Your Instructor – Mike Shiflett, Director of Training, CFII,MEI, ATP – Former FAA Designated Pilot Examiner for Initial CFIs and UK CAA Examiner.

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-**August 29th** - **Interview with an A&P**

September Lessons

-**September 5th** - **How to use the iPad as your only teaching tool**
-**September 12th** - **How did you succeed on your CFI**
-**September 19th** - **Live from the CFI Class - A tour of the apps we use at CFI Bootcamp**
-**September 26th** - **How to create lesson plans to work with a commercially produced syllabus**

FLIGHT INSTRUCTOR LESSON PLANS

Fourth Edition

CFI Bootcamp
Flight Instructor Training

Flight Instructor Lesson Plans

Fourth Edition

Mike Shiflett

CFI Bootcamp
Flight Instructor Training
CFI Bootcamp, LLC. Miami Beach, FL. 33139

Flight Instructor Lesson Plans

Fourth Edition
By Mike Shiflett

CFI Bootcamp, LLC.
429 Lenox Ave. Miami Beach, FL 33139
Website: www.cfibootcamp.com
Email: info@cfibootcamp.com

Visit the CFI Bootcamp's website (www.cfibootcamp.com) for updates posted for this book.

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Mike Shiflett's Aviation credentials and experience are as follows:

FAA Certificates
Airline Transport Pilot Certificate – Airplane Muli-Engine Land. CE-525 Type rating
Commercial Pilot Privileges: Airplane Single Engine Land and Sea
Flight Instructor Certificate – Airplane Single and Multi-Engine Land, Instrument Airplane
Former FAA Designated Pilot Examiner – Recreational – ATP including Initial CFI, CFII, MEI

UK Certificates
Commercial Pilot – Airplane Single Engine Land
Former UK Flight Examiner for Private Pilot and IMC ratings

Mike has amassed over 16,000 hours of which most was in general aviation aircraft. He also administered around 3,000 practical tests (Checkrides) for the FAA.

Mike has authored numerous courses used by top flight schools and Universities in his previous company. At CFI Bootcamp he authored all the course content including 42 hours of video, 10 books used by students at CFI Bootcamp and has been featured in many aviation media organizations. He has also presented at EAA Airventure – Oshkosh, WI, Sun-n-Fun and Aviation conferences as a speaker. He also produced a Podcast "Flight Training the way I see it", and has a weekly webinar called "The Power Hour". The CFI Bootcamp website has links to the webinar and previous Podcasts.

He continues to innovate in the aviation industry and is particularly focused on creating courses and training materials to produce better flight instructors.

Mike currently lives in both San Jose, CA and more often in Miami Beach, FL. He flies from the Opa-Locka airport just north of Miami International.

Introduction

Thanks for purchasing our Lesson Plans. This is the fourth edition. The content was reviewed for errors and updated. This complete set of lesson plans can be used for teaching flight maneuvers for Sport, Recreational, Private, Commercial Pilots, and Flight Instructors. There are also lesson plans for the technical subject areas such as Aerodynamics, Runway Incursion Avoidance, etc., for Private, Recreational and Commercial students.. Most of the technical subject areas for Flight Instructor students are also included.

These lesson plans are the same ones used by CFI Bootcamp students who go through our program in Miami, FL and Palo Alto, CA. They are time tested with hundreds of students that have used them for their checkrides and for teaching students once they got their Flight Instructor Certificate.

As always, if you find any errors, please send them to info@cfibootcamp.com..

Mike Shiflett – November 9th, 2021 - Miami Beach, FL

CFI Bootcamp
Flight Instructor Training

V

LESSON PLANS

The lesson plans can fit into most any training syllabus. If you don't have a training syllabus you can use ASAs or King Schools as a starting place. Both are very good.

Each flight maneuver lesson plan has an Objective, Motivation, Presentation (Elements), time for how long it should take, Key Points, 172 Maneuvers Guide, Common Errors, Questions to ask the students, Completion Standards and Risk Management. The ground lessons have an Objective, Motivation, Presentation with how long it should take, Instructor's actions, Student's Actions and references. There is also additional content behind the lesson plan that includes things like images, graphs, etc.

Note: Where a maneuver is common to both Private and Commercial pilots such as Steep Turns, the Private Pilot Knowledge Area, Risk Management and Skills (Completion Standards) are from the Private Pilot ACS. Refer to the Commercial Pilot ACS for Completion Standards for those maneuvers.

IMPORTANT: You need to teach each lesson plan out loud with a whiteboard and/or monitor. You will never know if you can teach the material in the plan until you do this. Simply reading over the lesson plans is NOT good enough. I realize this is a lot of work, but you will catch problems in your own understanding, flow issues and much more if you will take this on.

When teaching an actual student, you should teach from the lesson plan and at the end of your lesson you should ask the student to tell you how they will perform the maneuver. Demonstrating with a model airplane is very helpful. The idea is you don't want to get into the airplane until you are sure the student understands what they are going to do on that flight.

There are also lesson plans for ground instruction: All of the Technical subject areas in the Flight Instructor PTS are included. They contain the full lesson and include a lot of artwork and explanations.
I hope you find this book useful. Our instructors at CFI Boot Camp teach every day from these lesson plans, so they are field tested.

If you are working on your CFI now, consider purchasing our CFI Workbook. This book is intended to cement your knowledge by providing you with scenarios, assessment and study questions.

Thanks again for purchasing the Lesson Plans. Let us know how they work out for you.

Mike Shiflett - CFI Boot Camp Web: www.cfibootcamp.com

FLIGHT MANEUVERS LESSON PLANS FOR SPORT, RECREATIONAL, PRIVATE, COMMERCIAL PILOTS AND FLIGHT INSTRUCTORS

The following lesson plans are for teaching students pursuing the Private, Recreational, Sport and Commercial Pilot certificates.

They can be used in any order. They fit into the syllabus in the next chapter to form a complete course of training for the Private Pilot.

The lesson plans can also be used for the Flight Instructor Practical test if the flight instructor applicant personalizes them in such a way as to be able to teach from them.

Note: The Instructors Actions and Students actions are the same for all the maneuvers lessons, so they are not included on the Lesson Plans.

Instructors actions are always: Present the lesson, demonstrate the maneuver with the model airplane, and ask the student questions to assess their knowledge.

Student actions are always: Take notes on the presentation, demonstrate the maneuver to the instructor describing the key points of how to do it, and state any completion standards for

Maneuvers Lesson Plans Include:

1 **Objective and motivation** for each maneuver. The objective describes what will be accomplished and the motivation describes why it needs to be done.

2 **Presentation -** The Elements that should be taught in the order presented in the lesson plan. The step by step order of the lesson. Also includes the lesson

3 **Key Points -** These are areas to place extra emphasis after the presentation has been delivered. Not every lesson has key points.

4 **Risk Management -** In most lesson plans. These can be brought out at any point in the lesson. You may want to integrate them into the Presentation at the appropriate points, or you can teach them as separate topics at the end.

5 **Common errors -** Included for most lesson plans. They are from the Airplane Flying Handbook and Instructor Certification Standards.

6 **Completion Standards** and are reproductions from the Airman Certification Standards (ACS). Note: References to complex airplane standards have been removed from these lesson plans.

Sport, Recreational & Private Flight Maneuvers Lesson Plans

Objective

To perform a 360-degree level turn using between 45 - 50 degrees bank while maintaining altitude, airspeed and coordination.

Motivation

Develops smoothness, coordination, orientation, division of attention and control techniques to control the increase in load factor and stall speed. This maneuver can be used to avoid an encounter with clouds, terrain or other aircraft.

Presentation: 20 Minutes

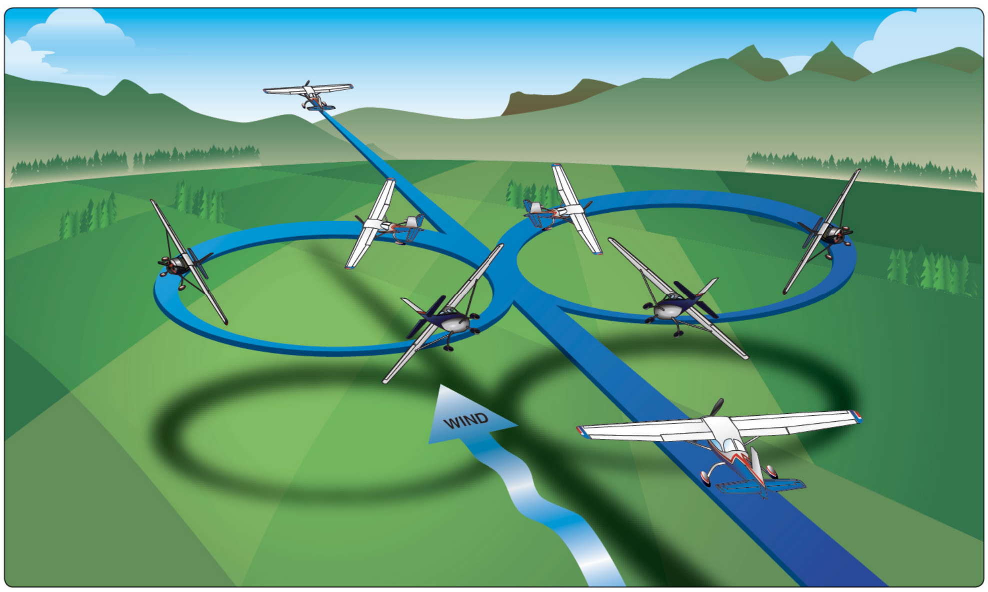
1. Aerodynamics review of turning flight including increases in load factor and stall speed and accelerated stalls.
2. How load factor increases with bank angle - Note how after bank angles of greater than 45 degrees load factor increases substantially with even small increases in bank angle.
3. Determining maneuvering speed, including changes in weight.
4. Identification of reference points and heading.
5. Adverse yaw and using rudder to stop it.
6. Use of horizon to determine bank and the different sight pictures in left / right turns.
7. Maintaining altitude with elevator and airspeed with power.
8. Use of trim in a turn.
9. Overbanking tendency.
10. Left turning tendencies and the use of rudder in the turn.
11. Anticipating rolling out. (1/2 bank angle in degrees)

Key Points:

- Load factor and stall speed increases quickly over banks angles of 50 degrees.
- Adverse yaw happens anytime the ailerons are deflected.
- Elevator controls altitude and power controls airspeed.
- During the turn right rudder will be needed to stop the left turning tendencies.

Risk Management - Teach how to identify, assess and mitigate risks enocmpassing the following:

1. Failure to divide the attention between airplane control and orientation.
2. Task management.
3. Energy management.
4. Accelerated stalls.
5. Spins.
6. Failure to maintain situational awareness.
7. Collision avoidance, scanning, and obstacle avoidance.
8. Failure to maintain coordinated flight.



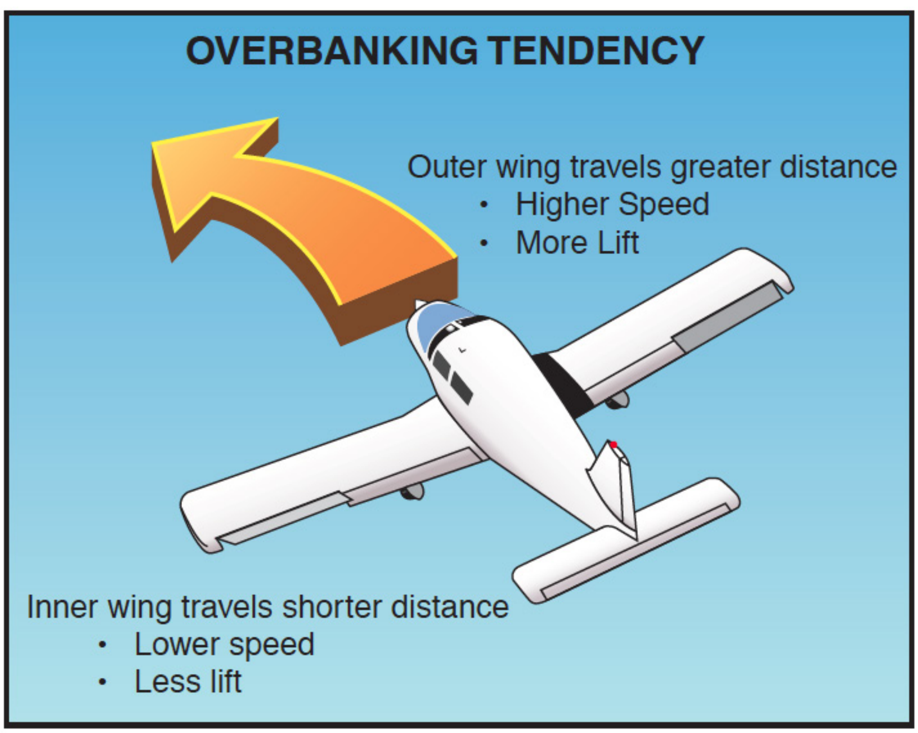
Questions for the Student:

1. What elevator, aileron and rudder control inputs will be necessary to maintain altitude during a steep turn?
2. What is the minimum bank angle required for a steep turn for a commercial pilot? Private pilot?
3. When should the roll out begin to be wings level at the 360-degree point of the maneuver?
4. What kinds of elevator control pressures will be required when entering and maintaining the steep turn?
5. What visual references should the pilot use during the turns to maintain altitude?

Common Errors

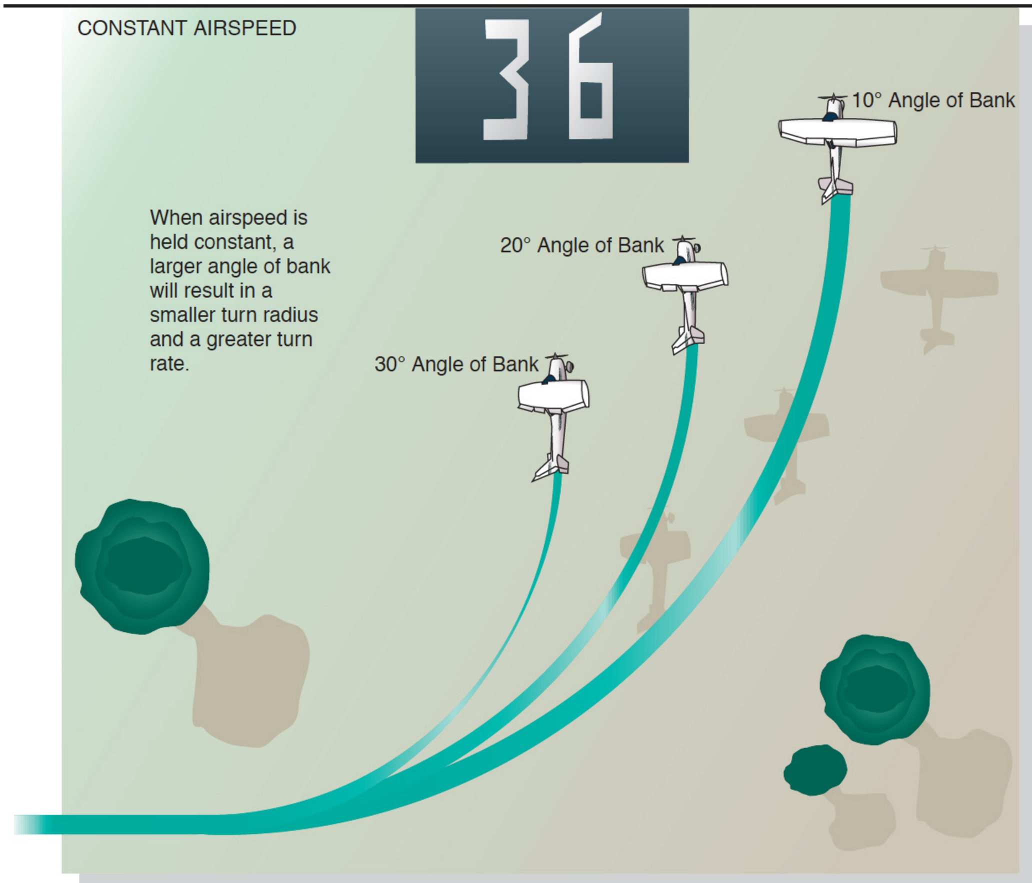
- Failure to adequately clear area.
- Excessive pitch changes during entry or recovery.
- Attempts to start recovery prematurely.
- Failure to stop the turn on a precise heading.
- Excessive rudder during recovery, resulting in skidding.
- Inadequate power management.
- Inadequate airspeed control.
- Poor coordination.
- Gaining altitude in right turns and losing altitude in left turns.
- Failure to maintain a constant bank angle.
- Disorientation.
- Attempting to perform the maneuver by instrument reference rather than visual reference.
- Failure to scan for other traffic during the maneuver.

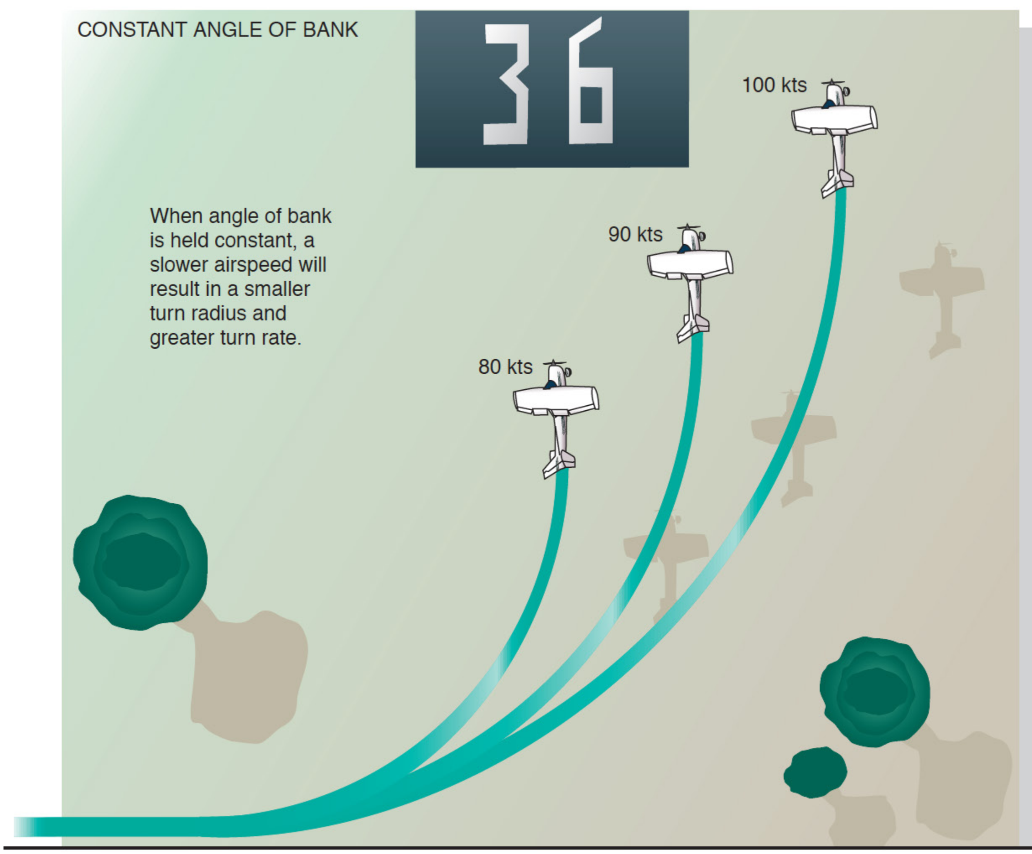
Steep Turns - Overbanking Tendency



Completion Standards

1. Establish the manufacturer's recommended airspeed or if one is not stated, a safe airspeed not to exceed V_A.
2. Roll into a coordinated 360° steep turn with a 45° bank.
3. Perform the Task in the opposite direction, as specified by the evaluator.
4. Maintain the entry altitude ±100 feet, airspeed ±10 knots, bank ±5°; and roll out on the entry heading, ±10° or as recommended by aircraft manufacturer to a safe maneuvering altitude.


CONSTANT AIRSPEED
36
10° Angle of Bank
20° Angle of Bank
30° Angle of Bank
When airspeed is held constant, a larger angle of bank will result in a smaller turn radius and a greater turn rate.


CONSTANT ANGLE OF BANK
36
100 kts
90 kts
80 kts
When angle of bank is held constant, a slower airspeed will result in a smaller turn radius and greater turn rate.

Objective

To maintain coordinated airplane control at speeds other than cruise speed while using different drag devices while straight and level, turning, climbing or descending.

Motivation

Develops control at slow speeds that will be used for landing.

Presentation: 30 Minutes

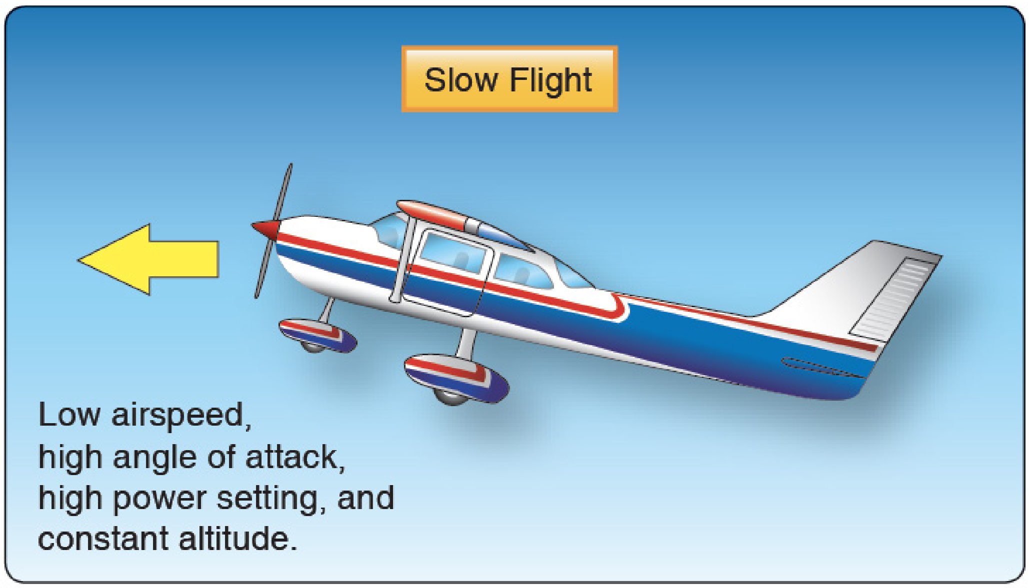
1. How this maneuver applies to different phases of flight. (Takeoff/Landing)
2. Review aerodynamics, Lift/drag. (induced and parasite)
3. Why AOA increases when airspeed decreases. (Lift equation/drag vs speed charts)
4. Show power available vs power required charts - at high and at low speeds the power required is high. (Climb not possible)
5. Therefore: At very low speeds - PITCH FOR AIRSPEED AND THROTTLE FOR ALTITUDE.
6. As speed reduced AOA must increase - Induced drag increases so power must also be increased.
7. This causes high torque, P-factor and slip stream causing the airplane to yaw left.
8. Prevent yaw with rudder.
9. At slow speeds controls are not as effective, stall warning horn 5-10 kts above stall.
10. Recognize the stall horn and take corrective action if activated.

Key Points:

- Throttle controls altitude at low speeds.
- Pitch controls airspeed at low speeds. Pitching for altitude only increases drag.
- Rudder must be applied to keep the airplane from yawing - maintain fixed heading.
- Flight controls will be less responsive and less effective at slower airspeeds.
- Turns should be shallow. Climbs may not be possible.

Risk Management - Teach how to identify, assess and mitigate risks enocmpassing the following:

1. Proper understanding of Angle of Attack.
2. Collision avoidance and scanning for traffic while at high nose attitudes.
3. Failure to avoid a stall or react appropriately to a stall warning.
4. Failure to remain coordinated.



Questions for the Student:

1. Why is additional right rudder pressure necessary during slow airspeed/increased throttle conditions?
2. What control input should be used to change airspeed when flying slow?
3. How does the pilot control altitude during slow flight?
4. Why is additional power required as the airspeed slows?

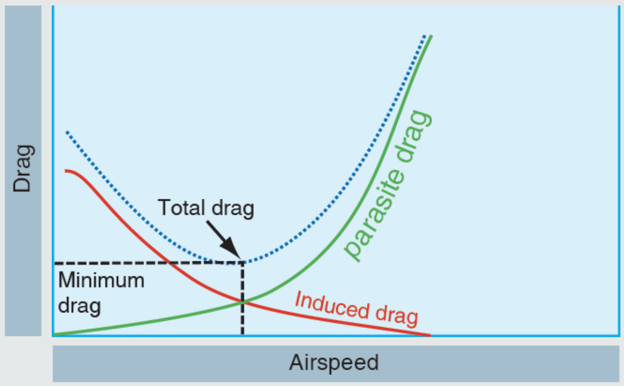
Common Errors

- Failure to adequately clear the area.
- Inadequate elevator back-pressure as power is reduced, resulting in a loss of altitude.
- Excessive elevator back-pressure as power is reduced resulting in a climb, followed by a rapid reduction in airspeed, and mushing of the flight controls.
- Inadequate compensation for adverse yaw during turns.
- Fixation on the airspeed indicator.
- Failure to anticipate changes in lift as flaps are extended or retracted.
- Inadequate power management.
- Inability to adequately divide attention between airplane controls and orientation.

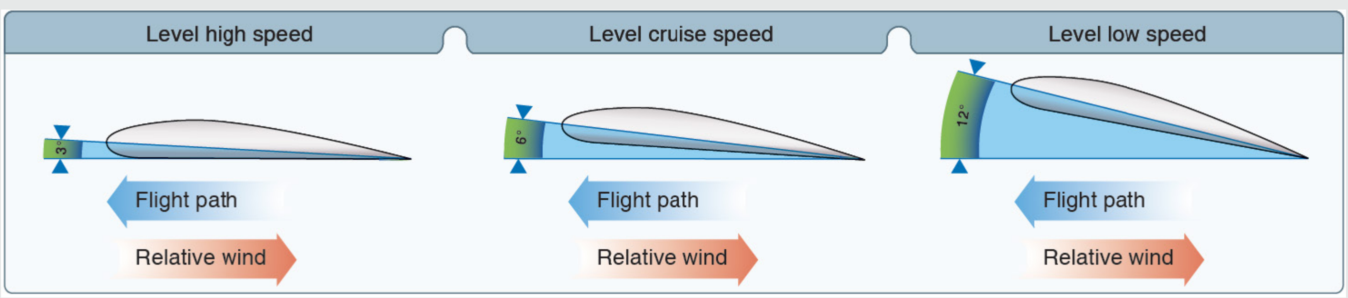
Completion Standards

1. Select an entry altitude that will allow the Task to be completed no lower than 1,500 feet AGL.
2. Establish and maintain an airspeed at which any increase in angle of attack, increase in load factor or reduction in power would result in a stall warning (e.g., aircraft buffet, stall horn, etc.).
3. Accomplish coordinated straight-and-level flight, turns, climbs, and descents with flap configurations specified by the evaluator without activating a stall warning. (e.g., aircraft buffet, stall horn, etc.)
4. Divide attention between airplane control, traffic avoidance and orientation.
5. Maintain the specified altitude, ±100 feet; specified heading, ±10°; airspeed +10/-10 knots; and specified angle of bank, ±10° or as recommended by aircraft manufacturer to a safe maneuvering altitude.

Lesson Additional Images



$$L = \frac{C_L \cdot \rho \cdot V^2 \cdot S}{2}$$



Objective

Develop recognition of an impending stall or stalled condition in the landing configuration and prevent a stall or unstall the airplane after a stall occurs.

Motivation

Recognizing, avoiding, recovery from stalls avoids stall/spin accidents.

Presentation: 15 Minutes

1. Stall aerodynamics - Critical AOA, not speed dependent, flight path vs relative wind, how load factor and weight affect stall speed.
2. AOA vs lift - Can generate lift at low speeds but not more than the critical angle.
3. Airplane in the landing configuration, full flaps on approach speed, descending.
4. Inducing the stall - Power idle (like the flare) raise the nose to landing attitude.
5. Importance of coordination - Avoid a stall with yaw. (Describe spin basics)
6. Approach to stall indications. Loss of control effectiveness, stall warning horn, buffeting.
7. Full stall indication - Uncommanded nose down attitude due to loss of lift possible wing drop.
8. Stall recovery procedure. Reduce AOA with elevator until the stall symptoms are gone, use full power to minimize altitude loss and rudder to stop yaw.
9. If a wing drops, prevent it from dropping further with rudder. Unstall the wing with elevator, then level with wing with aileron. Do NOT level the wings with rudder (Possible spin - Stall with Yaw.)

Key Points:

- Airplane will be in the landing configuration, on approach speed, descending.
- Stall recovery can always be made by reducing the AOA with elevator.
- Power is only necessary to minimize altitude loss.

Risk Management - Teach how to identify, assess and mitigate risks enocmpassing the following:

1. Aerodynamic factors AOA to airspeed, Load factor, weight, configuration.
2. The range and limitations of stall warning indicators.
3. Actions for maximum performance and the consequences of failing to do so.
4. Collision avoidance, scanning, and obstacle avoidance.
5. Failure to follow the stall recovery procedure.
6. Failure to maintain coordinated flight during the maneuver.
7. Secondary stalls and inadvertent stalls or spins

Questions for the Student

1. How will the controls feel during the initial symptoms of a stall?
2. How is angle of attack related to a stall?
3. What would happen if the flaps were raised too quickly during stall recovery?
4. To unstall the wing what must the pilot do?

Common Errors

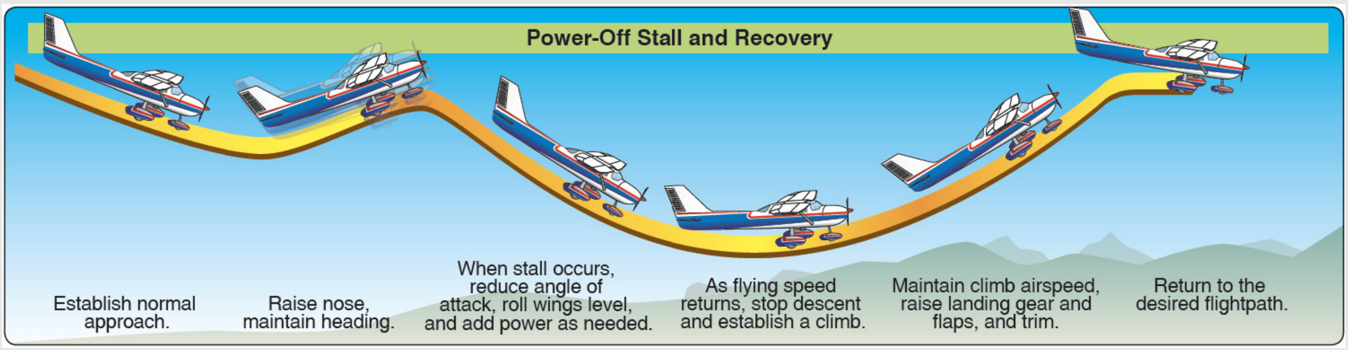
- Failure to clear area.
- Inability to recognize an approaching stall condition through feel for the airplane.
- Premature recovery.
- Over-reliance on the airspeed indicator while excluding other cues.
- Inadequate scanning resulting in wing-low condition during entry.
- Excessive elevator back pressure, resulting in an exaggerated nose-up attitude during entry.
- Inadequate rudder control.
- Inadvertent secondary stall during recovery.
- Failure to maintain a constant bank angle during turning stalls.
- Excessive forward elevator pressure during recovery, resulting in negative load on the wings and potential secondary stall.
- Excessive airspeed build-up during recovery.
- Failure to take timely action to prevent a full stall during the conduct on imminent stalls.

Completion Standards

1. Select an entry altitude that will allow the Task to be completed no lower than 1,500 feet AGL.
2. Establish and maintain an airspeed at which any increase in angle of attack, increase in load factor or reduction in power would result in a stall warning (e.g., aircraft buffet, stall horn, etc.).
3. Accomplish coordinated straight-and-level flight, turns, climbs, and descents with flap configurations specified by the evaluator without activating a stall warning. (e.g., aircraft buffet, stall horn, etc.)
4. Divide attention between airplane control, traffic avoidance and orientation.
5. Maintain the specified altitude, ±100 feet; specified heading, ±10°; airspeed +10/-10 knots; and specified angle of bank, ±10° or as recommended by aircraft manufacturer to a safe maneuvering altitude.

Stall Recovery Template	
1. Wing leveler or autopilot	1. Disconnect
2. a) Pitch nose-down b) Trim nose-down pitch	2. a) Apply until impending stall indications are eliminated b) As needed
3. Bank	3. Wings Level
4. Thrust/Power	4. As needed
5. Speed brakes/spoilers	5. Retract
6. Return to the desired flight path	

Lesson Additional Images



Objective

To understand the aerodynamic concepts of how an airplane can overcome its own weight and to understand how resistance to its movement is generated and managed.

Motivation

An airplane must overcome its weight to fly and must be able to move through the air in order to do it. An understanding of these aerodynamic concepts/forces allow the pilot to understand how to anticipate and manage these forces.

Presentation: 45 Minutes

Airplane Components to Introduce:

1. Fuselage – Airplane minus the wings and stabilizers – contains the cabin, engine etc.
2. Airfoil – Generates force to overcome weight.
3. Horizontal Stabilizer – Allows the airplane to be controlled to balance the effect of the airfoil.

The Four Forces:

1. Weight
2. Lift
3. Thrust
4. Drag

Lift and Weight

1. For an airplane to fly it must overcome its weight. Weight is always directed downward.
2. The force created to overcome weight is called lift.
3. Newtons Third Law – Reaction.
4. Bernoulli's Principle – Relationship of Pressure and Velocity.
5. Airfoil components.
6. Show restricted pipe and relate it to an airfoil.
7. Relative wind – Parallel and opposite the flight path.
8. Angle of attack of the airfoil – Larger AOA increases the path on the top of the airfoil = more velocity = increase in lift.
9. Lift equation – Lift = $PV^2SC_L/2$ – Lift increases at the square of the velocity.

10. Critical angle of attack – Air can no longer stay attached to the airfoil – Aerodynamic stall occurs – Lift decreases.
11. Lift equation – variables controlled by the pilot are velocity and C_L. (Angle of attack)
12. The slower the airplanes speed the more Angle of Attack is needed (C_L).
13. As speed or AOA increases lift increases and the Center of Lift (Cp) moves forward
14. Cp needs to always be behind the Center of gravity (CG).
15. Purpose of the horizontal stabilizer – Provides tail down force – keeps the wing from causing the airplane to rotate forward around it's CG.

Drag and Thrust

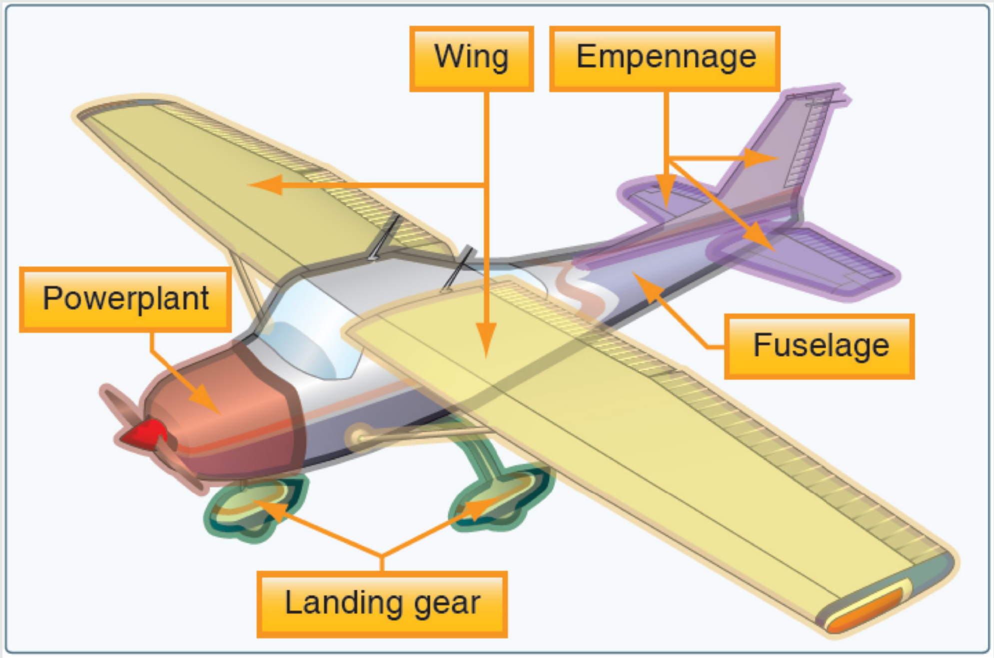
1. Thrust provides a means to create speed (Velocity)
2. Force that opposes motion that opposes thrust.
3. Parasite drag caused by the airplane parts – The larger the surface area the more the drag
4. Parasite drag – Increases at the square of the speed – Show graph Drag vs Speed
5. Induced drag – As speed is slowed more AOA is needed – Lift vector is tilted rearward - component of lift acting rearward has to be overcome by thrust or speed slows.
6. Induced drag – Wingtip vortices increase with higher AOAs. At the wingtips the High pressure below can corkscrew up toward the low-pressure area of the wing. It takes energy to create the vortices and this energy is lost the airflow causing lift which means more drag.
7. Induced drag – Show graph of Drag vs speed – Induced drag increases as speed is reduced. (AOA is generating lift instead of Velocity)
8. Total drag is the combination of Parasite and induced drag. (Show graph of Drag vs speed with total drag curve)
9. The lowest drag occurs at a particular speed.
10. Drag must be overcome by thrust in order to both speed up (Parasite drag) or to go slower (Due to induced drag) to maintain level flight.
11. Ground effect and how it relates to a decrease in drag.

Wing Design and Planform

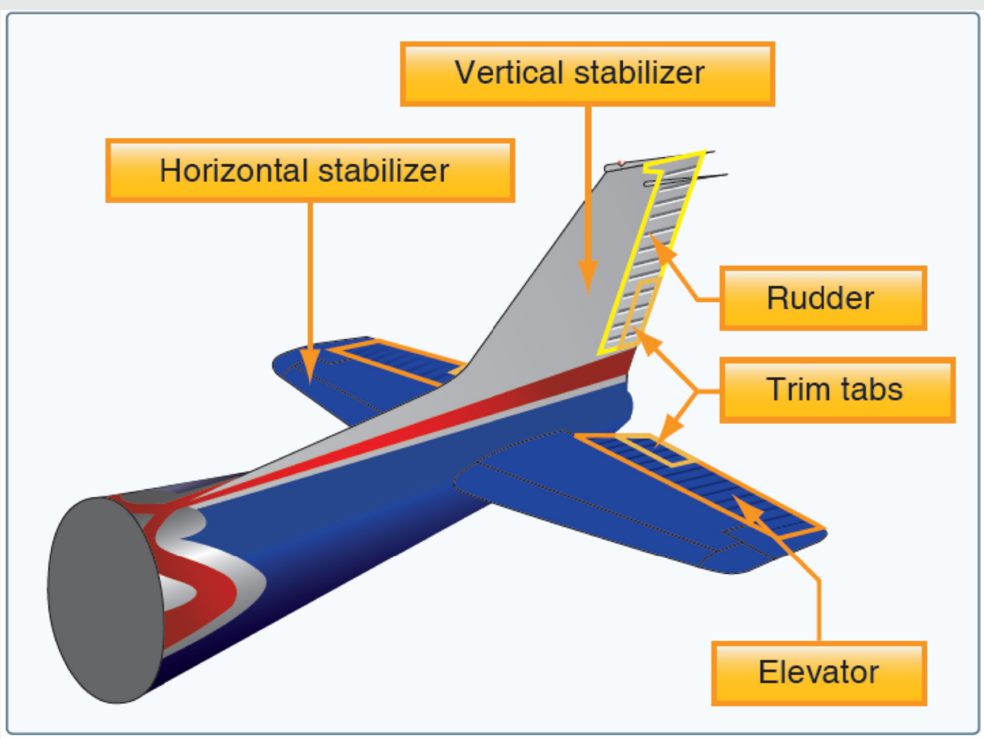
1. Aspect ratio as it relates to production of lift and drag.
2. Design choices of various wing planforms for speed and handling.

Lesson Additional Images

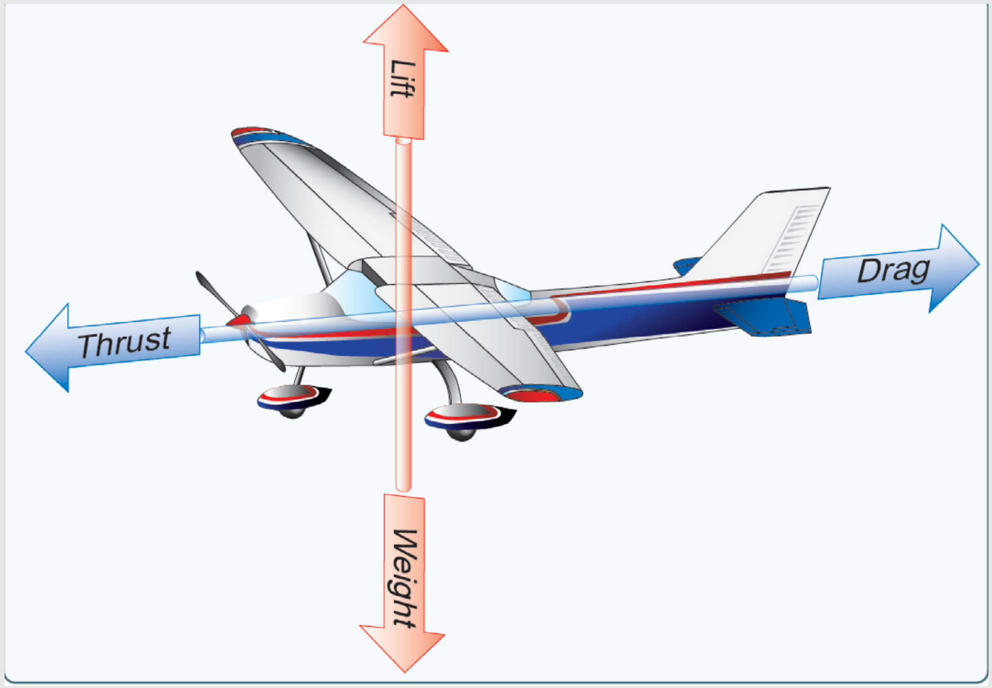
Components of an airplane



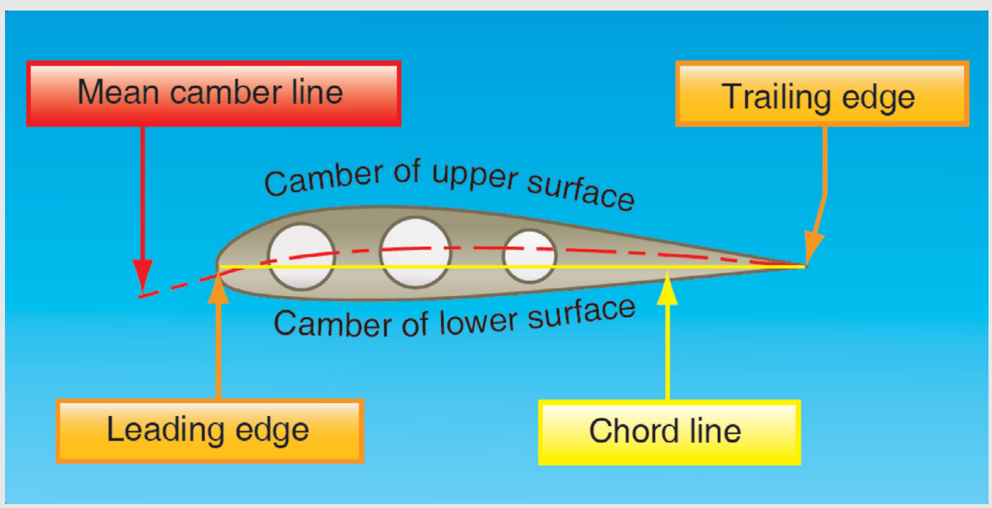
Horizontal Stabilizer



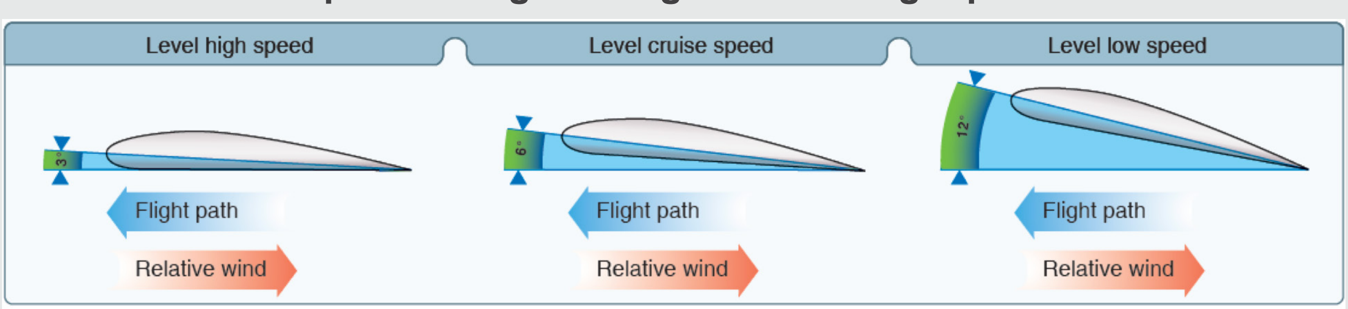
Components of an airplane



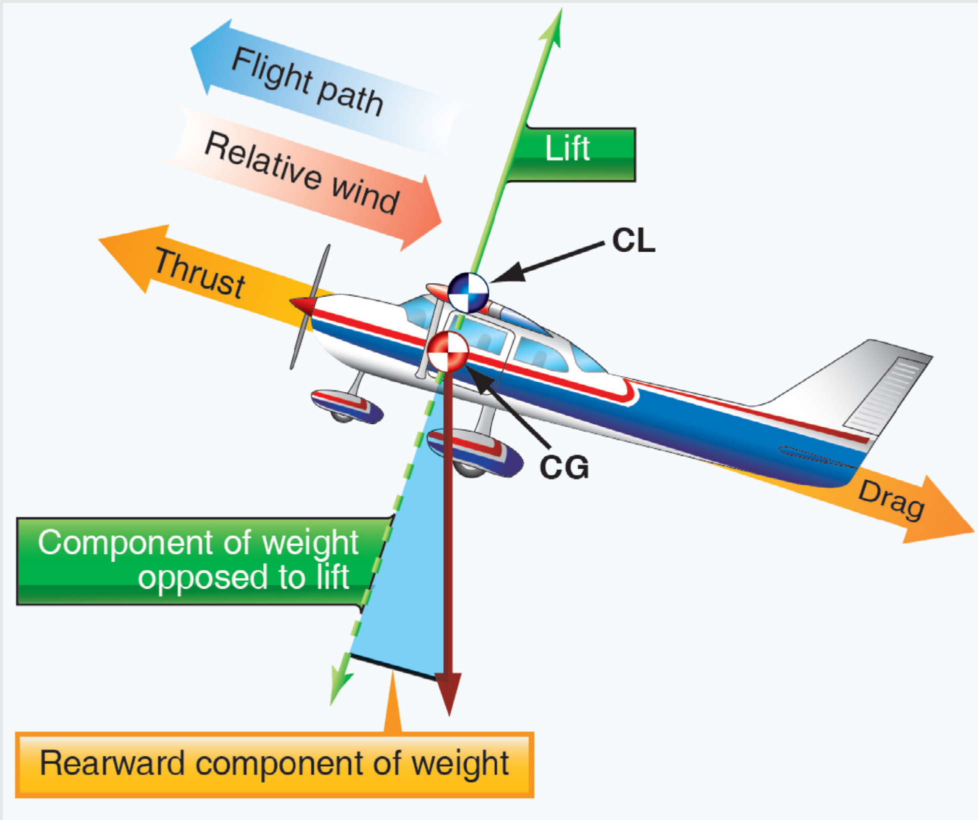
Horizontal Stabilizer



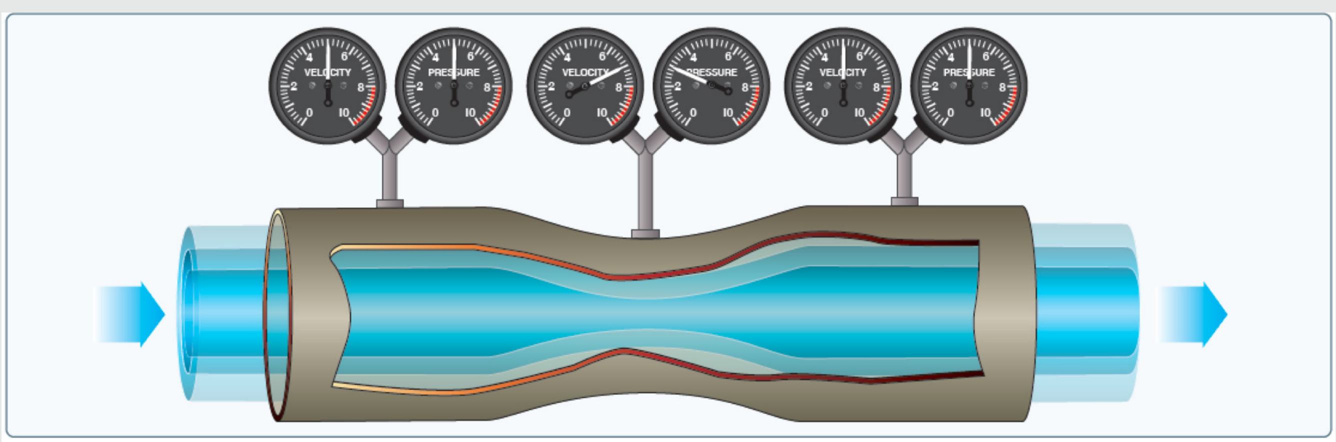
Relative wind as speed changes along the same flight path



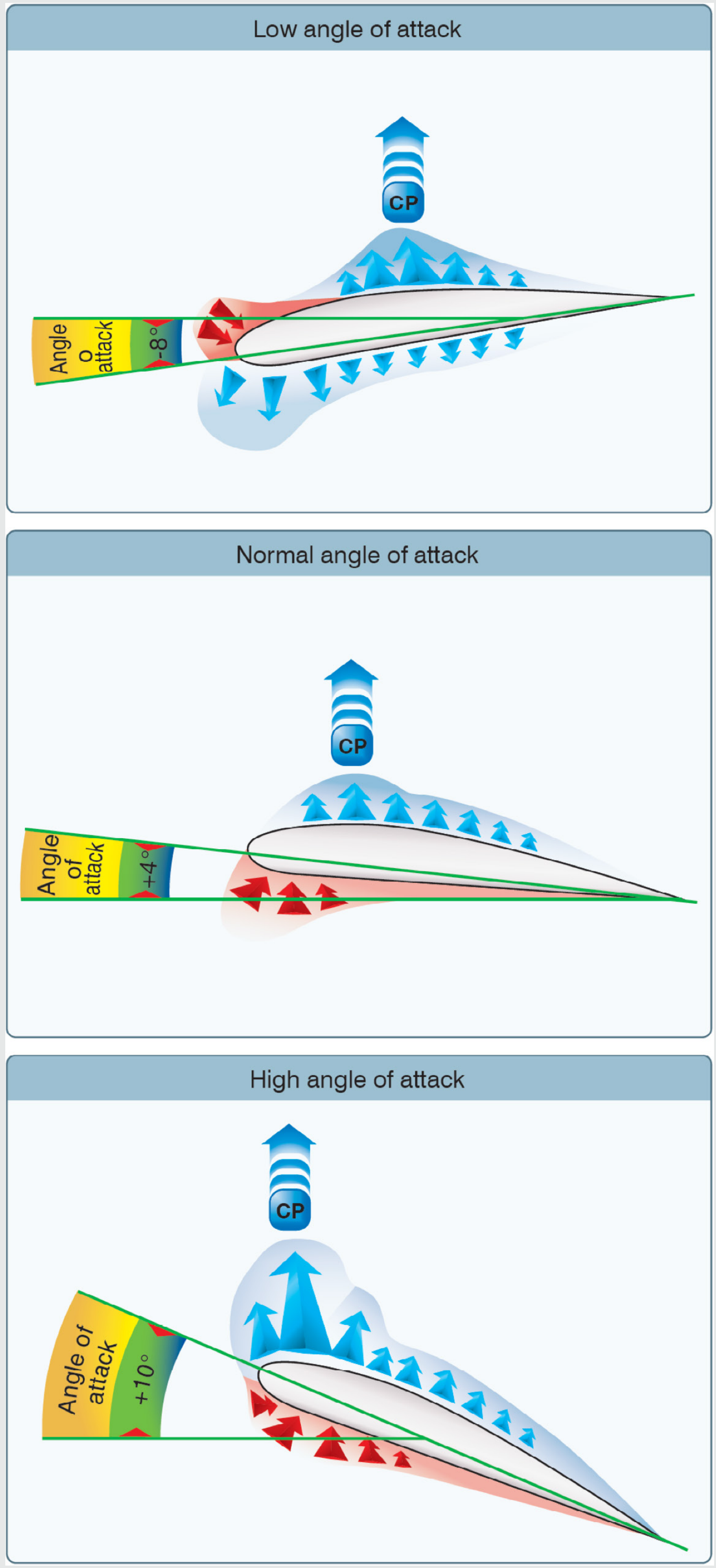
Relative wind in a climb



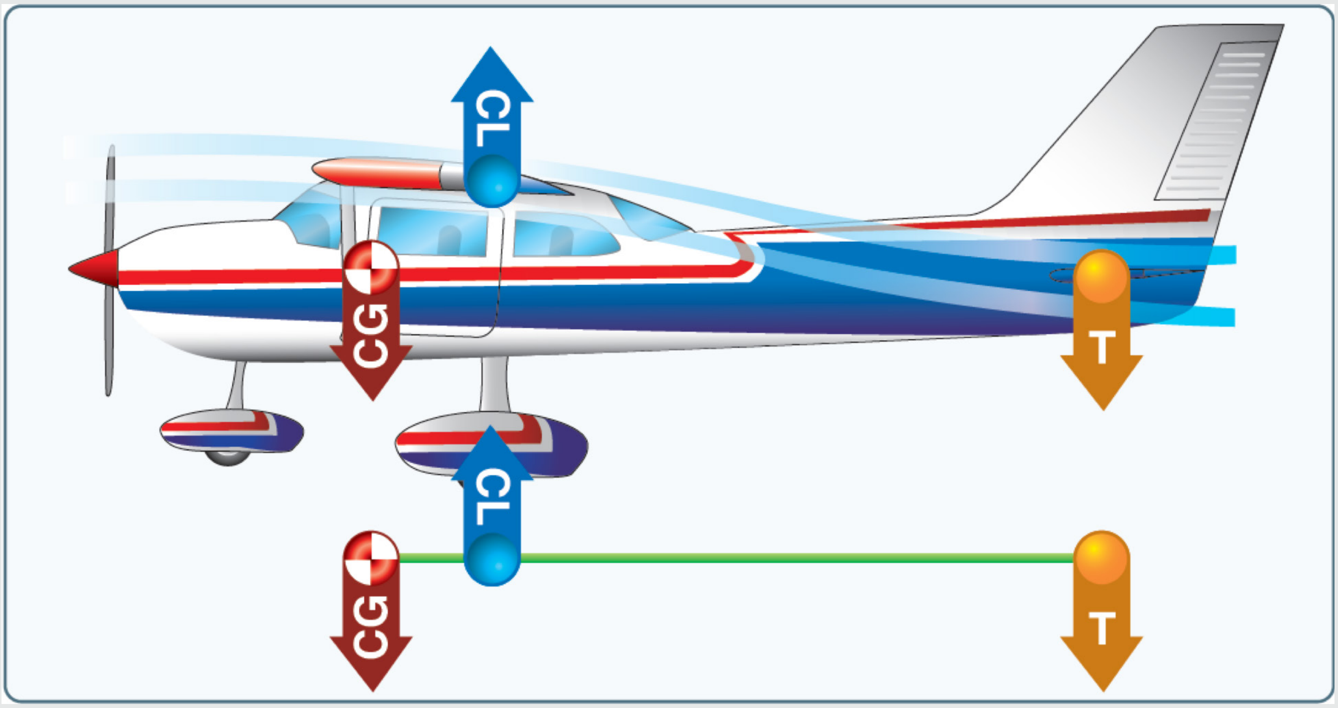
Pressure and Velocity Relationship - Bernoulli's Principle



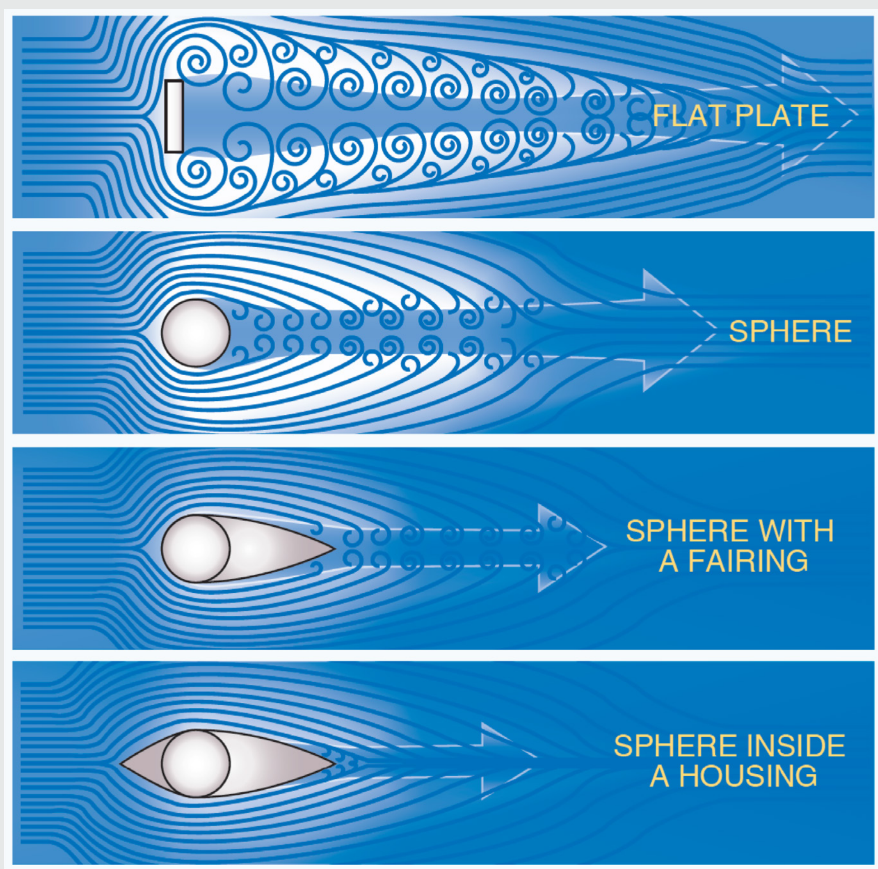
Center of pressure changes with angle of attack



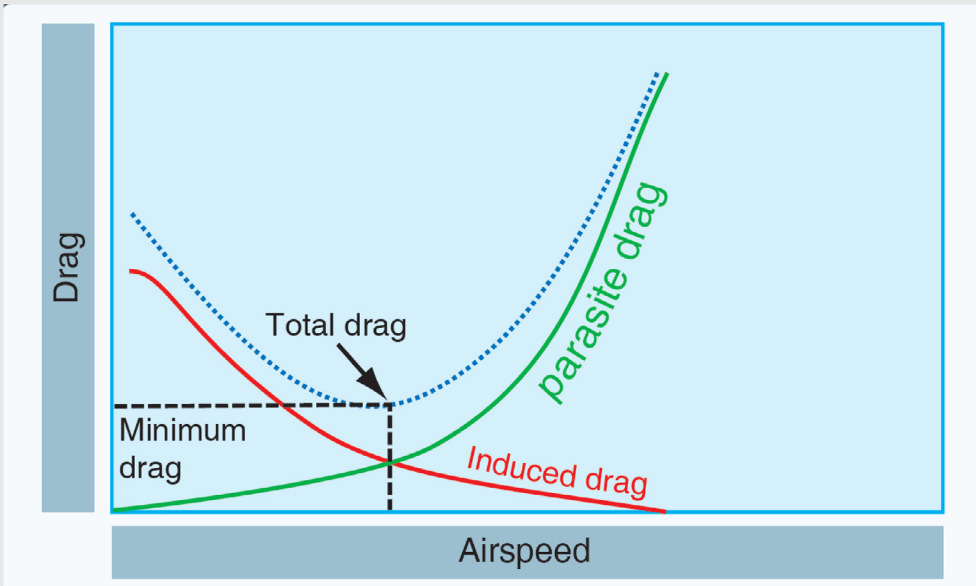
Relative wind in a climb



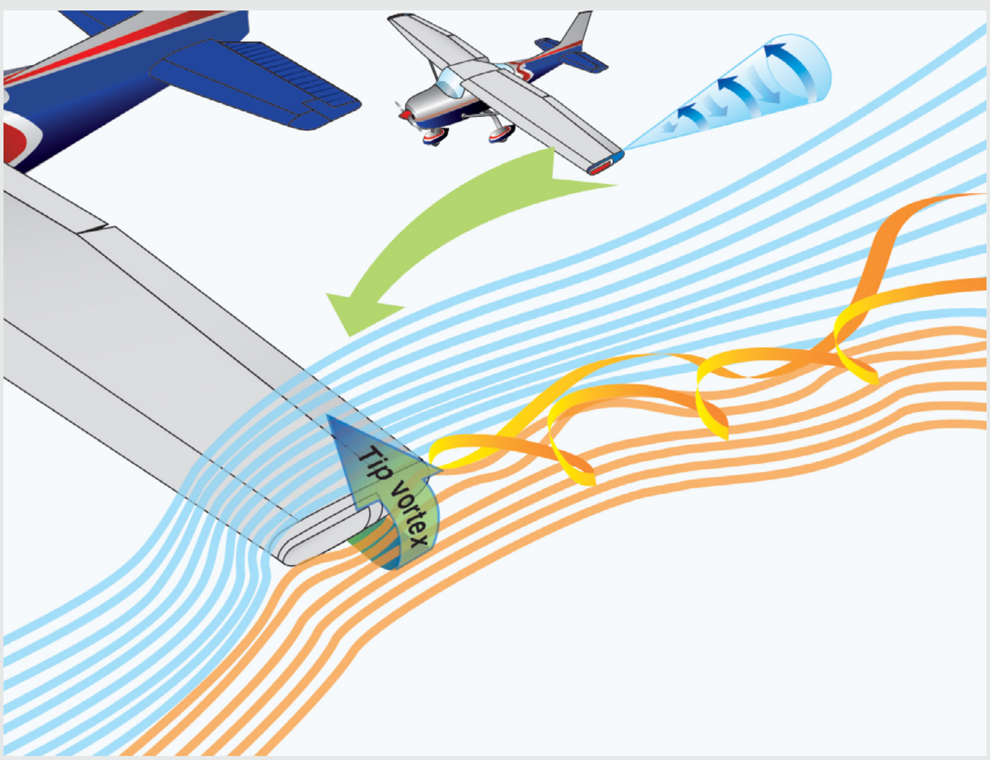
Pressure and Velocity Relationship - Bernoulli's Principle

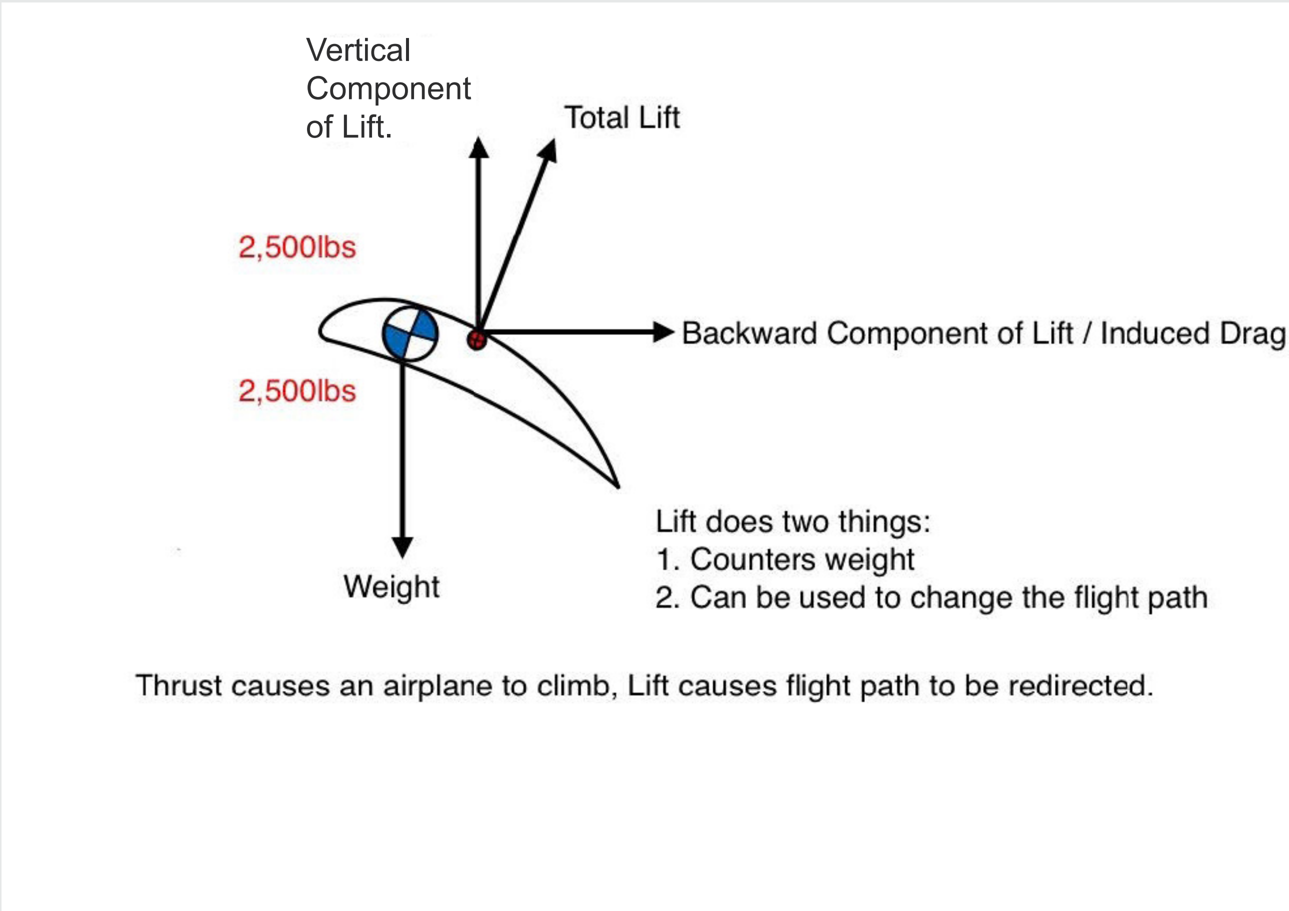


Components of an airplane

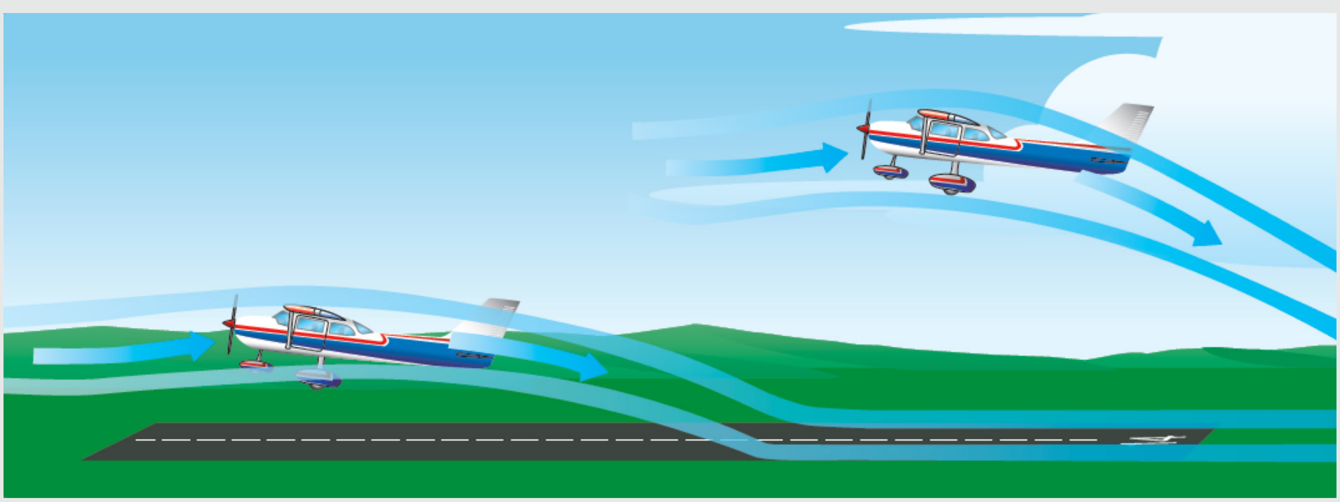


Horizontal Stabilizer

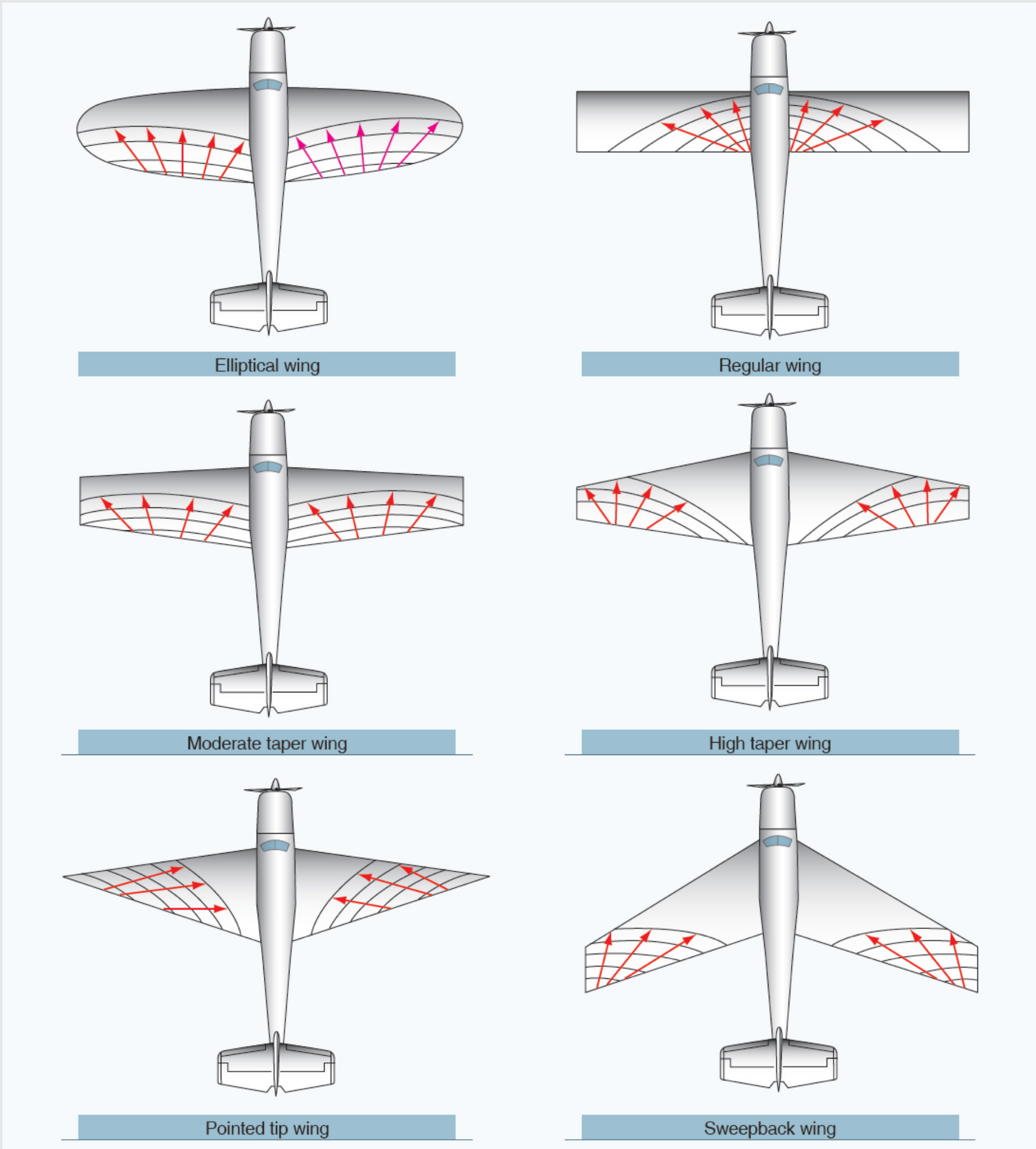




Ground effect changes the airflow



Components of an airplane



Objective

The student will understand how a training or transport airplane achieves stability around it's three axes. The student will also understand how the center of gravity affects the control over the airplane the pilot has.

Motivation

Understanding stability will help the pilot understand when and to the extent a control input may be necessary after the airplane is disturbed by the environment such as turbulence. Understanding how the center of gravity determines how controllable the airplane is will also help the pilot load the airplane in a safe manner where controllability is assured.

Presentation: Aircraft stability and Controllability 30 Minutes

Stability

1. Airplane stability relates to how the airplane behaves if disturbed from its flight path.
2. Static stability – The initial tendency of the airplanes movement once disturbed.
3. Types of static stability – Positive, Neutral and Negative.
4. Dynamic stability – The tendency of the airplane's movement over time.
5. Types of dynamic stability – Positive, Neutral and Negative.
6. Longitudinal stability (Pitching) – Achieved by more or less tail-down force due to downwash. Also thrust-line will affect stability when power is changed.
7. Lateral stability (Rolling) – Achieved in a high wing airplane by pendulous effect and keel effect.
8. Lateral stability (Rolling) – Achieved in a low wing airplane by Dihedral.
9. Vertical stability (Yawing) – Achieved by the fuselage aft of the CG and the vertical stabilizer.
10. Free directional Oscillations (Dutch Roll) – Dihedral brings the wings level before the nose is aligned with the relative wind. This causes the airplane to form a figure eight along the horizon. Dampens down eventually.
11. Spiral instability – Caused by good directional stability – Strong directional stability on the airplane results in the nose aligning to the relative wind quickly compared to the weak dihedral causing the airplane to bank. The outside wing travels faster than the inside wing and the bank increases. Easy for a pilot to fix. Better control then Dutch roll so most airplanes are designed with spiral instability rather than Dutch roll.

Controllability

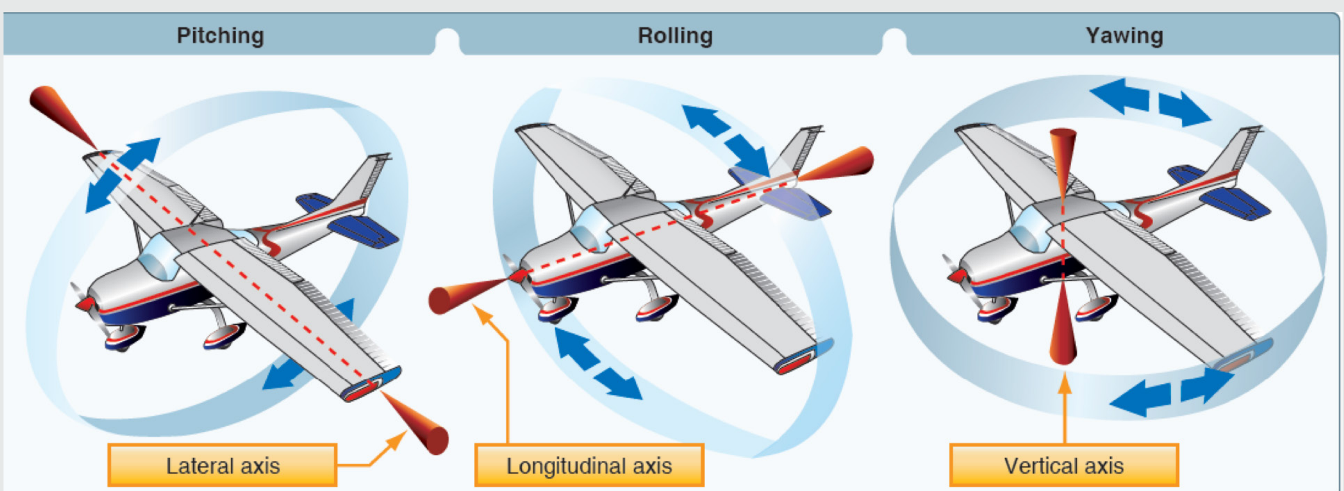
1. Controllability – The CG to the Cp is the determining factor. Design of the CG limits consider the amount of elevator control available to operate over all of the airplanes speed ranges.
2. CG location too far forward means less elevator travel upward – Not able to produce enough tail-down force (Impossible to flare). Very stable as a stall results in un-stalling quickly as the CG pulls the airplane down in the un-stalled direction.
3. CG location too far aft means too much tail-up force. Elevator may not be able to provide enough tail-up force to keep from stalling.

Completion Standards

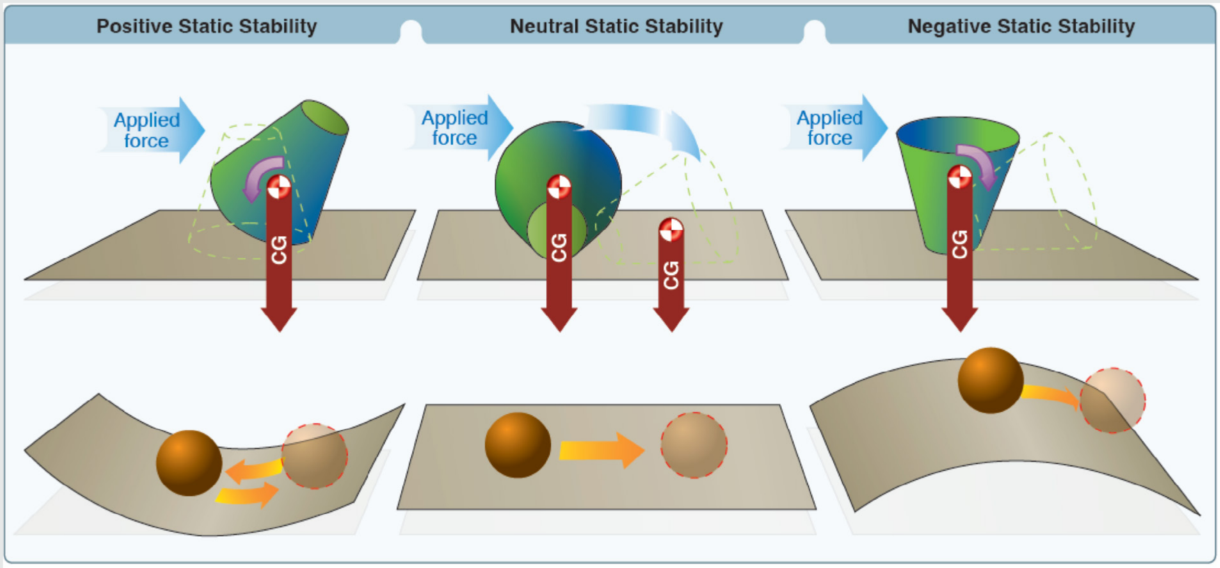
The student will be able to show how an airplane achieves stability around it's three axes using a model airplane or whiteboard. The student will also explain why an airplanes center of gravity is important for controllability.

Lesson Additional Images

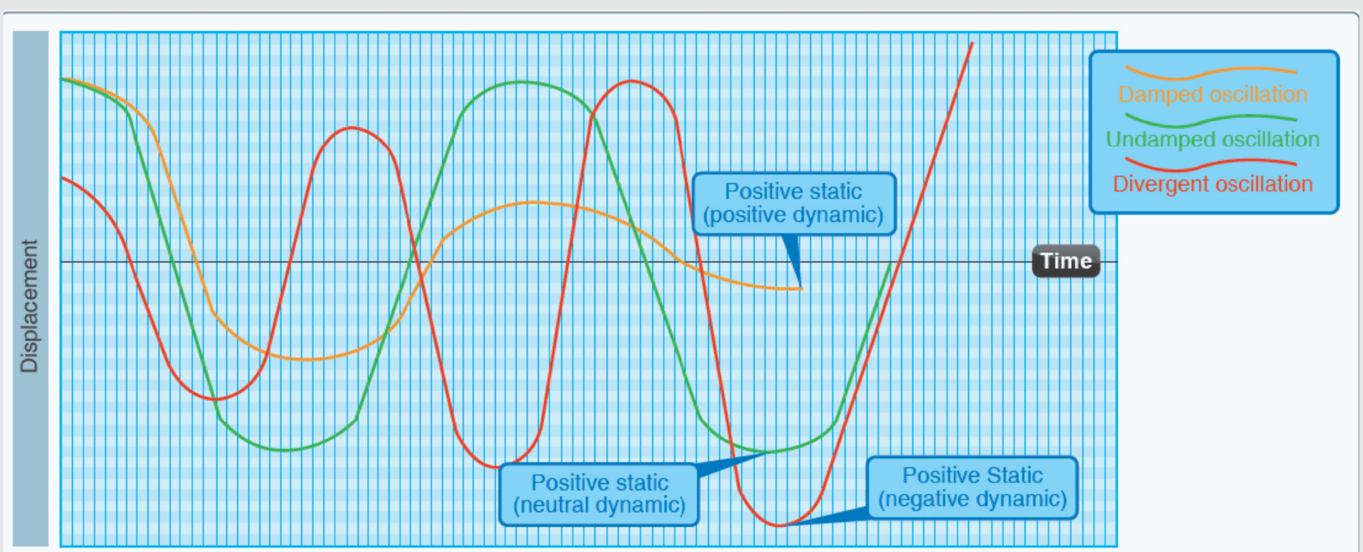
Axes of an airplane



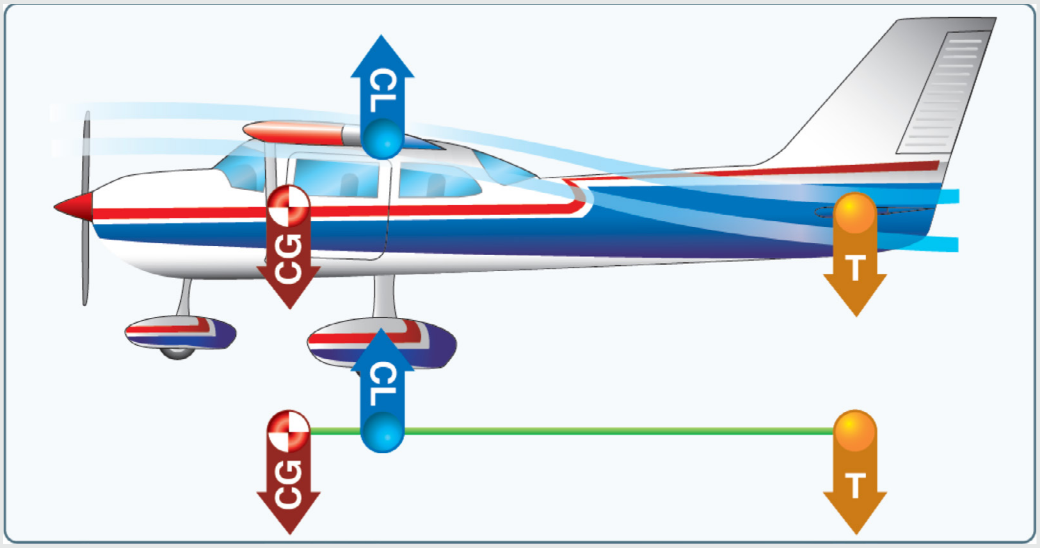
Types of static stability



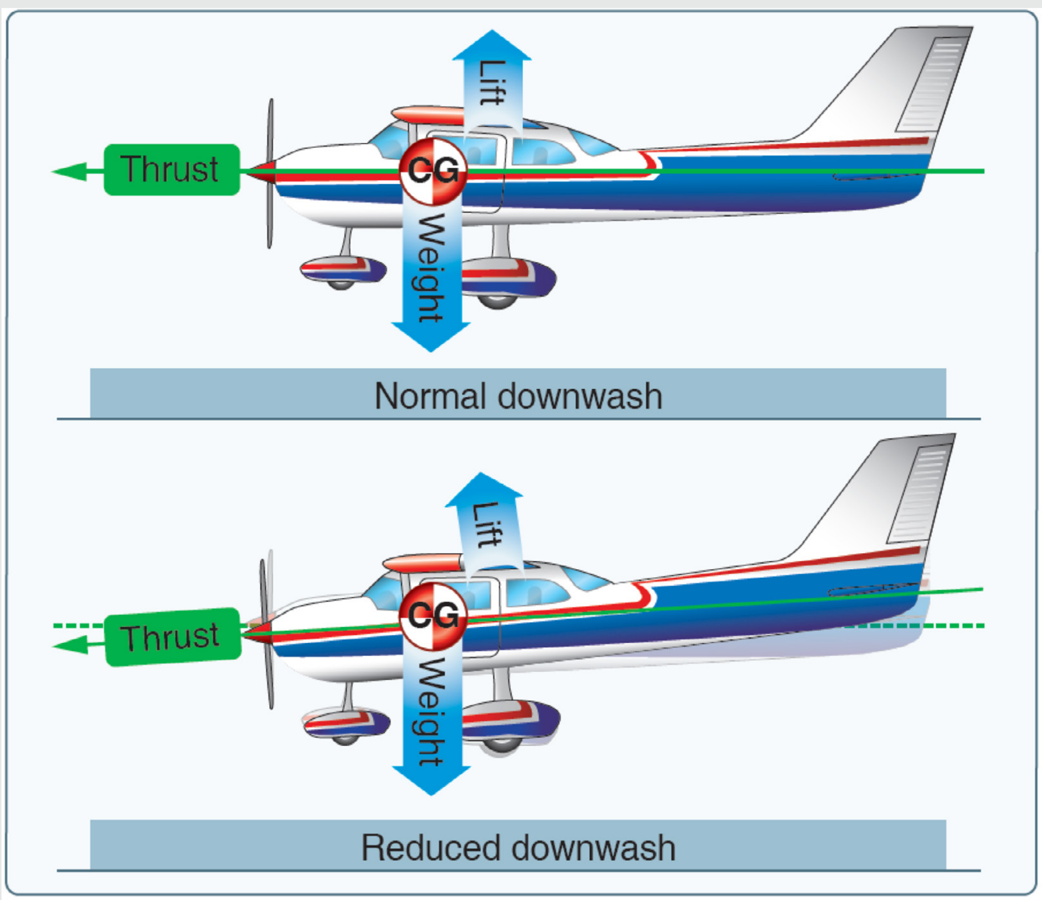
Dynamic stability and the effects of dampening



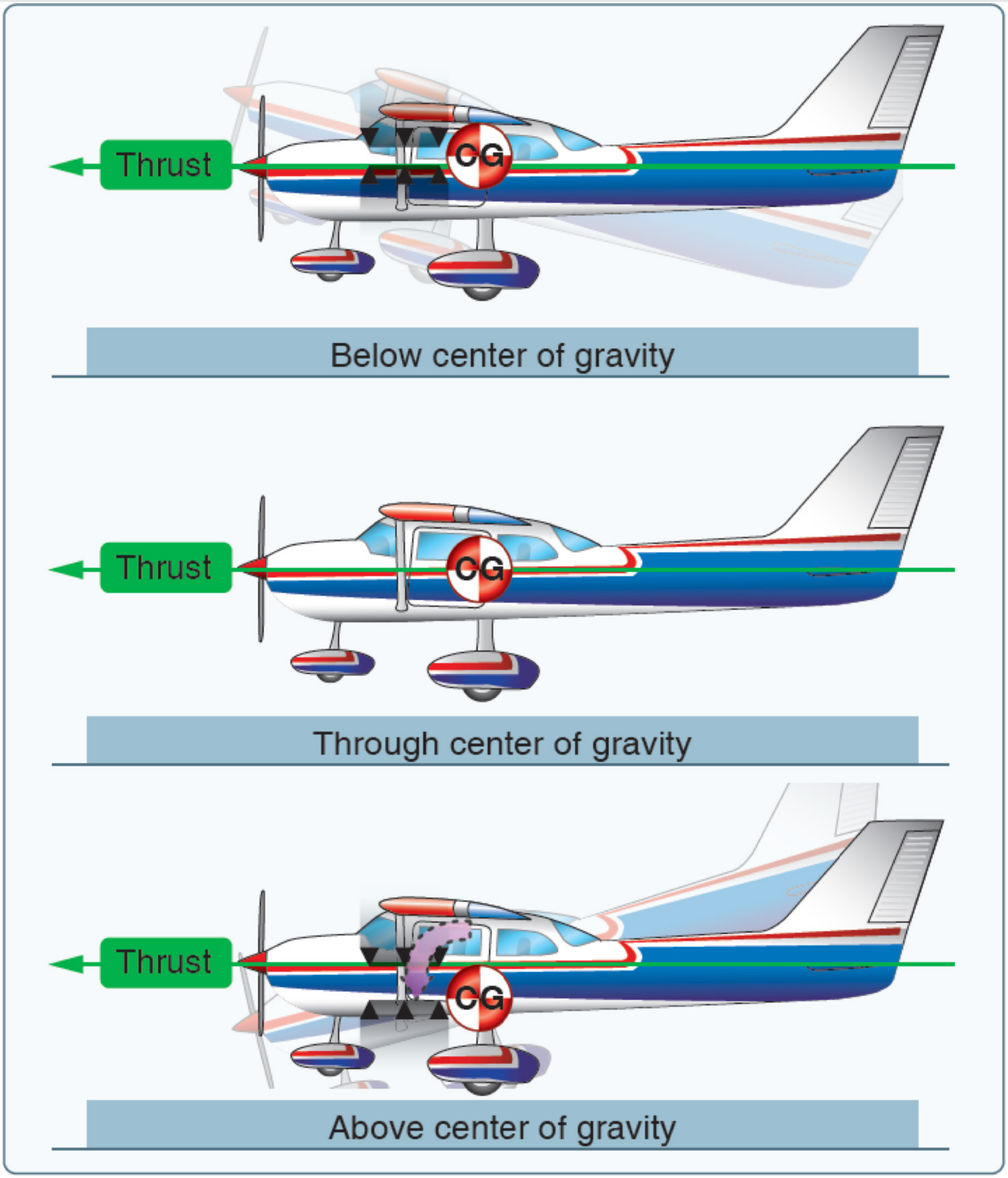
Longitudinal Stability



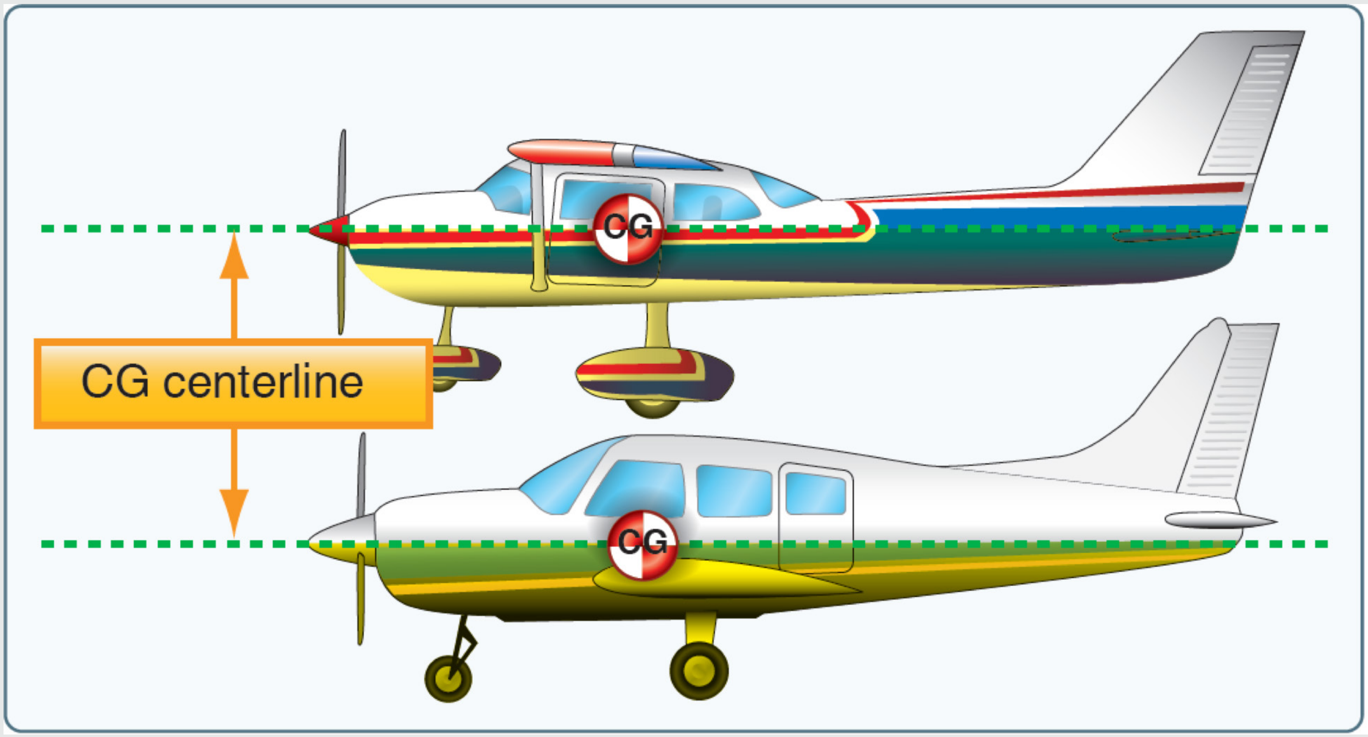
Downwash effect on longitudinal stability



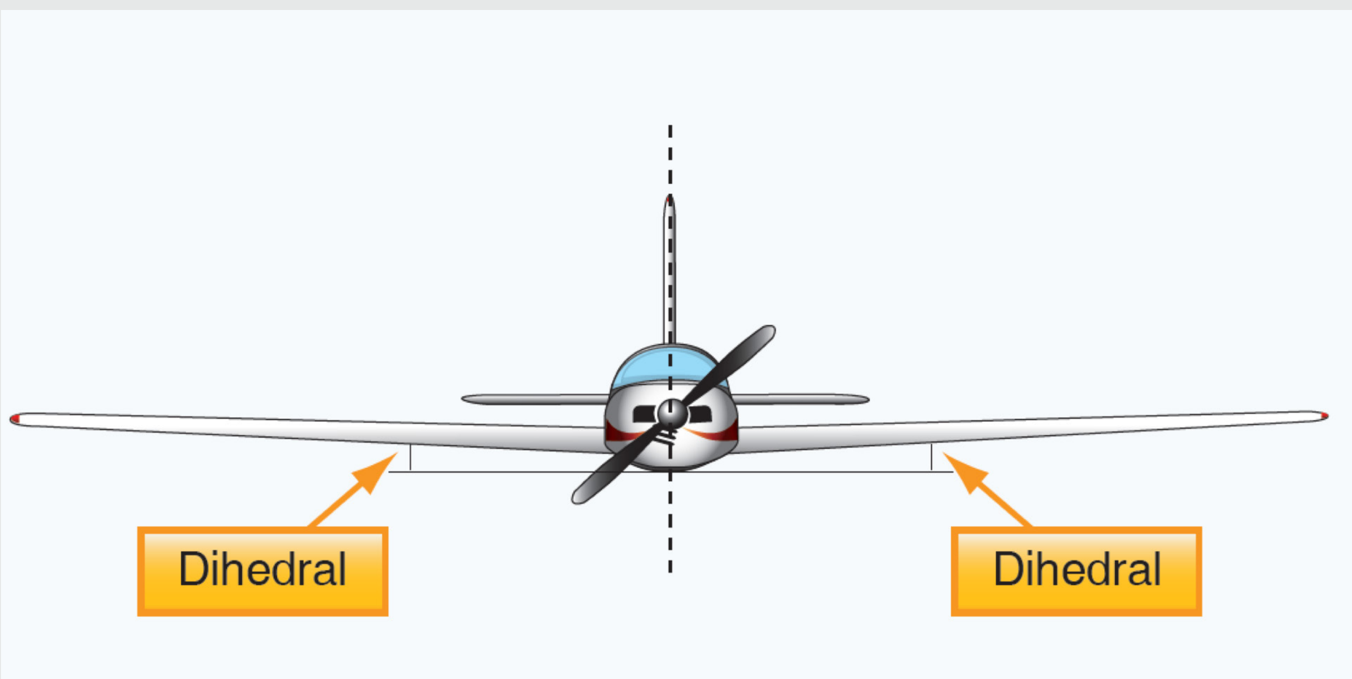
How the thrust line affects longitudinal stability



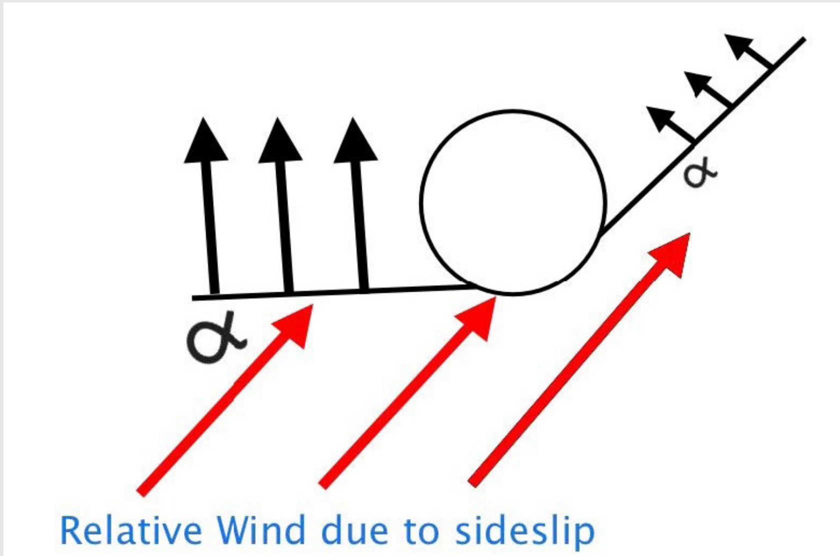
Keel effect



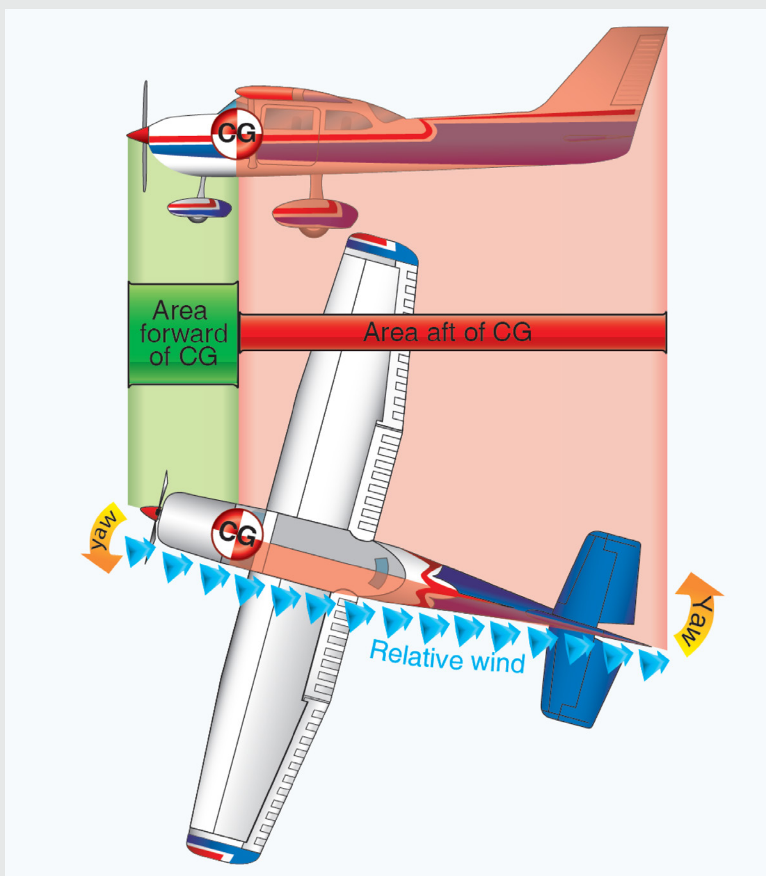
Dihedral



Increase of lift due to Slip



Fuselage and fin for directional stability



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