

Family Unit Study: *Flight*

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FAMILY UNIT STUDY: FLIGHT

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FAMILY UNIT STUDIES

Welcome Home!

Thank you so much for choosing a How Wee Learn Family Unit Study. This unit study has been created with care by me, a homeschooling Mom and former teacher. These unit studies have worked so beautifully with my own family, I knew they must be shared. My time in the classroom, certification as a Reading Specialist, and 18 years as a mom has given me a unique perspective on what children truly 'need to know'.

What is a unit study?

A unit study focuses on critical thinking and problem solving, allowing children to dive deep into fascinating topics and engage in meaningful learning.

When a child is engaged in what he or she is learning, that learning sticks. And when a child is engaged *and fascinated* in what he or she is learning, learning is amazingly fun for the whole family! Say goodbye to those power struggles.

Each unit study is broken down into ten topics with manageable, bite-sized amounts of incredible information. Each of these ten topics includes a hands on activity, a math or literacy enrichment activity, a curated YouTube video, book suggestion, interesting fact and discussion question.

What are the components of a unit study?

HANDS ON ACTIVITY

Each of the ten topics includes a hands on activity that brings the information shared and discussed to life! This allows children to really engage in and solidify their learning. The hands on activities use items you likely have already. If you do not have an item, think creatively about what you do have and adapt. No buttons? I bet beads could work. No pipecleaners? Maybe you have some yarn!

MATH ENRICHMENT WORD PROBLEM

Each unit study includes five math word problems modified to three levels so they are fitting for the whole family. They cover five math strands: Number Sense, Geometry, Measurement, Patterning and Data Management/Probability. The word problem introduces your child to each of these areas with

the belief of quality over quantity. This is not a full math curriculum of course, but an enrichment opportunity and chance to be exposed to some real world math.

As you go through a question, consider how you might change it slightly to ask a follow up question. Perhaps you could ask, "What would happen if there were 6 birds instead of 5?" Or you might get out some manipulatives and help your child dive into deeper learning about the geometry topic introduced.

LITERACY ENRICHMENT ACTIVITY

When a child is learning about a fascinating topic, there are so many natural opportunities to tie in literacy development. Reading, researching, recording information, labeling, and note taking will all happen naturally.

On top of this, each unit study includes five literacy enrichment activities modified to three levels so they are fitting for the whole family. Creating poems, public speaking, practicing letter formation, and literacy scavenger hunts are all fun ways literacy learning is brought to life with these unit studies.

CURATED YOUTUBE VIDEO

Each of the ten topics includes a carefully curated YouTube video. Dive into some fun and easy learning with experts in the field, entertaining stories, and inspiring tales, all selected to highlight key learning concepts. Enjoy some time snuggled on the couch learning with popcorn and a movie!

BOOK SUGGESTION

The book suggestions for each topic are just that—suggestions. Any books at all on the unit study



theme are strongly encouraged. Immersing our children in a literacy-rich environment and offering plenty of time to dive into research, pictures, and stories is key for child-led learning.

INTERESTING FACT

Did you know that elephants suck their trunks much like babies suck their thumbs? Or that a human has the same number of neck bones as a giraffe? Interesting facts are a wonderful way to spark a child's interest and imagination, which is why every topic includes an interesting fact.

DISCUSSION QUESTION

Asking the right questions and having meaningful discussions is a wonderful way to meet your child at his or her current level of understanding and to help your child grow his or her learning and thinking about topics. So much can be learned through one meaningful discussion!

How do I use a unit study?

These unit studies are completely flexible and can be used however you wish. For those who would like a few suggestions, I will outline two possible ways you might choose to use these unit studies.

OPTION 1: FOCUSED UNIT STUDY

Your family might choose to focus on one unit study over a two day period.

Day 1	- Introduce the topic with the curated YouTube video - Have an amazing discussion using the discussion question as a prompt - Research more about the topic with the suggested book or a book of your choice - Read the interesting fact together
Day 2	- Dive into the hands on activity for some deep learning - Complete the math or literacy enrichment question
Day 3+	- Core skill work in reading, writing and math at your child's individual level - Family outings - Extracurricular activities - Start another topic!

OPTION 2: BLENDED UNIT STUDY

Alternatively, your family might choose to blend the unit study with your core skill learning over a three day period.

Day 1	Morning: - Core skill work in reading, writing and math at your child's individual level Afternoon: - Introduce the topic with the curated YouTube video - Have an amazing discussion using the discussion question as a prompt
Day 2	Morning: - Core skill work in reading, writing and math at your child's individual level Afternoon: - Research more about the topic with the suggested book or a book of your choice - Read the interesting fact together - Complete the math or literacy enrichment question
Day 3	Morning: - Core skill work in reading, writing and math at your child's individual level Afternoon: - Dive into the hands on activity for some deep learning
Day 4+	- Core skill work in reading, writing and math at your child's individual level - Family outings - Extracurricular activities - Start another topic!

There is no right or wrong way to dive into this unit study. When learning is this exciting, you simply cannot go wrong!

I hope you and your family love this unit study! If you have any questions at all, wish to purchase more unit studies, or if I can be of assistance, please visit www.howweelearn.com/family-homeschooling-unit-studies or email me at sarah@howweelearn.com.

xo
Sarah



TOPIC 1

History of Airplanes

The Wright brothers made history by successfully building and flying the world's first piloted engine-powered airplane. Let's explore...

Spark Curiosity



Did you know? Orville and Wilbur Wright are credited with the first controlled and sustained human flight on December 17, 1903. There were many others working on developing planes around the world around the same time.



I wonder what aircraft might look like in the future? Could there be new types of flying vehicles?

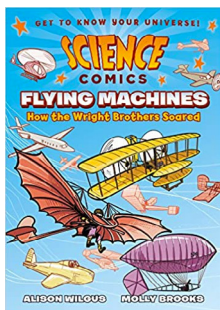
Resource Suggestions



Man's Early Flight Attempts

Mrfrankfranktube

See some of humanity's early attempts at powered flight (some images of crashes and fires might be scary for young children). Pilots are visibly unharmed in this video.



Flying Machines: How the Wright Brothers Soared

Alison Wilgus

Follow the famous aviators from their bicycle shop in Dayton, Ohio, to the fields of North Carolina where they were to make their famous flights.

HANDS ON ACTIVITY

- "The Wright Brothers" on page 7
- "History of the Wright Brothers" on page 26

Literacy Enrichment Activity

Have your child write a descriptive piece of writing to describe the process of making a paper airplane.

- ★ Have your child narrate the steps she takes as she folds her airplane while you record it. Work on "first, next, then" language.
- ★★ Have your child write the directions for making a paper airplane herself, or narrate them to you. Encourage "first, next, then" language.
- ★★★ Have your child write his directions for making a paper airplane, then try to follow those directions exactly and see if the airplane was created the way intended. If not, have your child edit his directions a little and try again!



HANDS ON ACTIVITY

The Wright Brothers

Types of Learning: Research Skills, Documentation, Summarizing Skills, Writing and Literacy

WHAT'S HAPPENING?

While the Wright Brothers are typically credited for being the first people to successfully fly in an airplane, there is some debate over if this is true. Two other people believe they should hold this title.

Alberto Santos-Dumont: Some historians are skeptical of the Wright Brothers being the first people to fly, as it was all done in private. Alberto, on the other hand, was very public and “showy” with his experiments with flight and is credited as having the first *public* flight on October 23, 1906. Furthermore, this flight took off unassisted, unlike the Wright Brothers’ flight.

Gustave Whitehead: Two full years before the flight of the Wright Brothers, Gustave Whitehead allegedly took to the skies in his bat-like flying creation. The problem was that this flight was not properly documented. Gustave flew alone and only had two eye witnesses. There was one photograph, but after being viewed, it went missing! Sounds like quite the suspicious mystery to me. What do you think?

Adapted from History.

[Check it out here for more interesting facts about early flight.](#)

Materials

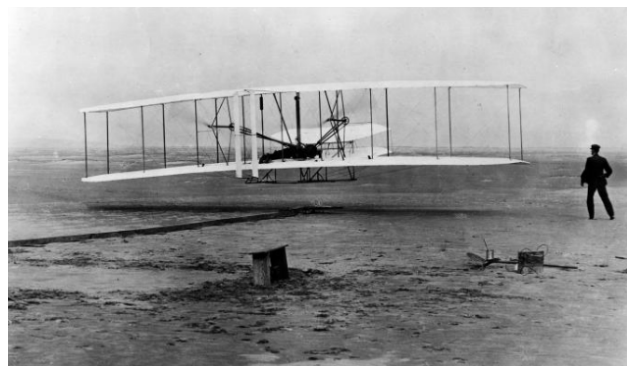
- Pencil
- Markers or crayons

Directions



“History of the Wright Brothers” on page 26

1. Read the History of the Wright Brothers printable and learn all about the amazing Wright Brothers.
2. The Wright Brothers persevered through a lot of challenges and ultimately succeeded in flying a plane! Think of a time that you had a big challenge and persevered.
3. Think about the questions below and talk about your answers or write them in a journal:
 - a. What was your challenge?
 - b. How did you feel?
 - c. What steps did you take to overcome this challenge?
 - d. What was the end result?
 - e. Next time you have a challenge, would you do anything differently?



Wright Flyer I First Flight in Kitty Hawk, December 17, 1903
Photo Credit [National Archives](#) (photo no. 7580929)



TOPIC 2

Aerodynamics

How can such huge vehicles, like airplanes, stay in the air? There are many forces and principles for us to consider – and that is exactly what we will be doing throughout this unit study! Let's explore...

Spark Curiosity



Did you know? Flying is the safest mode of transportation!



How many different kinds of flying machines can you think of?

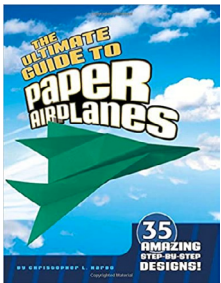
Resource Suggestions



How Airplanes Are Made

minutephysics

Discover the amazing elements that go into creating a commercial airplane. Designed for older learners.



The Ultimate Guide to Paper Airplanes

Christopher L. Harbo

Step-by-step instructions and easy-to-follow photos of every crease, tuck and fold make these paper airplane books like no other.

HANDS ON ACTIVITY

- "Longest Flier Paper Airplane" on page 9

Literacy Enrichment Activity

Using sticky notes or paper with masking tape, put some letters on the wall. Have your children fly a paper airplane at the letters.

- ☆ Use your child's name letters on the wall and encourage her to call out the letter names or sounds as her plane hits them.
- ☆☆ Use letters on the wall that your child has trouble identifying and have him call out those letters and sounds as his plane hits them. You could also use sight words.
- ☆☆☆ Use any letters on the wall and have your child throw his paper airplane at them, recording his letters. Have him keep throwing until he can spell a word with some of the letters he has hit! (For example he might hit: s, a, i, s, then t. Now he can spell the word sat!)



HANDS ON ACTIVITY

Longest Flier Paper Airplane

Types of Learning: Sequential Directions, Hand Dexterity, Visual Spatial Skills, Fine Motor Skills, Rotations and Translations

WHAT'S HAPPENING?

Anything at all that flies, like airplanes, birds and helicopters, uses the principles of aerodynamics to move through the air.

Later on in this unit study, we learn more about the four principles that allow flight to happen. But here, we will touch on the actual shape of the airplane.

Why is the nose of an airplane pointed, small and round? Why is it not flat like a book?

In order for wind to easily cut around the nose of an airplane, it needs to be thin, much like how a knife can cut into butter. This allows the four principles of flight to take effect!

Adapted from Real World Physics Problems.

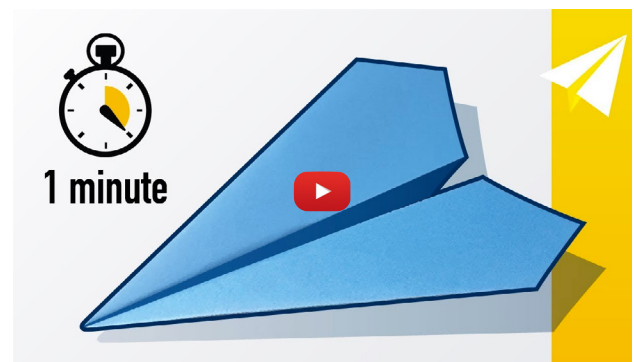
[Check it out here for more interesting facts about aerodynamics.](#)

Materials

- Paper
- Painters tape
- Measuring tape

Directions

1. Check out the YouTube video below on how to make a paper airplane that flies really far!



How to Fold an Easy Paper Airplane in 1 Minute Foldable Flight

Learn how to fold an easy and amazing paper airplane in less than a minute!

2. Make your own paper airplane using this YouTube tutorial, pausing it after each step for easy of copying.
3. Using a tape measure, mark lines on the ground with painter's tape that are 1 foot (or 30 cm) apart. See how far your plane can fly! You might need to take this one outside. What is the average length it flies after 5 trips?



TOPIC 3

How Do Airplanes Turn?

An airplane cannot simply turn like a car. Turning the steering wheel on an airplane adjusts the rudder on the tail of the airplane, but this will just turn the position of the airplane as it continues to fly straight! So how does an airplane turn? Let's explore...

Spark Curiosity



Did you know? In 2018, it is estimated that 4.3 billion passengers flew on scheduled flights.



Would you like to fly? Where would you like to go? What kind of aircraft would you like to take?

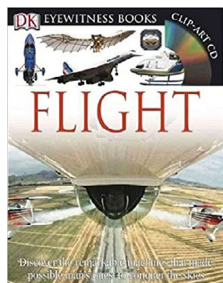
Resource Suggestions



What Makes an Airplane Turn?

Cyndy Hollman

Explanation of how an airplane turns.



Flight

Andrew Nahum

Take flight with this spectacular and informative guide to the fascinating world of aircraft.

HANDS ON ACTIVITY

- "Loop-de-Loop Paper Airplane" on page 11

Math Enrichment Word Problem

Have blocks, stones, or other manipulatives available for these math problems. Be flexible and change up the numbers to make these problems the right challenge for your children. Extend on the problems and ask follow up questions if your child is enjoying these challenges!

- ☆ Airplanes can hold as few as one person to as many as 850 people! At an airshow, there were 5 planes doing tricks. Each of the planes had 2 people inside. How many people were in the planes in total?
- ☆☆ Airplanes can hold as few as one person to as many as 850 people! If there were 500 people at an airport who needed to travel by airplane and each airplane at that airport could carry 50 people, how many airplanes would be needed?
- ☆☆☆ Airplanes can hold as few as one person to as many as 850 people! Imagine there were 500 people at an airport who needed to travel by airplane. This airport had two types of airplanes which could carry either 50 people or 100 people. There were 20 of each type of airplane. How might the people be split up on the airplanes? (For example, the 500 people could take 5 of the 100 passenger planes, etc.)



HANDS ON ACTIVITY

Loop-de-Loop Paper Airplane

Types of Learning: Sequential Directions, Hand Dexterity, Visual Spatial Skills, Fine Motor Skills, Rotations and Translations, Critical Thinking

WHAT'S HAPPENING?

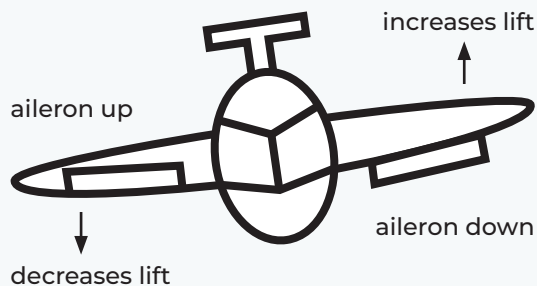
A lot of forces work together to make an airplane turn. In a real plane, the pilot initiates a right turn by banking the plane to the right.

The left aileron goes down and the right aileron goes up. The left wing is now creating more lift than the right wing, so it moves upwards, resulting in the airplane rolling to the right.

This action of the aircraft changes the aerodynamic product of the airplane wings.

The total lift force produced by the wings is now divided into horizontal and vertical components.

The vertical component of lift helps support the weight of the aircraft by opposing gravity. The horizontal component of lift pulls the plane towards the right. This horizontal component of lift is a centripetal force pulling the aircraft into the turn.



Adapted from Decoded Science.

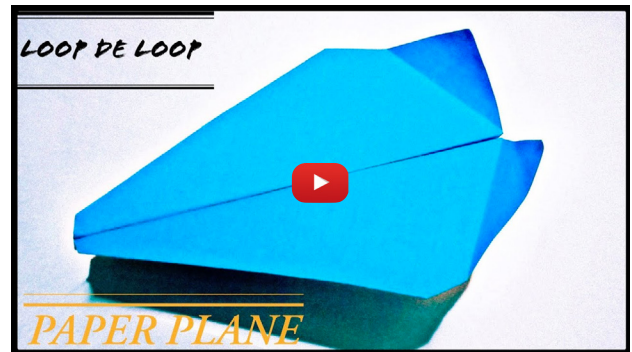
[Check it out here for a more detailed explanation on how a plane turns.](#)

Materials

- Paper

Directions

1. Check out the YouTube video below on how to make a paper airplane that does loop-de-loops.



How to Make a Loop De Loop Paper Airplane

Juniors Art and DIY

A loop de loop paper plane is a type of paper airplane that performs a loop upon release. It can be a fun variation of a standard paper airplane as this plane mimics tricks that you might see fighter jets perform in air shows.

2. Using this tutorial, create your own loop de loop airplane and try it out.
3. How is it different than the far-flier airplane? What adaptations make it do loops?



TOPIC 4

Carrying Heavy Loads

It is not enough for airplanes to simply be able to take off and fly using the four principles of flight. Other things need to be taken into account as well, like the weight a plane is carrying. For a plane to take off and land properly, it needs to be carrying the proper amount of weight. In fact, when a plane needs to make an unexpected stop, it often needs to release some of its fuel so it is not too heavy to land! Let's explore...

Spark Curiosity



Did you know? The world's first air mail route was established in the United States in 1918, with regular flights between Washington DC, Philadelphia, and New York.



Helicopters are sometimes used to take people to the hospital. How else can aircraft help in emergencies?

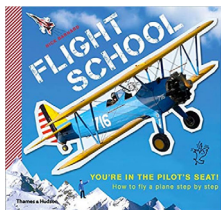
Resource Suggestions



How Do Airplanes Fly?

minutephysics

Learn more about the four forces that act on an airplane as it flies. Designed for older learners.



Flight School: How to Fly a Plane

Nicholas Barnard

An interactive introduction to aviation that encourages children to imagine themselves in the air, flying a plane.

HANDS ON ACTIVITY

- "Cargo Carrying Paper Airplane" on page 13

Literacy Enrichment Activity

Use the following story starter for this activity: "I'm going on a trip! I hop on the airplane and..."

- ★ Have your child narrate a story, starting with the story starter. Encourage her to explain what happens at the beginning, middle, and end.
- ☆☆ Have your child write some of her story on her own. Perhaps she can write the beginning of the story and can narrate the middle and the end to you. You can also write the story down as she narrates, and she can use it for copy work.
- ☆☆☆ Have your child write a story using the story starter. Before he begins, have a discussion, brainstorming setting, characters, and an exciting event that might take place.



HANDS ON ACTIVITY

Cargo Carrying Paper Airplane

Types of Learning: STEM, Critical Thinking, Problem Solving, Fine Motor Skills

WHAT'S HAPPENING?

Before a plane takes to the sky, its pilots need to do some serious math to make sure it can get where it's supposed to go. These days, that number-crunching is handled by a computer. Here are some metrics that need to be known before a flight departs:

Maximum takeoff and landing weight:

Everything that gets brought aboard is tallied by weight and the total has to remain below the maximum for takeoff.

Fuel weight: Planes are generally required to have enough fuel to get to their destination, plus sufficient reserves to get to an alternate airport in the event of an emergency (and then 45 more minutes of flying beyond that).

Passenger and baggage weight: Unless you're flying on a tiny "puddle-jumper" plane, airlines use a standard, assumed weight for their passengers and the baggage that comes aboard.

Cargo weight: Cargo is usually weighed directly for takeoff calculations, because there's too much variability in what can be shipped.

Balance: If too much weight is concentrated in one part of the aircraft, it can affect the pilot's ability to control the plane. So, the supercomputers also calculate how everything has to be distributed.

Adapted from The Points Guy.

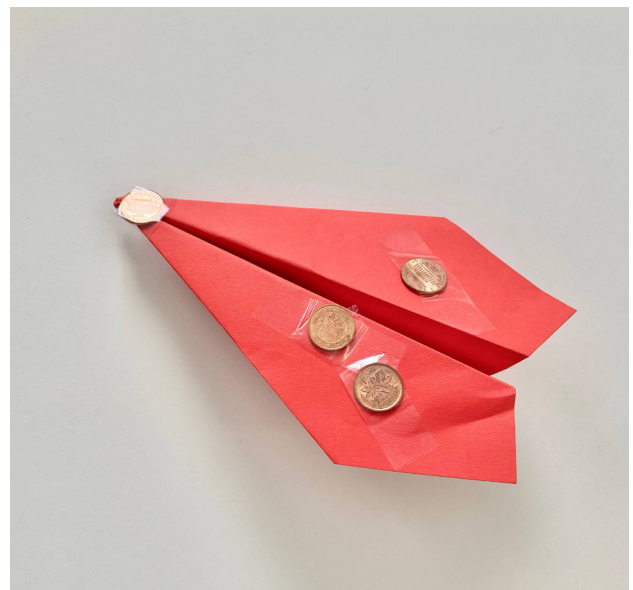
[Check it out here for more interesting facts about what pilots need to know for takeoff.](#)

Materials

- Different types of paper
- Coins
- Tape

Directions

1. Now that you have some experience building paper airplanes, use your knowledge to create a paper airplane that can carry the most cargo.
2. See how many coins you can tape to your airplane with it still able to take flight. Try using different types of paper and different folds as well!





TOPIC 5

Principles of Flight: Lift

Lift is the force that holds an airplane in the air. Wings create most of the lift used by airplanes. Let's explore...

Spark Curiosity



Did you know? The shortest available commercial flight is just 2 miles and lasts about 1 minute. It's known as the air bridge connecting two tiny Orkney islands off the coast of Scotland.



I wonder if airplanes would fly the same on the moon? What might be different?

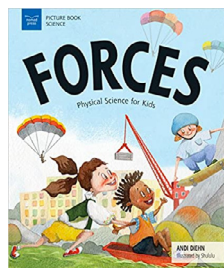
Resource Suggestions



Understanding Airplane Lift and Physics - for Kids!

Ansys

How do airplanes fly and stay in the air? The Wright Brothers figured this out by mastering a physics force called "lift". Mostly created by the wings, lift holds an aircraft in the air.



Forces: Physical Science for Kids

Andi Diehn

Perfect for children who love to ask, "Why?" about the world around them, Forces satisfies curiosity while encouraging student-led learning.

HANDS ON ACTIVITY

- "Demonstrating Lift" on page 15

Math Enrichment Word Problem

Have blocks, stones, or other manipulatives available for these math problems. Be flexible and change up the numbers to make these problems the right challenge for your children. Extend on the problems and ask follow up questions if your child is enjoying these challenges!

- ★ There are 4 principles of flight. How many more principles of flight would you need to make 10?
- ☆☆ There are 4 principles of flight. Jody did an informative paper about the 4 principles of flight and gave 3 examples for each principle. How many examples did her paper have in total?
- ☆☆☆ There are 4 principles of flight. Jeremy wrote a paper using exactly 64 words to describe each of the 4 principles of flight. How many words did his paper have in total (assuming he only wrote about the 4 principles)?



HANDS ON ACTIVITY

Demonstrating Lift

Types of Learning: Bernoulli's Principle, Science Concepts

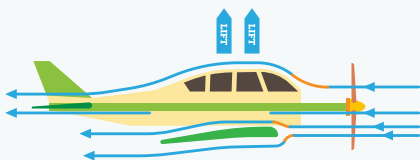
WHAT'S HAPPENING?

With this lesson and three following lessons, we will be examining the four principles of flight. The first principle of flight is called **lift**.

It is easiest to visualize and think about the four principles of flight with an example, so for these four lessons on flight we will be using the example of throwing a Frisbee.

Pretend you are at the park and you throw a Frisbee. The force that keeps that Frisbee in the air is lift.

Lift is the force that holds an airplane in the air. The wings of the airplane create most of this lift. Wings are shaped in a very special way – flat on the bottom and arched on the top. As air goes around this wing shape, the air goes faster over the curved top of the wing and slower under the flat bottom of the wing. This unequal pressure causes lift!



Adapted from NASA.

[Check it out here for more interesting facts about the four forces of flight.](#)

Materials

- Paper
- Scissors

Directions

1. To demonstrate lift, cut a 1" piece of paper.
2. Have your child pinch the sides of the paper strip and set it on their bottom lip (so it looks like a tongue).
3. Now, have your child blow strong and long, or soft and long over the paper strip and see it lift! The air blown over the curved surface of the paper strip is faster than the air under it. The unequal air pressure lifts the strip (similar to an airplane's wings).





TOPIC 6

Principles of Flight: Thrust

Thrust is the force that moves an aircraft in the direction it is to go. In airplanes, it is created with propellers and an engine. Let's explore...

Spark Curiosity



Did you know? The Guinness Book of World Records states the longest flight made by a paper airplane was 226 feet and 10 inches (69.14 meters).



How are rocket ships different from airplanes? What do they have in common?

Resource Suggestions



How does an airplane climb?
flight-club

Learn about the concept of thrust and how airplanes climb.



Wood, Wire, Wings: Emma Lilian Todd Invents an Airplane
Kirsten W. Larson

This riveting nonfiction picture book biography explores both the failures and successes of self-taught engineer Emma Lilian Todd as she tackles one of the greatest challenges of the early 1900s: designing an airplane.

HANDS ON ACTIVITY

- "Demonstrating Thrust" on page 17

Literacy Enrichment Activity

Have your child write a secret message on a piece of paper, then have him fold it into an airplane and fly it to you! You respond and fly it back! This is a fun way to let writing practice happen naturally.

- ★ Very young children can draw pictures and print the beginning sound of the picture. You can respond with a picture and simple word for her to read.
- ☆☆ Encourage your emergent writer to extend his reading and writing skills by answering back with a few questions. You can use pictures to help convey the meaning of your writing and assist your new reader as well.
- ☆☆☆ Build your child's vocabulary by introducing new words in your secret messages or ask some deep thinking questions! You could also include some word scrambles.



HANDS ON ACTIVITY

Demonstrating Thrust

Types of Learning: Measurement, Ordering and Ranking Numbers, Comparing Numbers, Fine Motor Skills

WHAT'S HAPPENING?

Let's head back to the park and throw our Frisbee once more. We now know that as that Frisbee is flying through the air, **lift** keeps it up. The initial throw of our arm is what gave that Frisbee **thrust**.

Thrust is a force that moves an object in the direction of the motion. In an airplane, this is accomplished with a propeller and a jet engine. Air is pulled and then pushed out which provides the thrust an airplane needs to get moving.

A household fan is a great example of how this works.



Adapted from NASA.

Check it out [here](#) for more interesting facts about the four forces of flight.

Materials

- Paper
- Household fan

Directions

We can see thrust in action by using a household fan.

1. Create a paper airplane using the tutorial for the longest flier, or create one all on your own.
2. Throw the airplane and measure how far it goes.
3. Now turn on a household fan and throw it with the help of the wind—or thrust—of the fan, and note how much further it goes.





TOPIC 7

Principles of Flight: Drag

Drag acts opposite the direction an airplane is going and slows it down. The more drag there is, the more thrust is required for flight. You may have noticed drag when you stick your hand out of a car window and feel it pull back. Let's explore...

Spark Curiosity



Did you know? The longest commercial flight currently available is a 19-hour trip from Singapore to London.



I wonder what has to be done to an airplane between flights? What has to be taken off or put on to the plane?

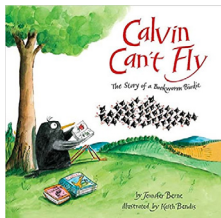
Resource Suggestions



Exploring Drag and Physics - for Kids!

Anslys

The Wright Brothers found out about the effects of drag the hard way, while trying to achieve the desired flying performance of their Flyer back in 1903. These effects are also exhibited when a streamlined sports car goes faster than a bulky truck.



Calvin Can't Fly: The Story of a Bookworm Birdie

Jennifer Berne

Calvin is one unusual starling! While his siblings and cousins learn to fly, this rare bird lets his imagination soar while reading about pirates, dinosaurs, and other fascinating things.

HANDS ON ACTIVITY

- "Demonstrating Drag" on page 19

Math Enrichment Word Problem

Have blocks, stones, or other manipulatives available for these math problems. Be flexible and change up the numbers to make these problems the right challenge for your children. Extend on the problems and ask follow up questions if your child is enjoying these challenges!

- ☆ An empty airplane can weigh as much as 40,000 kg! If a small empty airplane weighed 13,250 kg, which number is in the ones column? Which number is in the tens column? Which number is in the hundreds column?
- ☆☆ An empty airplane can weigh as much as 40,000 kg! If the maximum empty weight of an airplane is 40,000 kg and a small airplane weighs 13,250 kg, what is the weight difference between these two planes?
- ☆☆☆ An empty airplane can weigh as much as 40,000 kg! If the absolute total take off weight for an airplane is 80,000 kg and the empty airplane itself weighs 40,000 kg and the passengers, crew and cargo weigh a combined 18,000 kg, how much does the fuel weigh?



HANDS ON ACTIVITY

Demonstrating Drag

Types of Learning: Problem Solving, Critical Thinking, Gross Motor Development, Science Concepts

WHAT'S HAPPENING?

Now when we head back to the park with our Frisbee, we know much more about what is going on. We know that the Frisbee got in the air in the first place with a **thrust** from our arm. We also know that **lift** keeps our Frisbee in the air.

Each of these two forces have forces working against them. This is why our Frisbee doesn't keep going forever!

The force that acts against thrust is known as **drag**. Drag from the air is what makes our Frisbee slow down.

In order for an airplane to stay in the air, the amount of thrust needs to be stronger than the amount of drag.



Adapted from NASA.

Check it out here for more interesting facts about the four forces of flight.

Materials

- Plastic grocery bag
- String

Directions

We can see drag in action by creating a plastic bag kite.

1. Tie one string around both handles of a plastic grocery bag, closing them together to look almost like a balloon.
2. Run outside with the bag kite! As soon as the bag catches some air and fills, you will feel the effects of drag.





TOPIC 8

Principles of Flight: Weight

Weight is the force caused by gravity. The more weight, the more lift required for flight. Let's explore...

Spark Curiosity



Did you know? Pilots have to study hard and practice flying a lot before becoming certified, but qualifications are different all over the world, and there are many kinds of pilot licenses.



Four forces act on airplanes in flight: Thrust, drag, lift, and weight. Do these forces act on people as we walk? Or as we swim?

Resource Suggestions



How Airplanes Fly | The Four Forces of FLIGHT!

FL8MA.com Flight Training

Here we'll give you an introduction on how airplanes manage to fly, and the four forces that act upon all aircraft.



Flight: A Pop-Up Book of Aircraft

Robert Crowther

Get ready for takeoff! From an acclaimed 3-D master comes a jam-packed, interactive book on flying machines that will send readers soaring.

HANDS ON ACTIVITY

- "Principle of Flight #4: Weight" on page 21

Literacy Enrichment Activity

Using different tools for printing and writing is a fun way to encourage writing! Dip the end of a feather into some paint and let your children write.

- ★ Your child can print his name using the end of a feather. He can then try to paint using the feathery part of the feather.
- ★★ Encourage your child to write a sentence using the end of a feather. She can then paint a picture illustrating that sentence with the feathery end of the feather.
- ★★★ Have your child try his hand at some calligraphy!



HANDS ON ACTIVITY

Demonstrating Weight

Types of Learning: Measurement, STEM, Ordering and Ranking Numbers, Fine Motor Skills, Problem Solving

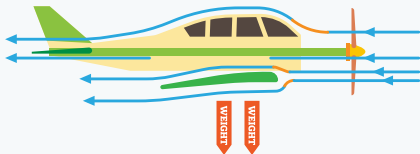
WHAT'S HAPPENING?

The final principle of flight is **weight**. This force acts opposite to the force of **lift**.

When we are at the park throwing our Frisbee, it is weight mixed with drag that brings our Frisbee back down to the ground.

Weight is simply the force that is caused by **gravity**. Gravity acts on every object on Earth, pulling it to the ground. The heavier an object is, the more weight it has, and the more difficult it is to get that object to take flight from the ground.

In order for a plane to fly, lift and thrust must be stronger than drag and weight.



Adapted from NASA.

[Check it out here for more interesting facts about the four forces of flight.](#)

Materials

- Paper coins
- Measuring tape
- Tape
- Painters tape

Directions

We can demonstrate the impact of weight on flight by adapting our earlier Cargo Carrying Paper Airplane activity.

1. Create a strong, sturdy paper airplane.
2. Measure and mark increments on the floor using painter's tape.
3. Tape a coin on the airplane and give it a toss, recording the distance.
4. Now add another coin and give it a toss with the same force, recording the distance.
5. Continue, noting the role weight must play in flight!





TOPIC 9

How Do Birds Fly?

The four principles of flight affect the flight of birds as well! Wings create lift, strong muscular bodies create thrust, an aerodynamic beak and streamlined body reduce drag, and lightweight bones limit weight. Let's explore...

Spark Curiosity



Did you know? About 40% of all birds in the world migrate. That is over 4,000 species of birds!



Can you think of any animals that fly, besides birds?

HANDS ON ACTIVITY

- "Applying the Principles of Flight to Birds" on page 23
- "The Principles of Flight: Birds" on page 27

Resource Suggestions



Bird Wing Shapes

BioBush

Learn about the different shapes that bird's wings can have and what they do.



How and Why Do Birds Fly

Baby Professor

Learn about the aerodynamics in birds that once led to the creation of our modern-day aircraft.

Math Enrichment Word Problem

Have blocks, stones, or other manipulatives available for these math problems. Be flexible and change up the numbers to make these problems the right challenge for your children. Extend on the problems and ask follow up questions if your child is enjoying these challenges!

- ★ There are about 10,000 species of flying birds. If there are 25 species of birds at a zoo and 20 of those species could fly, how many of those species would be flightless birds?
- ☆☆ There are about 10,000 species of flying birds. If there are 60 species of birds which cannot fly and 10,000 species of birds in total, what is the number of flying birds?
- ☆☆☆ There are about 10,000 species of flying birds. If there are 60 species of birds which cannot fly and 10,000 species of birds in total, what is the ratio of flightless birds to flight birds in the smallest possible form?



HANDS ON ACTIVITY

Applying the Principles of Flight to Birds

Types of Learning: Comparing and Contrasting Concepts, Writing Skills, Fine Motor Skills

WHAT'S HAPPENING?

Birds also use the four principles of flight. In addition to this, they also have bodies that are built for flying.

Most birds have:

- Light, hollow bones
- A beak instead of a jaw, teeth, and nose
- A rigid skeleton for attaching strong muscles
- A large sternum for attaching strong chest muscles used for flapping wings
- A streamlined body shape
- Smooth feathers that reduce drag
- Wings

Adapted from Kids News.

[Check it out here for more interesting facts about birds and flight.](#)

Materials

- Pencil

Directions



"The Principles of Flight: Birds" on page 27

See if you can transfer your knowledge of airplanes to birds on the How Do Birds Fly printable.

Young children can label the four principles of flight. Older children can write a description of each of the four principles in their own words, as well as their knowledge about airplanes.





TOPIC 10

Why Do Birds Fly in a V?

Birds fly in a V for a few different reasons. First of all, it conserves their energy. The birds in the back benefit from reduced wind resistance (lowering the amount of drag acting on them). When the bird in the lead gets tired, he or she goes to the back and another bird has a turn leading the way. Let's explore...

Spark Curiosity



Did you know? Bar-headed geese are the highest-flying migratory birds, reaching heights of up to 5.5 miles above sea level!



What do you think humans learned from birds while designing airplanes?

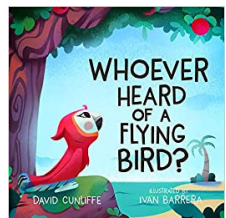
Resource Suggestions



How Do Birds Fly?

thependulumswing

Basic mechanics and physics of bird's flight.



Whoever Heard of a Flying Bird?

David Cunliffe

Have you ever been told something was impossible, but just knew it was possible?

HANDS ON ACTIVITY

- "Demonstrating Wind Resistance" on page 25

Math Enrichment Word Problem

- ☆ Birds come in all sorts of colours, shapes, and sizes. Draw a pattern of birds using at least two different colours.
- ☆☆ Birds come in all sorts of colours, shapes, and sizes. Create a pattern of birds using different colours and different sizes (for example, big red, small red, big blue, small blue, big red, small red, etc.).
- ☆☆☆ Birds come in all sorts of colours, shapes, and sizes. Create a pattern of birds with all three attributes changing (colour, shape, and size).



HANDS ON ACTIVITY

Demonstrating Wind Resistance

Types of Learning: Problem Solving, Science Concepts

WHAT'S HAPPENING?

By flying in a V formation, it has been found that the birds near the back glide more and need to flap their wings less frequently. This has many benefits, including the fact that these birds can get where they want to go faster as they don't need to rest as frequently.

Another reason birds fly in a V shape has nothing to do with wind resistance or conserving energy! It has to do with communication. Flying in this way allows for the birds to see one another and communicate easier.

Adapted from Library of Congress.

[Check it out here for more interesting facts about how geese fly.](#)

Materials

- Paper
- Scissors
- Marker
- Household fan

Directions

With this simple experiment, we will learn a bit about wind resistance and why a V shape helps birds fly.

1. Take a strip of construction paper and draw some little birds on it.
2. Using a fan, hold that piece of paper flat across the fan. The ends will start to blow back and it will be very difficult to hold it flat.
3. Now, put a crease in the middle of the paper. Have your child pinch just on that crease and notice how easy it is to hold now.





TOPIC: HISTORY OF AIRPLANES

History of the Wright Brothers

Adapted from National Geographic Kid's Taking Flight With the Wright Brothers.

Read the full story here: <https://kids.nationalgeographic.com/explore/history/wright-brothers>

The Wright brothers were interested in flying from a young age. As children in Dayton, Ohio, their favorite toy was a small helicopter-like object that was powered by a rubber band to twirl its blades. Fascinated by the toy and its mechanics, the brothers hoped to one day build a flying machine big enough to hold them both.

As young men, the brothers went into business together, first operating a printing press, then a bicycle repair shop. Eventually the duo began selling their own custom-made bicycles to customers.

But the brothers never lost their love of flying. At the time, other aircrafts such as gliders—or aircrafts without engines—did exist, but the Wrights wanted to add more power to the objects they were flying. In 1899, the brothers began experimenting with building their own aircrafts.

In 1900, the brothers traveled to Kitty Hawk, North Carolina, to begin their flight experiments. The oceanside dunes at Kitty Hawk had regular breezes and soft, sandy landing surfaces—perfect for their studies.

The brothers first conducted tests with kites before experimenting with gliders. Both Orville and Wilbur separately piloted the gliders during their testing process.

In 1903, the brothers built an airplane called the Wright Flyer I, which featured wooden propellers the men had designed and carved themselves. The plane also had a gasoline engine.

After weeks of unsuccessful attempts, the craft—with extra fabric incorporated to increase the stiffness of the wings—took flight for 12 seconds on December 17, 1903, traveling 120 feet before landing. The plane worked! Both brothers flew the craft a few more times that day. They had flown the world's first successful piloted engine-powered airplane.

After their success in North Carolina, the Wright brothers continued to travel around the world, perfecting their craft and modifying their designs. But they did so much more, kicking off the era of modern aviation and inspiring future adventurers.

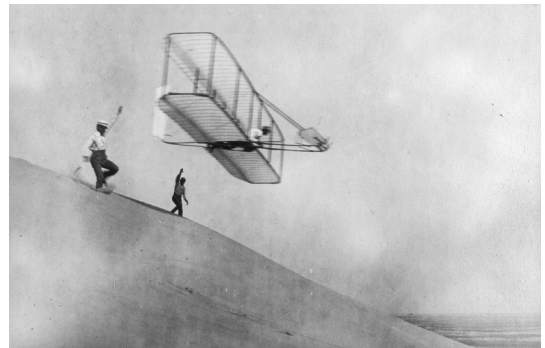
The decades following Kitty Hawk were filled with accomplishments in aviation, including the first solo flight across the Atlantic Ocean and the first passenger flight. And, of course, flight didn't just stay in this world—a little over 65 years after the Wrights' famous first flight, astronauts Neil Armstrong and Buzz Aldrin walked on the moon. The Wright brothers didn't just fly the first piloted engine-powered airplane—they created a whole new way for us to explore our world.



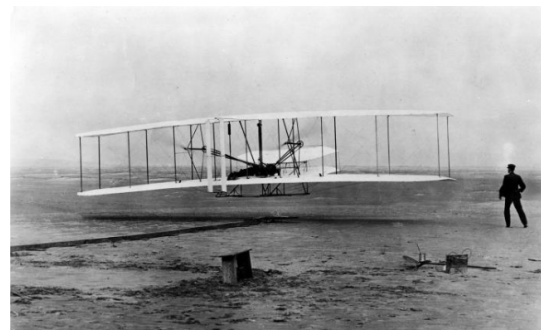
Wilbur Wright, 1876 (age 9)
Photo Credit: [Wikipedia](#)



Orville Wright, 1876 (age 5)
Photo Credit: [Wikipedia](#)



Wright Glider in Kitty Hawk, North Carolina, 1901
Photo Credit [Library of Congress](https://www.loc.gov/item/wright002818/) (<https://www.loc.gov/item/wright002818/>)



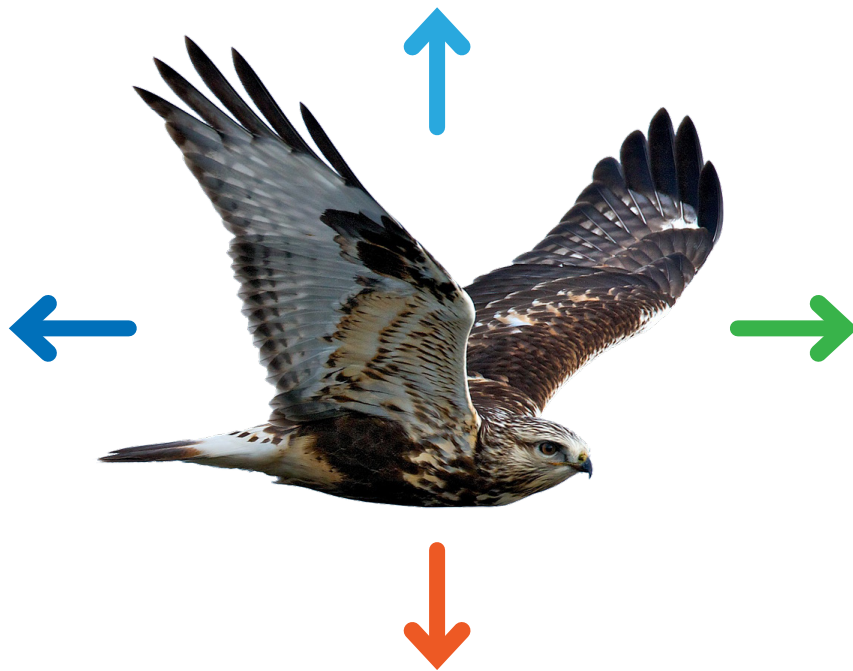
Wright Flyer I First Flight in Kitty Hawk, December 17, 1903
Photo Credit [National Archives](#) (photo no. 7580929)



TOPIC: HOW DO BIRDS FLY?

The Principles of Flight: Birds

Can you transfer your knowledge of airplanes and the four principles of flight to birds?





My Unit Study Notes on Flight

TOPIC 1: HISTORY OF AIRPLANES

TOPIC 2: AERODYNAMICS



My Unit Study Notes on Flight

TOPIC 3: HOW DO AIRPLANES TURN?

A large, empty rectangular box with a thin black border, intended for a drawing or illustration related to the topic.

TOPIC 4: CARRYING HEAVY LOADS

A large, empty rectangular box with a thin black border, intended for a drawing or illustration related to the topic.

TOPIC 5: PRINCIPLES OF FLIGHT: LIFT

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Patient Information	
First Name	
Last Name	
Address	
City	
State	
Zip	
Phone	
Insurance	
Physician Information	
Physician Name	
Physician Address	
Physician City	
Physician State	
Physician Zip	
Physician Phone	
Physician Insurance	
Referral Information	
Referral Number	
Referral Date	
Referral Type	
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My Unit Study Notes on Flight

TOPIC 7: PRINCIPLES OF FLIGHT: DRAG

TOPIC 8: PRINCIPLES OF FLIGHT: WEIGHT



My Unit Study Notes on Flight

TOPIC 9: HOW DO BIRDS FLY?

TOPIC 10: WHY DO BIRDS FLY IN A V?