LOUISIANA TECH UNIVERSITY
Department of Professional Aviation

FLIGHT OPERATIONS

PILOT AND INSTRUCTOR TECHNIQUES FOR OPERATIONS AND FLIGHT MANEUVERS

May 9, 2017

Revision 1, July 25, 2017

Revision 2, September 28, 2018

Revision 3, September 25, 2020

REVISIONS

Revision 1, 07/25/2017

Added Appendix 3, *G1000 guide for designated pilot examiners and certified flight instructors.*

Revision 2, 09/28/2018

P. 25, Technique 17. Third paragraph, entitled Short field takeoff, last sentence, replace "172RG (flaps up, 63 KIAS climb)" with "Arrow."

P. 25, Technique 17. Fourth paragraph, entitled ForeFlight, delete references to IFR and delete "Exceptions."

P. 25, Technique 17. Under Instrument course stage checks, first sentence, delete "ADF and/or." In the same section, pp.25-26, delete sentence that runs "Also, NDB holding...Instrument stage checks." Additionally, delete "vacuum failure."

P. 35, Technique 28. First sentence, replace "172RG" with "Arrow."

P. 35, Technique 28. In paragraph '1', Delete the sentence that runs "As soon as...for Vne."

P. 35, Technique 28. Delete paragraph '2' and replace with the following: 2. Arrow: Begin the maneuver at 3,000' AGL minimum at less than 129 KIAS (Vle.) Smoothly select idle power, landing gear down, bank 45 degrees, and pitch down 5 to 10 degrees nose-low, to achieve -2,000' per minute VSI. Do not exceed Vle. The instructor should assign a level-off altitude. The trainee is to lead the level-off and hit it within +/- 100'. Reduce speed to less than 107 KIAS prior to gear retraction. Begin recovery so as to be back in level flight by 1,500' AGL. In turbulence, do not exceed Va, and accept whatever VSI results from that speed.

P. 35, Technique 28. Delete paragraph 'a' under paragraph '2' and replace with the following: a. Pilots will observe the Arrow's placarded engine limitation regarding low power settings.

P. 36, Technique 30. Delete. Replace with "Reserved." PP. 37-39 are now intentionally blank.

P. 40, Technique 31. Corrected drawing and verbiage.

P. 41, Technique 32. Delete third paragraph.

P. 52, Technique 47. In the Commercial section of the table, replace "RG worksheet" with "Arrow test."

P. 55, Technique 50. Minor verbiage changes regarding G1000.

Added Appendix 4, Tie-down Knot photos as final page.

Revision 3, 09/23/2020

Contents P. 12, Technique 2. Altered "six miles" to read "five miles," to agree with SOP

P. 37 and 38. Deleted intentionally blank pages and repaginated from here onwards.

P. 47, Technique 43. Added direction to see Appendix 5.

P. 54, Technique 52. Added an explanatory note.

Added Appendix 5, The Jacobson Flare (visual aids to go with Technique 43) and Appendix 6, FAA ICAO flight plan guide.

INTRODUCTION

We (Tech) have been doing this (pilot training) for quite some time. There is a body of knowledge of "how we do things around here" that we wish we could assume "everybody knows," and that is "common sense". But, not infrequently, we bump into people who do *not* know, as well as people who appear to *lack* common sense.

We are keenly aware that "experienced" pilots, who may have worked in the aviation industry or flown with other organizations, may be unimpressed with our techniques, may be uninterested in how we want things done, or may "have a better way." Such pilots are not our target audience, but are welcome to discuss their opinions and techniques with the Chief Instructor.

The intent of this document is to provide guidance to, and standardization among, Louisiana Tech University pilots. We are aiming here, by design, to improve your flying techniques, as well as your general knowledge, attitudes, and behaviors. The subjects addressed herein will generally not rise to the level of flight safety. The reader may consider this document as doctrine and expectations, as distinct from rules and regulations.

Some definitions are offered.

A <u>procedure</u> is a thing directed, by a competent authority, to be done. Examples of competent authority in our present environment are aircraft manufacturers, Louisiana Tech University, and the Federal Aviation Administration. Tech pilots will comply with procedures, or they will not remain Tech pilots.

A <u>technique</u> is a way of doing something that works. Some techniques are better than others. Proper technique is always in accordance with procedure. Proper technique is efficient, desirable, and, when observed, easily recognizable. For our purposes here, "techniques," as a term, is expanded to include behaviors, information, knowledge, and memory aids.

<u>Courtesy</u> consists of those actions and behaviors, often small things, that everyone appreciates other people doing (or avoiding doing). Courtesy is quite helpful when working with others—particularly others whom one does not know well, as pilots frequently do. Common courtesy is assumed and expected from Louisiana Tech University pilots. Its absence is disturbing. You will be corrected if you fail to display it. If we find you to be uncorrectable, you will be dismissed.

Some of what is presented here will replace the old "Profiles" documents, which were rescinded. Some comes from Flight Information Files that were good information, but not necessarily directive. In some cases, we may simply be telling you what *not* to do; we'll be attempting to stamp out bad technique and poor behavior in advance.

Some items presented are techniques to give students something to "hang their hats on." Flight instructors should not understand such items to be procedure. However, Tech students and instructors should not be deviating far from our accepted techniques without good reason.

For flying techniques, we will not be cutting and pasting from FAA publications, but we may make references to them (or other publications).

The finite number of techniques and knowledge points in this document are clearly not "everything." Instructors are encouraged to share their best teaching and flying techniques (ways that work) with the Chief Instructor, for possible inclusion in future editions of this manual.

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Appendices (All appendices are separate documents.)

General

Technique 0: *Do's* & Do *Not's*: Common Courtesy, and General Behavior at Flight Ops

Before we get into flight-related and instructional techniques, let us cover some *Do's* and *Do Not's* of behavior (cultural norms, you might call them) for all personnel at Tech Flight Ops.

When you step through the entrance of Flight Ops, you cease being a college student, at least in your mentality. You become a respectful and respectable adult and an aviator, as well as a custodian of Louisiana Tech University facilities, resources, and property. You are expected to act accordingly. If you are not naturally a serious person, you had better get that way, pronto. Because we are not kidding.

Most of Technique 0, we really wish we didn't have to say (or print). (Remember the mention of "common courtesy" in the introduction?) But, lamentably, all of the things listed below have been observed as problems at one time or another at Flight Ops (believe it or not). Most of the items on this list fall into the categories of thoughtlessness, immaturity, and lack of care. Many of the items listed will, or would tend to, make a person smile. But, in the aggregate, they are not funny, just annoying. In essence, we are trying to inform you—up front, before you do them—of all the things we are tired of seeing students and instructors do (and/or fail to do).

Louisiana Tech University strongly prefers—we *will* have—thoughtful, mature, caring students and instructors. If your parents didn't teach you any better (and they almost certainly did!), and no one ever mentioned these things to you before, then here you go.

Do not be personally insulted by any of the below. We're sure *you* would *never* be guilty of these infractions. Observations over time have indicated that all the things below need to be addressed, though. We wish to—that is to say, we *are* going to—help you mold yourself into a person that an employer would actually hire. You need to comprehend that your job interview starts right here, right now.

And, please note that all of the below apply whether or not the Chief Instructor is present at Flight Ops or not. They are not in any priority order; they are all pretty much "#1."

So, here, we're not telling you how to fly; we'll get to that in a little while. Right now, we are telling you how to *be.* Hold on; here we go. We must, unfortunately and rather incredibly, begin our list with the how to use the toilet...

1. Do flush the toilet or urinal after use. Failure to do so screams out a lack of care for your fellows. (Our toilets are not of the automatic flush design.)
2. If you are a man, do *not* use the ladies' room and urinate all over the toilet seat. If you think such an act is funny, then you're an idiot, as well as a vandal.
3. Do *not* put any non-liquid object (candy wrapper, gum, paper towel, sunflower seed, etc.) in the urinals.
4. Do *not* use excessive force (hit) on the urinals' flush handles; this frequently causes the flush valve to stick open, which wastes a lot of water. If you happen to observe a urinal running continuously, do please lightly tap the flush handle in the 'up' direction; this will likely make it stop running.
5. Do *not* put trash on the restroom floor.

6. If you are so ill that you cannot even use the sit-down toilet without fouling the toilet seat, then please do *stay at home*.

7. If you are rinsing out a food dish in the restroom's sink, do ensure everything goes down the drain. If it's too chunky to go down the drain, then you are responsible to clean the sink. Better yet, just take your container back home with you, and wash it there.

8. Do *not* place open, leftover cups of liquid in any of the garbage cans in Flight Ops. The garbage cans are not waterproof. Dispose of the liquid first, preferably outside.

9. Do *not* continue to throw trash on top of an obviously full garbage can.

10. Do properly dispose of the perforated top strip from your completed tach sheet.

11. Do *not* draw graffiti on tach sheets, to include "invisible" drawings that ruin the yellow and pink carbon copies.

12. Do *not* continue to operate the paper shredder when it is full of waste.

13. Do *not* put your feet on the furniture. The sole exceptions to this rule are the couches and recliners in the CFI lounge.

14. Do *not* watch videos online or play games online during the hours of 0800L-1700L, Monday through Friday. Our Internet capacity is limited; we need it for administrative work.

15. Do be aware that the University computer folks have the capability to monitor our Internet traffic. That is to say, keep your Internet viewing clean.

16. Do *not* hit golf balls inside or outside Flight Ops. The airport is not a driving range.

17. Do *not* bounce rubber balls, or any balls for that matter, off of the interior or exterior walls of the Flight Ops building.

18. Do *not* remove the locked covers from the thermostats. If you believe the thermostat needs adjustment, see the administrative coordinator.

19. Do point out failed light bulbs to the administrative coordinator.

20. Do *not* wear your ball cap backwards. It looks stupid.

21. Do *not* wear LSU attire with your Tech polo shirt.

22. Do *not* wear ankle socks with long pants. It looks stupid.

23. Do wear an old or inexpensive T-shirt underneath your Tech polo shirt on the day of your initial solo flight.

24. Do *not* wear unsuitable attire while giving or receiving training at Flight Ops. Suitable attire is described in the SOP manual.

25. Do wear attire appropriate to the weather, when accomplishing a preflight inspection in cold weather.

26. Do *not* litter the parking lot. Instead, please do pick up litter in the parking lot.

27. Do *not* write graffiti with chalk in the parking lot.

28. Do *not* perform donuts in your car in the parking lot.

29. Do *not* park your motorcycle on the sidewalk by the entrance; use a normal parking spot.

30. Do *not* ride your motorcycle on the parallel taxiway.

31. Unless you have approval in advance, do *not* bring your pet to Flight Ops.

32. Do *not* spend the night at Flight Ops.

33. Do *not* write with permanent markers on whiteboards.

34. When taking a telephone message or transferring a call, do get the caller's full name, what they want(ed), the date and time of the call, and a phone number, if applicable.

35. Do *not* bring your remote-controlled toy car into Flight Ops, especially after operating it outside in the mud.

36. Do *not* enter the Chief Instructor's office if he or she is on the telephone, and then just stand there. Remain outside and wait for acknowledgement.

37. Do *not* enter the Chief Instructor's office if the door is shut. Knock and wait for acknowledgement.

38. Do *not* come to the Chief Instructor's office for academic advising without an appointment. You should not expect to do advising at Flight Ops at all; office hours at Davison Hall are allotted for this function.

39. Do *not* swear in the presence of ladies.

40. Do *not* walk on the grass to get to the flight line.

41. Do be aware that hydroplaning is not uncommon on LA146 after a rain.

42. Do *not* walk away from a malfunctioning printer or computer without reporting it to a Flight Ops employee.

43. Do *not* continue to send print jobs to a malfunctioning printer. Doing so will only create a queue, which must be manually cleared before the printer can ever start working again.

44. Do keep up with <u>your</u> equipment—logbook, eyeglasses, sunglasses, Foggles, flashlight…

45. Do keep up with <u>our</u> equipment—aircraft keys, fuel cards, tire gauges, fuel strainers…

46. Do *not* use nicknames on flight release forms.

47. If you observe or hear of an accident or incident involving a Louisiana Tech University aircraft or pilot, do *not* discuss or publish it on social media. Do not discuss it with *anyone* other than FAA, NTSB, emergency response, law enforcement, or University personnel.

48. Do *not* read or send text/social media/email messages during CFI/dispatcher safety meetings. It is rude, and it is highly unlikely that your communications are that important.

49. Do *not* provide your flight instructor's phone number to your parents. Your flight instructor is not authorized to discuss your training performance or progress with your parents. CFIs will refer any such calls to the Chief Instructor.

50. Do be aware that Ruston Aviation personnel do not work for Louisiana Tech University. Do *not* assume that you are, or should necessarily be, their first priority. See "common courtesy" in the Introduction.

51. Also with regard to the FBO, do *not* call them for fuel without first checking the fuel amount in the aircraft you intend to use.

Technique 0.1: Additional *Do's* and Do *Not's*: Davison Hall and Main Campus

1. Do *not* ever park your automobile in the orange-painted motorcycle parking areas on the main campus, to include the one at Davison Hall.

2. If you are parking your motorcycle in a designated motorcycle spot, do park it perpendicular to the direction of the cars. This is so that the spot can accommodate multiple bikes, and no one gets blocked in.

3. Do secure the door to Davison Hall Room 110 (the FTD room) when not in use.

4. Do *not* forcibly (without a key) open the door to the FTD room.

5. Do *not* make a mess of the approach plates in the FTD room.

6. Do *not* disturb any tools you may find in the FTD room.

7. Do *not* conduct extended ground training (oral lesson) in the FTD room while someone else is operating the FTD for their training.

8. Do *not* eat your take-out meal in the FTD room.

9. Do *not* use blackboard erasers to create graffiti on the walls in the FTD room. Note that the Department Head considers this to be vandalism, which is grounds for dismissal.

10. Do *not* skip Aviation academic classes. If this is your major, then you should be interested in it.

11. Do be familiar with the Department's class attendance policy. Failure to come to class can needlessly lower your GPA.

12. Do *not* be a slug in your non-Aviation classes. Doing so reflects poorly on us.

13. Do *not* sleep in the classroom. It is rude. If you're that tired, you probably need to manage your time better.

14. Do *not* skip the quarterly Department safety meeting in favor of a fraternity event.

15. Do *not* sign in to the quarterly Department safety meeting for your buddy, who is absent.

16. Do *not* depart the quarterly Department safety meeting during its intermission.

17. Do arrive at the quarterly Department safety meeting early enough to be signed in and seated by the scheduled start time.

18. Do *not* read or send text/social media/email messages during class or during the Department safety meeting. It is rude, and it is highly unlikely that your communications are that important.

19. Do *not* trash out your dormitory room. Doing so reflects poorly on us.

20. Do *not* skip your advising appointment. This is decidedly disrespectful to your advisor, and it will be noted and documented.

21. Do *not* sign up for two FAA knowledge testing slots because you are pretty sure you're going to fail your first attempt at the test.

Technique 0.2: *Do's* and Do *Not's* for Tech Dispatchers

1. If you are the dispatcher on duty, do *not* leave Flight Ops while a solo Student Pilot is airborne. The only exception to this would be if the building is on fire.
2. If you are the dispatcher on duty, brief your relief on the FLYING STATUS which is set by the operations supervisor.
3. If you are the dispatcher on duty, and you are handed new FAA aircraft registration cards for aircraft that are presently away for maintenance, do *not* hide the cards in a drawer and fail to inform anyone where you put them.
4. If you are locking the doors at Flight Ops, and you can't remove your key from the door, or you can't lock the door, please do try harder—wiggle the key, apply light force, whatever. Since 2009, there has only ever been one instance of the door lock itself malfunctioning. Every other time someone "couldn't" lock the door or "couldn't" remove the key, the problem could not be duplicated, or the key was able to be removed by someone else, with no tools involved.
5. When raising the flags, do pull them to the top of the pole. Due to the size difference in the two flags, and the requirement for the U.S. flag to be at the top, they can only attach to the rope one way. If it's done wrong, they won't reach the top.
6. Do *not* wear gym clothes to the monthly CFI/dispatch safety meeting.
7. Do learn how to work the hold and transfer features of the telephone.

Technique 1: Safety Procedures and Safety Program Ownership

Tech pilots need to comprehend, immediately and completely, that we're not just blowing air around when flight safety briefings are being given. We're serious, and you need to listen and take this stuff to heart. "Own" the safety program; believe in it. We know perfectly well that sitting in briefings can be tedious and boring. But, the putting of dedicated time towards flight safety is important. The idea is for you, the Tech pilot, to practice systematic avoidance of the things that are causing the GA accidents on which you're being briefed.

The same applies to the Flight Ops SOPs. You had better "own" them, too, because we are, once again, serious. It should never even cross a Tech pilot's mind that something in the SOPs could be ignored. (Note that this assumes the pilot has familiarity with the SOP manual.)

As of this writing, no one has died while operating a Louisiana Tech University aircraft since 1985, which was many, many thousands of flight hours ago. While acutely aware that this is somewhat of a statistical anomaly, *which could change any day*, we really, *really* want to keep it that way. The only way we know to do that is to continuously pound you at every opportunity with flight safety and SOP compliance. So, get used to it.

Technique 2: Louisiana Tech University Standard Radio Calls: A Rehearsal

New pilots usually have trouble talking properly after engaging the aircraft's microphone switch. A good pilot sounds good on the radio, and uses the minimum amount of correct phraseology to get his message across. Practice is required. The best way is to "chair fly" the radio calls, before you ever get to the airport. Below is how it should sound, when at the "home drome."

First, test the radio you intend to use as your primary with Flight Ops on 123.5:

"Tech Flight Ops, Skyhawk 123LT, radio check." They will respond "123LT, loud and clear". You will respond "loud and clear, also".

Next, monitor AWOS on 119.52. Set the altimeter as received; listen to wind direction and velocity. Absent any aircraft in the pattern, the wind determines your direction of takeoff.

After engine start, announce your intentions on 122.7:

"Ruston traffic, Skyhawk 123LT taxi from the south ramp to Runway 18, Ruston."

After engine run-up, visually clear final approach *and* the departure end and then say:

"Ruston Traffic, Skyhawk 123LT departing Runway 18, Ruston." Add "closed traffic" if you intend to remain in the traffic pattern.

Once established in the practice area, advise Tech Flight Ops on 123.5 of where you are:

"Tech Flight Ops, Skyhawk 123LT established in the northwest practice area." After that, switch back to 122.7 and monitor, periodically announcing on 122.7 your position relative to the airport along with your altitude. "Ruston traffic, Skyhawk 123LT is 12 miles north at 2,500', maneuvering." (Most appropriate when you hear an aircraft arriving from your direction.)

During your return, let everyone know you're coming on 122.7:

"Ruston Traffic, Skyhawk 123LT, five miles west (east, south, etc.) for landing, Ruston."

After pattern entry, these are the standard calls:

"Ruston Traffic, Skyhawk 123LT, left downwind Runway 18, Ruston."

"Ruston Traffic, Skyhawk 123LT, left base Runway 18, Ruston."

"Ruston Traffic, Skyhawk 123LT, final Runway 18, touch-and-go (or full-stop) Ruston."

"Ruston Traffic, Skyhawk 123LT, clear the active, Ruston."

Notes:

Radio calls during a touch-and-go or go around ("Skyhawk 123LT on the go") are *neither* required *nor* desired; just focus on flying the aircraft during these maneuvers.

Calling "crosswind" is optional; it may be appropriate, in particular situations.

IAW the AIM, "November" is not transmitted as part of your callsign.

"Last call Ruston" is an unnecessary call that Tech pilots do not transmit during departure.

Tech pilots do not say "Any traffic in the area, please advise" during their arrival.

"Have a good flight", "See you later", etc., etc., are not needed during radio checks.

If the letter 'V' is part of your callsign, do not say "Vic" on the radio. Say "Victor."

Technique 3: General Knowledge—Random

Here is an incomplete, ungrouped list of questions every post-solo Tech pilot is expected to be able to answer on the spot, without book reference.

1. If your Avgas is contaminated with water, what will it look like in the test cup? Answer: The water will sink to the bottom of the cup, forming globules or, if there's enough of it, a clear layer. This is because water has a higher molecular weight than gasoline.

2. Assuming you are under 40 years of age and that you are conducting an operation requiring an FAA 3rd class medical certificate, what is the last *date* that certificate is valid? (Note: We're ignoring the FAA's BasicMed program, as it does not really apply to our students and instructors.) Answer: 60 calendar months from the date of issue (14 CFR 61.23). As asked, the question requires the pilot to know what is meant by "calendar month." Calendar month means until the end of the final day of the month. So, if something expires after 12 calendar months, then the last day of that same month in the following year is the final day of validity. The day after that, it's expired. Also, the pilot needs to know how many days are in the various Gregorian calendar months. If you can't remember, try this rhyme:

"**Thirty days has September**
April, June, and November
February has twenty-eight alone
All the rest have thirty-one
Except in Leap Year, that's the time
When February's days are twenty-nine"

3. What is the power source for the airplane's alternator, magnetos, and vacuum pump(s)? Answer: The engine.

4. Where in the AFM/POH would the pilot find the aircraft's tire pressure requirement? Answer: Section 8.

5. What is the difference between aircraft *category* and aircraft *class*, as it relates to the certification of airmen? Answer: "Category" is the broadest classification. Examples are airplane, rotorcraft, glider, and lighter-than-air. "Class" is a subdivision of a category; the ones we're interested in are airplane single engine land and airplane multi-engine land.

    a. "Sea" is a separate class, for both single and multi. CFIs should know that instructing in seaplanes only requires the addition of that class rating to the Commercial privileges of their *pilot* certificate.

6. What is another, different FAA use of the word *category*? Answer: "Category" can also mean a grouping of aircraft based on their intended use or operating limitations. Examples include *normal*, *utility*, and *acrobatic*.

7. Explain the "equal transit time" theory of aerodynamic lift creation. Answer: You cannot explain it, because this theory is false. The fact that the upper surface of a cambered wing measures longer than its lower surface does *not* make the air on top accelerate to arrive at the trailing edge at the same time as air moving underneath the wing. If you were taught this theory, please forget it immediately.

8. Define *risk*. Answer: "Risk" is the pilot's assessment of the severity of a hazard versus the likelihood of that hazard's occurrence.

9. List four important elements of the total risk to examine prior to and during flight. Answer: PAVE. The PIC, the Aircraft, the EnVironment, and any External pressures.

10. What is the main difference in the Cessna 172S and the 172R? Answer: The R-model has a different ("cruise") propeller, which yields lower RPM and 20 less horsepower. Due to this (less power available), the R-model's max gross weight is 100 pounds less.

11. How tight should the engine oil dipstick be? Answer: The oil dipstick on our aircraft only needs to be finger-tight. Our engines run smoothly; there is little danger of the dipstick vibrating loose.

12. Why do Tech pilots always secure the aircraft's tackle box in the aft cargo area with a bungee cord? Answer: Because we have had at least two recorded instances of zero-G or negative-G flight resulting in the tackle box striking the aircraft's rear window from the inside, breaking it. Window replacement costs considerably more than bungee cords.

13. Where does the aircraft key belong? Answer: 1) When the aircraft is in its parking spot and the pilot is present, but not in the cockpit, the key goes on top of the instrument panel—*not* on the attitude indicator adjustment knob, *not* in the ignition, *not* in the pilot's pocket, and *not* on the fuel selector lever. Note: The aircraft key is the *only* object authorized to be placed atop the instrument panel. This rule was put into place years ago, due to pilots' gear (headsets, clipboards, etc.) damaging the inner side of the windscreens. 2) When the pilot is transiting between the aircraft and Flight Ops, the key goes on the aircraft clipboard—*not* in the pilot's professional gear, and *not* on his/her person. This rule is necessary to prevent aircraft keys from "walking off." 3) If, while cross-country, the pilot will be going out of sight of the airplane, *then* the key *will* be on the pilot's person until returning to the aircraft.

14. How far is a nautical mile? Answer: A nautical mile equals approximately 6,076 feet, or 1.15078 statute miles. A statute mile equals exactly 5,280 feet. Also of note is that a nautical mile equals one minute of latitude, so one degree (60 minutes) of latitude is 60 NM. This piece of knowledge can be handy when looking at a sectional.

15. What time is it *right now*, in UTC/Zulu time? Answer: Assuming you're in the U.S. Central time zone, it is the current local military time (24-hour clock) plus six hours (or plus five, during Daylight Savings Time). The first two digits of the time number cannot be greater than 23. For example, let say it's presently 4:05 PM Central Standard Time (CST). That means that it's 1605L(local) military time, and 2205Z(Zulu). What if it's 2200L? Then it's 0400Z, as we added 6 to our 22 and came up with 28, but then had to take away 24 to make a sensible time figure. How about 1800L? That would be 0000Z, not 2400Z, because the 24-hour clock never gets to 2400. (If you ever have to file a flight plan for 0000Z, it's better to just call it 0001Z, for clarity.)

16. Why does my airplane float in ground effect? Answer: In simple terms, flying near the ground reduces induced drag.

17. Does ground effect "always work"? Answer: No. If the airplane approaches ground effect with a very large sink rate, or already stalled, ground effect won't save it.

18. Is general knowledge tested and graded on every dual flight? Answer: Yes, it is.

Technique 4: General Knowledge—POH vs. AFM vs. IM

Pilots frequently use "POH" as slang, when what they mean is "information manual." This is slightly undesirable, as it can lead to confusion.

Is the descriptive manual that students purchase and study actually a Pilot's Operating Handbook (POH), or an Airplane Flight Manual (AFM)? No, it is not. It's a generic copy of the AFM/POH, called an information manual. The actual AFM is specific to a particular airplane (by serial number), and, IAW 14 CFR 91.9, is a required piece of that airplane's operating equipment, if that airplane was built after March 1, 1979. It would be difficult and expensive to replace this manual. So, absent any real need, you generally should not touch it, except to verify its presence in the aircraft.

The AFM for a particular aircraft includes the unique weight and balance information for that airplane, along with the supplements for the equipment actually installed in that specific airplane. So, at a minimum, Sections 6 and 9 in the "real" AFM are different to those in the information manual.

So, why do we sometimes refer to the AFM as "the POH" (Pilot's Operating Handbook)? Well, back in the 1970's, "POH" is the term that the General Aviation Manufacturers Association (GAMA) came up with during efforts to standardize manuals. Basically, the POH must contain the AFM, and may contain more than is legally required for the AFM. The FAA uses the term "AFM/POH" and Tech pilots should do so, as well.

All airplanes manufactured after March 1, 1979 require, by law, an AFM. Those made before that date may have different requirements, which are not really relevant to us here at Tech. Pilots intending to operate an older aircraft should review 14 CFR 91.9.

Technique 5: General Knowledge—Aircraft Right of Way Rules

Tech pilots are expected to be able to recite a correct understanding of 14 CFR 91.113(d). The overarching rule is that, in all cases of converging or overtaking traffic, the less maneuverable aircraft always has the right of way. Here is a memory aid that you can easily recall; it's a combination of two things you don't want on your car or your airplane—*BuGTAR:*

<u>B</u>alloon (The least maneuverable, obviously.)

<u>G</u>lider

Aircraft <u>T</u>owing or refueling another aircraft

<u>A</u>irship

<u>R</u>otorcraft or airplane (These are considered equally maneuverable.)

Technique 6: Chair Flying

What is "chair flying"? Chair flying is not daydreaming. Daydreaming is "Someday, I'm going to be a Tech CFI, a USAF Thunderbird, a B-747 captain (etc, etc). My goodness, it's going to be great!" Chair flying is different. It is mentally practicing an activity—visualizing it, breaking down its steps. For example, the student should, alone and in a relaxed setting, chair fly the VFR takeoff, pattern, and landing, including verbalization of the radio calls. It might go like this:

"Okay, checklist complete and ready for takeoff. I've been listening to the CTAF, and I don't hear any traffic in the pattern. I'm at the hold-short line. I look both ways for traffic on final approach. I announce my intentions, 'Ruston traffic, Skyhawk 123LT departing 36, closed traffic, Ruston', and roll out and get the airplane exactly on the centerline. I apply full power and check the RPM and engine gauges. As the aircraft rolls forward, I fight hard for centerline, using my rudder pedals. I watch the airspeed come alive, and I lift the nose wheel at 55 KIAS. I smoothly adjust pitch to achieve Vy, anticipating the need for right rudder during climbout. I adjust my heading for wind and attempt to track the runway's extended centerline during departure. At 300' below pattern altitude, I check my airspeed, clear visually in the direction of turn, and turn crosswind. About the time I reach pattern altitude and level off, it'll also be time to turn downwind. On downwind, I quickly throttle back to a low cruise power setting, report 'Ruston traffic, Skyhawk 123LT, left downwind 36, Ruston,' and go through the Before Landing Checklist. Also on downwind, I observe whether the aircraft is drifting either towards or away from the runway, and take corrective action if needed. Abeam my touchdown point, I reduce power, slow to 85 KIAS, add 10 degrees flaps, and start a 500 FPM descent. When the corner of the approach end of the runway is 45 degrees behind me to my left, I turn base, adding flaps to 20, slowing to 75 KIAS, and reporting 'Ruston traffic, Skyhawk 123LT, left base 36, Ruston.' I begin judging how my descent is working out, and I add flaps to 30. I visually clear the extended final approach area, turn final in time to avoid overshooting, and report 'Ruston traffic, Skyhawk 123LT, final 36, touch-and-go, Ruston.' I slow to 65 KIAS and observe my altitude versus my distance to fly, adding or reducing power as needed. I visually clear the runway for traffic. On final, I focus like a laser on my aim point and check my airspeed. When making it to my desired touchdown point is assured, I reduce power to idle. Entering ground effect, I shift my eyes to the departure end of the runway, and wait for the aircraft to settle to the ground, continually adding back pressure and holding the aircraft off the runway. I am alert to any drift, and correct with rudder or ailerons as needed. After touchdown, I select flaps up, trim for takeoff, stay on the centerline using my rudder pedals, and apply full power. I once again check engine operation and lift the nose wheel at 55 KIAS…"

Walking through a routine takeoff, pattern, and touch-and-go landing in this fashion is instructive; it shows you just how many small steps are involved. Practice is warranted. The whole thing might be best done in front of a cockpit poster, while holding a checklist.

Additionally, chair flying is a good way to speed up your ground operations. Again, a cockpit poster on the wall is ideal, but your aircraft information manual can work, too. Using the instrument panel diagram in Section 7 of the aircraft manual and a checklist, you can train your eyes as to where to look during preflight and before engine start. The payoff for this drill is that you get out of the parking spot faster, when it's actually time to go fly.

Technique 7: Learning the FARs: What Does the Private Pilot Need to Know?

NOTE: First off, we need you to know that "FAR," used as an intended abbreviation for "Federal Aviation Regulations," is incorrect. Anytime you're trying to be legal, or official, the term needed is Title 14, Code of Federal Regulations (14 CFR). Legally, "FAR" stands for Federal *Acquisition* Regulations. Acquisition regulations relate to government procurement, and, obviously, have zero to do with us.

With that said, we'll proceed with our slangy use of "FAR." It's probably too late to stamp it out. But if you're dealing with the FAA, or something official like a pilot logbook, always use "14 CFR" instead of "FAR."

The Private Pilot does need to know a fair amount of regulations, but it's not as bad as it looks. Your basic 1 ¾" thick ASA brand *FAR/AIM* (the ASA product is the most commonly used commercial version of the book) contains several (not nearly all) Parts of Title 14 of the Code of Federal Regulations (14 CFR), plus two Parts of Title 49, along with the Aeronautical Information Manual (AIM). It's pretty dense, kind of like the Bible.

In looking at the FARs, the pilot must learn to mentally translate the "legalese" into "pilot-speak." The FARs are the FAA's rules. As such, they are published "for the record" in the *Federal Register*. They basically have the force of Federal law. They have a lot of lines like "No person may...", "Unless otherwise authorized…", and "Except as provided in (some other paragraph)…"

Next, the pilot should learn to use the table of contents (TOC). For that, the pilot needs to know how the thing is laid out. The book has its contents listed on approximately Page xxi. Once you find what you're seeking as to a general category, then each Part has its own detailed list of contents. (It also has an index at the back of the book, but that won't always send you where you need to go.)

You may be saying "Well, it's in the book, so I needn't memorize it." You would be mistaken. A lot of this, particularly 14 CFR 91, the PIC had better *know*.

Below, we'll walk you through the Parts, Subparts, and paragraphs that you (the Tech student pursuing a Private Pilot certificate) need to learn. These Parts are all in Title 14, until the final two. (Note that as you step up to Instrument, Commercial, and CFI, the knowledge demands go up, and rather steeply.)

Part 1. Definitions. This Part lists the FAA's definitions of many, many things. The good news is that you don't need most of them. A quick skim of Part 1 shows less than 30 word definitions that we'd expect a Private Pilot to know, along with a few abbreviations and V speeds. Your CFI should make direct reference to this Part when a particular definition "really" matters to your operation. The Part 1 definitions are certainly not "everything."

Part 43. Maintenance. There are two things the Private Pilot needs to know in Part 43. The Private Pilot, as a potential aircraft owner, should be able to find what maintenance he can and cannot legally do to his own aircraft. This is listed in Appendix A. Also, an aircraft owner needs to understand what an annual inspection should consist of. This is listed in Appendix D.

Part 61. Certification of pilots and instructors.

Subpart A. These paragraphs: 61.2, 61.3 (a & c only), 61.15 through 61.19, 61.23 through 61.39, 61.43 through 61.51, 61.56, 61.57 (a & b only), 61.59, and 61.60. Note that in

61.57(a)(1)(ii), it says "…category, class, and type (if a type rating is applicable). Type ratings on pilot certificates are for large and/or jet airplanes. "Type" here does not mean make/model for small airplanes.

Subpart B. None.

Subpart C. If you understand that you must be a proficient English speaker of at least 16 years of age to be a Student Pilot, and that Student Pilots don't ever carry passengers, then you're good. You can skip this Subpart.

Subpart D. None.

Subpart E. You must be at least 17 years of age to get a Private certificate. Also, you'd do well to look at 61.105 line by line, and ask yourself this question: "Do I have the aeronautical knowledge a Private Pilot should have?" Also, note that if you were pursuing Private Pilot training under Part 61 (most of you aren't), you would be well served to look at 61.109.

Subparts F through K. None. Boom! You (as a Private Pilot) are done with 61.

Part 67. Medical standards. Unless you have concerns about your body's ability to pass a routine physical exam, you can more or less blow off Part 67. We would expect the Tech student to know that medical standards do indeed exist, and are found in Part 67.

Parts 71 and 73. These Parts form the legal basis for the lettered classes of airspace, along with airways, reporting points, and restricted/prohibited airspace. These Parts basically "have to be somewhere." If you know that, you know enough. Don't bother reading these.

Part 91. Flight rules. Now, we've gotten to a Part that you, the prospective Private Pilot, really do need to know, in order to operate. It looks like a lot, but, guess what? Starting at 91.1, you get to stop at 91.423, and there are almost no even-numbered paragraphs! Yay! Let's see if we can refine it a little further for you (again, with "you" being the VFR Private Pilot).

The first paragraphs following the table of contents are Special Federal Aviation Regulations (SFARs). Glance at the titles and you'll see they don't apply to our operation.

Subpart A. All, except 91.5 and 91.23.

Subpart B, All, up through 91.161, except that you can skip 91.115, 91.135, 91.138, 91.146, and 91.147. After 91.161, the remainder of this Subpart can be skipped until you begin pursuing the Instrument rating, at which point 91.175 will become quite important to you.

Subpart C. 91.203, 91.205 (a & b only), 91.207 (a, b, c, & d only), 91.209 through 91.215. Skip the remainder of Subpart C.

Subpart D. 91.307 applies to us. Skip the rest of this Subpart.

Subpart E. 91.403, 91.405, 91.407, 91.409 (a, b, & c only), 91.413 (a only). Skip the rest of this Subpart.

Subparts F through M. Skip.

Appendices. Only Appendix D has any possible application to us. Appendix D contains restrictions and requirements at Class B airports. We don't take or send Student Pilots to Class B airports, so we can skip that, too.

Part 97. Part 97, among other things, "prescribes standard instrument approach procedures." The IFR pilot should comprehend that the word "prescribe" means that a clearance for an instrument procedure is a legal matter. A pilot deviating from an instrument approach, SID, or STAR is violating the FARs. The VFR pilot, on whom we're focusing here, can skip this Part.

Parts 105 through 119. Skip.

Part 135. Part 135 governs charter flights and small scheduled airlines (commuters). While pretty much any pilot should know this fact, nothing in 135 applies to us. We expect the Commercial student to know simply that he, just by virtue of holding a Commercial Pilot certificate, *cannot* operate his own charter service. Skip the details, until such time as this Part applies to your job.

Parts 136 and 137. Air tours and agricultural aircraft ops. Obviously not our line of work.

Part 141. Pilot schools. Tech is a Part 141 pilot school. If you happen to be wondering why we do things the way we do, a lot of the reasons are in Part 141. CFIs should note that Part 141 says that "Each pilot school must comply with its approved training course outline." This is the reason you may have observed the Chief Instructor "making a big deal" about following the TCO, and demanding that the student's training folder and Talon/ETA record be correct and in compliance. Part 141 also requires us to have SOPs, stage checks, annual CFI proficiency checks, and a chief instructor. You, the student, are welcome to read Part 141, but it's not relevant to anything that you are actually going to do, or be responsible for. Basically, skip it, at least until you are on the instructional staff of a Part 141 school.

Part 142. Training centers. The differences in Parts 141 and 142 are rather technical and don't matter to you at all. 142 training mostly involves simulators. Skip it.

49 CFR Part 830. Part 830 defines what actually qualifies as an accident, as well as what must be reported to the NTSB. You should be familiar with this Part, which is very short.

49 CFR Part 1552. This Part is the reason you (the student) must show us (the flight school), via your original birth certificate or passport, that you are indeed a U.S. citizen. If you aren't a U.S. citizen, then this Part is why you must apply through (and be approved by) the TSA before we can train you. In either case, reading Part 1552 is not going to help you. So, skip it.

So, there you go. We're really only asking you, the student, to know a few terms from Part 1, along with a few sections of Parts 61, 91, and 830. Don't be intimidated. Just read the paragraphs listed above, taking note of how and when they would apply to you as a Private Pilot.

You should get a current year's copy of the FAR/AIM. In addition, pilots using the ASA FAR/AIM book can and should subscribe to receive email updates from ASA, regarding changes to the regs, which are not infrequent.

Technique 8: The AIM: What Does the Private Pilot Need to Know?

The *Aeronautical Information Manual* is, strictly speaking, non-regulatory. However, it's filled with good operating practices and things the pilot ought to know. Basically, the FAA "assumes" that the pilot has familiarity with the AIM. If you're operating other than as described in the AIM, and something negative happens, you will probably get the opportunity to explain it to someone.

Although the AIM is generally a much easier read than the FAR, there's a bit more volume.

AIM paragraphs are numbered by Chapter-Section-Paragraph. For example, "1-4-5."

Chapter 1: Section 1, the Private Pilot should know Paragraphs 1 through 8, 11 and 12, plus the short "VFR Operations" section of Paragraph 17. Section 2, none.

Chapters 2 and 3: All.

Chapter 4. Section 1, Paragraphs 1 through 13 and 15 through 20. Section 2, Paragraphs 1 through 4 and 6 through 14. Section 3, Paragraphs 1 through 14, 16, 18 through 20, and 22 through 26. Section 4, Paragraphs 1 through 4, 6, 7, 13, 14, and 15. Sections 5, 6, and 7, none.

Chapter 5. Section 1, Paragraphs 1 through 4, 6, and 14. Section 2, Paragraphs 4 and 7. Section 3, Paragraph 4. Section 4, Paragraph 3. Section 5, Paragraphs 1, 2, 6 through 10, 12, and 15. Section 6, Paragraphs 1 and 5.

Chapter 6, 7, and 8. All.

Chapters 9 and 10. None.

The AIM also contains the Pilot/Controller Glossary. Private Pilots should be familiar, at least, with those terms in bold italics.

Technique 8.1: Advisory Circulars

"Okay, I know about the AIM, but what are FAA Advisory Circulars (ACs) all about?"

ACs pretty much either a) contain guidance on means of compliance with particular regulations, or b) provide information of interest to the aviation community. They are generally numbered using a system that corresponds to the regulations to which they refer. Not infrequently, ACs get incorporated into the AIM.

Technique 9: A Really Old Way to Remember the Emergency Transponder Squawks

"Oh my, I have been hijacked; I must squawk 7500."

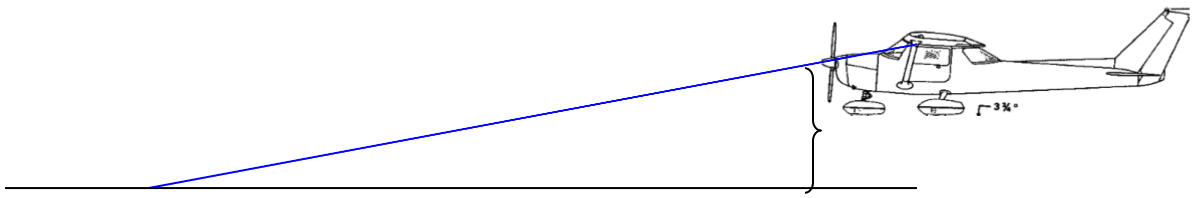
"Oh my, the hijacker has a gun and has shot out my radios; I am NORDO and must squawk 7600."

"Oh my, this is beginning to look like a real emergency; I must squawk 7700."

The above is exceedingly silly and cheesy, so it will probably stick with the student.

Technique 10: Estimating In-flight Visibility

In a typical single engine airplane where the pilot is looking out over the nose (like a Skyhawk), when the pilot looks forward, the point on the surface that is just visible over the nose of the aircraft will be one statute mile away per 1,000' AGL of height. (Points closer than this point are blocked to the pilot's line of sight by the engine cowling.) This ratio continues indefinitely: 2,000' AGL, two miles, 3'000' AGL, three miles, etc, etc.



1 statute mile from pilot's eye to ground per 1,000' AGL

Is this useful? Well, yes, it is. If you're at less than 5,000' AGL, and you're *not* seeing at least a point on the ground directly forward, over the nose, as described above, then you don't have five miles visibility. When you do see such a point, you can visually "flip it over," to estimate the in-flight visibility.

Note: In a more modern airplane with better forward visibility, the above is probably not accurate.

Technique 11: Glide Distance

Okay, having read the preceding technique on estimating visibility, I know about how far I can see. But how far can I glide, with engine power off?

The Skyhawk will glide 1.5 *nautical* miles per thousand feet of height (AGL), at 68 KIAS in no-wind conditions. With time and with practice, you will learn to correctly estimate how far away from your present position your proposed emergency landing field can be.

Technique 12: "When is an ATC clearance needed to operate VFR in Class E airspace?"

Flight instructors asking the above question of students are likely to be frustrated with the answers they receive. The most likely answer to the question will be "Never." But, if this was the case, then Class E would be the same as Glass G. What would be the point in that? What's going on here is that the student has never been forced to think through the questions "In what *sense* is Class E airspace 'controlled?'" and "What is the purpose of the Class E—either to the surface (dashed line) or to 700' AGL (shaded)— magenta rings, anyway?"

The answers to these questions lie in the Class E (below 10,000') cloud clearance and visibility requirements—500' below, 1,000' above, and 2,000' horizontally clear of clouds, along with three statute miles visibility. In addition, controlled airports, including Class E, are considered "IFR" when the ceiling is less than 1,000' and/or the visibility is less than 3 statute miles (SM). So, *if* the pilot, while in Class E (or C or D), is *unable* to maintain VFR cloud clearances, *or* the ceiling drops to less than 1,000', *or* the visibility is less than 3 SM, *then* an ATC clearance is required to operate in that airspace.

So, what would that ATC clearance be? Well, obviously (and ideally), the pilot could be on an IFR flight plan and an IFR clearance. If this is the case, though, our discussion of Class E cloud clearance and visibility is rather moot, right? Is there a legal alternative to IFR, when normal (legal) VFR is impossible? Yes, there is; it's called Special VFR. Under Special VFR, the pilot may, with ATC clearance, proceed with 1 SM visibility and clear of clouds into Class E (or C, or D, or, possibly B, although Special VFR is often prohibited in Class B) airspace. Note, again here, that Special VFR is an ATC *clearance*; pilots do not "self-declare" Special VFR.

The main purpose of Class E (controlled) airspace to the surface (and also Class E transition areas to 700'AGL at airports with non-precision instrument approaches) is to keep (or at least try to keep) VFR traffic away from IFR aircraft executing instrument approaches or departures. Pilots should note that, if an instrument approach or departure is presently being conducted by an IFR aircraft at a non-radar location or at a non-towered field, then ATC is unlikely to give Special VFR clearance to another arriving or departing aircraft into or out of that field until the IFR operation is clear of the airspace.

Technique 12.1: "Do Tech pilots fly Special VFR?"

So, having the knowledge above, it sounds like we are ready to go fly Special VFR right away, huh? Heck no, we don't recommend it at all. In particular, VFR flight with less than three miles visibility is potentially dangerous. Also, flying VFR underneath a low cloud deck is all fun and games until said deck starts lowering. You could suddenly find yourself staring at a "VFR into IMC" scenario, which is often fatal. Tech CFIs will avoid situations calling for the use of Special VFR to the maximum extent possible. It is not inconceivable, in a scenario where a Class C, D, or E airport has a ceiling of, say, 600' to 900' with excellent visibility underneath, that Special VFR might be useful and safe for an arrival or departure. But in general, Louisiana Tech University pilots should never have a need to use Special VFR during a training sortie.

In summary, Special VFR: 1) cannot be filed in advance; 2) requires a clearance, which ATC may be unable to provide; 3) may be safe and useful in rare situations; and, 4) is generally not recommended. And, of course, Special VFR is completely off-limits to Student Pilots.

Special VFR should remain only an academic subject for Tech pilots.

Technique 13: Daniel's Memory Aid for VFR Cloud Clearance Rules and Visibility

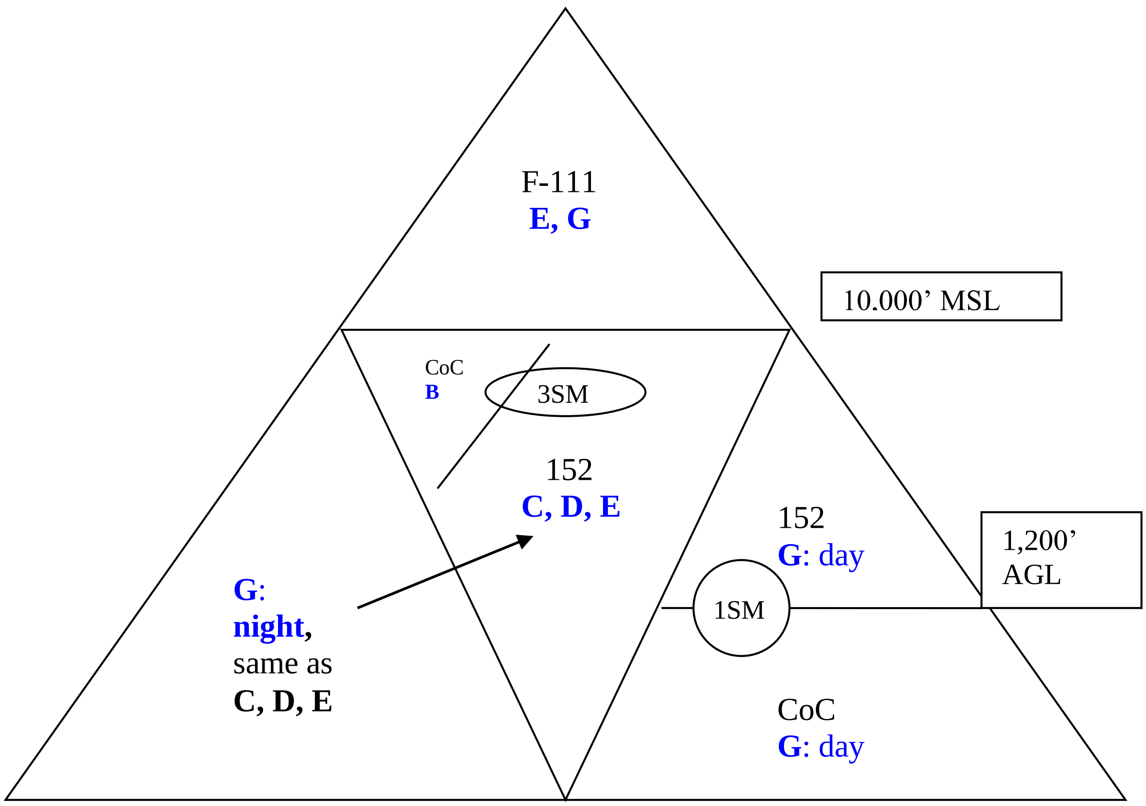
14 CFR 91.155 the presents basic VFR weather minimums in the various airspace classes, but the table there is slightly overwhelming. Here's an aid. (It excludes helicopter rules, Special VFR, and the "night local VFR pattern-only" exception of 14 CFR 91.155(b)[2].)

Key:

F-111 = 5 SM visibility, 1,000' above, 1,000' below, and 1 SM horizontally clear of clouds

CoC = Clear of clouds

152 = 1,000' above clouds, 500' below clouds, 2,000' horizontally clear of clouds



In using this diagram, there really only a few things to memorize:

- When operating VFR at or above 10,000' MSL, it's always F-111, except in two rare cases: 1) Class B extending above 10,000' MSL, and 2) being in class G above 10,000 MSL but at or below 1,200' AGL).
- The "3 SM" triangle includes B, C, D, E, and G (at night), below 10,000' MSL—which is nearly everything. Note that 'B' has no specified amount of cloud clearance other than "clear of", which makes sense, as the pilot is being controlled by ATC.
- G in daytime is the weird one. It's always 1 SM visibility, but from 1,201' AGL to (but not including) 10,000' MSL it shares the "152" cloud clearance, while at low altitude, it's just clear of clouds.

Technique 14: "Should my parents come to Flight Ops for my first solo flight?" (or stage checks)

The answer here is, unfortunately, generally "no." Parents, naturally, like to be present and celebrate their children's successful milestones in life. Obviously (or rather, hopefully), your first solo is one of these milestones. But there are several things against it. First off, if, for whatever reason, you cannot repeat the good pattern and landing performance that you displayed to the check instructor to pass your pre-solo stage check, then you aren't *going* to solo today. This is a potential source of embarrassment and/or disappointment to you, your parents, and/or your CFI. Also, weather, maintenance, and aircraft availability all could easily cancel the ride. If your parent(s) traveled to come here, and then it doesn't happen, this is not a happy outcome.

Neither you nor we need any extra pressure on the day of your initial solo. In our opinion, your parents' presence constitutes a pressure. Plus, as noted, we think they should avoid even the possibility of the hassle of coming here and getting a non-positive outcome on "the day." So, unless your parents a) live here in Ruston (unlikely), or b) are pilots themselves, who understand the limitations associated with students operating light airplanes (also unlikely), we strongly recommend they not be invited to Ops for this particular occasion. Same goes for stage checks.

Technique 15: Time to Graduate the University

Did you know that graduation from our fine institution of higher learning is not automatic? It must be *applied for*, to the Registrar, in the Quarter in which you intend to graduate. The reason you must apply for it is that the University has no certain knowledge of when a particular student is done with a particular curriculum. And, while the Department Head does know roughly where everyone "is" in the program, it's not his job to apply for you to graduate. And guess what else? There is a *deadline* to apply for graduation. It's typically about two weeks into a Quarter, if you're planning to graduate in that Quarter.

So, heads up! If you're complete with your academics and not routinely going to Main Campus, you might be no longer really conscious of what Quarter it is or where we are in the Quarter's progress. You better stay awake; you still have to sign up for graduation before the deadline to do so passes.

Technique 16: Terminating Flight Training—"I quit."

Not infrequently, while reviewing student lists in Talon/ETA, we come across names whose most recent activity happened months and months ago. "What ever happened to John Smith?" we ask. *NOBODY KNOWS.* Unless you tell us that you've actually quit, we're left wondering. You could be dead in a ditch, for all we know. Should we be contacting your parents?

Assuming that you gave it your best shot, there is no shame whatsoever in ceasing flying and/or changing majors. Flying is just not *for* everyone. There is no dishonor in quitting school and heading off to "sell shoes in Bossier City" or "become a welder's helper", as they say. However, don't you think you should, out of courtesy, tell your flight instructor (or the Chief Instructor or the Department Head) that you're quitting?

Technique 17: Stage Check Standardization

One goal of Louisiana Tech University's Part 141 flight courses is to produce a uniform pilot product that exceeds the standards set by the FAA. We use stage checks to ensure we are doing so. Check instructors are hand-picked by the Chief Instructor, based on their experience and demonstrated personal qualities, to include judgment and ability to evaluate. Students should understand that, as long as they and their instructors have done their work properly, then a stage check is nothing to fear. The check instructor is on your team.

The following is a partial list of things that the check pilot force has determined we need to standardize, as to what is to be tested and what defines "satisfactory" or, in gradesheet terms, "Good."

Short field takeoff. The initial climbout of a short field takeoff is accomplished at 56 KIAS with 10° flaps in the Skyhawk. "Initial climbout" means until the real or, more likely for us, imaginary 50' obstacle is cleared, at which time the aircraft is accelerated and the flaps retracted after achieving a speed greater than 60 KIAS. The stall horn will be honored. If the stall horn is sounding while you're attempting a 56-knot climb, then (for God's sakes!) lower the nose. Note that this procedure is done differently in the Arrow.

ForeFlight. The use of the ForeFlight's geo-referencing on an iPad allows you to view your GPS-derived position overlaid on a U.S. Terminal Procedures Publication approach plate, instrument navigation chart, or sectional chart—basically providing the pilot a moving map. This is undoubtedly a nice feature. However, it is not what pilots beginning their Private training need, as the moving map can (will) become a crutch. Trainees need to learn to use the equipment installed in the airplane to visualize their position and operate safely and legally under VFR, as a single pilot. For this reason, the use of the ForeFlight moving map/GPS features by students who use iPads for flight information is prohibited during the Private Final stage check.

Instrument course stage checks. Check instructors, particularly on the NavCom stage check, often observe weakness in students' abilities to navigate by sole reference to the VOR. Students, for fairly obvious reasons, seem to have a preference for the GPS. CFIs must equally emphasize all onboard navigation systems. Pilots must be trained to use what is available. Lack of ability to navigate with reference to NAVAIDs under simulated IMC often reflects inadequate radio navigation training.

To verify that trainees *can* operate safely without the GPS, check instructors conducting Instrument stage checks may simulate GPS satellite and/or receiver failure in the ATD.

Likewise, check instructors conducting Instrument stage checks may also require intersection holding without reference to the GPS. Although it may be a useful drill for CFIIs and their students, holding with partial panel will *not* be tested on stage checks. Exception: Being required to use a holding pattern for course reversal during a partial panel instrument approach is fair game.

Holding, generally, is difficult for students to learn, and retention of that learning is important. Stage 2 Instrument students must still be required to hold periodically; holding *will* be tested on all Instrument stage checks.

Quite frequently, and somewhat surprisingly, Instrument students exhibit confusion when directed to intercept a radial or bearing and track it. Students should have thoroughly learned this skill in their Private pilot training. The meaning and use of the TO/FROM indicator must be emphasized from the early stages of training.

Another chronic weak area is knowledge of approach plate symbology. We believe this is traceable to using the iPad instead of paper charts. Students no longer spend time studying the front matter of approach booklets, or the legend of en route charts. They must be made to do so.

One of the Vertical "S" maneuvers, described below, is to be tested on the NavCom stage check**.**

Airfield information. Those stage checks which require cross-country planning must be planned in detail, as if the trip were actually going to be flown. This means suitable charts, to include an airfield diagram and/or Chart Supplement information, must be obtained by the trainee. Failure to do so is Unsatisfactory for Preflight Preparation.

Steep Spiral and Emergency Approach and Landing (Simulated). If properly planned, these two maneuvers *may* be, and frequently are, "done together" on training flights to save time. However, for the purpose of testing and grading, these are two separate maneuvers. The training technique of combining the two maneuvers (for convenience and/or time saving) may lead the student to think that it *must* be done that way. It is so commonly done, that it has led to check instructors *requiring* the trainee to do it that way (combining the two maneuvers). This latter, for the purpose of grading a stage check, is not correct. While, per the AFH, the Steep Spiral *may* have "a practical application in providing a procedure for dissipating altitude while remaining over a selected spot in preparation for…emergency landing," it is really a separate PTS maneuver, requiring three 360° turns and a specified roll-out heading. Requiring a pilot to be able to simultaneously pick out an emergency landing spot and plan the aircraft's energy to precisely perform three Steep Spiral turns (to PTS) which conclude at exactly 1,000' AGL headed downwind with the aircraft abeam the desired emergency landing point is a bit much. Note: Although check instructors should not *require* the combination of maneuvers discussed above, they may elect to immediately *follow* Steep Spiral with Emergency Approach and Landing. In this case, the three-turn Steep Spiral must be concluded at an altitude sufficient to allow the trainee adequate time to adjust their glide and/or their emergency landing pattern.

Emergency Approach and Landing (Simulated), further information. Pilots may conduct their gliding maneuvers directly over the intended point of touchdown, or manage the glide about the downwind key position. The picture in the AFH merely contains the verbiage "Spiral Over Landing Field." Engine-out maneuvering in real life falls squarely into the realm of pilot technique; it is *not* to be graded except as to the result. Virtually any maneuvering (within the bounds of safety) conducted by the student, unaided by the instructor, to achieve the desired result is to be graded "Good."

For testing purposes, the emergency approach should be continued down to, but not below, 500' AGL (unless conducted at an airport, which, by the way, is a useful and informative exercise, but *not* a stage check requirement.) The purpose of this low approach is to allow both student and instructor to determine how well the approach would have "worked out."

For Talon/ETA grading purposes, "Engine-out Procedures" and "Engine-out Landing" are *two* different things. Basically, they are the two parts of the ACS/PTS's Emergency Approach and Landing (Simulated). The "procedures" part means that the pilot does the immediate actions listed in the AFM/POH, squawks (simulated) 7700, attempts a simulated restart, and, time permitting, calls (simulated) Mayday on a suitable frequency (121.5 or ATC). The "landing" part means that the pilot made it (or clearly would have made it) to the point of intended landing.

CFIs and check instructors should note that Emergency Approach and Landing (Simulated), if carried out to touchdown on a runway, has no *specified* touchdown distance standard associated with it. Only a gross under- or overshoot would be considered Unsatisfactory. Note that DPEs have been known to be displeased with really long emergency landings; some reasonable degree of accuracy is needed here, as to touching down.

Power-Off 180° Accuracy Approach and Landing. This maneuver (obviously) *does* have a standard associated with it, as follows: "Touches down…within 200' of the specified touchdown point." This has two implications. First, either the instructor or the student must *verbally* specify this point; neither person should assume that their "normal" intended point of touchdown is known by the other. Second, this maneuver is planned and is separate from Emergency Approach; there are *no* "surprise!" graded "Power-Off 180's." Lastly, CFIs and check instructors are reminded that this is not a graded item for Private students.

Arrival at non-towered fields other than KRSN. On those stage checks that involve VFR navigation, Diversion is a graded item. Typically, due to time constraints, this means a drop-in to Union Parish (F87) or Jonesboro (F88). Both of these non-towered airports lack weather reporting, and use MULTICOM, 122.9, as CTAF. Trainees who fail to monitor the correct frequency and fail to self-announce their position and intentions when arriving at such fields are Unsatisfactory for the grade item Communication. Also, although these fields are near KRSN, selecting the landing runway by obtaining the KRSN AWOS is not really the right answer (although it is an indicator). Instead, pilots should use available visual cues, such as the wind sock, to determine their landing direction. CFIs intending to use Union Parish or Jonesboro are reminded to check applicable NOTAMs (as the student likely didn't).

Checklist usage. Checklist items are to be accomplished in the order presented in a flow, with direct (or subsequent) reference to the checklist. For example, some students have been observed to have their own homemade ideas of how to accomplish a preflight inspection. Another checklist rule: checklists are never "broken." This means an individual item (retractable landing gear springs to mind as one example) is never, ever skipped with the intent of returning to it. If it's not yet time for that item, the checklist is simply paused.

Eights-on-pylons. Who chooses the pylons—instructor or student? For stage check purposes, the answer is the student. CFIs are recommended to train them to do so. Also, CFIs must teach students how to place the airplane such that the turn about the pylon occurs at about 30 degrees of bank. (25 to 45 degrees is fine; 15 or 50 degrees is not good.)

Chandelles. Only one chandelle, in either direction, is required on a stage check. Unless briefed otherwise, students may assume this.

Lazy 8. This maneuver consists of one leaf in each direction. Students should not ask if the check instructor wishes them to continue after completion of the first half. Neither should students inquire if the check instructor wishes them to "keep going" after both left and right leaves are accomplished. The check instructor wants to see one leaf in each direction, period.

Turns around a point. Observations indicate a need for both CFIs and students to review the description of this maneuver.

Tech pilots are reminded that all of us, up to and including the Chief Instructor, need to be continuous students of our profession. Line instructors are encouraged to routinely discuss standards and instructor techniques with check instructors. Check instructors are required to provide feedback on student performance to line instructors. CFIs are required to observe their students closely and stamp out poor techniques early on in training.

Technique 17.1: Stage Check Standardization—Grading

Students may wonder how check instructor arrive at overall grades. The instructor is first grading *individual* items and maneuvers, in an objective fashion, with the choices being Excellent, Good, Fair, and Unsatisfactory (EGFU).

"Excellent" is self-evident and self-explanatory. Excellence is its own reward, but there is no requirement for any trainee to ever achieve Excellent on any maneuver. Also, there is no particular benefit to the trainee for having gotten an 'E' (on the gradesheet). It is simply a signal to the owning instructor and the Chief Instructor that that item was really well-performed.

"Good" means good enough to meet PTS/ACS, with no instruction required. Good is the desired level.

"Fair" means a safe level of performance which doe not meet PTS/ACS.

"Unsatisfactory" means unsafe or unable, due to a demonstrated lack of knowledge or skill. Anything requiring instructor verbal or physical intervention would pretty much be automatically Unsat. Having any item graded Unsat on a stage check means a failure overall, with remediation required.

Okay, so the above discussion was about *individual maneuver* grades. Here are some guidelines regarding the *overall* grading of checks, so you know where we (check instructors) are coming from on that. The overall grade, at least in making the choice between and an 'A' and a 'B', is somewhat subjective. 'C' and 'D' are not used; as we discuss 'A', 'B', and 'F' below, you'll probably get why this is so.

'A'. Good to Excellent.

An overall 'A' on a stage check indicates to the assigned CFI (and to the Chief Instructor) that the student is right where he should be, for the current position in training. Little to no instruction was required from the check instructor, and there were zero to very few required maneuver repeats. Note that 'A' does not equate to "outstanding," and does not necessarily require that any items be graded Excellent. It just means that standards were met with little to no instruction. Stage checks begin with the student assumed to be at the 'A' level.

'B'. Okay.

A 'B' overall basically says that the check instructor was forced to instruct some, or to offer second attempts at particular things. The student was not unsafe, but had some difficulty meeting standards. A 'B' stage check would result in a debrief to the assigned CFI. Minor remediation may be warranted, but the student is considered good enough to proceed in the TCO, or to the practical test, if applicable.

'F': Fail.

Stage check failure means that the trainee requires remediation. If you fail your stage check, you should take the result seriously, but not emotionally. The check instructor doesn't dislike you, he doesn't have a quota, and he didn't want to have to fail you. It's not personal; it's business.

Most often, ground evals get failed on the "three strikes and you're out" rule. Check instructors don't mind doing a little instruction, but when we're getting blank stares and "deer in the headlights" looks from the student, it's not going well. If the knowledge being tested must be known while maintaining (or in order to maintain) aircraft control, or to avoid violation, then the student probably won't be offered the opportunity to "look it up" during the ground eval—and might legitimately be failed on the spot. Also, if you *are* offered the opportunity to look up something you've been asked, be aware there's most definitely a time limit to do so; if you don't know it *and* you can't find it, and it's considered essential, you may be in trouble.

In flight, check instructors are, again, not looking to fail anyone; it's not like we enjoy it. However, the expectation is that the standard will be met by the student, *without instruction*. If instruction must be offered on a stage check flight, it will be brief; and the student is expected to "get it" on the next attempt.

On Private and Commercial course *final* stage checks, a practical test is being simulated; on these rides, if a maneuver doesn't meet standards, a second attempt at that particular maneuver *may* (not "will") be offered, but *no* instruction will be given. Note that, if a lot of instruction is needed for the student to meet the standard, it's not satisfactory, even though the physical performance of the maneuver might meet the numerical standard (+/- 100', etc.)

Instrument final stage checks, both the ground and flight portions, must be graded a bit differently—harshly, even (from the student's point of view). This is so because most everything that the student is doing in the cockpit is being done, or is simulated to be being done, *on an IFR clearance*. If the student fails to comply with a clearance, either real or simulated, then that is indeed what is referred to as a "clean kill." There's no undoing the violation of a clearance; the check instructor's hands are pretty well tied.

In flight, whatever the stage or course, anything observed to be unsatisfactory for which there's no legitimate way for the check instructor to repeat it will result in an immediate return to KRSN and issuance of an 'F' overall. Likewise, any pilot action (or lack thereof) requiring immediate check instructor intervention will result in an 'F' overall. Here are several examples of ways to end your stage check early:

1. Entering an incipient spin during slow flight.
2. Flying 070° when proceeding VFR direct from Ruston to Little Rock.
3. Achieving full-scale CDI deflection on the final segment of an instrument approach.
4. Flying your ILS down to DA, then continuing to drone straight ahead at 200' AGL with your Foggles still on (or in the clouds in the ATD), not initiating a missed approach.
5. Failure to descend in a timely fashion (or at all) from the FAF altitude on a non-precision approach.
6. Getting lost during the missed approach procedure.

7. During a short field approach, setting your visual aimpoint at or beyond the departure end of the runway, and, when questioned, telling the check instructor "Yes, this will be fine."
8. Proceeding to navigate "on course" when assigned a heading to fly (clearance violation).
9. Inability, on multiple attempts, to land the airplane straight (crabbing, drifting, not on centerline).
10. You get the idea…

It would be an exceedingly rare case (like rare as a live unicorn) for a student to successfully argue a stage check failure into a pass with a check instructor; this should not be attempted. If you sincerely believe you have been wronged in the grading of your stage check, discuss it with your CFI, *after* he has been debriefed by the check instructor. If you still think the failure call was wrong or unfair, then have your assigned CFI bring the matter to the Chief Instructor.

While not impossible, it is unlikely that your assigned CFI, prior to the stage check, actually failed to cover a testable flight maneuver with you. It is equally unlikely that, among your assigned CFI, your textbook, and your academic instructors, they *all* failed to cover a required knowledge area. So, a student's claim of "I was never taught that" is generally false. (You may have failed to *learn* it, but it's unlikely you were not *taught* it.) Basically, if you fall short on a stage check, the odds are about 99 to 1 that it's your fault. You're welcome to "throw your CFI under the bus" when explaining a failure (and God knows we've seen that), but it's pretty much on you. Both your assigned CFI and you thought you were good to go, but you demonstrated otherwise. You should consider it a good thing that you got to find out your weakness(es) here at home, rather than while out solo or on an FAA practical test.

Consider this: Being good at something means being able to do it when you're under pressure. Pilots have to get used to this, and your performance on stage checks is an indicator of whether you can do so. Consider this, as well: Being able to perform a thing only when conditions are optimum does not mean you're good at it. In fact, the opposite is true: *Only* being able to perform the thing in optimum conditions means you are *not* yet good at it.

Summary. To summarize, stage checks exist for the purpose of quality control, as well as to protect you, the student, against practical test failures. (Practical test failures are recorded by the FAA, in your permanent file. Also, whether or not you've failed any FAA checkrides will come up in most pilot job interviews.) Stage checks offer the student a chance to get used to being judged, so that "real" checkrides (hopefully) become less of a big deal. They are graded 'A', 'B', or 'F' (rather than just pass/fail) in order to give us a better look at how well you, the student, and we, the training providers, are succeeding. We don't bother with 'C' or 'D' as overall grades, because we don't think a 'C' or 'D' pilot has any business flying around out there as PIC.

VFR Patterns and Landings

Technique 18: General Knowledge—Computing the Crosswind Component

The Louisiana Tech University SOP lists limiting crosswind components. However, it is impossible to read the POH's crosswind chart while operating an airplane in solo flight. So, how do you figure out the crosswind component while you're flying down final approach?

Given any wind and any runway, we expect the pilot to be able to immediately determine the crosswind component. In all wind conditions excluding extreme (when we should not be flying at all), the following estimation technique will suffice:

Degrees difference in runway and wind	Crosswind component
30°	one half the total wind
45°	two thirds of the total wind
60° or greater	all the wind is considered crosswind

Notes: The fraction for 30° is mathematically correct; the figure for 45° is accurate (enough); and the crosswind assumption for 60° or greater is slightly conservative, becoming less so as the angle increases to 90° degrees off, when it again becomes mathematically correct.

If you wish to get a bit "finer" in determining the crosswind, you can do it using one-sixth of the total wind per each 10° that the wind differs from the runway heading. The math is more challenging, though; the "30, 45, 60" rule is easier to remember.

Technique 19: VFR Traffic Pattern Spacing

Louisiana Tech University pilots must learn how to space themselves in the VFR traffic pattern, with the objective being to avoid long final approaches. Pilots should realize that "everyone" wants to train in a standard, normal-sized VFR pattern, rather than in a pattern with 2-mile long final approaches.

One good way to create spacing, when needed, is by extending the upwind leg—there is nothing that says pilots *must* turn crosswind upon reaching 700' AGL. An additional technique is to slow down early on downwind. Although it's sometimes necessary, the least desirable way to create spacing is to extend your downwind because the preceding aircraft extended. When you must do this, pick a wind-corrected heading to fly, or better yet, a visual point to fly to, in order to preclude drifting. Additionally, if an extended downwind is necessary, don't start descending at the normal point, or you'll wind up with a low final approach. Pilots may and should turn from downwind to base when the airplane on final passes abeam. It's also helpful for pilots on final to let everyone know if they intend to full-stop, as this may require additional spacing.

During a busy traffic pattern, a CFI whose student is simply *unready* to turn base at the appropriate point (as distinct from being *unable* to turn base due to preceding traffic) should require the student to break out from downwind via a climbing right-hand turn to rejoin the pattern at the normal 45° downwind entry point.

Technique 20: Aim Point and Glide Path (or, "What should the runway look like to the pilot during a correctly flown final approach?")

CFIs attempting to instruct on this subject (and students struggling with this subject) should make reference to the drawings in Chapter 8 of the *Airplane Flying Handbook* (AFH). (We're referring to Figures 8-10 and 8-11 here.) While fairly basic, the idea is that the student may not know what these things ought to look like.

Technique 21: Straight-in Visual Approach

Sometimes, we bump into students who simply cannot manage the aircraft's energy to get down to the runway without first flying downwind, base, and final. If that's all they've ever done, this is understandable. A straight-in approach, although seemingly easy, requires practice.

The simplest practice technique, to see what it should look like, is to go to an un-busy airport that has an operational PAPI. Establish the landing configuration two, three, or four miles out, and fly the thing at final approach speed all the way down.

Another way to figure it out is to calculate altitude to lose versus distance remaining to the runway. A typical power-on approach should be losing about 300' per NM. So, set yourself up 3 NM on final at 1,000' AGL and count down the altitude as you go. (This technique could pay off some day, if the pilot must make a straight-in visual approach at night, without glidepath guidance.)

Technique 22: Offsetting the Runway During a Go-around

Flying to one side of the runway (offsetting) *may* be appropriate during a go-around. *When* is it appropriate?

If you're going around because another aircraft entered the runway, offset is appropriate, to avoid overflying it and/or to keep sight. If you're going around for whatever reason (training or check requirement, landing/approach anomaly, etc.) and you're overtaking an aircraft on departure leg, offset is appropriate. So, to which side will you offset?

Well, the standard rule is to overtake a slower aircraft by passing on its right side. But, the most likely situation, at a non-towered field like Ruston, is that you need to go around, pass the other guy who's on the runway, the takeoff roll, or the departure leg, and then pull yourself onto a left crosswind. If you do this after having passed on the right, then you will have to pull across the other aircraft's flight path, which is undesirable. So, to avoid this, passing on the left is probably the best technique. This is basically a case of 14 CFR 91.3 overriding 14 CFR 91.113.

During a go-around, add full power and right rudder, maneuver the aircraft away from the ground at a safe speed, and remain "well clear" of traffic. Once these are accomplished, judge your closure towards any other aircraft, and then decide which way, or whether, to offset.

Technique 23: Improving Landings

In teaching landings, instructors face challenges, including getting the student to land the aircraft 1) *on* the runway centerline, 2) *aligned with* the centerline (not crabbed), and 3) *tracking straight with* the centerline (overcoming drift). All three are required for a satisfactory landing.

Failure to land on centerline indicates a sloppy pilot. It should be easy to solve. Advise the student to put his/her butt on the centerline. Literally. If the student, sitting in the left seat, can land the aircraft with the centerline between his legs, then the aircraft is about one foot to the right of the centerline. We can live with that.

Touching down in a crab and touching down while drifting sideways are both bad, but they are separate issues. Crabbing means the aircraft's heading is different to the runway heading; one main wheel is ahead of the other, and the nosewheel is pointed to one side, frequently the right. Touching down in this condition is decidedly undesirable, as it creates stress on the landing gear. In calm wind conditions, this crabbing/cocking may be caused by precession, as the motion of flaring the aircraft (raising the nose) for landing tilts the propeller slightly aft, resulting in a felt force towards the aircraft from the propeller's right side (as viewed from the cockpit). This problem is solved by proper use of rudder during the flare.

Drifting means that, even though the airplane's heading matches the runway heading, the airplane is moving sideways. Touching down while drifting puts a sideload on the main gear, and is undesirable. This should be overcome by use of aileron and rudder, touching down on one wheel if necessary.

Due to the stress these landing maladies impose on the undercarriage, Tech CFIs will be extremely intolerant of them, and strive to solve them early on in their students' training.

Technique 24: Touch-and-go vs. Full Stop Landing at Cross-country Destinations

If pre-Private students' CFIs only ever have the students do touch-and-goes at cross-country destinations, then such students will inevitably be weak and/or confused in the area of airport ground operations, especially at airports with multiple runways. CFIs conducting dual cross-countries should at least include a "full-stop, taxi back" if no fuel or rest is needed.

Additionally, students in the Private course must comply with (and *log* compliance with) 14 CFR 141, Appendix B, Paragraph 5(a)(2), which requires three solo takeoffs and landings to a full stop at an airport with an operating control tower. (So, plan cross-countries accordingly.)

Technique 25: Short Field Approach and Landing

The idea on the short field approach and landing is to practice it as if there is a 50' obstacle at some point prior to the beginning of the runway. Establish a stabilized power-on approach at the manufacturer's recommended approach speed, which will be specified and slower than normal. This speed should yield a slightly steeper than normal glidepath. Set the aimpoint slightly shorter than normal. Pass over the "pretend" 50' obstacle with safe clearance. Reduce power to idle as normal. The airplane should settle right on down, due to the slightly slower airspeed. If it floats, you were too fast.

Technique 26: Emergency Landing

The event of an actual emergency off-airport landing is rare, but it is a 100% certainty that it will be tested on a private pilot practical test. In preparation for this, CFIs should have their Private students approach (with engine power reduced to idle) Union Parrish (F87), Jonesboro (F88), or any convenient non-towered airport while cross-country. Arrive from unplanned angles and altitudes, carrying the approach all the way to landing.

The successful outcome of this drill is defined as follows. The student:

- establishes best glide speed;

- observes the airport and selects it as most appropriate landing zone;

- simulates attempting an engine restart;

- simulates declaring an emergency with ATC or general mayday on 121.5;

- observes wind direction and lands into it if time and altitude permit; (Note here that part of the judgment needed is to figure out if a downwind landing is called for.)

- lands in the first third of the runway.

If a student is incapable of the above, they will not be signed up for a final stage check or a practical.

The purpose is for the student to observe that a particular set of gliding maneuvers and energy management "works," and that there's only so much excess energy that can be dissipated with a forward slip to landing.

Airwork

Technique 27: Steep Turns

Here are several techniques that may improve the student's performance on level steep turns.

1. To start, get trimmed for cruise at 100 to 105 KIAS, with power set. You will have a much better maneuver if it's begun from a stable position.
2. Align the aircraft's heading to a well-defined, and particular, visual point. A water tower is a good visual reference point; "Lake D'Arbonne" is rather vague, due to its size (although a particular feature on a lake would be fine). Using the heading set marker is fine, and a good technique. But it's not primary.
3. Think it through in advance. You *know* the nose is going to drop passing 30 degrees of bank. So, be ready with the extra back pressure on the yoke. You *know* the extra back pressure is going to slow the airplane down, so be ready on the throttle.
4. Let's think on it a bit more. Once the turn is established, you may find your altitude varying. But, if you try to correct the problem with pitch, you're going to feel the G's varying, and you'll have a herky-jerky maneuver. Instead, correct minor altitude deviations by altering the bank slightly. (You've got plus or minus five degrees to play with, remember?) Descending? Reduce the bank two or so degrees. Climbing? Increase your bank slightly.

5. Here's a nice, legal "cheat" for you. The VSI will indicate a climb or descent well before the altimeter actually moves. And, the VSI is easy to see. It's *right there*, yelling, "Hey! Your altitude is about to change in the direction that I'm pointing!" So, glance at it periodically, and see if your altitude control improves.
6. To trim during the turn, or not? This one is totally up to you. Trimming may improve your performance, and most instructors recommend it. But, if you're trimming because you're too weak to hold the yoke back, you probably need to go the gym. If you're trimming because you cannot hold altitude, see Items 3, 4, and 5 above. If you're trimming so you can remove your hands from the yoke, that's cute but it's of little practical value. Most importantly, if you trim during the roll-in, you must re-trim (or push, with some precision, on the yoke) during each roll-out. Failure to do so will result in an altitude bust, which most definitely "counts" in the grading of the maneuver. Your call.

Technique 28: Emergency Descent

Although required by both the Private and the Commercial ACS, emergency descent is not addressed procedurally in the Skyhawk or Arrow manuals.

Louisiana Tech University pilots will use the following the guidance, developed from the *Airplane Flying Handbook* and a conversation with a Designated Pilot Examiner, in the performance of the emergency descent maneuver in training:

1. Skyhawk: Begin the maneuver at 3,000' AGL minimum. Smoothly select idle power, bank 45 degrees, and pitch down 5 to 10 degrees nose-low, to achieve -2,000' per minute VSI. The instructor should assign a level-off altitude. The trainee is to lead the level-off and hit it within +/- 100'. Do not exceed Vne. Begin recovery so as to be back in level flight by 1,500' AGL. In turbulence, do not exceed Va, and accept whatever VSI results from that speed.

2. Arrow: Begin the maneuver at 3,000' AGL minimum and less than 129 KIAS (VLE). Smoothly select idle power, landing gear down, bank 45 degrees, and pitch down 5 to 10 degrees nose-low, to achieve -2,000' per minute VSI. Do not exceed VLE. The instructor should assign a level-off altitude. The trainee is to lead the level-off and hit it within +/- 100'. Reduce speed to less than 107 KIAS prior to gear retraction. Begin recovery so as to be back in level flight by 1,500' AGL. In turbulence, do not exceed VA, and accept whatever VSI results from that speed.

    a. Pilots will observe the Arrow's placarded limitation regarding low engine power settings.

Students and instructors who use the emergency descent as their final area work maneuver are reminded to accomplish the Descent Checklist beforehand, to properly position the mixture control.

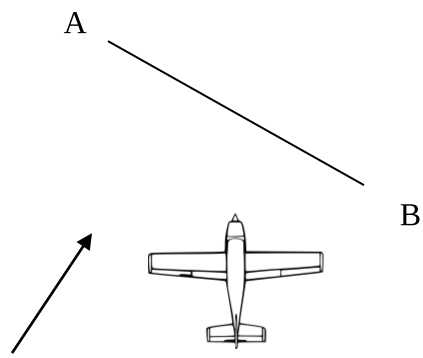
Technique 29: Eight Along a Road

Eights along a road is an excellent ground reference maneuver which is, unfortunately, rarely introduced to students by their instructors. Why? Presumably, it's because eights along a road is not tested by the ACS. Take a look at the maneuver in the *Airplane Flying Handbook*, and give your student a chance to see something aside from turns around a point and S-turns across a road.

Technique 30: Reserved

Technique 31: Eights on Pylons Entry

Despite some rather complicated verbiage, the *Airplane Flying Handbook*, Figure 6-10, shows eights on pylons are to be entered 45° to downwind. Our feeling is that that figure might be better if seen from the pilot's point of view, tracking up. What does "45° to downwind" look like? Do you have trouble picturing it? It looks pretty much like this, below. In our example, the arrow represents a southwest wind, and the pylons are at either end of segment AB. The pilot is headed north, and intends to make the first turn to the left.



Speaking of turning left first—that would generally be recommended. This is so the student sees the first pylon out his own side window, which seems a bit easier.

Instrument

Technique 32: Instrument Steep Turns

Instrument steep turns are a valid training maneuver, described in the *Instrument Flying Handbook.* Louisiana Tech University pilots and instructors will train on steep turns as described in that publication, with the trainee expected to achieve a 'Fair' level in the early stages, and a 'Good' level by course completion.

Steep turns are not a task in the Instrument Rating ACS. They are, however, a task in the Instrument Instructor PTS. Thus, check instructors conducting final Instrument stage checks will require steep turns only as an exercise; the maneuver will be graded 'Good' regardless of the outcome. (Future TCO revisions may delete Steep Turns as a graded item on the final check.)

Technique 33: Required ATC Reports

Here's a mnemonic for reports always required: **WISHVAAM5**

Weather—unforecast

Instrument—including navigation/communication—malfunction

Safety of flight information

Holding—time and altitude leaving or reaching

VFR-on-top altitude change

Airspeed (TAS) change of 10 knots or 5%

Altitude, leaving

Missed approach—NOTE: Executing ATC climbout instructions is not a missed approach.

500'/minute climb or descent—unable

Mnemonic for additional reports required when not in radar contact: **F2C**

Final approach fix inbound

Greater than 2 minutes change of ETA to next reporting point (Note: This changed from three minutes to two minutes in the 2015 AIM. Many, if not most, pilots still think it's three.)

Compulsory reporting point

Technique 33: Required ATC Reports (continued) (chart courtesy of AOPA)

Required Events to Report to ATC

At All Times

1. Vacating one altitude for another.
2. Time and altitude reaching/leaving a holding fix or point.
3. VFR-on-top altitude change.
4. Missed approach/intention.
5. True airspeed change of 10 knots or 5% (whichever is greater).
6. Unable to climb/descend at 500 feet per minute.
7. Safety of flight information.
8. Unforecast weather.
9. Any navigational, approach, or communication equipment malfunctions occurring in flight. This report should include:
   - Aircraft identification
   - Equipment affected
   - Degree to which pilot is impaired to continue flight under IFR
   - Nature and extent of assistance needed from ATC.

Nonradar

1. Leaving final approach fix or outer marker inbound on final approach.
2. Revised ETA of more than two minutes, IAW AIM 5-3-3
3. Position reporting at compulsory reporting points required by FAR 91.183.

This resource is from ASI's *IFR Insights: Regulations*. View this course and others online at http://www.airsafetyinstitute.org/courses

Technique 34: Vertical "S" Series—Basic Attitudes Instrument Training Exercises

The vertical "S" maneuvers are United States Air Force instrument training proficiency maneuvers designed to improve a pilot's crosscheck and aircraft control. There are four types: the A, B, C, and D. These maneuvers will be incorporated into Stage 1 of our Instrument training.

1. Do not confuse the positions, listed as "A", "B", "C", etc. in the drawings below with the maneuvers themselves. Also, note that the last drawing (Figure 3) is of a vertical "S"- C, with the vertical "S"- D described in words at the upper right.

2. Any of the vertical "S" maneuvers may be initiated with a climb or descent. Conscientious practice of these maneuvers will greatly improve the pilot's familiarity with the aircraft, instrument crosscheck, and overall aircraft control during precision instrument approaches.

3. For the Skyhawk, the vertical "S" is to be done at 85 KIAS, 500'/minute VSI and a standard rate turn (if turning).

4. At least one vertical "S" will be tested on each Basic Attitudes and Nav/Com stage check.

5. Vertical "S"- A. (Figure 1). The vertical "S"- A maneuver is a continuous series of rate climbs and descents flown on a constant heading. The altitude flown between changes of vertical direction and the rate of vertical velocity used must be compatible with aircraft performance. It seems easy, but may be the most difficult, due to the requirement to maintain heading. Note: The figure shows 1,000' of altitude change, but 500' is sufficient for our aircraft.

6. Vertical "S"- B. (Figure 2). The vertical "S"- B is the same as the vertical "S"- A except that a constant angle of bank is maintained during the climb and descent. The angle of bank used should be compatible with aircraft performance (standard rate). The turn is established simultaneously with the initial climb or descent. Maintain a constant angle of bank throughout the maneuver. If flown perfectly in no-wind conditions, the aircraft will return to the same point in space where the maneuver was begun.

7. Vertical "S"- C. (Figure 3). The vertical "S"- C is the same as vertical "S"- B, except that the direction of turn is reversed at the beginning of each descent. Enter the vertical "S" - C in the same manner as the vertical "S"- B.

8. Vertical "S"- D. (Figure 3). The vertical "S"- D is the same as the vertical "S"- C, except that the direction of turn is reversed simultaneously with each change of vertical direction. Enter the vertical "S"- D in the same manner as the vertical "S"- B or "S"- C. Note that Figure 3 does not draw out vertical "S"- D. The vertical "S"- D is sort of like a Lazy 8 flown on instruments, using a set bank angle.

Figure 1, Vertical "S" – A

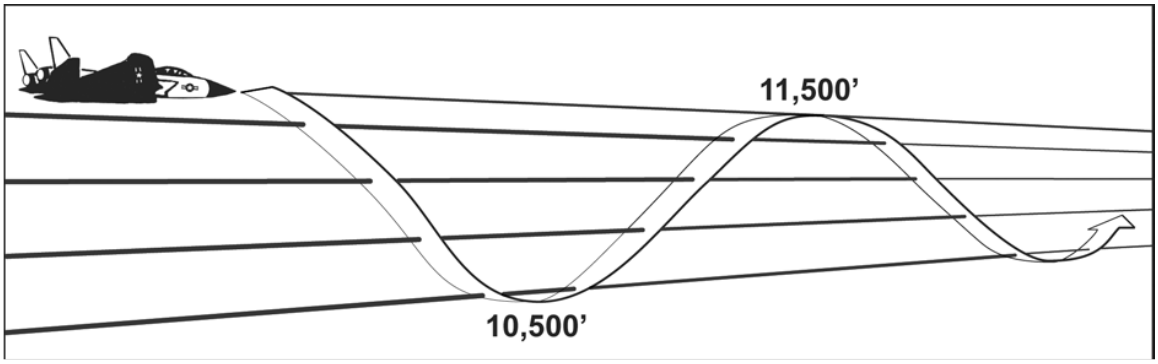


Figure 2, Vertical "S" - B

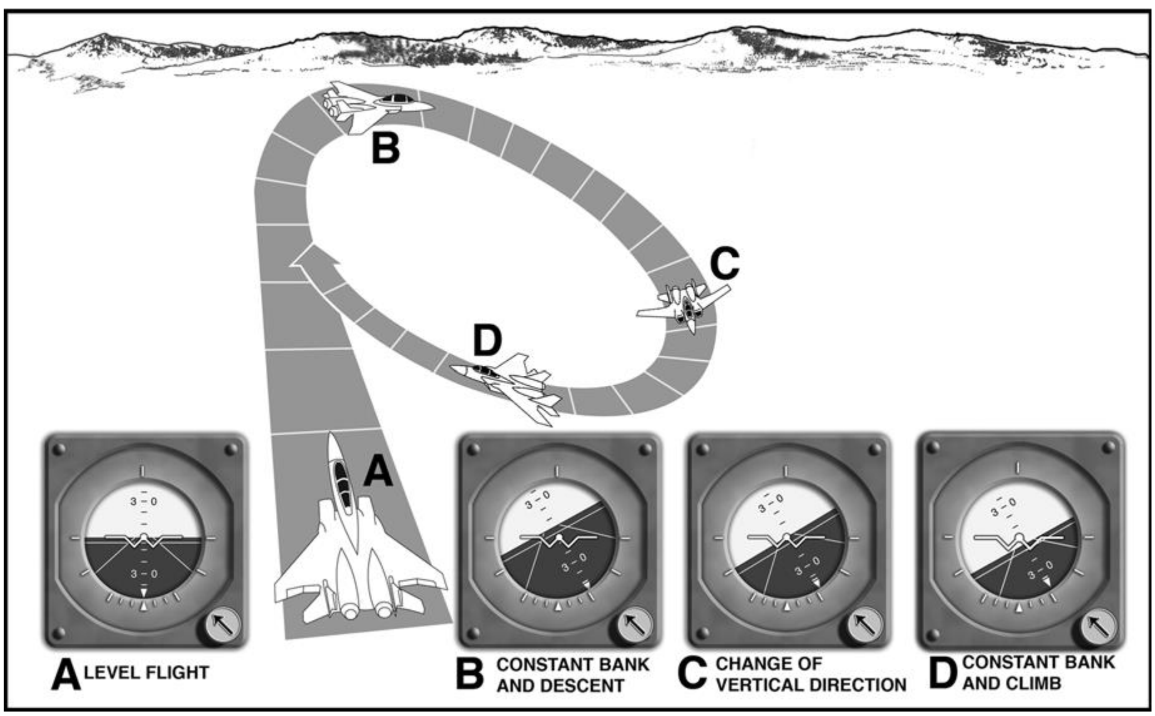
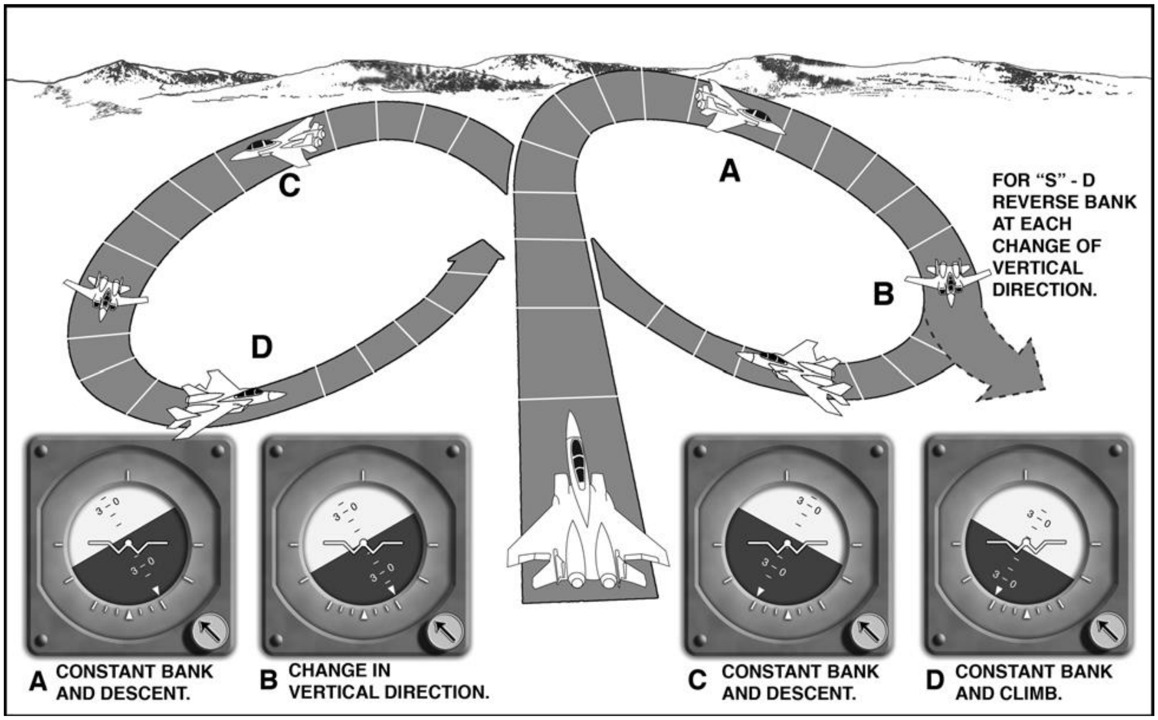


Figure 3, Vertical "S" - C and - D



Technique 35: Understanding the "Trouble T"

What is indicated by the negative 'T' symbol found on many approach charts? It means that the pilot should refer to the front of the TPP, and look for obstacle departure procedures (ODPs) or non-standard takeoff minimums. Additionally, notes and takeoff obstacles may be listed.

ODPs are not technically directive to general aviation pilots. However, failure to comply with a published ODP at night or in IMC is utterly foolish. It can be, and has been, fatal.

Strictly speaking, pilots not operating under FAR Parts 121, 125, 129, or 135 do not *have* (legal) takeoff minimums. Tech's mins for takeoff are the mins for the departure airport's lowest available and compatible approach(es), assuming an IFR-current CFI is on board. Your personal minimums should probably be higher than this (like 1,000'/3 SM, as listed in the SOP). If and when you become an airline pilot or a military pilot, those organizations will prescribe takeoff minimums for you. See 14 CFR 91.175(f) for more details about takeoff minimums. The thing to understand about takeoff minimums is this: If they're published, your best technique would be to comply with them. If they include a gradient, and you're taking off IFR, you had better be able to make it, aircraft performance-wise.

Technique 36: Understanding the Initial Segments of GPS Approaches

There are several possible ways to get to final approach via pilot navigation on a GPS approach. How it lays out often depends on whether the approach in question is (or was) a GPS overlay approach. Modern GPS approaches are named "RNAV(GPS)", while the older overlay approaches will say, for example, "VOR *or* GPS." Two places to look, in order to figure out how to fly the initial segment, are at the IAF and at the MSA or "Terminal Arrival Area" (TAA). The initial approach segment(s) can be any, or many, of the following: a left base without procedure turn (NoPT), a right base (NoPT), an angled segment of less than 90 degrees (NoPT), a holding pattern for course reversal, a true straight-in (NoPT), or a TAA "pie slice" from which a NoPT route can be flown from multiple bearings.

This last one, the Terminal Arrival Area (TAA) will have whole quadrants, or maybe even an entire 180 degree sector, from which a NoPT approach can be made. It might also have a 180 degree sector set up from which the pilot *must* fly the holding pattern for course reversal. The pilot must be note two things about the holding patterns found on GPS approaches. If holding is depicted without any NoPT routing(s), then the holding pattern *must* be flown (unless specifically cleared otherwise by ATC). Conversely, if a holding pattern is depicted but the pilot is arriving from a TAA sector which says "NoPT," then holding is *not* authorized without specific ATC clearance.

Here's one more note regarding GPS holding. Typical charted GPS holding pattern leg lengths are 4 NM. This is a maximum. If using the hold for course reversal, there is no requirement to obtain additional clearance to shorten it. If the pilot is ready for the approach, and is cleared for the approach, then he may commence the inbound turn at his discretion.

Technique 37: Intermediate Approach Fixes and Segments

Occasionally, instrument approaches may have the initial segment leading to an intermediate fix (IF), rather than directly to the final approach fix (FAF). This segment, from the IF to the FAF, is called, rather unsurprisingly, the intermediate segment. It may have an "at or above" altitude, or perhaps even a "hard" altitude. Aside from being familiar with the terminology, this is no big deal. Pilots may treat the intermediate fix and segment as just an extension of the initial segment, and fly it according to their clearance and the printed procedure.

Technique 38: FAA *Instrument Procedures Handbook*

The information in the preceding two Techniques was drawn from the FAA's *Instrument Procedures Handbook* (IPH), which is a separate publication from their *Instrument Flying Handbook* (IFH). The IPH is available as a free .PDF at www.FAA.gov . This book is somewhat under-utilized in our training. Instrument students and CFIIs are encouraged to review it.

When studying the IFH, the IPH, or any other FAA pub, pilots are strongly encouraged to obtain the most current version.

Technique 39: Bracketing While Flying an Instrument Approach

The idea of "bracketing" is to avoid chasing the CDI and VDI needle(s) during an approach. Once the course is centered, pick an initial heading to fly with reference to any crosswind. (You *were* listening when the wind was reported to you, right?) The moment you observe your chosen heading to be incorrect, based on it failing to hold the course, pick a precise *new* heading. Treat the glidepath of an ILS likewise. You should have, from training, a pretty solid idea of the pitch and power required to let you descend on glidepath (and on airspeed) in a no-wind condition. Set this attitude and power first, then adjust as needed. In this case, we treat the heading, attitude, and power indicators as "control" or "input," and the CDI and glideslope needles as "performance" or "output."

Technique 40: PAPIs and VASIs

Question 1: Does a Precision Approach Path Indicator (PAPI) qualify as "the visual approach slope indicator" mentioned in 14 CFR 91.175(c)(3)(vi)? Answer: Per the FAA's legal interpretation, yes, it does. Notwithstanding that it's pretty obvious, their legal counsel formally answered the question in the affirmative in the year 2011. We don't really know why the verbiage in Part 91 hasn't been modified. Per the AIM, both VASI and PAPI fall under "Visual Glideslope Indicators," so one might wish that Part 91 would use that term.

Question 2: When briefing an instrument approach to conducted at night or in IMC, why is it important to include which type of glidepath aid, PAPI or VASI, is installed? Answer: Whether it's a PAPI or a VASI is utterly critical for the pilot to know. Why? Who cares? PAPIs and VASIs work equally well, right? PAPIs, the newer of the two systems, are differently oriented to normal VASIs, *by 90°*. What if a pilot is accustomed to "always" seeing a particular system (whether PAPI or VASI) when breaking out at the completion of an approach? Flying an approach down to ILS minimums, while expecting one type of glidepath lighting, and then breaking out and finding the *other* style of indicators (with no foreknowledge of it) can create an urge within the pilot to "make the lights look right." This feeling can be powerful enough to cause the pilot to put the aircraft into 90° of bank (at 200'AGL!) in order to do so. Chances of recovery would be slim.

PAPIs are by no means universal. Just perusing the South Central approaches booklet, we quickly find an airport (KLCH) with a PAPI on one end of a runway, and a VASI at the other. (Also note, by the way, that there's more than one type of VASI in use around the world.)

One additional note is that some (usually smaller) airports may have either PAPIs or VASIs consisting of only two lights. Check the Chart Supplement (formerly known as the A/FD) prior to arrival, to avoid confusion or thinking that it's a malfunction.

CFIs

Technique 41: How to Be a Good Instructor

Generally, a flight instructor must first be a good pilot. If you really and truly were (are) a good Private pilot and a good Commercial pilot, you should have no trouble with the flying portion of CFI training. Keep in mind that a good pilot is a knowledgeable pilot. Experience indicates that the typical new Commercial pilot is nowhere close to the required knowledge level of a CFI. So… study! You need to know, not only the right answer, but where it says so. To quote Austin Collins, the former chief pilot of a small airline: "People often tend to believe they understand something when in fact they only grasp the bare, minimal essentials of it. Until you are capable of explaining it clearly and in detail—and *correctly*—to someone else, then you do not truly know it yet…you only know *of* it or *about* it. That's not the same thing, although many people seem to think it is."

So, knowledge and piloting skill are important, right? But, there's another important thing for the CFI applicant: self-evaluation. Are you as good as you think you are, and can you prove it? If you can accurately self-evaluate, you can probably also self-correct. Also, if you can accurately self-evaluate, you can probably accurately evaluate students.

If you plan to work as a CFI (and in particular, a Tech CFI), your attitude needs to be one of *care.* You need to care about the student, the airplane, and the organization. Care about the execution of individual maneuvers—don't just fill squares. Care about training folders. Care about your appearance. Care about trash on the floor. Work like it matters what you do here, because it does. (Note that how much you have been observed *to* care about the program during your own training will affect whether you're selected to instruct here at Tech in the first place.)

In the cockpit, when acting as instructor, you should stop being a good copilot. What do we mean by this rather rude statement? Someday, being a good copilot might be your job. And it is totally natural for the student to be looking to the instructor for the answer, whatever the question is. But right now, you are (supposed to be) attempting to create a competent *single* pilot—a pilot who is ready to solo, ready to fly cross-country alone, and ready to stand on his own two feet on checkride day. Every time one of these milestones approaches, you must force the student into making his own decisions and doing things for himself.

Never forget what it was like to be a Student Pilot. What scared you (back then)? What overwhelmed you? Did your instructor do anything that irritated you? If so, don't be that guy. Empathize with the student. If possible, pre-brief things that may cause stress, such as how the aircraft feels when it's going slow with the nose up in the air, or how busy things can get during arrival to a controlled airport.

Empathy is good. However, you are not Santa Claus. Do not tolerate sluggishness or a lack of effort. Be straight with the student; critiques, by definition, should include good and bad. Certainly, there are times when sympathy is warranted. But think "tough love" most of the time.

Earlier, we mentioned self-evaluation. But objective evaluation of the student is big, as well. Not only objective, but continuous. Certainly, keep things positive, but keep them real, as well. Ensure the student understands that they must eventually meet the standard without input from you. You must understand this too, in order to grade accurately. It is incredibly easy for a check instructor to spot a student whose CFI has been "carrying" him.

Never let a student generate a situation in the cockpit that could get you violated, or from which recovery will be challenging for you. But you *must* let them make mistakes, in order to learn. (See the difference here? If you're "a good copilot," you *prevent* the captain's mistakes in advance, without making a fuss about it.) If the student's mistake a) will not breach flight safety or the FARs, b) will not negatively affect another party's flight operation, c) does not waste too much time, and d) does not cross the boundary of easy recovery (for you), then they should be allowed to make it. When possible, at least let them go far enough to *see* their mistake. (This is called "terminating at desired learning objective," or DLO.)

Of substantial importance is to be a good administrator. (Please see below.) This means several things. Mainly, it means attention to detail in the maintenance of the student's training folder and logbook. (When the FAA comes here for inspection, they don't fly with your student; they look at the training folder.) Additionally, it means watching both Talon/ETA "Minimums" as well as the student's logbook to make sure that requirements are being met. And especially, consider this: What is the biggest event in your student's young professional life? The practical test! It is your responsibility to have your student utterly ready for his checkride, in all areas—flying skills, general knowledge, *and* paperwork.

Big picture? When working with a student, you should be trying as hard as you can to create a pilot with whom you would feel totally safe flying your loved ones around. Because, someday, that could well be the case.

Technique 42: Learning to Land from the Right Seat

1. During your roundout, be aware of any apparent centerline movement. If (when) the centerline "moves," fix the problem through rudder use.
2. Become conscious of how much the cowling is part of your "landing picture." If it (the cowling) is what you're accustomed to looking at, then it's going to look very different from the right seat. Ignoring the cowling and looking toward the departure end of the runway may help.
3. Review the landing techniques mentioned previously and below.
4. Keep your shoulders against the seat back; be conscious of body position. Don't strain to look at the instruments on the pilot's side of the cockpit.
5. Pay attention during taxiing, noting that the centerline has "moved."
6. Look outside (versus chasing needles) during visual maneuvers, such as steep turns, to become aware of how the aircraft's pitch looks from the right seat.

Technique 43: Teaching the Student When to Flare by Using a Horizontal Visual Cutoff Point (See Appendix 5, "The Jacobson Flare")

Note: This technique, along with the visual aids in Appendix 5, derive from a document entitled THE JACOBSON FLARE ®, ©(1987) Revised 1999 (Version jfmr99d) by Captain D.M. Jacobson. CFIs interested in the mathematical formulae that back up this method should see the Chief Instructor for a copy.

Student pilots are often confused as to how to judge the height at which the flare for landing should commence. It can take quite a lot of repetitions for a student pilot to correctly "feel" how high the aircraft is over the ground; in fact, some folks simply *cannot* do it. All experienced CFIs are familiar with students flaring too high, and running out of airspeed while still airborne. Likewise, all CFIs are familiar with students fixating on the aimpoint and failing to flare, risking a propeller strike to the ground, or, at best, experiencing a sizable bounce. Both of these are undesirable, and both may be related to the student's difficulty with height judgment.

The ability to judge height can be, to some degree, removed from the equation. First, the student must be taught to stabilize the approach as to speed, glidepath, and aimpoint. These are critical—being on speed, holding the aimpoint, and flying a reasonable glidepath.

Once aimpoint, glidepath, and airspeed are mastered, select a "cut-off point." This point should be 100' (technically 92', for the Skyhawk) short of the aimpoint. It should be a particular stripe or other visible point on the runway. (It should be specific—like, say, the beginning of a certain stripe prior to the aimpoint.) When this point is passed and is "cut off" from view by the top of the instrument panel, the pilot should begin to flare the aircraft.

To flare the aircraft, the pilot shifts his gaze from the original aimpoint to the center of the departure end of the runway, simultaneous with a smooth, continuous power reduction. These parts, rate of flare and timing the power reduction, will still require some practice, but should be much easier to master, once the "when to start the flare" problem is solved.

Technique 44: "When is my student ready for solo flight?" (Or, "When am I, a Student Pilot, ready for solo flight?")

A Student Pilot is, generally, ready for solo when he or she, *without CFI help*, consistently makes correct control inputs, along with conservative decisions regarding the survival of the pilot(s) and the airplane, especially in the takeoff and landing regimes, to include go around decisions.

To put it melodramatically, the student is ready to solo when both student and instructor are ready to bet the student's life on it, and they are certain they will win the bet. (Or, to put it in risk management terms, they judge that the likelihood of a catastrophic outcome is improbable.)

Students and CFIs should note that our TCO is written to solo the student in the absolute minimum time. This may not be something a particular student can achieve. CFIs already know this, but students should avoid comparisons to their buddies, who may have already soloed. In no case will Tech CFIs yield to any felt pressure from the as to "When am I going to solo?" If such questioning (which may, by the way, be originating from a parent) from a student becomes persistent, refer the student to the Chief Instructor.

Tech students and instructors are blessed with the stage check system, in which a more senior CFI must agree with the assigned instructor that the student is indeed ready to solo.

Technique 45: An Aid to Teaching Aerodynamics

There exists an iPad/iPhone app called Wind Tunnel Free. This app can be very helpful in clearing up fuzzy student concepts about relative wind, angle of attack, wing behavior, and airflow. By drawing a simple airfoil section on the screen (preferably with a stylus, but your finger will work) and switching among "Particles," "Speed," and "Pressure," it can be seen that: a) The wing does indeed accelerate and deflect air particles down, which creates the equal and opposite reaction we call "lift"; b) The pressure is indeed lowered atop the wing; c) If angle of attack is increased too much, airflow separation and stall result; d) The boundary layer can be observed; and e) The effect of flaps can be observed. (Note that the expectation remains that that CFIs are able to explain all of the above on a chalkboard.)

Technique 46: When to Enroll Your Student in the Commercial Course

IAW the SOP, students will *not* be enrolled in the Commercial course until such time as they have passed the Instrument Approaches stage check. This rule was put into place to preclude a particular situation we were observing: Students were dawdling about and not getting their Instrument Rating course done, while, instead, they were flying VFR cross-countries in the Commercial course, for pleasure.

So, we think that policy is valid. But with that said, once the Approaches stage check *is* complete, we think it *is* prudent for most students to proceed on into Stage 1 of the Commercial course, using those sorties to build experience and airmanship, both in the aircraft and in the sim. Once the instructor sees that the student is able to successfully and routinely employ instrument flight skills, he can jump right back to the Instrument course and finish it up. The extra experience should improve the student's performance on the Instrument rating practical test.

This (working well into the Commercial TCO before the Instrument practical) has no downside; we recommend it for virtually every student. The main exception to this advice should be obvious: Students who will not *be* pursuing the Commercial certificate here at Tech should *not* be started in the Commercial TCO. Additionally, if a VA-funded student has not yet registered for PRAV 342, then definitely don't do it.

Technique 47: John's Talon Qualifications and Currencies Guide

Generally, Qualifications for students are required (and recorded) prior to associated events; Currencies are issued afterwards, and may apply to students or instructors.

Events	Qualifications	Currencies
Training Start	Flt course agree DrugPolicyAgree Training Record (Folder) TSA Endorsement 172 Info man rev	Medical (after issuance)
Presolo Stage Check	Solo knowledge (Worksheet, Endorsement)	
Solo	Initial Solo (Endorsement)	90 Day Solo
Night Flight	Night worksheet	Night Currency
Cross-country Stage Check	XC worksheet	
Solo Cross-country	Solo XC (Endorsement)	
Final Stage Check	Ground PVT (Classes, Knowledge Test)	
Checkride Pass		BFR
Private		
NAV/COM Stage Check	BA worksheet NAV/COM (Worksheet)	
Approaches Stage Check	GPS Workshop (Handout) Approaches (Worksheet)	
Cross-country Flights	Ins XC (Worksheet)	
Final Stage Check	Ground INS (Classes, Knowledge Test)	
Checkride Pass		IFR Currency
Instrument		
Maneuvers Stage Check	Com Man (Worksheet)	
Complex Training	Arrow test	
Final Stage Check	Complex endors Ground Com (Classes, Knowledge Test)	
Commercial		
CFI Checkride Pass		CFI
Hired by LA Tech		TSA Training CFI prof check
CFII Checkride Pass		CFII
MEI Checkride Pass		MEI
Instructor		

Technique 48: Spins in the Skyhawk

Spin recovery is required by our Private and Commercial TCOs (Stage 1, Lesson 6, and Stage 2, Lesson 1, respectively). Likewise, IAW 14 CFR 61.183, flight instructor applicants are required to demonstrate proficiency in spin entry and recovery procedures. Prior to conducting any of the above training, the CFI will do a detailed ground review with the student of the spin procedures found in the AMPLIFIED PROCEDURES portion of Section 4 of the *Cessna 172 Information Manual.* Direct reference to the publication is required during the review.

In no case will CFIs demonstrate or allow spins without the required pre-brief. There will be no "Hey, watch this!" spin events. Such would be considered a breech of flight discipline, which is grounds for dismissal.

In no case will a Tech student, regardless of pilot certificates held, practice spins without an instructor aboard. Once again, such would be considered a breech of flight discipline, which is grounds for dismissal.

CFI applicants need to enter and recover from spins beginning with four different conditions: power-off to the left and right, and power-on to the left and right. The order of the practice is up to the PIC.

The airplane must be in the Utility category, as to its weight and balance. Note that this may be impossible for particular pairs of students and instructors. If this is the case, an alternate instructor must be found. The use of Skyhawk N24576 is preferred; this aircraft is kept at a low fuel state for the purpose. However, if 576 is unavailable, any Skyhawk in our fleet is authorized for spin training, provided that its weight and balance puts it in the Utility category. Some planning and coordination with the dispatcher may be needed to achieve a low enough fuel state for a particular aircraft, but no further permission from the Chief Instructor is required. The aircraft's cabin will be clean, and all items secured. A second bungee cord will, if needed, be provided and utilized to assure the security of items. Items within the seatback pockets and side pockets are considered secure.

The minimum cloud ceiling for a spin ride should be 6,000'.

The Skyhawk's low fuel annunciators illuminate at five gallons per side. This should be pre-briefed, to preclude alarm in flight on the part of the student. (Hopefully, most of our students have never otherwise seen the LOW FUEL lights on in flight.) In no case will the aircraft be taken off with either LOW FUEL light illuminated.

Prior to the flight, review, with reference to the drawings in the *Airplane Flying Handbook*, how the entry is going to go. Having the airplane roll over on its back, as it must do during spin entry, is not a familiar sensation to many of us.

Note that, in a spin in a properly loaded Skyhawk, the nose is going to "bury," especially initially. The first turn will usually be a bit sluggish, and during it the nose will appear to be pointing straight down, which is fairly scary. A lot of altitude will be lost in that first turn. After that, the nose may rise slightly, and the turning will accelerate. Up to six turns are authorized. Typically, a three-turn spin is more than adequate to get the point of the maneuver. (The point of the maneuver is drive home the necessity of managing airspeed, angle of attack, and yaw during flight, especially when close to the ground!)

If the pro-spin flight controls are relaxed during that first incipient turn, it is entirely possible that the pilot will find himself 45 degrees (or greater) nose down *and* inverted with the airplane ceasing its rotation. In addition to causing an awfully strange-feeling position and the need for a very unusual attitude recovery, it somewhat defeats the point of the exercise—the pilot has stopped the spin prior to it getting started. If this position occurs, roll the aircraft to find the horizon, while looking "up."

This tendency of the Skyhawk to keep its nose down means that the pilot must firmly hold pro-spin flight control inputs (especially holding the yoke fully aft) until recovery is initiated. Failure to do so may result in a spiral dive, an extremely rapid airspeed buildup, and potential overstress of the airframe during recovery. This is undesirable, and CFIs must be quite vigilant to prevent it.

The rapid acceleration of airspeed during the recovery phase should make it obvious that intentional spin entry will be practiced with the wing flaps retracted.

If you ever become truly disoriented during a spin, check the turn coordinator or rate of turn; it won't lie.

Technique 49: Student Fears and Situational Awareness

How does the CFI overcome the beginning student's natural human fear of what we're doing here (flight training)? We'll get to that here in a bit. First, let us define four kinds of non-normal students—two kinds that aren't afraid, and two who are overly so.

There is the student who is literally afraid of nothing. Such a person is an accident waiting to happen; he will be eliminated from training upon identification.

The second kind of student is unafraid because he lacks threat awareness. Politely, we would pretty much call it a situational awareness (SA) deficiency. This person must be identified and monitored closely. SA can be and is "grown" through experience and proper training; this person *may* turn out to be perfectly fine in the end. Note here that SA has both natural and learned components, as do singing, throwing a baseball, etc. Many good pilots, professional pilots even, were "rocks" during their Student Pilot days; they "caught on" in due time. But, if the individual's "SA start point" is too low, he may be unable to "get there from here," and must be eliminated, even though we may like the student and respect his effort and good intentions. A not uncommon subset of this type of pilot is one who can fly okay and get by well enough in VFR, but really has no hope of making it through instrument training.

Next comes the student who is overly afraid of doing something wrong, and thus refuses to, or cannot, make timely control inputs. History indicates that this student is probably never going to get there. One classic example of this type was an international student who'd never driven a car. This person, who was a strong academic performer, had no concept nor experience of steering *any* vehicle, and was basically petrified of making flight control inputs. In fact, she could hardly be taught to taxi the aircraft, much less fly it with accuracy.

Lastly comes the student who is, consciously or subconsciously, truly afraid of flight in light aircraft. This person probably likes the *idea* of being a pilot, but really does not actually like *flying*. Common symptoms for this type may include: 1) airsickness (while airsickness is not always attributable to fear, it certainly can be an indicator); 2) self-control so rigid during flight that it's patently obvious to the instructor that the student is just barely "holding it together"; 3) extreme slowness in setting up for the slow flight maneuver and/or stalls, due to fear of the aircraft being nose-high; 4) extreme reluctance to roll into enough bank to accomplish steep turns; and 5) during VFR approaches, setting a long aimpoint, lack of airspeed control (too fast), and flaring too high for landing, with all the above happening due to a fear of the ground or fear of the landing maneuver.

Keep in mind that every symptom we just listed (excluding the fearless, reckless first example) can and will be present, somewhere along a continuum, in "normal" students. Determining that the student is (or is not) within the range of "normal" is the CFI's job.

Now, back to the original question, as to how to overcome normal, natural fear. We're proposing to put the student's body into a small aluminum tube and transport it a mile into the air. The tube is kept aloft and powered by unfamiliar and perhaps magical forces. It's not like we're boarding a jet that's bigger than an 18-wheeler, crewed by well-trained, uniformed professionals. No sir, this is *us*, proposing to take this tiny thing up and control it ourselves! It is, or should be, a scary proposition to a normal, thinking human. Even when, intellectually, we know that flight in light aircraft is a routine phenomenon, it still warrants a certain amount of apprehension. The CFI's job here is, by consistently modeling safe and smooth piloting behavior, to repeatedly show the student that, done correctly and within proper constraints, what we're doing is safe and enjoyable. The CFI shows and tells the student *what* to be afraid of, and *when*. Assuming that this—correct demonstration and discussion—is indeed happening, then the normal, thinking human student will pick up on it, lose any excessive apprehension, and be fine.

Technique 50: G1000

Our fleet of fixed gear aircraft are equipped with the Garmin G1000 NXi Integrated Flight Deck. Surely, there are a myriad of possible techniques as to how to best utilize that system.

For this technique, we'll limit ourselves to standardizing some of the basic displays on the G1000. The PFD's HSI view will always be 360°, without any map on it. The standard view on the MFD will be "track up" (not "north up,") except (obviously) when viewing electronic charts. (Reasons for this: 1) Traffic and weather information need to oriented to the current track, in order to make sense, and 2) The Air Force and the airlines do it this way.) The standard temperature will be Celsius.

One very real safety concern is that the volume of information presented on the MFD is potentially quite distracting. Frequently, the CFI may need to be heads-down demonstrating some neat G1000 capability, while the student is likewise heads-down (or under the hood). Who is clearing outside the aircraft in this situation? No one. Once your G1000 cockpit is "set up," the pilot has all the time in the world to look outside—it's great. But training someone *to* set it up is definitely a hazard. *CLEAR VISUALLY AND VIGILANTLY*. Make it a priority.

Also with reference to visual clearing, pilots are cautioned not to become over-reliant on the ADS-B traffic presentation. The system does not necessarily display all aircraft.

VOR

Note regarding these next two Techniques: We are well aware of students and instructors potentially feeling that GPS and modern avionics make VOR navigation, and thus the need to comprehend VOR navigation, obsolete (or even archaic). However, our feeling is that professional pilots must know how to use a VOR. Just because Tech has G1000 equipment does not mean every aircraft you'll be flying after graduation will have it.

Technique 51: Teaching VOR Use to Beginners

1. Stage check and practical test results do indicate a continuing weakness in the area of VOR navigation.

2. Terms: "course" and "radial." Radials are associated with VHF signals; they *radiate*, which means that they go out from the station. There are 360 radials, of which your radio can receive 180 at any given time. When tracking or intercepting a radial inbound to the station, it may simplify your speech and thinking to refer to it as a "course TO the station." (ATC will most likely say "radial inbound" or "radial outbound," instead of "course.")

3. The first steps for VOR use are always: 1) tune the VHF frequency, 2) identify (the station's three-letter Morse code identifier), and 3) monitor the identifier. ("TIM," we'll call it.) This is critical, obviously. If you're not tuned to the correct station, you're out to lunch.

   a. On G1000 equipment, the VOR identifier should present visually, near the frequency. This obviates the need for aural identification.

4. First basic skill: State what radial you are presently on, i.e. your line of position from the VOR. TIM. Center the CDI with a FROM indication; you are, regardless of your heading, on the radial listed in HSI's course select window (or at the top index of the omnibearing selector [OBS], if so equipped). Or, center the CDI with a TO indication; you're on the radial indicated at the tail of the HSI's course select pointer (or at the bottom index of the OBS). (It's the same, one way or the other, but we prefer the former to the latter.) Seeing this should immediately enhance your positional awareness. ("I'm on the 225 radial, so I'm southwest of the VOR station.")

   a. By performing this same action on a second VOR station (preferably on a separate VOR receiver), the intersection of the two radials forms a precise, plot-able position. If the aircraft has radio DME (slaved to the same VOR frequency), that's even better—you can immediately determine your precise position. ("I am 13 DME southwest of the VOR station.") Sadly, DME receivers are no longer common.

5. Second basic skill: Proceed direct to the VOR. TIM. Center the CDI with a TO indication. (For the G1000, simply press and hold the "CRS" knob.) Turn in the shorter direction to match the aircraft's heading to the course selected at the OBS/HSI's top index. This heading will, in a no-wind condition, hold the selected course and lead you directly to the station. Since no-wind conditions rarely exist, establish a correction angle into the wind to stay on course, instead of repeatedly re-centering the CDI, which is "homing."

6. Intercept a particular course to the station. TIM. Set the desired course in the HSI's course select window (or at the top of the OBS), and look for a TO indication. Turn in the shorter direction to a heading 30 to 45 degrees beyond the desired course, in the direction of

CDI deflection. Note that if TO is not displayed with the presently selected course, then you cannot get *to* the station (on a straight line) via that course from your present position.

7. Intercept a particular radial and track it away from the station. TIM. Set the desired course in the HSI's course select window (or at the top of the OBS), and look for a FROM indication. Turn in the shorter direction to a heading 45 degrees beyond the desired course, in the direction of course deviation indicator (CDI) deflection. Note that if FROM is not displayed with the presently selected course, then you cannot intercept it, at least not until you get to the other side of the station.

8. For both '6' and '7' above, if you are presently less than 10 degrees away from the selected course, or if you're very close to the station, then the listed intercept angles may result in an excessively rapid course intercept. So, lessen the intercept angle. (The 30- and 45-degree recommendations are generic.) If you're far away, and want a more rapid intercept, then use a bigger angle, not to exceed 90 degrees.

9. The above list is by no means exhaustive, as to what can be done with the VOR, or what should be understood about VORs. See the next Technique, along with **Appendices 1 and 2**.

Technique 52: VOR Knowledge Test and Answers, by DPE Clifford H. Rice

Explanatory note: This technique, along with Appendices 1 and 2, refers almost exclusively to the use of the old omnibearing selector (OBS) style of VOR indicator, which is installed in only one Tech airplane (and no one ever uses it). Thus, for Tech pilots operating Tech aircraft day-to-day, this is only an academic exercise. However, many aircraft in the world still have OBSs, and a DPE might legitimately expect a CFI applicant to understand it.

Note: The VOR knowledge test and its answers are .PDF files, found separately, as appendices. Before you head over there, here's a bit of explanation on Mr. Rice's "test," which is really a teaching tool, not a test.

In discussing VOR navigation, the FAA's *Instrument Flying Handbook* makes reference to "reverse sensing," while the *Pilot's Handbook of Aeronautical Knowledge* makes reference to "reverse action." As long as pilots remain correctly oriented to the station, and are clear about whether they need to track TO or FROM it, reverse sensing is a non-issue. However, Mr. Rice is known to really dislike the term "reverse sensing." While not incorrect, his reasoning (in his answer regarding reverse sensing) seems somewhat based on semantics.

So, while we can agree that it might've been better to call the phenomenon "*apparent* reverse sensing" (or some other term), we do not agree the author's answer (to his own question) on Question #13 (of his test). The FAA uses the term "reverse sensing," and you are free to use it, as long as it's clearly defined.

Mr. Rice is correct, in this sense—on an old-school OBS, the CDI needle is not malfunctioning (nor even really functioning in reverse) when "reverse sensing" is displayed by the CDI; it is correctly showing the *magnetic direction* to go to intercept the selected course. The usual problem, if the pilot is observing "reverse sensing" on the OBS, is that the pilot has simply put the OBS's course index 180 degrees away from where it should be, based on his intended use of the course selected. (So, don't do this in the first place.)

Visualize this (draw it out, if that helps you): You are in range of a working VOR, and your navigation receiver is on the correct frequency. The aircraft is southwest of the station, and headed north. If you dial in a 360 course, you'll see TO with the CDI needle deflected right, toward 090. If you change the course selected to 180, you'll get FROM. The needle will still point toward 090, but now 090 is to the left side of the instrument's card, while 090 (obviously) remains to the right on the heading indicator. The first case (the 360 course, which is the 180 radial inbound) "makes sense"—you're southwest of the station, in the lower left-hand quadrant. Obviously, the 360 course inbound is over to your right; a right turn to 090° would result in a 90-degree intercept. The second case (with 180 dialed in), though, "looks wrong" and can result in confusion, especially if you're thinking in terms of "left-right." This is an instance of what they mean by "reverse sensing" (regardless of how one feels about the term).

Let's reiterate the scenario. When, from that same starting position (southwest of the station heading north), you dial in 180 on the OBS, you get FROM, but the CDI needle does *still* point toward 090. Your (apparent) problem is that, on the instrument, the CDI is deflected to *your* left, but 090 is to the *right* on your *heading* indicator. This is not really "reverse," it's correct. If you're southwest of the station and you select 180 on the OBS, you are telling the OBS, "I want to intercept the 180 radial." The OBS, via its CDI needle, says, "Fine, fly an easterly heading," and that's what it points to. If you turned the airplane to head south, southeast, or even east, this left-hand deflection would begin to "make sense" (assuming you did indeed wish to track outbound on the 180). But, if you comprehend that the needle is a magnetic direction indicator, not really a left-right turn director, it already does make sense. Think about it—hard.

Two situations do exist in which the OBS must be used somewhat backwards, or in reverse. If you're using an OBS to fly inbound on a localizer back course approach or to fly outbound on a localizer for a course reversal, then the pilot <u>will</u> have to "turn away" from the CDI's deflection to get it to center. This can be rather confusing and, given the rarity of practicing these maneuvers, should definitely be mentioned during the approach briefing. (Safety-wise, we would hope the pilot's first attempt at these maneuvers does not happen while IFR.)

Notwithstanding his "hating on" reverse sensing, we feel Mr. Rice's VOR test is a valid training aid, and so we've have included it here, as **Appendices 1 and 2**. If the reader can "get" where Mr. Rice is coming from, his explanations should prove enlightening.

<u>Appendices</u> (All appendices are separate documents.)

Appendix 1: Check your VOR knowledge test

Appendix 2: VOR knowledge test answers

Appendix 3: G1000 Guide for DPEs and CFIs

Appendix 4: Tie-down Knot Photos

Appendix 5: The Jacobson Flare

Appendix 6: FAA ICAO FPL Quick Guide

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Check your VOR knowledge

By Clifford H. Rice

Answer the following questions using only the information as shown on the above instrument. Note; Use clock terminology to specify the location around the omni rose one would look for the answers. Since the questions are not answered by numbers, numbers around the omni rose are <u>not</u> required to determine the answer.

1. Exactly what information does the To/From indicator provide?
2. Where are the receivable radials?
3. What radial has been selected for use and what is the intended use of that radial?
4. What magnetic course will be tracked when the needle is centered?
5. What heading will be flown in a no wind condition when the needle is centered?
6. Exactly what information does the CDI provide?
7. What magnetic course, if flown, would intercept the selected radial at a 90-degree angle?
8. What heading should be flown to intercept the selected radial at a 45-degree angle?
9. Where are you in relation to the station on the ground?
10. What is the difference between a radial and a bearing?
11. Why is the OBS knob labeled OBS instead of ORS for <u>O</u>mni <u>R</u>adial <u>S</u>elector?
12. What is the proper use of the OBS?
13. What is the meaning of "reverse sensing"?

A bit of information that should be understood before reading the answers to the VOR knowledge test questions.

North-Up vs Track-Up.
The advent of electronic navigation displays has been the root cause of argumentative discussions as to what presentation, North-Up or Track-Up, offers the best situational awareness.

Track-up information was first presented to the pilot when the flat card compass came into being. Shortly there after, VOR indicators evolved so that they too present track-up information. The bottom line, all modern-day electronic navigation displays and the old "steam gauges" (as they are often referred to) that use numbers to presents the pilot with directional information, presents that information as "track-up" only. This method of presenting information becomes a very useful aid by allowing the pilot to quickly understand and use the information being presented.

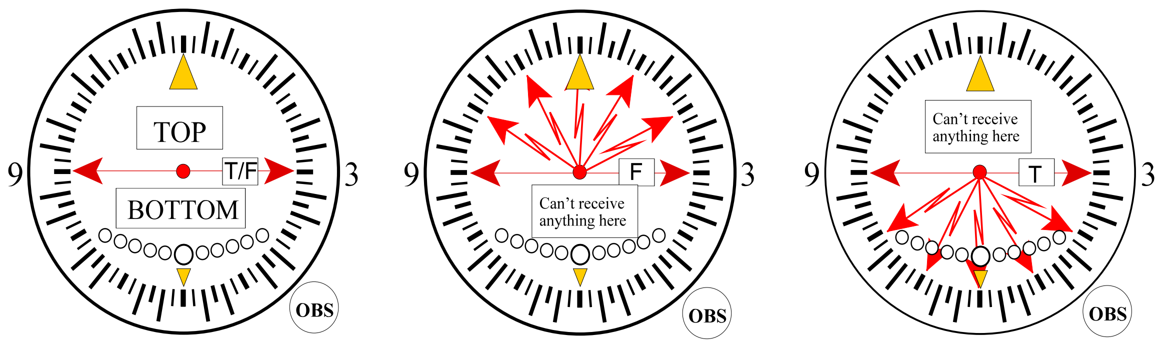
There is no such thing as a North-up navigation display. The people who favor North-up have simply failed to realize that track-up information has been around for years. Only maps and charts are orientated North-up and should be used for flight planning purposes only.

Note that all of the navigation displays below are track-up, the direction the plane is flying is indicated by the number at the top of each display.

1. **Exactly what information does the To/From indicator provide?**
The “To/From” indicator (Ambiguity Meter) divides the VOR indicator in half horizontally thus allowing the pilot to immediately determine what radials are available for use, i.e., receivable.

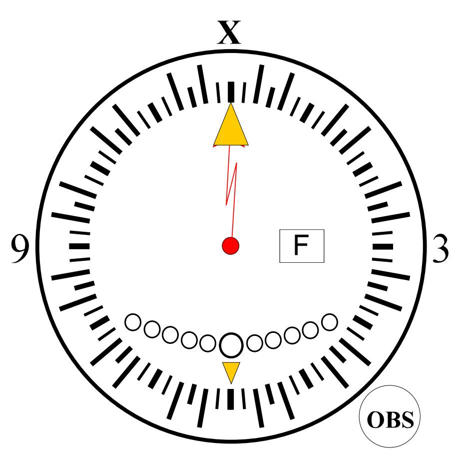
When the “From” is displayed, the receivable radials are located clockwise around the instrument from the 9 o’clock position around to the 3 o’clock position. The receivable radials are in the top half of the VOR indicator.

When the “To” is displayed, the receivable radials are located clockwise around the instrument from the 3 o’clock position around to the 9 o’clock position. The receivable radials are in the bottom half of the VOR indicator.



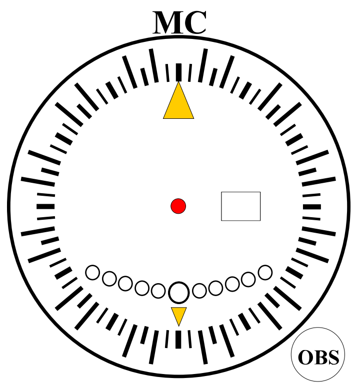
2. **Where are the receivable radials?**
In the top half of the VOR indicator. Somewhere in the radials from the 9 o’clock position clockwise around the top to the 3 o’clock positions.

3. **What radial has been selected for use and what is the intended use of that radial?**
The number at the 12 o’clock position above the top index mark is the radial that has been selected for use. The intent is to track outbound on that radial.



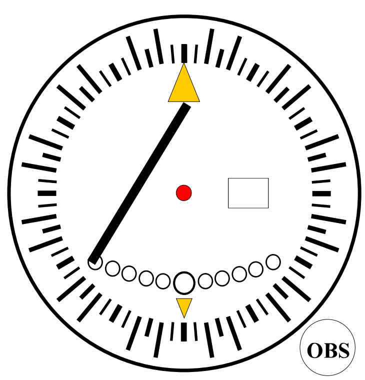
4. **What magnetic course will be tracked when the needle is centered?**
First a word about magnetic courses. All directional numbers on aeronautical charts and maps are magnetic courses. All the numbers around the omni rose that represent radials are magnetic courses. Once the DG has be set to the magnetic compass, all of the numbers on the DG are now magnetic courses. The numbers on runways are rounded off magnetic courses.

What ever number is in the 12 o'clock position above the top index mark is always the MC that is going to be tracked when the needle is centered. This is true regardless of whether tracking *inbound* or *outbound*.



5. **What heading will be flown in a no wind condition when the needle is centered?**
In a no wind condition, a heading and magnetic course will be the same. The answer is what ever number is above the top index mark in the 12 o'clock position.

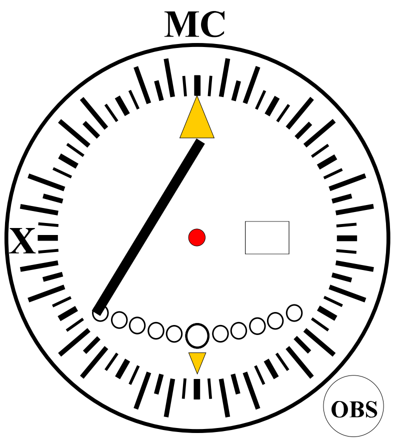
6. **Exactly what information does the CDI provide?**
Without fail, the CDI is a magnetic direction indicator. The needle should always be thought of as a magnetic direction indicator. Whether tracking inbound or outbound, the CDI always indicates the magnetic direction that is necessary to fly in order to intercept the selected radial. The CDI should never be referred to as a "Left" - "Right" needle. The VOR indicator does not have sense enough to tell the pilot whether to turn left or right. The pilot must always look around the DG to find the magnetic direction the VOR is indicating to go, and then turn the shortest way to get there.

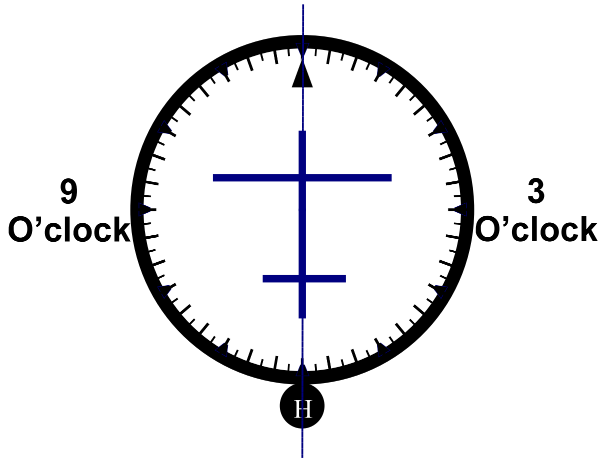


The CDI is always a
Magnetic Direction Indicator

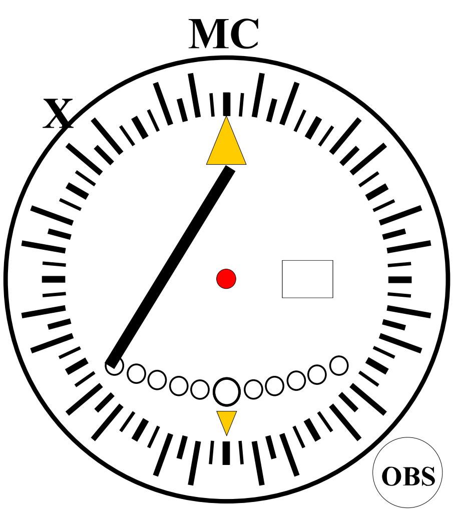
7. **What magnetic course, if flown, would intercept the selected radial at a 90-degree angle?** What ever number is at the 9 o'clock position is also the magnetic course that if flown would intercept the selected radial at a 90° angle. If that number is located on the 9 o'clock side of the DG, turn left to it. Likewise, it that number is located on the 3'oclock side of the DG, turn right to it.

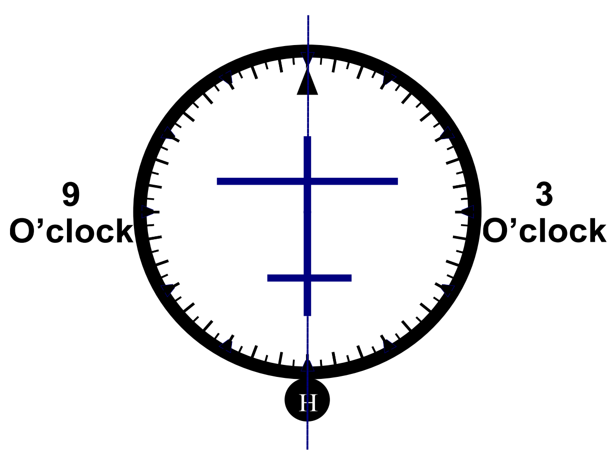
There is no need to have a "To" or "From" indication displayed, the answer is the same regardless of whether intercepting to track inbound or outbound.





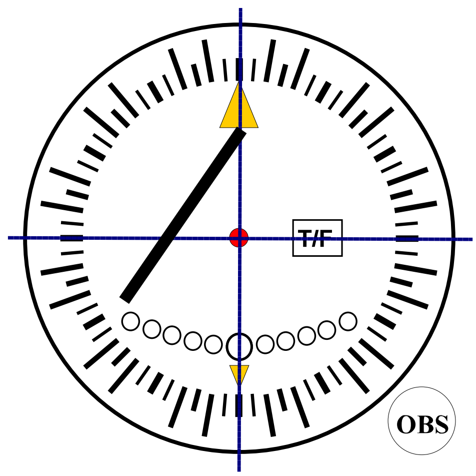
8. **What heading should be flown to intercept the selected radial at a 45-degree angle?** A 45° intercept angle is the industry standard intercept angle used when intercepting radials, bearings, localizes courses, Etc.. The heading to fly will be in the 10:30 o"clock position when the CDI is deflected to the 9 o'clock side or in the 1:30 o'clock position when the CDI is deflected to the 3 o'clock side. Starting with the number in the 12 o"clock position above the top index mark, count 45° in the direction of the deflected needle and fly that heading. If that number is located on the 9 o'clock side of the DG, turn left to it. Likewise, it that number is located on the 3'oclock side of the DG, turn right to it.





Considering the fact both the numbers around the omni rose on the VOR indicator and on the face of the DG are all magnetic courses, the number at the top of the DG must be the same as the number at the top of the VOR indicator except for the intercept angle or wind correction angle. In the real world, there is no case for the indications of two instruments to ever be more than 45° degrees apart.

9. Where are you in relation to the station on the ground?
The ground station should always be thought of as being in the center of the VOR indicator. The To/From indicator divides the VOR indicator in half horizontally and the CDI divides the VOR in half vertically. With the "From" being displayed, you are somewhere in the top half of the VOR indicator. With the CDI deflected to the 9 o'clock position you are somewhere on the 3 o'clock side of the instrument. This places you somewhere amongst the radials that would be displayed in the top right quadrant of the VOR indicator.

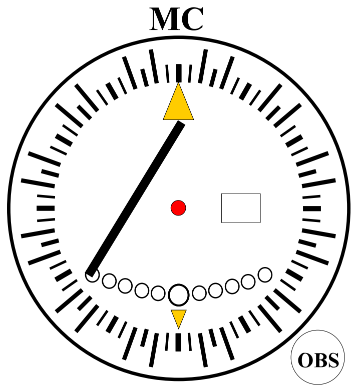


10. What is the difference between a radial and a bearing?
The definition of a bearing is as follows; The horizontal direction to or from any point, usually measured clockwise from true North, Magnetic North, or some other reference point through 360°. The definition of a radial is; A magnetic bearing extending from a VOR/VORTAC/TACAN navigation facility.

As used in aviation for the purposes of navigation, all directional numbers are magnetic courses. Therefore, there is no difference between a radial and a bearing as they are both a MC and both can be tracked inbound or outbound. Basically, the word radial is used to indicate the type of transmitting facility that the signal was generated from.

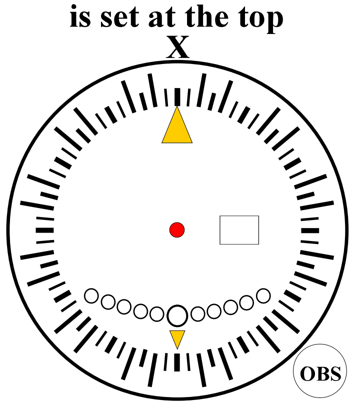
11. Why is the OBS knob labeled OBS instead of ORS for Omni Radial Selector?
The labeling on the knob is correct. As we just learned from the question above, radials and bearings are the same. A radial is a magnetic bearing. During conversation, one could interchange bearings and radials and be correct.

12. **What is the proper use of the OBS?**
First and foremost, when known, the MC that is going to be tracked should be set at the 12 o'clock position above the top index mark. Setting the MC in that position also places the receivable radials in the proper place for either tracking outbound or inbound.

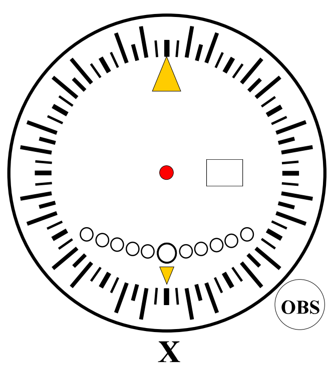


The radial that is going to be tracked outbound is always set at the 12 o'clock position above the top index mark.

Radial to be tracked outbound is set at the top



The radial that is going to be tracked inbound is always set at the 6 o'clock position below the bottom index mark.



Radial to be tracked intbound is set below the bottom index mark

One should never use the word "Tune" when selecting a radial to be used. Being told, or telling someone to "Tune" in the ??? radial does not state whether the radial will be tracked inbound or outbound. Again, the radial that is going to be tracked inbound is always set at the 6 o'clock position below the bottom index mark and the radial that is going to be tracked outbound is always set at the 12 o'clock position above the top index mark.

13. What is the meaning of "reverse sensing"?

Nothing, the term has no meaning, there is no such thing. Electronically, reverse sensing simply does not exist. That term came into being by some incredibly less than smart person who attempted to explain an electronic condition that never existed in the first place. Unfortunately, this term still appears in the current reference material(s) and on written exams in use today.

The CDI is a magnetic direction indicator and always indicates the magnetic direction necessary to fly to intercept the radial that has been selected for use. Again, without fail, the needle always indicates the magnetic direction necessary to fly. If the needle always indicates the magnetic direction to fly, and it does, how can anyone claim that it is reverse sensing? Try this, the next time you use your cell phone, walk around in a circle and note when reverse sensing occurs.

Something to consider when using/teaching the VOR.
Never use the words "Left" and "Right" when speaking about the CDI, instead the direction of deflection by referencing clock positions.

Never use the words "To" or "From". Instead, use the words inbound or outbound. One will never hear ATC to tell a pilot to "tune in the ???? radial. ATC will only tell the pilot what radial or bearing to use and whether to track it inbound or outbound.

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G1000™

guide for designated pilot examiners and certified flight instructors

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Technology, such as that found in the G1000 integrated avionics system has the potential to bring a higher level of safety to general aviation (GA). However, this can only occur if pilots operating aircraft with such equipment are properly trained and held accountable to the Practical Test Standards (PTS). The purpose of this document is to provide both an overview of the typical G1000 potential failure modes and sample system operation/failure mode scenarios that correspond to the applicable sections of FAA-S-8081-4D, Instrument Rating Practical Test Standards, so that the Designated Pilot Examiner (DPE) and Certified Flight Instructor – Instrument (CFII) can properly prepare pilots for the instrument rating by simulating realistic failures and teaching appropriate failure response plans.

The system recommendations provided in this document are Garmin's recommendations only and are superseded by the aircraft manufacturer's recommendations and FAA-approved documentation for each aircraft model. The basic G1000 system architecture is similar across many aircraft models. However, the location of the actual components of the system, the location and grouping of the circuit breakers, and the engine instrumentation presentations vary between aircraft. Therefore, it is important to review the aircraft manufacturer documentation for each aircraft model.

***NOTE:** As part of Garmin's commitment to flight safety, any specific questions or recommendations about both this document and the G1000 system as it is to be used for the instrument check-ride can be sent via e-mail to "**CFI_Tools@garmin.com**". For general questions, please visit "**http://www.garmin.com/support**" to correspond with Garmin's aviation technical support specialists.*

The G1000 integrated avionics system consolidates all communication, navigation, surveillance, primary flight instrumentation, engine indication system and annunciations on two (or three) liquid crystal displays (LCDs) and one (or two) audio panels. All of the components of the G1000 system are line-replaceable units (LRUs). This modular approach allows the various components to be mounted either behind each of the displays, or in remote locations in the aircraft, based upon the needs of the aircraft manufacturer. Figure 1 is a sample system schematic that shows the G1000 components used in a typical single-engine, GA aircraft.

***NOTE:** Autopilot interfaces are not shown, for they vary from aircraft to aircraft.*

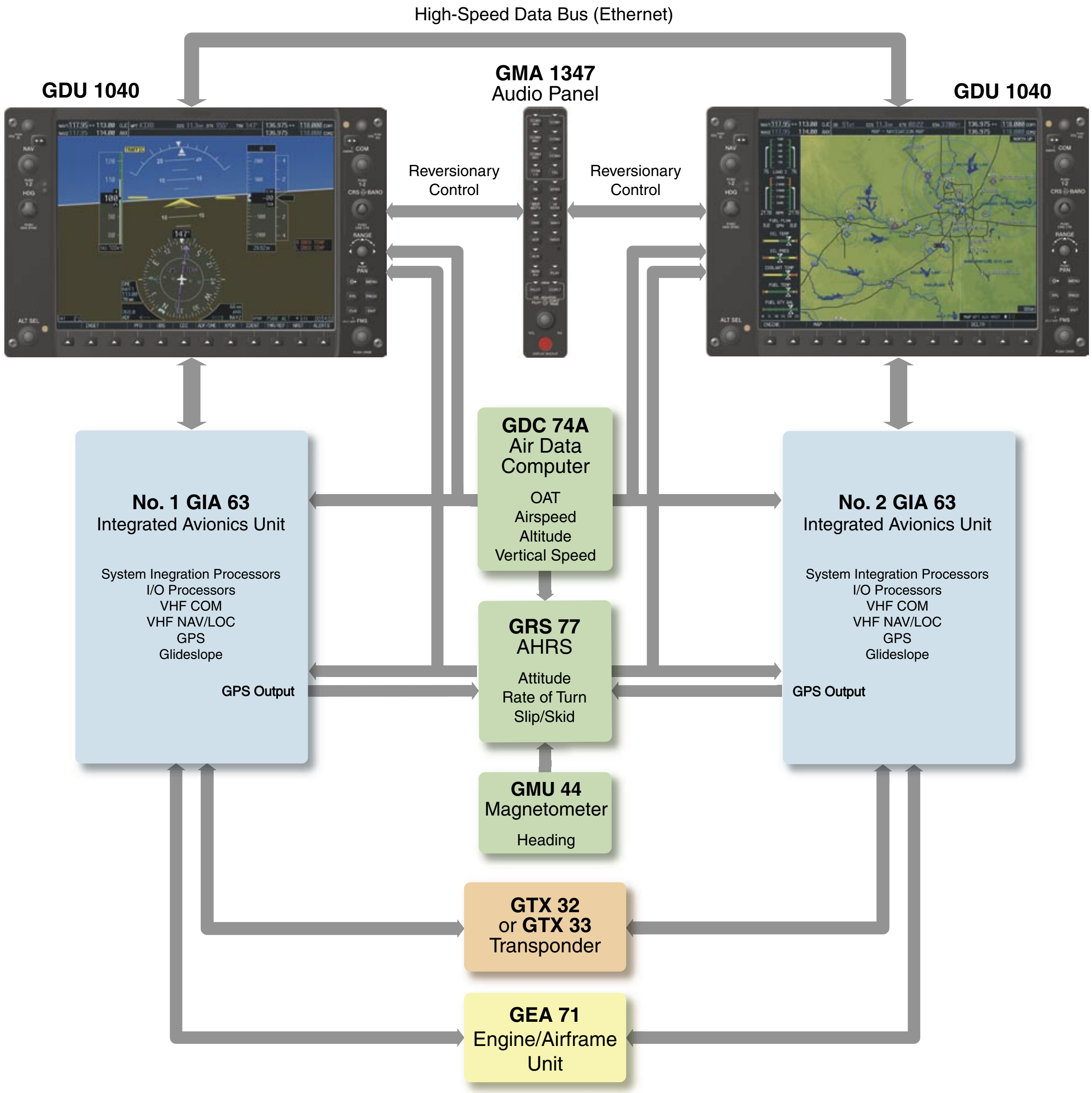

Figure 1 G1000 System

The main components of the G1000 system are the two GDU 1040 displays used for the Primary Flight Display (PFD) and the Multi Function Display (MFD), and the two GIA 63 Integrated Avionics Units (IAUs). These components are interfaced with each other via a proprietary Ethernet-based, high-speed digital databus system. All other components, such as the Attitude and Heading Reference System (AHRS), Air Data Computer (ADC), transponder and Engine/Airframe Interface units, use combinations of RS-232, ARINC 429 and RS-485 interfaces.

GDU 1040

Both GDU 1040 displays are identical in hardware. The aircraft wiring harness determines whether the display functions as a PFD or an MFD (see Figure 2). A configuration module within the PFD connector contains aircraft-specific backup configuration data.

Figure 2 GDU 1040 (PFD Shown)

Failure Mode(s)

If one display fails, the primary flight instruments and Engine Indication System (EIS) are displayed on the remaining screen. No moving map is presented in this mode (see Figure 3). This operating mode is called "reversionary mode" and may be either detected automatically by the system, or initiated manually via the red **DISPLAY BACKUP** button located on the lower portion of the audio panel.

GIA 63

The GIA 63 units serve as the main interface hub for the individual components of the G1000 system. All key components, such as the GRS 77 AHRS, GDC 74A ADC, GTX 33 Mode-S transponder and GEA 71 Engine/Airframe Interface, provide inputs to both GIA 63 units. This allows for a higher level of system redundancy and integrity as data is cross-checked to ensure proper system operation. The only component that is not connected directly to the GIA 63 units is the GMU 44 magnetometer; the latter interfaces directly with the GRS 77 AHRS to provide it with magnetic heading input. The GIA 63 units also contain the communication and navigation radios that include the VOR/LOC/GS and GPS receivers.

Failure Mode(s)

If a GIA 63 unit fails, the associated COM/NAV/GPS receiver data is no longer available and is automatically replaced by the COM/NAV/GPS receiver data from the other GIA 63 unit. The operative GPS receiver automatically takes over any active GPS navigation (without any pilot input). A red "X" appears over the COM/NAV frequencies to indicate GIA 63 failure (see Figure 4) and an alert annunciation appears to the right of the altitude/vertical speed tapes on the PFD. The remaining GIA 63 continues to provide all interface and system integrity functions. If both GIA 63 units fail, the AHRS and ADC continue to provide data directly to the GDU units, although no navigational or communication capabilities are available. Partial failures in the GIA 63 units (such as failure of the COM component) are more likely to occur than full component failures since the COM/NAV/GPS and interface components are all independent inside the GIA 63.

GDC 74A

The GDC 74A is the ADC for the system and receives the standard pitot and static system inputs as well as the outside air temperature (OAT) input. This allows the system to automatically perform most E6B calculations, such as that of density altitude and true airspeed.

Failure Mode(s)

If the GDC 74A fails, the PFD presentations of the airspeed, altitude, vertical speed, OAT and true airspeed (TAS) display a red "X", as shown in Figure 4. In this case, the pilot should refer to the standby altitude and airspeed indicators installed in the aircraft. Certain obstructions of the pitot static system can be verified by cross-checking the associated PFD indications with the standby instruments. These PFD indications should be consistent with the readings found in non-G1000-equipped aircraft (zero airspeed on takeoff, etc.). If the OAT probe fails, a red "X" appears both on the TAS box and the OAT box, and E6B-type calculations should be completed manually. Pressure altitude reporting for the transponder is also lost. That is, the transponder can only work in Mode A and can no longer provide the information necessary for operating in Class C and B airspace.

GRS 77

The GRS 77 AHRS provides attitude and turn-rate presentation on the PFD and is interfaced with the GMU 44 magnetometer. The GMU 44 is a tri-axial magnetometer which allows the system to measure both the horizontal and vertical components of the earth's magnetic field. Both the GRS 77 and GMU 44 are solid-state components that require very little initialization time (less than one minute) and that can initialize while moving during taxi and in flight at bank angles of up to 20 degrees. The GRS 77 AHRS can still operate in the absence of other reference inputs such as those from the GPS receiver, ADC, or magnetometer.

Failure Mode(s)

If the system detects that the GRS 77 is not operating properly when compared to other aircraft sensors, such as the GPS receiver, ADC, or magnetometer, all attitude presentations are removed from the PFD and are replaced with a large, red "X" and the words "Attitude Fail" (see Figure 4). Failure indications are designed to be displayed before any hazardous or misleading information (HMI) is presented to the pilot. This represents a significant improvement over conventional mechanical gyro systems. If the GMU 44 fails, only the stabilized heading data is lost.

GTX 33/GTX 32

The GTX 33 Mode-S and GTX 32 Mode-C transponders provide the ground radar surveillance capability to the G1000 system. Both transponders are solid-state units and require no warm-up time. As installed in most aircraft, these units transition to an ALT reporting mode at a ground speed of 30 kt. This is designed to minimize pilot workload when at the threshold of the runway. Proper operation can be verified by looking at the transponder box on the PFD and ensuring that the appropriate mode is displayed in green and that an "R" indication appears, indicating that the system is being interrogated. Typically, only one Mode-S or Mode-C transponder is installed per aircraft. The GTX 33 Mode-S transponder also receives and presents (if selected) airborne traffic, using the FAA-provided TIS (Traffic Information Service) system.

***NOTE:** For more information on TIS, refer to "http://www.tc.faa.gov/act310/projects/modes/tis.htm".*

Failure Mode(s)

If the transponder fails, a red "X" appears over the transponder box of the PFD (see Figure 4) and an advisory message appears.

GEA 71

The GEA 71 Engine/Airframe Interface is the main processing unit for all engine instrumentation data, which includes manifold pressure, RPM, oil temperature/pressure, electrical system, exhaust gas temperature (EGT), cylinder head temperature (CHT), fuel and vacuum system—the latter depending upon the aircraft. The EIS can also contain annunciations such as those associated with doors and canopies.

Failure Mode(s)

If the GEA 71 fails, all engine/airframe data is lost. However, a much more likely scenario would be one in which the EGT/CHT probes would fail, or in which other engine/airframe sensors would become inoperative. Those items would display a red "X" to indicate this type of failure (see Figure 4). EIS-related advisories may also appear, depending upon the aircraft.

GMA 1347

The GMA 1347 is a solid-state digital audio panel that integrates NAV/COM audio, intercom system and marker beacon. The unit operation is conventional when compared to that of other audio panels. Pressing the COM/MIC buttons selects the COM radio to be used for both transmitting and receiving communications. Pressing the COM button only allows the selected COM radio to be monitored. Pressing a NAV button activates/deactivates the audio for the corresponding NAV radio. The intercom controls are located on the lower portion of the audio panel; the small knob controls pilot volume and the large knob controls copilot and passenger volume. The audio panel is auto-squelch enabled and also has clearance recorder capability. The reversionary mode (**DISPLAY BACKUP**) button for the GDU 1040 displays is located on the lower portion of the GMA 1347.

Failure Mode(s)

In the event of failure, the GMA 1347 has an analog emergency mode that automatically connects the pilot to COM1. This allows the pilot to retain communication capabilities over one COM radio, even though the audio panel/intercom system has become inoperative.

Figure 3 Reversionary Mode

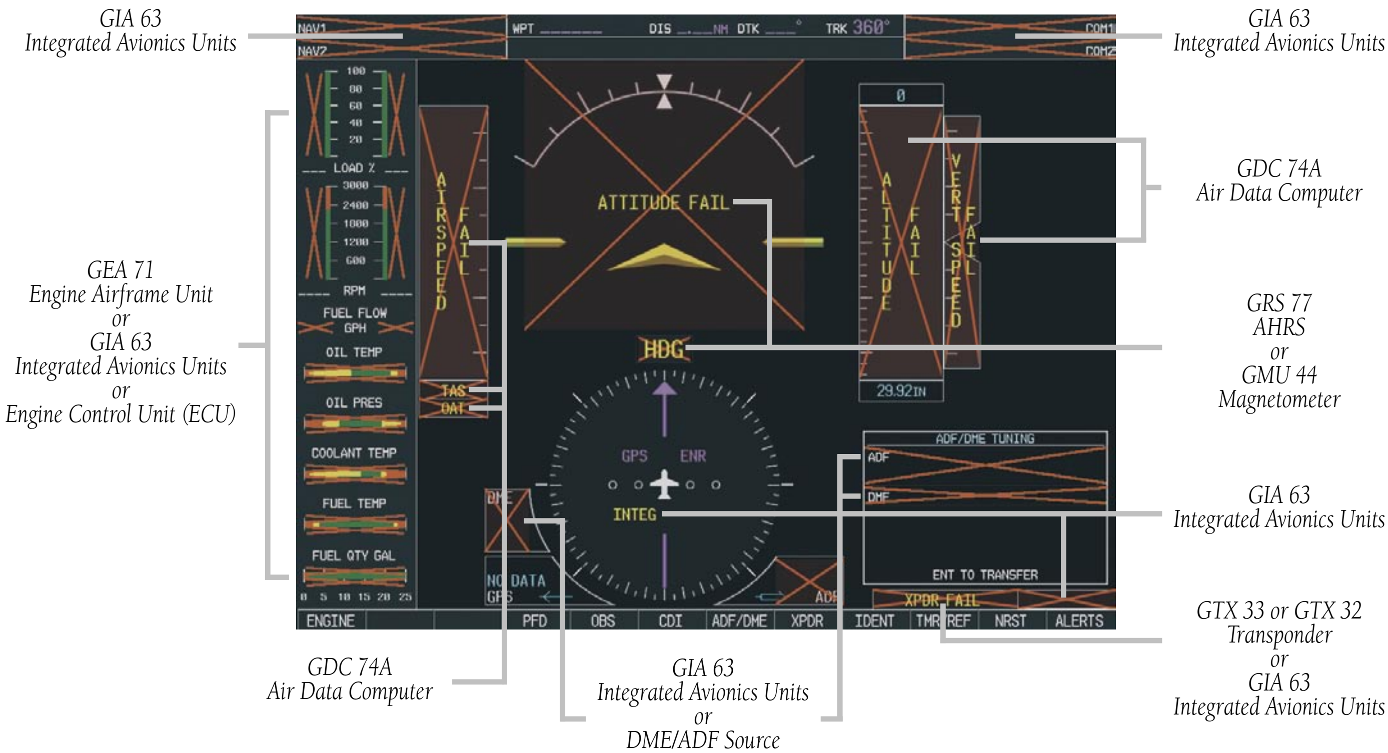

Figure 4 G1000 System Failure Indications

The G1000 system allows for realistic failures to be simulated safely and does not require a substantial change to the administration of the practical examination. Aircraft system knowledge is still important in order to both understand the various failure modes and take appropriate corrective action.

***NOTE:** Recommendations from individual aircraft manufacturers supersede any guidance provided in this document. Detailed system data can be obtained from the aircraft Pilot Operating Handbook (POH) and/or Aircraft Flight Manual Supplement (AFMS).*

With the emphasis on Single Pilot Resource Management (SRM), Aeronautical Decision Making (ADM) and Risk Management (RM), certain operational aspects of the G1000 system should be evaluated. These aspects are covered in FAA-S-8081-4D under the "Special Emphasis Areas" in the categories of collision avoidance, controlled flight into terrain (CFIT), ADM and RM, and include the following items:

- Use of and knowledge in the operation and limitations of the terrain awareness system that is part of the G1000 system.
- Use of and knowledge in the operation and limitations of TIS traffic awareness in aircraft equipped with a GTX 33 Mode-S transponder.
- Use of weather-related systems, such as either lightning detection devices or the Garmin GDL-69/69A weather datalink receivers.

Approaches with vertical guidance (APVs) are mentioned in the section concerning the "Aircraft and Equipment Required for the Practical Test". APVs can be ILS-like in their lateral and vertical navigation cues, yet the associated minimums are not sufficient for these approaches to be considered precision approaches, hence their being used only for the non-precision approach requirement. APVs require a TSO C-146 GPS/WAAS navigator, which should be available for the G1000 system sometime in 2005.

***NOTE:** Please refer to the Aeronautical Information Manual (AIM) for more information on the Wide Area Augmentation System (WAAS) and APVs.*

Currently, all aircraft with the G1000 integrated avionics suite are also equipped with an attitude indicator, an altimeter and an airspeed indicator as standby or backup instruments. This is a departure from the mantra "altitude, airspeed, and needle and ball." The main advantage to using a standby attitude indicator is the ability to control the aircraft by providing a direct indication of pitch and bank. With no yaw indication in the event of an AHRS failure, the applicant should be evaluated on the ability to maintain positive control, as well as on prudent aircraft maneuvering, when compensating for the lack of yaw information. Within the turbine community, it has been the practice for years to use only an attitude indicator for backup pitch and bank information without reference to yaw. By all accounts, this practice has shown good results.

In the same section, the applicant is required to demonstrate the ability to utilize an autopilot and/or flight management system (FMS). In the G1000 system, the FMS functions are very similar to those used in the Garmin 400/500 series units. This should help pilots familiar with these units make the transition to the G1000 system. The FMS functionality includes the process of creating a flight plan, direct-to navigation and selecting, loading and activating an approach procedure. Autopilot operation is dependent upon the make and model of the autopilot installed and is only covered in this document in reference to the operational modes consistent with those listed in "Designee Update, Special Edition on Testing in Technologically Advanced Aircraft" by the AFS-600 (the FAA Regulatory Support Division).

Normal preflight practices still apply in the various Areas of Operation. This includes knowledge of aircraft systems, flight instruments and navigation equipment as well as the instrument cockpit check. However, the PTS diverge in the Areas of Operation IV and VII-D. The following subsections help provide guidance as to the method with which to evaluate and simulate system failures.

AREAS OF OPERATION SECTION IV: RECOMMENDATIONS FOR FAILURE SIMULATION

The tasks listed in this section cover flight by reference to instruments. According to the PTS, the examiner is expected to evaluate the applicant's use of the backup instruments with both a full panel and a partial panel. In the case of the G1000-equipped aircraft, failures can be simulated in two ways. The preferred method is to use the dimming controls on the G1000 system combined with the reversionary mode button on the lower portion of the GMA 1347 audio panel. The other, less desirable method consists of pulling various circuit breakers.

***NOTE:** It is important to follow the aircraft manufacturer's recommendations for failure simulation, for they supersede any guidance provided in this document.*

Using the dimming controls and the reversionary mode is straightforward.

To dim the displays:

1. Press the **MENU** key on the PFD (while no other data windows are active) to display the Setup Menu window.
2. Turn the large **FMS** knob to select the display to be dimmed ('PFD DSPL' or 'MFD DSPL').
3. Turn the small **FMS** knob to switch dimming from 'AUTO' to 'MANUAL' mode and press the **ENT** key.
4. Turn the small **FMS** knob counterclockwise to decrease the display brightness.

To put the displays in reversionary mode:

1. Press the **DISPLAY BACKUP** button located at the bottom of the GMA 1347 audio panel.

The following table shows typical configurations using the display dimming function to simulate failures.

Failure to Be Simulated	Examiner Action	Applicant Action
Loss of primary flight instruments on the PFD (AHRS, ADC failure)	Dim PFD.	Control the aircraft by reference to the backup attitude, altitude and airspeed indicators.
Complete loss of PFD	Dim PFD.	Manually initiate reversionary mode and control aircraft via reversionary mode presentation on the MFD.
Loss of MFD	Dim MFD.	Manually initiate reversionary mode and control aircraft via reversionary mode presentation on the PFD.

***NOTE:** Appropriate use of the autopilot should be observed to reduce pilot workload and maintain positive control of the aircraft. It is important to verbally quiz the applicant on the operation of the autopilot based upon the data presented in the table associated with the use of pulling circuit breakers (see following page).*

The following table gives recommendations on simulating various partial panel configurations by pulling circuit breakers.

***NOTE:** Due to the differences in autopilot interfaces, the recommendations for autopilot engagement are generic and may not be suitable for all aircraft.*

Failure to Be Simulated	Examiner Action	Applicant Action
Loss of AHRS and ADC* (simulates loss of all primary flight instruments)	Pull AHRS and ADC circuit breakers.	Control the aircraft by reference to the backup attitude, altitude and airspeed indicators; engage the autopilot if it is rate-based and has its own gyro source in roll mode.
Loss of AHRS (attitude and heading)	Pull AHRS circuit breaker.	Control the aircraft by reference to the backup attitude indicator; engage the autopilot if it is rate-based and has its own gyro source in roll mode.
Loss of ADC (airspeed, altitude and vertical speed)*	Pull ADC circuit breaker.	Control the aircraft by reference to the PFD attitude presentation and the backup airspeed and altitude indicators; engage the autopilot in roll, HDG, or NAV mode.
Loss of PFD	Pull PFD circuit breakers. This action prevents the tuning of the COM 1/NAV 1 frequencies; COM 2 must be tuned to the proper frequency and must be in use.	Control the aircraft by reference to the MFD in reversionary mode (this mode also removes all moving map presentations).

***NOTE:** * When the ADC has failed, pressure altitude data is no longer available to the transponder. As a result, the transponder loses its Mode C (i.e., altitude reporting) capability. Therefore, without the required coordination with the appropriate air traffic control facility, failing the ADC should be avoided in Class B and C airspaces, or within the Mode C veil of Class B airspace.*

AREAS OF OPERATION SECTION IV: RECOMMENDATIONS FOR FAILURE SIMULATION (Cessna Nav III)

Cessna does not recommend pulling circuit breakers as a means of simulating failures on the Garmin G1000. Pulling circuit breakers—or using them as switches—has the potential to weaken the circuit breaker to a point at which it may not perform its intended function. Using circuit breakers as switches is also discouraged in Advisory Circulars 120-80, 23-17B, and 43.13-1B. Additionally, a circuit breaker may be powering other equipment (such as avionics cooling fans) that could affect the safe operation of other equipment.

Failure to Be Simulated	Examiner Action	Applicant Action
Loss of AHRS and ADC* (simulates the loss of all primary flight instruments)	Press the **MENU** key on the PFD. AUTO is highlighted in the PFD DSPL field. If AUTO is not highlighted, activate the cursor by pressing the small **FMS** knob. Turn the large **FMS** knob to move the cursor to the AUTO field. Turn the small **FMS** knob, select 'MANUAL' from the Setup Menu window and press the **ENT** key. The cursor moves to the backlighting percentage field. Turn the small **FMS** knob counterclockwise; adjust the backlighting value to the lowest value (0.14%).	Control the aircraft by reference to the backup attitude, altitude and airspeed indicators; engage the autopilot in roll mode.
Loss of PFD	Press the **DISPLAY BACKUP** button on the lower portion of the audio panel. Press the **MENU** key on the MFD and use the method described above to dim the PFD.	Control the aircraft by reference to the MFD in reversionary mode (this mode also removes all moving map presentations).
Loss of MFD	Press the **DISPLAY BACKUP** button on the lower portion of the audio panel. Press the **MENU** key on the MFD. Use the large **FMS** knob to move the cursor to the AUTO field adjacent to the MFD DSPL field. Use the procedures above to dim the MFD.	Control the aircraft by reference to the PFD in reversionary mode (this mode also removes all moving map presentations).

***NOTE:** * The simulated loss of AHRS and ADC cannot be accomplished individually in the Cessna Nav III aircraft. In this case, the applicant must simulate navigation on a desired course during en-route or approach operations by using the moving map display. In order to determine more precisely the horizontal distance from the desired active leg, the applicant or the examiner may select the cross-track (XTK) data bar field option on the MFD.*

AREA OF OPERATION SECTION VII, D: RECOMMENDATIONS FOR FAILURE SIMULATION

According to the PTS, this area only applies both to Task D and unless weather and other circumstances dictate that a precision approach be used. The table presented on the previous page can be used to create a realistic scenario. As noted in the "Designee Update, Special Edition on Testing in Technologically Advanced Aircraft" by the AFS-600 (the FAA Regulatory Support Division), appropriate use of the autopilot should be evaluated either via verbal questioning or, in the case of an AHRS failure, via actual demonstration by the applicant.

***NOTE:** The use of the autopilot during an AHRS failure typically limits the autopilot to operation in roll mode.*

A

B

C

D

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W

Garmin International, Inc.
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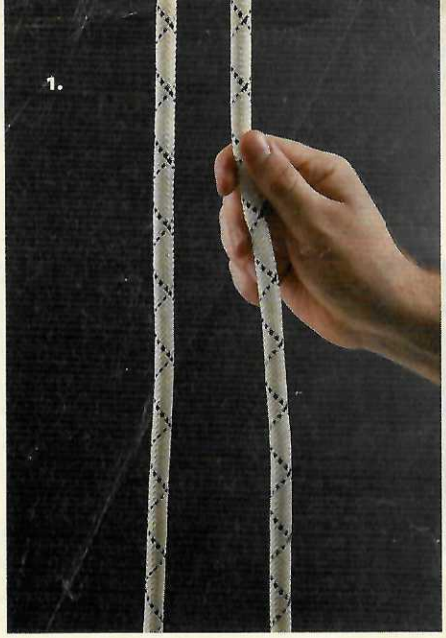
190-00368-02 Rev. A

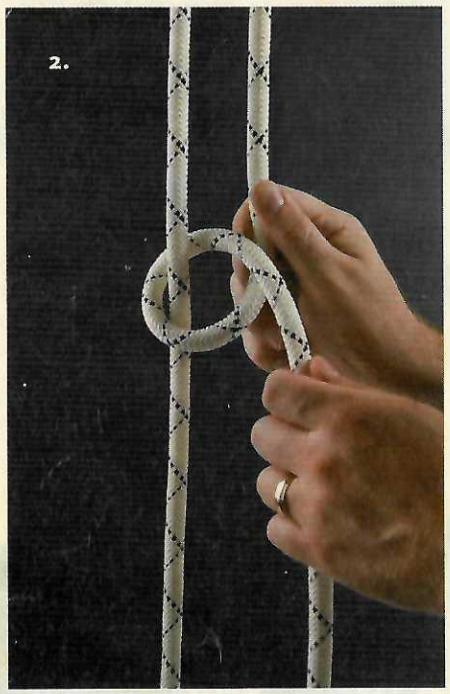
Techniques
Appendix 4

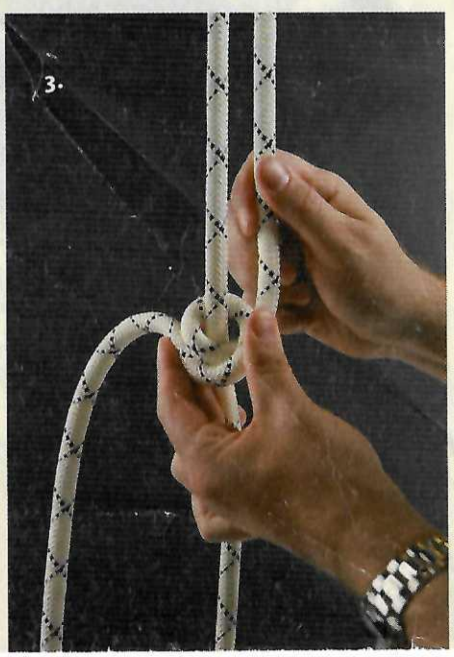
TIEDOWN KNOT. It's said that the proper airplane tiedown knot is a double locking hitch, but not everyone in the knot world is on board with that description. Whatever the name, the technique is universal.

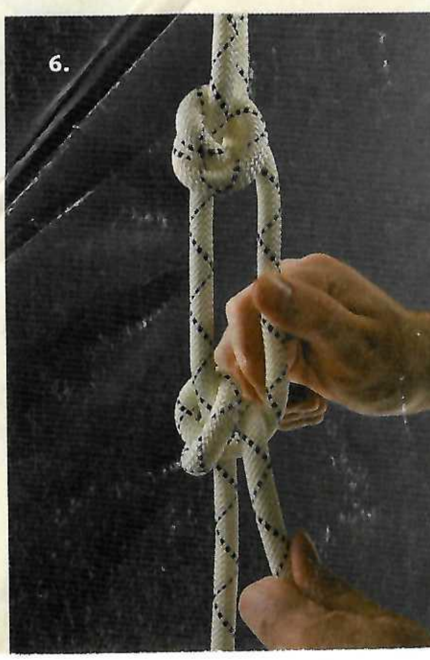
You'll need to start with a rope long enough that you're left with at least three feet of slack after it's been fed through the tiedown ring. From there, place the slack over the taught line, then back up through the opening. Then gently pull. Repeat this step, but this time guide the line between the first knot and the slack side. Now pull hard and the rope should "lock" in place. Repeat farther down the line.

Ian J. Twombly is editor of *Flight Training* magazine.







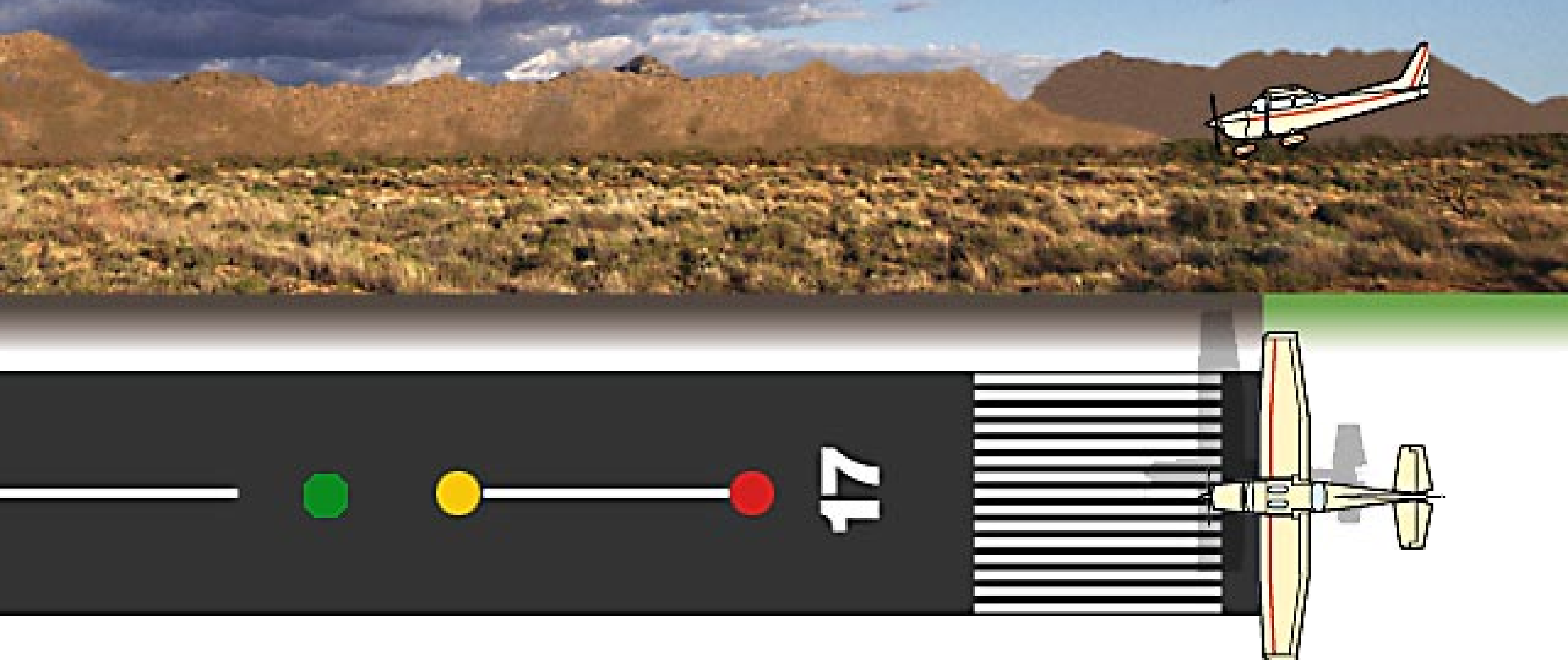


SPEND THE TIME to learn and execute the proper tiedown knot.
1. Place rope through tie-down ring creating two equal lengths.
2. Cross end over one end of the rope.
3. Tuck end through to form an overhand knot.
4. Cross end over again.
5. And tuck to make second overhand knot.
6. Tighten.

Landing techniques:

Introducing the

"Jacobson Flare"



Existing techniques

Speed descent technique

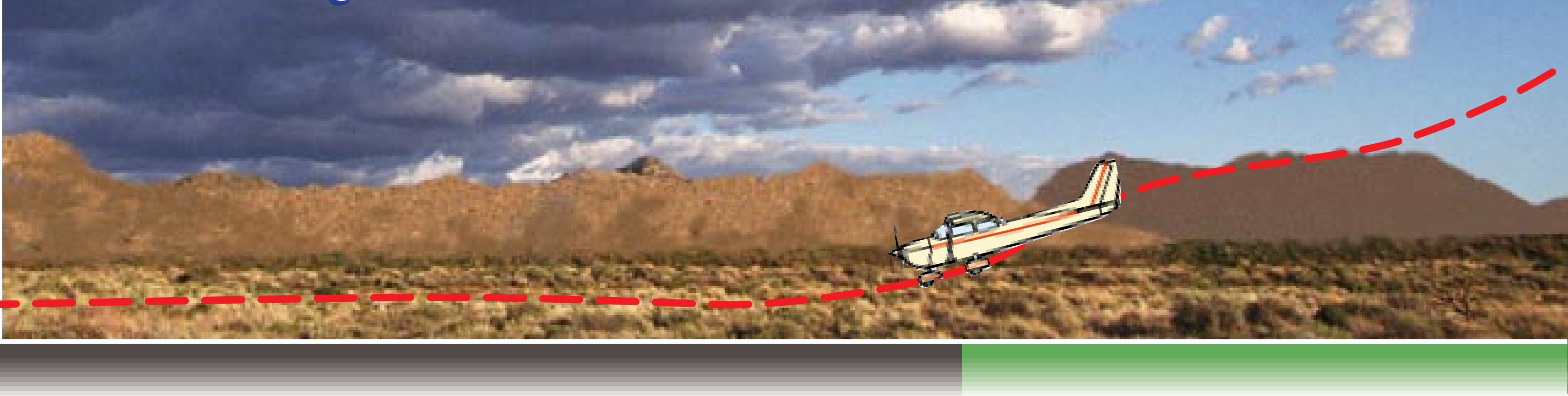
- airspeed controlled by elevators

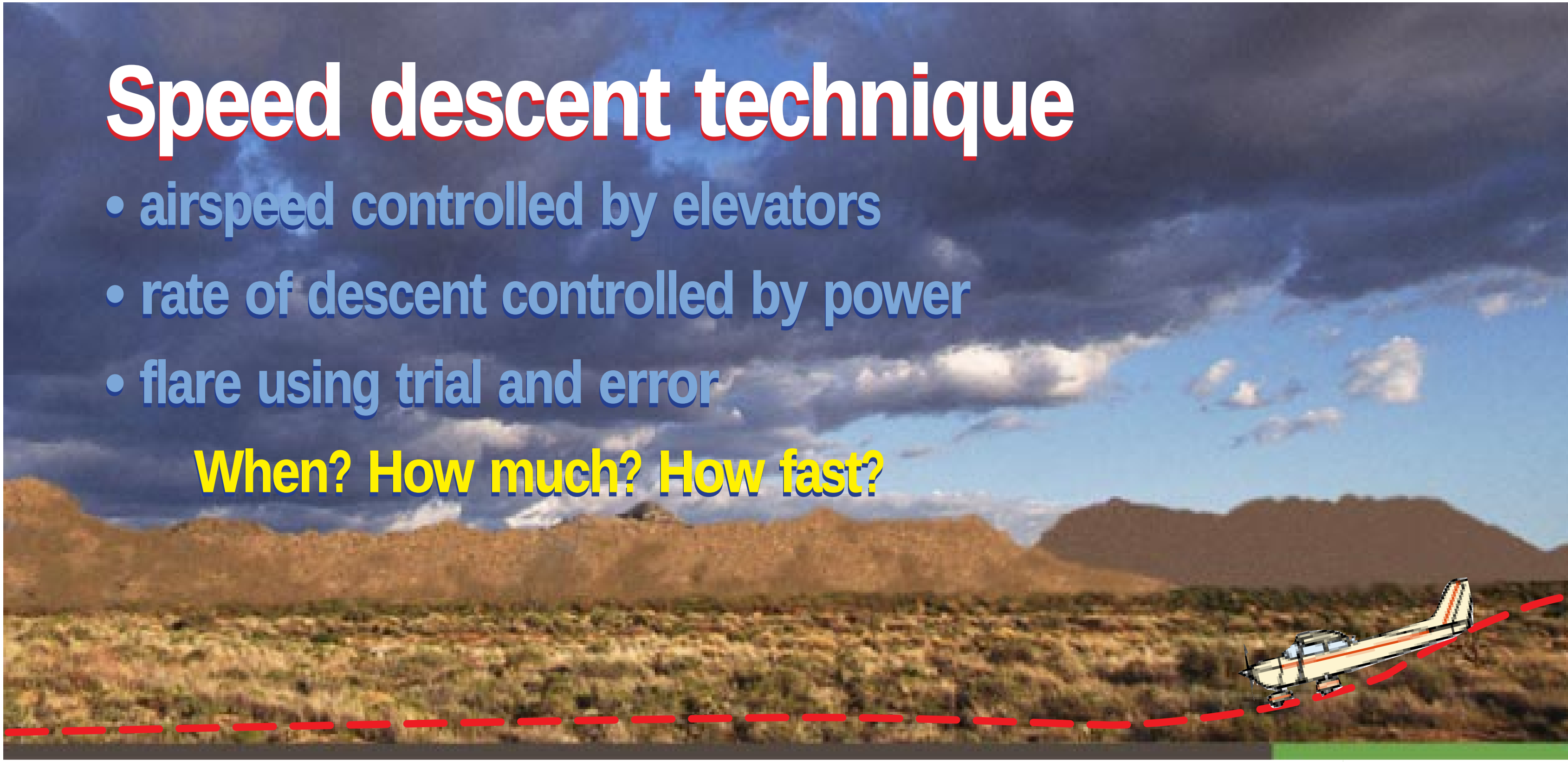
Speed descent technique

- airspeed controlled by elevators
- rate of descent controlled by power

Speed descent technique

- airspeed controlled by elevators
- rate of descent controlled by power
- flare using trial and error

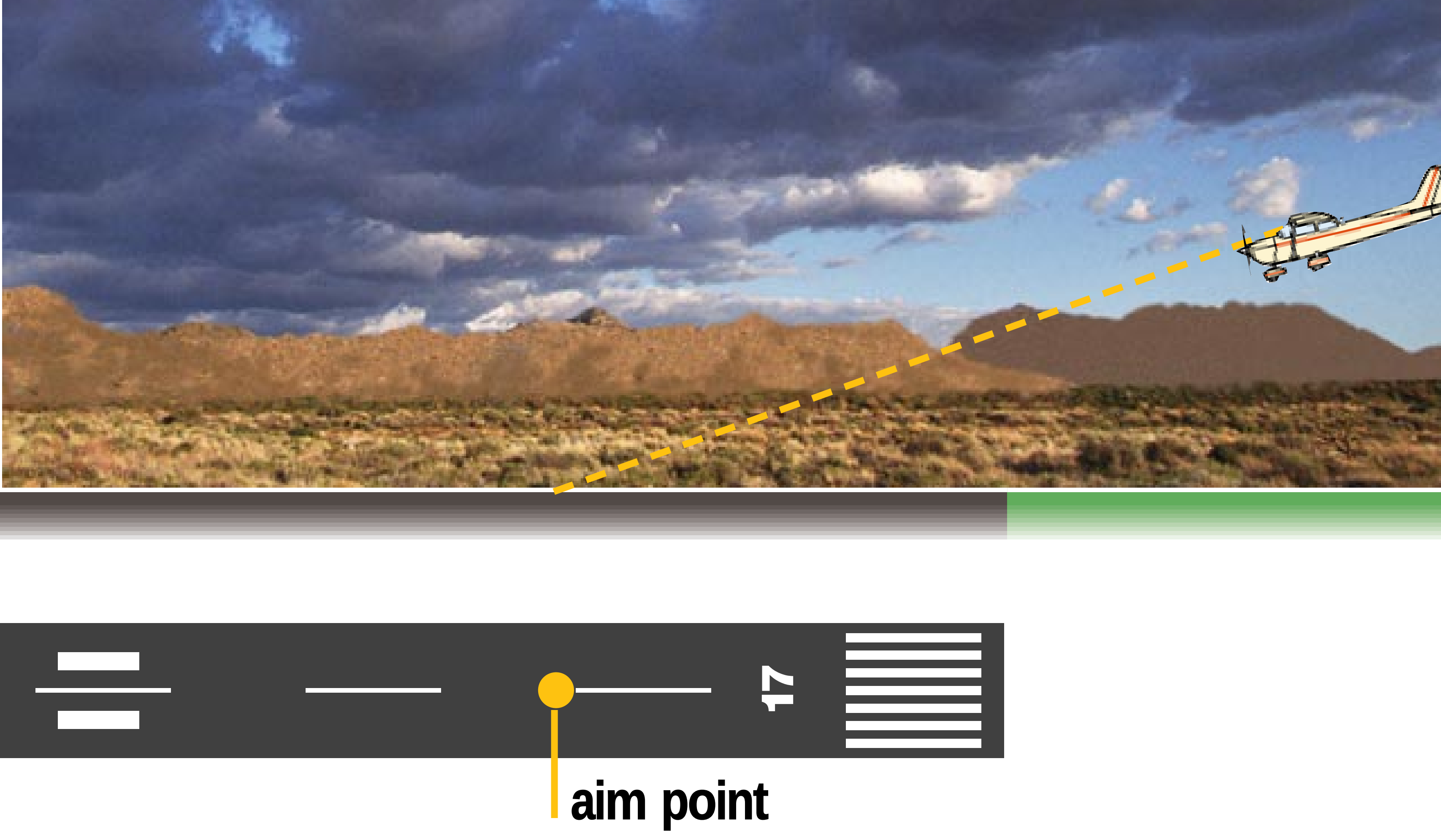



Speed descent technique
• airspeed controlled by elevators
• rate of descent controlled by power
• flare using trial and error
When? How much? How fast?

The
"Jacobson Flare"

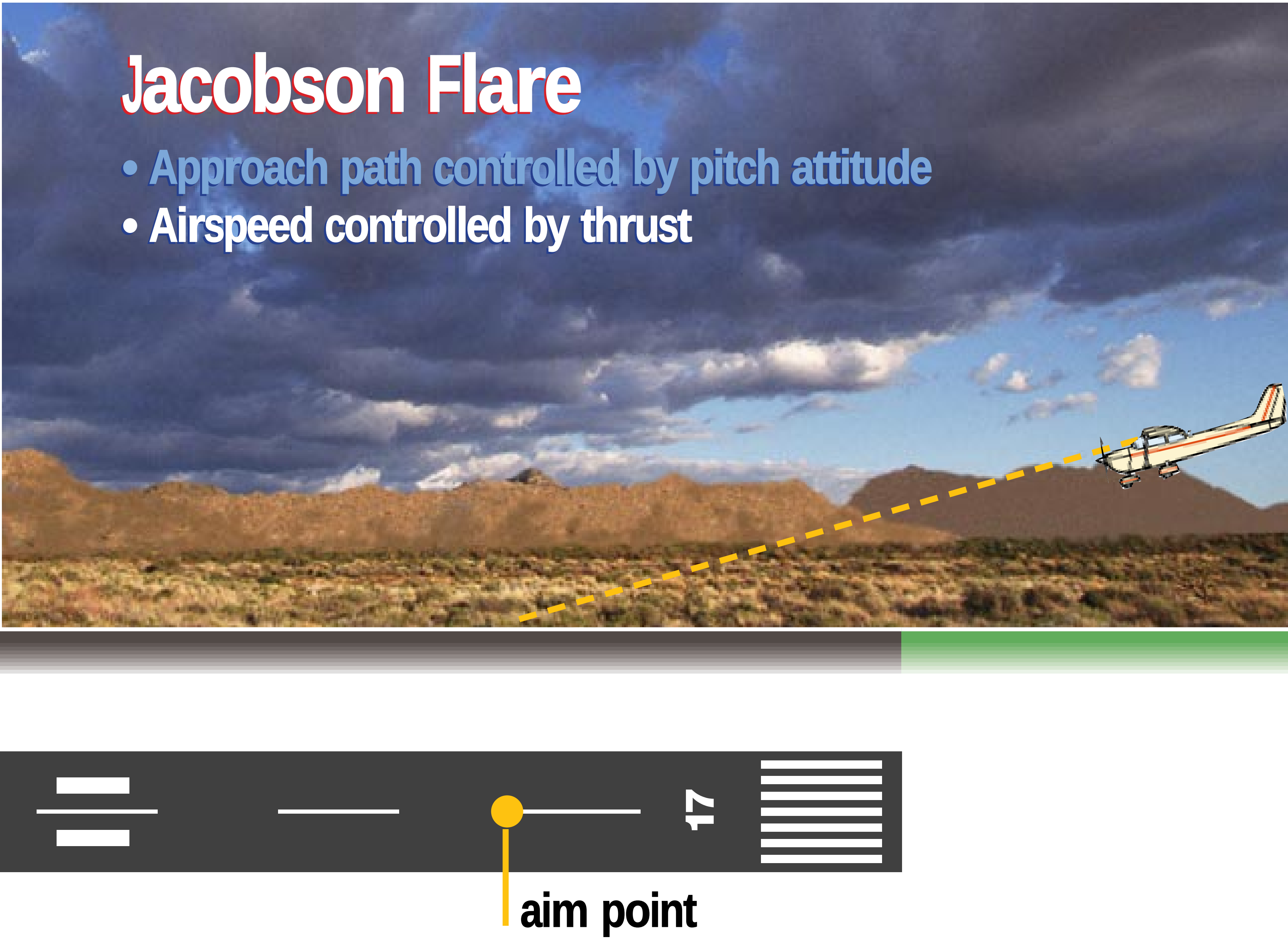
Jacobson Flare

- Approach path controlled by pitch attitude



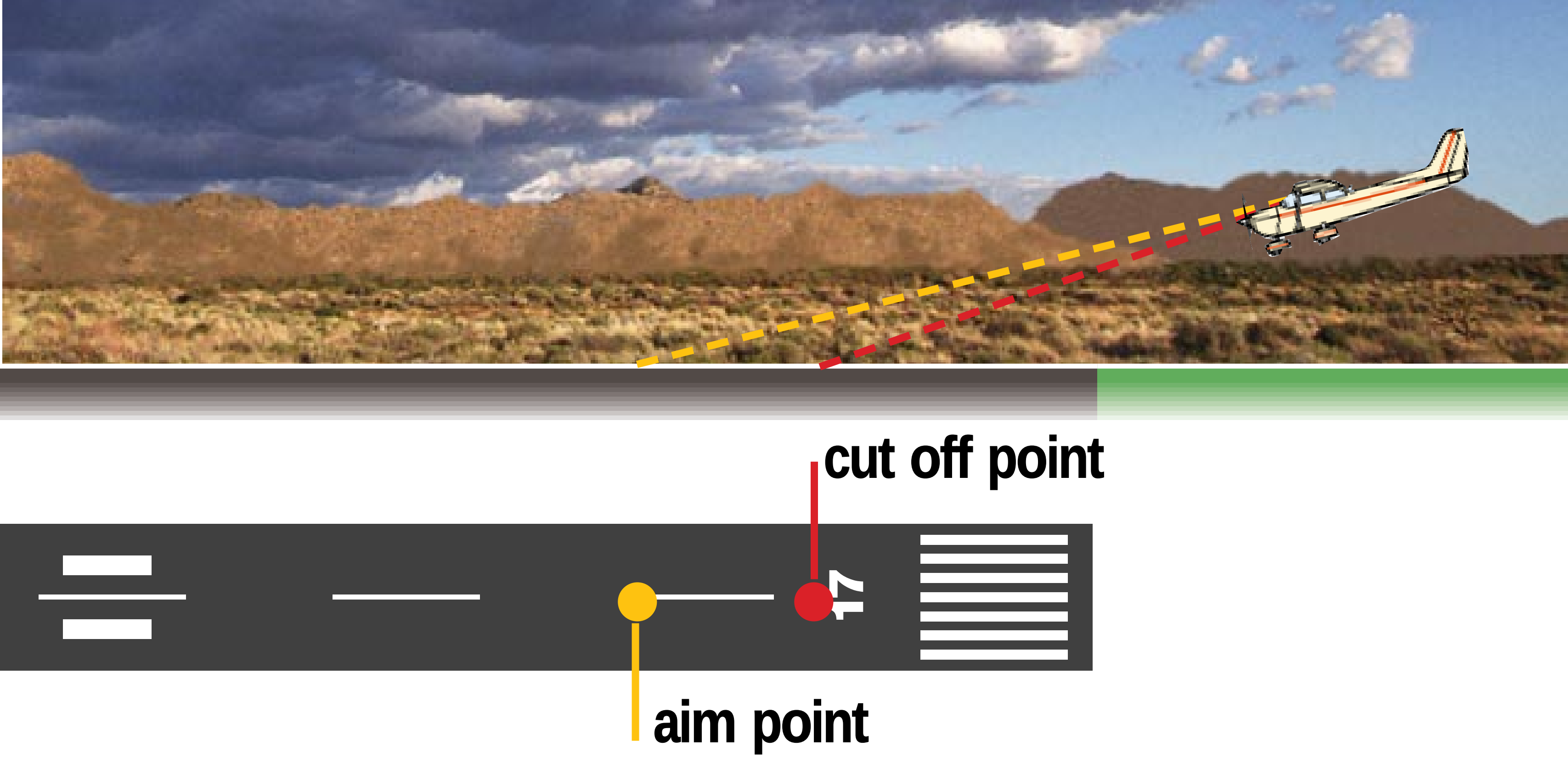
Jacobson Flare

- Approach path controlled by pitch attitude
- Airspeed controlled by thrust



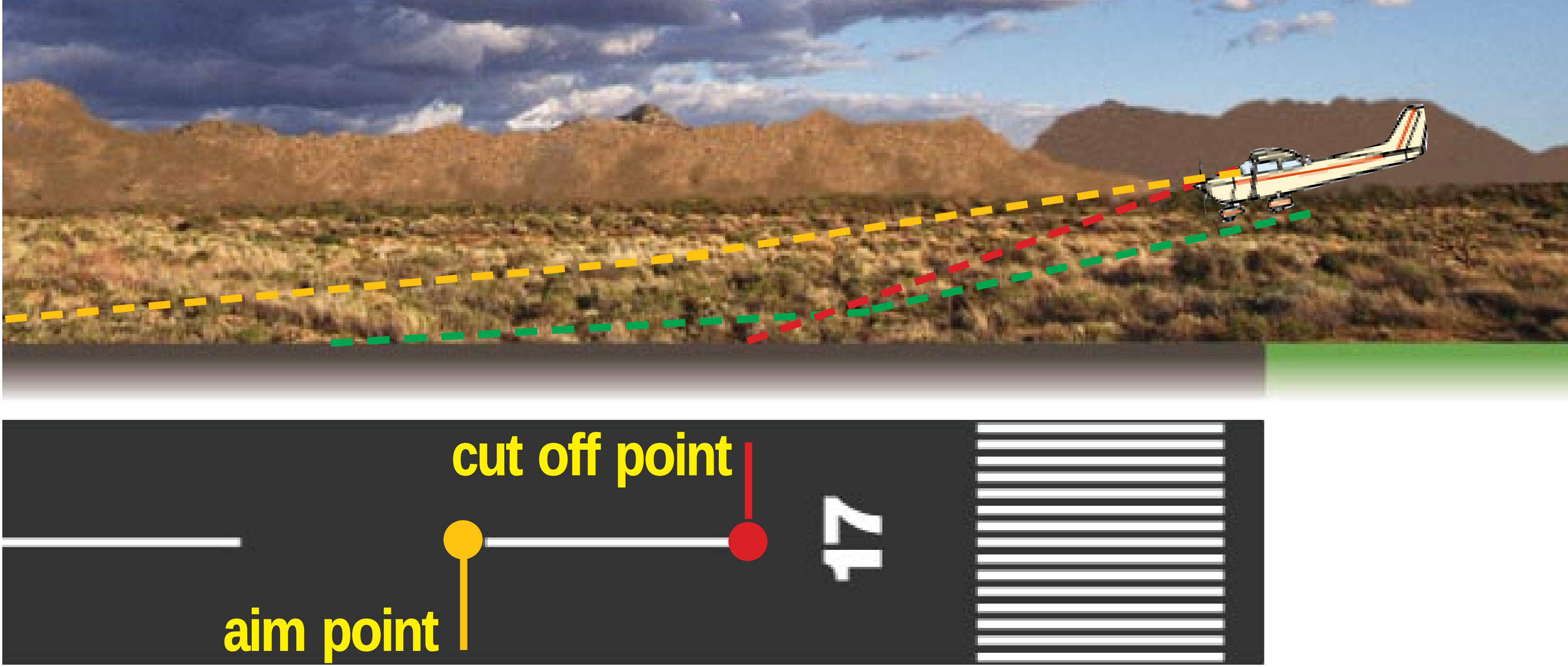
Jacobson Flare

- Approach path controlled by pitch attitude
- Airspeed controlled by thrust
- Commence flare at a pre-determined visual fix



Jacobson Flare

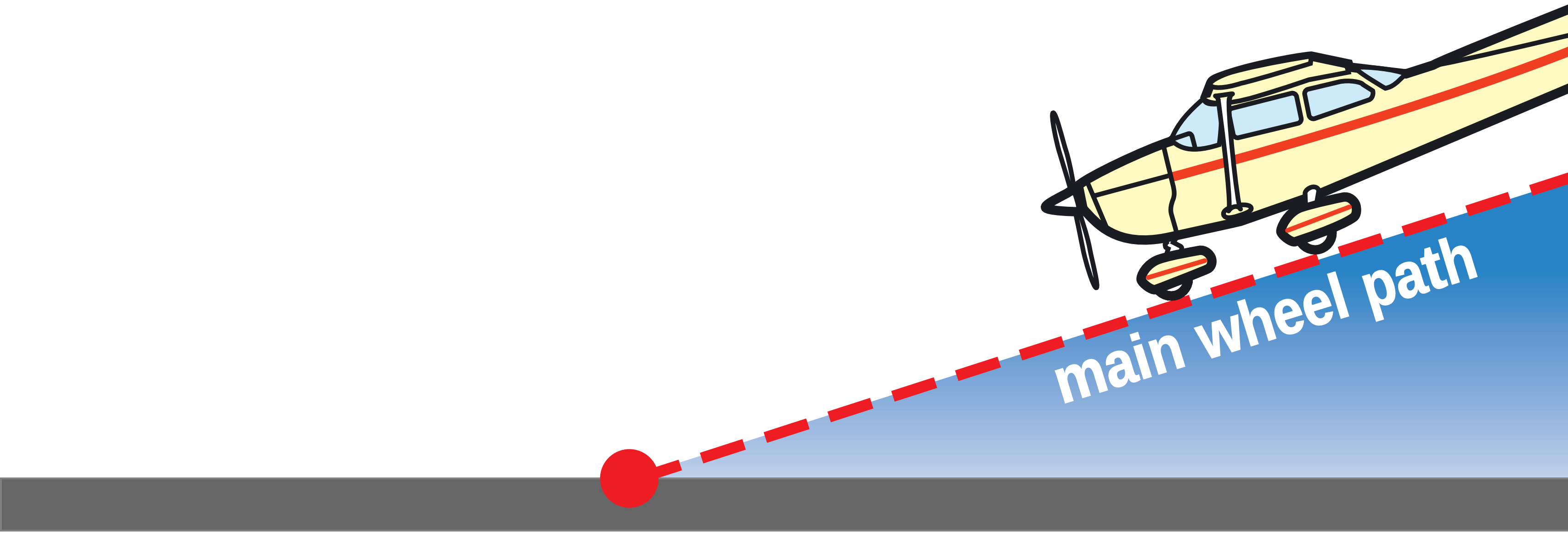
- Approach path controlled by pitch attitude
- Airspeed controlled by thrust
- Commence flare at a pre-determined visual fix
- Visual cues utilised through to touchdown



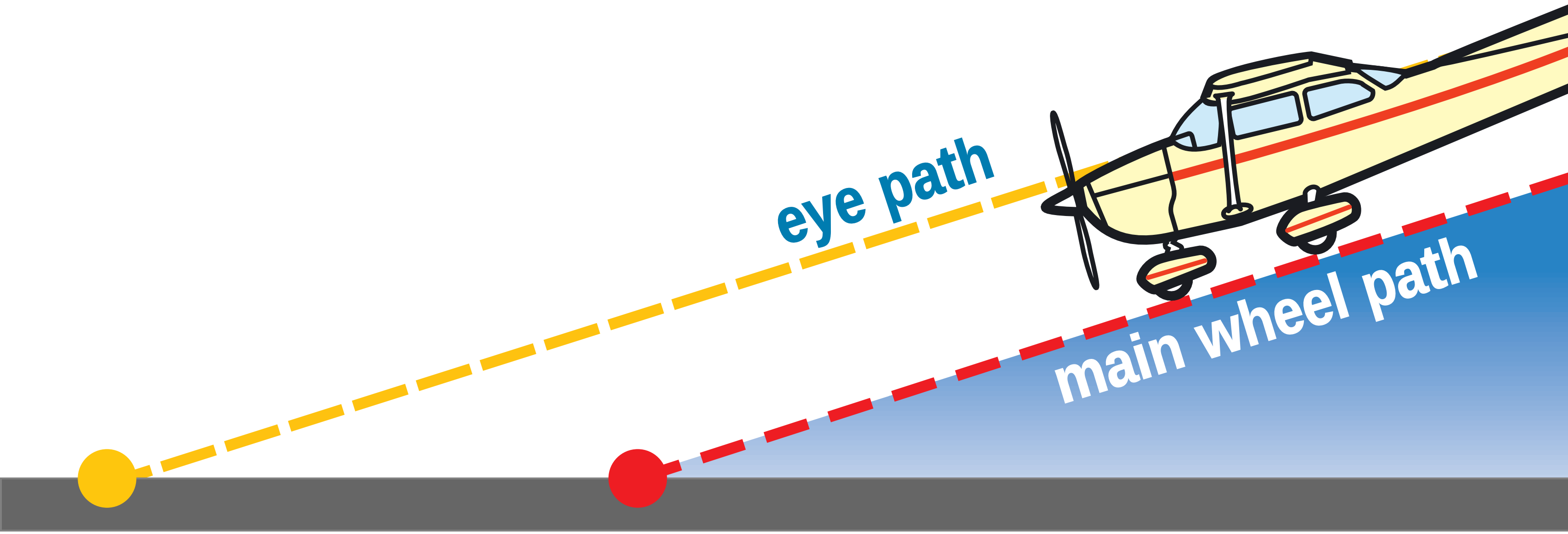
1. Where to aim?
2. When to flare?
3. How to flare?

1. Where to aim?

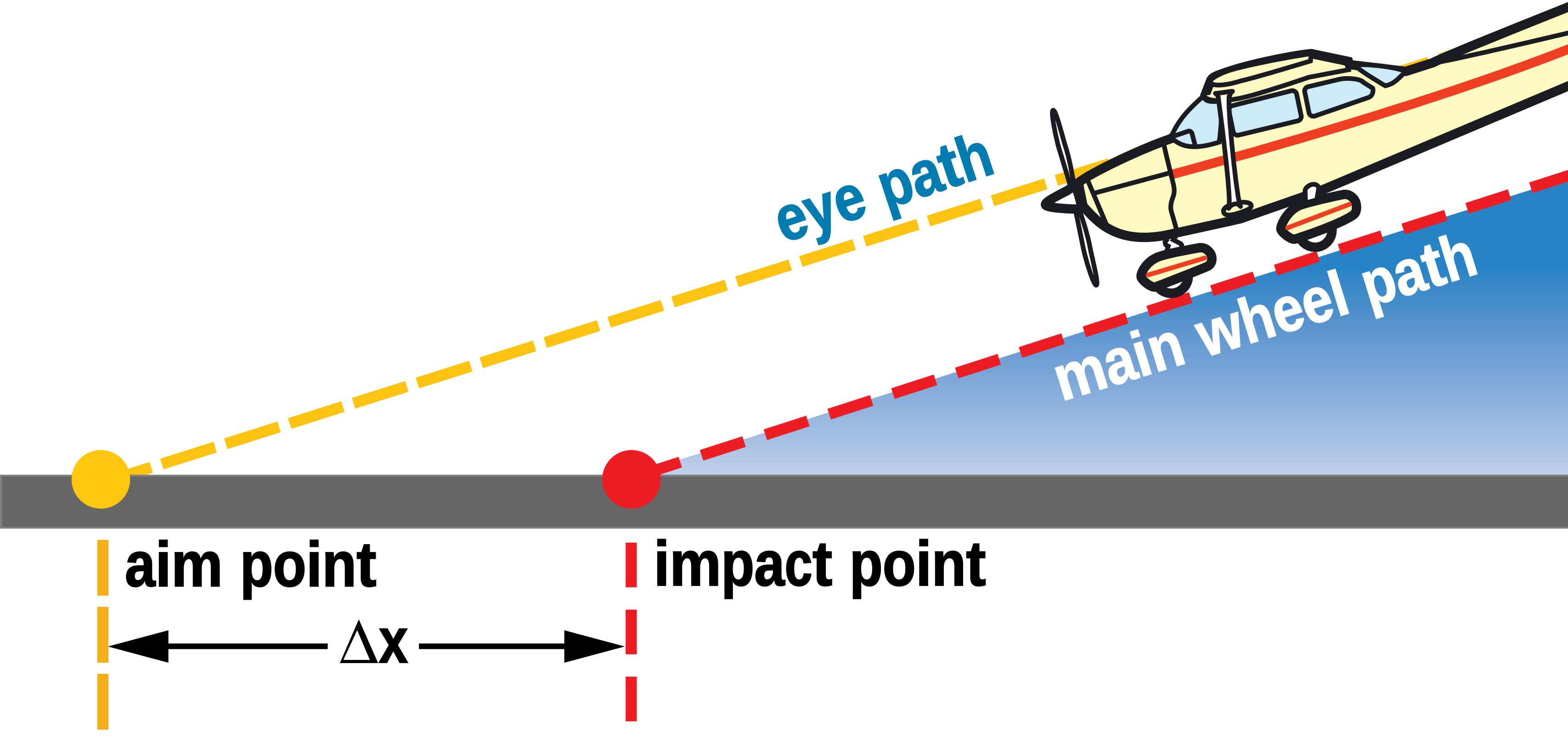
Selecting an aim point



Selecting an aim point

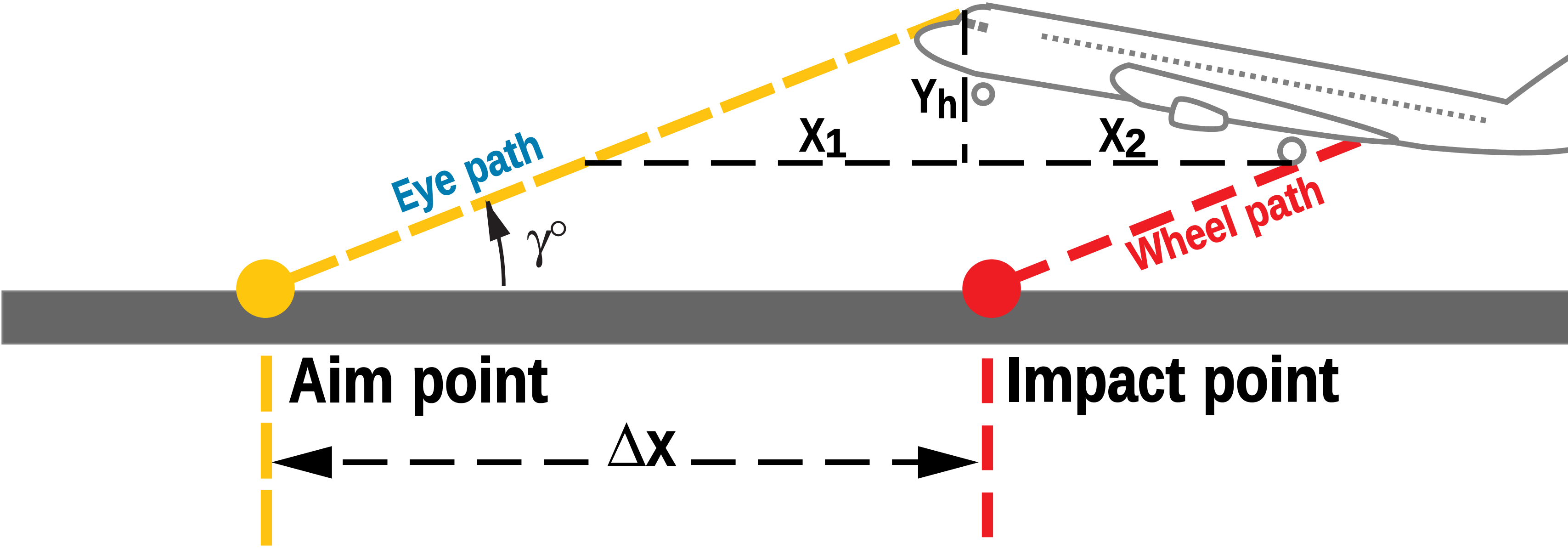


Selecting an aim point



The distance between Aim point and Impact point
(simplified version)

$$\Delta X \approx (Y_h \times 60 / \gamma^\circ) + X_2$$

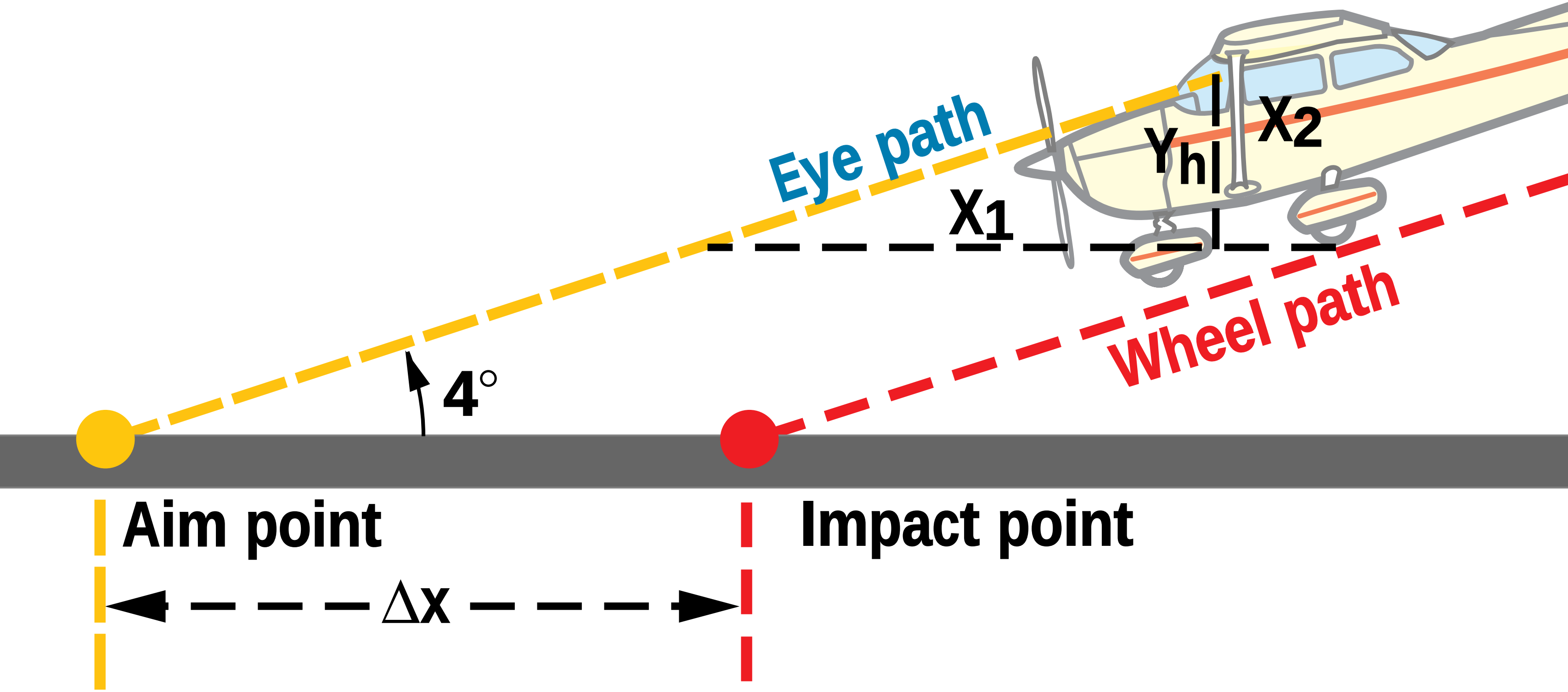


The distance between Aim point and Impact point

(for example a typical single engine light aircraft)

$$\Delta X \approx (6' \times 60/4) + 2'$$

$$\Delta X \approx 92'$$

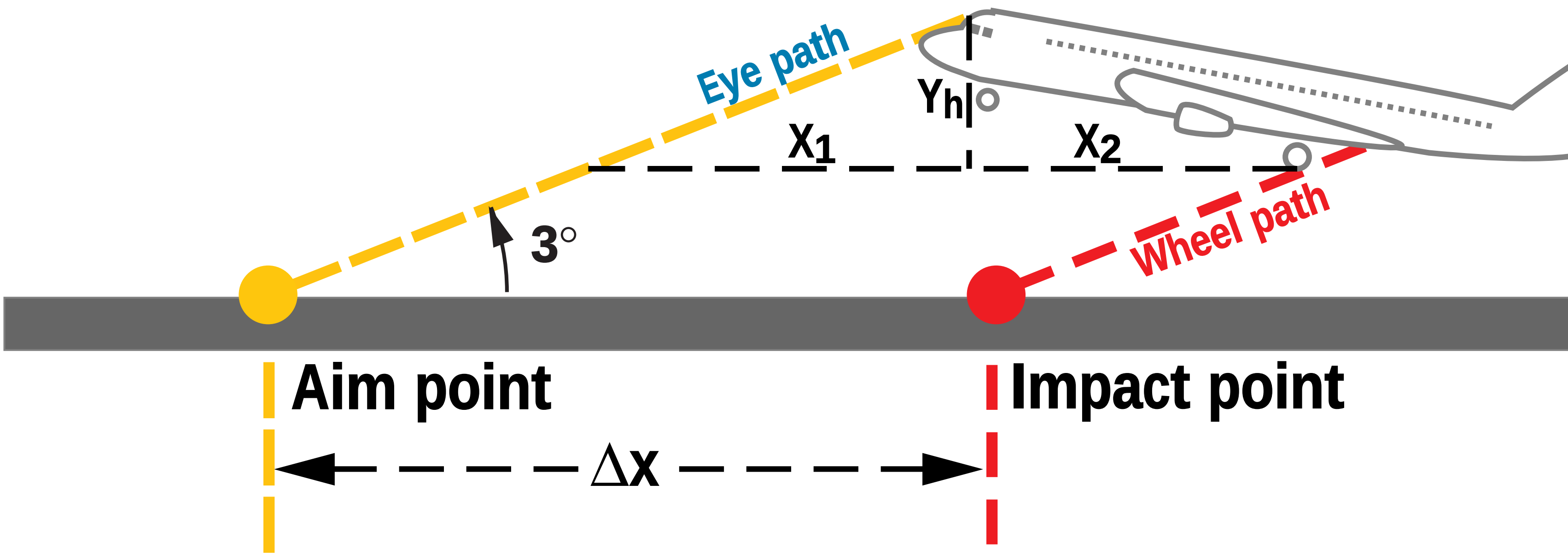


The distance between Aim point and Impact point

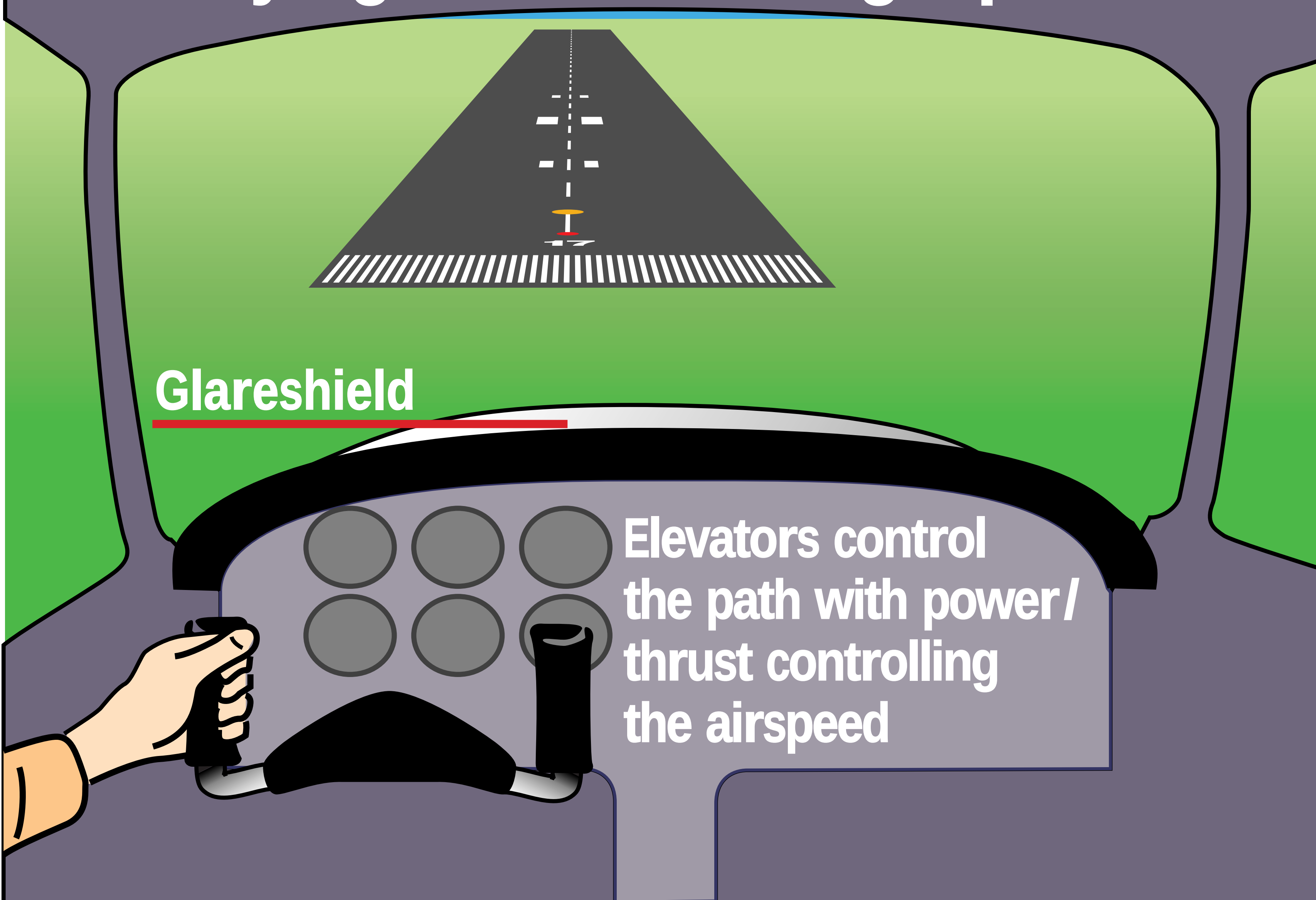
(for example a typical wide–bodied twin)

$$\Delta X \approx (32' \times 60/3) + 80'$$

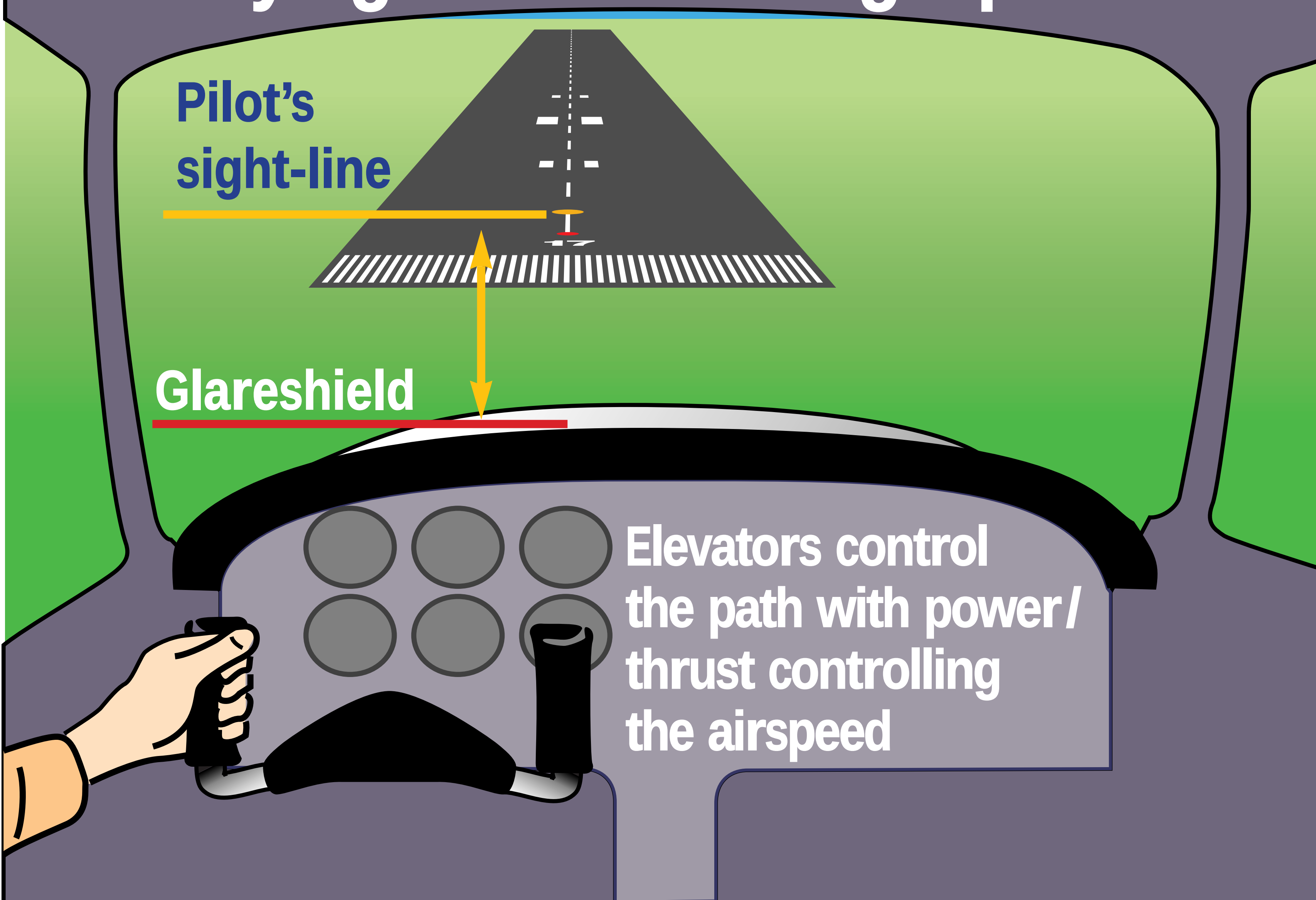
$$\Delta X \approx 720'$$

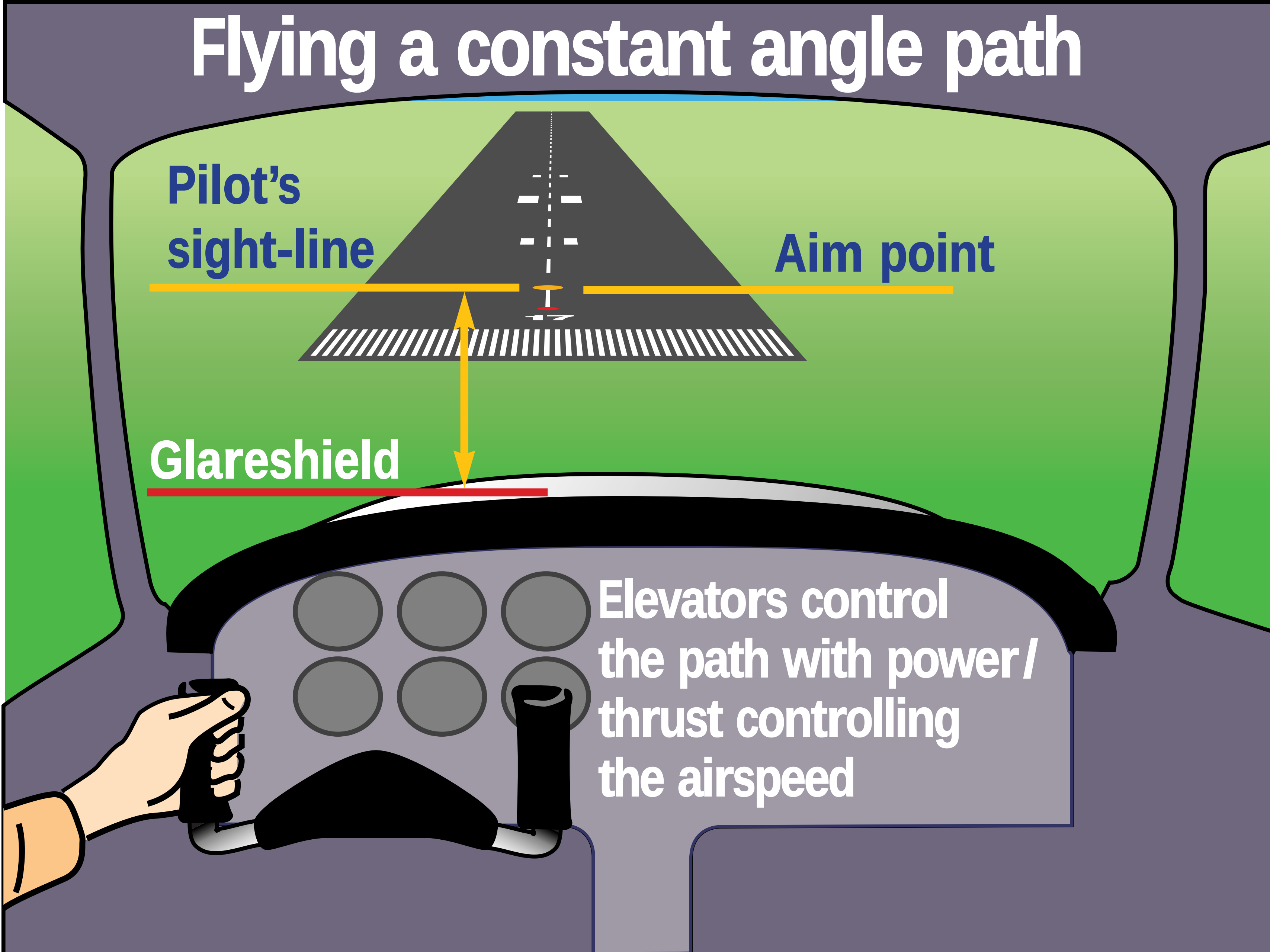


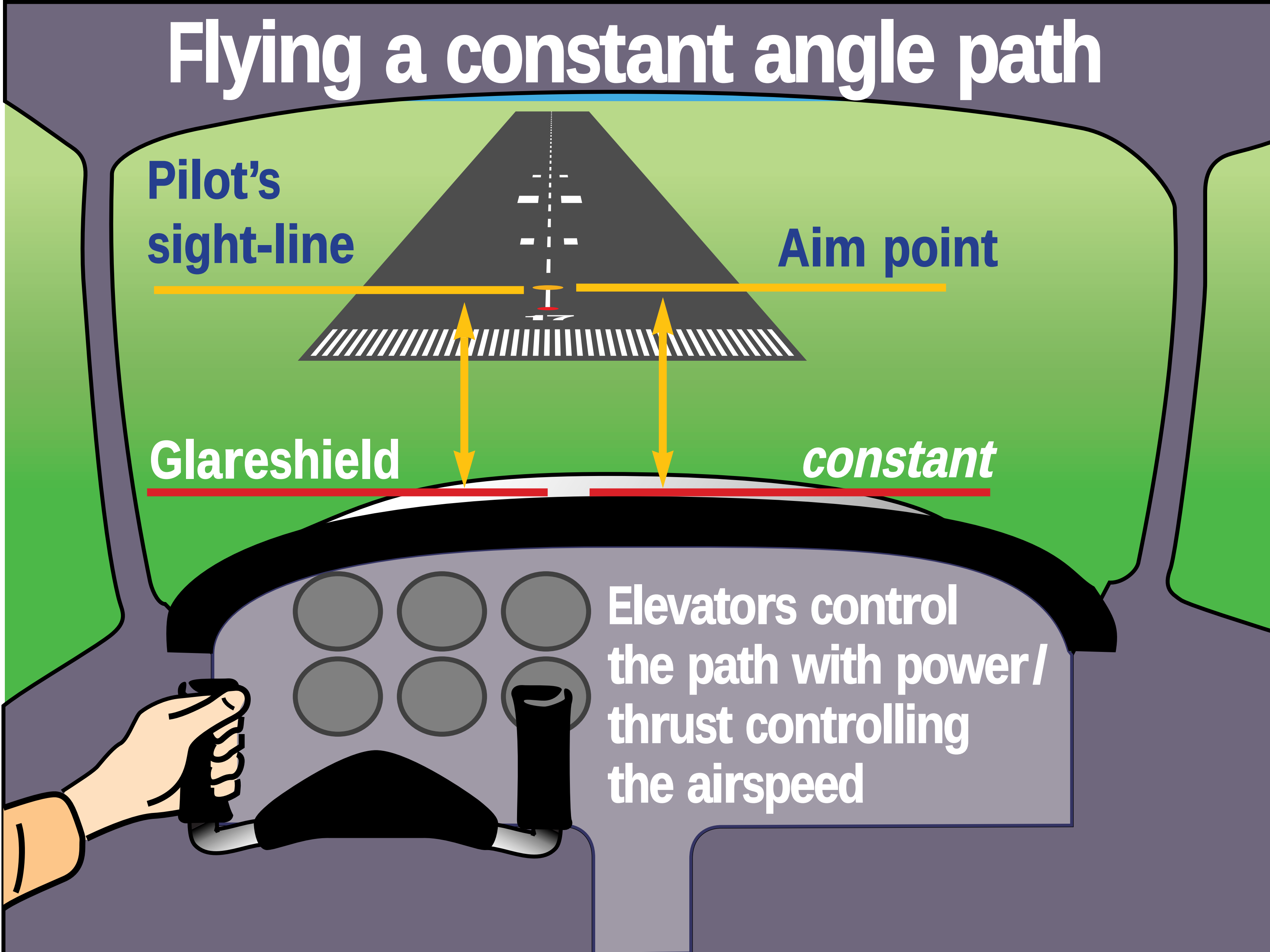
Flying a constant angle path



Flying a constant angle path

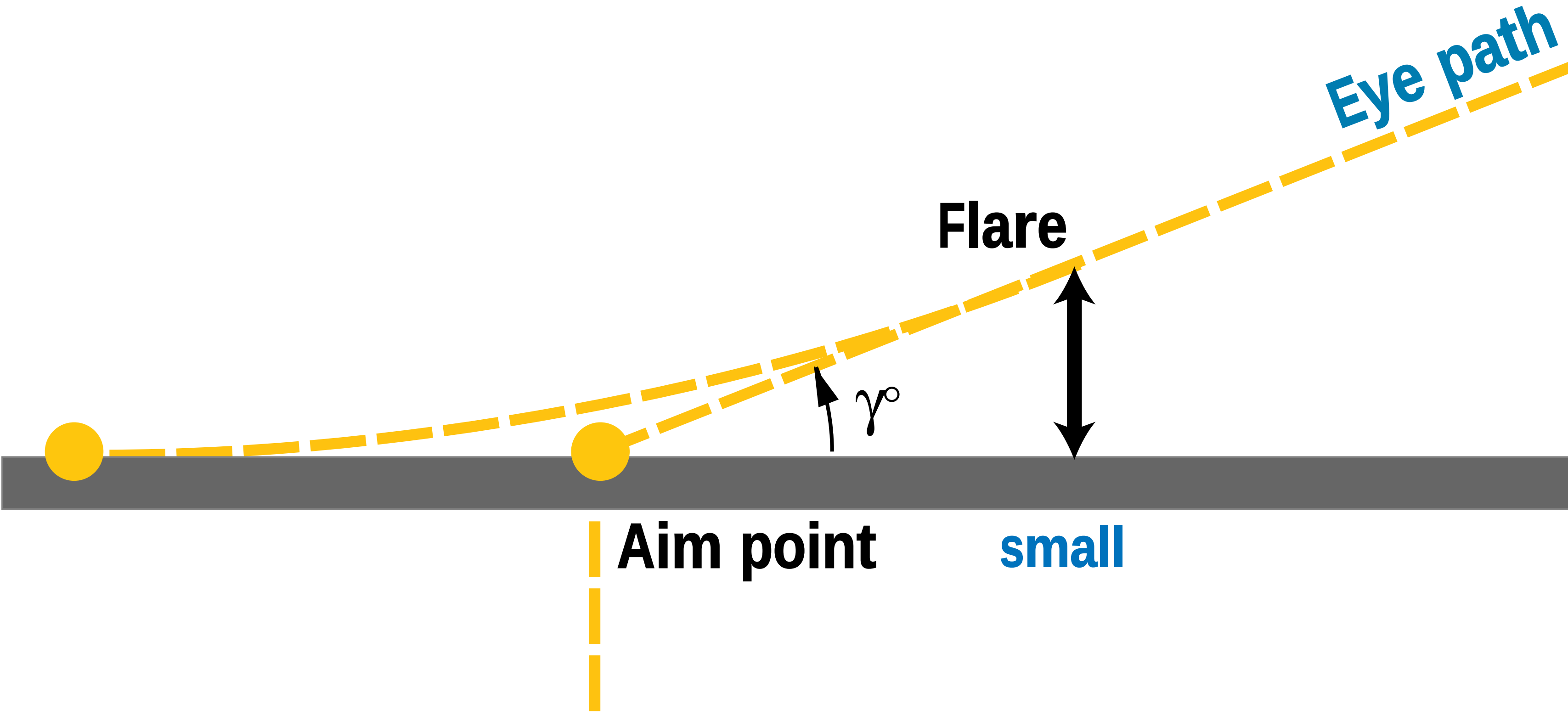



Flying a constant angle path
Pilot's sight-line
Aim point
17
Glareshield
Elevators control the path with power/thrust controlling the airspeed

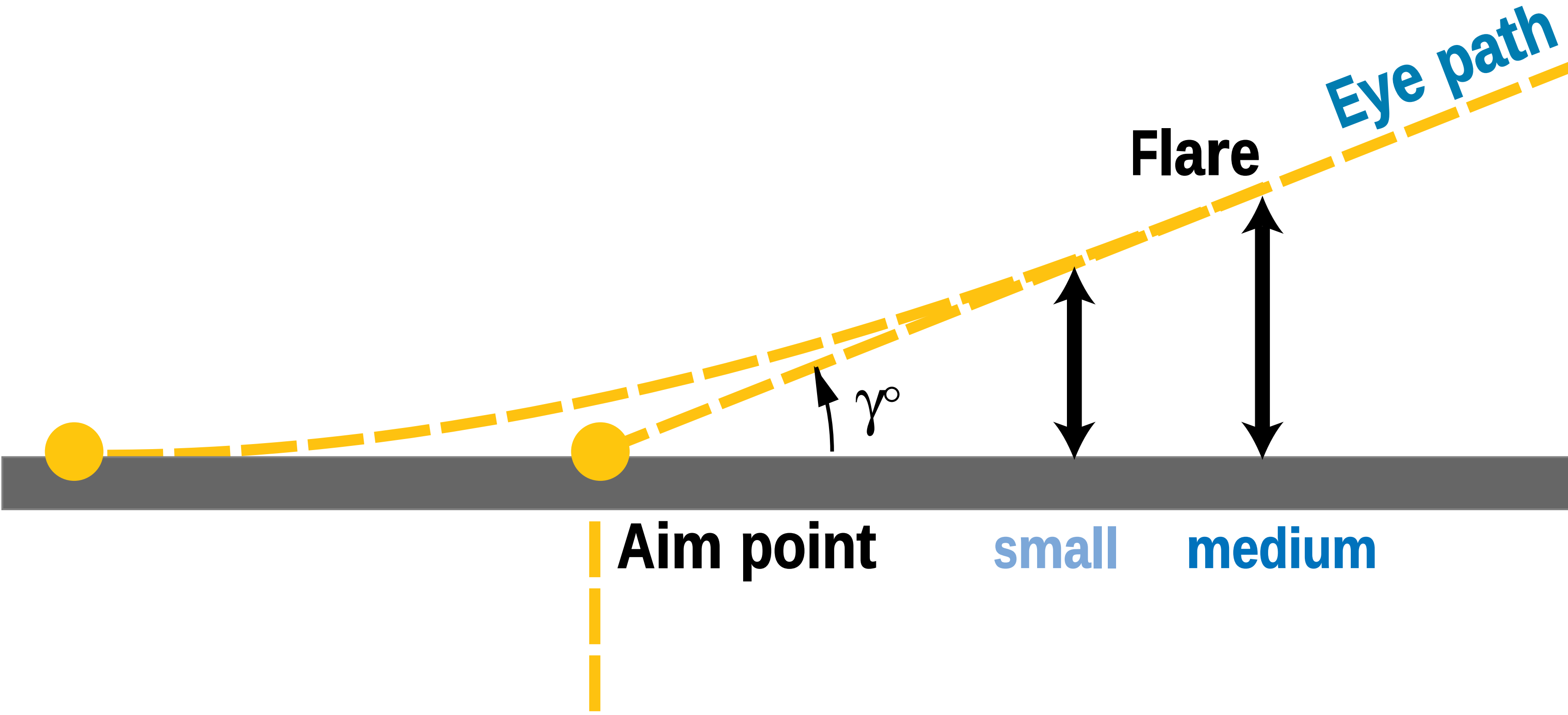

Flying a constant angle path
Pilot's sight-line
Aim point
Glareshield
constant
Elevators control the path with power/ thrust controlling the airspeed

2. When to flare?

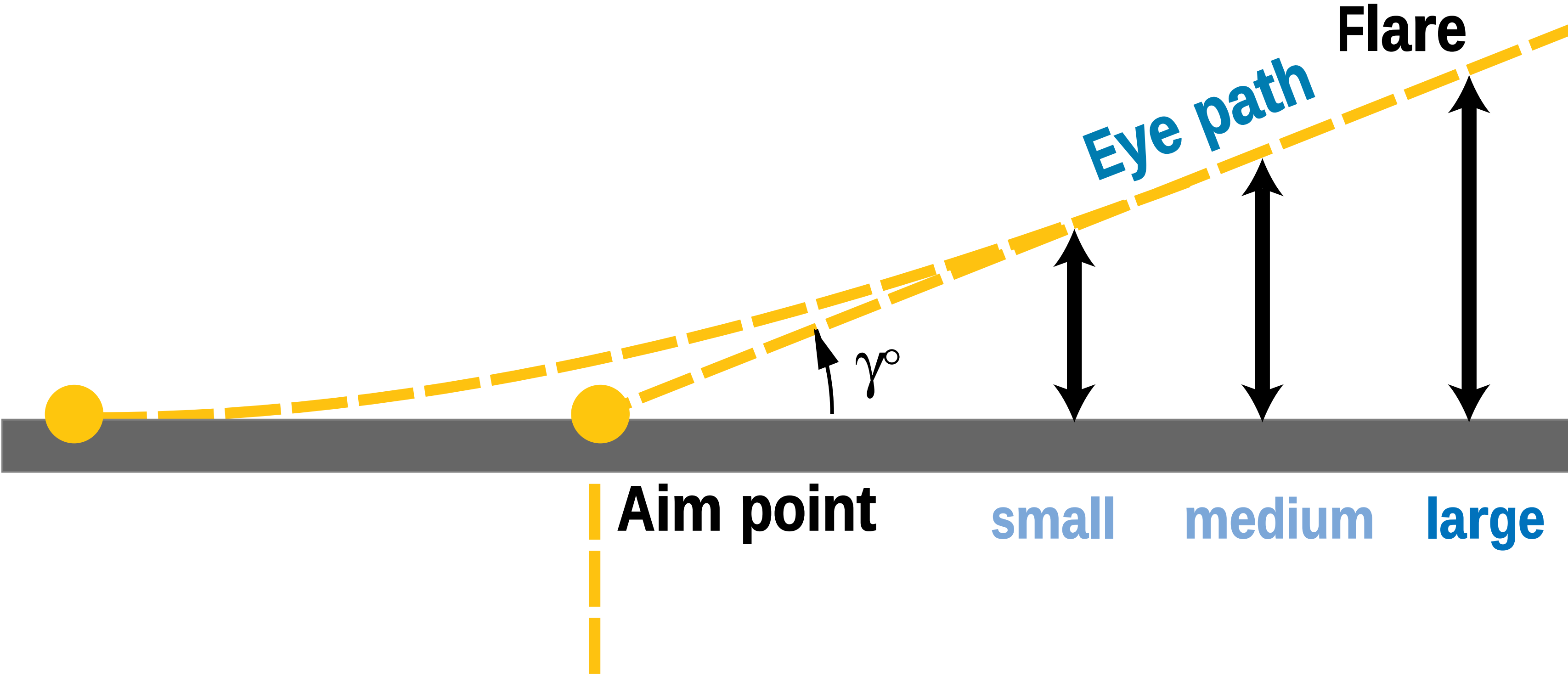
Vertical perception of flare height



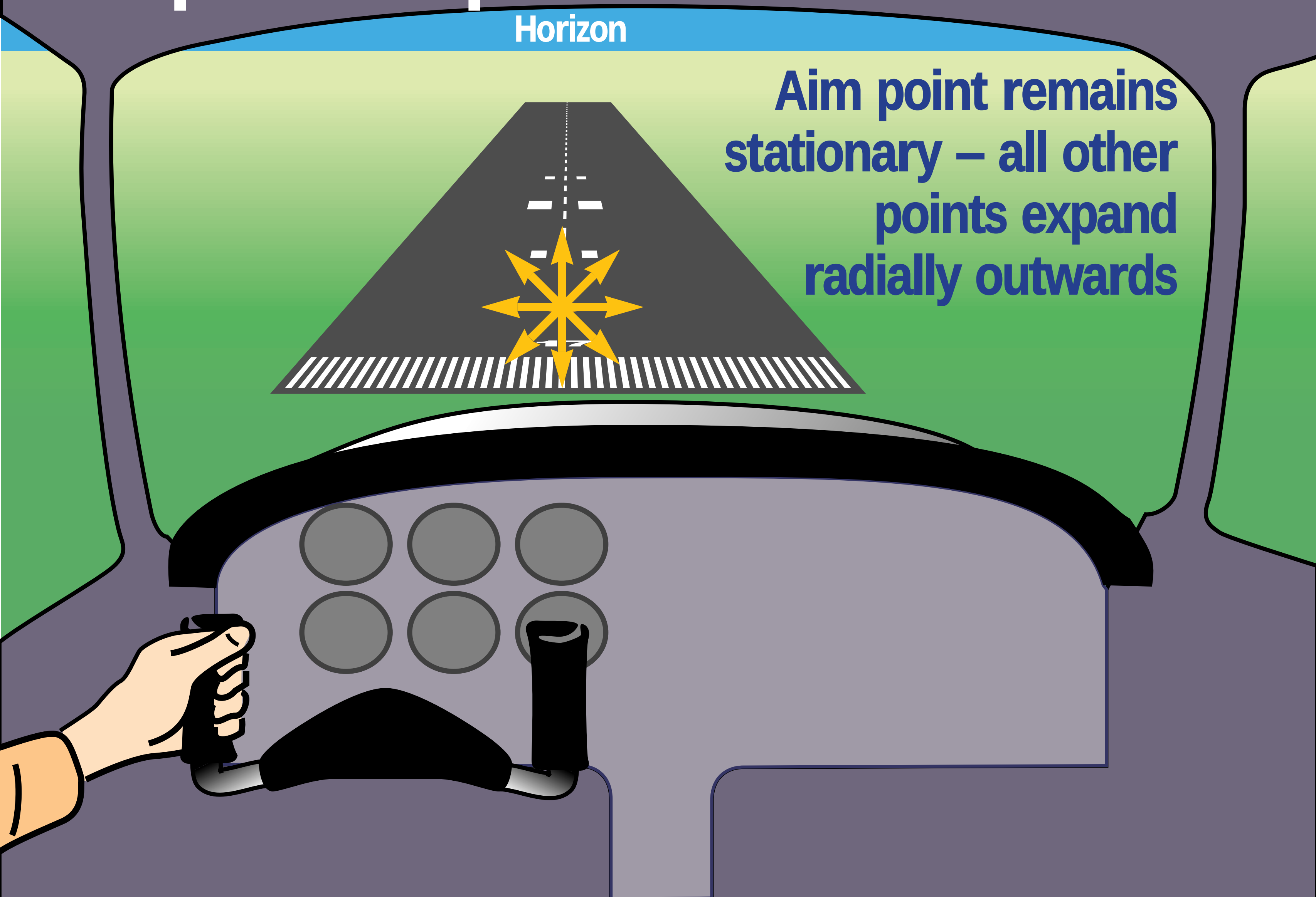
Vertical perception of flare height



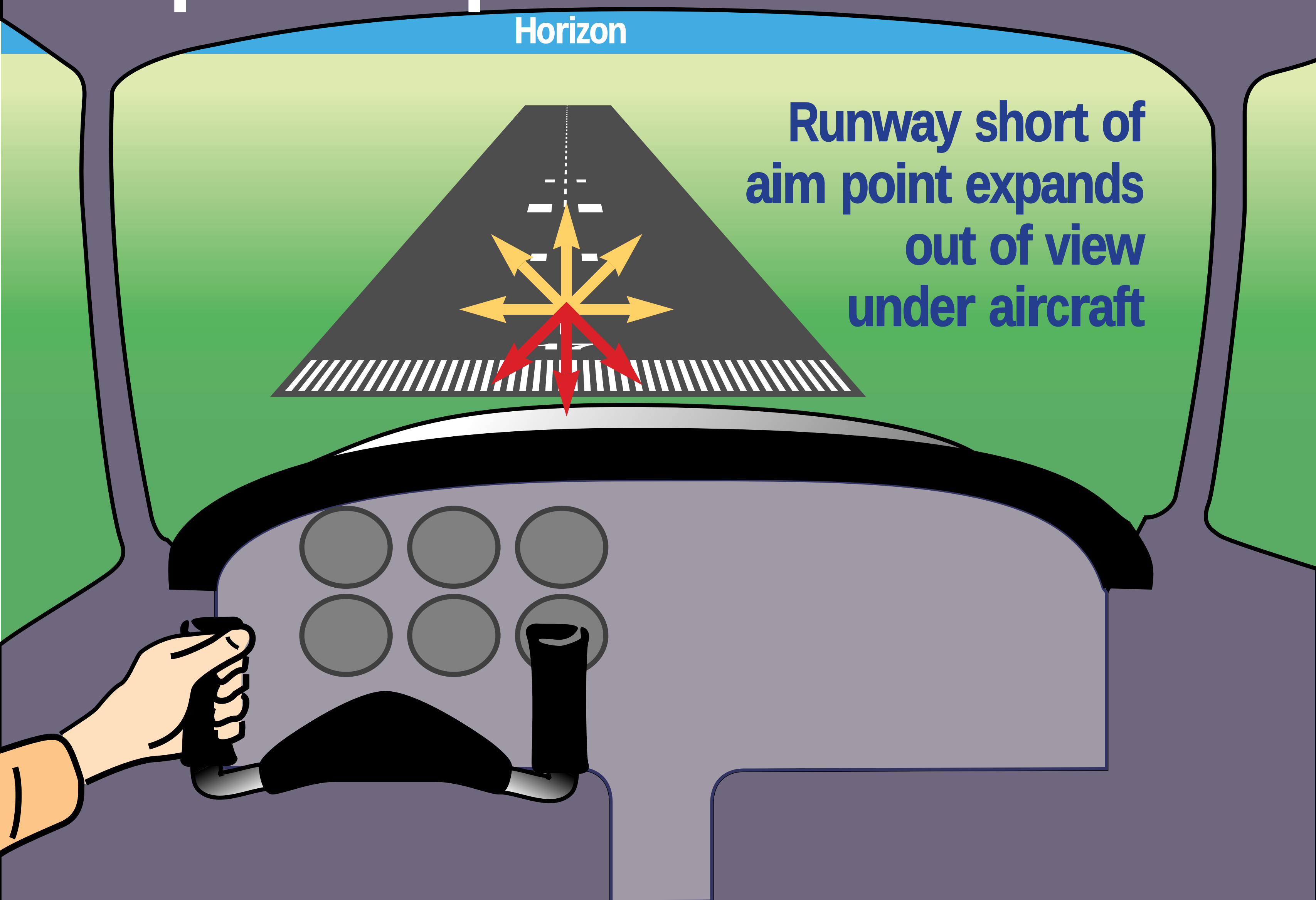
Vertical perception of flare height



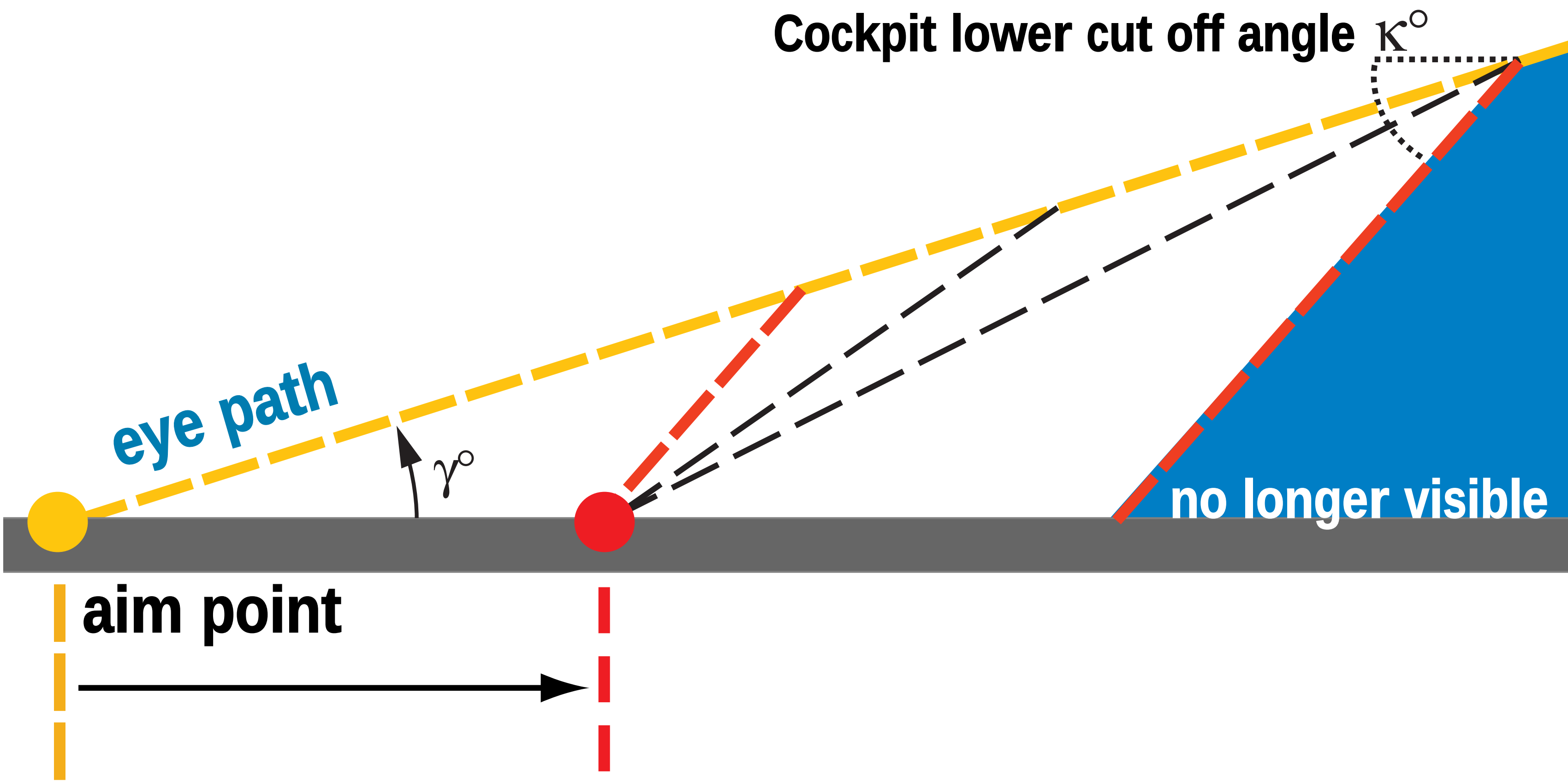
Expansion pattern as cue to flare



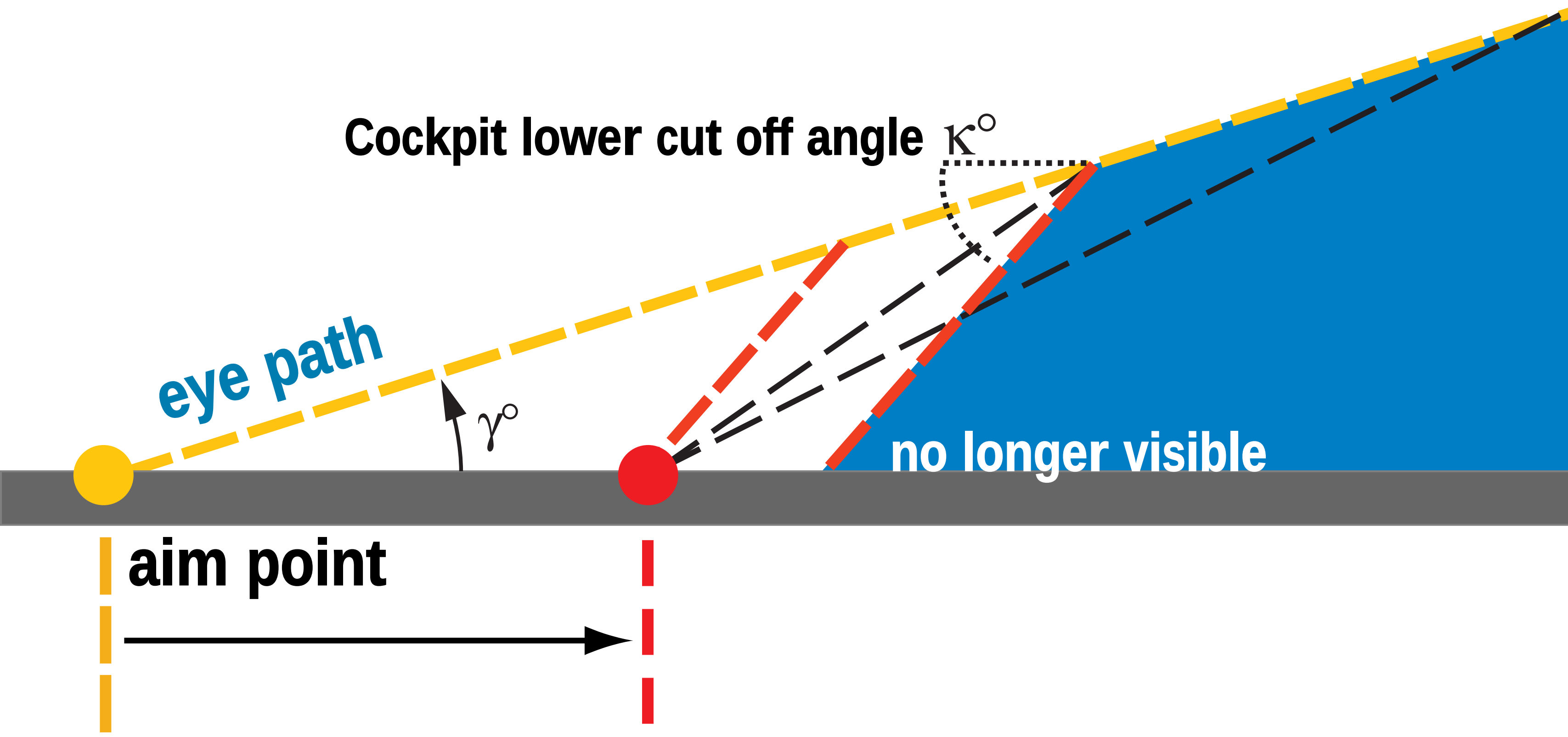
Expansion pattern as cue to flare



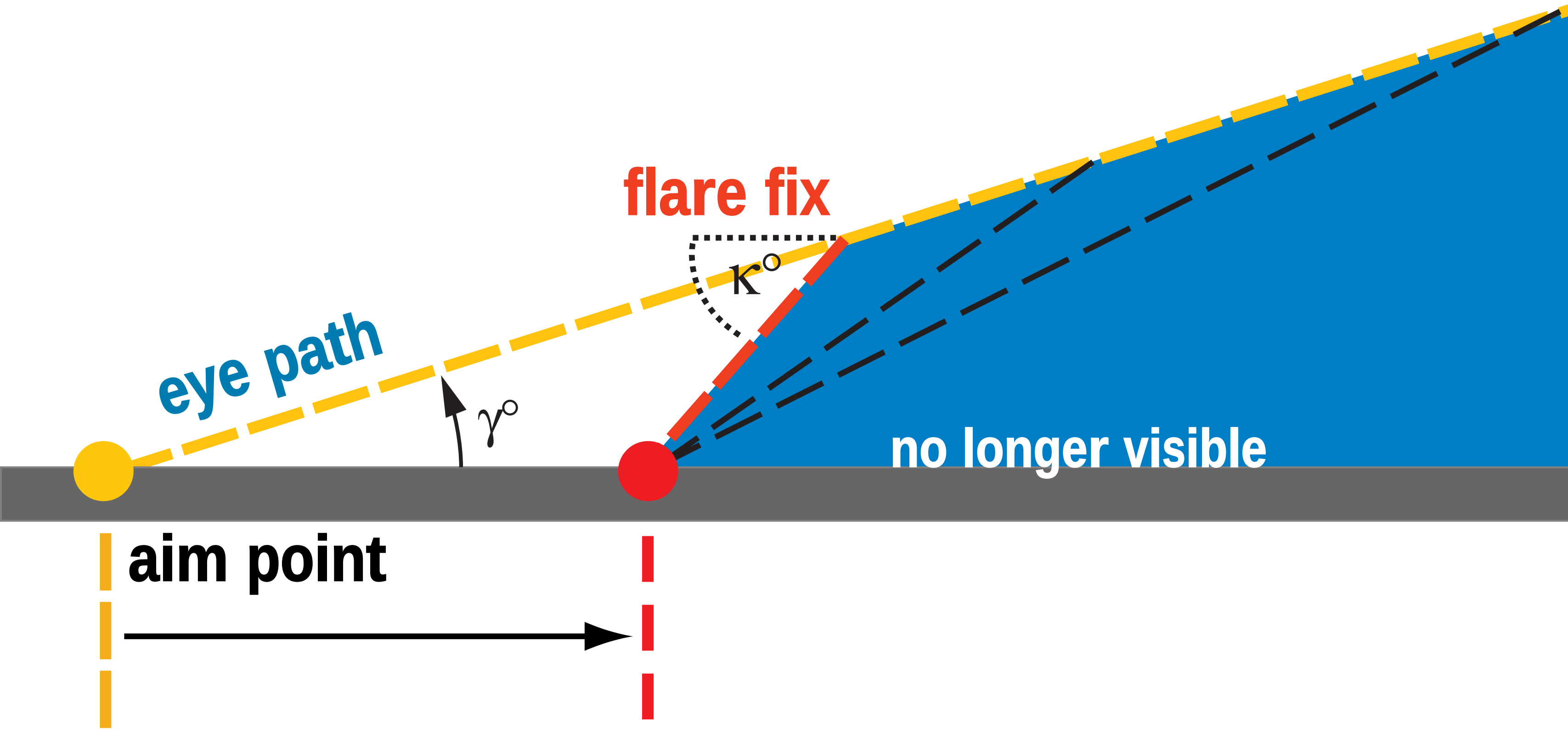
Cut-off angle as a flare fix



Cut-off angle as a flare fix

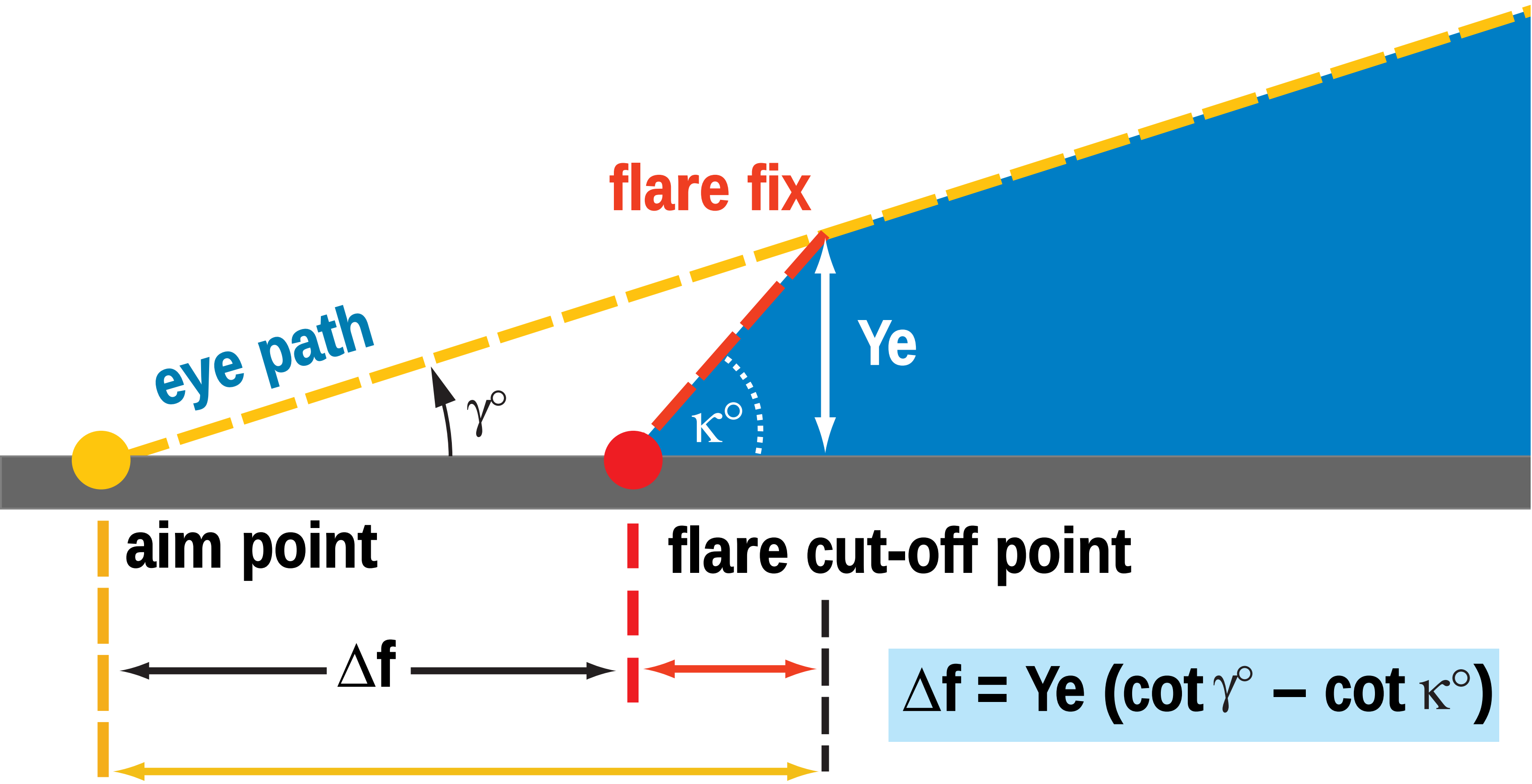


Cut-off angle as a flare fix



Cut-off angle as a flare fix

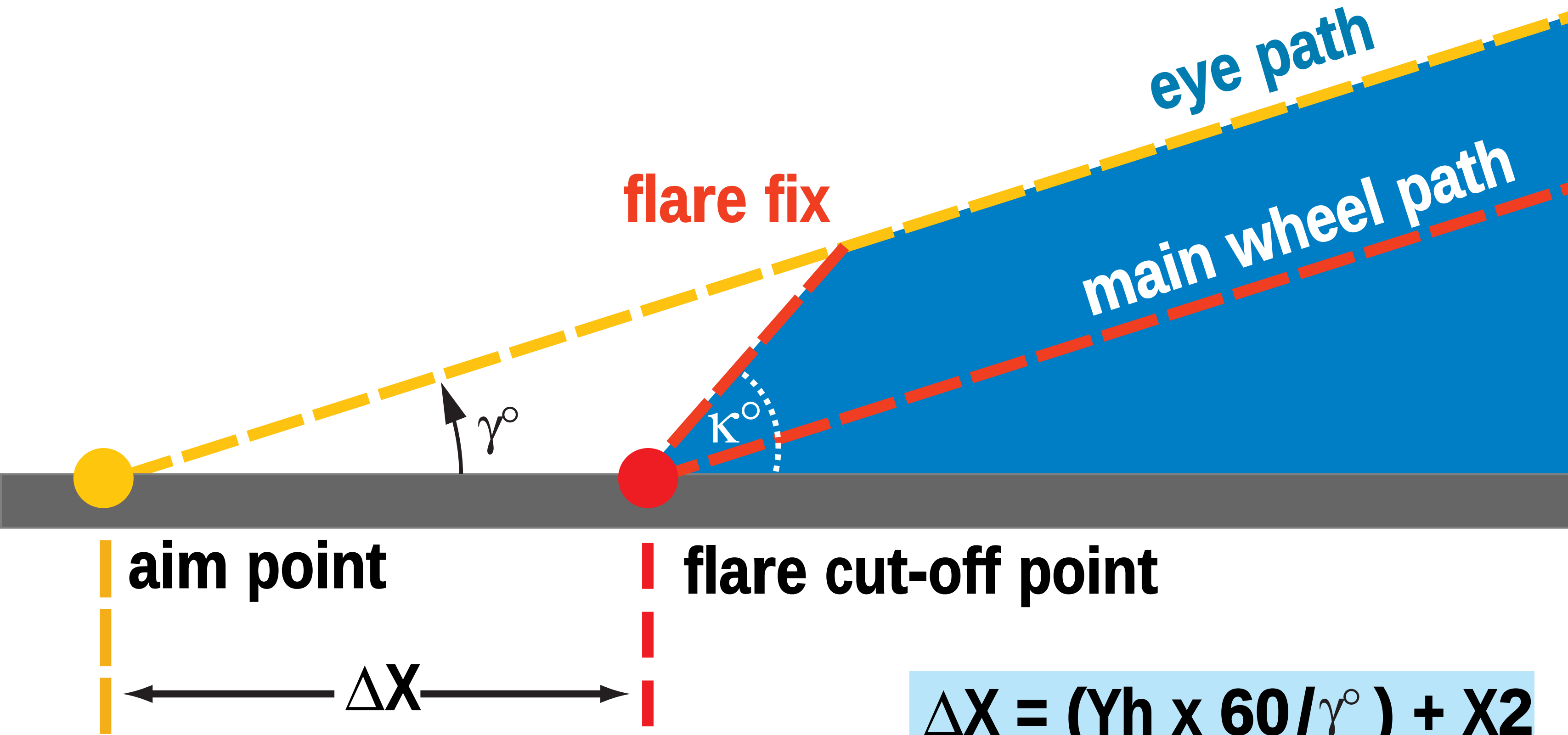
where flare height (Ye) is known



$$\Delta f = Ye\,(\cot \gamma^\circ - \cot \kappa^\circ)$$

Cut-off angle as a flare fix

where flare height (Ye) is not known



$$\Delta X = (Yh \times 60 / \gamma^{\circ}) + X2$$


AIM 1


AIM 1
CUT-OFF
90 feet


COMMENCE FLARE
AIM 2
AIM 1
CUT-OFF

3. How to flare?

The Robson "gentle touch"


COMMENCE
FLARE
AIM 2
AIM 1
CUT-OFF


AIM 2


AIM 2

Finally, a flare for landing:

- Hold an accurate eye path

Finally, a flare for landing:

- Hold an accurate eye path
- Commence flare at cut-off point

Finally, a flare for landing:

- Hold an accurate eye path
- Commence flare at cut-off point
- Reduce thrust and fly the eyes progressively towards runway end until touchdown

Pilot’s eye view

Summary

The traditional art of landing

- Does not explain how to land
- Costs time, money and stress
- Relies on experience & judgement
- Subject to too many "intangibles"
- Remains unpredictable

The Jacobson Flare

- Explains how to land
- Faster to learn
- Completely visible
- Transferable to any aircraft
- Extremely tolerant of variables
- Predictable, therefore much safer

STS/ Special Handling Reasons

ALTRV	*altitude reservation*	**HUM**	*Humanitarian*
ATFMX	*exempt from ATFM*	**FFR**	*Fire fighting*
FLTCK	*Flight Check*	**HEAD**	*Head of State*
HAZMAT	*Hazardous Materials*	**SAR**	*Search and Rescue*
MEDEVAC	*Life-critical medical flight*	**HOSP**	*Medical Flight*
MARSA	*Military assumes responsibility for separation of aircraft*		
NONRVSM	*Non-RVSM requesting operations in RVSM airspace*		
STATE	*Military, customs, or police*		

PBN/ capabilities (8 max)

A1 RNAV 10 (RNP10)

RNAV 5
B1 All (at least B1-B5)
B2 GNSS
B3 DME/DME
B4 VOR/DME
B5 INS or IRS
B6 LORANC

RNAV 2
C1 All
C2 GNSS
C3 DME/DME
C4 DME/DME/IRU

RNAV 1
D1 All
D2 GNSS
D3 DME/DME
D4 DME/DME/IRU

L1 RNP 4

There is no PBN/ code for RNP2; file as NAV/RNP2

RNP 1
O1 All
O2 GNSS
O3 DME/DME
O4 DME/DME/IRU

Approach
S1 RNP APCH
S2 RNP APCH w/BARO VNAV

AR Approach
T1 RNP AR APCH With RF
T2 RNP AR APCH Without RF

See "Filing for Advanced Services" on back panel for detailed guidance by route type.

PER/ Performance Cat.

Categories based on Vref if specified, or 1.3Vso, each at maximum certificated landing weight per CFR 97.3

A less than 91 knots IAS
B at least 91 and less than121 knots IAS
C at least 121 and less than 141 knots IAS
D at least 141 and less than 166 knots IAS
E greater than 166 and less than 211 knots IAS
H Helicopters

Filing for advanced services

Oceanic 50 NM lateral separation (AC 90-105A)
R in Fld 10a
A1 or L1 in Fld 18 PBN/

Oceanic 50 NM longitudinal separation (AC 90-105A)
R and (J5, J6, or J7) in Fld 10a D1 in Fld 10b
A1 or L1 in Fld 18 PBN/

Oceanic 30 NM Longitudinal or Lateral separation (AC 90-105A)
R and (J5, J6, or J7) in Fld 10a D1 in Fld 10b
L1 in Fld 18 PBN/
Note: The ADS-C contract requirements differ for longitudinal and lateral. See AC 90-105 for details.

Performance Based Oceanic Separation:
R, P2, and (J5, J6, or J7) in Fld 10a D1 in Fld 10b
RSP180 in Fld 18 SUR/
In addition to the above, also include:
For 23 NM lateral: L1 in Fld 18 PBN/
For 5 minutes longitudinal: A1 or L1 in Fld 18 PBN/; or RNP2 in Fld 18 NAV/
For 30 NM longitudinal: L1 in Fld 18 PBN/, or RNP2 in Fld 18 NAV/
For 50 NM longitudinal: A1 or L1 in Fld 18 PBN/

RNAV Route Assignment
Q Route: C1, C2, or C4 in Fld 18 PBN/ ; R in Fld 10a
T Route: C1, C2, or C4 in Fld 18 PBN/ ; R and G in Fld 10a
RNAV DP or STAR: D1, D2, D4 in Fld 18 PBN/ ; R in Fld 10a
Include a NAV/ entry to exclude an arrival or departure:
Can fly the RNAV departure only: NAV/RNVD1E2A0
Can fly the RNAV arrival only: NAV/RNVD0E2A1

Datacomm DCL (basic options):
Include Z in Fld 10a and Include in Fld 18 DAT/:
PDC- for ACARS PDC
FANS- for FANS DCL Only
FANSP- for FANS 1/A+ DCL

```
Examples:
DAT/1FANS
DAT/1FANS2PDC
```

Note: DCL does not require a "J" code
In item 10a. Codes J1-J7 indicate en route/oceanic CPDLC (not DCL).
See AC 90-117 Appendix D for full details and all options.

Datacomm En Route Services:
Include appropriate codes in Fld 10a and Fld 18 DAT/
According to AC 90-117 Appendix D.

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FAA ICAO FPL Quick Guide (2019)

(FPL-ACID-Flt Rules Flight Type
- AC Type/Wake Cat-Equip.&Capability
- Departure EOBT
- Speed Altitude [sp] Route
- Destination ETE [sp] Alternate(s)
- Other Information)

```
Example:
(FPL-TTT123-IS
-C550/L-SDE1E2GHIJ3J5RWZ/SB1D1
-KPWM1225
-N0440F310 SSOXS5 SSOXS DCT BUZRD
 DCT SEY DCT HTO J174 ORF J121
 CHS EESNT LUNNI1
-KJAX0214 KMCO
-PBN/A1B1C1D1L1 DAT/1FANS2PDC
 SUR/260B RSP180 DOF/180217
 NAV/RNP2 REG/N123A SEL/BPAM
 CODE/A05ED7
```

For more information

FAA ICAO Flight Planning:
http://www.faa.gov/ato?k=fpl

Field 10a (Nav/Com/Appr)

File capabilities in the order shown

N No capabilities

Include no other entries if filed

S Standard

A GBAS Landing Sys.

B LPV (APV w/SBAS)

C LORAN C

D DME

E1-E3 ACARS

- **E1** FMC WPR
- **E2** D-FIS
- **E3** PDC

F ADF

G GNSS

H HF RTF

I INS

J1 CPDLC ATN

- **J1** VDL Mode 2

J2-J7 CPDLC FANS 1/A

- **J2** HFDL
- **J3** VDL Mode A
- **J4** VDL Mode 2
- **J5** Satellite Inmarsat
- **J6** Satellite MTSAT
- **J7** Satellite Iridium

K MLS

L ILS

ATC Satvoice

- **M1** Inmarsat
- **M2** MTSAT
- **M3** Iridium

> When filing ATC Satvoice capability, Include the Aircraft Address in CODE/

O VOR

P1-P9 RCP → See AC 90-117 and AC 20-140C; Requires Ops Approval Auth.

- **P1** RCP400
- **P2** RCP240
- **P3** RCP400 (Satvoice)

R PBN → Must include type of PBN in Field 18 PBN/

T TACAN

U UHF RTF

V VHF RTF

W RVSM → Do not file W unless authorized for RVSM operation

X MNPS

Y 8.33 kHz VHF

Z Other Cap. → Requires NAV/, COM/, or DAT/ in Field 18

Notes:

1. **Standard equipment is VOR, VHF, and ILS**
2. **J1-J7 signify authorization for En Route/Oceanic CPDLC**
3. **Always file the aircraft registration in Field 18 REG/ when planning a CPDLC login.**

Field 10b (Surv)

File Transponder, ADS-B and ADS-C capabilities as applicable, in the order shown. File 'N' only if none of these capabilities are present.

N No capability- include no other entries if filed

Transponder (file no more than one letter)

- **A** Mode A
- **C** Mode A and C
- **S** Mode S, ACID and Altitude
- **P** Mode S, Altitude, no ACID
- **I** Mode S, ACID, no Altitude
- **X** Mode S, no ACID, no Altitude
- **E** Mode S, ACID, Altitude, extended squitter
- **H** Mode S, ACID, Altitude, Enhanced Surveillance
- **L** Mode S, ACID, Altitude, Enhanced Surveillance, extended squitter

ADS-B

- **B1** 1090 MHz out capability, **or**
- **B2** 1090 MHz out and in capability
- **U1** UAT out capability, **or**
- **U2** UAT out and in capability
- **V1** VDL Mode 4 in capability, **or**
- **V2** VDL Mode 4 out and in capability

Notes:

1. **Include Aircraft Address in Field 18 CODE/**
2. **When compliant with 14 CFR 91.227 and AC 20-165, also include in Field 18 SUR/:**

   260B *(for 1090 MHz)*

   282B *(for UAT)*

ADS-C

- **D1** ADS-C FANS-1/A, and/or
- **G1** ADS-C ATN

> **Note: Always file the aircraft registration in Field 18 REG/ when planning an ADS-C login.**

Field 18 (Other Info)

> **Note:**
> **Do not use an oblique stroke except as part of an indicator. Do not use special characters in Field 18 text.**

(File in this order)

STS/	Special Handling (see list)
PBN/	Performance Based Navigation (see list on back)
NAV/	Other Navigation Capability (see advanced services)
COM/	Other Comm. Capability
DAT/	Other Data Application (See AC 90-117)
SUR/	Other Surv. Capability (e.g. 260B RSP180)
DEP/	Non-standard Departure (e.g. MD24)
DEST/	Non-standard Destination (e.g. EMI090021)
DOF/	Date of Flight (YYMMDD, e.g. 121123)
REG/	Registration (e.g. N123A)
EET/	Estimated Elapsed Times (e.g. KZNY0124)
SEL/	SELCAL (e.g. BPAM)
TYP/	Non-standard AC Type
CODE/	Aircraft/Mode S address in hex (e.g. A519D9)
DLE/	Delay (at a fix) (e.g. EXXON0120)
OPR/	Operator
ORGN/	Flight Plan Originator (e.g. KHOUARCW)
PER/	Performance Category (e.g. A)
ALTN/	Non-standard Alternate(s) (e.g. 61NC)
RALT/	Enroute Alternate(s) (e.g. EINN CYYR KDTW)
TALT/	Take-off Alternate(s) (e.g. KTEB)
RIF/	Route to revised Destination
RMK/	Remarks- include any information instructed to include in Remarks (e.g. for NAS Field 11)