

**MODULE 11B**

FOR CAT-A2 CERTIFICATION

# **PISTON AEROPLANE AERODYNAMICS STRUCTURES AND SYSTEMS**

## **Aviation Maintenance Technician Certification Series**



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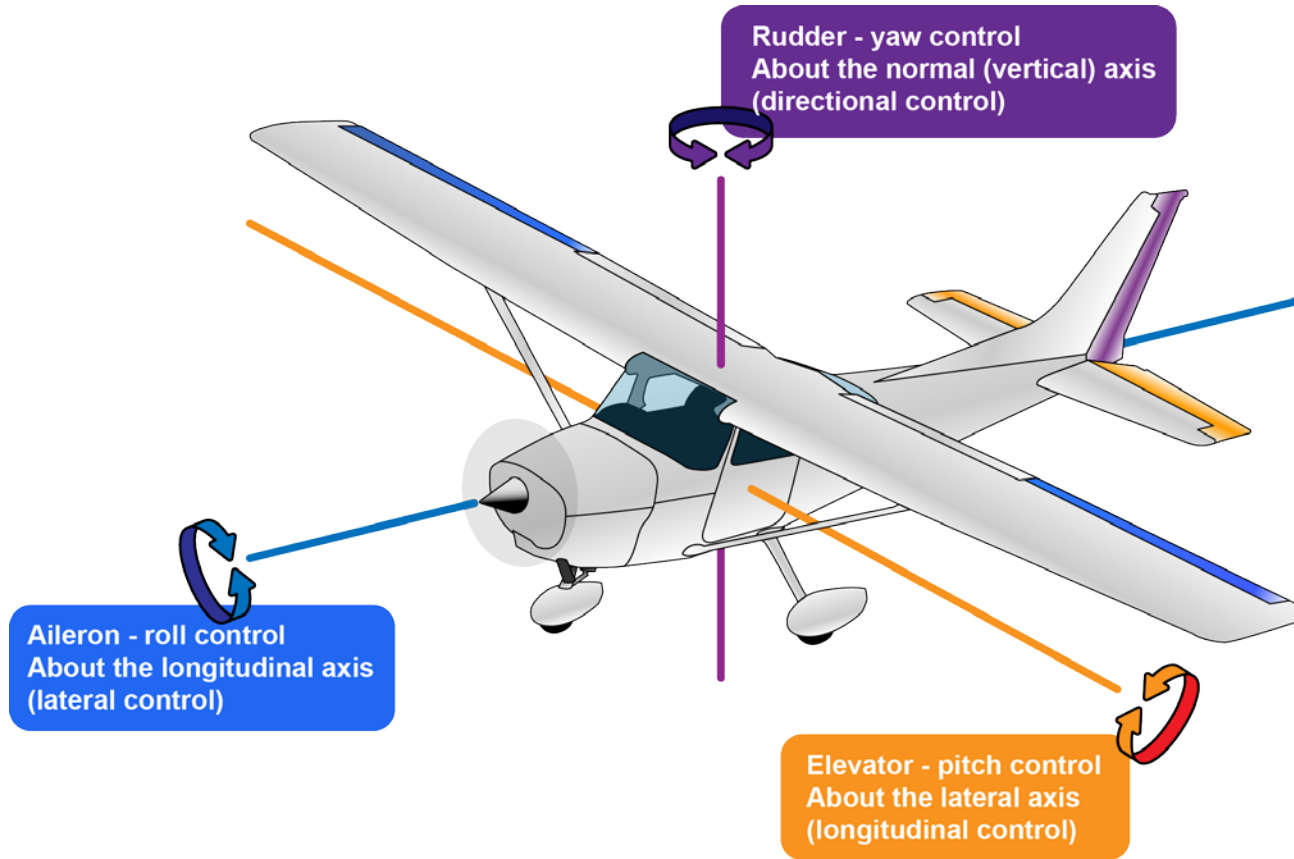
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Primary control surface	Aeroplane movement	Axis of rotation
Aileron	Roll	Longitudinal
Elevator/stabilator	Pitch	Lateral
Rudder	Yaw	Normal (or Vertical)

**Roll control - ailerons and/or spoilers**

The longitudinal axis of an airplane extends lengthwise through the fuselage, and rotation about this axis, or banking, is controlled by the ailerons.

Contrary to common belief, an airplane is not turned using its rudder as a boat is turned in water. But for an airplane to turn, it must be banked by moving the control wheel in the direction it is desired to turn.

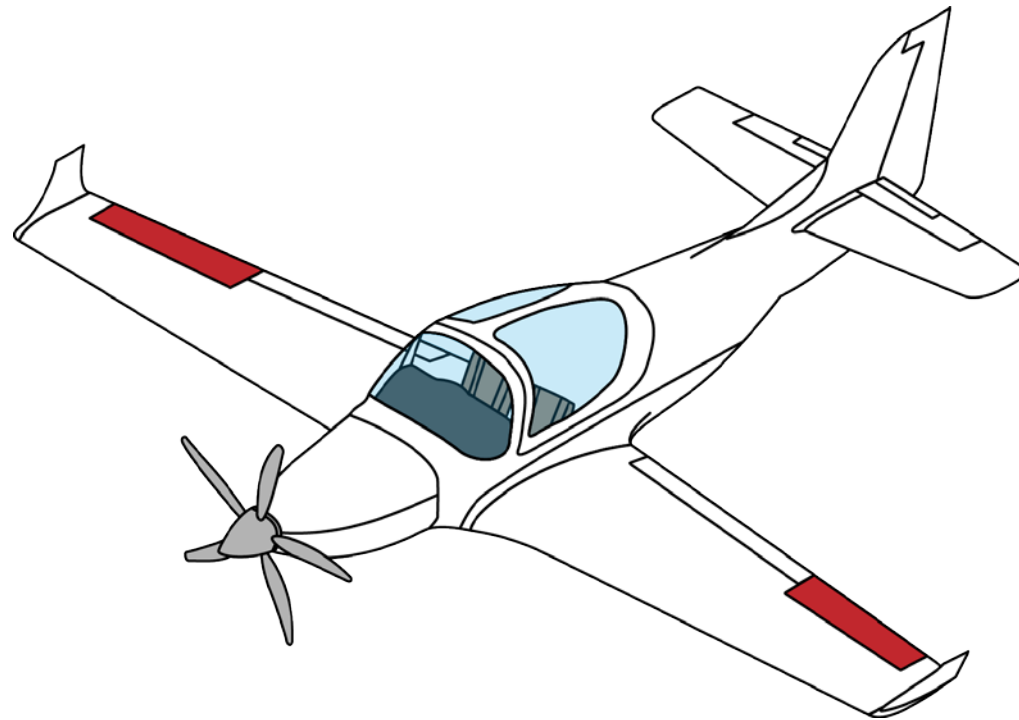
When the airplane banks, the lift produced by the wings no longer acts vertically but tilts, since it always acts in line with the vertical axis of the airplane. This inclined, or tilted, lift force not only supports the airplane against the force of gravity, but it also pulls the nose around in curved flight in much the same way a weight suspended from a string and swung around your head will follow a curved path.

Hinged surfaces called **aileron**s on the trailing edge of the wing near the tips are connected to the control wheel, usually by steel cables, in such a way that the rotation of the wheel to the left will raise the left aileron and lower the aileron on the right wing. The action deflects the air that passes over the left aileron upward, lowering the left wing, while the air passing over the right aileron is deflected downward, which raises the right wing.

A **spoiler** is a control device that destroys lift by disrupting the airflow over a part of the wing. The most common spoilers are used on sailplanes. They are “popped up” to “kill off” lift on a portion of the wing, allowing a rapid rate of descent, while still retaining full control. They can be retracted to regain full lift when the desired altitude is reached.

Spoilers may be used asymmetrically, to reduce the lift on one wing and thus make the aircraft roll. This is rare on small aircraft however.

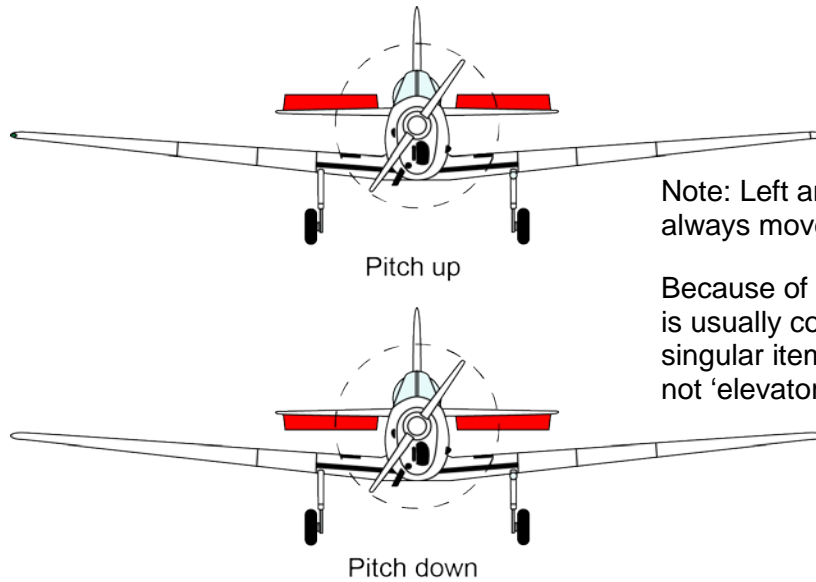
Spoilers are used on large aircraft only.



Conventional aileron location

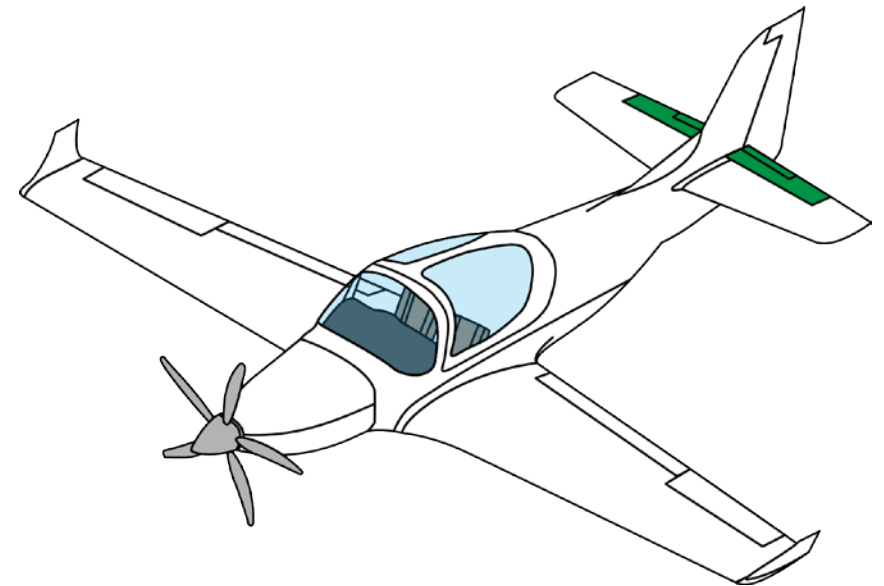
**Pitch control - elevator**

The lateral axis of an airplane is an imaginary line that parallels the span of the wing and passes through the center of gravity. The elevators, which are the horizontal movable control surfaces mounted on the tail of the airplane, cause the airplane to rotate about its lateral axis.



Note: Left and right elevator always move in unison.

Because of this, the elevator is usually considered a singular item, i.e. 'elevator' not 'elevators'



Conventional elevator location