Straight and Level

BASIC CONCEPTS

Objectives

To establish and maintain straight and level flight, at a constant airspeed, constant altitude, in a constant direction, and in balance.

To regain straight and level flight.

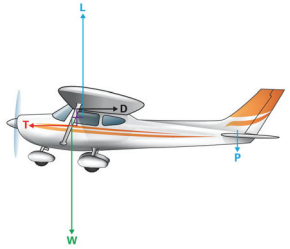
To maintain straight and level flight at selected airspeeds or power settings.

1. Principles of Flight

- The horizon is the line where the sea meets the sky
- All flying references the aeroplane's nose with the horizon

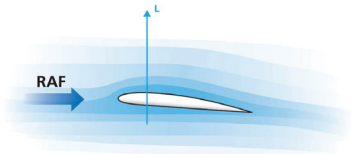
The Four Forces

- Lift, Weight, Thrust, Drag
- Equilibrium when Lift = Weight and Thrust = Drag
- Forces don't act through the same point → moment arms → couple
- Lift and Weight couple balanced by tailplane force
- Changes in Thrust → pitch changes



Lift

- Air over the top accelerates compared to air passing under the wing
- $L = C_L \frac{1}{2} \rho V^2 S$
- L = Angle of attack x Airspeed
  - Angle of attack altered with elevator



Performance

- Power + Attitude = Performance

2. Airmanship

- Lookout
- Situational Awareness, training area boundaries, clear of cloud
- "I have control / you have control"

3. Aeroplane Management

- Smooth throttle movements
- Mixture rich
- Carb heat

4. Human Factors

- Blind spots
- New learning consistently reinforced in later lessons

5. Air Exercise

- Horizon
- Power setting
- Attitude for level

Establishing Straight and Level

Power	set for straight and level		
Attitude	elevator	set nose	attitude
	aileron	wings level	relative to horizon
	rudder	in balance	no yaw – stand on the ball
Trim	to relieve pressure – hands off		

Maintaining Straight and Level

Lookout	ahead
Attitude	four fingers
Instruments	to confirm – not set Altimeter, DI, TC, RPM checked every time Other instruments and gauges, less frequently

Regaining Straight and Level

1. Airspeed and power setting correct
2. Attitude correct for straight and level
3. Wings level and balance ball centred
4. Reset power
5. P A T

Straight and Level at Different Airspeeds

- Any changes in power must be balanced with rudder
- While moving rudder wings must be kept level

Power + Attitude = Performance

Power	2200	1800	2500
Airspeed	80–90 knots	60 knots	110 knots
Attitude	Normal	High	Low