

Primary Flight Controls - Ground Lesson

Attention

Don't pull back to hard and stay coordinated so we can stay alive. Thanks.

Objective

To understand how the plane is moved where we want it to.

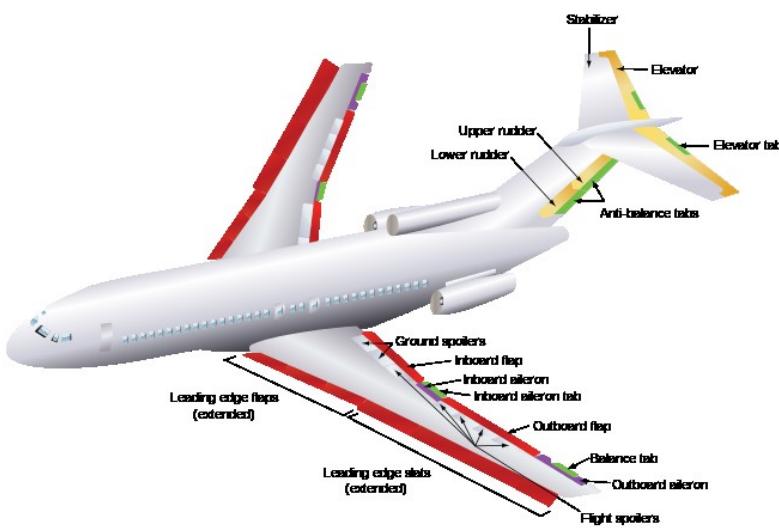
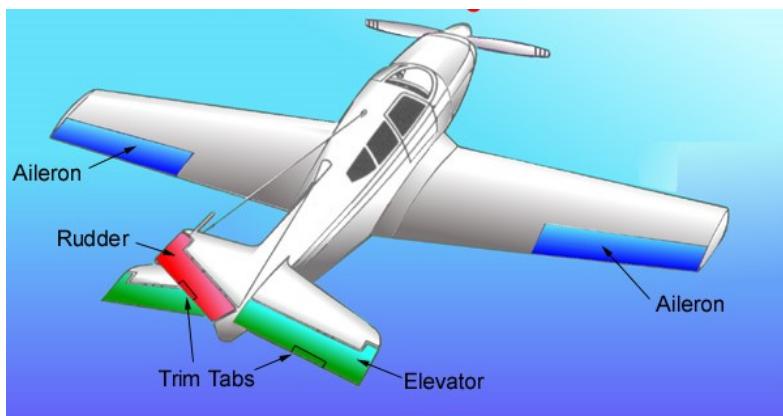
Schedule

Ground instruction – 15 minutes

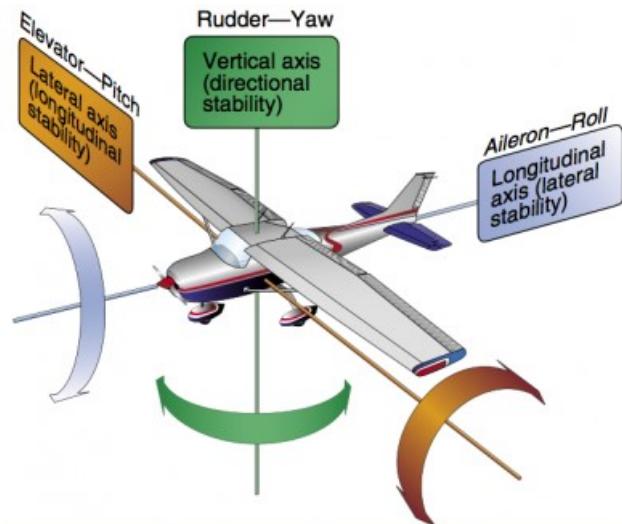
Reference Material

PHAK FAA-H-8083-25B

Material



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Primary Control Surface	Airplane Movement	Axes of Rotation	Type of Stability
Aileron	Roll	Longitudinal	Lateral
Elevator/Stabilizer	Pitch	Lateral	Longitudinal
Rudder	Yaw	Vertical	Directional

Ailerons

Ailerons control roll about the longitudinal axis. The ailerons are attached to the outboard trailing edge of each wing and move in the opposite direction from each other. Ailerons will be attached to the stick or yoke by cables in many planes while some large newer planes use electric systems.

Moving the control wheel, or control stick, to the right causes the right aileron to deflect upward and the left aileron to deflect downward. The upward deflection of the right aileron decreases the camber resulting in decreased lift on the right wing. The corresponding downward deflection of the left aileron increases the camber resulting in increased lift on the left wing. Thus, the increased lift on the left wing and the decreased lift on the right wing causes the aircraft to roll to the right.

Elevators

The elevator controls pitch about the lateral axis. Like the ailerons on small aircraft, the elevator is connected to the control column in the flight deck by a series of mechanical linkages.

The up-elevator position decreases the camber of the elevator and creates a downward aerodynamic force, which is greater than the normal tail-down force that exists in straight-and level flight. The overall effect causes the tail of the aircraft to move down and the nose to pitch up. The pitching moment occurs about the center of gravity (CG). The strength of the

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pitching moment is determined by the distance between the CG and the horizontal tail surface, as well as by the aerodynamic effectiveness of the horizontal tail surface. Moving the control column forward has the opposite effect.

Rudder

The rudder controls movement of the aircraft about its vertical axis. This motion is called yaw. Like the other primary control surfaces, the rudder is a movable surface hinged to a fixed surface in this case, to the vertical stabilizer or fin. The rudder is controlled by the left and right rudder pedals.

When the rudder is deflected into the airflow, a horizontal force is exerted in the opposite direction. By pushing the left pedal, the rudder moves left. This alters the airflow around the vertical stabilizer/rudder and creates a sideward lift that moves the tail to the right and yaws the nose of the airplane to the left. Rudder effectiveness increases with speed; therefore, large deflections at low speeds and small deflections at high speeds may be required to provide the desired reaction. In propeller-driven aircraft, any slipstream flowing over the rudder increases its effectiveness.

How you control the plane

On the ground...

Stick or yoke => Nothing except to counter act when windy

Left rudder pedal => Plane moves left

Right rudder pedal => Plane moves right

In the air...

Move the stick right or the yoke clockwise => Plane rolls clockwise using ailerons

Move the stick left or the yoke counter clockwise => Plane rolls counter clockwise using ailerons

Move the stick or yoke forward => Plane pitches down

Move the stick or yoke toward you => Plane pitches up

Left rudder pedal => Plane's nose moves left

Right rudder pedal => Plane's nose moves right

Very important: When flying, you must combine the ailerons and rudder pedals to have a coordinated turn.

Stick right/yoke clockwise + right rudder => Plane banks to the right

Stick left/yoke clockwise + left rudder => Plane banks to the left