Build a Launch and Landing System

Brought to you by:

Maria Mitchell Association

Become a flight engineer and build a device to launch a ping-pong ball through the air! See how far your ball will fly and how well you can aim its trajectory!

Materials for Launch:

- Cardboard tubes (from toilet paper or paper towel rolls) (2)
- Rubber bands (2), Paper clips (4), Tape, Ping-pong ball, Scissors

Instructions:

1) Cut a slit all the way down the long side of one of the tubes.

2) Roll the sliced tube in on itself by about an inch (2.5cm) and tape it back together.

3) Attach two paper clips to each rubber band.

4) Clip one end of each rubber band to the end of the smaller tube. This is now the back end.

5) Slide the back end of the smaller tube inside the front end of the larger one.

6) Clip the free sides of the rubber bands to the front end of the larger tube. Now the back end of the small tube should be attached the front end of the large tube.

7) Pull the back end of the smaller tube slightly through the back end of the larger tube and insert your ping-pong ball at the front end.

8) Hold the back end of the inside tube and pull it through so the rubber bands are stretched tight.

9) Aim your launcher, let go of the inside tube, and watch the ping-pong ball fly!

Troubleshooting:

Make sure the rubber bands are attached to the **back** of the inside tube and the **front** of the outside tube and that they stretch along the inside of the larger tube. This ensures that the rubber bands can get fully stretched out and that they do not pull the paper clips off. If the paper clips fall off anyway, try taping them on.

Extra fun:

- Practice your aim! Draw a target and hang it up or set out boxes on the floor at different distances and try to get your ping-pong ball to make it in!
- Experiment! Try aiming your launcher at different angles. What angles make the ping pong ball go the farthest or the shortest distances?

- What happens if you use thicker or thinner rubber bands? Or if you twist them up?
- What shape does the ping pong ball trace as it travels through the air, from the moment it leaves the launcher to when it hits the ground? Why do you think this is?
- Decorate your launcher and your goal boxes! Use markers or stickers to make them shine!

How does it work?

Rubber bands are stretchy, but they want to stay unstretched. When you do work by pulling on them to stretch them out, the rubber bands turn this into potential energy. As soon as you let go, the rubber bands want to bounce back to their unstretched state and they turn that potential energy into kinetic energy as they move. Since the rubber bands have nowhere to go with this kinetic energy, it gets transferred to the cardboard tubes and then to the ping pong ball, blasting it out of the launcher and pushing it through the air!

Although airplanes do not use this same system to fly through the air, it is still important to understand how the different pieces of an airplane store and transfer energy to make the plane lift off and stay in the air. Engineers and mechanics study and maintain the many different parts of an airplane in order to keep them all working together and flying safely.

Materials for Lander:

- For Astronaut: Ping Pong Ball
- For Lander: Plastic or paper cup, scissors, tape, construction paper or paper plate, cotton balls or recycled material to use as filler

Instructions:

Step 1: Put ping pong ball in the empty up. Hold out your arm and drop the cup. What happens to the astronaut? Your challenge: Build a landing platform so when you drop the lander the astronaut remains safe inside

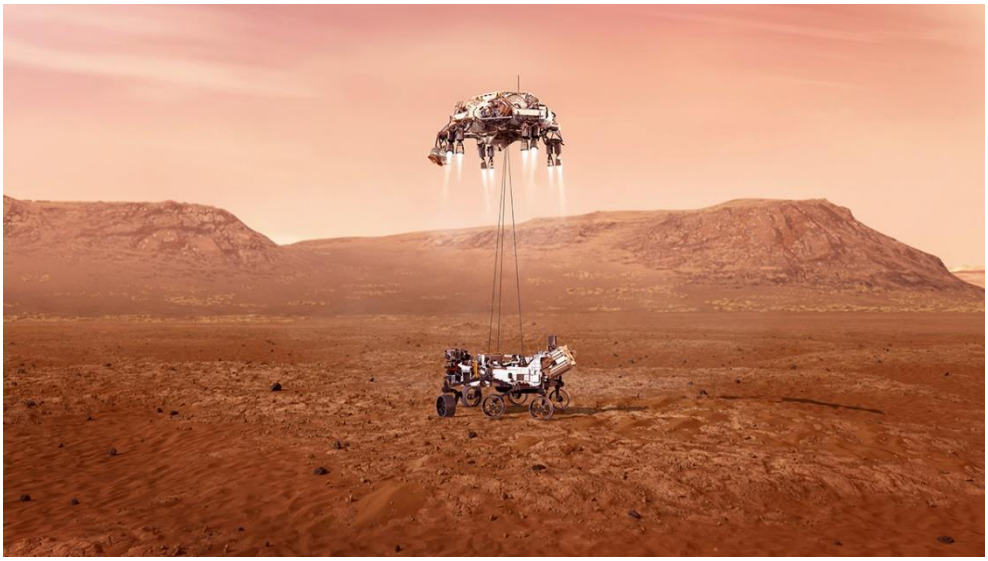
Step 2: First, tape your cup to a landing structure such as a half sheet of construction paper or paper plate. Drop this again with the astronaut inside the lander. What happens?

Step 3: Challenge: Add cotton balls, paper, recycled materials to the underside of your landing platform. Keep testing until you find something that lands safely and your astronaut stays inside.

A real life aviation technician:

Sandra Granados is an aviation technician, or flight technician, which means she fixes airplanes and makes sure they fly safely. She is a certified mechanic and travels all over the world, checking all the parts of the airplane and making repairs. Sandra grew to love airplanes and traveling when she was a kid and flew to visit her grandparents in Mexico every year.

The Mars Rover: Perseverance



What is the Perseverance rover?

Perseverance is a rover that landed on Mars on February 18, 2021. It is studying a region of Mars called Jezero Crater. This crater is interesting to scientists because it is a very old region of Mars, and it may have once been the site of an ancient river delta. The rocks in this region could tell us about the history of the Red Planet and may have preserved signatures of past life on Mars.This rover will answer lots of questions about the Red Planet and search for signs of past microbial life.

Rovers on **Mars** have collected evidence of water and some of the chemical building blocks of life. Scientists think it might be possible that life existed on Mars a long time ago. If there were living things, they were probably teeny tiny little organisms—something like bacteria here on **Earth**. But, did life actually ever get started on Mars?
The Mars 2020 mission hopes to answer that question. The mission sent a rover very similar to **Curiosity** to explore the rocks, dirt, and air on Mars. Like Curiosity, the Perseverance rover is the size of a small SUV. The new rover has a different goal and different instruments. It will look directly for signs of past life on Mars.
The new rover will also experiment with a natural resource that would be helpful in planning a human mission to Mars.

The atmosphere of Mars is made mostly of a gas called carbon dioxide. But many living things (including humans) need oxygen to breathe. If a human were to go to Mars, they would have to bring lots of oxygen. However, there isn't much room on the spacecraft to carry liquid oxygen.

The rover will test a method for getting oxygen from the air in the Martian atmosphere. This will help NASA plan for the best designs to send human astronauts to explore Mars one day.

Participate and Win Prizes

Scan this QR code and fill out a quick questionnaire to be entered to win a prize for participating in the Nantucket Science Festival 2021!

Video and Photography Contest

Take part in this science festival **technology** challenge. Make a video or shoot photographs of you or others engaged in STEAM (Science, Technology, Engineering, Art, Math) activities, post it on FaceBook or Instagram with #ACKSciFest and tag @The Maria Mitchell Association and @Nantucket Community School and be automatically entered to win one of our great prizes. You can choose activities from https://www.mariamitchell.org/nantucket-science-festival or come up with your own experiment or challenge.

A Special Thanks to Our Sponsors and Community Partners

Lead Sponsors

CAPE COD 5 Foundation

Maria Mitchell Association Nantucket's Science Center

Nantucket Community School ENGAGE • STRENGTHEN • CONNECT

Dr. David & Beverly Barlow

NISE NATIONAL INFORMAL STEM EDUCATION NETWORK

Nantucket Land Council Est. 1974

Community Activity Partners

Linda Loring Nature Foundation

Nantucket Land Council Est. 1974

Nantucket Conservation Foundation An Island Nonprofit Organization

Nantucket Atheneum Enriching Island Life Year-Round

UMass Boston

Roger Williams Park Zoo

Supporting Business and Organizations: Donated Materials & Prize Give-a-Ways

Stop & Shop
Dan's Pharmacy
Espresso-to-Go
Keeper's Restaurant
Born & Bread Nantucket
Marine Home Center
The Sunken Ship
Create
Nantucket Cottage Hospital
Siam To Go
Linda Loring Nature Foundation
Maria Mitchell Association
Nantucket Community School
Island Kitchen
Paula and Schuyler Henderson