



Team Design Challenge

Find your team



Team Design Challenge

Why a Team Design Challenge?

- Learn Engineering Design Process
- Work with a team of other talented TAME students
- It's really fun!**

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Team Design Challenge

Today's challenge is all about exploring the surface of Mars.

NASA's current Mars rover is _____.

Any ideas of interesting engineering challenges they encountered?

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Landing – speed (13,200 mph to 0 mph),
different gravity, time limit (only 7 minutes to
land)

Power – solar power has been unreliable in the
past, this time NASA used radioactive decay of
Plutonium-238

Necessary capabilities and trade-offs –
maximum speed of 0.00073 mph

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Why is this information important?

Your challenges today will be different than **NASA's**, but use these examples to inspire creative engineering approaches to solving your challenges and trade-offs.

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Congratulations on being the first team of humans to reach Mars. Unfortunately, your spacecraft crashed upon impact and destroyed your Mars Rover. Your team must be able to explore the Martian landscape. Your mission is to build a replacement self-propelled vehicle using debris gathered from the wreckage.

Today's task is to design and build a prototype for this vehicle.

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Primary objectives:

Distance and accuracy – want to travel as far and as straight as possible

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You will have 60 minutes to design, build and test your project.

Suggested schedule:

- Design – 10 minutes
- Build – 30 minutes
- Test and refine – 20 minutes

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- Each inch that the rover travels scores points.
- Bonus points will be awarded if your rover travels at least 6 inches on all three runs.
- Win by scoring the highest number of points.
- Additional awards will be given for creative designs.

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Each team will be given the same set of instructions and supplies.

Be sure to check your supplies immediately since any missing supplies must be replaced in the first five minutes of the challenge.

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Assign roles for each team member:

- Process Engineer
- Propulsion Engineer
- Design Engineer
- Structural Engineer
- Production Engineer
- Test Engineer

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Rules:

- Each rover must have a propulsion system (something to make it move on its own), a release mechanism (some way to get the rover moving) and a chassis (vehicle body) when brought in for testing.
- The team-number sticker must be visible when looking down on the rover.
- The rover must be self-propelled and cannot be pushed forward by a team member.
- Rovers must be able to travel on the floor in the testing area. Each time the rover travels down the testing area **it has completed one 'run' down the track.**

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Regulations for judging:

- Only qualified runs will be scored at judging. To qualify:
 - Rovers must be released from behind a clearly marked starting line in the judging area.
 - All parts of the rover must be behind this start line when the rover is released.
 - The rover must touch the ground as it moves.
 - The rover must move forward and a portion of its body must cross the start line.
- Once the rover is released it cannot be adjusted/touched while in motion and until the judges score the run.

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- Team members may watch the judging runs from a distance, as specified by the judges.
- If the rover rolls backward or runs into an obstacle, judges will wait until it stops and then measure the distance traveled. If the rover stops behind the start line, the distance traveled will be counted as 0.
- If necessary, teams may repair the rover during the **‘reset and repair’ time between runs. However the design may not be changed during this time.** The fabrication station is closed during testing.

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TASK	SCORE
Rover has a name	10
Rover chassis is creatively built and decorated	10
Team can explain why the rover moves (identify its propulsion system)	10
Team number sticker is visible when looking down at the rover	10
Rover completes 3 qualified runs	10
For the top 2 qualified runs, 5 points are awarded for each inch traveled by the rover. The perpendicular distance between the start line and the part of the rover closest to the start line is used to calculate score.	Distance * 5
For every 6 inch segment traveled, 30 bonus points are added to the score.	Segments * 30
TOTAL SCORE	Sum of above

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Suggestions

- Spend about 10 minutes planning and drawing your design before building.
- Test your ATV as you build to make sure it works.
- Divide and conquer – allow team member to work on different parts of the rover.
- Be creative. There are many different ways to build a winning vehicle, so think about different approaches you could take.

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Fabrication Station

- Each team will be given 2 tickets to visit the fabrication station.
- The fabrication station will have hot glue guns and needle-nose pliers with wire cutters available for use.
- Only the production engineer may visit the fabrication station. He/she must redeem a ticket to glue parts or use the tools provided at the station.
- The rover (or its parts) must be taken to the fabrication area. Tools and glue guns cannot be checked out for team use at the work table.
- Team time at the fabrication station is limited. Each team may receive up to 4 dots of glue and use the other tools available at the station for a maximum of 2 minutes. The volunteer at the fabrication station will enforce the time limit.
- Be careful around glue guns—the metal tips and glue are VERY HOT. If you touch either while they are hot, you will burn your skin.
- Plan your trips wisely – there may be a wait to use the tools.

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Some quick hints:

- Study all of your supplies and think about multiple ways to use them.
- Determine how you will propel your ATV.
- Think of sources of potential energy and how to convert potential energy to kinetic.
- Use the Engineering Process to design, build and test your rover.

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Read the instructions carefully, follow them precisely. Read what the rules state and base your decisions on the rules. If the rules do not state that you cannot do something, then you may do it, as long as it is safe and not destructive.

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Fabrication station location

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Listen carefully when you hear the air horn in the work area. Instructions will be given at that time.

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When you leave the auditorium, stay with your team and find the table where you will be working. You may not touch any of the items on your table until our head judges give you the signal to start.

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