## **🌌 Exploring Space: How Technology Takes Us Beyond Earth**

**6th Grade Science + Engineering Design Project**

### **🧭 Project Overview**

This summer, you’ll become an **engineer and explorer of space!** You’ll research amazing tools scientists use to study space, and then use your creativity to **design and build your own invention** that could help us explore even farther.

By the end of this project, you will:

* Understand how **engineering and technology help us explore space**
* Create a **timeline** of real space inventions
* Use the **engineering design process** to create your own invention
* Share your ideas in a fun and exciting presentation

**📘 Learning Goals**

By completing this project, you will:

* Learn how telescopes, satellites, and rovers help scientists learn about space
* Discover famous space missions and tools
* Practice the **Engineering Design Process (EDP)**
* Build a model of your own space technology

### **📅 Project Schedule**

|  |  |
| --- | --- |
| **Day** | **Task** |
| **Day 1** | Learn about space technology and take notes |
| **Day 2** | Create a timeline of major inventions |
| **Day 3** | Learn about the Engineering Design Process (EDP) |
| **Day 4–5** | Design and build your own space exploration invention |
| **Day 6** | Make a digital or paper poster/presentation |

## **🔬 Part 1: Space Technology Research**

Use the internet, books, or videos to research **5–6 important tools or inventions** that help scientists study space (including the planets themselves!)

When researching, it’s important to use credible websites that provide accurate and up-to-date information. Credible sources are usually run by experts, government agencies, or respected institutions. Look for websites that end in **.gov**, **.edu**, or are well-known organizations like NASA or national museums. These sites often cite their sources, avoid ads or clickbait, and are written by professionals in science or education.

**Credible websites to use (there are more on the last page of this document):**

* [NASA](https://www.nasa.gov/) – The official site of the U.S. space agency, full of reliable info on space tools and missions.
* [Smithsonian National Air and Space Museum](https://airandspace.si.edu/) – Offers detailed information on historical and modern space exploration tools.
* [European Space Agency (ESA)](https://www.esa.int/) – Great for international space tools and technology.
* [Jet Propulsion Laboratory (JPL)](https://www.jpl.nasa.gov/) – Part of NASA, with specific details on space probes, rovers, and instruments.

 Create a chart, like the one below to record your research:

|  |  |  |  |
| --- | --- | --- | --- |
| **Invention or Tool** | **Year Invented** | **What It Does** | **Why It Was Important** |
|  |  |  |  |
|  |  |  |  |

## **🗓️ Part 2: Create a Space Tech Timeline**

Choose **5 inventions** from your chart and create a **timeline** showing when each was invented and what it does.

You can make:

* A **poster**
* A **Google Slide**
* A **scroll or foldable booklet**

Be creative! Add drawings, photos, or fun facts!

**🛠️ Part 3: The Engineering Design Process**

The **Engineering Design Process (EDP)** helps you solve problems and build great things!

### **✏️ The 6 Steps of EDP:**

1. **Ask** – What problem are you solving?
2. **Imagine** – Brainstorm your ideas
3. **Plan** – Sketch your design
4. **Create** – Build a prototype or model
5. **Test** – See how it works
6. **Improve** – Make it better!

**🚀 Part 4: Design a Space Invention**

Now it’s your turn! Use the EDP to create your own space tool. This can be:

* A robot to explore planets
* A tool for astronauts
* A machine to grow food in space
* A new kind of telescope

### **📝 Planning Sheet**

1. **What problem does your invention solve?**
2. **Who would use it?**
3. **What materials will you use to build your model?**
4. **Sketch your design:**

**🧪 Part 5: Build and Improve**

* Build your model using **recycled materials**, paper, foil, or whatever you have at home.
* Ask family or friends to “test” it by asking questions!
* Think of **1 or 2 ways to improve it.**

**How could you improve your design?**

## **🎤 Part 6: Share Your Work**

Prepare to present your invention. You can:

* Show your model
* Make a **poster**
* Create a **slide show**
* Record a **video presentation**

Make sure to include:

 ✅ What your invention does

 ✅ What problem it solves

 ✅ What inspired your idea

 ✅ What you learned during the project

# **Exploring the Universe: Telescopes, Rovers, Satellites, and Rockets**

## **Galileo's Telescope**

Galileo Galilei invented the first practical telescope in 1609. This groundbreaking instrument used lenses to magnify distant objects, allowing Galileo to make incredible discoveries. He observed the moons of Jupiter, the phases of Venus, and the surface of the Moon, revealing that celestial bodies were not perfect and unchanging, as previously believed. Galileo's telescope worked by bending light through glass lenses, which helped him see objects that were millions of miles away.

## **Hubble Space Telescope**

Launched in 1990, the Hubble Space Telescope orbits Earth at about 340 miles above the surface. Unlike telescopes on the ground, Hubble is above the atmosphere, allowing it to capture clearer images without distortion from air particles. Hubble observes galaxies, stars, and nebulae across the universe, providing stunning images and important data that help scientists understand the cosmos. Its ability to see in multiple wavelengths of light, including ultraviolet and infrared, makes it a powerful tool for astronomical research.

## **Mars Rovers**

Mars rovers, like Perseverance, are robotic vehicles designed to explore the surface of Mars. They move using wheels and are equipped with a variety of tools. Perseverance has a drill to collect rock samples, cameras to take high-resolution images, and sensors to analyze the Martian atmosphere. These rovers have made significant discoveries, including signs of past water on Mars and organic molecules that could indicate the presence of life. They help scientists gather data to prepare for future human exploration.

## **James Webb Space Telescope**

The James Webb Space Telescope, launched in December 2021, is designed to see in infrared light. This capability allows it to observe objects that are too cool or faint for other telescopes to detect. Webb's mission includes studying the formation of stars and galaxies, exploring the atmospheres of exoplanets, and looking back in time to see the early universe. Its advanced technology enables scientists to gather data that can answer fundamental questions about the origins of life and the universe.

## **International Space Station (ISS)**

The International Space Station (ISS) is a unique laboratory that orbits Earth. It supports scientific experiments in various fields, including biology, physics, and astronomy. Astronauts live and work on the ISS for extended periods, conducting research and testing new technologies. Life on the ISS is different from Earth; astronauts experience microgravity, which affects how they move and how fluids behave. They exercise regularly to stay healthy, and their daily routines include conducting experiments and communicating with scientists on the ground.

## **Satellites**

Satellites are crucial for modern communication, navigation, and weather forecasting. There are several types of satellites, including:

* **Communication Satellites**: These relay signals for television, radio, and internet services.
* **GPS Satellites**: They help users determine their location anywhere on Earth.
* **Weather Satellites**: These monitor weather patterns and help predict storms.
* **Space Satellites**: They explore outer space and gather scientific data.

Satellites orbit Earth at different altitudes and speeds, allowing them to cover vast areas and provide valuable information.

## **Rockets**

Rockets are vehicles that launch into space, carrying satellites, scientific instruments, or astronauts. They work on the principle of Newton's third law of motion: for every action, there is an equal and opposite reaction. When a rocket's engines burn fuel, the exhaust gases push down, propelling the rocket upward. Various organizations, including NASA and private companies, design and build rockets. They carry out missions to explore space, supply the ISS, and launch satellites that enhance our understanding of the universe.

In conclusion, telescopes, rovers, satellites, and rockets play vital roles in our exploration of space. Each of these technologies contributes to our understanding of the universe and helps answer questions about our place within it.

## **🔭 More Student Research Resources**

### **🔹 1. NASA Space Place**

🌐 [https://spaceplace.nasa.gov](https://spaceplace.nasa.gov/)

* Designed for upper elementary and middle school students
* Easy-to-read articles, videos, and activities about planets, satellites, telescopes, and rovers
* **Great for building understanding of tools used in space**

### **🔹 2. NASA STEM for Students**

🌐 <https://www.nasa.gov/stem/forstudents/>

* NASA's official student page with missions, videos, and design challenges
* Topics include spacecraft, telescopes, astronauts, and more
* Includes student engineering design challenges!

### **🔹 3. ESA Kids (European Space Agency)**

🌐 <https://www.esa.int/kids/en>

* Simple breakdowns of space missions, space technology, and Earth observation
* Fun facts, mission profiles, and interactive games

### **🔹 4. DK Find Out – Space**

🌐 <https://www.dkfindout.com/us/space/>

* Visually engaging and very readable
* Covers space tech, telescopes, planets, satellites, and astronauts
* Excellent for timeline research

### **🔹 5. National Geographic Kids – Space**

🌐 <https://kids.nationalgeographic.com/space>

* Videos and articles about astronomy, space exploration, and famous scientists
* Great introduction to Mars rovers, telescopes, and more
* Includes mission photos and short descriptions