

Effects of controls

BASIC CONCEPTS

Objectives

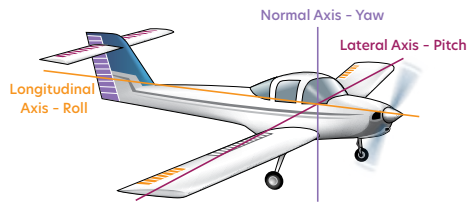
- To operate the primary control surfaces and to experience the feel and observe the first aerodynamic effect on the aircraft in flight.
- To operate the primary control surfaces and observe the further (or secondary) aerodynamic effects on the aircraft in flight.
- To operate the ancillary controls and to experience the feel and observe the effect on the aircraft in flight.

Principles of flight

On the ground

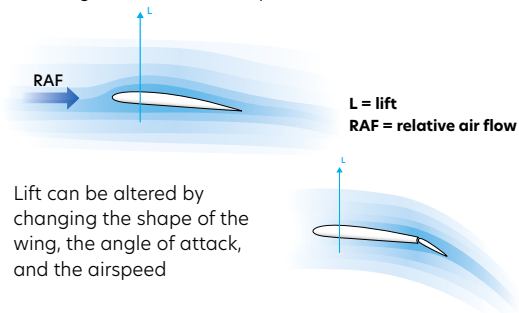
- Control speed with throttle and brakes
- One hand on control column and other on throttle
- Dual controls fitted

Aeroplane axes



Lift

- As air flows over the wing, increased speed above the wing results in reduced pressure = Lift



- Lift can be altered by changing the shape of the wing, the angle of attack, and the airspeed

Primary controls

- Elevator pitches aeroplane - changing attitude
- Aileron rolls aeroplane - changing direction
- Rudder yaws aeroplane - balanced flight
- Slipstream strikes rudder and elevator (low-wing)



Ancillary controls

- Throttle affects speed, direct connection to propeller
- Trim tabs provide a force to hold primary controls
- Flap changes shape of wing, increases lift, drag, and affects the L/D ratio - changes pitch, trim change required

Inertia

- Tendency for body to remain in current state - in speed or direction

Airmanship

- "I have control / you have control"
- "follow me through"
- See and be seen
- Clock code, relative height/distance
- Horizon is main reference
- Land features
- I'M SAFE

Air exercise

Taxi practice

Attitude

- Attitude flying by referencing nose and wings to the horizon



Controls

Axis	Control	Input		1st Effect	2nd Effect	Use
Lateral	Elevator	Control column	forward rearward	Pitch down up	-	Attitude and Airspeed
Longitudinal	Aileron	Control column	right left	Roll right left	Slip - Yaw	Direction
Normal	Rudder	Rudder pedals	left right	Yaw left right	Skid - Roll	Balance

Airspeed

- Increased airspeed - increased control feel, response rate, smaller control movements needed
- Decreased airspeed - decreased control feel, response rate, larger control movements needed

Slipstream

- Increased power → increased slipstream
- Increased flow over elevator → more effective control (not applicable to T-tail aeroplanes)
- Strikes rudder → yaw
- Must balance with rudder

Power

- Decrease in power → nose pitch down and yaw right
- Increase in power → nose pitch up and yaw left
- Must balance with rudder

Trim

- To relieve the pressure
- If holding back pressure - trim backwards
- If holding forward pressure - trim forwards

Flap

- Extending flap → increase in lift and drag → pitch change - trim change required
- Retracting flap → decrease in lift and drag → pitch change - aeroplane will sink

Aeroplane management

- Engine controls
 - throttle
 - mixture
 - carb heat
 - temperatures and pressures
- Flap speed - white arc
- Preflight inspection

Human factors

- Limitations on lookout
- Limitations of memory
- More comfortable with workload
- Uncoordinated lesson by nature