Wing-drop stalling

Objectives

- To revise stalling with power and flap.
- To carry out a stall from straight and level flight (and the turn) recovering from a wing drop with minimum altitude loss.

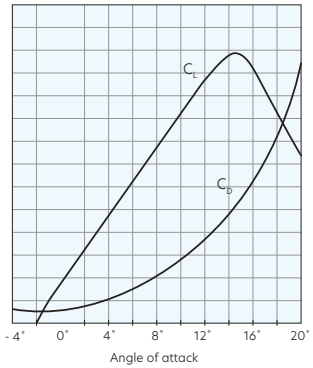
Principles of flight

- Cause of stall – aeroplane exceeding critical angle of attack

Aileron use at stall

Turning	AoB maintained with aileron
Out of balance	• Yaw at or near stall → tendency to roll, which ↑ AoA on down-going wing • Also, if trying to maintain wings level with aileron, down-going aileron will ↑ the mean AoA on that wing
Ice or damage	• Smooth airflow over affected wing disturbed, may break away sooner than over other wing
Weight imbalance	• If all passengers / fuel on one side of the aeroplane, aileron needed to maintain wings level
Turbulence	• May result in aileron being used to maintain wings level, or may cause one wing to exceed the critical angle
Rigging	• Wings fitted at different angles of incidence, or flaps rigged incorrectly – one wing would reach the critical angle before the other
Power	• Slipstream modifies the angle of attack on each wing therefore aeroplane may drop a wing more readily when partial power used
Flaps	• Flap may extend at slightly different angles • Also, with flap extended aeroplane less laterally stable (CoP on each wing moves in toward wing root). ↑ tendency for aeroplane to be disturbed in roll • Also, greater need to use aileron to maintain wings level in this configuration

- Wing that stalls first has a ↓ in lift → roll
- Roll ↑ the AoA on down-going wing and may delay stall of up-going wing
- ↑ AoA past critical angle → ↓ lift but substantial ↑ drag
- ↑ drag yaws aeroplane toward the down-going wing, may further delay stall of up-going wing as result of ↑ airspeed – yaw causes roll, which causes yaw = autorotation
- Using aileron to stop roll → ↑ AoA on down-going wing
  Lift ↓ with ↑ AoA (past the critical angle), while drag ↑ rapidly with any small ↑ AoA
- Rudder used to prevent yaw and lower nose



CL and CD versus angle of attack

Air exercise

Entry

- **HASELL** checks
- Prominent reference point
- Carb heat HOT
- Set power to _____ RPM
- Keep straight with rudder, and maintain altitude with backpressure
- Below _____ kt (white arc), select flap
- Through _____ kt (stall warning) – carb heat COLD
- At the stall, altitude is lost, nose pitches down, and one wing may drop

Recovery

To unstall	Keep ailerons neutral
At the same time	Simultaneously • decrease the back pressure/check forward and • apply sufficient appropriate rudder to prevent further yaw
To minimise the altitude loss	Smoothly but positively apply full power. At the same time: • level the wings with aileron, • centralise the rudder, and • raise nose smoothly to horizon – to arrest the sink and minimise altitude loss

- Hold nose at level attitude, reduce flap setting immediately
- At safe height, safe airspeed and positive RoC – raise remaining flap (counter the pitch change)
- Regain starting altitude and reference point

Airmanship

- **HASELL** and **HELL** checks
- Stall with power and flap
- SA – attitude, airspeed, configuration, flight phase, symptoms

Aeroplane management

- Carb heat
- Airspeed and RPM limits

Human factors

- Overlearn correct technique