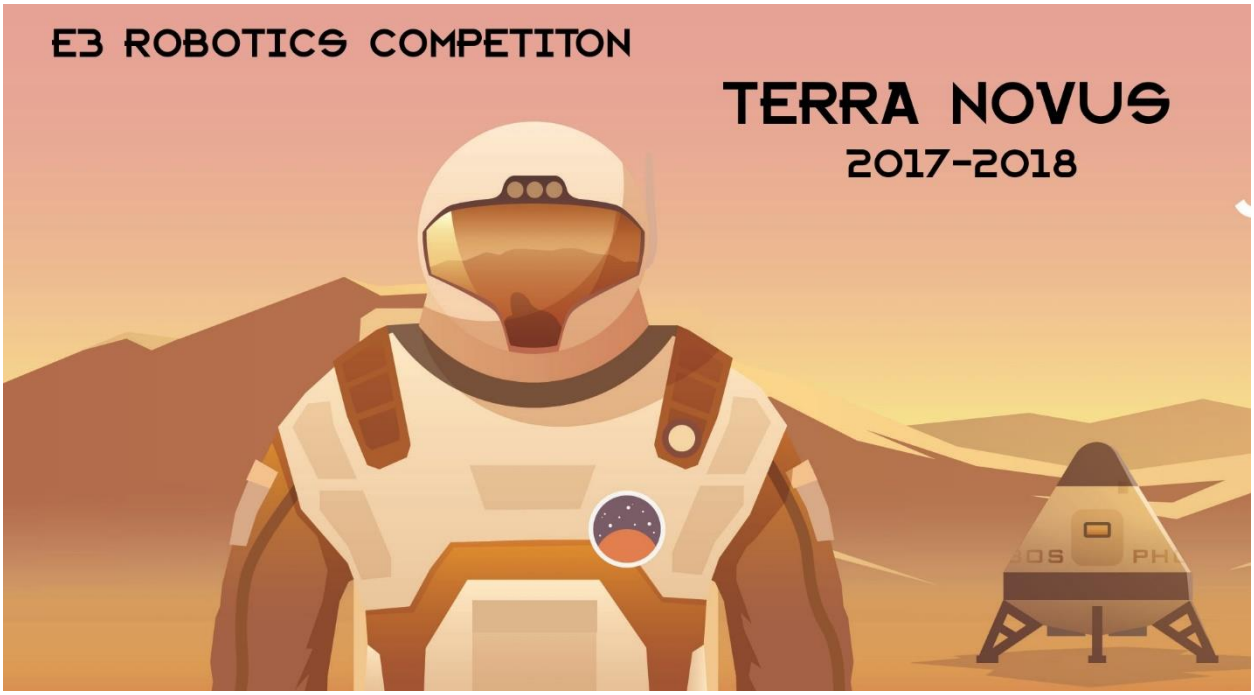


2018 E3 ROBOTICS COMPETITON

PRODUCT DEMONSTRATION AND SPECS BRIEFING

E3 ROBOTICS PHILOSOPHY

- THE E3 ROBOTICS COMPETITON IS ABOUT STUDENT LEARNING
- IT IS DESIGNED TO BE AN EVENT THAT CHALLENGES STUDENTS TO APPLY THE PHYSICS, MATH, ELECTRONICS, AND ENGINEERING SKILLS THEY ARE LEARNING IN THE CLASSROOM TO SOLVE PROBLEMS FROM THE WORKPLACE.
- MENTORS (TEACHERS, PARENTS, WORKING PROFESSIONALS) ARE EXPECTED TO LIMIT THEIR INPUT TO EDUCATIONAL AND INSPIRATIONAL ROLES AND ENCOURAGED TO FOCUS ON THE BENEFITS OF THE LEARNING PROCESS AND NOT SIMPLY ON "WINNING" THE COMPETITON.

Terra Novus: Terraforming Mars

Context

Terraforming Mars is the process by which the surface and climate of Mars would be deliberately changed to make large areas of the environment hospitable to humans, thus making the colonisation of Mars safer and sustainable.

There are a few proposed terraforming concepts, some of which present prohibitive economic and natural resource costs, and others that may be achievable with foreseeable technology.

Future population growth, demand for resources, and an alternate solution to the Doomsday argument may require human colonisation of bodies other than Earth, such as Mars, the Moon, and other objects. Space colonisation will facilitate harvesting the Solar System's energy and material resources.

In many respects, Mars is the most Earth-like of all the other planets in the Solar System. There is a theory that Mars had a more Earth-like environment early in its history, with a thicker atmosphere and abundant water that was lost over the course of hundreds of millions of years. Given the foundations of similarity and proximity, Mars would make one of the most plausible terraforming targets in the Solar System.

Need

Space X, located in Hawthorne, California has issued a request for proposals (RFP) for a remotely operated vehicle (ROV) and crew that can operate an expedition to terraform Mars. The specific tasks for the ROV and operators include:

1) Retrieve ores and sediment samples
2) Partition Carbon
3) Retrieve damaged equipment

Before launch and operations, the ROV must complete a series of "product demonstration" staged at various regional locations. Companies that successfully complete the product demonstrations and deliver exceptional engineering and communication components (e.g. technical documentation, engineering presentation, and marketing displays) will be awarded the contract.

REFERENCES

- https://www.bibliotecapleyades.net/universo/terraforming/terraforming04.htm
- http://blogs.discovermagazine.com/crux/2016/06/14/terraform-mars-experiments/#.WdJdzmhSz6Q
- http://www.sciencedirect.com/science/article/pii/S0273117798001665
- https://www.nbcnews.com/mach/space/scientists-hatch-wild-plan-terraform-mars-n751306
- http://www.users.globalnet.co.uk/~mfogg/paper1.htm
- https://www.researchgate.net/publication/222582956_Terraforming_Mars_A_review_of_current_research
- http://www.dartmouth.edu/~humbio01/s_papers/2001/budzik.pdf
- https://www.space.com/36563-terraform-mars-asteroid-strike-lake-matthew.html
- https://www.popsci.com/climate-change-on-red-planet
- https://spectrum.ieee.org/aerospace/space-flight/terraforming-mars
- https://www.universetoday.com/113346/how-do-we-terraform-mars/
- https://phys.org/news/2017-03-nasa-magnetic-shield-mars-atmosphere.html
- https://blogs.scientificamerican.com/life-unbounded/so-you-want-to-terraform-mars/
- http://www.pbs.org/exploringspace/mars/terraforming/page3.html
- https://www.nasa.gov/centers/ames/news/releases/2004/04_22AR.html
- https://astrobiology.nasa.gov/news/how-to-give-mars-an-atmosphere-maybe/
- http://ngm.nationalgeographic.com/big-idea/07/mars-pg2

DESIGN BRIEF

Below is a summary of the product demonstrations organised by competition class. All product demonstrations should be attempted in one product demonstration run.

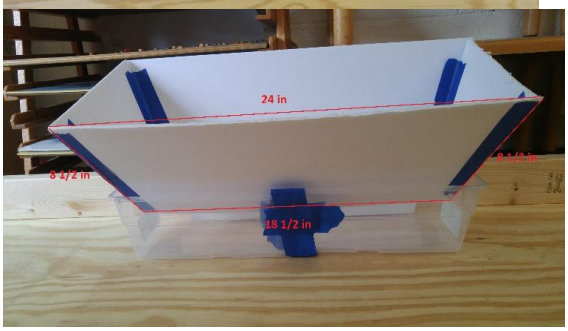
BETA

- Retrieve ores and sediment samples
  - Gather rocks containing Martian samples to return to base
- Partitioning Carbon
  - Using magnets, move the iron filament to the marked centre to complete the circuit for the carbon partitioning system
- Solar Receiver
  - Unlock the solar panels so that they fold outwards.
- Retrieving the damaged equipment during the sandstorm
  - Use any methods to gather the damaged modules on the rough terrain and bring them back to a base for repairs.
- Cooling Rods
  - Remove the pin so that the top pops up and the cells can be cooled by the atmosphere
- Mountain Transmitter
  - Activate the button to transmit the data before the sandstorm hits.

GAMMA

- Retrieve ores and sediment samples
  - Gather rocks containing Martian ores to deposit in the ore extractor
  - Gather rocks containing Martian samples to return to base
- Partitioning Carbon
  - Using magnets, move the iron filament to the marked centre to complete the circuit for the carbon partitioning system
- Retrieving the damaged equipment during the sandstorm
  - Use any methods to gather the damaged modules on the rough terrain and bring them back to a base for repairs.
- Solar Receiver
  - Unlock the solar panels so that they fold outwards.
  - Adjust the satellite dish on top to acquire frequency.
- Cooling Rods
  - Remove the pin so that the top pops up and the cells can be cooled by the atmosphere
- Mountain Transmitter
  - Activate the button to transmit the data before the sandstorm hits.

Retrieve Ores and Sediment Samples



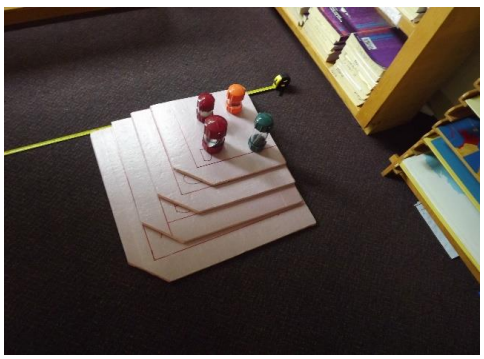
1. Gather rocks containing Martian samples to return to base. Rocks will be randomly scattered across the board.

2. Gather rocks containing Martian ores to deposit in the ore extractor.

Partitioning Carbon

1. Using magnets, move the iron filament to the marked centre to complete the circuit for the carbon portioning system.

Retrieving the damaged equipment during the sandstorm



1. Use any method to gather the damaged modules on the rough terrain and bring them back to base for repairs.

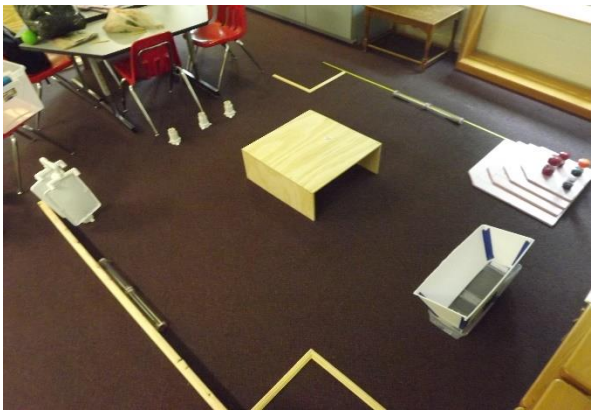
Solar Receiver

1. Unlock the solar panels so that they fold outwards.

Cooling Rods

1. Remove the pin so that the top pops up and the cells can be cooled by the atmosphere

Mountain Transmitter



1. Activate the button to transmit the data before the sandstorm hits. To trigger the Led lights

2. If each teams triggers a LED light strip, bonus points for each team.

SPECS

What follows is a summary of the electrical and fluid power requirements for each competition class. The complete design and building specification will be included in the competition manual.

Size Requirements:

Space X has included an ROV size and weight requirement in the request for proposals (RFP). Smaller, lighter vehicles will be given consideration and vehicles above a certain size and weight will not be considered for points.

To receive points for the smaller sized vehicles, the two largest dimensions of the vehicle and tether (if applicable) must fit through a round hole of the following dimensions

Weight Requirements includes the Batteries in the Robot

Beta			
Size	**Points**	**Weight**	**Points**
32 cm diameter	**50**	**2.27 Kg**	**70**
42 cm diameter	**10**	**4.55 Kg**	**50**
42+cm diameter	**0**	**6.80 Kg**	**0**

Gamma			
Size	**Points**	**Weight**	**Points**
21 cm diameter	**50**	**2.27 Kg**	**50**
32 cm diameter	**30**	**4.55 Kg**	**30**
42 cm diameter	**0**	**6.80 Kg**	**0**

Mechanical & Electrical Specifications and Restrictions

- **Electrical:**
  - Power (robot must have onboard power)
  - Electrical battery (12 Volt 15-amp max)
    - Must be machine manufactured (no home-made batteries)
  - Transmitter/Receiver: For wireless transitions robots, must use radio transitions, Bluetooth, or other wireless methods (Vex, Vex iq controller etc.)
  - Tethered robots must connect tether to our ceiling mount (6ft high pully system) for all robot runs. Recommended tether of 25ft. It is the operator's responsibility to ensure their tether does not interfere or hinder robots on the field.
  - All custom circuits must be secured inside of the housing.
  - The metal frame cannot carry charge (Grounded).

- **Mechanical**
  - Pneumatics, all compressors must be off the robot, with air tanks located on the robot.
  - The Robot must be able to have four corners touching the surface of the game board via gravity – (e.g. no flying robots)
  - Any materials are allowed in the construction of your robot unless they have been prohibited. Please check rules for details.

- **No:**
  - Lasers, Liquids
  - Explosive
  - Intentional Flammability
  - Sharp objects/parts
  - Projectiles
  - Objects intentionally designed to damage or cause harm to field, obstacles or other robots.

Resources

Teams are permitted to use the materials of their choice provided that they are safe, will not damage or otherwise mar the competition environment and are within the defined design and building specification.

Teams are encouraged to focus on engineering a vehicle to complete the product demonstration tasks; when considering design choices, teams should ask themselves which one most efficiently and effectively allows them to solve the problem. Re-using component is built by previous team members is permitted provided that the current team members evaluate, understand and explain their engineering and operational principles. Using or re-using commercial components is permitted, provided that the team members evaluate, understand and can explain their engineering and operational principles. Teams will be questioned **extensively** on their overall design and component selections during their technical sales presentation.