Dell presents
The Tech CHALLENGE

201 South Market Street
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Rules

The Tech Challenge 2019: No Roads, No Problem!

Hovercraft in General

Hovercraft float on a cushion of air, allowing them to go places boats, cars, trains and other vehicles can't. They don't need roads or rails and can move tons of stuff over land or water.

The 2019 Challenge

Design and build a hovercraft that can navigate different terrains.

Device Specifications *(all measurements are nominal)*

1. The device must be a hovercraft. Air must blow onto the ground to create a cushion of air. Helicopters and drones are not hovercraft and are not allowed.
2. Store-bought solutions are not in the Spirit of the Challenge.
3. No wheels that touch the ground (track) are allowed on the device.
4. Maximum size: 16 inch x 16 inch footprint.
5. Height: The device must fit through the tunnel on Track A. (See Figure 1)
6. Weight limit: None.
7. Payload: Each team must provide its own payload of 5 unmodified U.S. quarters to be placed during device performance.
   a. Grades 4-8 teams may distribute quarters anywhere on the device.
   b. Grades 9-12 teams must mount all 5 quarters in a single stack on the device. The location of the stack of quarters is up to the team.
8. If batteries are used:
   a. Batteries must be contained and carried by the hovercraft itself.
   b. Only single-cell dry batteries of these sizes may be used: AA, AAA, C or D.
   c. Battery voltage limit is 12 volts (12V) per circuit.
   d. Teams must include a clearly labeled circuit(s) drawing/schematic in their journal to show that each circuit is 12V or less.
   e. Battery voltage markings must be clearly visible to the judges for inspection.
9. Each team must have its own device. Teams may not share their device or any portion of their device with other teams.
10. All devices must be clearly marked with the team number.

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Course Specifications

1. The course consists of three tracks, labeled Track A, Track B and Track C. See Figures 1-5 and test rig drawings.
2. Each track is 23 inches wide and 8 feet long, with 2-inch curbs.
3. Midway down Track A is a tunnel. The tunnel is 19 inches long, 23 inches wide and 16 inches high at the center.

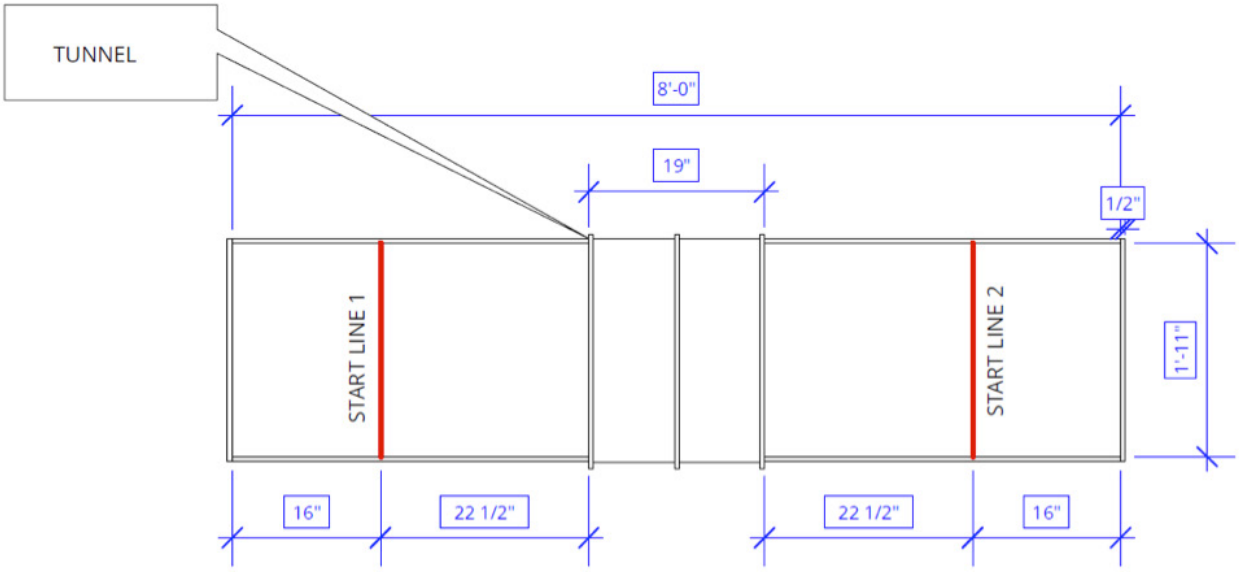
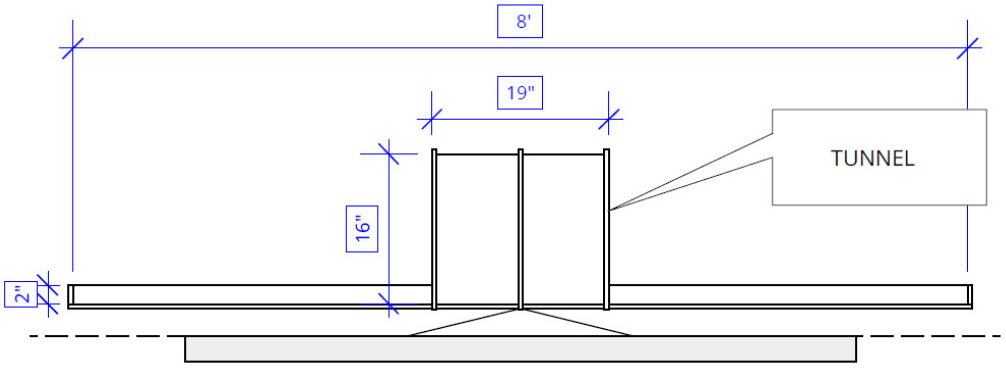
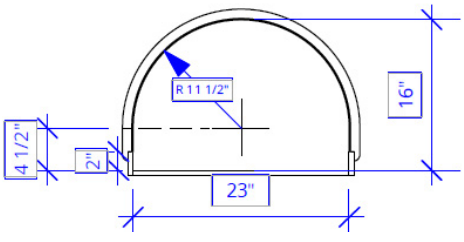


Figure 1. Plan View



Elevation View



Tunnel Section View

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4. Tracks B and C have specific terrains the device must cross.
   a. Track B contains 100-grit sandpaper and low-pile carpet.
   b. Track C has Type A and Type B pegboard with 1-inch hole spacing and hole diameters of 3/16" and 1/4", respectively.

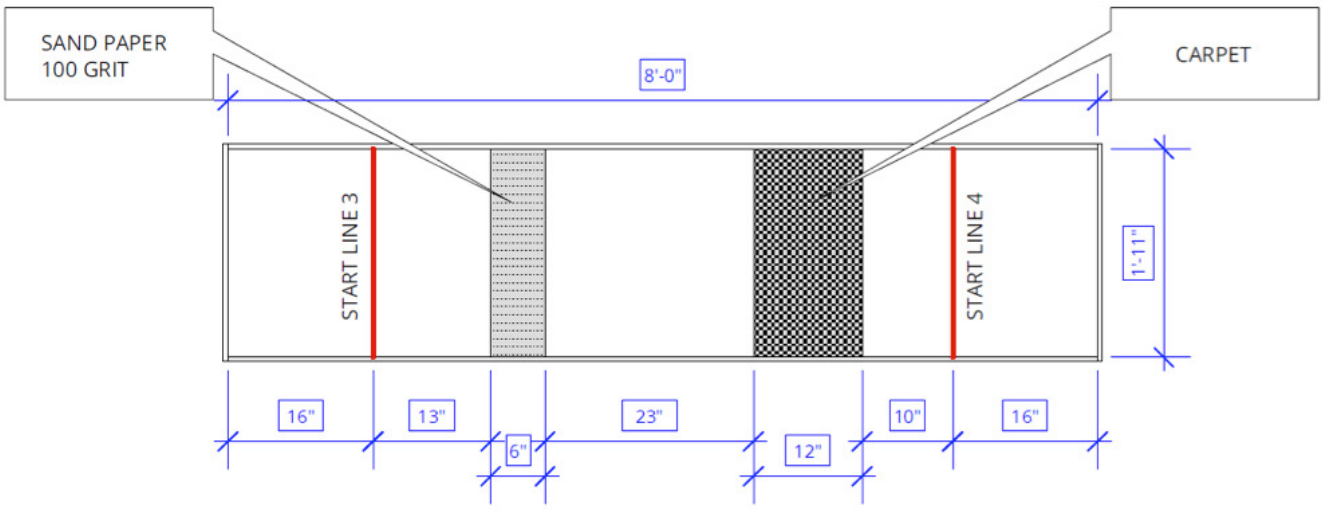

Figure 2. Track B

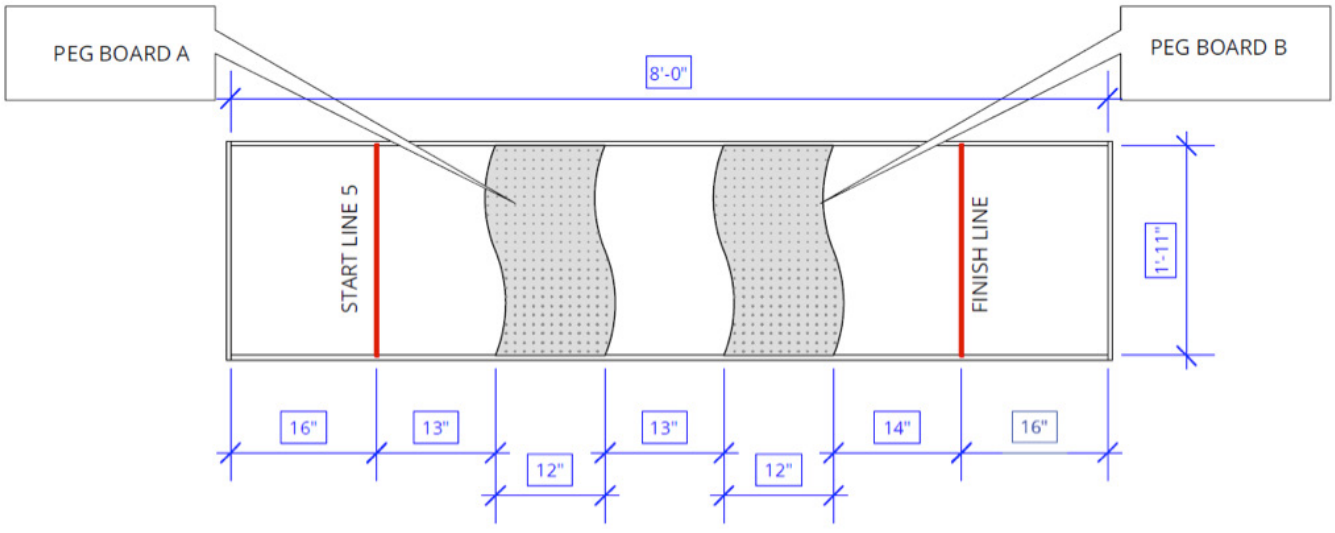

Figure 3. Track C

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5. Teams can tilt Tracks A and B in both directions like a seesaw to assist device movement. The tilt is measured from the raised end of the track. (See Figure 4)
6. The amount of tilt on the first two tracks is:
   a. 6" for Grades 4-6.
   b. 4" for Grades 7-8.
   c. 2" for Grades 9-12.

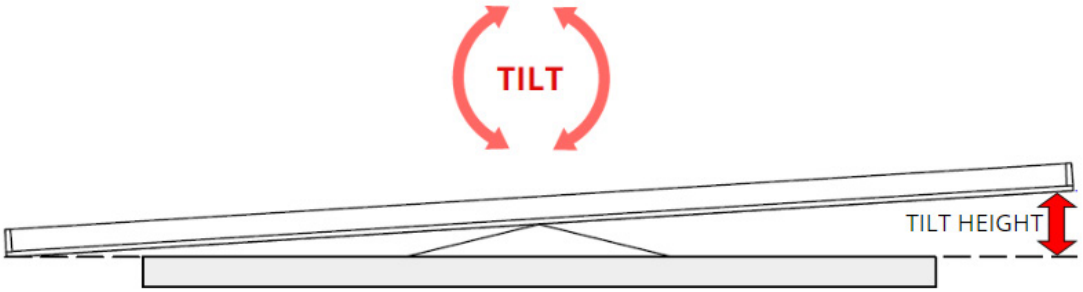

Figure 4. Tilt for Tracks A and B

7. Track C does not tilt.

Figure 5. Track C - no tilt

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Device Performance Rules

1. One device per team is allowed.
2. Teams have four minutes total for both setup and performance.
3. Device performance ends when teams complete the challenge or at the end of four minutes.
4. No pushing or pulling (human power) of the device is allowed at any time.
5. The run order for the device is shown in Figures 6 and 7 and is described below.
   a. For Run 1, the device must be placed on the track surface completely behind the starting line. A team member will initiate the run by tilting the track. The device must completely cross the finish line at the end of Track A.
   b. After the device completely crosses the finish line for Run 1, a second team member must place the payload on the device.
   c. Run 2 will be started by tilting the track, allowing the device to return to Run 1 starting area.
   d. At the completion of Runs 1 and 2 on Track A, the team will move the device to Track B and repeat the process for Runs 3 and 4.
   e. At the completion of Runs 3 and 4 on Track B, the team will move the device to Track C for Run 5. Track C does not tilt. The device is required to travel in one direction only.
   f. The team may pick up and reorient their device between runs.
   g. The team may make changes to their device between runs as long as they do not add or remove parts to their device that were not present prior to Run 1, except:
      i. Adding payload as required.
      ii. Restoring power source such as replacing batteries or balloons between runs.
      iii. Simple repairs such as taping or gluing.
   h. Payload must be on the device for Runs 2-5.

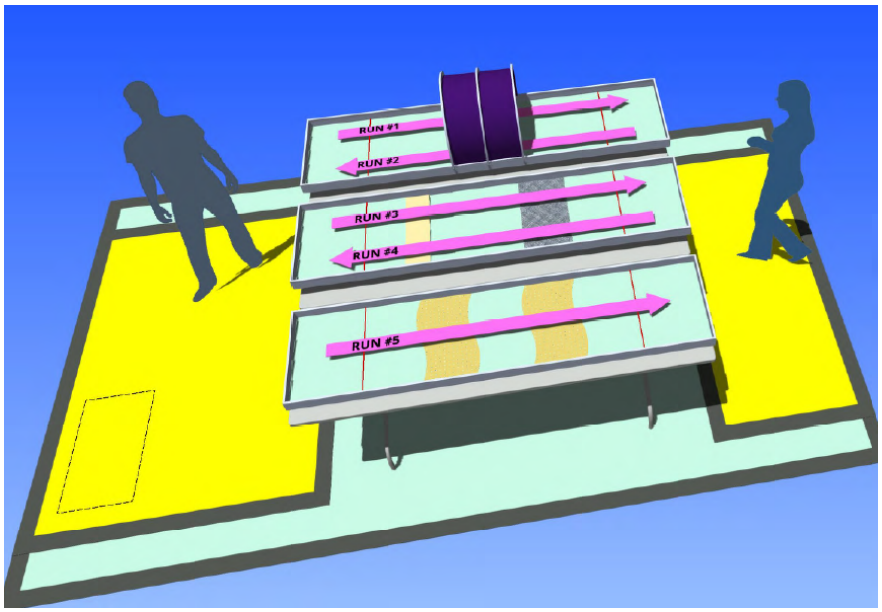

Figure 6. Run Order

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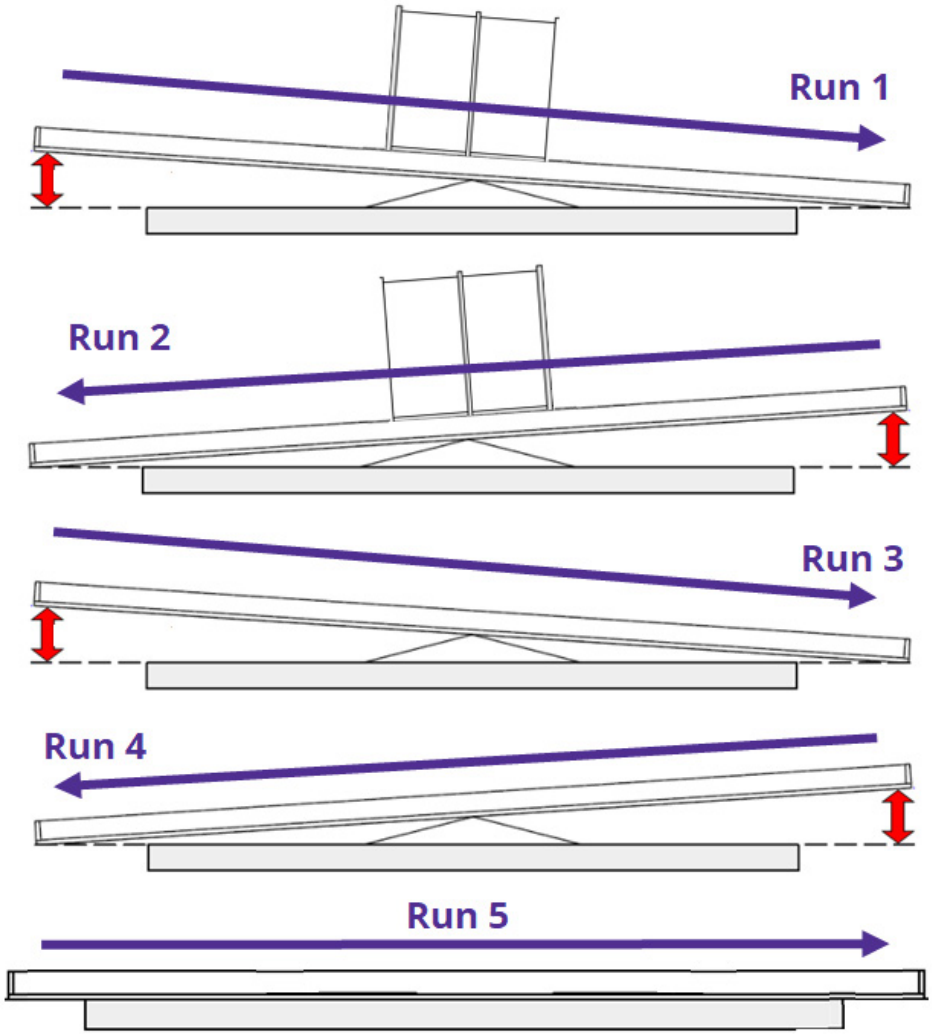

Figure 7. Run Order (Elevation View)

6. If the device stops or gets stuck, the team may:
   a. Tilt the track (Tracks A and B only) in the opposite direction to free the device. No scoring penalty will be assessed. Shaking the track is not allowed.
   b. Reset – The team may elect to pick up the device, return it to the beginning of the current run, and start again. If needed, the team may refresh the power source and/or make repairs. The four-minute clock will continue to run. Teams that do not require a reset will score higher than teams that do require a reset.

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Engineering Journal

1. How teams develop their solution is as important as the solution itself. The engineering journal is a record of this process and is included in judging team success. The journal must be an organized and detailed notebook or binder.
2. At the showcase, each team must submit one engineering journal.
3. The engineering journal should be started at the beginning of the team's involvement in the program. Organized records should be kept of all team activities. The team's journal is a living document. More information on engineering journal requirements can be found on The Tech Challenge website. Go to Team Guide then click Engineering Journal.
4. Display boards (like those used for science fairs) and digital presentations are not a substitute for an engineering journal. However, these may be a useful part of a team's presentation to the judges.
5. Journals may be typed or handwritten. Legibility and organization are important.

Safety

1. Safety is the top priority during all phases of The Tech Challenge.
2. Teams will be judged on safe design and implementation.
3. Judges have full authority to stop any activity they view as unsafe. The judges' word is final.
4. Teams must be able to transport their device safely without the assistance of others such as parents, advisers, siblings or friends. The use of carts, wagons or other transport devices is recommended.
5. Each team will identify a team safety officer who will ensure safety from design through implementation.
6. Teams must provide their own ANSI-approved eye protection (glasses, goggles, shields) and wear eye protection at all times when in designated areas around test rigs or when constructing/testing their device.
   a. Regular eyeglasses do not provide the necessary level of eye protection and are not an acceptable substitute for ANSI-approved eye protection.
   b. Teams will not be allowed to participate at test trials or the showcase unless all members have the required eye protection.
7. Batteries used in the device must be sealed and adhere to Device Specifications Rule 8.
8. Teams may not use flammable liquids or gases.
9. Teams may not use pressurized gases greater than 5 psi. Teams using pressurized gas must use a gauge to demonstrate to judges that the pressure does not exceed 5 psi.
10. No pressurized tanks/cylinders are allowed.
11. No use of animals is allowed.
12. The use of AC power is not permitted at test trials or the showcase.
13. Closed-toe shoes are highly recommended.
14. For more information on safety refer to Science Safety Handbook 2014.

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Adviser

1. Teams must have an adult adviser. Team solutions must be designed, built and tested by team members, not the adviser.
2. The adviser role is to guide, facilitate and mentor.
3. The adviser may not be a Tech Challenge judge.
4. An adviser may work with more than one team. However, it is important that advisers ensure each team receives the necessary level of attention.
5. Click here for the Adviser Guide.

Spirit of the Challenge

The Tech Challenge emphasizes the importance of developing engineering solutions that would be practical in real life, otherwise known as the Spirit of the Challenge. Judges will be looking for compliance with this idea and will ask teams questions like, "How would your design work in real life?" They will also look to a team's engineering journal for evidence of real-world application of the team's solution.

Store-bought solutions are not in the Spirit of the Challenge. Teams are encouraged to design and build devices using their own ideas and creativity. Use of existing plans for reference and inspiration is allowed. All plans, and the source of those plans, must be documented in the engineering journal.

Important Note Regarding the Rules

Clarifications and additions to the rules may be made due to lessons learned at test trials. When changes occur, registered Tech Challenge teams will be alerted by email. Changes will be noted in the rules on The Tech Challenge website in red type. Teams are encouraged to monitor the website for changes. The website also includes answers to frequently asked questions (FAQs) which are added and updated periodically.