

Wing-drop stalling

ADVANCED MANOEUVRES

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.

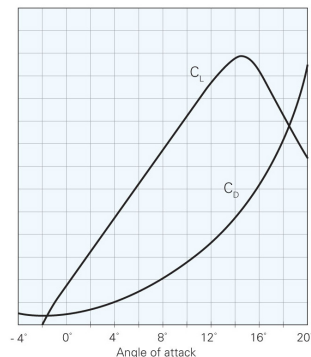
Principles of flight

- Cause of stall – aeroplane exceeding critical angle of attack

Aileron use at stall

Turning	AoB maintained with aileron
Out of balance	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Smooth airflow over affected wing disturbed, may break away sooner than over other wing
Weight imbalance	<ul style="list-style-type: none">• If all passengers / fuel on one side of the aeroplane, aileron needed to maintain wings level
Turbulence	<ul style="list-style-type: none">• May result in aileron being used to maintain wings level, or may cause one wing to exceed the critical angle
Rigging	<ul style="list-style-type: none">• Wings fitted at different angles of incidence, or flaps rigged incorrectly – one wing would reach the critical angle before the other
Power	<ul style="list-style-type: none">• Slipstream modifies the angle of attack on each wing therefore aeroplane may drop a wing more readily when partial power used
Flaps	<ul style="list-style-type: none">• 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

At the same time

To minimise the altitude loss

Keep ailerons neutral

Simultaneously

Smoothly but positively apply full power.

At the same time:

- decrease the back pressure/check forward and
 - apply sufficient appropriate rudder to prevent further yaw
 - 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