National Engineering Month 2014 Meeting Plan
"Mission to Mars"

Age 5-6
Duration: 50 Minutes

National Engineering Month takes place during the whole month of March. It is a national opportunity for engineering professionals to show young Canadians the true value of engineering, and what a fun and rewarding career it can be.

Premise of this meeting plan:
Humans have begun colonizing Mars. With this colonization comes a series of engineering challenges that must be addressed for the people to survive and thrive. During the process of colony building a large amount of supplies will be delivered from Earth, but the noise and dirt clouds thrown up by the rocket thrusters mean the rocket landing site must be a long distance from the colony. The main task then is to safely transport all the supplies from the rocket to the colony as quickly as possible to ensure that the harsh environment of the red planet does not adversely affect any of the parts.

National Engineering Month 2014 Crests are no longer available for purchase from www.e-patchesandcrests.com, but you we can create you a custom patch instead.

Training videos can be found on the **Mission to Mars- NEM 2014** YouTube Channel: http://bit.ly/1jnhjDQ.

Get involved by sending photos of your completed rovers to rmalmond89@gmail.com to post on our Pinterest board http://bit.ly/LGXRGR. Please provide a first name and age (and unit/troop name). Please confirm that anyone under the age of 18 featured in the photos has a completed photo release form allowing use of their photo.

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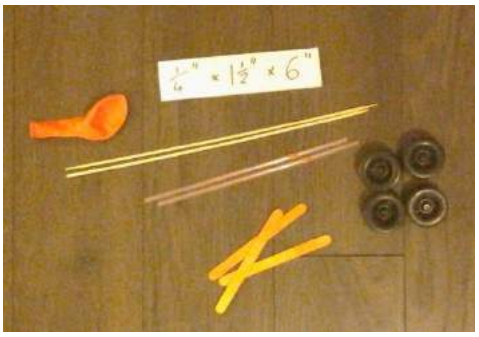
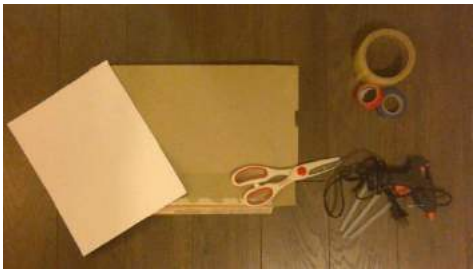
Materials List

Materials needed per participant:



4 wheels or bottle lids
1 drinking straws
1 wide straw or ¼” tube
1 dowel rod (1/8) or bamboo skewer
1 Wood/foam board platform cut to ¼" x 1 ½" x 6"
1 balloon
2-3 popsicle sticks
Cardboard, thick, thin, paper

Group supplies:



Rubber balls/ golf balls or eggs (load)
Tape
Hot Glue (optional)
Scissors
Pens/pencils
Extra materials

Working Space: Each participant should have adequate table space to work on.

Test Area: This consists of three parallel strips of tape placed on the floor at 0m, 1.5m and 2m. For visual reference you can print the rocket and colony images at the end of this package and place them at 0m and between 1.5 and 2m respectively. The aim will be to land the rover/ device between 1.5 and 2m.

Recommended suppliers:

www.kelvin.com has a great selection of car kits and parts including a complete balloon rover bulk kit for groups.

Warm-up Activity: Setting the scene

Duration: 10 minutes

Activity: Story about Mars with actions

Start by demonstrating the actions below. Explain that when they hear one of these words in the story they should do the action. You can assign each part to smaller groups if preferred or ask the participants to choose their own actions for each word.

Word	Action
Rocket	Stand up put hands together over head and make 'whoosh' noise
Martian	Make your best alien impression!
Earth	Hold hands with neighbors.
Gravity	Get as low to the floor as you can.

A great book to use for this activity is:

'Mission to Mars' by Franklin Branley.
Publisher: HarperCollins (September 3, 2002)
Language: English
ISBN-10: 0064452336
ISBN-13: 978-0064452335
Available from Amazon.com

This book has very clear explanations of Mars and excellent illustrations. Due to copyright a full copy of this story cannot be provided here, however an alternative ending is given below which gives a great lead in to the next activities.

"You will need to have a Mars rover to explore the parts of the planet far away from the station.

As you move around in the rover you will gather samples of rock to be taken back to the laboratory. Very likely some will be 4 billion or 5 billion years old- as old as the solar system. Some of these will be very heavy, even with the low gravity, and you will need to carry them using your rover.

All the basic parts for the rover were sent with the cargo, but you need to put them together to build your rover. In the pack you have one rover platform, four wheels, two wooden rods, two tubes, some structural materials and an air power supply. How can you put these parts together to make a device that will help you get the rocks back to the laboratory?"

Learning objectives: this story presents some interesting facts about space and the planet Mars, as well as providing the basis for the next activities. Encouraging the participants to prompt each other for actions will provide some teamwork element

Intro to activity and idea generation

Duration: 5-10 minutes

From the end of the story we found several objects in the supplies which we can use to build a transporting device. These are the basic materials of their Mars rover.

Ask the participants to think of ways to get the rocks (the ball or egg) back to the laboratory in the colony using only these objects. No ideas are too crazy at this time.

Demonstrate the balloon by blowing it up and releasing it. Explain that when the air is in the balloon it makes the rubber stretch, but the rubber wants to return to its relaxed position so when it is released it forces all the air out really quickly which makes the balloon fly forward. How could we use this to make our rovers?

Show a sample of a finished balloon rover and point out the different parts and what they do, e.g. the straws allow the wheels to turn freely, the dowel holds the wheels together etc.

Learning Objectives: to get the participants to think about different ways they could solve the same problem. Understanding of the basic principles of air propulsion and how each part of the rover works.

Mars Rover Building Activity

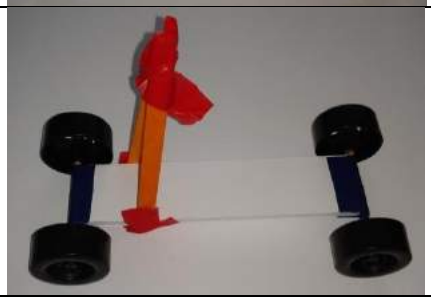
Duration: 20 Minutes

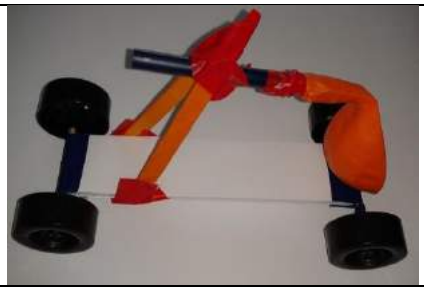
Design rules

1. The rover must land within the bounds of the colony (between 1.5m and 2m from the rocket landing site).
2. The package must be able to be removed from the rover at the colony without destroying the rover!

Build the basic rover (steps 1-6) as a group so that everyone has the same platform to adapt. Once complete each child can test their rover and make any modifications they want to make it go further or faster or improve the balloon mounting structure.

Build the basic rover

Step	Picture	Description
1		Cut two pieces of straw roughly the same width as the platform. Tape or hot glue one piece to each end of the platform.
2		Cut the dowel in two pieces approximately 1.5- 2 times the width of the platform. The additional length is needed to push into the wheels. Put one wheel on each dowel and glue or tape in place.
3		Push the other end of the dowel through the straw and secure the wheel on the other side to complete the basic platform. Check that the wheels spin freely.
4		Tape or glue two popsicle sticks into a triangle shape on top of the platform. Tape the tops together to secure the structure.

5		Cut a wide straw to a length of approximately 3in. Tape or glue this wide straw section to the balloon. Make sure to seal the edges well to prevent air leakage (fuel loss!)*Alternatively you can roll a tube out of paper or card in place of the straw.
6		Tape the straw to the top of the popsicle sticks. Be sure to leave enough straw sticking out to blow air into the balloon.

Design a rock holder

7. There is no standard method to attach the 'rocks' to the rover. It is up to the participants to decide how they want to attach the rocks.
   Suggestions: create a box from card to fit the ball. Cut and tape popsicle sticks to the platform to create a low barrier that will stop the ball rolling, use a small drinking cup to hold the package (if available).

Testing and refinement

8. Test the rover by carefully blowing up the balloon and placing a finger over the open end of the straw. Place the rover on the start line of the test area and release the balloon. See how far it goes.

9. Try fixing any failing parts of the rover to improve the performance. Design changes are acceptable.

Final Test- Allow at least 5 minutes for this

10. Remind the participants of the end of the story; that we need to get the space rocks back to the lab. Each participant gets a single chance to land their rover in the colony area. Mark the location each rover lands in with a name sticker or tape.

Wrap up Discussion

Duration: 10-15 minutes

Topic	*Questions*	*Reflection*
Getting Supplies to the Colony	How many people got the supplies to the colony? How many didn't make it? How many went too far? Why did/ didn't your rover make it? What differences in rover designs helped or didn't help?	The aim is for the participants to see that the amount the balloon is blown up determines how far the rover goes. The more air in the balloon the greater pressure on the rubber and the more force the rubber exerts to push the air out when the mouth is released. Controlling the fuel release is important because too much air will cause the rover to overshoot, just as too little will not reach the target.
Storing the package safely	Did anyone's package fall off their rover? Can everyone remove the package at the colony without destroying the rover? What package holder designs worked/ didn't work? How could you change something to make it work better?	Multiple different designs works, there is no single right answer. For the ones that didn't work there is always something you can to modify the design to make it better.
Using the rover on earth	Could you use this type of rover on earth? Where? Would it work the same or would you need to make changes to it? Do you think this would be better than the current options for transport and why?	This might be a cheap method of transport for developing countries as it doesn't use any non-renewable fuel sources, which makes it a clean technology and better for the environment. May need to add common transport features such as brakes and steering! Protection for the balloon (if you had some pop) might be a good thing to add.
Engineering	What is an engineer? How did it feel to be an engineer? **What kind of skills did you use that would be important for an engineer to have?** Do you think it would be fun to be an engineer?	Engineers solve problems. Reflect on things that engineers helped make from the story. Sometimes solving problems can be frustrating when it's going wrong but it's a really good feeling when you figure it out for yourself. The skills will be dependent on the group. Try to reflect on the activity and note any good examples you saw of these.

Engineering Skills:

Teamwork	Working together during the story to make sure all the actions were done
Creativity	To come up with ideas for the rover and package carrier
Problem solving	To figure out why the rover isn't working and fix it
Resourcefulness	Being able to use just the materials we found in the rocket
Helping others	Without the engineer the supplies wouldn't have been able to reach the colony!

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Hands on skills	Being able to build something from scratch.

Background to National Engineering Month

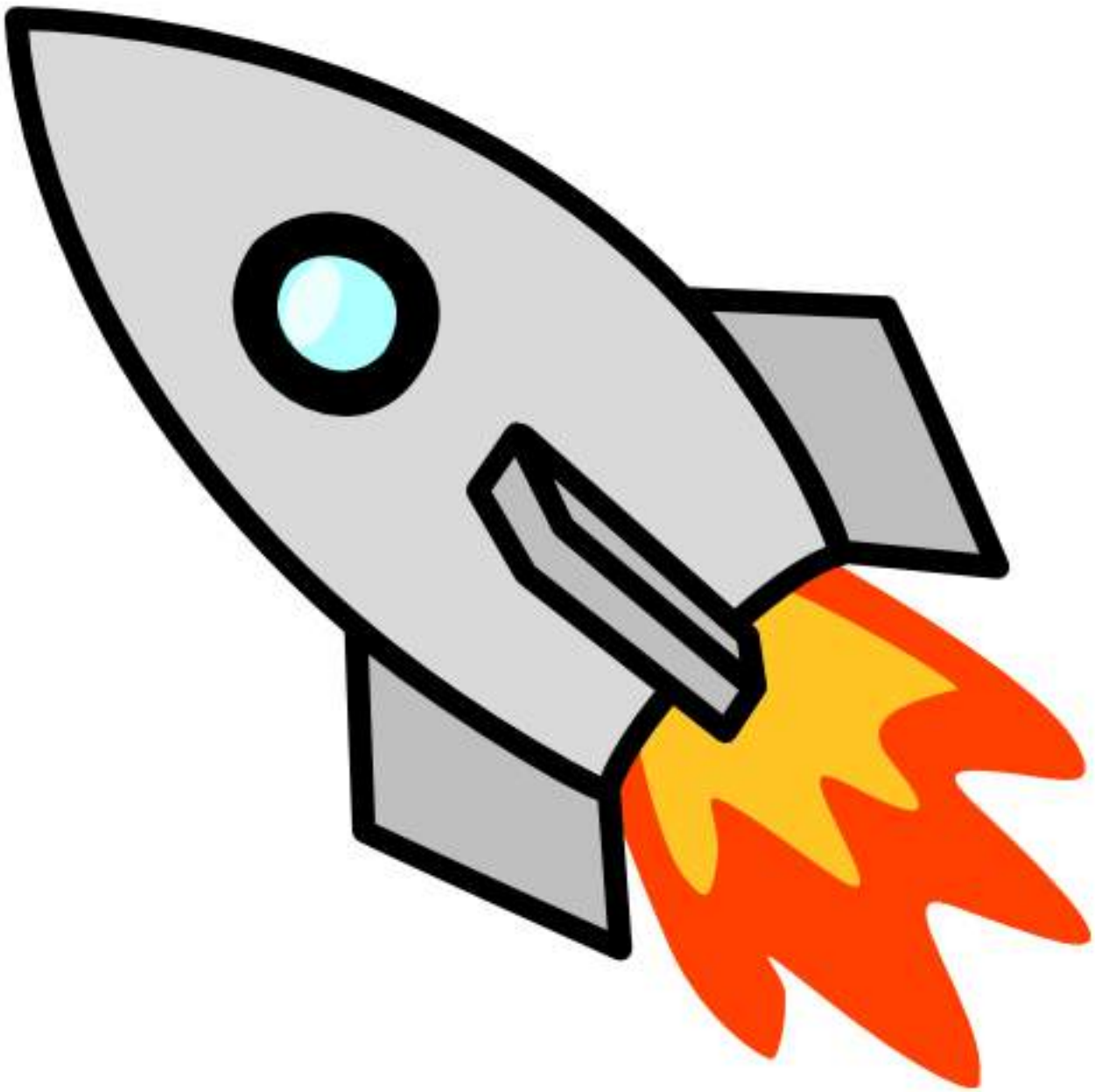
There is nothing you can't do and there are no heights you can't reach, once you discover what engineering has to offer!

Engineering is more exciting than many think. It is truly all around us. When you drive across a bridge, fly a plane, use a computer or make a cell phone call, you experience the brilliant work of engineers. The results of their work can also be seen in satellites orbiting the Earth, on offshore oil rigs and in tall buildings rising from the world's metropolitan cities. Canadians can work more efficiently, play more safely and enjoy life more fully, thanks to engineers.

Engineers shape our future with forward thinking designs, new technologies and breakthrough developments that haven't been thought up yet. They prove, each and every day, that anything's possible.

National Engineering Month is the biggest national celebration of engineering excellence, where volunteers in each province and territory host over 500 events that show Canadians how rewarding the career choice can really be. During the month of March, the profession strives to reach out to young Canadians to let them know what an exciting and fun career choice engineering really is. It is an opportunity for youth to learn about many disciplines of engineering, and allow them to see where their skill set and interests are best fitted. Since there are so many areas of engineering, it's important for kids to understand the various things they can do as engineers so they can pick the discipline that truly motivates and excites them the most. Additionally, the month can teach youth what exactly is needed to excel in the profession.

National Engineering Month also gives students the opportunity to learn about the remarkable accomplishments Canada's engineers have made over the years. For more information you can check www.nem-mng.ca to see examples in the Great Canadian Engineering section to learn things like how engineering work pushes the boundaries of flight and contributes to amazing manmade structures, and the Engineers in Profile section to meet incredible engineers who have been conducting important work like allowing amputees to control their artificial limbs with ease and building earthquake resistant structures.



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