




The Tech Challenge

Presented by
Dell Technologies

201 S. Market St.
San Jose, CA 95113

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Rules

The Tech Challenge 2020: Launch, Land, Expand!

Scenario

Your team is going to explore a distant planet!
The mission: **Launch, land** and **expand**
equipment for scientific research and
life support.

Challenge

Your team will build a launcher to propel
devices in an arc through a hoop to land in
a designated area. After landing, devices
should expand into a larger size. The challenge:
Design, document and build a solution.



Launcher Specifications

1. Each team must build their own launcher. Only one launcher is allowed per team. The launcher can aim in any direction as required to launch devices.
2. Maximum launcher size: 4' x 4' x 4' [1.2 m x 1.2 m x 1.2 m] at all times during setup and while launching. See Figure 1.
3. Weight limit: None. However, the team must be able to transport and set up the launcher and devices by themselves.
4. A trigger mechanism must be built into your launcher and used during Test Trials and Showcase. The trigger must be initiated from the safety area without team members reaching into the launch area.
5. Battery power is allowed for your launcher and must adhere to the rules given in the Safety section below.
6. Remote control is only allowed for triggering or aiming.
7. Human power can only be used to load, ready and trigger the launcher.
8. Launcher must be clearly marked with the team number.
9. Adjustments of your launcher are allowed between attempts.
10. Each team must have its own launcher. Teams may not share their launcher or any portion of their launcher with other teams.

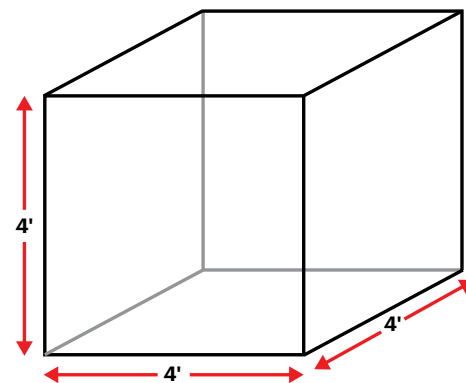
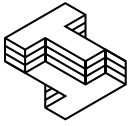


Figure 1. Maximum Launcher Size



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Device Specifications *(all measurements are nominal and metric conversions are rounded)*

1. Maximum weight per launch: 1 lb. (454 g)
2. Maximum launch envelope: 10" x 10" x 10" [25.4 cm x 25.4 cm x 25.4 cm]. See Figure 2.
3. All parts of your device must stay connected before and after expansion.
4. Teams will build a minimum of two types of devices:
 - a. Area Device(s) — Expand in 2 perpendicular dimensions beyond the **maximum launch envelope**, like a solar array. Your device should cover as much ground as possible.
 - b. Volume Device(s) — Expand in height and area beyond the **maximum launch envelope**, like a habitat.
5. Battery power is allowed for your devices and must adhere to the rules given in the Safety section below.
6. Remote control is not allowed for your devices.
7. Each device must be clearly marked with the team number.
8. Each team must have their own devices. Teams may not share their devices or any portion of their devices with other teams.

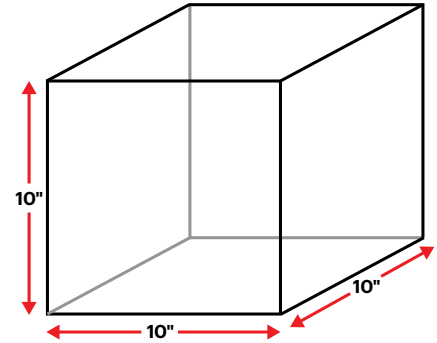


Figure 2. Maximum Launch Envelope

Course Specifications

1. Launcher area will be 7' [2.1 m] away (measured on the ground) from the suspended hoop. See Figures 3a and 3b.
2. Team safety area: 4' x 10' [1.2m x 3.0m] team safety area will be behind the launch area.
3. Landing zone: 15' x 10' [4.3m x 3.0m].

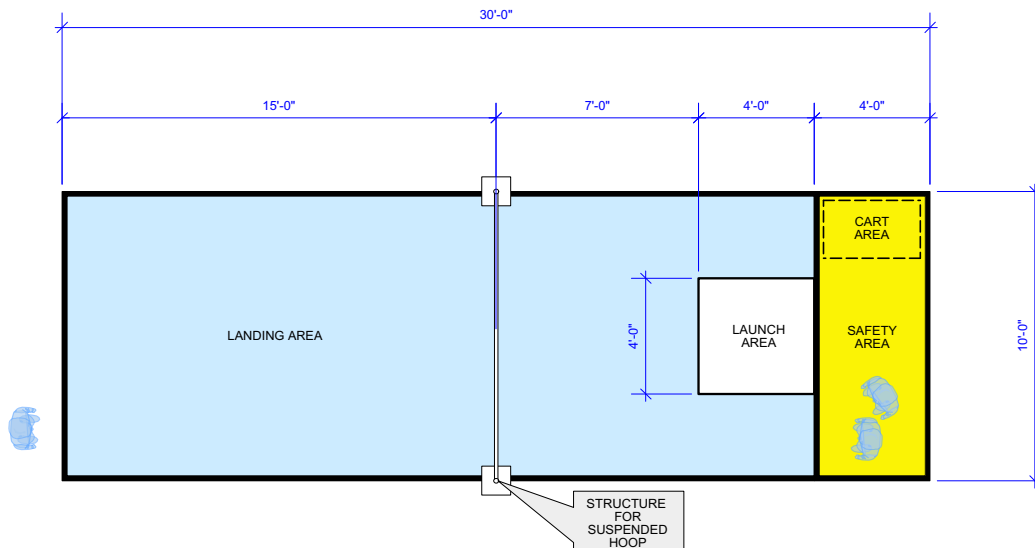


Figure 3a. Course specifications for [Challenge Rig](#)

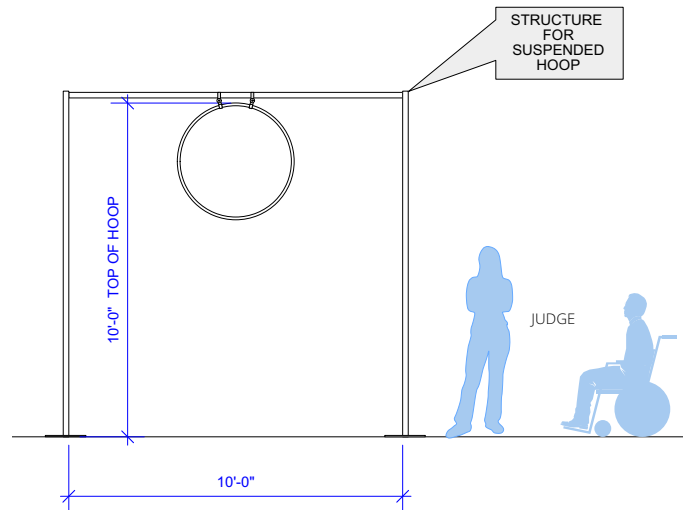
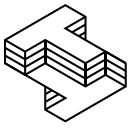


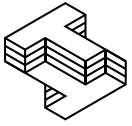
Figure 3b. Course specifications for [Challenge Rig](#)

4. Hoop diameter/height:

Grade	Hoop diameter (inner diameter)	Top of hoop (suspension point)
4-6	40 inches [101.6 cm]	10 feet [3.0m]
7-8	36 inches [91.4 cm]	10 feet [3.0m]
9-12	30 inches [76.2 cm]	10 feet [3.0m]

Device Performance Rules

- Prior to device performance, the team must give the judges a photo or detailed sketch of each planned expanded device with legible dimensions on an 8½ x 11 inch sheet of paper. See [Planned Device Expansion Template](#) for an example.
 - This photo or sketch will help the judges determine if the team has met their planned expansion goal, **including whether it is an area or volume device.**
 - Team number must be clearly visible on photo or sketch.
 - The photo or sketch will not be returned to the team.
 - High school teams must include orientation of expanded device in their photo or sketch.
- Each team has 4 minutes total for both setup and performance.
- Device performance ends when the 4-minute time ends or the team completes launching all devices, whichever happens first.
- Your launcher will be placed on the ground in a specified 4' x 4' [1.2m x 1.2m] area.
- After your device is loaded, no human power may be used to push or pull your device.
- No tethers may be attached from the launch area to the device.
- The trigger mechanism must be initiated from the safety area.



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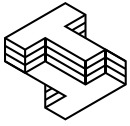
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8. What if a device hits the hoop?
 - a. If the team's device hits the hoop and does **not** go through, this is a failed attempt. No do-overs are allowed. The device may not be retrieved until the end of the performance period.
 - b. If a device hits the hoop but continues through no penalty is assessed.
9. Devices may not expand while in flight.
10. Only parts of the device expansion that remain in the landing zone will be measured.
11. After landing, the device must autonomously expand.
12. All parts of the device used in the final expansion must be connected together.
13. Teams may have up to 4 launches.
14. Due to safety considerations, devices cannot be retrieved **or removed** between launches.
15. Battery power is allowed and must adhere to the rules given in the Safety section below.
16. Remote control of devices is not allowed but may be used to trigger the launch.
17. Use of chemical reactions for launch or expansion is not allowed.
18. One area and one volume expansion will be judged.
19. Success is going through the hoop, landing in the landing zone and expanding.
 - a. The closer you are to your planned device expansion, the better.
 - b. A larger planned expansion in area or volume is better.
 - c. Enclosed devices are strongly encouraged.

Engineering Journal

1. How your team works together to research, brainstorm, build, test, evaluate, document, revise and repeat (iterate) is as important as the solution itself. The Engineering Journal is a record of this process. Start the journal at the beginning of your team's involvement in the Challenge.
2. At the showcase, each team **must** submit only one Engineering Journal.
3. Organized records should be kept of all team activities. The team's Engineering Journal is a living document. More information on Engineering Journal requirements can be found on The Tech Challenge website in the [Team Guide](#).
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.
6. Photo or detailed sketch of planned device expansion — This sketch or photo must be contained in your journal. You will be required to give a separate copy of this sketch or photo to the performance judges. The copy given to the performance judges will not be returned to your team.



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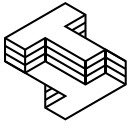
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7. Calculations — The team members must calculate the area and volume of the planned device expansion. Include all calculations in the team journal. Show your work!

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 launcher and devices safely without the assistance of others, including parents, advisers, siblings, friends, etc. The use of carts, wagons or other transport devices is encouraged.
5. Each team will identify a team Safety Officer who will ensure safety from design through implementation. All team members are responsible for safety.
6. Teams must provide their own head protection (e.g., bump hats, bicycle helmets, hardhats, or athletic helmets). Head protection must be worn at all times when in designated areas around test rigs or when constructing/testing their devices.
7. Teams must provide their own ANSI-approved eye protection (e.g., glasses, goggles, masks). Eye protection must be worn at all times when in designated areas around test rigs or when constructing/testing their devices.
 - 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 Showcase unless all members have the required eye protection.
8. All batteries used must be sealed and in good condition.
9. Teams may not use flammable liquids or gases.
10. Teams may not use pressurized gases greater than 5 psi. Teams using pressurized gas must be able to use a team-provided gauge to demonstrate to judges that the pressure does not exceed 5 psi.
11. No pressurized tanks/cylinders.
12. No chemical reactions may be used for launch or expansion.
13. No use of animals allowed.
14. The use of AC power is not permitted at Test Trials or Showcase.
15. Closed-toe shoes are highly recommended.
16. For more information on safety, refer to [Science Safety Handbook 2014](#).

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.





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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 team Engineering Journal.

Important Note Regarding the Rules

Clarifications and additions to the rules may be made due to lessons learned during 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 posted and updated periodically.