Lesson Plan 6: Space

Title: Space is the Place!

Aerospace Workforce Educator Program lessons are designed to help students build the foundational skills needed for aviation careers while gaining early awareness of the many professions that support our aviation system. Each lesson introduces core concepts—such as navigation, communication, safety, design, or problem-solving—and connects them directly to the real work of pilots, air traffic controllers, drone operators, maintenance technicians, airport specialists, and other aviation professionals. By making these connections visible and age-appropriate, educators can help students see how classroom learning links to real careers and inspires interest in fields they may not yet know exist.

Grade Level: Varies
Primary STEM Skill Focus Area: Problem Solving
NextGen Science Standards: 4-ESS1 Earth's Place in the Universe

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1. Lesson Objectives

Students will be able to:

- Explain how technologies enable humans to travel to space
- Explain the role of the FAA in enabling space transportation / travel
- Describe the role of a Spaceport

2. Overview

This lesson focuses on introducing students to the people, processes, and technologies that enable humans to travel to and work safely in space. The lesson will touch on the role of Federal Aviation Administration (FAA) in integrating space launches and commercial space transportation into the National Airspace System (NAS).

The presenter, an Educator, will get students inspired and engaged by first watching a short video of the Mars Perseverance Rover landing. The students will see kids just like them watching and cheering on the mission along with the emotional reactions of mission control team members. Then the Educator will talk with students about how it is that we fly to space. The lessons will then help explain the technology that makes this all possible.

3. Resources

This section includes resources for the Educator to review before delivering the lesson. These tables are intended to provide pertinent background information. Table 1 lists basic terms to know. Table 2 lists possible resources to share with students as part of the lesson.

Educators and the school officials should review the resources and links in advance of the lessons to ensure the content is consistent with school policies and security protocols before presenting to students.

Table 1. Terms to Know

Term	Definition
Propulsion	The action of driving or pushing forward – it's how Rockets fly in space

Term	Definition
Rocket	"Rocket" can mean a type of engine or it can mean a tall, thin, round vehicle that uses that engine to launch into space
Spaceport	Also known as launch sites, a place where spacecraft or rockets launch into space for various types of missions

Table 2. Potential Materials for Use During the Lesson

Title	Length	Source	Platform	Description
1. Perseverance Lands on Mars, as the World Watches	2:11	NASA	YouTube	NASA video from Feb 2021 when the world watched live as the rover landed on Mars. Includes footage of the landing while scientists, kids, and classrooms from around the world watched.
2. FAA Support First FAA Licensed Orbital Human Space Flight	1:16	FAA	YouTube	The FAA worked with NASA and Space X on the launch, reentry, and management of the airspace to ensure a safe and efficient launch.
3. NASA's SpaceX Crew-1 Launch	2:21	NASA	YouTube	In Nov 2020, SpaceX with NASA launched the Dragon Resilience, the first commercial space craft with astronauts to dock to the International Space Station (ISS)
4. Spacesuit Gloves	3:43	NASA	YouTube	See NASA interns trying a few simple tasks while wearing the gloves that astronauts wear during spacewalks. Hint: it's not simple.
5. FAA Commercial Space Transportation video	1:56	FAA	Faa.gov	FAA's role in commercial space transportation.
6. Introducing the Solar System and Beyond: Kids Edition	0:32	NASA	YouTube	Intro to a collection of videos straight from NASA that focus on our solar system and the instruments used to study it.
7. Action Cam Footage From October 2017 Spacewalk	1:30	NASA	YouTube	GoPro footage during a spacewalk outside the International Space Station.
8. Map of U.S. Spaceports	N/A	FAA	Faa.gov	Map of U.S. Spaceports, active as of Feb 2021
9. Spaceports by State	N/A	FAA	Faa.gov	List of U.S. Spaceports by state with detailed information

4. Activate Prior Knowledge (5 minutes)

The questions below are suggested prompts to introduce the lesson. Educators should modify these questions to align with the audience, their community, and their own experience.

- Today, we get to talk about flying -- from your local airport to commercial space flight to the Moon, Mars and beyond.
- Who here has seen movies about space?
- Has anyone watched a live space mission?

- Raise your hand if you saw the Mars Rover Landing on Mars in February 2021
- The FAA works with other organizations to make space travel as normal as flying an airplane

5. Instructional Sections

The lesson sections below include talking points to help Educators deliver a consistent message about how humans travel safely to space and how commercial space flights and evolving technologies are going to increase space travel.

Educators should modify these sections and the suggested timing to align with the audience, their community, and their own experience.

5.1 Introduction to Space (5 minutes)

- Does anyone remember the name of the Rover that landed on Mars in February 2021? *[Perseverance]*
- Let's watch a video to see the amazing landing, the team who made it happen and all the people, just like us, watching and getting inspired – maybe for their own **trip to space** one day

> **Suggested Video:**
> Highlights include reactions inside the NASA Jet Propulsion Laboratory, kids and home and classrooms watching the landing, and the emotions of the scientists and flight control team.
>
> - Perseverance Lands on Mars, as the World Watches [2 min 11 sec]

- How did we get to Mars and what's it going to take to get more of us to Mars, the moon, and beyond?
- Well, it starts with **rockets**

5.2 How Do We Get to Space? Rockets! (5 minutes)

- A **"Rocket"** can mean a type of engine or vehicle that uses a rocket engine
- A **rocket engine** is different from a **jet engine** (like in airplanes)
- A rocket engine doesn't need air – and airplanes do
- That's why a rocket can work in space where there is no air
- Rocket engines are used as the launch vehicles to carry the space craft from Earth's surface to space – to the orbit or beyond

5.3 How Do Rockets Work without Air?! (10 minutes)

- What happens once the space craft reaches the Earth's orbit or leaves the Earth?
- In space, because there is no air, an engine has nothing to push against
- Space engines create their own exhaust and push against it in order to move
- When a rocket pushes on its own exhaust, the exhaust pushes the **rocket**, and makes it move forward —this is called **propulsion**
- Engines work like this by using a scientific rule called "Newtons' third law of motion"
  - *300* years ago, English scientist Sir Isaac Newton listed three laws of motion. The 3rd law of motion is that for every action there is an equal and opposite reaction
- You can actually see how this science works yourself
  - Imagine a person standing still on a skateboard
  - Now that person on the skateboard throws a bowling ball
  - The ball will go forward, but the person on the skateboard will move backward
  - And because the person is heavier than the ball, the bowling ball will move farther forward than the person on the skateboard will move backward
- Now let's each make our own straw rocket

Suggested Video and Activity:

- NASA JPL Edu Learning Space: Make a Straw Rocket [2 min 33 sec]

5.4 How Does the FAA Helps Us Get to Space Safely? (5 minutes)

- Now that we know how **rockets** power space engines to get us to space, let's talk about take-off and landing
- Each space launch requires a launch system
- What are some of the items in the launch system?
  [A launch vehicle, a launch pad, a launch crew]
- The FAA plays an important role in enabling launches and re-entries of spacecraft
- The FAA issues licenses, or grants permission, to anyone who wants to launch a spacecraft from a **U.S. Spaceport**

Suggested Visuals:

- Map of U.S. Spaceports or the list of Spaceports by State

5.5 Will You Fly to Space One Day?! (10 minutes)

- We know astronauts fly to space, but did you know that the FAA is working to ensure we can all

safely fly in spaceplanes?

- As we start seeing more and more space launches and re-entries, the FAA is working with NASA and other private entities to make things easier for everyone to fly to space one day
- To do that, the FAA keeps space launch and reentry operations separate from other flights in our airspace to ensure safety
- Space launches may require closing off large chunks of airspace, so commercial airlines or military can't fly there
- Who's ready to go to space?
- Let's all draw our own spacecraft

Suggested Video:

- NASA Color the Galaxy video with craft project [3 min 24 sec]

5.6 Activity (15 minutes)

The table below includes sample activities for the lesson. These activities are also referenced in the appropriate Instructional Section. Please select one or two, depending on the time available:

Table 3. Sample Activities

Activity	Objectives	Educator Actions	Student Actions	Closing
Make and launch a Straw Rocket (Section 5.3)	The students will create their own straw rockets, powered with their own breath	The Educator will provide students with: ○ scissors ○ a pencil ○ tape ○ a soda straw ○ a measuring tape The Educator will reference this video instruction: NASAJPL Edu Learning Space: Make a Straw Rocket The Educator will need to print copies of this Make a Straw Rocket page for each student.	The students will watch the 2 min lesson video and then repeat the steps themselves with the guidance of the Educator.	Ask the students to describe how they powered their straw rockets
Color the Galaxy (Section 5.5)	Students will draw their own NASA Spacecrafts	The Educator will repeat the instructions for students to draw their own spacecraft, referencing this video: NASA Langley Research Center: Color the Galaxy with NASA Spacecrafts Video	The students will watch a 3:24 min video with step-by-step instructions for drawing their own spacecraft landing on the moon.	Ask the students to describe their spacecraft and how it got to the moon

Make a helicopter for Mars as extension activity	The students will build their own paper Mars Helicopter	The Educator will print out copies of the template for this activity or use a blank piece of paper that students can sketch the template onto. Students will also need: ○ a pencil ○ a pair of scissors ○ a measuring tape ○ a little strip of ribbon The Educator can reference and show this video in the classroom: NASJPL Edu Learning Space: Make a Paper Mars Helicopter	Good option for more advanced students. Students will watch a 5 min video with instructions for making their own Mars helicopter.	Ask the students if they are ready to go to Mars

6. What Did You Learn? (5 minutes)

For closing and wrap-up, Educators can ask the students the following questions:

- What was the favorite thing you learned about space today?
- Is there air in space?
- What is propulsion?
- How is a rocket engine different than an airplane engine?
- What is a spaceport?

Suggested Game:
10 question knowledge check game

7. Extension Activities

- Look up details for some of the upcoming space launches or missions
- Use the Map of U.S. Spaceports to find the spaceport closest to your home
- Look up details for a Spaceport using the Spaceports by State list
- Build your own Mars Helicopter NASA-JPL Edu Learning Space: Make a Paper Mars Helicopter

8. Supplies

- Access to Internet to view and share videos on screen
- Depending on the choice of activities, will need:
    - Print templates for drawing activities provided in the activity's links, one per student
    - 1 straw per student

    - 2-3 sheets of paper per student
    - 1 pencil per student
    - Scissors for the classroom that could be shared
    - Measuring tape for the classroom that could be shared
    - 1 small ribbon per student
- Spark sheet (PDF) for students to have as a reference