



DISCOVERY ASTRONAUT SPACE PROGRAM

Missions Overview: Physics of Space

MISSION 1: LAUNCH INTO SPACE CAMP

In this mission the astronauts will prepare for their upcoming space camp missions. The mission includes: getting familiar with the Usborne Books Space Camp books included in their kit, gathering the necessary materials, and designing the cover of their Space Camp Lab Notebook.

MISSION 2: MAY THE FORCE BE WITH YOU

In this mission the astronauts complete experiments to explore the idea of how forces affect motion. They will explore the concept that force is a push or pull that makes something move, stop, or change direction.

MISSION 3: I'M DOWN WITH GRAVITY

In this mission the astronauts complete a series of experiments to explore gravity. They will investigate the concept that gravity is a force that is always present, pulling objects towards the Earth. What goes up, must come down!

MISSION 4: MOON WALK

In this mission the astronauts will explore the Moon and how it compares to the Earth. They will learn about the different phases of the Moon with a yummy cookie experiment.

MISSION 5: HERE COMES THE SUN

In this mission the astronauts explore the sky, Sun, and light. These experiments will have astronauts answering their own questions such as "Is the sky blue?", "What makes a sunset?", and "How high is the sky?".

MISSION 6: 3-2-1 BLAST OFF!

In this mission the astronauts will build and launch rockets. This mission will bring together many of the concepts from our previous missions such as forces and gravity. In addition, they will get a high level introduction to Newton's Laws of Motion.

MISSION 7: LIVING IN SPACE

In this mission the astronauts will explore living in space and how that is different from living on Earth. This mission will include several family activities such as making moon pies, and a creative writing assignment based on Kane Miller's book Pelly and Mr. Harrison Visit the Moon.

MISSION 8: SPACE: THE FINAL FRONTIER

In the last mission the astronauts show what they have learned during Space Camp by creating a travel brochure for space. They will answer questions such as "How will you get there?", "What will you see?", "What you should pack?", and many more!

Welcome Letter to Parents

This will be an adventure for your whole family. There are eight missions in the Apollo Space Camp program. Each mission has been designed to help your child explore and understand specific concepts. Studies have found that combining hands-on experience with reading promotes greater learning in science than just experimenting or reading alone.

Program Curriculum—The Space Camp curriculum is focused on the physics of space. Each of the eight missions has a series of experiments that allow the child to explore ideas for that mission. The missions should be completed in order because they are designed to build on each other. The Space Camp program is designed around the National Science standards and follows an inquiry based teaching method. This method is explained later in the Space Camp Notebook.

Reading—The Space Camp program recommends and encourages reading. You can read the recommended selections together or have your child read independently. The program comes with a selection of fiction and non-fiction books about space. Many of these books are linked to the internet via *Usborne Quicklinks*. These internet links are reviewed regularly and are appropriate for children. By using these links children can reference additional and appropriate information on space. They can also play games, look at videos, and download pictures from their book. Each book includes instructions on how to use *Usborne Quicklinks*.

Writing and Drawing Activities—One of the goals of the Space Camp program is for your child to write all summer long. As a general rule, the grade your child is entering is equal to the number of sentences he/she could write about a subject. For example, a second grader could explain an idea with 2 sentences, while a sixth grader could use 6 sentences. This is meant as a guideline; we want this experience to be fun, not stressful. Use your best judgment when encouraging writing. The program also regularly asks children to draw—remember that sometimes a picture is worth a thousand words!

How-What-Where—We want this experience to be fun and rewarding. There are many different ways you can work on this program. Some ideas include starting a “Science Day” and choosing one day a week to do the activities. You can also spread the activities out over the week. It is a great opportunity for families or groups to get together and have something fun to do. There is a shopping list for the entire program that includes items you may not have in your home. Each mission also has a Mission Materials page that lists all the items you will need to complete that mission.

Good luck and have fun!



Literacy Quick Tip: It is estimated that students can lose up to 30% of their skills and knowledge during the summer! Keeping your child reading, writing and problem solving during the summer can prevent “Summer Brain Drain.”

The 5 E's of the Inquiry Learning Cycle

Each mission design follows the 5 E's of the Inquiry Learning Cycle.

Engage — This is something fun to grab your astronaut's attention and peak his/her interest. It may be something quick or silly, but it is designed to immediately engage your child.

Explore — These are the experiments and learning activities selected to help your child begin to understand the concepts. These are guided inquiry lessons, where your child will be working to answer questions, exploring concepts, and having "Aha!" moments.

During these activities, you may find your child asks great questions and makes predictions. This means that they are working on understanding the concepts and thinking critically! Encourage questioning in this phase and use it as a chance to do some more exploration to find the answers. You should not be answering their questions, but instead helping them to explore. Your child may want to do a follow up experiment, or design/modify an experiment to test his/her theory. You may also want to consult your Space Camp books for help. If your child is not asking questions, you can help facilitate exploration by asking a few open-ended questions such as "What do you think will happen?", "What happened?", "Were you surprised by the results?", "Why did that happen?", "Will it always happen that way? Why or why not?", "If we were to do this experiment again, would you want to change anything? Why?".

Explain — After your child explores the concepts he/she will have an understanding of the concept. This step is a chance for your child to write or talk about their understanding of the concept. This is where vocabulary is introduced.

Elaborate — This is an extension on what they have learned or a new application of the concepts. This is another critical thinking activity to take the information they have learned and apply it to a new situation.

Evaluate — The last phase of the learning cycle is to evaluate how well the concept is understood. In a school environment, the teacher would be assessing student learning at this point. This section has been designed to wrap up what they have learned during the mission.



MISSION 2: MAY THE FORCE BE WITH YOU

How do forces change motion?

If you choose to accept this mission, you will be exploring forces and motion.

Engage

- Air Hockey Experiment*

Explore & Explain

- Balloon Rockets Experiment*
- Falling Orange Experiment*
- Mission Debrief*

Elaborate

- Balloon Hovercraft Experiment*
- Online Game Forces Fairground Mystery.** Go to *Usborne Quicklinks*, *100 Science Experiments* book, page 25

Evaluate

- Wrap It Up!*

Looking Ahead...

- Moon Observations.** In Mission 4, you will be exploring how the Moon looks different in the sky. You will need to observe the Moon two times this week. Record these observations under **Mission 4: Moon Walk**, *Moon Observations Experiment*, on page 33 of this notebook. For each observation, color in the picture of the Moon based on what you see, and write the date.



Literacy Quick Tip: Encourage your child to read and follow directions. With practice, children gain confidence in their ability to figure things out and are more eager to take on greater challenges. They will be less likely to get “stuck” in the early stages of problem solving or in math word problems.

Balloon Rockets Experiment

So What's Up?

Let's build balloon rockets to see how forces can move objects.

Mission Materials

- Usborne 100 Science Experiments book
- String or fishing line**
- Balloons, different sizes
- Small objects (e.g.: penny, action figure, etc.)

**Extra note: Heavy fishing line works better than string. This is a great experiment to let your astronauts use their imagination to create new adaptations! This is also a fun rainy day activity – so you may want to keep some of these supplies on hand.

Let's Make it Happen!

Refer to the procedure on page 24 of the Usborne 100 Science Experiments book.

**Extra note: If your paper clip on the end of the balloon does not keep the air in, have someone help you hold the end of the balloon and then let it go.

As a variation on this experiment: add a small object (e.g.: penny, action figure, etc.) to your balloon rocket. Predict how this might change the flight of your rocket.

What's Happening Here?



Answer the following questions about your results.

1. What happened to your balloon rocket when you let it go?

2. Did anything “unexpected” happen during your experiment?

3. When you added a small object to your rocket, you increased the mass of the rocket. What happened during flight?

Bet You Can Challenge!

Spacecraft have many rockets that launch it at the same time or launch in multiple stages. Can you design a balloon rocket with the force of two balloons? Predict how this would change the flight of your rocket.

Can you give it a try? **We Bet You Can!**



What happened?

Falling Orange Experiment

So What's Up?

Here's a neat trick using an orange, a mug, and some forces.

Mission Materials

- Usborne *100 Science Experiments* book
- Orange (or you can substitute a ball)
- Coffee mug
- Postcard, cardboard, or card stock

Let's Make it Happen!

Refer to the procedure in Usborne *100 Science Experiments* book, page 25.

- As a variation on this experiment – place a note card or playing card on top of a mug. Then place a penny on top of the card. Quickly flick the paper out and watch the penny drop.

What's Happening Here?

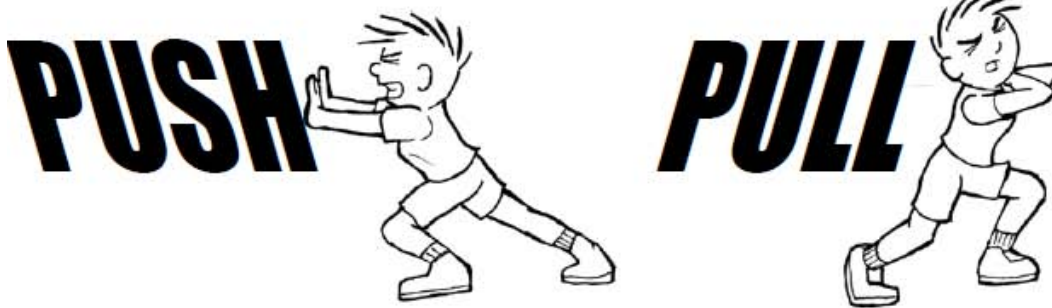
Discuss these questions before moving on.

1. The heavier an object is, the more it wants to stay where it is. This is called **inertia**. The more inertia an object has, the more force is needed to move it or stop it.
 - Name 5 other items that would have **more inertia** than the orange.
 - Name 5 that would have **less inertia** than the orange.
2. How could a magician use this experiment to create a magic trick?



Mission Debrief

A **Force** is a push or pull that makes something move, stop or change direction.



You use forces around your house and in your everyday life. You can represent a force in a picture with an arrow. The bigger the arrow, the larger the force.



Small arrow = smaller force



Bigger arrow = bigger force

- Find 3 *Pull Forces* at work in your life! Draw pictures and arrows to show the forces.