**ACTIVITY: Observing wings for flight**

**Activity idea**

In this activity, students use an online interactive or paper-based graphic organiser to consider how wing size and shape influences the specific flight capabilities of both birds and aircraft.

The activity helps students practise the science capability ‘Interpret representations’.

By the end of this activity, students should be able to:

* identify and discuss some flight capabilities shared by birds and aircraft, such as soaring and hovering
* use wing size and shape to match a bird species and an aircraft to a specific flight capability
* consider how designers have observed and adapted birds’ wing shapes for use in modern flight technologies.

# For teachers

## Introduction/background

Different wing sizes and shapes allow fliers to have specific flight capabilities, such as gliding and manoeuvrability. Aircraft that have wings similar in shape and comparable size to wings of certain birds can achieve similar flight capabilities. For example, the albatross has long, slim wings that enable effortless gliding.

This activity encourages students to take a closer look at six bird species and the adaptive wing features that meet their flight needs. They match the bird’s wing size and shape with those of an airplane, which has been designed to mimic the flight capability.

## What you need

* Copies of the [student handout](#_heading=h.3znysh7).
* Access to the interactive graphic organiser [Wings for flight](https://www.sciencelearn.org.nz/drag_and_drops/17-wings-for-flight). Alternatively, use the paper-based graphic organiser worksheet Wings for flight and the images for classifying, which are part of the student handout.
* Access to the articles [How birds fly](https://www.sciencelearn.org.nz/resources/303-how-birds-fly), [Wing loading](https://www.sciencelearn.org.nz/resources/301-wing-loading) and [Wing aspect ratio](https://www.sciencelearn.org.nz/resources/302-wing-aspect-ratio), if desired, for background information and glossary links.

## Teaching suggestions

Use the graphic organiser as a pre-test or post-test for summative assessment.

The student handout contains a wealth of scientific vocabulary. Consider assigning a bird or plane to small groups to research and explain words they think are useful for completing the task.

Use the text in the student handout to learn a few specifics about the bird and aircraft wings. Use the silhouette icons to compare wing shapes.

Complete the interactive or paper-based graphic organiser.

***Answers***

**Soaring**: king vulture and spy plane

Both spend hours spying out the land with their high aspect ratio wings.

**Speed**: falcon and swing-wing bomber

Both the bird and the plane are capable of tightening the angle of their wings to reduce drag and increase speed.

**Gliding**: albatross and glider

Both have long slim wings (high aspect ratio) and low wing loading, enabling effortless gliding.

**Hovering**: hummingbird and helicopter

They both have hovering capabilities.

**Manoeuvring**: hawk and Spitfire

Both have elliptical-shaped wings to allow for precise manoeuvrability.

**Endurance**: godwit and Airbus

Although there is a huge difference in size, both these fliers have high aspect ratio wings and are equipped for the long haul at relatively fast speeds.

## Extension ideas

The article [Flight mythology](https://www.sciencelearn.org.nz/resources/304-flight-mythology) has information on Māori kites. Te Ara has additional information on [manu tukutuku](https://teara.govt.nz/en/kites-and-manu-tukutuku). Observe the images of manu tukutuku and consider what might have inspired them – do the wings resemble native birds?

# For students

Different wing sizes and shapes allow fliers to have specific flight capabilities, such as gliding and manoeuvrability. Planes that have wings similar in shape and comparable size to wings of certain birds can achieve similar flight capabilities. For example, the albatross has long, slim wings that enable effortless gliding. Can you think of a type of aircraft that also uses long, slim wings to achieve a similar effect?

The following tables have information about the wing shapes of birds and planes and their associated flight capabilities. Use this information to complete the [Wings for flight](https://www.sciencelearn.org.nz/drag_and_drops/17-wings-for-flight) interactive.

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| **Birds** | |
| **Albatross**  Wandering albatrosses have the longest wingspan of any bird. The long, narrow, pointed wings coupled with low wing loading enable the birds to glide effortlessly on updraughts – sometimes for months at a time. |  |
| **Falcon**  Falcons are the fastest animals on Earth (with the peregrine falcon reaching speeds of over 320 kph). They can tuck their wings in to reduce drag. |  |
| **Godwit**  Migratory birds like godwits have high aspect ratio wings equipped for long ranges and endurance at a relatively fast speed. |  |
| **Hawk**  Hawks’ wings are wide and rounded at the ends. This low aspect ratio, elliptical shape with separated or slotted feathers at the end allows them precise manoeuvrability. |  |
| **Hummingbird**  Hummingbirds have the ability to hover in one place by rotating their wings in a figure 8. |  |
| **King vulture**  The high aspect ratio wings allow king vultures to spend hours in flight, soaring slowly without flapping their wings. They search for carcasses while riding thermals. |  |

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| **Planes** | |
| **Airbus**  Aeroplanes such as the Airbus or Boeing 747 with high aspect ratio wings have long ranges and endurance times at fast speeds. |  |
| **Glider**  A glider’s long, slim wings and low wing loading maximises lift, enabling the gliding action. |  |
| **Helicopter**  The helicopter has the ability to rotate its wings, enabling it to hover in one place. |  |
| **Spitfire**  The elliptical shape of the wings (short and rounded low aspect ratio) give the Spitfire excellent manoeuvrability. They allow the plane to turn sharply while still flying at speed. |  |
| **Spy plane**  The high aspect ratio wings of a spy plane allow it to move slowly, not using much energy. This means it can stay airborne for some time while spying out the land. |  |
| **Swing-wing bomber**  This B-1B swing-wing bomber has adjustable wings that can be swept back for high speed. The tight angle of the wings helps to reduce drag, giving it supersonic speed capability. |  |

**Wings for flight**

A picture containing calendar

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