

Maximum Rate Turns

ADVANCED MANOEUVRES

Objective

To carry out a balanced, maximum rate, level turn using full power.

1. Principles of Flight

- To change direction at the highest possible rate – maximum degrees in minimum time

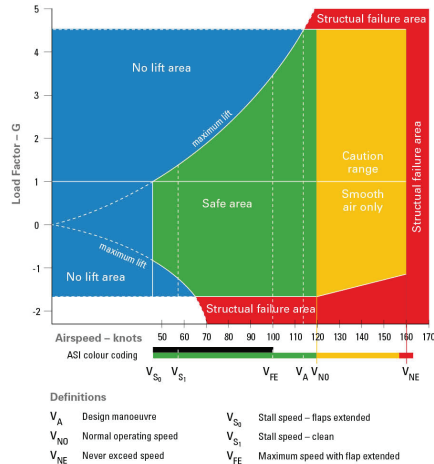
Maximum Lift

- $L \propto \alpha$ AoA and Airspeed

- Max C_L at start of stall warning or edge of buffet

Airspeed

- Max rate turns limited by V_A
- V_A is the speed at which you can make abrupt and extreme control movements and not overstress the aeroplane's structures
- Found in Flight Manual
- Affected by weight



Rate of Turn and Radius of Turn

- Rate of turn = rate of change of direction – $^\circ$ /min
- Radius of turn = size of the arc made by the aeroplane
- Slow speed – high rate of turn
- High speed – low rate of turn
- Turning at max rate requires max CPF and max lift
- Rate of turn \propto velocity \therefore power is limiting factor in a max rate turn

Angle of Bank

- Between level and 90

Structural Limit

- For this aeroplane is _____ G

Limiting Angle of Bank

- \uparrow in AoB requires \uparrow in AoA to \uparrow lift, associated \uparrow drag \rightarrow decrease in airspeed
- Power available limited \therefore airspeed will reduce as AoB \uparrow

- Stalling speed \uparrow as the $\sqrt{\text{load factor}}$
- Maximum AoB limited by the amount of power available usually 60° AoB

2. Considerations

Entry above V_A

- Smooth roll in, delay power until decelerated to V_A

Entry below V_A

- Lead with power or at same time as roll in

3. Airmanship

- V_A is _____ kts
- Smooth control movements
- Minimum altitude

4. Aeroplane Management

- RPM limit
- C of G limits

5. Human Factors

- 360° turn to minimise disorientation
- Physical G limits during turn, generally $\leq 2G$

6. Air Exercise

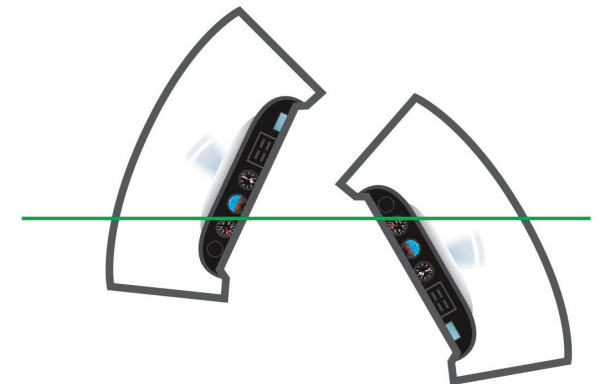
Entry

- Choose reference altitude and prominent reference point
- Check speed relative to V_A
- Apply full power, roll in smoothly, balance with rudder – will need more rudder than usual

- Through 30° AoB increase backpressure to maintain altitude
- Stop at the stall warning (light buffet)
- Check ailerons and rudder
- Maintain backpressure and AoB

Maintaining

- LAI
- Attitude differences due side by side seating
- Maintain first note of stall warning with backpressure
- Altitude maintained with AoB
- With stall warning sounding if altitude is being gained or lost, alter AoB



Exit

- Anticipate roll out by 30°
- Smoothly roll wings level with aileron, balance with rudder, and relax the backpressure to re-select the level attitude
- Delay power reduction
- Through _____ kts, reduce power to cruise rpm