

Flight Instructor Training Manual

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Sample

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Introduction and How to Use This Guide

This manual was created as a guide to both instructor and initial CFI applicant. The current ACS for Flight Instructor Airplane is the “de facto” training syllabus for your study. *It is necessary the CFI applicant to understand the available training resources and how to use them. Please do not skip the first several pages below.* The following are the general categories of required training:

- 1) Fundamentals of Instruction
- 2) Technical Knowledge Areas for ground and flight lessons
- 3) Regulations and Endorsements
- 4) Instructional Proficiency in flight maneuvers

The Fundamentals of Instruction: Fundamentals of Instruction (FOI) promotes advanced training concepts to assist the CFI in reaching the highest levels of instruction to train competent pilots. FOI is the most important foundation for excellence in instructing. *Without thorough understanding and applications of the FOI, instructor technical knowledge is no better than what can be found in a book (and applicants are not likely to meet minimum standards to pass the initial CFI practical).* The chapter “Fundamentals of Instruction” provides a synopsis of the FAA publication “Aviation Instructors Handbook” with the addition of real-world examples and application to compliment the concepts and provide a working framework. Additionally, the last several pages provide an outline of the key steps to pre-prepare and present both a ground school lesson to a group as well as a ground lesson on a flight maneuver to be demonstrated. These outlines incorporate the FOI into the method of preparation and presentation of these lessons essential to demonstrate instructional ability on the practical.

Technical Knowledge Areas for ground and flight lessons: Rote memorization of technical information will not meet the requirement to demonstrate “Instructional Knowledge” of these subject areas. The CFI applicant is expected to demonstrate a depth of knowledge and application far beyond that required for the private or commercial certificates. This requires rigorous study, research and copious note taking to synthesize information from a variety of sources to produce a cohesive understanding and application of the related material. The best way to prepare for a ground lesson while you are training for your initial CFI certificate is to prepare as if you are going to teach it. Then find a volunteer and practice your instructional skills. There is no on-line course, no ground school and no study app on your phone that can prepare you for this level of knowledge and understanding. There is no way around it. It requires hard work. There is some good news. The companion “Private, Commercial and Sport Pilot Training Manual” does provide an exhaustive outline of the required material with resources to guide study. Additionally, the associated “VFR Pilot Study Questions” are 52 pages designed to help you investigate and develop a solid foundation on the technical knowledge areas. Lastly, use the current ACS Flight Instructor Airplane as your training guide!

Regulations and Endorsements: It is not enough to have the FAR/AIM or the AC 61-65 as references believing you can just look up the requirements as you need them during a practical test. The CFI candidate must have a working knowledge of how and when the training and endorsements are required in various scenarios. You will have to run through these scenarios and build your own check lists and algorithms. The references are used as needed for verification and completeness.

This study guide includes a chapter “*14 CFR Regulations*”, and “*Training Requirements and Endorsements*” have succinct outlines and explanations along with check lists to help you master this area. Additionally, there is the associated “*14 CFR Study questions*” that will help you with typical real-life scenarios to apply these regulations BEFORE you are required to demonstrate this in your initial CFI check ride.

The regulations section of this document include a descriptive outline of *CFR 14 part 61, 91 and TSA requirements* for quick reference to the critical items relevant to the flight instructor. This is supplementary and not a replacement for the actual regulations. Additionally, there is included an *outline of how to qualify a commercial student* including how to document training time and what training can and cannot be used from the private and instrument toward the commercial certificate. This has citations from legal interpretations and the regulations. In summary this document includes:

- ❑ 14 CFR 61 & 91 relevant to initial CFI
- ❑ training and endorsements for Sport through Commercial certificates.
- ❑ CFI qualifications, privileges, limitations, renewal requirements
- ❑ Relevant parts of 23, 61, 91, NTSB reporting requirements
- ❑ TSA vetting and endorsement for foreign and US citizens
- ❑ Legal requirements to qualify a commercial student, including legal interpretations

Instructional Proficiency in flight maneuvers: many applicants believe this only requires the ability to fly the commercial maneuvers from the right seat. There is nothing that could be further from the truth. First, the CFI applicant must become intimately familiar with the requirements of each maneuver from the ACS, Airplane flying handbook, and the aircraft specific POH to an “INSTRUCTIONAL LEVEL OF KNOWLEDGE”. This means understanding and EXPLAINING both the aerodynamics and *specific control inputs* to achieve the outcome measures in the ACS as a MINIMUM. Then the applicant must be able to apply the concepts studied in the Fundamentals of Instruction to demonstrate effective instructional techniques including recognition and correction of common errors for each maneuver. This is a lot of work and typically should be done after most of the initial CFI ground and FOI have been nearly mastered. This also requires an experienced CFI to mentor and guide the applicant on teaching techniques, evaluation, and providing feedback in a professional manner. These are skills that are generally new to most pilots. Fortunately, many of the flight maneuvers are detailed from an instructional point of view, in the companion “*Private, Commercial and Sport Pilot Training Manual*.” This volume has lesson plans with CFI tips and tricks on how to teach the maneuvers. Additionally, the “*Fundamentals of Instruction*” section gives explicit examples and techniques to instruct both maneuvers and ground lessons.

CAUTION:

On the use of Pre-made lessons and presentations: Many CFI applicants will rely on pre-prepared lesson plans and instructional presentations (Back Seat Pilot). This is allowable and may work if the applicant is well prepared. Power point presentations can have excellent graphics, teaching points and be a powerful tool if used correctly. Conversely, these pre-made presentations can fill the applicant with false confidence until the examiner starts asking “Why,” or “explain that further, I don’t understand.” To reach a level of instructional knowledge, there is no easy path other than hard work and organizing the presentation yourself. Applicants that use pre-prepared lesson plans

frequently omit the preparatory steps of organizing the material, preparing students with homework and fail to implement the teaching and evaluation techniques required by the ACS. Frequently, the slide presentation devolves into a non-engaging (boring) “lecture” and fails to provide effective instruction. For the typical training event in real application or on a practical exam, the guided discussion is more appropriate and effective. If you use pre-made lesson plans or presentations, make sure you use them as a tool after you have done the preparatory work and integrated the teaching techniques as required. Slide presentations should “augment” and not replace the instructional lesson. Reading off slides has catapulted many presentations into the category of “Most Boring and ineffective” lesson. Be CAREFUL.

Flight Instructor Airplane (FIA) and Fundamentals of Instructions (FOI) Knowledge tests are required exams for your initial flight instructor certificate. In addition to the ground lessons provided by your flight instructor, you may also enroll in a formal ground school course at a flight school or computerized courses are available (King Schools and Sporty’s are popular).

It is recommended that you take advantage of practice test questions which are available via Sporty’s, KING Schools, Rod Machado’s course, and ASA. *NOTE: The computer and web-based courses prepare you ONLY for passing the written test. It does not prepare you for the oral (ground) portion of the practical test with an FAA Designated Pilot Examiner.*

Supplemental sections of this training manual:

Stall and spin aerodynamics. This section is a compilation and distillation of several aerodynamic sources. This helps the initial CFI understand the aerodynamics at an instructional level. Included are study questions to help master the fundamentals and begin Stall and Spin training with a qualified instructor.

Typical scenarios used to train private pilots: This is a general outline and examples that follows a **typical scenario based practical test** and can be used for training private pilots or evaluating a candidate during check ride prep. Can be used as a mock oral for a check ride.

Recommended References

Appropriate reference materials should be readily available and used for study. I believe these are the MINIMUM references. Almost all these are FREE to download from the FAA or purchase online.

FAA-H-8083-3C Airplane Flying Handbook, 2021 + 3C addendum (Mosaic) 2025

FAA-H-8083-25C Pilot's Handbook of Aeronautical Knowledge, 2023, + addendum (Mosaic)

FAA-H-8083-28A Aviation Weather Handbook, 2024

FAA-H-8083-9B, Aviation Instructor's Handbook, 2020

FAA-H-8083-2A, Risk Management Handbook, 2022

FAA-S-8081-29, Sport Pilot - PTS for Airplane, Gyroplane, Glider, Flight Instructor

FAA-S-ACS 6C Airman Certification Standards- Private Airplane Nov 2023

FAA-S-ACS 7B Airman Certification Standards -Commercial Airplane Nov 2023

FAA-S-ACS 25 Airman Certification Standards- Flight Instructor Airplane Nov 2023

FAA Aeronautic Chart Users Guide, January 22nd, 2026

Federal Aviation Regulations/Aeronautical Information Manual "FAR/AIM"

(ASA app recommended. Only \$9.99 and free lifetime updates!)

AC-61-65K Certification of Pilots and Flight and Ground Instructors

AC-61-67C, Chg. 1 & 2 Stall and Spin Awareness Training, 2025

(recommends AGAINST impossible turn back to airport If engine failure on climb out)

AC-61-98E Currency Requirements and Guidance for the Flight Review and Instrument Proficiency Check, 2024

AC-90-66 C Non-Towered Airport Flight Operations, 2023

(teardrop entry not an FAA recognized VFR procedure for pattern entry)

Aerodynamics for the Naval Aviator, HH Hunt, 1965 (free on FAA site)

Aircraft Information Manual (specific to the aircraft you will be training and teaching in) This can frequently be found as a free PDF download on the internet, or order from an online aviation publisher.

Other Recommend Reference material:

Aerodynamics:

Stalls, Spins, and Safety. Revise Ed. Sammy Mason. 2012. Practical aerodynamics of stalls and spins. Excellent and captivating.

Aerodynamics for the Naval Aviator, HH Hunt, 1965 (free on FAA site). This is by far the most comprehensive resource that is still relevant. To fully appreciate the text requires some background in trigonometry and physics (high school level). Absolute best discussions on how an airspeed indicator works relating it to lift generation. Great discussion on aerodynamics of spins and high-altitude aerodynamics.

Understanding Aerodynamics: Arguing from the Real Physics (Aerospace Series) 1st ed, Doug Mclean, 2012. Written for engineers and aerodynamicists. Most texts use only mathematical formulas to predict or characterize the dynamics which leaves most people not able to grasp the underlying concepts. Probably the best text that clearly presents concepts that can be grasped by our imagination. Bravo!

Understanding Flight, 2nd ed. David F Anderson, and Scott Eberhardt- Overall a good resource, sometimes the math is not well explained to the layperson. Tends to oversimplify how lift is generated favoring predominately Newton aspect. Excellent discussion on Wake Vortices or “Sheet Vortices.”

The illustrated guide to Aerodynamics. 2nd ed. H.C. “Skip” Smith. Probably the easiest read for the average pilot. Does not go into the depth of the other recommended texts.

AV8N.COM – This is a great resource often cited in Physics Journals and scholarly papers on aerodynamics. It is written on a level most pilots should be able to understand by a pilot who is a Physics professor.

Aircraft systems:

ASA: A Pilot’s Guide to Aircraft and Their Systems, Dale Crane 2002- A good general aircraft systems description. Goes into more depth than the PHAK. Good overall reference for CFI to instruct from. Does not cover engine mixture, manifold pressure and propeller interactions as completely as John Deakin’s Pelican Perch.

John Deakin’s Pelican’s Perch: John Deakin was a gifted aviator and author of hundreds of pertinent articles on operating aircraft systems. His articles are preserved on AVWEB.

<https://avweb.com/?s=pelican%27s+perch>

Recommended reads are:

Pelican’s Perch #15: Manifold Pressure Sucks!

Pelican’s Perch #16: Those Marvelous Props

Pelican's Perch #18: Mixture Magic

Pelican's Perch #19: Putting It All Together (*props, mixture, and manifold P.*)

Pelican's Perch #84: Don't Set Mixture with CHT

Pelican's Perch #30-36: Those Fire-Breathing Turbos (Part 1-6)

Aviation Weather:

Jeppesen Aviation Weather, 4th ed, 2022: Excellent reference that dives further into weather theory with easy-to-understand concepts such as stability, latent heat and others that clarify just how weather works. More succinct and not as comprehensive as the FAA Aviation Weather Handbook.

Supplemental Training Material

Private, Commercial and Sport Pilot Training Manual, Fred A Sweet. This is a "Cliff notes" of training materials that is very useful for both students and instructors. Below is a brief description of content and organization of the training manual. Available on Amazon as a print or eBook.

Example Private Pilot Training Syllabus (Training Course Outline). This is a recommended series of lessons, both ground and flight, similar to part 141 schools. This is especially helpful structure for providing instruction under part 61. There are a lot of benefits to following a course outline for both the student and instructor. While most examiners don't require an applicant to produce a Training Course Outline (TCO) or syllabus, understanding and using a TCO is foundational to providing adequate instruction as detailed in the FOI and outlined in ACS.

Student Training Checklists. These checklists are built from the specific requirements of part 61 for training and required endorsements *including notes on how and why they are used*. They are extremely helpful to ensure the CFI has met the regulatory requirements and presents a qualified student for the practical. There are examples of the endorsements from AC 61-65 and TSA. Additionally, there are quick references for providing additional endorsements such as solo in class Bravo, tailwheel, high performance and more. These checklists cover regulatory training requirements and endorsements for sport, private, commercial, added category and class and more. *Use of these checklists for reference during the initial CFI practical is highly recommended.*

Flight Lesson Plans: These are flight lesson plans for all the flight maneuvers required for sport, private and commercial certificates. They follow the recommended formats of the Aviation Instructors Handbook. These lesson plans are enhanced with the following features:

- ❑ Abbreviated steps for completing maneuvers
- ❑ discussions on how to teach
 - Rudder use without depending on the "ball" or "seat of pants"
 - stabilized approaches and energy management concepts
 - short, soft, and cross wind landings
- ❑ Flight instructor tips and tricks for effective instruction on most maneuvers
- ❑ Common errors are from real flight instruction experience

Ground lessons: These lessons follow the recommended format of the Aviation Instructor's Handbook. These lesson plans include extensive notes on the subject areas for quick reference to facts and concepts. After a foundational understanding of concepts and material, these notes make recall and explanation of the topics much easier. There are references to FAA and authoritative materials. The more complex concepts are outlined and explained in simple terms that are not always clear in the common FAA references. There are also lessons that outline material that is not otherwise well organized or succinct such as:

- ❑ Aircraft performance & systems
- ❑ Weather theory
- ❑ Night operations with illusions of flight
- ❑ NTSB reporting requirements
- ❑ Navigation planning including how to use EFB such as Foreflight
- ❑ Radio Communications

VFR Pilot Study Questions. Fred A Sweet: This is a comprehensive set of study questions, if used and answered diligently, will help the initial CFI applicant obtain the foundational knowledge required to provide instruction. *Assigning questions for homework to any student makes the reading assignment proactive and purposeful when they have problems to solve. (Reading with a purpose)* There are references for many of the questions so there is no wasted time with frustrated searches. When I train initial CFIs, they are used as homework assignments to help them prepare and provide instruction on the next scheduled topic for our ground lessons. These questions can be used for private, commercial and sport pilots as homework assignments to help guide them to the critical foundational information and concepts. It is recommended to highlight just those questions the CFI feels appropriate, so the student is not overwhelmed and loses motivation. Available on Amazon as a print or eBook.

Fundamentals of Instruction

PRELUDE (aka disclaimer): Fundamentals of Instruction (FOI) promotes advanced training concepts to assist the CFI in reaching the highest levels of instruction to train competent pilots. FOI is the most important foundation for excellence in instructing. **Without good FOI, instructor technical knowledge is no better than what can be found in a book.** My personal observation is the reference text, Aviation Instructors Handbook (FAA-H_8083-9) lacks personal and practical applications. In short, it is missing effective “Scenarios” and examples of practical application. Thus, it appears, the majority of FOI training is by rote memorization! What Irony! The following is a “Cliff Notes” style recapitulation with personal interpretations, “mini scenarios,” examples and some recommendations for applications.

Risk Management

Formalized process assessing the risks vs benefits and determining best course of action. Risk-probability and severity of possible adverse event.

Principles of risk Management

- Accept no unnecessary risk (don't fly new plane in IFR)
- Make decisions at appropriate level (yourself vs another pilot or controller telling you to do something)
- Accept risk when benefits outweigh costs (fly new plane in VFR)
- Integrate Risk Management into planning at all levels (think ahead, repeat process through whole event/flight)

Risk Management Process “I – AM” responsible!

Identify Hazard

PAVE**

IMSAFE**

Assess Risk-

Probability: Probable, Occasional, Remote, Improbable

Severity: Catastrophic, Critical, Marginal, Negligible

Mitigate Risk

Delay flight, Wait out weather

Go with IFR pilot

FAAST Flight Risk Assessment Tool “FRAT”: computerized questionnaire that automates the risk management process. There are other “FRAT” tools available online.

https://www.faasafety.gov/gslac/ALC/lib_categoryview.aspx?categoryId=31

Recommendation: Practice using, **I-A-M** (or a FRAT tool) before every flight starting with the first training flight (Primacy) and every flight after (Recency, Exercise). This “Habit formation” will have a better chance integrating into their “Affective” domain so they “Organizes & Integrate” into their personal beliefs.

PAVE: four fundamental risk elements

Pilot

- Proficiency
- Currency -3 takeoff/landings 90 days, Flight review, IPC
- Required documents -pilot certificate, medical, Gov ID
- **IMSAFE** checklist

Aircraft-

- load, weather, range, runway, equipment
- documents in Aircraft **AROW**
- inspections **AVIATE-A**
- **91.205 equipment** day/night VFR, IFR
- **Weight and Balance** for current flight

enVironment –

- **NWKRAFT+ NAV LOG**
 - NOTAMs, weather, runway, Terrain, airport facilities, NOTAMs
 - Airspace, TFRs, survival gear, alternates, nighttime, take off/land
 - distance, Performance/Nav Log

External pressures:

- someone waiting, take challenge or impress, Get there it is, pride.

Single Pilot Resource Management “SRM” includes:

- Aeronautical Decision Making (ADM)
- Risk Management
- Task & Automation Management
- CFIT & Situational awareness
- “Crew” Resource Management - passengers and ATC to help!

5 P Checklist for SRM.

- **Pilot-** IMSAFE, before, during and end of flight
- **Plan-** the mission and alternate plan A, B, C and D, abort
- **Plane-** autopilot for single pilot IFR, databases, fuel, oil etc.
- **Programming-** best time, best phase, avoid fixation, fly aircraft
- **Passenger-**special needs, ground transport, alternate transport

Operational Pitfalls:

Peer pressure (my CFI does it, bob does it, I can do it)

Mind set (cognitive rigidity= stubbornness despite evidence)

Get-there-it is

Duck-under –(go below minimums on IFR approach)

Scud Running –(just this once or I’ve done it before and it worked out)

Continue VFR into IMC (when scud running doesn’t work out)

Getting behind the aircraft (lack of experience, training, planning)

Loss of positional or situational awareness (automation dependence)

Inadequate fuel reserves – poor planning, pushed limits before without problem

Exceeding flight capabilities of aircraft- overconfident

Neglect Pre-flight planning, inspections, checklists- overconfident, done before

Aeronautical decision making: Systematic approach to determine best course of action to a set of circumstances. Pilot error 80% of accidents. (chain of events that can be interrupted)

- **Risk Management: See previous**
- **Decision making process**
 - Define problem
 - Choose course of action
 - Implement and evaluate
 - **Repeat**
- **Hazardous attitudes that affect decision making and Anti-Dotes**
 - **Anti authority:** “Don’t tell me what to do!”
 - *Follow the rules-they are right*
 - **Impulsivity:** “Do it NOW!”
 - *Not so fast, think about it*
 - **Invulnerability:** “it won’t happen to me!”
 - *I could happen to you!*
 - **Macho:** “I can do it! I am super pilot!”
 - *Taking chances is foolish (don’t be stupid)*
 - **Resignation:** “What is the use... we are just screwed!”
 - *You are not helpless, KEEP FLYING!*

WARNING: *if a learner demonstrates a persistent and pervasive hazardous attitude, there is not an ANTI-DOTE as suggested by the FAA-H-8083-25. This may be woven into the fabric of their personality (search Personality Disorders). They may not be suitable for further flight instruction. Consult with senior CFI.*

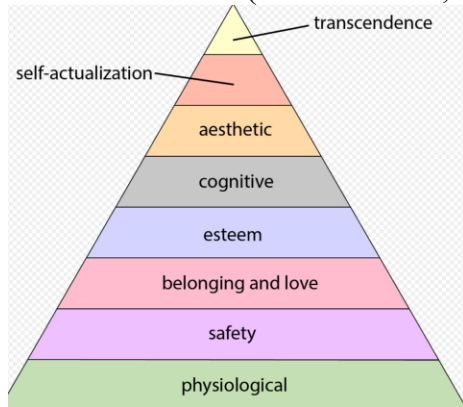
- a. **Stress Management:**
 - i. Physical and Psychological affect performance and learning
 - ii. **Recognize, admit, and intervene**-(self or on behalf of student)
 - 1. Take a break
 - 2. Re-group, re-plan, re-prioritize
 - 3. Get assistance- CFI, ATC, significant other
 - 4. Re-schedule

Instructor-Learner Relationship- teach to learner style or personality. Aviation Instructors Handbook (FAA-H-8083-9) ambiguous about this vast topic. See section 2-1.

Human Behavior

Product of innate nature (genetics) , experience, environment. Attempts to satisfy needs-food, respect, recognition (Value)

Maslow's Needs- (start at bottom, no food, then the rest doesn't matter):



- ❑ **Physiologic-** can't learn if don't have basic needs:
 - Did you eat? Can I get you something?
 - Warm enough? Need a coat or changing rooms?
 - Get enough sleep?
 - How are things at home? Stressed about anything?
 - Health- COVID, Headache, etc.
- ❑ **Security/Safety-** hard to learn if doesn't feel safe/private
 - Professional well-mannered CFI
 - Aircraft and facilities clean and well maintained
 - introduces maneuvers slowly and with pre-brief
 - Ground and debriefs done in private
- ❑ **Belonging** –Newby's feel alienated, outcast- (see esteem below)
 - Be kind, courteous, polite
 - introduce to other pilots
 - invite to social events
- ❑ **Esteem**-self-confidence required to learn and fly
 - Highlight well done activities and efforts
 - Positive re-enforcement
 - do not be condescending, rude, harsh, or demeaning
- ❑ **Cognitive need to know-** gives feeling of security, increases motivation
 - Outline what it takes to get a pilot certificate
 - Provide training curriculum- Syllabus or **Training Course Outline**
 - **What lesson are we doing next week**
 - **Give specific reading assignments w/ specific questions or problems**
 - Outline and update training schedule with reachable milestones (i.e., SOLO)
- ❑ **Aesthetic-** Do things we "like," agreeable, fun. Should like CFI or learner!
- ❑ **Self-Actualization** –reaching full potential only after all the above realized.
 - Problem focused, appreciation of life, concerned
 - about personal growth, have peak experiences

Demonstration-performance

- ❑ **Demonstration and Performance method**-kinesthetic (hand eye) skills. Recommend student starts with “Play or Flash Card” with key elements of each maneuver. Chair fly with this technique before repeating in aircraft. *VERY EFFECTIVE*.
 - **Explanation phase**-(*on the ground*)
 - Guided discussion on the ground
 - Aerodynamics, how and why of a procedure
 - Discuss objectives and control inputs
 - Discuss completion and evaluation criteria
 - **Demonstration Phase**- (*in the air*)
 - Describe technique **before** beginning maneuver
 - Call out key control inputs as CFI demonstrates
 - Call out any errors in demonstration
 - **Student Performance** –
 - Student describes before performing (*CFI has controls*),
 - CFI transfers controls to Student
 - Student performs (*minimal or no coaching*)
 - **Evaluation Phase: Collaborative Assessment**
 - Student self-assessment, recall, replay, reflect- how to improve
 - Instructor assessment- verify or correct student’s self-assessment
- ❑ Telling and Doing Technique-variation of Demonstration –Performance
 - Instructor tells and does
 - Student tells and instructor does
 - Student tells and does
 - Student does and instructor evaluates
- ❑ **Use of Distractions**-maintain control of aircraft while distracted
 - Chat about recent events or ball game
 - Divert to airport using chart
 - Get ATIS or Call AFSS
 - Computing true air speed or asking what fuel reserves are
 - Ask to re-program a new waypoint in GPS
 - Get something from back seat
- ❑ **Integrated flight instruction:**
 - Use outside reference, verify performance with instrument
 - **If student fixates inside, cover instruments**
 - **If student fixates outside, ask “what is our altitude or bank angle”**
 - See and Avoid-look outside for traffic

- ❑ **Assessment of piloting ability** *Best done with Collaborative Assessment. Only way to know if student understands errors and how to correct.*
 - Demonstrated ability on standards of performance,
 - Student recalls and performs procedural steps for maneuver
 - Student able to identify and correct errors
 - Consistently meets ACS standards
 - Proficient in flight tasks necessary for solo, practical
 - Post flight Evaluation:
 - Keep student informed of progress after each maneuver or in debrief
 - Written Post flight critiques
 - Traditional: discuss errors and corrective measures
 - SBT: collaborative assessment with self and instructor critique
 - Correction of Student Errors:
 - Allow mistakes if safe
 - Vary procedures (**Random Practice**) to ensure understanding of principles.
 - Pilot Supervision (for solo work)
 - Guidance and restraint for solo operations
 - Demonstrate consistency in fundamental maneuvers
 - Dealing with challenges
 - Teach how to work with congested patterns, unexpected cross winds, change in active runway
 - **Visualization techniques** (chair flying)
 - Practice procedure on ground before flight
 - **Call out control inputs to achieve outcome standards**
 - Instructor gives realistic variations/challenges to evaluate student ADM
 - **Practice Landings:**
 - Full stop in first third of runway
 - practice check list use
 - can stop solo flight if needed
 - If unable in first third, immediate go around
 - Practical Test Recommendations: FAA 8710-1 Certificate or rating application requires written recommendation. See regs.

When is your student ready to solo?

After they have met the training standards as required in 61.87, the student demonstrates:

- **Consistency** in take-off and landing over different training sessions
 - **random practice** where landings mixed with other maneuvers
- **Cognitive** understanding of common **landing errors and how to correct**
 - can only be assessed with **collaborative assessment**
- **Psychomotor skills** and ADM of how to respond to common errors
 - **CFI observes recovery from** bounce, porpoise, floating, balloon and when to execute go around (CFI may need to “induce” these errors in a safe manner)
- **Take off and landing** is in the **automatic phase of skill acquisition**
 - They can *talk on radio and land on center line*
 - Landing on centerline is low priority for students learning to land as they are more worried about crashing. Only when the landing sequence is automatic do they have enough bandwidth to think about landing on centerline.

Typical scenarios used for training a private pilot.

I would start out with planning a cross country. Make sure it crosses special use airspace, over and near class B, C, & D airports.

Risk mitigations, SRM, ADM and pilot quals and privileges. Then I ask them how do you prepare for the cross country?

There should be some risk analysis such as using PAVE + IMSAFE plus pilot qualifications, recency of experience, proficiency and currency.

Airworthiness: Part of the "aircraft" evaluation is qualifying it as airworthy and flying with broken equipment. Do we know what an AD compliance list is and how to use it? Do they know how to use 91.205, 91.213, KOEL, MEL, Ferry permit etc. Then there may be a discussion on how the broken equipment works (think turn coordinator, ammeter, fuel gauge, tachometer etc.) and get into a little of aircraft systems to see if they are comfortable flying the aircraft with whatever the broken equipment is.

Weather: Some use NWCRAFT to dial in on the weather, NOTAMs etc. Then walk me through how you get a weather brief and what products you look at. Then on weather, I just ask simple questions to see if they understand what they are looking at and some understanding of applying weather theory to the reports. Students won't know all the symbols etc., but **they should know where to look it up.** Here the student should **refer to the ACS to see all the weather products that should be reviewed at a MINIMUM.** NOTE:

The current ACS actually calls out minimum weather products required in a brief. Review this and make sure they are familiar. Most "Canned" briefs from fore flight, 1-800 WX brief cover MOST but not all of the weather products. Weather products frequently missed are:

Radar (really? YES!) and many applicants don't know how radar works or how to Interpret

Convective outlook – slight, marginal, moderate risk? What the heck do these mean and where do you look them up? 90% of applicants have no clue.

Prognosis Charts: These are really helpful, but most can't find them. Easy to interpret.

Cross country Nav Log: Then there is the NAV log. Here I ask them how they decided on their chosen altitude. Review MEF, towers, terrain, crossing airspace etc.

True Course vs TH vs MC etc. How they determine TC and take it to CH. If they use an EFB, have them show you how they got TC. Frequently it will be an MC or MH and then they add variation to it not realizing variation has already been added. Then winds aloft (reported in True, are added to the magnetic course or heading (oops).

TAS: Then a discussion on how they determine TAS (performance charts) and how they come up with a ground speed and how much fuel they burn.

Standard Temp aloft: Watch out for using 15 degrees Celsius as a standard temp at all altitudes (clearly they don't know what a lapse rate is).

Pressure altitude? Frequently calculate pressure altitude at airport but then apply to cruise. What?

Training Requirements and Endorsements

Initial Solo Requirements for Student Pilots

61.83 The student must be 16, receive and log flight training for the following maneuvers and procedures, have medical, state/gov ID and Student Pilot certificate.

Before Any flight training begins, verify US Citizenship or approval from TSA for foreign nationals (<https://www.fts.tsa.dhs.gov/home>) Flight Training Security Program and document with TSA endorsement in logbook. (See AOPA training module)

Training 61.87(c)

Completion Date
and CFI Int.

- _____ (1) Proper flight preparation procedures, including preflight planning and preparation, powerplant operation, aircraft systems.
- _____ (2) Taxiing or surface operations, including runups.
- _____ (3) Takeoffs and landings, including normal and crosswind.
- _____ (4) Straight and level flight and turns in both directions.
- _____ (5) Climbs and climbing turns.
- _____ (6) Airport traffic patterns, entry and departure procedures.
- _____ (7) Collision, windshear, and wake turbulence avoidance.
- _____ (8) Descents, Descending turns, high and low drag configurations.
- _____ (9) Flight at various airspeeds from cruise to slow flight.
- _____ (10) Stall entries from various flight attitudes and power combinations with recovery initiated at the first indication of a stall, and recovery from a full stall.
- _____ (11) Emergency procedures and equipment malfunctions.
- _____ (12) Ground reference maneuvers.
- _____ (13) Approaches to a landing area with simulated engine Malfunctions.
- _____ (14) Slips to a landing; and
- _____ (15) Go-arounds.

Testing

Completion Date
and CFI Int.

- _____ 1. 61.23(a)3(iii) Successfully pass a third-class medical exam
- _____ 2. Hold a student pilot certificate (IACRA app with CFI, DPE, FAA)
- _____ 3. 61.87(b) successfully pass a written exam administered by His/her instructor. **Test corrected reviewed on completion** covers:
 - (i) Applicable FAR from parts 61 and 91
 - (ii) Airspace rules and procedures for the airport where the solo flight will be performed
 - (iii) Flight characteristics and limitations, make and model of aircraft to be flown.

Endorsements

The student pilot must have the following written endorsements

- _____ 1. Logbook – Pre solo aeronautical knowledge, administered by the Student's authorized instructor: 61.87(b)
- _____ 2. Logbook - completion of 61.87(c) pre solo flight training
- _____ 3. Logbook – **current 90-day solo** for make and model by the instructor who gave the training within the 90 days preceding the flight 61.87(n) and (p)
- _____ 4. **TSA endorsement (see below)**

Instructor responsibilities 61.87 (p)

1. Give training in make and model
2. Student proficient in maneuvers/procedures
3. Student proficient in make and model
4. Endorsed logbook for make and model (90 day)
5. **Consider limitations on 90-day solo endorsement. i.e. crosswind, wx, etc.**

Example Endorsements (from AC 61-65K)

Endorsement of U.S. citizenship recommended by the Transportation Security Administration (TSA): Title 49 of the Code of Federal Regulations (49 CFR) § 1552.3(h). I certify that (First name, MI, Last name) has presented me a [insert type of document presented, such as a U.S. birth certificate or U.S. passport, and the relevant control or sequential number on the document, if any] establishing that [he or she] is a U.S. citizen or national in accordance with 49 CFR § 1552.3(h).

Pre-Solo Aeronautical Knowledge: I certify that _____ has satisfactorily completed the pre solo knowledge exam of section 61.87(b) for the _____ (make/model).
Date/CFI signature/CFI certificate number/exp date

Pre-Solo Flight Training:

I certify that _____ has received the required pre solo training in a _____ (make and model aircraft). I have determined he/she has **demonstrated proficiency and safety on the maneuvers** and procedures required by 61.87 in this or similar make and model of aircraft to be flown.

Date/CFI signature/CFI certificate number/exp date

Solo flight (first 90-day period): § 61.87(n). I certify that _____ has received the required training to qualify for solo flying. I have determined he/she meets the applicable requirements of § 61.87(n) and is **proficient to make solo flights in** _____ (make and model). *Date/CFI signature/CFI certificate number/exp date*

Solo flight (each additional 90-day period): § 61.87(p). I certify that (First name, MI, Last name) has received the required training to qualify for solo flying. I have determined he/she meets the applicable requirements of § 61.87(p) and is proficient to make solo flights in (make and model). *Date/CFI signature/CFI certificate number/exp date*

TSA initial endorsement, Instructors of U.S. citizens:

All CFI must register as a “Provider Agent” with TSA. If you are instructed for part 141 and part 61, must register twice. Once for the 141 school and once as independent part 61 CFI.

<https://www.fts.tsa.dhs.gov/home>

Certified Flight Instructors (CFIs) must complete TSA security awareness training within 60 days of hire or being certificated and then annually thereafter. This training is mandatory for all employees who have direct contact with flight training students, regardless of their citizenship status. AOPA has online course.

1. **Determine applicability.** The requirements for determining citizenship status for any student, whether U.S. or alien, applies only to flight training towards an initial pilot certificate, including a recreational pilot, sport pilot, or private pilot certificate; instrument rating; or multiengine rating.
2. **Proof of citizenship.** Student must show evidence of U.S. citizenship to instructor with one of the following:
 - a. Valid, unexpired U.S. passport
 - b. A government Issued ID plus original copy of one of the following
 1. government-issued birth certificate of the U.S., American Samoa, or Swains Island
 2. Certificate of birth abroad with raised seal (Form FS-545 or DS-1350)
 3. Certificate of U.S. citizenship with raised seal (Form N-560 or N-561)
 4. Certificate of Repatriation (Form N-581)
 5. U.S. Naturalization Certificate with raised seal (Form N-550 or N-570)
3. **Logbook or record-keeping requirements.** An instructor must do one of the following:
 - a. Keep a copy of the documents used to provide proof of citizenship for five years
 - b. Make an endorsement in both instructor’s logbook, or other record used by the instructor to record flight student endorsements, and the student’s logbook with the following:

"I certify that [insert student's name] has presented me a [insert type of document presented, such as a U.S. birth certificate or U.S. passport, and the relevant control or sequential number on the document, if any] establishing that [he or she] is a U.S. citizen or national in accordance with 49 CFR 1552.3(h). [Insert date and instructor's signature and CFI number.]"
4. **Students who change flight schools and/or locations** will be required to prove citizenship and receive a logbook endorsement. Recurring logbook endorsements are required when students change flight schools or instructors (if the instructor did not know the student when the student received the initial logbook endorsement).

Exceptions to Citizenship verifications for:

- 1) Introductory or Discovery flights
- 2) Recurrent training such as Flight reviews, IPC, aircraft check out
- 3) Training in Airships, balloons and gliders
- 4) Application for foreign based FAA pilot certificate

Foreign Flight Students: A candidate (the flight student) must participate in the Alien Flight Student Program and undergo a security threat assessment if:

- He/she is an alien; and
- He/she is seeking flight training inside or outside the United States for U.S. airman certificate under 14 CFR. This rule applies to flight training that you could use toward a recreational, sport, or private pilot certificate; multiengine or instrument rating; or any initial U.S. airman certificate issued by FAA.
- **Requires separate and new training request for each of following:**
 - Initial pilot certificate – private, recreational or sport
 - Added instrument rating
 - Added multi-engine rating
 - Transferring to new or different flight school
 - Transferring from independent CFI to another CFI or school
- NOTE: Information on this page applies only to aliens training in aircraft with a maximum certificate takeoff weight of **12,500 pounds or less**. If you are training in an aircraft exceeding this weight read, TSA Background Checks for Training in Aircraft over [12,500](#).

If this rule applies, follow the steps below before you begin providing flight training. Click on the steps for further information.

- [Candidate informs you that he or she intends to start flight training.](#)
- [Register online with TSA. https://www.fts.tsa.dhs.gov/home](https://www.fts.tsa.dhs.gov/home)
- [Assist the candidate in applying for training, as needed.](#)
- [Confirm candidate's training request.](#)
- [Look for a "Preliminary Approval" email from TSA.](#)
- [Assist candidate in submitting fingerprints per instructions emailed to him or her.](#)
- [Wait for TSA to notify you of its decision.](#)
- [Once the candidate has received TSA approval, START FLIGHT TRAINING!](#)
- [Take the candidate's photo on the first day of flight training and submit to TSA.](#)
- [Maintain the appropriate records per TSA regulations.](#)

Exceptions to the Alien [Flight Training Rule and Citizenship verifications](#) for:

- 1) Introductory or Discovery flights
- 2) Recurrent training such as Flight reviews, IPC, aircraft check out
- 3) Training in Airships, balloons and gliders
- 4) Application for foreign based FAA pilot certificate

Once approved for flight training, training must begin within 180 days and complete

Aerodynamic Force is the total force generated by the acceleration of air over the wing and is *perpendicular to the chord line* (tilts with the AOA). This aerodynamic force can be resolved into two components. **Lift** is the vertical component *perpendicular to the relative wind*. **Drag** is the horizontal component *parallel to the relative wind*. As the AOA increases, the total aerodynamic force increases, therefore both the vertical (Lift) and horizontal component (Drag) increase. Also note, as the AOA increases, the ratio of drag to lift also increases. The base of the triangle is “stretched” (purple line below).

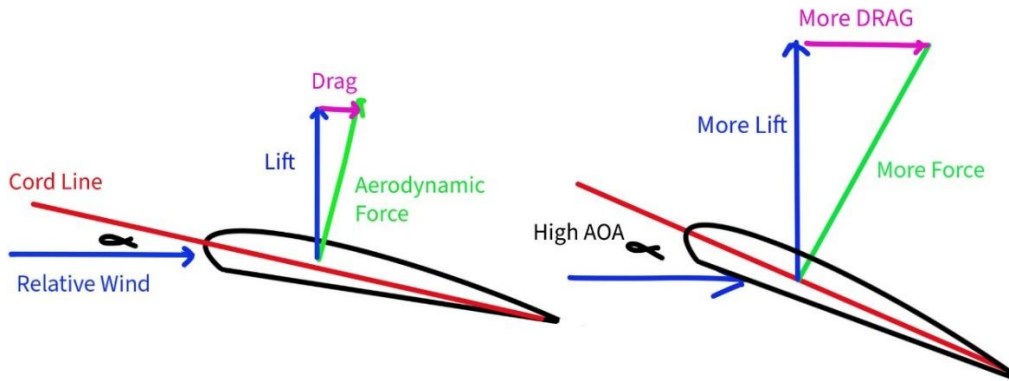


Figure 16.

As the AOA exceeds the critical AOA, Lift declines but Drag increases. As air separates from the wing, it becomes turbulent and creates a lower pressure behind the wing producing a large pressure gradient on the wing and increases in “pressure drag” (form drag). The air mass loses significant acceleration and thus lift. While lift decreases, drag increases.

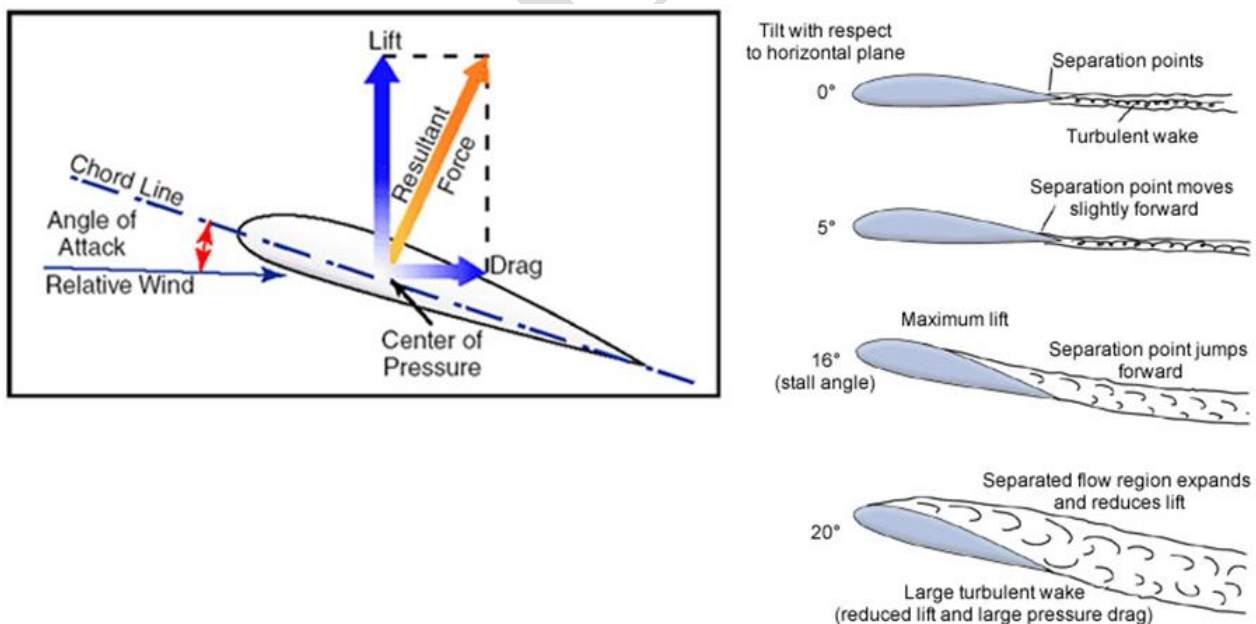


Figure 17.

Control Surfaces

Rudder, Elevator and trim tabs. The horizontal and vertical stabilizers are typically symmetric airfoils which have a symmetric pressure distribution with zero lift at zero degrees of angle of attack. When the elevator or rudder are displaced, the cord line changes and these airfoils will produce lift in either direction efficiently. Cambered airfoils can produce lift in either direction but require significant AOA below zero to produce negative lift. It is common misconception the displacement of the control surface impacts and thus “deflects” the airstream to produce the required pitch or yaw moments. *The force generated by impact of the free air stream against a displaced control surface is very small compared to the lift force generated through AOA created by the same control surface.*

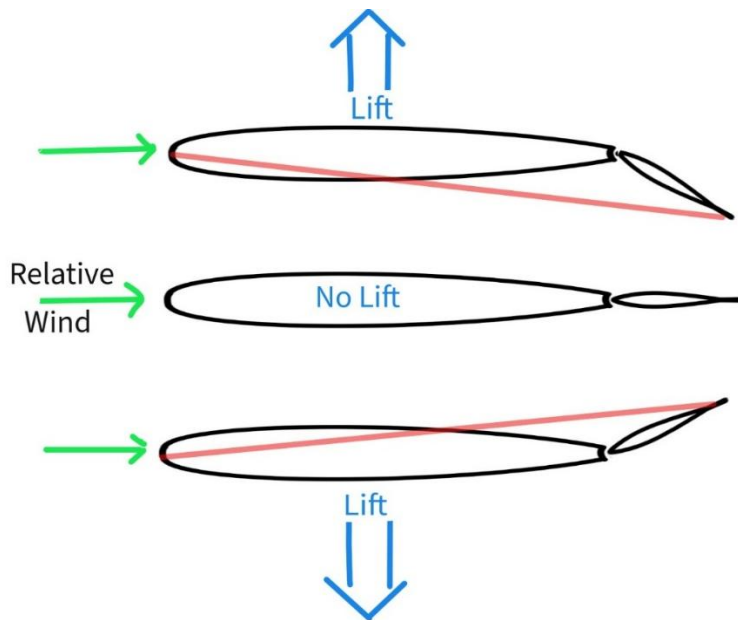


Figure 25

Trim tabs work in the same way as other control surfaces. However, the trim tabs move opposite as the desired primary control surface direction. In the diagram below, the local negative AOA moves the elevator down till it reaches equilibrium with other aerodynamic forces or reaches zero local AOA. The Elevator displaces downward causing the AOA to increase in the horizontal stabilizer. This creates lift in the upward direction on the horizontal stabilizer moving the tail up and the nose down (*aircraft rotates around CG*).

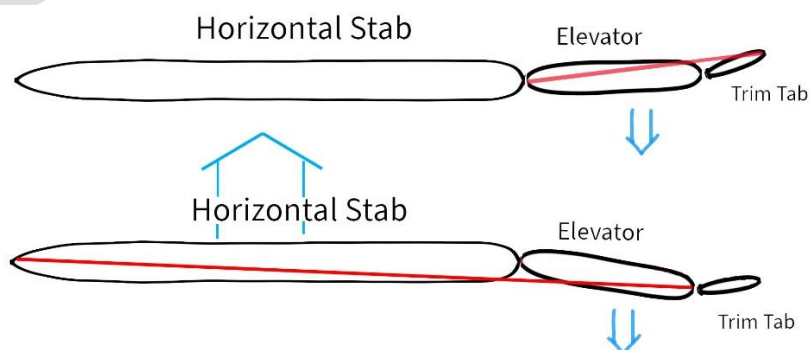


Figure 26

The elevator changes the pitch of the aircraft relative to the head and feet of the pilot. If the aircraft is in level flight, moving the controls aft, the nose moves up toward the head of the pilot. Moving the controls forward, the nose moves down toward the feet of the pilot. In a 90° bank, moving the control aft, the nose moves inside the turn and moving the control forward moves the nose outside of the turn. In a level 45° bank, moving the control aft moves the nose toward the head of the pilot which results in equal amount of nose travel vertically (up) and horizontally (into the turn). In all cases, there is a “turning” of the aircraft along the axis between the pilot’s head and feet. Turning flight includes a curved flight path in the horizontal and vertical planes and anywhere in between. See the previous discussion on loads in turns.

The elevator is the primary control of AOA and load in most regimes of flight. In positive G flight, moving the control aft increases load and AOA, forward reduces load and AOA. The opposite is true for inverted (negative G) flight. In either case, the change in load is produced by turning flight. For example, as we pitch up to a climb attitude, there is a brief period of turning flight where both the AOA and load factor increase. This is commonly experienced if the aircraft is briskly rotated on take-off, the stall warning horn will chirp. Once the pitch attitude and climb rate stabilizes, the aircraft is no longer “turning”, and the load factor returns to 1. Similarly, while in level flight or on stall recovery, if we pitch down briskly, we enter a brief moment of turning flight with a load factor opposite of gravity we experience as negative Gs (load factor) and feel light in the seat. Lastly, if we roll into a bank, the horizontal component of lift initiates a turn and increases the load on the aircraft. However, the elevator is still the primary control of the AOA and load. While in the level turn, if we pull the control stick aft, we increase the AOA and total lift. This “tightens” the turn with an increase in the rate (and decrease of the radius) of the turn.

The Rudder and coupled roll reaction. Application of the rudder produces a side force by increasing the AOA to yaw the aircraft. There is complex interaction of aerodynamic forces that induce a roll in the same direction as the yaw. For a detailed discussion of the factors at play I would recommend the discussion on Jonh Denker’s website AV8.com
<https://www.av8n.com/how/htm/roll.html#sec-roll-budget>

The rudder, slips, skids and coordination. The rudder controls yaw and thus slips, skids and controls the direction of the aircraft on solid surfaces.

How the inclinometer (slip skid indicator) works: For coordinated flight, the centrifugal force away from the turn must match the horizontal lift into the turn. This keeps the net acceleration (from centrifugal force and gravity) pointing through bottom of the centerline of the aircraft. See figure 28. The “ball” or other slip-skid indicator follows the net acceleration. If the “ball” is centered, then

centrifugal and horizontal lift must be equal, *and the aircraft pointing into the relative wind*. To balance the centrifugal force with the horizontal lift, yaw rate must equal turn rate.

Yaw rate: degrees per second aircraft is rotating around the vertical axis (independent of the direction of travel of the aircraft). The greater the yaw rate, the greater the centrifugal force. Controlled by rudder or adverse yaw

Turn rate: degrees per second entire aircraft is changing course (independent of where the nose of the aircraft is pointing). The greater the bank angle, the greater the turn rate.

The yaw rate is proportional to the centrifugal force, and the horizontal lift is proportional to the bank angle. The yaw rate must match the rate of turn from the bank. If the yaw rate is less than the turn rate, the nose will point outside of a turn. Acceleration from gravity will predominate and the ball will fall to the inside of the turn (slip). If the yaw rate is greater than the turn rate, the nose will point inside of the turn, and centrifugal force will dominate to displace the ball outside of the turn (skid). When the yaw rate matches the turn rate, then the horizontal lift (inward acceleration) matches the centrifugal acceleration (outward acceleration), and the ball will be centered. See figures 27 and 28.

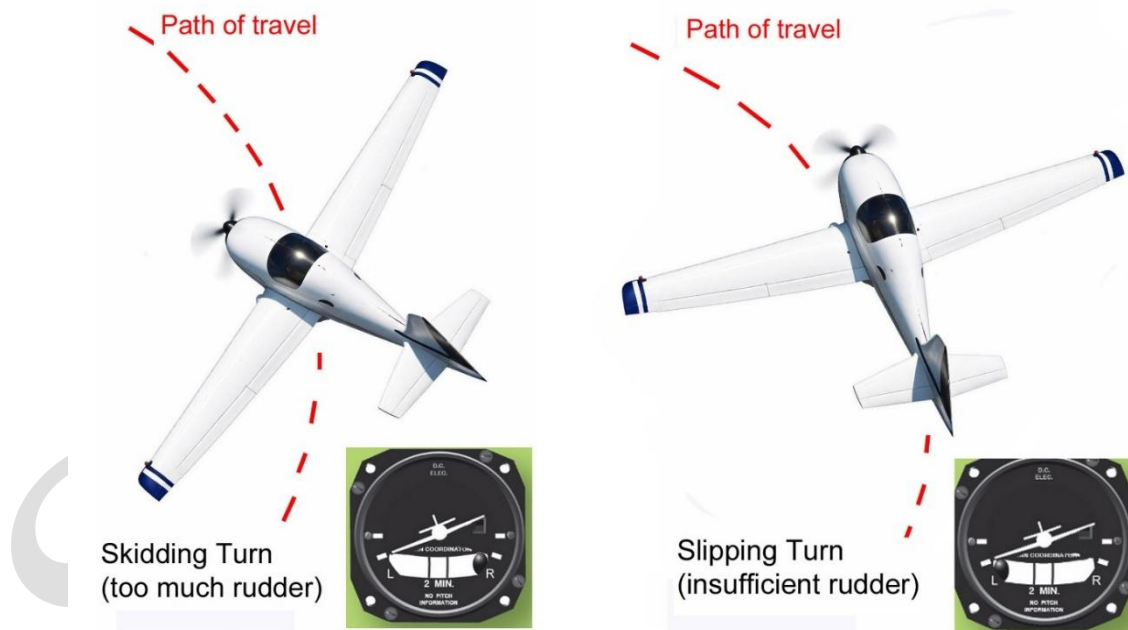


Figure 27. Recall the relative wind is opposite the direction of travel. *Skidding turns the yaw rate is greater than the turn rate and nose points inside the turn (and relative wind). Slipping turn, the yaw rate is insufficient for the turn rate and the nose points outside of the turn (and relative wind). See discussion on how the inclinometer works.*