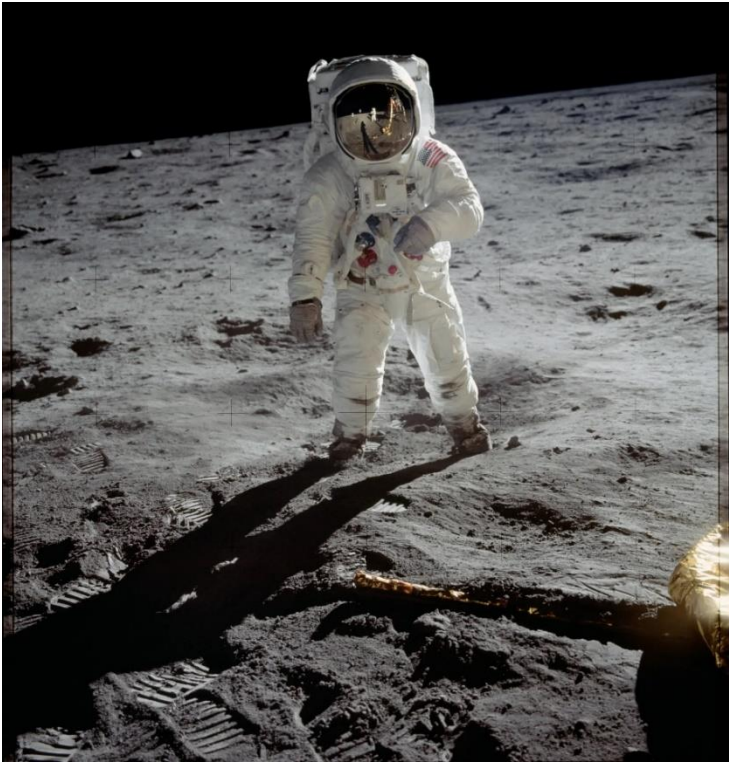


Explorations into the US Space Program



Moon Landing
Examine the image on the cover.

OBSERVE (facts & details)	REFLECT (connections)	WONDER (questions)
<i>Circle important details</i> Guiding Questions: What do you notice first? Are there any symbols, words, or numbers? What do you notice that others might miss? What do you notice that you can't explain?	<i>Draw lines to details that spark connections & write captions.</i> Guiding Questions: Why was this image made? What adaptations do you see? What can you learn about the U.S. Space Program from this? What's missing from this image? How might this image be different if it was made today?	<i>Compose 3 Questions.</i> Guiding Questions: What would you ask the creator of this image? What would you ask a person in this image? What are you wondering about right now?
My Observations	My Reflections	My Questions



My Questions:

What does an Astronaut Look Like?

Astronauts are **heroic** scientists and pilots who explore space. Some have special knowledge about medicine and machines. Most work for a government group called **NASA: National Aeronautics and Space Administration**. Astronauts can travel into space on rockets or a space shuttle (from 1981-2011). Some even live and work in space at the International Space Station.

Look at them closely at the images of astronauts. Can spot some special details?

Heroic – very brave

Aeronautics-

the science of studying how to traveling through air

Administration-

running an organization; making sure tasks gets done

Patriotic – love of country



Analyzing Images

Examine the images of astronauts on the previous page. Use a hand lens if it helps you see details better. Think about what you observe. Answer the questions.

What are some things they all have in common?

What differences do you notice?

What symbols do you notice?

How do these images show that astronauts are heroic and patriotic?

In Their Own Words

You have left the hold of Earth behind you. Space spreads its glorious darkness before you. Silence surrounds you. What do you have to think or say in these moments? Read astronaut ponderings and let your imagination soar.

Neil Armstrong:

I believe every human has a **finite** number of **heartbeats**. I don't intend to waste any of mine.

Sally Ride:

The stars don't look bigger, but they do look brighter.

Sunita Williams:

I think that when we really leave the planet— we all go as humans, not as people from one country or another. We are humans; we work together. This is our only planet as human beings that we know if. So we all should have an interest in **preserving** it.

Kalpana Chawla:

The path from dreams to success does exist. May you have the vision to find it, the courage to get on to it, and the **perseverance** to follow it.

Finite - limited number, not going to last forever

BIG IDEA:

Finite number of heartbeats

means our hearts will only beat for so long.

Astronaut Armstrong wants to do as much as he can with his lifetime. What do you want to do with your lifetime?

Preserving - saving

Astronaut Williams says we should act to save the Earth.

Perseverance - Keep going even if you are tired

Astronaut Chawla says when you have a goal, keep going to achieve your goal.

Which astronaut quote on this page do you find most interesting? Why is that?

Buzz Aldrin:

I still say 'shoot for the moon, you might get there.'

Yuri Gagarin:

I see Earth! It is so beautiful.

Jim Lovell:

There are people
who make things happen,
there are people
who watch things happen,
and there are people
who wonder what happened.

To be successful,
you need to be the person
who makes things happen.

Scott Kelly:

The Earth is a beautiful planet.
The space station is a great vantage point to observe it and share our planet in pictures. It makes you more of an environmentalist.

Planet - circular object at least 2000 km wide that orbits the sun. Earth is one of 8 planets orbiting our Sun.

Vantage Point - a place where you are able to see clearly

Astronauts in space are able to see Earth like we are able to see the Moon.

Environmentalist - Person who cares for an area of land, water, plants, and animals.

When you stand in a field you are standing in an environment.

Astronaut Kelly says seeing Earth from space makes him care more about the environment and Earth as a whole.



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The International Space Station allows astronauts from many countries to live and work in space for weeks, months, and even years!

What do astronauts “give” to their community?

What character trait helps astronauts succeed?

What can you do to develop these traits in yourself?

Expedition 59 Crew



Astronaut Poetry

Rising from the Earth

Rising from Earth
Motion
Shaking, rattling we lift
Straight up

We climb on plumes of thunder
Into a rising sun
And away from reality

Goodbye my friends
You are gone
The whole world has gone
On a trip

But this must be finished.
Faster, faster, can't turn back
Insignificant, I am insignificant

Lights flash, panel moves
Floating in nothingness
Then softly, softly
The movement begins again
Push up the switch

Teach this Poem Strategy

<p>Warm Up: How would it feel rising on a rocket?</p>	
<p>Analyze: <i>Study the image of the Expedition 59 Crew.</i></p> <p>What differences do you notice compared to how things would be on Earth?</p> <p>How might the technology you see contribute to or help solve problems?</p>	
<p>Silently read the poem <i>Rising from Earth.</i></p> <p>What words, phrases, and structures “jump out” at you?</p>	
<p>Read the poem aloud with a partner. Twice.</p> <p>What else “jumps out”? What do you think happens next?</p>	
<p>Illustrate:</p> <p>Read the poem one more time and draw a picture of something the author saw or experienced.</p>	

Poetic Challenge

- Write your own poem about space.
Include adjectives and a countdown sequence.

Let's Hear a Story...



Guy Bluford Jr. was the first African American to fly in space. Hear his account of the first shuttle night launch.

“In order to reach the targeted **deployment** point on time and **inject** the **satellite** into its ultimate orbit, we had to launch the space shuttle at night.

The first surprise on liftoff was the amount of light generated by the **SRBs**.

We had darkened the cockpit in order to maintain our night vision, just in case we had to make an emergency landing at Kennedy Space Center.”

“The cockpit lit up like daylight as we rose off the pad and rotated to go **down range**.

Deployment-
to be sent out

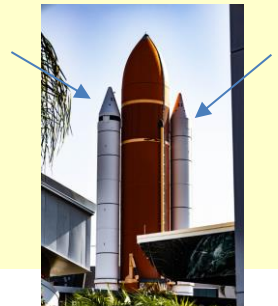
Inject-
push something
into something else

Here they pushed a satellite into space.

Satellite-
1) A machine built by people that is sent into space.
2) a natural body that orbits a planet

The moon is a satellite.

SRBs- solid rocket boosters



It looked like we were inside a fireball with the bright glow flooding through the windows...

The ride up on the SRBs and the three main engines of the shuttle was thrilling-- very noisy and bumpy as the **G-forces** increased to around 2.5g's, like we were driving a pickup truck over **railroad ties**.

I remember thinking: "This thing moves! Like riding the simulator but it moves!"

The next surprise was the brilliant flash of light just after two minutes from the firing of **pyros** at **SRB separation**.

It took me several hours to get my "space legs" as I floated **clumsily** around the cockpit...

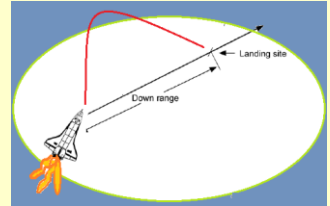
I found that due to **zero-g**, I was almost 2 inches taller in space, and both of my thighs were one inch thinner due to the fluid shift in my body."



What happens to an astronaut's body in space?

Down-Range-

the horizontal distance traveled by a space-craft after it launches up



G-Force-

the push that happens when something moves really fast (like a rocket)

Railroad ties -

small pieces of wood that support the 2 metal rails on a train track

Pyros-

bolts that connect two pieces of space-craft and EXPLODE to separate them.

SRB Separation-

when the booster rockets separate from the shuttle and fall back to Earth

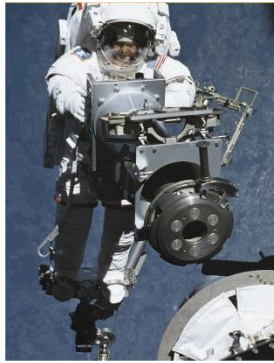
Clumsily-

To drop things or fall down easily

Zero-G-

In space, astronauts no longer feel the pull of gravity on their bodies.

Let's Hear another Story...



Juliet Payette is a Mission Specialist on space shuttle Endeavor's July 2009 trip to the **International Space Station**.

"Being the flight **engineer** was **phenomenal** because I was right in the middle of the action, seated on the center **Mission Specialist 2** seat behind the pilots, with the overhead window behind me.

I wondered if I'd see flame shoot out behind us at takeoff.

Chris Cassidy was sitting to my right in the Mission Specialist 1 seat, holding a mirror so we could see.

I will never forget the moment when the engines lit. In a flash, I saw this **boulevard of flame** below us, the flame trench was just a mass of bright orange fire. Then we took off, and of course I had to concentrate on something else.

Engineer-
someone who
designs and
builds things

Phenomenal- wow!

Boulevard of flame-
when a rocket lifts off,
burning fuel looks like a
long street of fire.

Extended-
made as long
as it can be

Flexing-
able to bend,
like your elbow

Swivel-
able to turn back and
forth, *like your
shoulder*



Once docked at the **ISS**, we used the Station's **Canadarm2** to reach out to the batteries at the very end of the **P6 trusses**. Those batteries are massive, and the **EVA crew** had to go on the carrier platform to retrieve a spent battery and replace it with a fresh one.

Because the arm was so fully **extended**, every single time they'd get on or off the platform, the arm would start **flexing**, swinging dangerously close to Station Structure and every time that arm started to **swivel**, I got a little scared; we engaged the breaks on the arm joints and quickly floated down to the **Kibo module porthole** where we were able to see the actual distance between the tip of the arm carrying the battery platform and the end of the Station Structure.

It was close. We continued, but asked the guys to be careful.

Where is the "platform" and what almost happened?

The International Space Station (ISS) orbits Earth. Astronauts from around the world work there together for up to a year at a time

Canadarm2 is a robotic arm on the ISS.



Mission Specialists - astronauts who lead the other astronauts in experiments or spacewalks.

Kibo Module Porthole window inside the ISS where astronauts can see what is happening outside in space.

EVA crew –

group of astronauts who go on spacewalks outside the shuttle or space station.

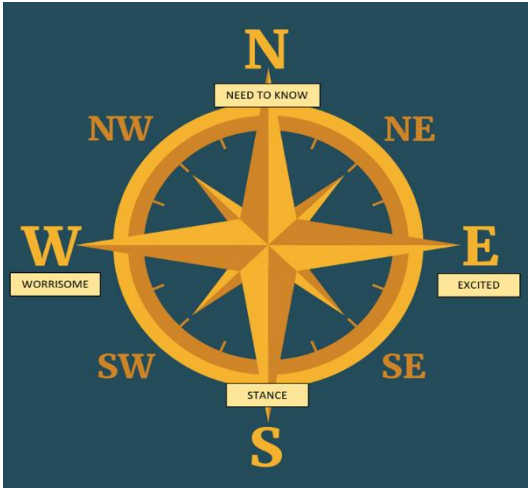
*EVA stands for
"Extra Vehicular Activity."
This means they are outside
of the space station!*

The 4 C's Text Strategy

After reading the quotes, poem, & astronaut stories, explore connections, challenges, concepts, and changes. Put your thinking to the test.

Connections	What connections do you draw between the texts?
	What connections do you draw between the texts and your life? <i>How are your experiences similar to Guy or Juliet?</i>
	What have you learned from the text? <i>What did Guy and Juliet learn?</i>
Challenge	What ideas do you want to challenge or argue with in the text?
Concepts	What BIG IDEAS are important in the texts?
	What ideas are worth holding onto? (<i>*Hint: focus on the quotes</i>)
Changes	What changes in attitude are suggested by the texts? <i>How did Guy or Juliet's feelings or expectations change?</i>
	How has exploring space changed the way we think?

Conclusion: COMPASS POINTS



What if you could be an astronaut?

After reading quotes, stories, and poems by astronauts, consider what it would be like for you to have a future heading toward the stars.

Excited: What excites you about this idea?	
Stance: How can you move forward with this idea?	
Worrisome: What concerns you about this idea?	
Need to Know: What else do you need to know?	

Extension 1: Changes

*The US Space Program is important to the United States. There are 20 locations across the country. Anywhere a Space Force Station is built, NASA and the **federal government works with local groups** to make sure the water and wildlife are protected. Private companies have begun using NASA locations. Manned and unmanned rocket launches **are increasing every year**. This impacts the environment and local communities. Let's explore!*



Kennedy Space Center (KSC) is in **Florida**.

These images show **before**, **during** construction, and **after** area was built.

KSC attempts to limit the damage to the environment. It has made the surrounding land into a **protected wetlands habitat**.



What changes do you notice?

How are those changes positive?

How are those changes negative?



What might be the impact on the local community?

If you were an alligator, what would you think about a rocket launch?

Extension 2: Rocket Gardens



Houston Space Center Rocket Garden Image



Kennedy Space Center Rocket Garden Image

Compare and Contrast Primary Sources

Study the two images.
What do you notice first?

How are these images
similar?

How are these images
different?

Why did the space centers
build rocket gardens?

Extension 3: Charting Progress

The US Space Program means a lot to Florida. Use the chart below and respond to the prompts on the next page.

FLORIDA Space Day

Jan 27th 2022

ADVANCING INNOVATION AND GROWING THE ECONOMY

NASA
EMPLOYMENT
IMPACT
33,093

Source: NASA Economic Impact Report – 2020

31 **SUCCESSFUL**
LAUNCHES
IN 2021

Source: Space Florida Annual Report 2021

FLORIDA
AEROSPACE
EMPLOYMENT
130,000⁺

Source: AIAA Aerospace Key Facts and Figures

NASA
OUTPUT
IMPACT
\$5,913,168,000

Source: NASA Economic Impact Report – 2020

8
HUMANS
LAUNCHED
INTO SPACE

Source: Space Florida Annual Report 2021

5,220
RECRUITED
RETAINED
EXPANDED

Source: Space Florida Annual Report 2021

MOON TO MARS
ARTEMIS PROGRAM
OUTPUT
IMPACT
\$2,013,858,000

Source: NASA Economic Impact Report – 2020

#2 in aviation &
aerospace
establishments

Source: AIAA Aerospace Key Facts and Figures

FLORIDA
IS THE NATIONAL
LEADER
IN ANNUAL AVIATION &
AEROSPACE BUSINESS EXPORTS
\$7.6⁺ billion

Source: AIAA Aerospace Key Facts and Figures

MOON TO MARS
ARTEMIS PROGRAM
EMPLOYMENT
IMPACT
10,870

Source: NASA Economic Impact Report – 2020

SPACE 15
& AEROSPACE
RELATED COMPANIES
RECRUITED
RETAINED
EXPANDED

Source: Space Florida Annual Report 2021

KENNEDY
SPACE CENTER
ECONOMIC
IMPACT
\$4 billion

Source: AIAA Aerospace Key Facts and Figures

Charting Progress

What is this chart about?
Why did someone make the chart?
In my own words, what is it saying?
How do the pieces relate?
Has this chart been a positive or negative influence?
What questions do I have about the chart?

Extension 4: Hidden Layers

How do these two images relate to each other?



Circle the letter or the LAYER that appeals to you first.

- A. **Narrative** (*the stories the image tells*)
 B. **Connections** (*how this image connects to other things*)
 C. **Aesthetic** (*the beauty of this image*)
 D. **Dynamic** (*the power, emotions, and movement in this image*)

Choose an **IMAGE**: _____

Choose a **red layer** and a **blue layer**.

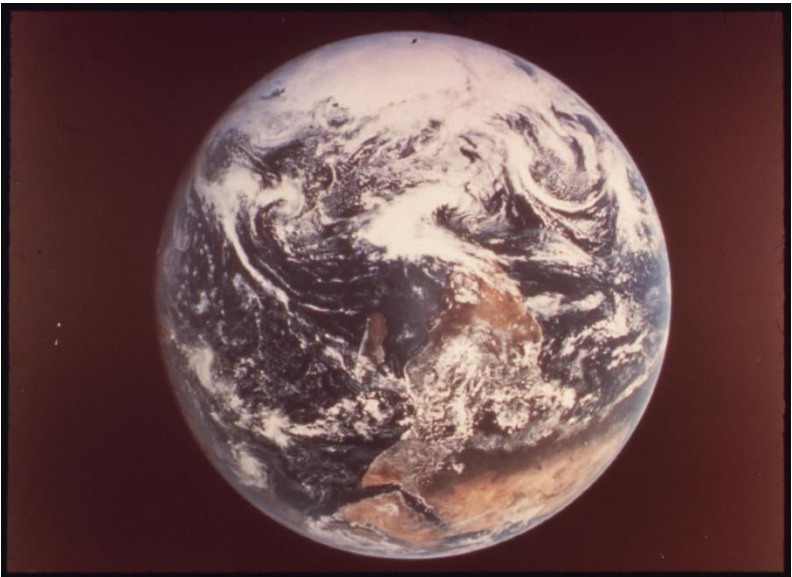
Explore the image with those **LAYERS**.



Narrative 1 sentence each		Connections 2 + bullet points each	
The Story	The Backstory (how they got here)	Connections to other works	Connections to History
The Hidden Story (<i>whose story still needs to be told</i>)	The Moral of the Story (Message this image sends)	Connections to ME!	Other Connections (ex. To Math, Science)
My Question			

Aesthetic (Beauty)		Dynamic (Power & Movement)	
Appeal <i>What is appealing about this image?</i>		Surprise What surprised you about this work?	
Reward <i>What reward - feeling or knowledge- do you get from observing this image?</i>		Tension What points of tension, stretching, conflict, or friction do you see?	
Skill/Mastery <i>What skills are required in order to create this image?</i>		Emotion Which emotions are embedded in or emitting from this work?	
New/Unusual <i>What is new or unusual about this image?</i>		Movement Who or what is moving?	
My Question			

Extension 5: Inspiring to Reality



Beginning, Middle, End

The image on top was drawn around 1918 by Wladyslaw Benda, a Polish illustrator showing his imagination of what the earth might look like from space.

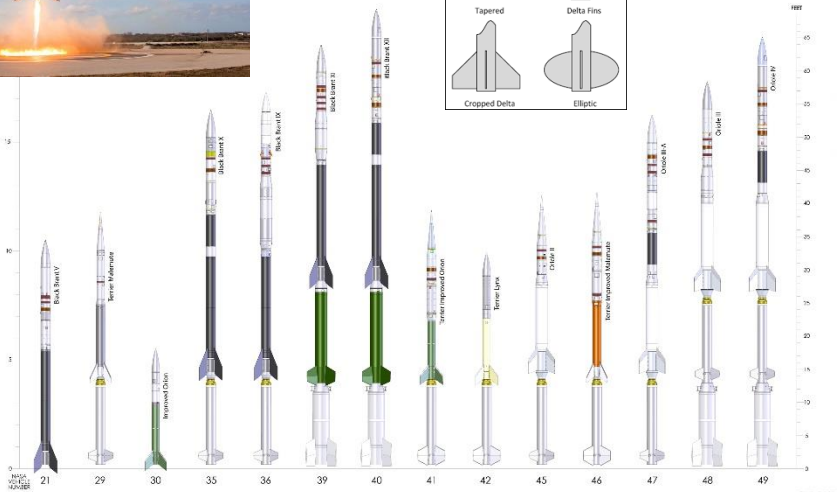
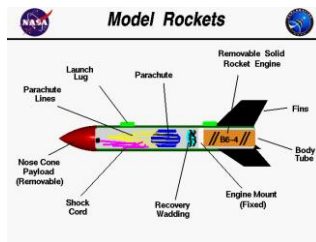
The second image is a photograph of earth taken from space in 1972 during the last Apollo mission to the moon.

Beginning	Middle	End
<p>Which image is the beginning (<i>the one made first</i>)?</p> <p>What stands out the most?</p> <p>Why was this image made?</p> <p>What might they have wanted?</p>	<p>What stands out about the second image?</p> <p>Why did someone take this photo?</p> <p>What might they have wanted?</p> <p>What happened before they took the photo?</p> <p>What might happen next?</p>	<p>50 years later, people are still interested in space.</p> <p>What might the end of space exploration be like?</p> <p>Will that really be the end, or will it lead people even farther?</p> <p>Draw a picture illustrating your answer.</p>

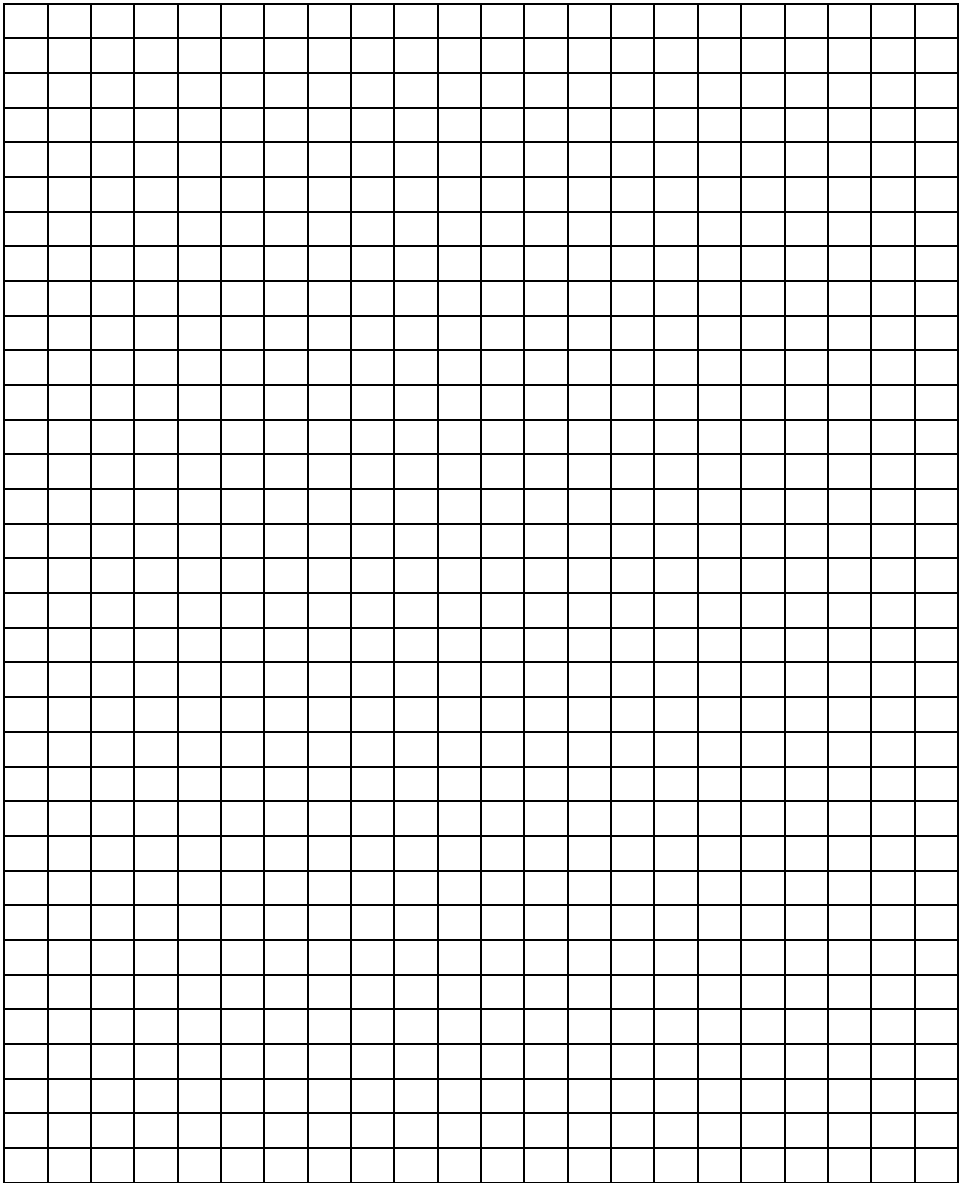
Science and STEM Connection: Exploring Rockets and Fins

The US Space Program is all about exploring space. Rockets have been through a lot of designs, some good and some end in disaster.

For this next activity, let's explore fin shapes of a variety of rockets. We'll focus on model rockets since we'll be building a basic one. Where on the model rocket are the fins?



*What shapes of fins do you notice in the illustrations on this page?
Use the graph paper to draw the various shapes you see.*



Which fin shape do you think will work best on a paper rocket?

How many fins will you use, 2 or 3?

Scientific Journal Page

My Process:

For my first creation, I used _____

_____.

The first launch was (good fair awful). **Circle One.**

It traveled (distance) _____.

I was surprised by _____.

To improve my rocket, I then changed _____

_____.

I entered a competition with a rocket that was a little different. The other rocket had _____

_____.

In the competition, my rocket _____.

It traveled (distance) _____.

which was (more about the same less) than the other.

I wanted to enter another competition. I improved my rocket by _____

_____.

The new and improved rocket (won tied lost) and traveled (distance) _____. I was _____.

I named my rocket _____.

- ☐ After the competition, we engineers discussed how our rockets were similar and different.

My Conclusions:

I learned _____

Scientific Journal Page

What it takes to create a successful rocket:

- ☐ _____
- ☐ _____
- ☐ _____

It was (**working together** **racing against other rockets**)
that MOST helped me create a successful rocket!

*Space X – a private company – and NASA – a government agency- **work together** to launch rockets. Other new private companies like Blue Origin, Space Perspectives, and Virgin Galactic **compete** in building and launching space-travel vehicles. Florida launches many rockets near Kennedy Space Center. They set off car alarms 5 miles away, rattle windows 8 miles away, and can be seen 25 miles away. I wonder where I can launch my next rocket....*

STEM QUESTIONS

Which do you think will lead to more growth in Florida:
cooperation or **competition**?
Explain.

How might the Space Program
affect the experiences and beliefs of children in Florida?

How might the growth of the Space Program in Florida
affect children around the world?

Reference List

Al Wordon's Poem *Rising from Earth* comes from Collect Space. ['Rising from Earth,' a poem by Al Worden, Apollo 15 astronaut and author of 'Falling to Earth' | collectSPACE](#)

Astronaut images available through NASA.Gov

Astronaut with his Dogs page 19

<https://www.nasa.gov/podcasts/houston-we-have-a-podcast/nasa-photographers/>

Benda, Wladyslaw The Earth with the Milky Way and Moon page 21

<https://www.loc.gov/item/2010715099/>

Cover Image with Buzz Aldrin on the moon

<https://images.nasa.gov/details/as11-40-5903>

Earth as Seen from Apollo 17 Mission page 21

<https://www.loc.gov/item/2021669760/>

Expedition 59 Crew page 7

<https://www.nasa.gov/gallery/expedition-59-image-gallery/page/4/>

Expedition 59 Crew page 10 <https://www.nasa.gov/image-article/six-member-expedition-59-crew-gathers-portrait-4/>

Guy Bulford and Juliet Payette's stories come from a Smithsonian Magazine blog titled *Amazing Astronaut Stories from the Space Shuttle Program*. [Amazing Astronaut Stories From the Space Shuttle Program | Smithsonian Voices](#).

Images by Laurie Boulden include:

Rocket garden page 16

Kennedy Space Center Rocket Garden page 16 Apollo Logo page 4

Space Shuttle Rocket Boosters page 4, 9 NASA Logo page 4

Kennedy Space Center Top Image page 15

International Space Station page 6, 12 <https://www.nasa.gov/get-to-know-the-space-station-2/>

Kennedy Space Center Construction middle image page 15

Kennedy Space Center Completed bottom image page 15

<https://www.nasa.gov/gallery/ksc-history/>

The US Space Program has had an impact on the world.

*In this booklet, we introduce elementary students to ideas, ideals, influences, and imaginations of our space program using **primary sources**. The accompanying teacher guide indicates specific standards and objectives for the booklet.*

Most of the images and narratives have been obtained through NASA and the Library of Congress sites. They are not subject to copyright. Images provided by Laurie Boulden have permissions for use within the booklet.

It is important to note that the language of the personal narratives may include terms that are not commonly used in today's culture.

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