

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.

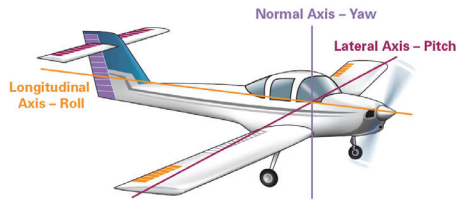
To operate the ancillary controls and to experience the feel and observe the effect on the aircraft in flight.

1. Principles of Flight

On the Ground

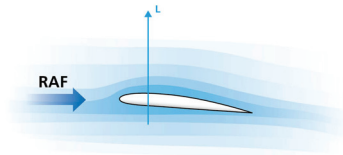
- Control speed with throttle and brakes
- One hand on control column and other on throttle
- Dual controls fitted

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

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 L/D ratio – changes pitch, trim change required



Inertia

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

2. 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

3. Aeroplane Management

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

5. 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, movement needed
- Decreased airspeed – decreased control feel, response rate, movement needed

Slipstream

- Increased power → increased slipstream
- Increased flow over elevator → more effective control (not applicable to Tomahawks)
- 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