

Learning Worksheet

Name: _____

Date: _____

Use this worksheet to record your ideas as you move through the learning bytes.

Flight Basics: 1. How do planes fly?

What are pitch, roll, yaw?

1. In your own words, what is the main idea of How does a plane fly?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: describe roll, yaw, and pitch and identify the control surfaces that create them?

- Circle one: 1 - 2 - 3 - 4 - 5

5. When one aileron goes up, does the other go in the same direction or the opposite?

☐ A. Same direction

☐ B. Opposite

6. Left wing aileron up and right wing aileron down. Which direction does the plane roll?

☐ A. Left

☐ B. Right

7. Right wing aileron up and left wing aileron down. Which direction does the plane roll?

- ☐ A. Left
 - ☐ B. Right
8. Move the rudder to the left. Which direction does the plane go?
- ☐ A. Left
 - ☐ B. Right
9. Move the rudder to the right. Which direction does the plane go?
- ☐ A. Left
 - ☐ B. Right
10. Elevator up. Does the nose go up or down?
- ☐ A. Up
 - ☐ B. Down
11. Elevator down. Does the nose go up or down?
- ☐ A. Up
 - ☐ B. Down
-

Which forces act on plane in the air?

1. What keeps a plane up in the air?
- ☐ A. Air pushes up on the wings (lift) while the engines push forward; when lift balances weight, the plane can stay up.
 - ☐ B. Drag and weight push upward and keep the plane floating in the sky.
 - ☐ C. The engines pull the plane upward like a magnet.
2. Fill in the table with a short note for each force.
- 1. Lift
 - Direction: _____
 - What It Does: _____
 - 2. Weight (gravity)
 - Direction: _____

- What It Does: _____
3. Thrust
- Direction: _____
 - What It Does: _____
4. Drag
- Direction: _____
 - What It Does: _____

3. Which force pushes a plane forward?

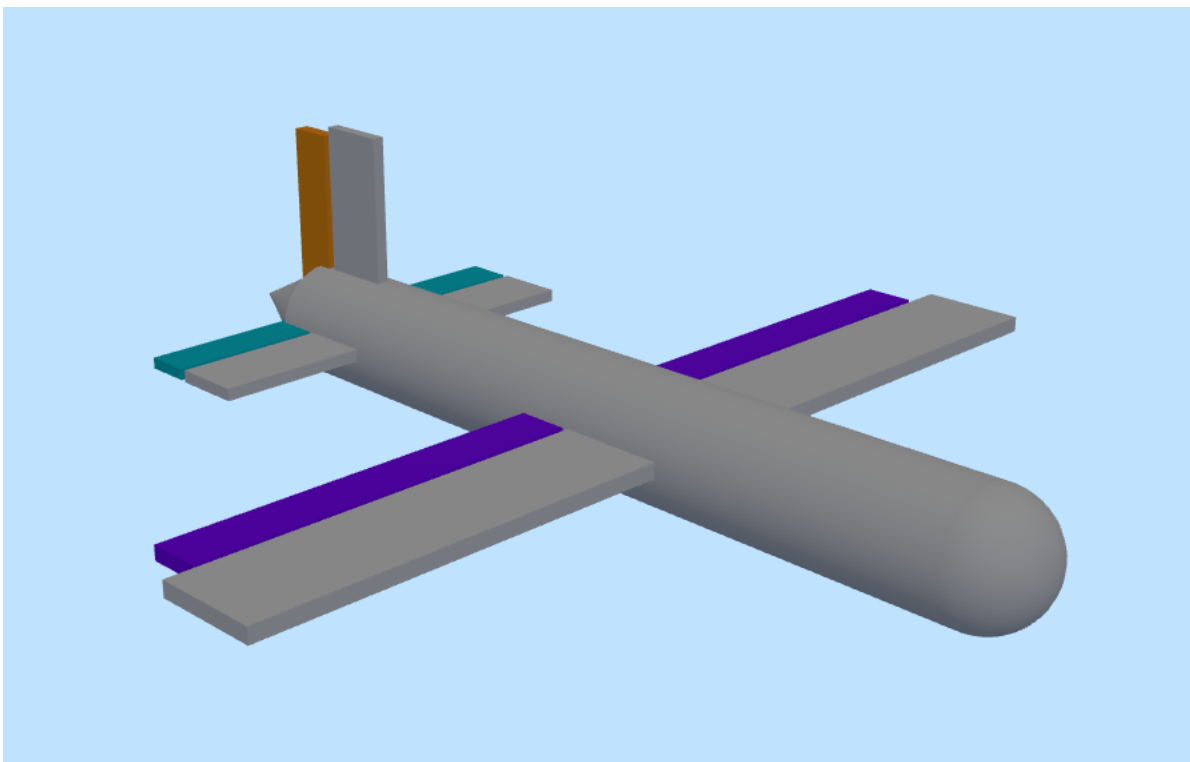


Figure 1: Look at the airplane

- ☐ A. Lift
 - ☐ B. Weight (gravity)
 - ☐ C. Thrust
 - ☐ D. Drag
4. What do you notice about how different forces must work together to keep a plane flying?

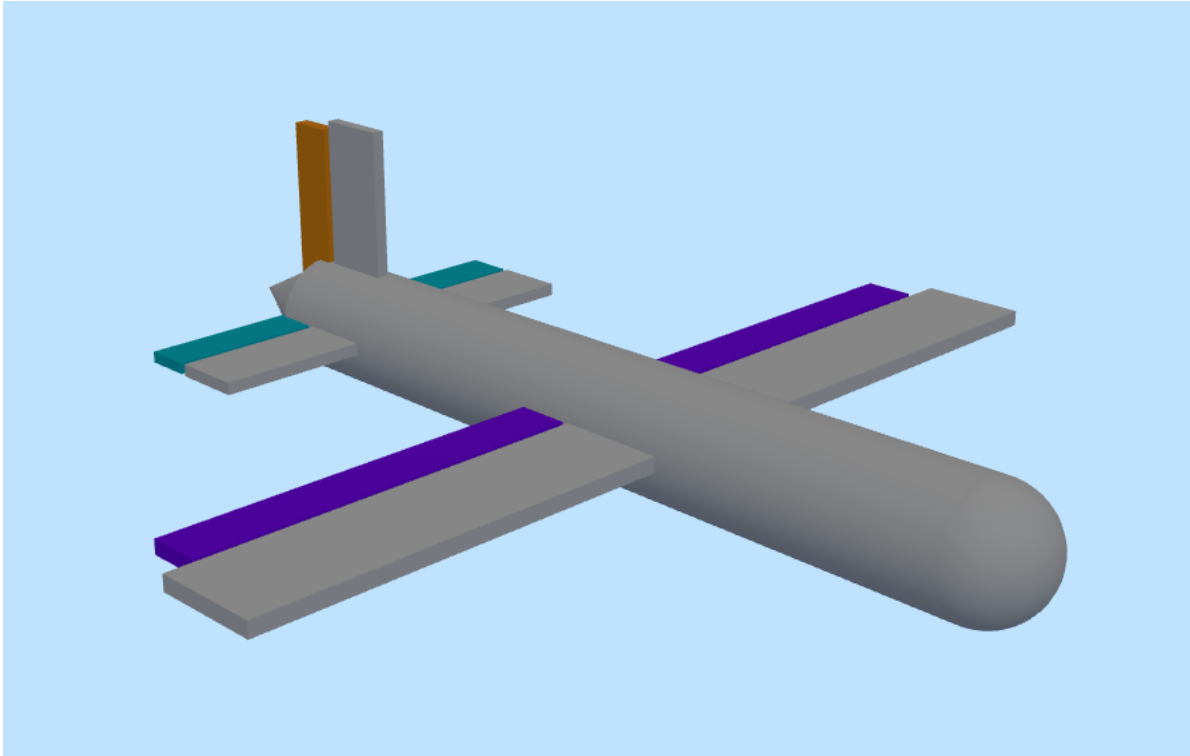


Figure 2: Look closely at the plane

- Response: _____

5. In your own words, what is the main idea of Aerodynamic Forces?

- Response: _____

6. Summarize what you have learned today.

- Response: _____

7. What did you find most surprising or intriguing in this learning byte?

- Response: _____

8. How well do you understand: describe how planes fly and explain the four forces involved: lift, weight (gravity), drag, and thrust?

- Circle one: 1 - 2 - 3 - 4 - 5

Flight Basics: 2. How do birds fly?

How do birds fly?

1. In your own words, what is the main idea of How do birds fly?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: describe how birds flap, glide, and steer, and why wing shape changes matter?

- Circle one: 1 - 2 - 3 - 4 - 5

Comparing bird flight with planes

1. In your own words, what is the main idea of Comparing bird flight with planes?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: compare how birds and planes achieve lift, control, and efficiency?

- Circle one: 1 - 2 - 3 - 4 - 5

Avian Research: 3. Let's learn about Avian-inspired Engineering

Why scientists are interested in birds?

1. In your own words, what is the main idea of Avian-inspired engineering?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: explain avian-inspired engineering and name examples of bird-inspired drones?

- Circle one: 1 - 2 - 3 - 4 - 5

Avian Research: 4. Meet LisEagle

Research Case 1: Story of LisEagle

1. In your own words, what is the main idea of Research Case?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: summarize the LisEagle research case and why adaptive morphing matters?

- Circle one: 1 - 2 - 3 - 4 - 5

Design Challenge: 5. Designing a Bird Automaton

Introduction to Design Challenge

1. In your own words, what is the main idea of Design Challenge?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: describe the design challenge steps and pick a bird movement to prototype?

- Circle one: 1 - 2 - 3 - 4 - 5

Meet Mochi - the Albatross

1. Which idea best explains why albatrosses can travel far with very little flapping?

- ☐ A. They use wind gradients and efficient wing design
- ☐ B. They have short wings that flap faster
- ☐ C. They only fly on completely calm days

2. Fill in the missing words from the Mochi page.

1. Albatross wings are long and _____. Answer: _____
2. Dynamic soaring helps the bird gain energy from changing _____ speeds. Answer: _____

3. A glide ratio of 22:1 means the bird moves far _____ while losing little height. Answer: _____

3. (No prompt text)

- ☐ A. Albatrosses usually need strong ocean winds to make long-distance soaring easier. () True () False
- ☐ B. Dynamic soaring requires continuous flapping during the whole cycle. () True () False

4. Put the dynamic soaring cycle in the correct order.

- Items: Windward ascent | Turn | Leeward descent | Sharp turn

5. Match the flight idea to what it helps the bird do.

- Pairs: Wing lock -> Save energy during long glides | High glide ratio -> Move far forward while descending slowly | Dynamic soaring -> Use changing wind speeds over the ocean

6. What did you find most surprising or intriguing in this learning byte?

- Response: _____

7. Summarize what you have learned today.

- Response: _____

8. How well do you understand: explain how an albatross uses long, narrow wings to glide efficiently and why that matters for design?

- Circle one: 1 - 2 - 3 - 4 - 5

9. Imagine you are designing a drone inspired by Mochi. Which one feature would you borrow first, and why?

- Response: _____

10. Which wing shape helps an albatross glide efficiently over long distances?

- ☐ A. Short, wide wings
- ☐ B. Long, narrow wings
- ☐ C. Short, triangular wings

11. Dynamic soaring helps an albatross because it:

- ☐ A. Lets the bird hover in place
- ☐ B. Only works when the air is still
- ☐ C. Uses wind gradients to gain energy without flapping

12. What comes right after a windward ascent in the dynamic soaring cycle?

- ☐ A. Turn
- ☐ B. Land on the water
- ☐ C. Fold the wings

13. A glide ratio of 22:1 means the bird can:

- ☐ A. Travel about 22 meters forward for every 1 meter it descends
- ☐ B. Flap its wings 22 times in 1 minute
- ☐ C. Climb 22 meters without wind

14. Why is wing lock useful during long flights?

- ☐ A. It helps the bird save energy
- ☐ B. It makes the bird invisible
- ☐ C. It only works underwater

Design Challenge: 6. Choose your bird

Bird Sound

1. In your own words, what is the main idea of Bird Sound and Size?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: compare bird sizes and sounds and connect size to flight behavior?

- Circle one: 1 - 2 - 3 - 4 - 5

Bird Card

1. In your own words, what is the main idea of Know the Birds?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: match birds to wing types and explain how wing shape connects to flight style?

- Circle one: 1 - 2 - 3 - 4 - 5

5. What wing type is typical of the Albatross?

- ☐ A. Elliptical wings
- ☐ B. High-speed wings
- ☐ C. Active soaring wings
- ☐ D. Hovering wings

6. Albatrosses primarily use winds over the ocean to...

- ☐ A. Hover in place
- ☐ B. Perform plunge dives
- ☐ C. Dynamic soar and glide long distances

- ☐ D. Climb thermal updrafts in deserts
- 7. What wing type characterizes the Bald Eagle?
 - ☐ A. Passive soaring wings
 - ☐ B. High-speed wings
 - ☐ C. Active soaring wings
 - ☐ D. Hovering wings
- 8. Bald eagles typically stay aloft by riding...
 - ☐ A. Sea breezes near the surface
 - ☐ B. Thermal updrafts
 - ☐ C. Jet streams
 - ☐ D. Mechanical turbulence behind buildings
- 9. Terns are best matched with which wing type?
 - ☐ A. Elliptical wings
 - ☐ B. High-speed wings
 - ☐ C. Passive soaring wings
 - ☐ D. Hovering wings
- 10. Which behavior is common for terns during foraging?
 - ☐ A. Backward flight while drinking nectar
 - ☐ B. Plunge diving after agile turns
 - ☐ C. Riding thermals for hours
 - ☐ D. Hopping through shrubs to escape predators
- 11. Sparrows have which wing type?
 - ☐ A. Active soaring wings
 - ☐ B. Hovering wings
 - ☐ C. Elliptical wings
 - ☐ D. High-speed wings
- 12. Elliptical wings help sparrows primarily with...
 - ☐ A. Endurance over oceans
 - ☐ B. Tight maneuvering and quick burst take-offs

- ☐ C. Long glides in thermals
- ☐ D. Hovering near flowers

13. Hummingbirds are known for which wing type?

- ☐ A. Passive soaring wings
- ☐ B. High-speed wings
- ☐ C. Hovering wings
- ☐ D. Elliptical wings

14. What unique flight ability do hummingbirds have?

- ☐ A. Dynamic soaring across oceans
 - ☐ B. Riding thermals for hours
 - ☐ C. Sustained backward flight
 - ☐ D. Silent gliding with slotted tips
-

Wing Shape

1. In your own words, what is the main idea of Wing Shapes?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: describe common wing types and connect each shape to a flight behavior?

- Circle one: 1 - 2 - 3 - 4 - 5

Bird Pictures

1. In your own words, what is the main idea of Bird Images Gallery?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: notice wing shapes and flight cues across many bird examples?

- Circle one: 1 - 2 - 3 - 4 - 5

Design Challenge: 7. Let's design our sketch prototype!

Birds in slow motion

1. In your own words, what is the main idea of Slow Motion Flights?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: observe wing arcs and timing in slow-motion bird flight?

- Circle one: 1 - 2 - 3 - 4 - 5

Prototyping: 8. Can we use gears and popsicles to copy bird flapping motion?

4-bar linkage

1. In your own words, what is the main idea of 4-bar linkage basics?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: explain a four-bar linkage and test how changing a link affects the motion?

- Circle one: 1 - 2 - 3 - 4 - 5

5. If you increase Gear Size (OA), what do you think will happen to the output trace?

- ☐ A. The trace will stay exactly the same.

- ☐ B. Only the speed will change, but not the trace.
 - ☐ C. The trace can change in size and also change shape.
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Demo Prototype

1. In your own words, what is the main idea of Prototypes?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: describe how digital and physical prototypes support the design process?

- Circle one: 1 - 2 - 3 - 4 - 5
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Reflection: 11. Time for Reflection!

Design Process

1. In your own words, what is the main idea of Design Process?

- Response: _____

2. Summarize what you have learned today.

- Response: _____

3. What did you find most surprising or intriguing in this learning byte?

- Response: _____

4. How well do you understand: describe the project design process and why iteration matters?

- Circle one: 1 - 2 - 3 - 4 - 5
