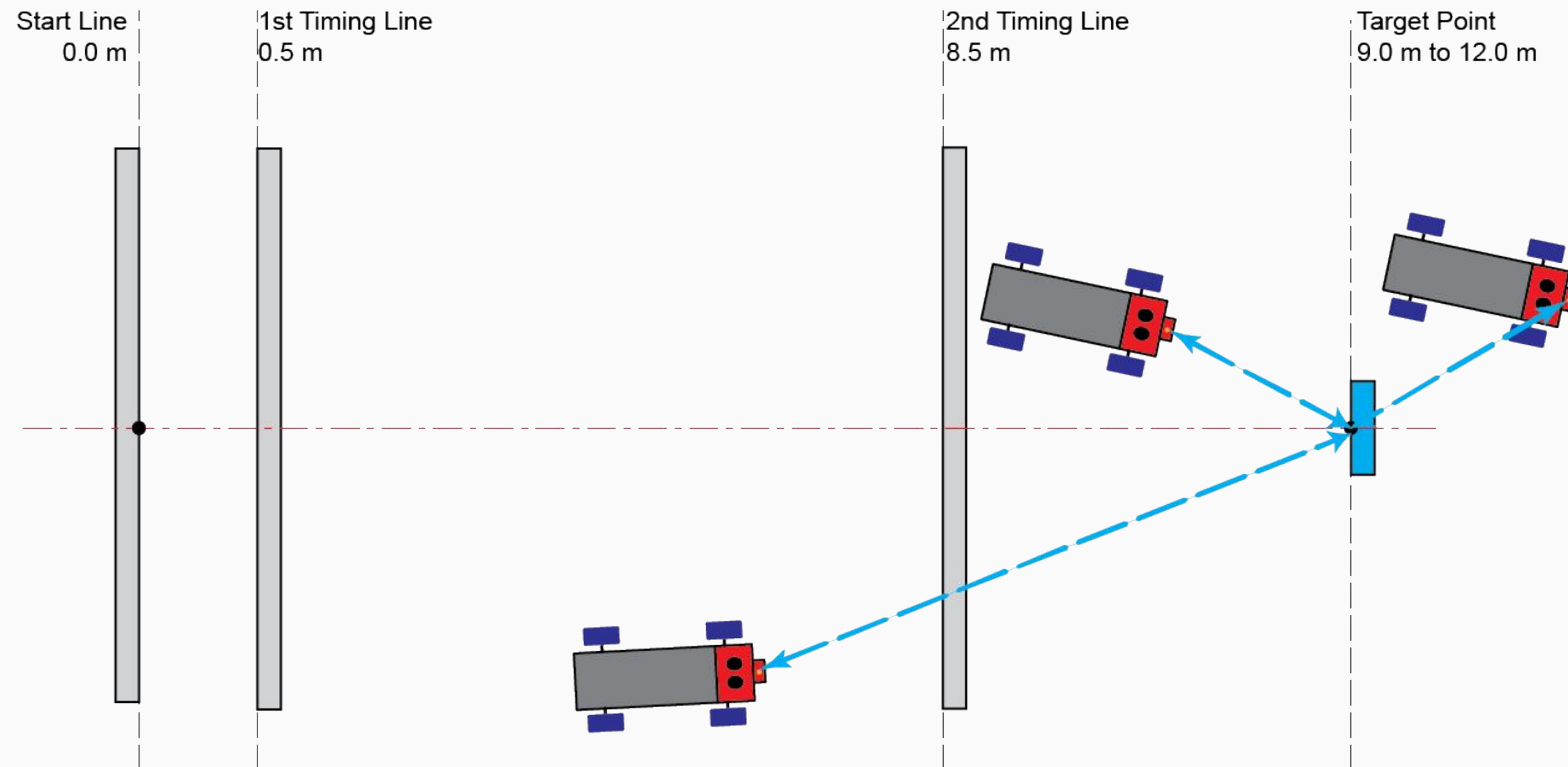


- Low Score Wins
- Run Score = $2 \text{ pts/cm} \times \text{Vehicle Distance} + 1 \text{ pt/sec} \times \text{Run Time} + \text{Penalties}$
- Will be using a Tier System.
 - Tier 1: A run with no violations
 - Tier 2: A run with any Competition Violations
 - Tier 3: A run with any Construction Violations
 - Tier 4: Teams with 2 Failed Runs
 - Tier 5: Vehicle not impounded during the impound period

Scoring - Vehicle Distance Score

- Run Score = **2 pts/cm x Vehicle Distance** + 1 pt/sec x Run Time + Penalties

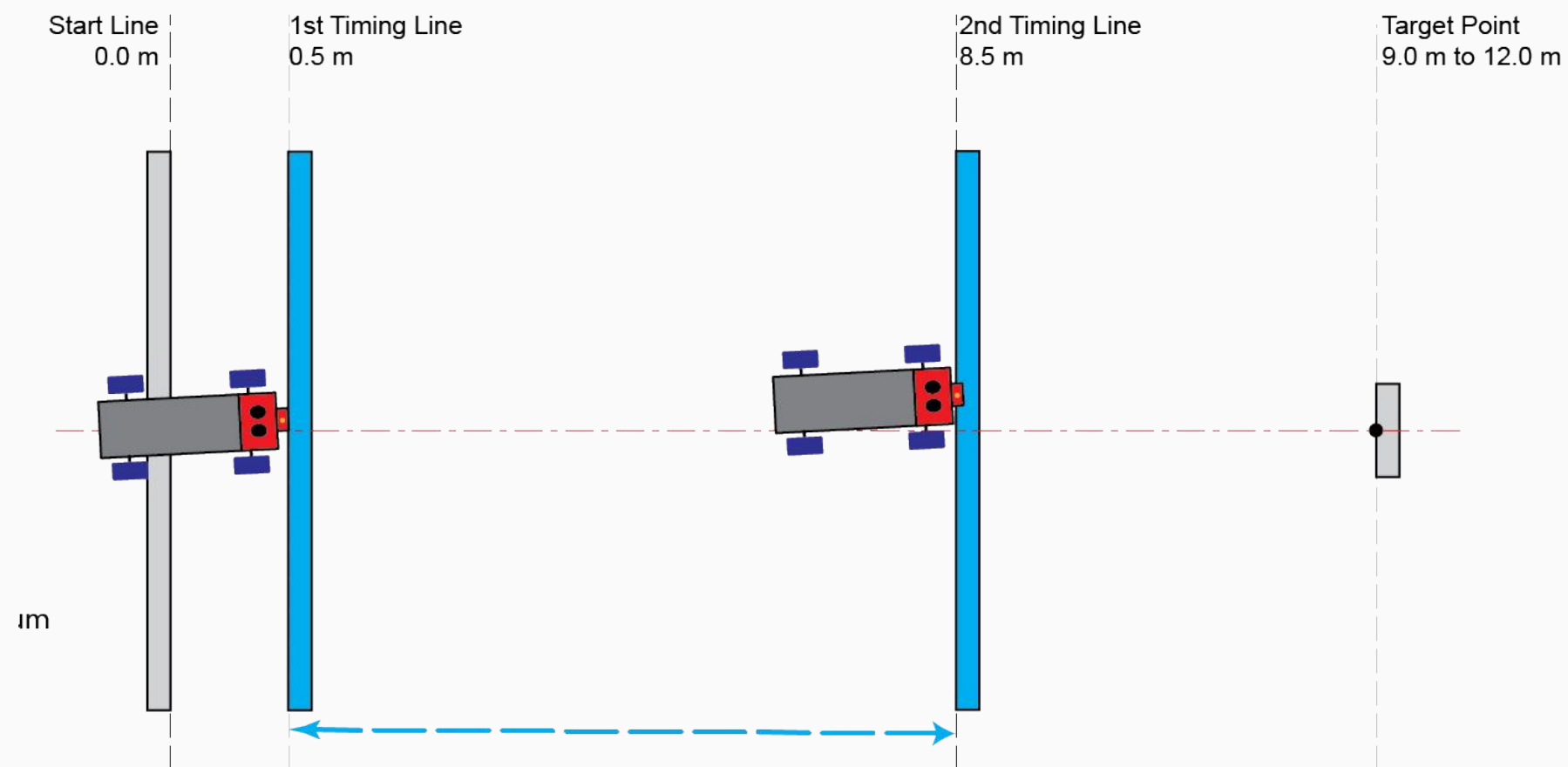
- Point to point measurement from the dowel (Measurement Point) to the Target Point, rounded to the nearest 0.1cm



Scoring - Run Time

- Run Score = 2 pts/cm x Vehicle Distance + **1 pt/sec x Run Time** + Penalties

- The Run Time is the time it takes for the vehicle to travel between the 0.5m and 8.5m lines
- If the vehicle passes the 0.5m line but fails to pass the 8.5m line the time will count as 60 seconds



Practice Log



● Run Score = 2 pts/cm x Vehicle Distance + 1 pt/sec x Run Time + Penalties

- Impounded with vehicle, will be returned when team's run
 - Teams without impounded logs are penalized 500 points
 - Teams with incomplete logs are penalized 250 points
- Intent is to show that teams are testing prior to competition and varying parameters while testing
- Practice log must record the Target Distance, Vehicle Distance from Target Distance, Run Time, and one additional parameter (e.g.; # of axle turns for braking, alignment angle)
- Minimum of 10 runs

Run Number	Target Distance	Vehicle Distance	Run Time	(additional parameter)
1	10.5 m	75.6 cm	15.67 seconds	[data entry]
2	11.5 m	37.5 cm	14.54 seconds	[data entry]
...

Common Mistakes / Tips and Tricks



- Dowels - NEED TO HAVE THEM! Have extras, and even better if it is adjustable!
- Start mechanism does not start with a pencil
- Not reading the rules
- Phones, can not be used as a calculator, can not be used during competition for any reason
- Let the students do it! Parents and coaches want to help, but once students are in the event area, they can not receive assistance with the competition
- Check the NCSO website for any rule clarifications and any updated diagrams, scoresheets, this presentation!
- Not reading the rules
- Remember to have fun and learn!

Resources:

National website videos, youtube videos