Principle of Flight

SUBSONIC

- 1. parasite drag - independent of lift generation,
  2. induced drag - the result of lift generation.
  parasite drag is further sub-divided into:
  Skin friction drag , form (pressure) drag, and interference drag.

- Flaps down - nose down
  Slats down - nose up

- the strength of the vortices increase as the angle of attack increases.

  The strength of the vortices is proportional to the angle of attack.
  The strength of the vortices is inversely proportional with the aspect ratio

- Cambered aerofoils: CP moves forward if AoA increases
  Symmetrical aerofoils: CP is fixed

- Induced Drag decrease <- Upwash decrease <- Induced AoA decrease
  When you decrease your Induced AoA, the Upwash decreases, so your Induced Drag decreases.

- CL new = CL old x n
  load factor = n = lift/weight

- Dynamic pressure = speed
- Ground effect 50% of wing span.

- - Positive cambered = Negative AOA
  - Negative cambered = Positive AOA
  - Maximum cambered = At the origin

- If the velocity increases by 41%, lift increases by 1.412
  For speed you can use a fix number like 100 for the old speed. And since the new one increases by 41%, then new speed is 141.

- Least amount of lift reduction: High-wing on take-off
  Most amount of lift reduction: low-wing on take-off
  Most amount of lift increase: Low-wing on landing
  Least amount of lift increase: High-wing on landing

- If question asks about Drag: Always Low Wing On Landing
  If question asks about Lift: More Lift ==> High Wing on Take Off, Least Lift ==> Low Wing On Take Off

- Entering at ground effect ++lift so lower AoA to compensate

- The strength of the vortices
  1) Angle of Attack ----> Proportional
  2) Aspect Ratio -----> Inversely Proportional

- Lift dumpers = Spoilers

- Speed DECREASE = INCREASE induced drag & DECREASED parasite drag
  Speed INCREASE = DECREASED induced drag & INCREASES parasite drag

- Flaps extend --> Increase/Increase
  Flaps retract --> Decrease/Decrease

- CDI x Increased Factor^2
  $0.1 \times 1.5^2 = 0.225$

- The wing platform that gives a constant lift value along the whole area is elliptical.

- Induced drag always related to aspect ratio or wing vortex

- Symmetrical airfoil only generates lift at positive angles of attack.
  Airflow being paralell to the chord means that the wing is at

- AOA proportional to WINGTIPS vortices (+ +)
  ASPECT RATIO inversely proportional to WINGTIPS vortices (+ -)
  INDUCED drag is proportional to MASS (+ +)
  Elliptical wing generates LESS Induce Drag than a Rectangular wing

- Parasite drag changes for a factor of V^2
  Induced drag changes for a factor of $1/V^2$
  Induced drag coefficient (CDI) for a factor of $1/V^4$

- If we reduce the angle of attack, a particle that travels through the upper part of the wing has to travel less distance to reach the end of that surface at the same time as the particle that travels through the lower part, therefore, the speed of the particle of the upper layer travels slower and produces less lift.

- SPEED BRAKES = More drag.
  Therefore,
  rate of decent increased - Higher drag on descent = loosing altitude faster.
  Angle of descent - Increased - as our drag is higher on the descent we have to lower our nose steeper in order to avoid a STALL.

- CP movement affect ==> pitch moment + stabiliser movement (+ stick force stability + speed stability)
  AC movement affect ==> static longitudinal stability
- Graph drag/tas
  alt increasing they're moving to the right
  alt decreasing they're moving to the left

- Angle of Attack: Angle between the chord line and the relative air flow
  Flight Path Angle: Angle between the flight path and the horizon
  Pitch Angle: Angle between the aircrafts longitudinal axis and the horizon
  Angle of Incidence: Angle between the chord line and the aircrafts longitudinal axis

- A way to distinguish TE from LE devices is that the
  TE decrease the AoA
  LE increases AoA
- CL/CD = max when lowest drag

- enter/leaves Ground Effect
  Drag - +
  Lift. + -
  Downwash - +
  Effective Aoa + -
  Induced aoa - +

- TapeR from T to R - Tip / Root

- Load factor = lift / weight
  aspect ratio = wing span^2 / wing area or wing span / MAC
  lift to drag = lift / drag
  wing loading = aircraft weight / wing area

- each 1000ft, pressure changes 27 hPa.
- Minimum Sink Rate is achieved by flying at VMP => the Minimum Power Speed.
  Minimum Descent Angle is achieved by flying at the faster speed VMD => Minimum Drag Speed.
- IAS - dynamic pressure.
  If dynamic pressure stay the same - drag also stay the same.

HIGH SPEED

- Subsonic = Less than Mcrit (M0.8)
  Transonic = Mcrit (M0.8) - M1.2
  Supersonic = More than M1.2

- Cg moves aft = Nose pitches up -> to keep level flight you need a LOWER Angle of Attack (decreasing).

- Constant IAS climb - CL constant
  Constant Mach climb - CL increases

- Constant IAS climb - CL constant
  Constant Mach climb - CL increases

- CL = AoA
  Climb = Increase
  Descent = Decrease

- High altitudes -> aerodynamic (mach buffet)
  Low Altitudes -> Structural (For example, flaps speed limitation is structural)

- Shockwave moves fwd when:
  - Mach number decreases
  - Upward moving aileron
- No Deflection - AFT
  With Deflection – FWD

- upper less accelerated
  lower more accelerated

- With increasing temp, both TAS and LSS increase, Mach const
  With decreasing temp, both TAS and LSS decrease, Mach const

- The air velocity perpendicular to the wing span corresponds to the free stream velocity multiplied by the cosine of the sweepback angle.

- Mcrit = Tuck under = CP moves aft = DECRESING STICK FORCE
- Mcrit in increased by :
  1- Sweepback of the wings (it also increase the drag divergence mach number)
  2- Thin wing
  3- Lower mass
  4- Smaller AOA
  5- Smaller camber

- When higher mass ===> lower MCRIT due to a greater AOA to maintain a level flight at a given speed
  When lower mass ===> higher MCRIT due to a smaller AOA to maintain a level flight at a given speed

- 1)A shock wave on a lift generating wing will:
  -> move slightly forward in front of an upward deflecting aileron

  2)A shock wave on a lift generating wing will:
  -> move aft as Mach number is increased

- Mach-increases.
- Shock-wave-moves aft
  Temperature ahead of the shock wave decreases. LSS-decreases. TAS-decreases. CL-increases
  Temperature behind the shock wave increases. LSS-increases. TAS-increases. CL-decreases
  Mach- decrease.
- Shock wave moves forward
  Ahead of the shockwave its supersonic and behind its subsonic
  Supersonic= flying over (M1). OVER LSS
  Subsonic= flying under (M1) UNDER LSS

- Supercritical aerofoil:
  - Larger nose radius, flatter upper surface & with negative as well as positive camber
  - Allows a wing of relative thickness to be used for approximately the same cruise Mach number
  - Shows no noticeable shockwaves when flying just above MCRIT

- Sweepback is GOOD for --> increase Mcrit
  Sweepback is BAD for --> everything else

  Least effective high lift devices >>> 25*
  Most effective high lift devices >>> 0*

- stall tendency:
  Swept: Tip stalls (Sweptip)
  Rectangular: Root stalls (Rectangularoot)

- Mcrit increase when:
  AOA decrease
  Camber decrease
  thickness to chord ratio decrease
  leading edge radius decrease

- Through a normal shockk wave:
  + Temperature
  + Static Pressure
  + Local speed of sound
  + Density
  - Mach number
  - Total pressure

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- Moving aerodynamic centre aft will cause a pitch down moment, so this is a stabilising effect and its the same effect if you put the CG forward

- If the speed < mcrit, then there are no shockwaves

- Most effective -->Zero Sweep Angle / Least Effective --> The biggest sweep angle

STALL, MACH TUCK AND UPSET PREVENTION AND RECOVERY

- If you fly below VA and apply full elevator deflection, the aircraft will stall
  If you fly above VA and apply full elevator deflection, you will exceed the limit load factor and the aircraft may suffer from either permanent deformation or catastrophic failure.
- Why the elevator and not another control surface ?
  because the tailplane carry the most load of forces during the flight(more than the other surfaces)
  Know, there is a difference between Spin and Spiral Dive, the difference is that in spin both wings are stalled, one more than the other. However, in Spiral Dive the wings arent stalled yet. Although the aircraft nearly act the same in both cases.
  And as you can see from this question that the aircraft is flying above VA. Therefore, the pilots need to use the elevator carefully to not exceed the Limit load factor

- Sweep back = Nose up / pitch up tendency
  Straight wing = Pitch down / nose down tendency

- Turn indicator : the needle
  Turn coordinator: the ball

- if you are asked about the BUFFET ONSET use 1.3 g. the other conditions where they do not mention BUFFET ONSET, you either will be provided with the load factor OR if not provided, use 1 g.

- -In incipient stage; FORCES are not balanced yet, so there is acceleration and speed is increasing.
  -In developed stage; FORCES are balanced, so there is no acceleration and speed is pretty low.

- Greater than 1:
  When lift is greater than weight
  During a steady co-ordinated horizontal turn
  During a pull-up manoeuvre
  When weight is less than lift
  During recovery after a wings level stall

- Less than 1:
  When lift is less than weight
  When weight is greater than lift
  During a steady wings level descent
  During a steady wings level climb
  During a wings level stall before recovery
  During a push-over manoeuvre

- AFT CG= FLAT SPIN

- Negative Tail - piTch dowN
  Positive Tail - piTch uP

- Wing always stalls at the same angle of attack (being the critical angle of attack) irrespective of the weight

- sWept wing = CP moves forWard
  strAght wing = CP moves Aft

- buffet on set chart questions
  1. 0.80 is correct (any other number incorrect)
  2. Higher = correct / Lower = incorrect

- Turbulent boundary layer:
  1) Produces MORE Friction Drag.
  2) Better able to resist at Positive Pressure Gradient.
  3) Less tendency to separate from surface.

- A sweept-back wing with corrective design stalls at the root first, which is desirable to avoid the pitch-up moment that exacerbates the stall.

- Trailing edge flaps extension
  - INCREASE DOWNWASH
  - DECREASE WING TIP VORTICES

- Turning climb -> overbanking:
  Outer wing -> greater AoA
  Inner wing -> smaller AoA
  Turning descend -> underbanking:
  Outer wing-> smaller AoA
  Inner wing -> greater AoA
  DIAL - Descend Inner AoA Larger
  COAL - Climb Outer AoA Larger

- When it Rains the CLmax decreases and Stall Speed increases

- Laminar boundary layer produces less drag and has less energy and the turbulent boundary layer produces more drag and it has more energy

- - Tail Engine acceleration = pitch down and be stabalise
  - Wing Engine acceleration = Pitch up and be destabilse

STABILITY

- Stable: Cg fwd, neutral point aft
  Unstable: Neutral point fwd, Cg aft

- Dorsal Fin = +d +lat
  Ventral Fin = +d -lat
  both have no effect on longitudinal stability

- CG FWD = LONGER DISTANCE (ARM) TO THE TAIL = INCREASED NEGATIVE FORCE
- - Forward CG = HIGHER Stick Force Stability
  - Aft CG = REDUCED Stick Force Stability

- if going up increase stability
  if going down decrease stability

- Nacelles mounted aft of aircraft "above" CG level , nose down pitching moment, positive impact
  when engine below the wing, "below" CG level, nose up pitching moment, negative (de-stabilising)

- + Contribution to static directional stability => Dorsal Fin
  + Contribution to static longitudinal stability => The Horizontal Tailplane
  - Contribution to static longitudinal stability => The Fuselage

- If you see the lines getting more intense (going higher) its dynamic instability
  If you see the lines getting less intense (lower) its dynamic stability.
  If you see a constant flow its neutral.

- Positive Sideslip: From the right
  Negative Sideslip: From the left

- Wing going into the airflow has more lift.
  More lift = more stable
  Sweep is opposite to lift. E.g. more lift = less sweep OR less sweep = more lift

- When the plane climbs / increases altitude, the stick shaker force will decrease.

- beLow --> puLL
  aboVe --> pVsh

- + dihedral = + stability = - controlability = + stick force

- the tail stabilise
  the wing does not
  wing: line y, aft cg
  tailplane: line z, forward

- High altitude - aerodynamic damping reduced - dynamic stability reduced

- lateral stability = focuses on roll has a connection with Yaw
  directional stability = focus on yaw has a connection with Roll
  Roll & Yaw movements often influence each other

- \- Short period oscillation (2 sec)
  Variation: 1- Angle of Attack , 2- Load Factor
  Constant: 1- Speed , 2- Altitude , 3- Longitudinal Attitude

  -Long period oscillation/Phugoid (20 sec and more)
  Variation: 1- Speed , 2- Altitude , 3- Longitudinal Attitude
  Constant: 1- Angle of Attack , 2- Load Factor

- A swept wing makes a small positive contribution to static directional stability.
  A swept wing makes a significant positive contribution to static lateral stability.

- Sweepback need a higher AoA than a rectangular wing to create the same lift.
  Sweepback is good at high speeds, increase Mcrit, retarding shock waves.

- Sweepback on WING is Good
  Sweepback on Vertical Tail is Bad

- Lowest value wing lift : CG Aft, Hight thrust
  Highest value wing lift : CG Fwd, Low thrust

- Mach number increases, dutch roll increases

- Static stability refers to equilibrium
  Dynamic stability refers to oscillations.

- When CG moves forward
  -stability increases
  -stick forces increase
  -increase fuel consumption

- CG forward… nose goes down
  CG Aft… Nose goes up

- Lateral stability: High & Directional stability: low
  - Dutch roll
  Lateral stability: low & directional stability: high
  - Spiral instability

CONTROL

- AC is trimmed nose up when in LDG config. so when performing a G/A the effect will be increased.

- If the elevator becomes jammed, the trim tab will work as a small elevator itself and so its effect will be reversed.

- Trim Tabs = Less & Zero
  Stabilizer = More & Larger

- Anti-Balance = Moves in the same direction
  Balance = Moves in the opposite direction
  Small control surface = servo tab

- adverse yaw / aileron deflection

- Speed increased- elevator deflected DOWNwards and trim tab UPwards
  Speed decreased- elevator deflected UPwards and trim tab DOWNwards

- Fully powered -> elevator deflection is 0
  Power assisted -> elevator deflection depends on speed, configuration and CG position

- Elevator= primary control, which controls movements around the lateral axis.

- Trim tab =opposite direction
  Anti-balance tab = same direction

- Why Trim ? Changes In :
  S : Speed
  P : Power
  C : CG

- TRIM TAB
  IAS increases => elevator DOWN and trim UP
  IAS decreases => elevator UP and trim DOWN

- ANTI-BALANCE TAB
  Elevator and trim moves in the same direction and also increases control effectiviness right?

- STABILISER
  Cg fwd ==> low leading edge
  cg aft ==> high leading edge

- IAS increase -> maneuverability increase
  IAS decrease -> maneuverability decrease

- Right aileron up = Right spoiler up

- Outboard ailerons, during cruise flight, are locked out. They are used at low flight speeds only

- Horizontal trimmable stabilizer
  -Enables a larger CG range
  -It is more complex and heavy (its a disadvantage)
  -Neutral position of control column change: for speed incr./decrease = doesnt change
  -More powerfull means of trimming

- Fully - servo valve
  Assisted – hydraulic

- Aerodynamic balances- effectiveness
  1) Horn Balance +
  2)Anti-Balance tab +
  3)Balance tab -
  4) servo tab -
  5) Spring tab -
  6) inset hinge neutral
  7) internal balance neutral

- Its about the control column, not control surfaces.
- - yoke in cessna for trim tab; after trimming for nose up, the yoke will move aft
- - joystick in Airbus for fully powered; the position of joystick won't change

LIMITATIONS

- -Design speed use EAS
  -Calculate climb gradient TAS
  -To compressibility MACH NUMBER

- Large -1.0g +2.5g (+2.0 with flaps)
  Normal. -1.52g +3.8g
  Utility. -1.76g +4.4g
  Acrobatic. -3g +6.0g

- change in Va is half of change in weight.
  So if weight has decreased 20%, Va decreased half of it: 10%

- VS1 lower part of green arc
  stall speed clean config

- MMO VMO CS23/CS25
  VNO VNE only CS23

- Gust: speed = 0, load factor = +1
  Stall speed originate: speed = 0, load factor = 0
  Stall speed - runs through: speed = Va, load factor = limit load factor
  and : speed = Vs, load factor = +1

- change in load factor (increase or decrease)
  (New speed / Old Speed)^2

- VD = Dive = Japanese Zero

- Gust Load Factor Chart has to do with the "STALLING" Speeds

- Greater Lift = Greater Load Factor
  the steeper the CURVE.. the GREATER the LOAD

- VA - Manoeuvring Speed, the speed where the aircraft will stall at exactly the limiting load factor (2.5 G for CS-25 aircraft).
  VB - Design Speed for Maximum Gust Intensity, the speed where an aircraft must be able to manage a gust of up to 66 fps.
  VC - Design Cruise Speed, the maximum speed an aircraft is able to cruise at, giving sufficient safety margin to VD, and means the aircraft will not exceed VD if a particular disturbance occurs when cruising at VC. It is also the point where gusts of up to 50 fps should be managed by the airframe. VC should not be more than 0.8 x VD.
  VD - Design Dive Speed, the maximum speed that the aircraft can handle in a dive, often limited by vibrations, buffet or flutter. This is the absolute speed limit of the airframe, and the aircraft should be able to manage 25 fps gusts at this speed.

- Gust LF is inverse prop with: Height, Mass, Wing Load WILLIAM
- Gust LF is direct prop with: Speed, Slope, Wing Area   ASS
  PROPORTIONAL TO LOAD FACTOR
  ASS:
  Area
  Speed
  Slope

- VB 66 FT SEC
  VC 50 FT SEC
  VD 25 FT SEC

- wings fluttering = change your speed>>>>>>>hard wings = less flutter

PROPELLERS

- Fine is climb
  Coarse is cruise

- The Centrifugal Twisting Moment tends to decrease the blade angle of attack

- Propeller Efficiency = ((Thrust × Axial Speed)) / ((Torque × Rotational Speed))
  shaft power(torque) is the input
  propeller(thrust) is the output
  torque= output/input

- Aoa -> Cord to Flow
  Blade Angle -> Cord to Plane
  Helix -> Path to Plane

- in fixed pitched propellers:
  ---in speed
  speed increases = blade AoA decrease
  INVERSELY PROPORTIONAL
  speed decreases = blade AoA increase
  ---in RPM
  RPM increases = blade AoA increase
  proportional
  RPM decreases = blade AoA decreases

- Geometric = Theoretical Distance
  Effective = Actual Distance

- fixed pitch propeller's angle of attack (highest) WHEN RPM is highest.
  fixed pitch propeller's angle of attack (lowest) WHEN TAS is highest.

- Negative prop AoA = Upgoing + to the right
  Positive prop AoA = Downgoing + to the left

- Torque —> During Taxi
  Slipstream —> Take Off (Tail still on Ground)
  Gyroscopic —> Take Off (Rotating - Pitch - Raising Tail - Tail on Air)
  Asymmetric —> Go Around

- better performance= high vmc

- -Initianting TAKE-OFF > ASSYMETRIC BLADE (P FACTOR)
  -When you apply POWER> SLIPSTREAM / Torque
  -Raising tail > Gyroscopic precession

- Fixed pitch prop:
  AoA increase
  RPM increase
  TAS decrease
  (one must remain constant)

- The blade angle of Feathered prop is 90 degree
  Windmilling produces more drag

- With fixed prop we have the highest RPM and thrust at take-off, then it decreases

- Variable pitch propeller= blade angle--> increases
  Fixed pitch propeller= blade angle--> remain costant
  however the AOA and RPM varies with velocity

- Rpm ⬆️ Angle ⬆️
- TAS ⬆️ Angle ⬇️

- -RPM is directly proportional to AOA,
  -if AOA decreases then the RPM must decrease, but this is constant speed propeller, so we want the same RPM always
  -since AOA has reduced BUT we still have the same RPM (GOVERNER DOING ITS JOB), the props are running way faster than needed.
  -we cannot change the RPM, so if we increase the PITCH, this effectively balances out the rpm (in a way we increase the aoa to match the constant rpm)

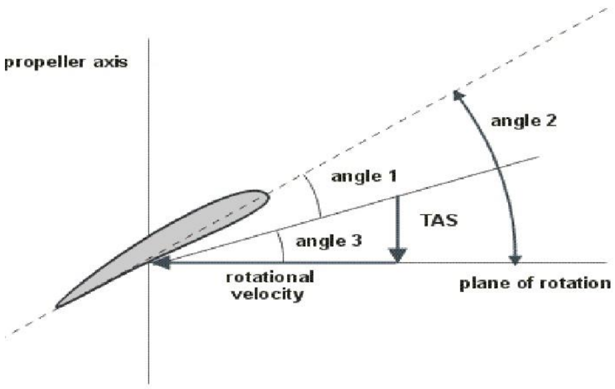
- Counter rotating prop right svastica,
  anticounter inverse svastica
- Same engine shaft: contra
  Twin-engine shafts: counter

- Propeller + ice = 20% reduction

- Propeller ahead of aeroplanes CG --> pitch up, destabilizing
  Propeller below aeroplanes CG --> pitch down, stabilising

- Asymmetric blade effect is greatest at high power and high AoA

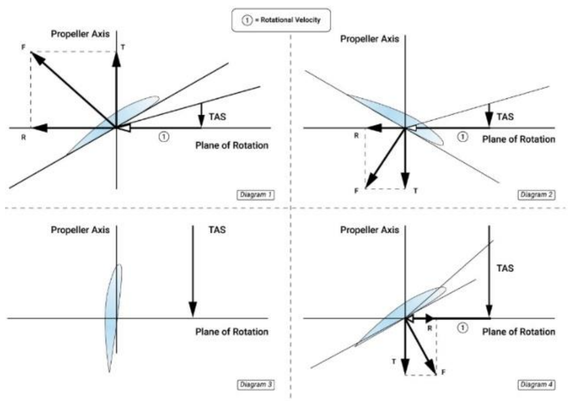
- -Forward position --> Finer - Drag increases - RPM increases - L/D ratio decreases - Rate of Descent increases (like 1.gear in a car).
  -Back (aft) position --> Coarser - Drag decreases - RPM decreases - L/D ratio increases - Rate of Descent decreases (like 5.gear in a car).



Angle 1 - AoA
Angle 2 - Blade Angle (Blade angle + AoA)
Angle 3 - Helix Angle

- -When you're about to land you want better handling characteristics hence faster response to inputs, a smaller weight will give you that.
  -When you're in the cruise we talk about instantaneous movement, a higher weight is better to counteract the controllability.

- 'STAG' (FOR ANTI-ClockWise):
  - Slipstream: RIGHT >
  - Torque: RIGHT >
  - Asymmetrical: RIGHT >
  - Gyroscopic: LEFT <
  (OPPOSITE FOR CW)



- Cant Read Fake Watches is a mnemonic for every Diagram in the picture.
Fig. 1 : Cruise
Fig. 2 : Reverse Thrust
Fig. 3 : Fine Pitch
Fig. 4 : Windmilling

- Everytime you have an engine failure you have to roll and yaw towards the live engine.

- SMALL blade twist ---> LARGE blade angle ---> COARSE pitch
LARGE blade twist ---> SMALL blade angle ---> FINE pitch
If you read TWIST is INCORRECT.
If you read ANGLE is CORRECT.

- The helix angle is the angle between the plane of rotation and the relative airflow
- The blade angle is the angle between the plane of rotation and the chord line.
- The angle of attack is the angle between the relative airflow and the chord line.

- fixed pitch -> only at one value of tas
constant speed prop -> max efficiency over a wider range

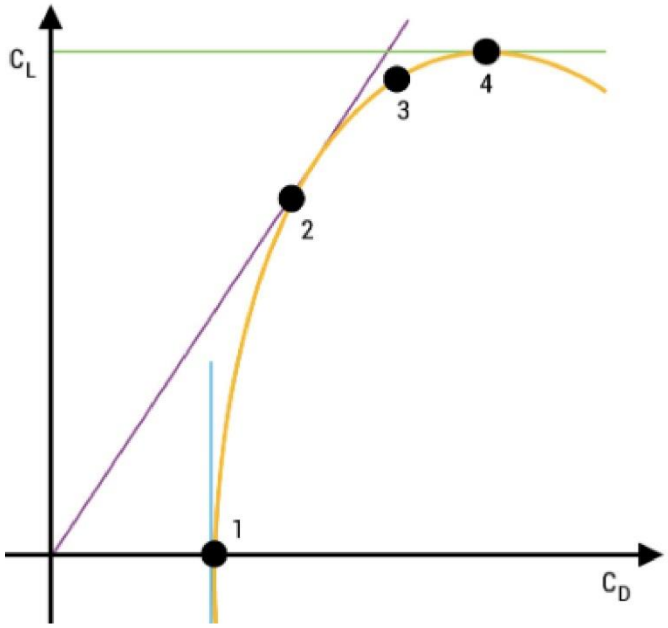
FLIGHT MECHANICS

- if you do not correct the turn with rudder the plane will sideslip towards the lower wing and if u re not lucky you will enter in a spin due to uncontrolled turn.

- SLIP
NOSE OUT
TAIL IN
LOW WING

- SKID
  NOSE IN
  TAIL OUT
  HIGH WING

- When ball and head of the needle are close to each other (same direction) = slipping.
  When ball and head of the needle are far from each other (opposite direction) = skidding



1- Min. Cd
2- Min. Glide Angle VMD
3- Min. Sink Rate VMP
4- Lowest Speed

- High temperature = Low density = Low thrust = Lower speed (Vmcg)
  Low temperature = High density = High thrust = Higher speed (Vmcg)

- Pushover manoeuvre - load factor is decreased - less than 1
  Pull up manoeuvre - load factor is increased - AoA is increased

- -The strength of the yawning moment is unrelated to the CG
  -The aircraft response to that yawning moment is CG dependent

- - Rate of turn GREATER with SLOWER aircraft
  - Turn radius GREATER with FASTER aircraft
- Aerodynamic ceiling = Coffin corner
  Service ceiling = 100ft/ min (prop)/ 500ft/min (jet)
  Absolute ceiling = 0 ft/ min

- Steady power-on descent: thrust is less, weight gives forward press.

- Lift
  L= W x cos(angle)
  Turn : Lift = W / Cos (angle)
- Drag
  D=W x sin(angle)

- Bank angle
  from 5 to 0 --> Vmca increases
  beyond 5 --> increasing risk of fin stall

- Pitch Angle = Flight Path Angel + AoA
  If Pitch Angle is constant: either FPA increases and AoA decreases or
  FPA decreases and AoA increases
  As we climb, density decreases so according to the lift formula we would have to increase something

- Mass doesn't affect turn radius
- Slip:
  Bankangle too high
  Ball on downwing
- Skid:
  Bankangle too low
  Ball on upwing

- VMCG:
  -maximum available take-off power or thrust on the engines
  -the airplane trimmed for take-off
  -the most unfavourable CG position/CG at the aft limit
  -maximum sea level take-off weight
  -VMCG is determined with the gear down
  -During VMCG determination, the aeroplane may not deviate from the straight-line path by more than 30 ft
  -Only rudder. No nose wheel steering
  -Wet/slippery runway included
  -Airport elevation (also for VMCA) and temperature - as main factors contributing for VMCG determination

- Same speed, same turn radius
  turn radius has nothing to do with airplane mass

- 0° bank => 0 Centripetal Force
  45° => CF = W
  less than 45 ° => CF < W
  more than 45° => CF > W

- CF= Weight x tan(angle)
  CF= Lift x sin(angle)

- slower aircraft= higher CL
  if V reduces CL must increase.

- Steeper descent = GREATER DIFFERENCE
- Shallower = SMALLER DIFFERENCE

- configuration influences the drag.
  angle of attack influences the lift.

- Minimum Power = Max endurance
  Minimum Drag = max glide range

- SKIM = Skidding Inside Minus (too little [-] bank, too much rudder)
  SLOP = Slipping Outside Plus (too much [+] bank, too little rudder)

- "Increased angle of attack on the inoperative engine's side" is worst

- distance = angle (just think about triangle of ground distance and hight)
  time = rate (fpM - a minute means time)

- Highest Lift / Drag = VMD
  equals Vx for Jets
  equals Vy for Props
  equals Best Glide Speed (for both Props and Jets)

- lift x2
  induced drag x4

- Vmcl = calculated for OEI (one enigine inoperative)
  trimmed for AEO (all engines operative)

- about normal axis = yaw
  about lateral axis = pitch
  about longitudinal axis = roll
  along lateral axis = bank angle or sideslip