FROST SCIENCE

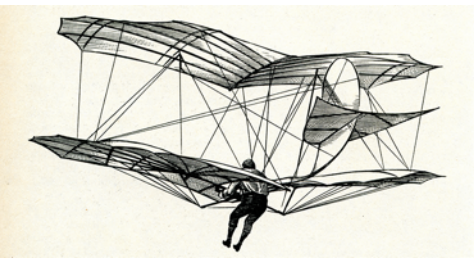
Field Trip Guide

Feathers to the Stars
Grades K-2

Contents

Questions? Ready to book your field trip? | Please visit: www.frostscience.org/fieldtrips


Flamingo in flight


Early flight design drawing


Space shuttle launch

Overview

Students will explore the evolution of flight, from dinosaurs to the future of space travel. Along the way, they will learn how natural flight has inspired human flight. They will also learn how human flight has developed with new innovations and discoveries in many fields of science, technology and engineering.

Educational Standards

Kindergarten

Big Idea 1 - The Practice of Science

- SC.K.N.1.4 Observe and create a visual representation of an object which includes its major features.

Big Idea 5 - Earth in Space and Time

- SC.K.E.5.1 Explore the Law of Gravity by investigating how objects are pulled toward the ground unless something holds them up.

1st Grade

Big Idea 1 - The Practice of Science

- SC.1.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.

Big Idea 12 - Motion of Objects

- SC.1.P.12.1 – Demonstrate and describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.

2nd Grade

Big Idea 1 - The Practice of Science

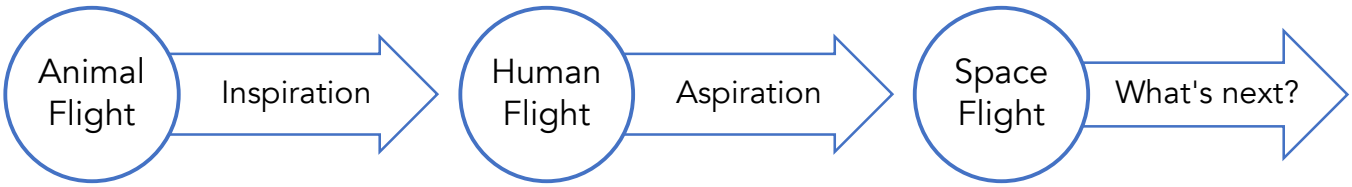
- SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.

Big Idea 13 - Forces and Changes in Motion

- SC.2.P.13.3 Recognize that objects are pulled toward the ground unless something holds them up.

Background Information

"Through research, inspired humans can overcome any challenge."
Dr. Jorge Perez-Gallego
Feathers to the Stars Exhibition Developer



From feathered dinosaurs to space travel and beyond, *Feathers to the Stars* is a journey over millions of years, from the distant past, to the present day, and into the future. The exhibition has three areas to explore: inspiration from nature, manned flight, and space travel. In each area, students will discover how nature has played a role in inspiring man-made advances in science, technology and engineering that have allowed us to travel the sky and explore the universe.

Looking back at feathered dinosaurs, students can explore the principles of how flight first evolved in nature, leading to the many flying creatures of today. Next, students can explore the trial and error of early pioneers in flight and the basic physics principles of flying. Lastly, students can explore the progress humans have made to travel off of our own planet and project where we may be going in the future.

Feathers to the Stars Exhibition Key Questions

- How do animals fly?
- How do humans fly?
  - How are human and animal flight connected?
- What makes space flight different than flight on Earth?
  - What's next?

Pre-Activity

See pages 5 - 13 for pre-activity instructions and presentation.

Field Trip Experience

All Museum field trips are a three-hour experience, offered Monday through Friday, beginning at 9:30 a.m. or 10:00 a.m. Each field trip includes three experiences of the teacher's choice and time for lunch. Upon arrival, the teacher will be provided with a specific schedule for his/her visit based on the three chosen experiences. Additional information regarding field trip logistics is provided in the field trip package that each teacher will receive upon booking a field trip.

During the field trip, students will encounter a variety of experiences. To enhance these learning opportunities, facilitator cards are provided at arrival for all teachers and chaperones who would like to use them (please see pages 20 - 22 for a sample). The facilitator cards include prompting questions, additional content, and exhibition location maps which show where in the exhibition one can find content related to that card. Additionally, a student guide that corresponds to the exhibition prompting questions are available in this document on pages 18 - 19. Please print a student guide for each student in advance of your arrival to the museum, and bring pencils; student guides and pencils will not be provided by Frost Science.

Post Activity

See pages 14 - 17 for post-activity instructions and presentation.

Select Recommended Extensions:

Kindergarten
ECHOS – Astonishing Air – Flight Test (included at end of packet)
Grade 1: What Is a Bird?
http://serc.carleton.edu/sp/mnstep/activities/birds.html
Grade 2: What Goes Up Must Come Down!
http://www.cpalms.org/Public/PreviewResourceLesson/Preview/154892
Grades K – 2: Cornell Lab of Ornithology - Amazing Birds: Activity Sheet 1 – Bird Parts
http://www.birds.cornell.edu/physics/lessons/elementary/pdfs/ss

Pre-Field Trip Activity: See, Think, Wonder
(A Visual Thinking Routine)

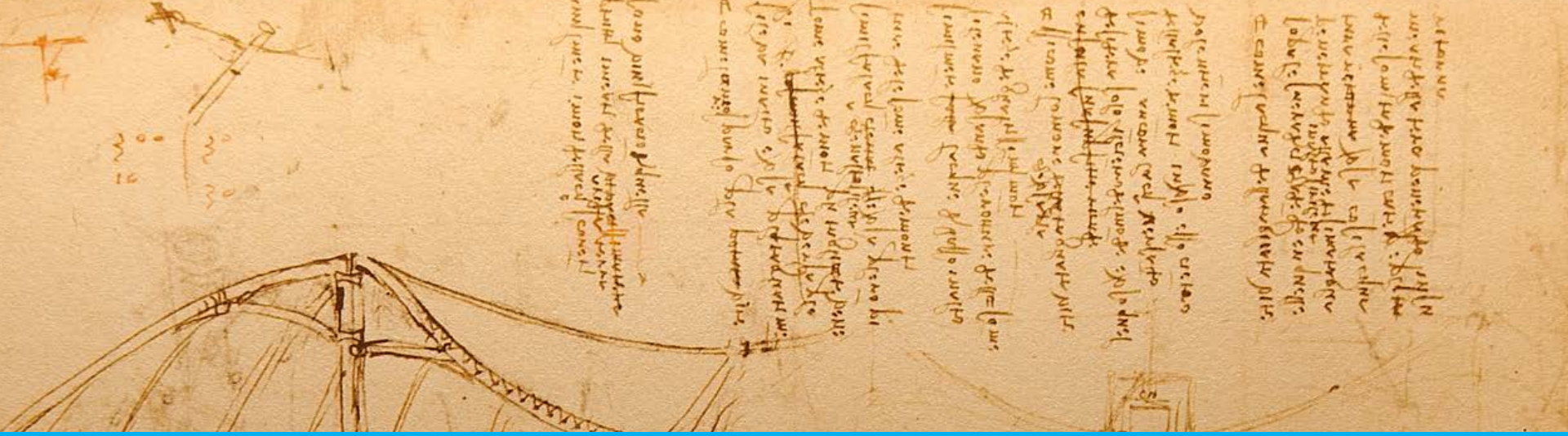
Overview
Students will participate in a visual thinking process to stimulate curiosity about flight. The routine encourages students to observe and think carefully about why something can look a certain way, or behave the way it does. Students will make observations about flight from three images, and are then encouraged to answer question about what they see, what they think, and what they wonder about the images and flight.

Objective
Students will observe different images to identify what they know and what they are curious about related to the concept of flight.

Materials
- Computer, white board and projector
- *Optional: sticky notes*
- *Feathers to the Stars* Grades K-2 Pre-Field Trip Presentation (pages 6 - 13)

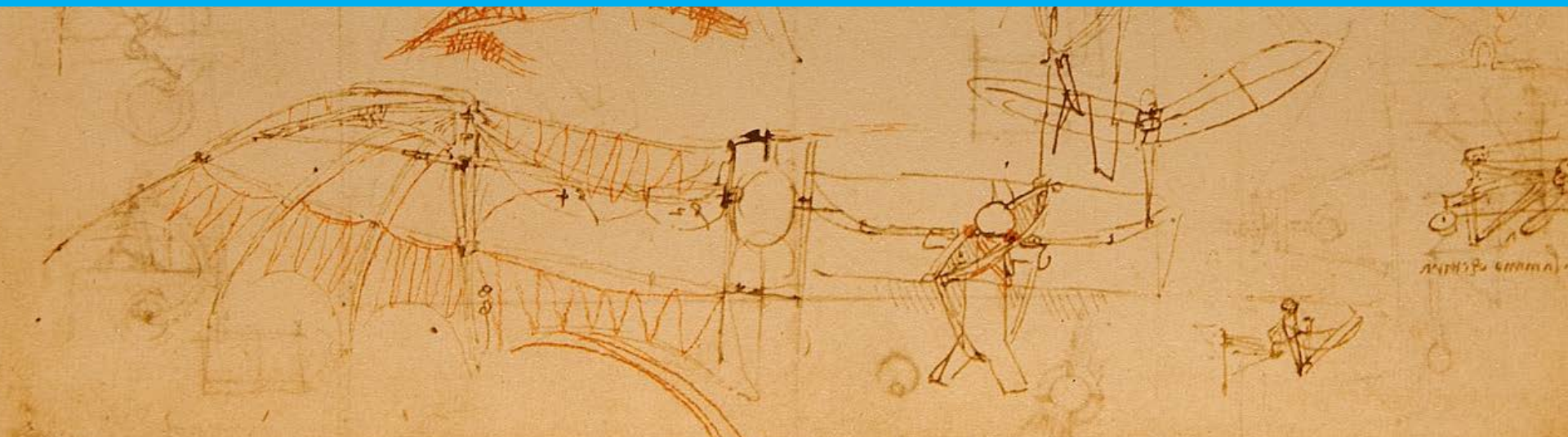
Activity Steps
1. Test the presentation on your computer: open the document, go to "View" on the menu bar, then click the full screen option ("Enter Full Screen" or "Full Screen Mode").
2. Use the presentation to guide the activity.
3. *Optional: Have students write or draw their responses on sticky notes and add to a chart labeled, "See," "Think," and "Wonder" at the top. Please see sample chart on page 13 for reference.*
4. Conclude with a class discussion about flight and what the students may see during their field trip.

Helpful Hint
For the facilitation of the "I see…" component, it can help to remind the students to only point out what they see (imagine they can put their finger on it, e.g. a feather, the bird, etc.) as to not jump ahead to the "I think…" component.



Frost Science | Feathers to the Stars Pre-Field Trip Activity | K - 2ND Grade

SEE – THINK - WONDER



I See...

- Describe what you see in this image.

I See...

- Describe what you see in this image.

I See...

- Describe what you see in this image.

I See...

- Describe what you see in these images.

I Think...

- Describe what you think is going on in these images.
- What makes you say that?

I Wonder…

- What do these pictures make you wonder about flight?

Sample Pre-Field Trip Chart

Post-Field Trip Activity: "I Used to Think… But Now I Think…"
(A Visual Thinking Routine)

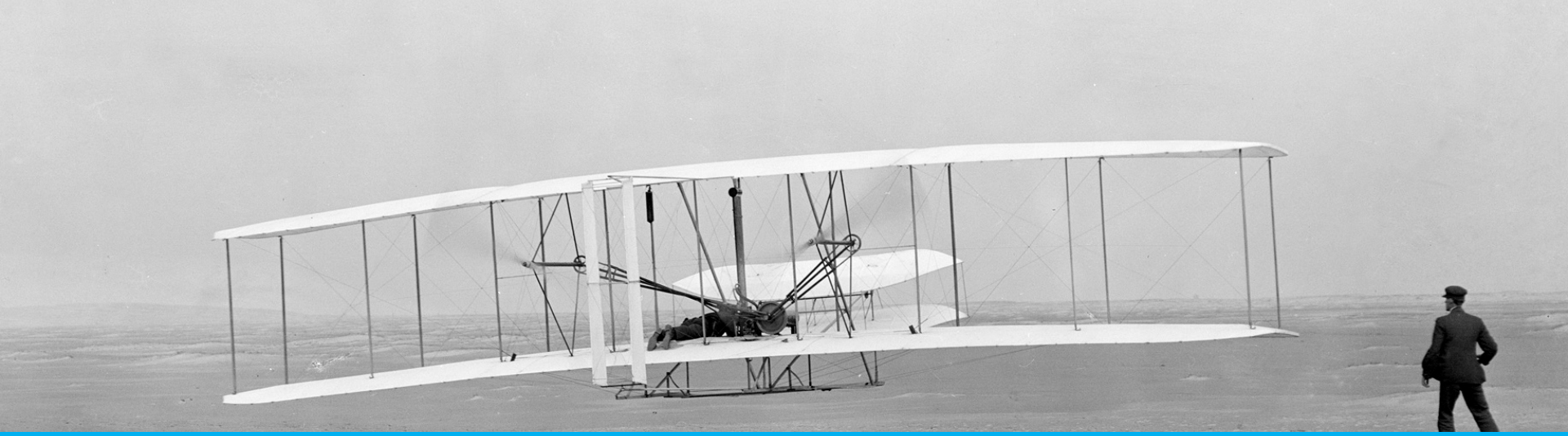
Overview
After the field trip, students reflect on what they have observed, explored and learned. Students will complete the Visual Thinking Routine "I Used to Think… But Now I Think…" This activity can be used when students' initial thoughts, opinions, or beliefs are likely to have changed or expanded as a result of an experience. The students can also share and explain their shifts in thinking as a classroom group for further group learning opportunities.

Objective
Students will reflect on their experience at the Museum and how their thinking about flight has changed.

Materials
- Computer, white board and projector
- *Optional: poster paper*
- *Feathers to the Stars* Grades K-2 Post-Field Trip Presentation (pages 15 - 17)

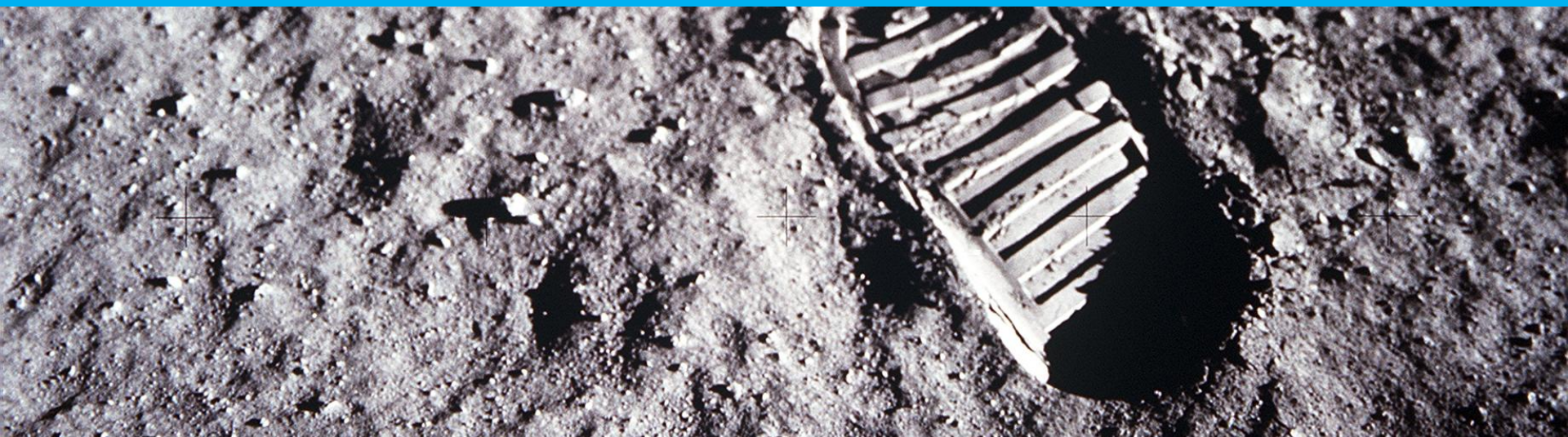
Activity Steps
1. Draw a chart on the white board *(or poster paper)* for you to record the students' ideas.
2. Test the presentation on your computer: open the document, go to "View" on the menu bar, then click the full screen option ("Enter Full Screen" or "Full Screen Mode").
3. Give each student several sticky notes.
4. Use the presentation to guide the activity.
5. Conclude with a class discussion about the completed chart.

Helpful Hints
- Younger students may benefit by drawing their responses and then sharing and explaining them to help prompt a class discussion.
- Additionally, teachers can allow for a "parking lot" extension to the chart for students whose thinking has not changed, but rather remained the same.

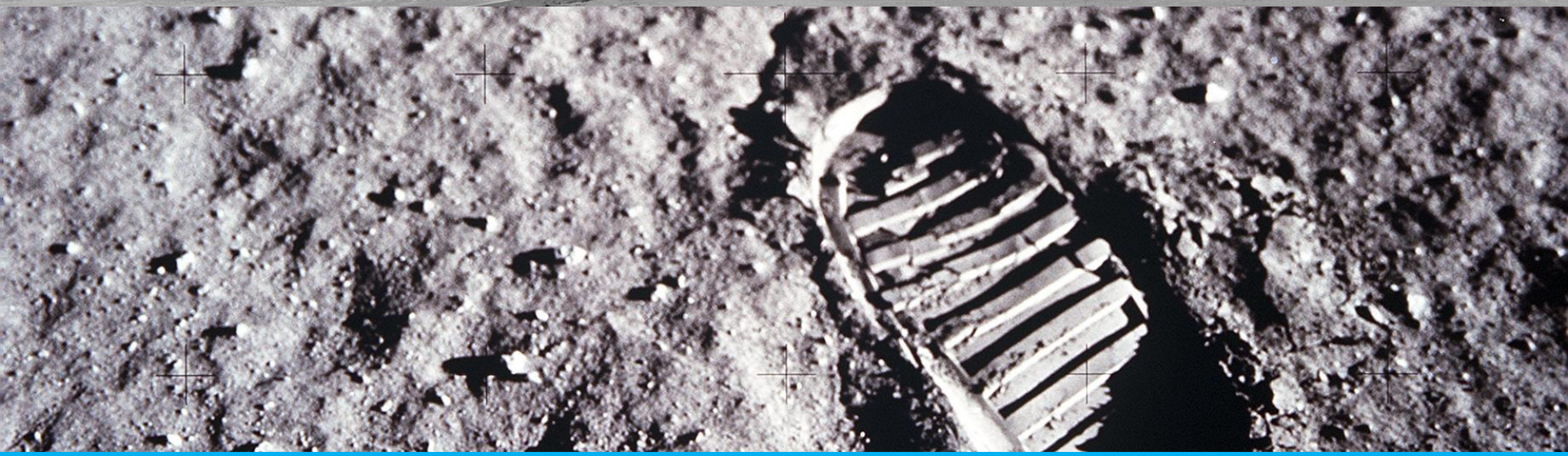


Frost Science | Feathers to the Stars Post-Field Trip Activity | K - 2ND Grade

I USED TO THINK… BUT NOW I THINK…

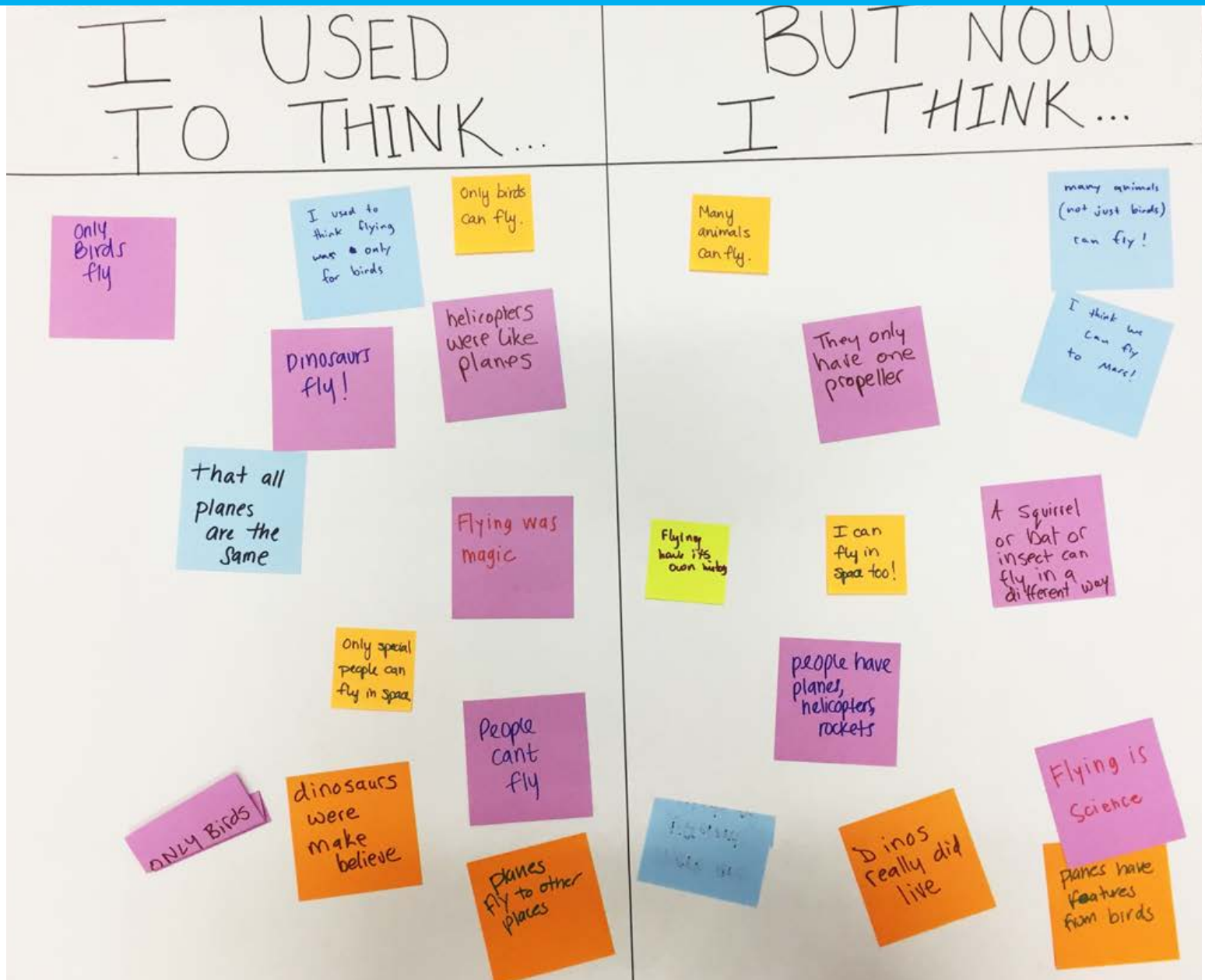


How has your thinking changed?



- What did you think about flight BEFORE the field trip?
- What do you think NOW about flight?

Sample Post-Field Trip Chart



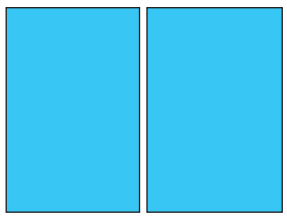
FROST SCIENCE

FEATHERS TO THE STARS

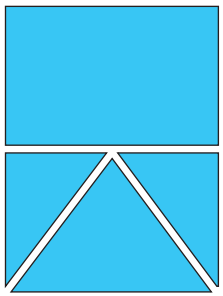
K - 2ND Grade Student Guide

Hi, future flyers! We need volunteers to fly in the future!

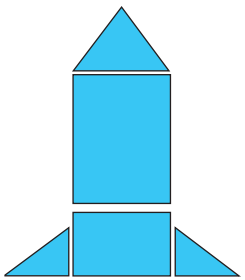
Your mission is to complete the activity using this paper, then create and color your very own rocket.



1. Cut the paper in half (along the larger rectangle).



2. Cut out the three triangles.



3. Arrange the pieces to look like the rocket below, then color to make it your own.

How to make a rocket

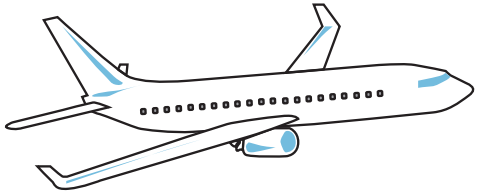
Cut here

Cut here

Cut here

Who Flew First?

Directions: Number the images in order from 1 (first) to 5 (last).



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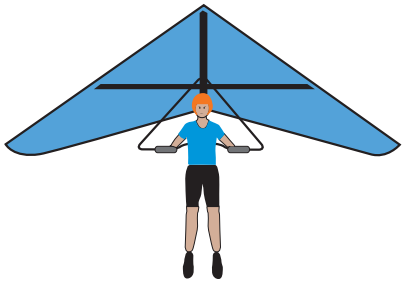

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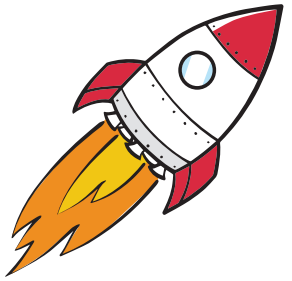

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CHECK IN

Animal Flight

Say:

"Flight has evolved in different ways in the animal world, and we can see the evidence by observing insects, pterosaurs, birds, and bats."

Explore and use the Student Guide

Discover the features that allow animal flight.

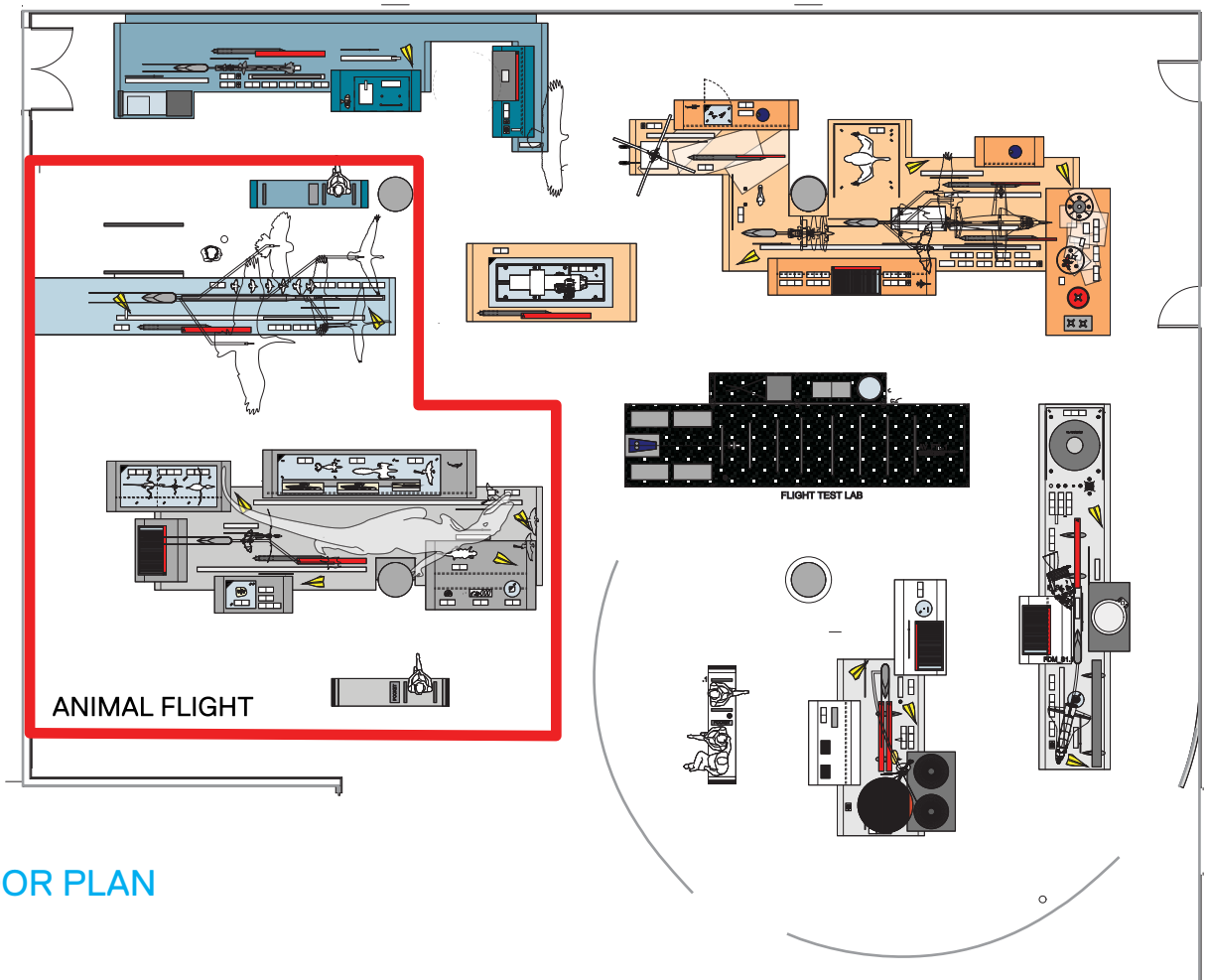
Discuss:

How do animals fly?

Some possible answers include…

- *Lightweight **wings** attached to muscles on insects*
- *Long flight **feathers** on birds*
- ***Skin** stretched over **long fingers** like the bat*
- ***Hollow bones** that make a bird's body light*

FROST SCIENCE | FEATHERS TO THE STARS FIELD TRIP



FLOOR PLAN

CHECK IN

Human Flight

Say:

"Humans were inspired by birds to fly in the sky."

Explore and use the Student Guide

Discover the different ways humans fly.

Discuss:

How do humans fly?

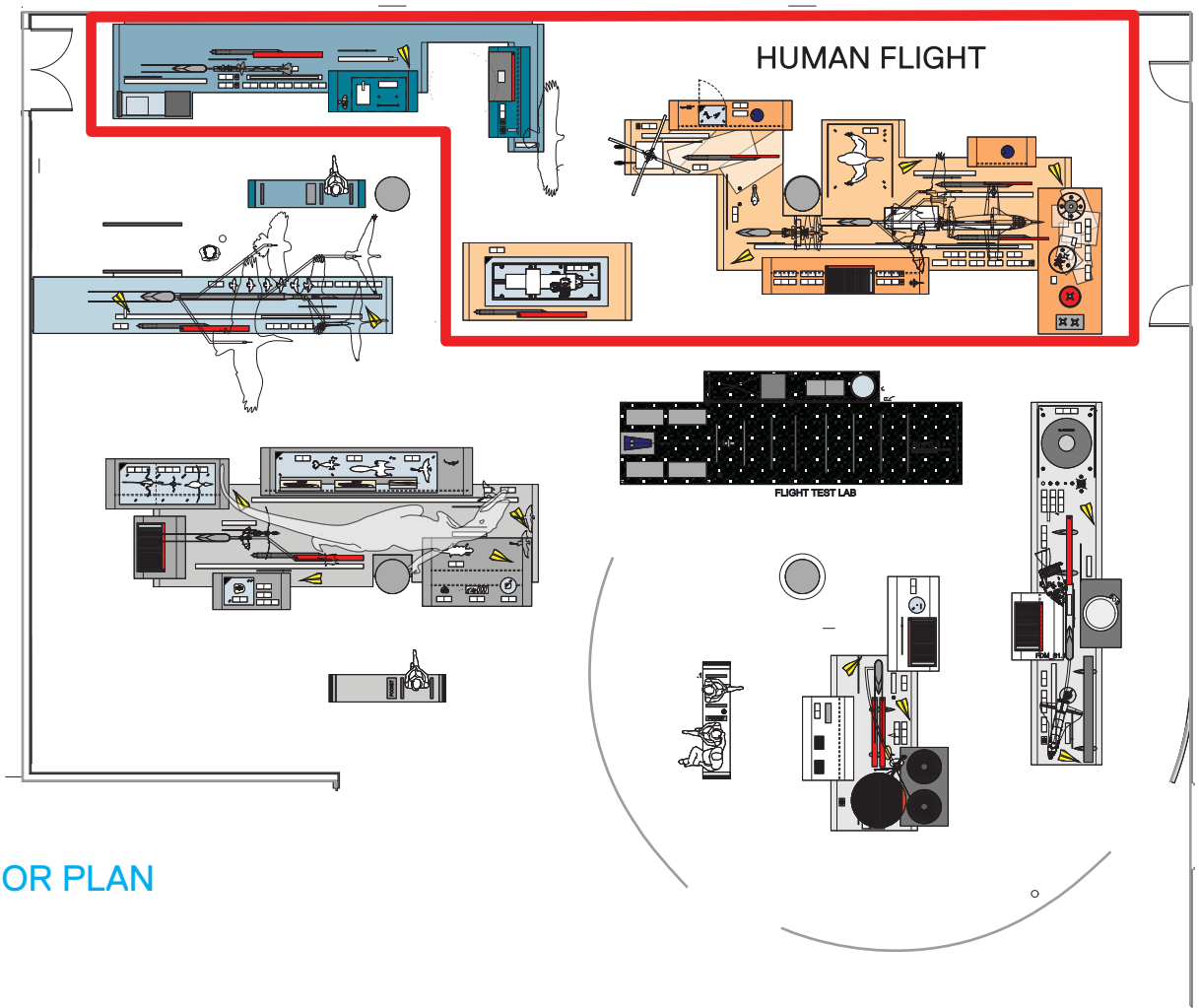
Some possible answers include…

- *Providing **lift** by changing the wing shape*
- *Using the **thrust** of an engine to move forward*
- ***Gliding** through the air like birds*

What is a connection between how humans and animals fly?

Some possible answers include…

- *They both use wings to get **lift**.*
- *Both are affected by **gravity** and **drag** from the atmosphere (air).*
- *They use **thrust** to move forward.*



FLOOR PLAN

CHECK IN

Space Flight

Say:

"Nature provided the inspiration for humans to find ways to fly. Finding ways to fly in space, without examples from nature, was our next big challenge."

Explore and use the Student Guide

Explore how humans get to space and the differences between Earth and space flight.

Discuss:

What makes space flight different from flight on Earth?

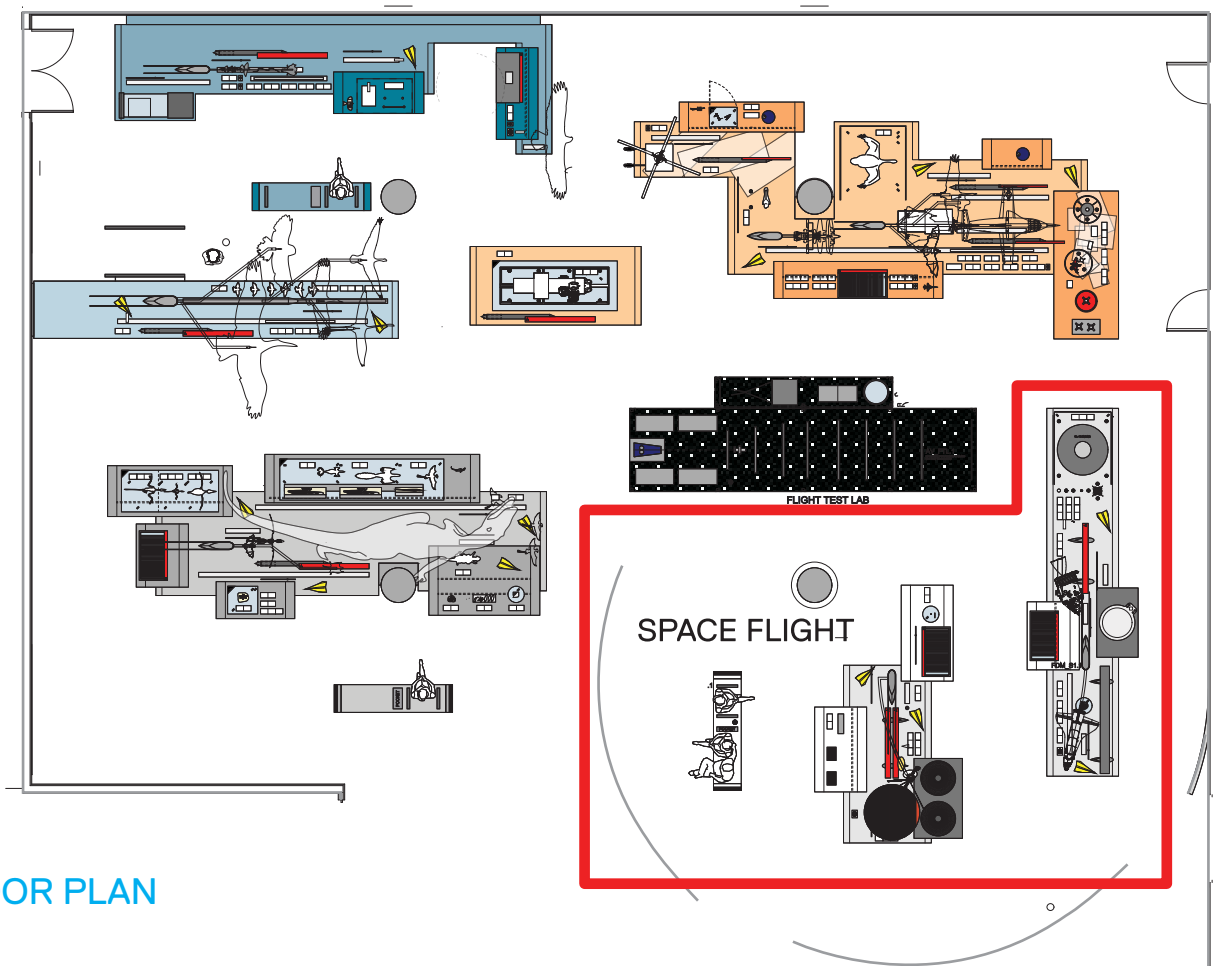
Some possible answers include…

- ***Without air**, the laws of aerodynamics don't apply.*
- *There is nothing to imitate from nature.*

What's next?

Some possible answers include…

- *Find ways for humans to visit another planet.*
- *Make airplanes go farther, faster, or greener (solar, hydrogen fuel, etc.).*
- *Have airplane wings move like birds.*



FLOOR PLAN