

# The importance of centre of gravity when loading an aircraft

Babcock has a fleet of over 530 aircraft and we operate many more. Our fleet includes a mixture of fixed wing (aeroplanes) and rotary wing (helicopters) aircraft many of which have had several modifications and re-fits to ensure they can carry out our specialist missions.

As part of our daily operations our technicians and engineers will load and unload multiple aircraft, as well as fueling, de-fueling and re-fueling them.

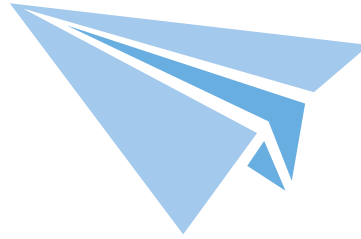
When fueling or loading an aircraft for flight it is important to understand what happens to the aircraft's aerodynamic properties when weight is added in different locations.



In our aerial firefighting operations, the centre of gravity of the Canadair waterbombers (pictured above) are constantly changing as they scoop up and release water over and over again. These aircraft can scoop up to 6,100 litres of water at a time so our pilots need to be highly aware of the change in centre of gravity so that they can keep the aircraft level and counteract the gravitational forces.

Complex calculations are used to work out where the centre of gravity is on an aircraft. Our engineers must be aware of what forces act on an aircraft, and how they change when fuel, people and cargo are added.

# Finding a paper aeroplane's centre of gravity



## Materials

- › A4 piece of paper
- › Pen
- › Paperclip

## Activity Overview

- › Every object has a point through which the force of gravity acts, this is called the object's centre of gravity. It is important to know where the centre of gravity is on an aircraft as it affects how an aircraft flies.
- › Do the experiment below to find out where the centre of gravity is and what happens when you move it.

## Activity Plan

- › Make a paper aeroplane.
- › Balance the plane on one finger - or a ruler - the centre of gravity is the point where the plane balances without falling off.
- › Mark this point with a pen as you need it for the next part of this activity.
- › Throw your paper aeroplane and then draw the flight path - what does it look like?
- › Add a paperclip to change the centre of gravity on your paper aeroplane - how does this affect the flight of your aircraft?
- › Move the paperclip across your paper aeroplane and see how each placement affects the flight path - try this five times, and remember to draw the flight path each time!
- › Discuss your findings.

## Learning Objective

- › Understand what forces act on an aircraft and how they are generated.
- › Understand what the centre of gravity is and be able to find it on a paper airplane.
- › Be able to predict what will happen to the flight path when you change the centre of gravity.



## Reflection Questions

- › What effect does moving the centre of gravity have on the flight path? In real life adding people, fuel and cargo affects the centre of gravity so it's an important part of everyday flying operations.
- › Was there one position of the paper clip that made the paper plane fly better?
- › Why is that one the best, did it fly the straightest or longest?