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General

Introduction

This guide has been designed to assist anyone involved in Flight Instructor training. It can be used by a perspective applicant preparing for the Flight Instructor certificate. It can be used by the Flight Instructor preparing a prospective Flight Instructor. It is my hope it will be used by FAA Inspectors testing a Flight Instructor applicant.

The idea for this guide has been floating around in my head for some time. After retiring from the FAA, with just short of 30 years as an Operations Inspector, I decided to teach part-time. My agreement with the owner of the school where I teach is that I could focus my efforts on Flight Instructor students. Between my experience as an Inspector, giving Initial Flight Instructor flight checks and working with students, it became increasingly obvious that there just wasn't any real hands-on guidance designed to prepare the Flight Instructor student.

The more I work with students, the more I find a disconnect between the task of preparing a would-be flight instructor and what the Certificated Flight Instructor (CFI) Practical Test Standards (PTS) is all about.

Writing this guide also became important to me on a more personal basis, as I realized how far too many of my fellow FAA Inspectors failed to understand the intent of the PTS and how their application of it was inconsistent. In retrospect, that statement is probably an analysis of my own Flight Instructor checkrides as an Inspector.

Part of preparing a Flight Instructor Student includes making sure that they understand what takes place, who the folks are that they will meet and work with, what they do and do not need to learn, and where they fit into the puzzle. I have also tried to explain how the PTS works and what to expect in the Practical Test.

The Players

Preparing a would-be Flight Instructor is like a three-legged stool. There is a student, there is the student's instructor and there is the Inspector. If any of the legs isn't holding up its part of the stool, the stool tips over.

The Student (aka, the CFI Student, the CFI applicant, the applicant)

Let’s start with the central figure, the student seeking a Flight Instructor certificate. He is usually under 25 and has around 250 hours total flight time. His goal isn't usually to become a career Flight Instructor, it's to gain hours and experience to move up in the aviation world. Up until the day the student starts training to become a Certificated Flight Instructor; he has only been a student learning to fly. With 250 hours a student is like a sponge, with a very limited base of experience but eager to learn. In the role of a "student" he has typically been a receiver of information, far too often taking what he is taught as gospel. This is not a criticism; it is an observation. Once he becomes a Flight Instructor, the roles change; he becomes a dispenser of information and a recipient of "Why?" questions.

The Student's Instructor

To begin with, this guy has to have 200 hours as an Instructor and has to have been a CFI for at least two years. That makes him a really old guy. Beyond his age and experience he is hard to describe. In my case I am retired, wanting to

give back something to flying. The fellow I work with is the owner of a flight school and a Designated Pilot Examiner. He is over 60. Most everyone that teaches Flight Instructor students has been around for a while. That experience is what is necessary to help the student learn how to answer the "Why?" question.

The FAA Inspector

The FAA Inspector is usually seen as the bad guy, the obstruction, agd the gate through which all CFI applicants have to pass on their way to their goal.

In fact FAA Inspectors are human beings and put their pants on one leg at a time, just like everyone else. With very few exceptions, FAA Inspectors do not get a thrill when they fail CFI applicants. In reality they are just as frustrated as anyone when they get an ill-prepared applicant, and they get far too many of them.

FAA Inspectors receive little or no formal training regarding the use of the Flight Instructor PTS. That does not diminish their basic skills; it means they are doing the best they can with what they have. It also means they interpret the PTS from their own individual perspective. This is what contributes to inconsistency.

FAA Inspectors are generally over-worked and spread too thin. A General Aviation Operations Inspector must have a working knowledge of about two dozen regulations, a new Handbook that has been described as over a foot thick, as well as tons of other guidance material. They are also responsible for hundreds of skill sets including accident investigation, legal enforcement, airline/operator certification, Designated Pilot Examiner oversight, airshow surveillance, 709 re-examinations, and medical flight checks, among others.

Flight Instructor certification is but a small part of an inspector's workweek.

The CFI PTS

The CFI PTS is the bible when it comes to CFI training and testing. Reading and understanding it should be the first thing anyone wanting to get their CFI should do. It should be in the student's hands whenever receiving training or practicing teaching.

The CFI PTS as published by the U.S. Department of Transportation, Federal Aviation, Airman Testing Standards Branch, AFS-630 is divided into three major parts:

- The first part is the Introduction, which is general in nature and explains how to use the PTS. (Everything from the Cover Page through the Contents Pages)
- The second part is titled, SECTION 1, FLIGHT INSTRUCTOR AIRPLANE-SINGLE-ENGINE, Practical Test Standards. It describes all of the Areas of Operations, Tasks and Elements for Airplanes with one engine.

. The third part is titled, SECTION 2, FLIGHT INSTRUCTOR AIRPLANE-MULTIENGINE, Practical Test Standards. It describes all of the Areas of Operations, Tasks and Elements for Airplanes with two or more engines.

SECTION 1 defines how single-engine practical tests are to be conducted. It establishes the Areas of Operation and Tasks. It also describes the Elements within the Tasks, and it establishes the standards of performance. It also has a list of all of the references used in its development and administration.

For our purposes we will only be concerned with the first two parts of the CFI PTS.

The PTS is the one document that the Student, the Student's Instructor and the FAA Inspector **must** follow when conducting the Practical Test.

Another function of the PTS is to define the regulatory nature of the Flight Instructor Practical Test. The only "standards" of acceptable performance are those listed in the PTS. The success or failure of any given task must be judged solely by the standards of the particular Task.

The Practical Test

Certificated Flight Instructor applicants have a horrible failure record. Actually, their failure rate is remarkable; it's their pass record that is horrible. Most applicants fail the "oral" portion of the test. "Oral" is code for that portion of the Practical Test that happens before the flying part of the test. There really isn't an "oral" or a "flight" any longer. It is all rolled up into a Practical Test and the "oral" isn't really over until the Inspector signs the certificate.

Far too many Instructors, who prepare CFI applicants, believe that the focus of this test is the applicant's flying ability. In fact, the focus should be the ability to communicate ideas, organize thoughts and therefore teach. Flying is important but less often the cause of a failure. Keep in mind, the applicant has already shown his prowess as a pilot when he took his Private, Commercial and Instrument Rating flight checks.

The PTS is set up in a very logical fashion. It starts with the Fundamentals of Instruction, moves to Technical Subjects, and then Preflight Preparation. At this point there is a shift to teaching a flight maneuver from a lesson plan, which will be taught in-flight. Once that is completed the applicant and Inspector are generally off to the airplane to fly. The flight covers a generous sampling of the Private and Commercial maneuvers as well as the maneuver that was the subject of the lesson plan.

Once the flight portion of the Practical Test is completed satisfactorily, the Inspector issues the applicant a certificate.

Back to what happens during the "oral." Even the best flight instructors do not have all of the knowledge in the world when it comes to aviation. The really good ones rely on a solid basis of personal information, which they supplement with lots of reference materials. Some of this is store bought, some is collected from reliable sources and some is home made. This should be true of someone preparing to become a CFI. They start with their own base of knowledge and add to it as they learn. They develop a reference library. They use that library to learn how and what to teach. They use that library while they are Flight Instructing, and they should use that library while taking the Practical Test. That's why the CFI PTS says: "The term 'instructional knowledge' means the instructor applicant is capable of using the appropriate reference to provide the 'application or correlative level of knowledge' of a subject matter topic, procedure, or maneuver."

What an applicant is not allowed to do is to look up every answer. For the purpose of this guide, there are two types of reference materials. The first is the list of references used as the basis for the CFI Practical test. This list is found in the Introduction of the CFI PTS. It is supplemented by Task specific reference lists in each task. The second type of reference material used is the one developed by and for the Instructor. When preparing a reference library, it should be assembled using the reference list in the PTS and from personally developed/collected reference document(s). More about this process will be found further along in this guide.

Tho practical test for the CFI should not be a series of questions asked by the Inspector and answered by the applicant. That is how Private and Commercial Practical Tests are conducted. Almost every Objective in the CFI PTS has language that says something like: "exhibits instructional knowledge of the elements of.....by describing:" That concept is a significant departure from the Private or Commercial practical test where the PTS says: "To determine that the applicant exhibits knowledge of.....by explaining."

The CFI practical test isn't about memorizing anything. That's for the written test. It's about knowing the material to be taught and understanding the concepts behind that material. If a student knows "TOMATO FLAMES" but does not understand that it may not answer the whole question: "Does this airplane have all of the equipment required for this flight?" then he does not understand the subject of required equipment. Likewise, if an Instructor believes that ARROW stands for the paperwork that must be onboard the airplane in order to fly, I issue a challenge: find a regulatory reference that says that. Again the "oral" is about teaching and not about minutia.

Because of the language in the Flight Instructor PTS, it's my opinion that the "oral" should go something like this. The Inspector says: "I have selected Task J of Area of Operation II for you to teach. I am a student pilot with 14 hours. I have soloed at an uncontrolled airport and am about to take my first dual cross-country. I will be going to an airport with a control tower and along the way I will be transitioning through Class C airspace. Using the Elements of that Task teach me about the National Airspace System." The CFI applicant then puts his thoughts together, digs out a teaching aid and teaches the information required by the Task. As the lesson progresses, the Inspector would then ask questions, but only the kind that a student, at the prescribed level, would ask if the information presented didn't make sense or wasn't clear. The Inspector would also reserve the right to ask additional subject matter questions, if he didn't think the material presented was accurate or that the applicant didn't have a command of the subject matter. The latter type of questions would tend to be more direct in nature, aimed at determining if the applicant knows the basic information. "Orals" do not always go like that, but one can hope.

This approach would allow the applicant to teach the material in a logical and realistic manner.

Reference Material

The FAA uses the PTS to define the material the applicant must study and know in order to successfully pass a practical test. I like to use the term "sandbox" to describe the concept. Think of a group of kids playing in a sandbox. They are expected to follow a set of rules: don't throw the sand, don't eat the sand, and keep the sand in the box. Everyone playing has to know the rules and is expected to follow them. So it is with the list of references in the FAA sandbox.

The student has to learn and demonstrate "instructional knowledge" of the information in those references. The Student's Instructor has to teach from those references, and the FAA Inspector has to test from those references. Only the student or the student's Instructor has the right to expand that list. If the student doesn't venture outside the list of FAA references, the Inspector can't either. The reference material listed in the PTS is what anyone seeking their CFI should study, know and know how to work with. Be careful with using material from outside the sandbox. It may not be accurate. It may be too complicated. It may lead to more questions than it answers, and an applicant may find that one

Inspector who knows the information better than anyone else and turns the applicant inside out and backwards with questions. The best example of this is the book Aerodynamics for Naval Aviators. It's a great book, but it isn't on the list. If a student elects to use it and refers to it, then the FAA Inspector can ask questions about it. If the student isn't sure or gets lost or confused, the chances of passing go down.

There is no reason to be an aeronautical engineer or a rocket scientist. I have a brother-in-law that fills both descriptions. He is a great source of information. I ask him to explain lots of things to me, but only after I send him the text from one of the FAA publications on the following list.

These practical test standards are based on the following references:

- **14 CFR part 1** Definitions and Abbreviations
- **14 CFR part** 23 Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes
- **14 CFR part** 39 Airworthiness Directives
- **14 CFR part 43** Maintenance, Preventative Maintenance, Rebuilding, and Alteration
- 14 **CFR part** 61 Certification: Pilots and Flight Instructors
- 14 **CFR part** 67 Medical Standards and Certification
- **14 CFR part 91** General Operating and Flight Rules
- **NTSB part 830** Notification and Reporting of Aircraft Accidents and Incidents
- **AC 00-6** Aviation Weather
- **AC 00-45** Aviation Weather Services
- **AC** 60-22 Aeronautical Decision Making
- **AC** 60-28 English Language Skill Standards as Required by 14 CFR parts 61,63, and 65
- **AC** 61-65 Certification: Pilots and Flight Instructors FAA-S-8081-6C 4
- **AC 61-67** Stall and Spin Awareness Training
- **AC 61-84** Role of Preflight Preparation
- **AC 61-107** Operations of Aircraft at Altitude Above 25,000 feet MSL and/or Mach Numbers (Mmo) Greater than 75
- **AC 90-42** Traffic Advisory Practices at Airport Without Operating Control Towers
- **AC 90-48** Pilots' Role in Collision Avoidance
- **AC 90-66** Recommended Standard **T**raffic Patterns for Aeronautical Operations at Airports Without Operating Control Towers
- **AC 91 -13** Cold Weather Operation of Aircraft
- **AC** 91-55 Reduction of Electrical System Failures Following Aircraft Engine Starting
- **AC** 120-51 Crew Resource Management Training (Note 1)
- **FAA-H-8083-1** Aircraft Weight and Balance Handbook
- **FAA-H-8083-3A** Airplane Flying Handbook
- **FAA-H-8083-9A** Aviation Instructor's Handbook (Note 3)
- **FAA-H-8083-27A** Student Pilot Guide (Note 2)
- **FAA-S-8081-4** Instrument Rating Practical Test Standards
- **FAA-S-8081-12B** Commercial Pilot Practical Test Standards
- **FAA-S-8081-14A** Private Pilot Practical Test Standards
- **FAA-H-8083-15A** Instrument Flying Handbook

- **FAA-H-8083-25A** Pilot's Handbook of Aeronautical Knowledge (Note 3)
- **Order 8080.6** Conduct of Airman Knowledge Tests
- **AC 150/5340-1** Standards for Airport Markings
- **AC 150/5340-18** Standards for Airport Sign Systems
- **AC** 150/5340-30 Design and Installation Details for Airport Visual Aids
- **AIM** Aeronautical Information Manual
- **A/FD** Airport/Facility Directory
- **NOTAMs** Notices to Airmen
- **POH/AFM** Pilot Operating Handbooks and FAA-Approved Airplane Flight Manuals
- **Navigation Charts** (Note 1)

(Note 1) (Reference found in FAA-S-8081-14A, Private Pilot Practical Test Standards and FAA-S-8081-12B, Commercial Pilot Practical Test Standards)

(Note 2) References added by author. (The guy who wrote this guide.)

(Note 3) In the summer of 2008 the FAA published two new reference documents, FAA-H-8083-9A Aviation Instructor's Handbook and FAA-H-8083-25A Pilot's Handbook of Aeronautical Knowledge.

Preparing for the Practical Test

- **The "Oral" Portion of the Practical Test**

The "oral" portion of the Practical Test usually takes place at the Flight Standards District Office (FSDO). That's because it is convenient for the Inspectors, and they would like CFI applicants to have the experience of coming to the Flight Standards District Office. It is intimidating but not all that bad given the responsibilities of a CFI. The applicant is generally signed-in at the front desk, after showing the prerequisite identification. Next the assigned Inspector shows up and leads the applicant to either his office or an area used for interviews and meetings. After a short introduction, including location of facilities, the test starts.

It isn't all that uncommon to get an introduction to the Practical Test that explains that this is just about the only flight test that the FAA mandates must be done by an FAA Inspector, and this is perhaps the most important rating of them all. Both are important concepts to consider. If IACRA is being used the Inspector will have the applicant electronically sign the application. At this point the applicant can expect to be asked to "qualify himself." This translates to presenting identification, an application, and a logbook. He will be asked to explain the required endorsements and generally prove his eligibility for the test. In addition he will be expected to present all of the aircraft documents and miscellaneous equipment required by the PTS. This is quite a departure from showing up for the Private or Commercial Pilot Practical Test where the examiner looks through the material the applicant brings and proclaims "You look qualified, so let's start the checkride."

Once the applicant has explained how it is that he is eligible for the check ride, the Inspector starts with questions and scenarios. He will usually start with Area of Operation I, Fundamentals of Instructing. He works his way through the Practical Test Standards one Area of Operation at a time. It is important that the applicant follows along with his own copy of the PTS.

At some point the applicant will be asked to teach the Inspector a flight maneuver that will also be an in-flight lesson, Area of Operation IV. Generally when that lesson is complete, assuming all has gone well, the applicant and the Inspector will be headed towards the airplane for the flying part of the checkride.

Mandatory Areas of Operation and Tasks

Like Death and Taxes, THE APPLICANT WILL BE ASKED ABOUT Area of Operation I, Task F. Flight Instructor Characteristics and Responsibilities and Area of Operations II. Task L. Logbook Entries and Certificate Endorsements. Given that inside tip, the applicant might as well become an expert on those topics. Even with that information, believe it or not, I failed more applicants on Endorsements than any subject other than airspace. If an applicant knows endorsements, thoroughly, it should make proving that his logbook endorsements are correct a snap. I don't make this stuff up. The first sentence of Area of Operation I. and II. tells the applicant what tasks are mandatory. That is true of flight maneuvers too.

• How to prepare for the "oral" on Fundamentals of Instructing (FOI)

Look at the Renewal or Reinstatement of Flight Instructor Table in the PTS. Note that Area of Operation I isn't included. The ONLY time an applicant will be queried about Area of Operation I is during the initial CFI practical test. The rest of the time applicants have to demonstrate the theory by applying it. Because this is about theory and the Inspectors conducting the Practical Tests are pilots first and Instructors second, there is a good chance they will like Fundamentals of Instruction just about as much as the applicant will. It isn't their favorite subject.

I believe the best way to really learn Fundamentals of Instruction is to learn by doing and by finding examples of each term or concept. For example, there are two terms a CFI student will need to know as part of Fundamentals of Instruction, positive and negative transfer. The concept applies to much of how a Flight Instructor teaches a student, but there is no better example than the "touch and go." I ALWAYS tell my CFI students that "I DO NOT DO TOUCH AND GOES," and I don't. Then I ask if they do them, and if so, "Why?" I get lots of answers, but most center on the idea that they improve efficiency. "You can do more takeoffs and landings if you do touch and goes." Once I have heard their logic, I tell them mine. When flying an airplane, especially a complex airplane, after landing, the pilot is expected to taxi clear of the runway, stop the airplane and go through the after-landing checklist. If a student of mine does anything other than that, I am very unhappy. If they insist, I will not keep them as a student. The reason, I do not want my students doing "stuff" while they are supposed to be paying attention to controlling the airplane. Most importantly, I do not want a student grabbing the gear handle thinking it is the flap handle and retracting the gear. I simply have investigated far too many inadvertent gear retractions while the airplane was on the ground. Next, I ask, "How are habit patterns developed?" and "How hard is it to break old ones?"

Teaching a student to do touch and goes and then expecting them to not touch anything until they taxi off the runway is an example of negative transfer. Requesting "the option," then landing, coming to a complete stop on the runway, and then cleaning up the airplane using the checklist, is an example of positive transfer. It is not important that an applicant agrees with my theory about touch and goes; the point is to understand the terms and the theory involved in Fundamentals of Instructing and then use those examples when describing them.

By the way, is the touch and go a maneuver required by the PTS?

NOTE: As indicated earlier, the FAA has published a new FAA-H-8083-9A Aviation Instructor's Handbook. Rather than comment on the value or the need for the new handbook I want to point out a concern. As I stated earlier FAA

Inspectors receive little or no formal training regarding the use of the Flight Instructor PTS. That statement is also true about the reference materials. For the most part, rewriting a handbook wouldn't constitute a problem, except for the Aviation Instructor's Flandbook. Very few Inspector's hold teaching credentials. Very few Inspectors have any formal training in the educational process. The new Instructor's Flandbook includes a lot of new material, emphasizes new information and has been both enlarged and rearranged. Talk to your instructor about the change and suggest that they discuss the matter with the local FSDO.

My concern is that a CFI applicant will learn from the new Flandbook and be tested from the old Flandbook.

• Flow to prepare for the "oral" on Technical Subjects

Let's move on to the technical subjects in Areas of Operation II. and III. Flaving the technical subjects mastered is a great starting place, but the applicant will be only halfway there. The next step is to be able to teach them. The best way to teach the material is to sit down with the PTS and carefully read each Task. Read each Task with a critical bent. Dissect it and if still confused ask an instructor and of course look at my strategy for the particular Task. The point is an applicant should develop his own approach to teaching the material. The next step is to practice teaching. A CFI student should work with his Instructor to find someone to teach each Task to, over and over and over.

The same idea goes for all of the "maneuvers," Areas of Operation V through XIII. Read the Task and analyze the question, then develop an answer. Then practice teaching the maneuvers, first on the ground and then in the air.

The "Flying" Portion of the Practical Test

Getting to this part of the practical test assumes you have been successful at Areas of Operation I through IV. Now you are off to the airplane. If you will remember from my description of an FAA Inspector, I told you that they are like everyone else and put their pants on one leg at a time. If you believe they are human then you must believe they are fallible. If they are fallible then it goes that you must learn to insure the safety of each flight regardless of who is in the other seat, even an FAA Inspector. That protection is both in terms of your personal safety and the protection of your pilot and Flight Instructor certificates. Translated, you are Pilot-In-Command of the airplane you are flying, and therefore you are in charge.

One very good place to start is with a pilot briefing. If you fly with me you will hear something like this: "I am pilot-in-command; therefore I am responsible for the airplane and the flight. If something goes wrong the FAA will look to me for answers. If we experience an emergency, I get to make the final decision. That doesn't mean I will take the controls away from you. In fact if you are at the controls when all hell breaks loose, I would expect you to keep flying and start to deal with the emergency. As the emergency progresses, I might elect to take over and fly the airplane, maybe not; it depends on what will serve us the best."

As far as emergencies go, if I elect to simulate an emergency, IT WILL BE OBVIOUS! An airplane is no place for playing games. I will only simulate an engine failure if there is a place to land should there be a problem. I will only simulate an engine failure with the throttle and NEVER the mixture (single engine airplane). Let me say this again, any simulated emergency will be <u>obvious</u>.

Exchange of controls will be exactly that. “You have the controls, I have the controls,: and so on. “I have the airplane” means you have visual contact with traffic. If I am relinquishing control of the airplane, I tend to show my hands. I like to lift them in front of me and move them around.

Maneuvering, such as stalls, slow flight, etc. is done above 3,000 feet AGL. Recoveries from simulated engine failures will be initiated above 700 feet AGL, unless we are going to actually land. That assumes a real runway in front of us and not a farmer's field.

With that briefing or something like it in mind, who gives that briefing on a check ride? The answer is you. The FARs say the pilot taking the checkride is the pilot-in-command, not the Inspector or the Examiner. Recognize that they may look like PIC and they may even act like a PIC, after all they will be directing the flight like an orchestra conductor. But like the 1st chair trumpeter, you are playing the notes. You are PIC.

Here are some of the things that FAA Inspectors have done or let happen during checkrides. They have let a Jet run off the side of a runway, killing at least one person. They have landed with the gear in the wells. They have caged the engine of a single engine airplane in flight and asked the applicant to perform a dead stick landing. They have chopped a throttle so close to the ground that the pilot taking the checkride couldn't recover, and the Inspector now rolls around in a wheel chair. They have run off runways and struck props. <u>They are human</u>.

The person in the other seat is often an unknown commodity and should be treated as such. The best way to do that is to do a preflight briefing. Get everything out into the open. Then if you don't like what you see, don't go. An unsafe checkride isn't worth a CFI certificate.

How to use this Guide

Besides being able to walk, talk and chew bubblegum all at once, as well as fly, a CFI applicant MUST be computer literate. He **MUST** also be literate in a word processing program. My preference is Microsoft Word. He **MUST** also be Internet literate, being able to copy and paste information from the Internet. He **MUST** have a printer and preferably one that will print in color. Lastly, he **MUST** have Adobe Acrobat. It would be nice if it is a full version, but that isn't absolutely necessary. It just means having to be selective when printing instead of cutting and copying.

This guide will work best if the CFI applicant has a command of the reference materials. The best way to have a command of the reference material is to decide what reference materials apply to which Task and Element and turn each Task Tab into a single source document.

My point is, if a CFI student is teaching Area of Operation/Task II. D. Airplane Flight Controls and wants to study the material, refresh his thoughts or look something up, all he has to do is to flip to Tab II. D. and look at the reference material and any notes they may have made.

Sounds simple. After it is put together, it will be.

STEP 1

Buy at least three, large 3" legal style binders often described as "Swing Hinge" and/or "Linking Arm Prong Binder." Whatever binders are purchased, they will need to open easily and contain a lot of material.

Buy dividers, one set of 15 for each of the 15 Areas of Operations. Buy lots of tabs. Get enough to have one for each Task within each Area of Operation. For example, have one divider for Area of Operation II and 12 tabs for the 12 Tasks in Area of Operation II.

Each Task tab will become a stand-alone reference document for that Task. I believe there are 84 Tasks of which 12 will not apply. (This assumes a check ride in a single engine airplane.)

The first four dividers in the binder will be for the first four Areas of Operation. They represent the "oral." I suspect that these first four Areas of Operations will fill one of the binders, perhaps the better part of two. The next 9 dividers will be for the maneuvers, the "flying" part of the Practical Test.

STEP 2

Purchase the following reference documents:

AC 00-6 Aviation Weather
AC 00-45 Aviation Weather Services
FAA-H-8083-1 Aircraft Weight and Balance Handbook
FAA-H-8083-3A Airplane Flying Handbook
FAA-H-8083-9A Aviation Instructor's Handbook
FAA-S-8081-12B Commercial Pilot Practical Test Standards
FAA-S-8081-14A Private Pilot Practical Test Standards
FAA-H-8083-15A Instrument Flying Handbook
FAA-H-8083-25A Pilot's Handbook of Aeronautical Knowledge

Print any document listed in my guide for the specific Task Tab that is needed. Everything except NTSB 830 and the POH/AFM can be found at FAA.GOV. NTSB 830 can be found at NTSB.GOV. Don't print information that isn't pertinent, like transport category climb performance for the Performance and Limitations task.

STEP 3

Building your binders is very time consuming. That's just how it goes and anything less than a fully self-contained set isn't going to get a CFI student where they need to go.

Here is how I suggest you build your binders:

1. **Area of Operation Divider** - One for every Area of Operation. There are fifteen.
2. **Task Tab** - One for every Task. Too many to count.
3. **A reprint of the TASK,** including TASK title, References and Objective. Just like the FAA published it. (Cut and paste from FAA.GOV)
4. **STRATEGY** - This will be written by the student; for maneuvers, this will also include RELATED MANEUVERS and COMMON ERRORS.
5. **REFERENCE MATERIALS LIST** - Think of this as an index for the reference materials that follow. Most of this can be extracted from the References section of the specific Task as provided in this manual.
6. **References** - Reprints of the references on the Reference Materials List.
7. **References** - Developed or collected by the CFI student. (May include notes, drawings, teaching aids, etc.)

As I indicated earlier, behind each Task Tab will be several pages of information. An example of the first three pages, the TASK, STRATEGY, and REFERENCE MATERIALS LIST can be found in **Appendix 1.** The Task is first because it is the master document for the topic. It contains the Task Title, References and the Objective containing the Elements of the Task. The strategy page is second because it helps the CFI student to organize his approach to teaching the Task. The Reference Materials List is third and is a list of the documents to be used as the reference library for the specific Task. The CFI student should modify it as desired, adding things like matrices, spreadsheets, handouts, outlines or notes.

Following the Reference Materials List will be **ALL** of the assembled reference materials.

By the way, do not photo copy my book and try to use it. It will be breaking a copyright law, but more importantly copying short cuts the process and short changes the learning process. There is no reason to copy my Tasks since they are easily available at www.faa.gov. The worst thing a CFI student can do is to blindly use my strategies. Developing his own strategies is one of the major reasons for developing this guide, and if a CFI Student photocopies the Reference Materials List, it will be missing the student's personal references.

One of the most important concepts of this guide is the development of strategies for each task. I have provided my ideas and explanations. As the CFI student works through each task, reading my thoughts, he must remember they are MY thoughts and may not work for anyone else. The CFI student must develop his own strategy, recognizing that time and experience will change them. The way I teach a subject such as weight and balance, will be very different than how a starting CFI student would teach it. Our approaches should be different. I have almost 40 years of aviation experience; the CFI student may have only 2 or 3. I have seen more; I have investigated fatal accidents caused by pilots that overloaded their airplane. I have violated pilots that didn't respect the weight and limitations imposed by the FAA or the manufacturers; therefore, I see the subject differently than others. The strategy developed by the CFI student must be unique to the student.

• After the Binder

The CFI student should take the written tests before going too far down the training road. I would suggest taking three. Take the Fundamentals of Instruction, the Flight Instructor Airplane and the Advanced Ground Instructor. The CFI student can buy a test prep book to help. I like ASA; other Instructors like Gleim. The CFI student should get the one that suites his needs best and study for one written at a time. Then take the written tests. Try to score a 90% or better.

USE OF REFERENCE MATERIAL DURING THE PRACTICAL TEST

I am not sure where else to put this so right here, at the end of this Section will have to do. Once your binder is completed it will serve as a single source document for studying, practicing, and teaching once you have your CFI, and it will serve as a reference document while taking your Practical Test, most specifically the "oral." Not all FAA Inspectors believe in allowing the use of reference materials during an oral. Because of that I contacted the Manager of AFS-630, March 26, 2008. His response follows:

"A CFI applicant is allowed to use reference materials, but not to the extent that they are dependent on them to answer questions. The evaluator must use judgment. For example an applicant is asked to explain stalls. While answering the question they might show an illustration from the Airplane Flying Handbook. That would be acceptable. If they pulled out the handbook and started reading it that would not be acceptable."

Section 2
Area of Operation I
FUNDAMENTALS OF INSTRUCTING

General

Section 2 is all about Area of Operation I, Fundamentals of Instructing: "how to lunch" or "how to be an Instructor." It is based solely on the material found in FAA-H-8083-9A.

NOTE: Until October, 2008 the Areas of Operations, Tasks and Elements were dearly tied to specific chapters of Handbook, FAA-H-8083-9A. I believe the mnson for that is that the current Practical Test Guide was written **after** the old Instructor's Handbook. With the newest revision that relationship is less clear. In led terms and concepts seem to have changed which do not appear to be inflected in the current PTS. Because of that change, I have tried to be as specific as possible in tying the PTS Element (question) to the Chapter and page of the Instructor's Handbook where possible.

What I have included in this section

- Two pages of general information.
- A reprint of each TASK in Area of Operation I of the CFI PTS.
- An associated STRATEGY for each TASK.

Each TASK is divided into three sections, REFERENCES. OBJECTIVE and STRATEGY.

REFERENCES - Although the Task is a reprint of the PTS, the REFERENCES section as provided by the FAA is incomplete, providing only the document number. I have modified the references by including the corresponding name of the document and at least the chapter or section.

OBJECTIVE - This includes the Elements (the questions) of the Task.

STRATEGY - This is the way I would teach, describe or explain the Task. This is also the place where I give suggestions about things I think are important. In the case of Fundamentals of Instructing there aren't a lot of different ways to work through the Elements in the Tasks. It is pretty much a matter of following the Elements.

Building the Binders - The First Divider

As I said in Section 1, you are going to build a reference binder. The first divider will be devoted to Area of Operation I. Label it, Area of Operation (AO) I, Fundamentals of Instructing. Behind the divider will be seven tabs, one for each TASK

TASK - The first page behind each tab should be a reprint of the TASK as found in the PTS. Cut and paste it directly from FAA.GOV and then format it as you like. Having this as the first page will allow it to be used as a quick reference without thumbing through a separate book.

STRATEGY - This should be the second page(s) behind each tab in this section of the binder.

This is the way **you** would teach, describe or explain the Elements of the Task.

At first this may be a blank page. You should develop your strategy for each Task only after you have read the appropriate section of this Guide, the corresponding Task in the PTS, and all of the reference material related to the Task.

REFERENCE MATERIAL LIST - This should be the third page behind the Task Tab in this section of the binder. Think of it as an index for the reference materials you assemble. Your primary source will be the REFERENCES found in the specific TASKS that follow.

REFERENCE MATERIAL - These should go behind the Reference Material List. This section should include three items:

- The appropriate Task Outline from Appendix 2.
- The chapter or chapters from FAA-H-8083-9A Aviation Instructor's Handbook cited in the REFERENCES section of the TASK.
- Any reference materials developed by the CFI student.

Now to the question of how the FAA Inspector will "determine that the applicant exhibits instructional knowledge of the elements of the learning process by describing:"

There are basically two methods that I see used by Inspectors. I describe the first method as the direct question approach. That is where the Inspector asks questions like; "What is this, what is that? Explain this, explain that." The second way is for the Inspector to tell the applicant to "Take me through Task "X" and explain each of the Elements." The first method puts the applicant at the mercy of the Inspector, who controls the order of the material and the pace of the subject matter. This is especially true if the Inspector asks introductory questions like: "What are the four levels of learning?" The second method lets the applicant work his own way through the Elements of the Task in an orderly fashion. This would let the applicant actually organize and teach the material, just like he would do if working with a student.

By the way, I see no value in memorizing a list of terms. That is a display of rote learning, not the "application or correlative level of knowledge" described in the PTS. Asking for a list of terms is an easy way for the Inspector to get started with a specific Task. It makes it difficult for the applicant. If asked for a rote memory list of terms or titles, I suggest that you refer to your Task Outline provided in Appendix 2.

Now, how best to prepare for all the theory that makes up the Elements within the Tasks in Area of Operation I.

As I indicated earlier, the clear connection between the old Instructor's Handbook and the Practical Test Standard really isn't always that clear any more. I recommend that you assemble the suggested references in your Reference Material section. Then I would use the "find" feature of the Adobe Acrobat program to scour the other parts of the Instructor's Handbook.

I have tried to be as specific as possible in tying the PTS Element (question) to the chapter and page of the Instructor's Handbook where possible.

My last suggestion is to work from a list or an outline of the terms and/or concepts associated with each Task. The "Task Outline" provided in Appendix 2 is just such an aid. Each one can be condensed to a single page in length and

contains nothing more than an outline of the Task. If the applicant has studied the material, has supplemented the terms and concepts with examples, and has practiced explaining them, this Area of Operation should be a snap

Two things to remember:

1. A CFI applicant is allowed to use reference materials. He is just not allowed to read from them as his answer.

2. Have your copy of the CFI Practical Test Standards out and opened to the Task being tested. If unsure of what Task is in play, ask the Inspector. If he is following the PTS, he has developed a Plan of Action and will be working from it.

A SUGGESTION: If the Inspector starts asking direct questions, ask him what Area of Operation he has selected. If that doesn't put him off, ask if you can just go through the Task from start to finish on your own. Worst thing that can happen is you will be told no. The best thing is that you will get the chance to teach the material your way.

I know this sounds intimidating, but it really is worth the effort.

I. AREA OF OPERATION: FUNDAMENTALS OF INSTRUCTING

NOTE: The examiner shall select TASK F and at least one other TASK.

TASK: I. A. THE LEARNING PROCESS

REFERENCES

FAA-H-8083-9A - Aviation Instructor's Handbook - Chapter 2.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of the learning process by describing:

1. Learning theory.
2. Characteristics of learning.
3. Principles of learning.
4. Levels of learning.
5. Learning physical skills.
6. Memory.
7. Transfer of learning.

STRATEGY

This task is all about the learning process, or "How people learn." When studying Chapter 2 of the Aviation Instructor's Handbook, get a handle on the terms and concepts used in the seven Elements of the Task. Some of them will make sense, some are pure theory. I suggest using the Reference Document included in Appendix 2 to help you study. Put a practical meaning to every term and concept in the chapter. Come up with examples. For example, being asked to recite the four levels of learning is an example of a question that tests to the rote level of learning.

Be prepared to explain every term or concept in each Element.

As an aside, my guess is that the applicant will be asked for the definition of learning. The answer is that learning can be defined as a "change in behavior as a result of experience."

An outline of Chapter 2 of the Aviation Instructor's Handbook

Learning Theory (Chapter 2-2)
- Behaviorism
- Cognitive theory

Characteristics of Learning (Chapter 2-15)
- Learning is Purposeful
- Learning is the Result of Experience
- Learning is Multifaceted
- Learning is an Active Process.

Principles of Learning (Thorndike and the Laws of Learning) (Chapter 2-10)

- Readiness
- Effect
- Exercise
- Primacy
- Intensity
- Recency

Levels of Learning (Chapter 2-13)

- Rote
- Understanding
- Application
- Correlation

Learning Physical Skills (Acquiring Skill Knowledge) (Chapter 2-20)

- Stages of Skill Acquisition
  - Cognitive Stage
  - Associative Stage
  - Automatic Response Stage
  - Knowledge of the results
  - How to Develop Skills
  - Learning plateaus
- Types of Practice
  - Deliberate Practice
  - Blocked Practice
  - Random Practice

Memory (Chapter 2-32)

- Sensory Memory
- Short-Term Memory
- Long-Term memory
- Remembering What Has Been Learned
- How Usage Affects Memory
- Forgetting
  - Retrieval Failure
  - Fading
  - Interference
  - Repression or Suppression
- Retention of Learning
  - Praise Stimulates Remembering
  - Recall is Prompted by Association
  - Favorable Attitudes Aid Retention
  - Learning With All Senses is Most Effective
  - Meaningful Repetition Aids Recall
  - Mnemonics

Transfer of Learning (2-36)

- General definition
- Positive transfer
- Negative transfer

TASK: I. B. HUMAN BEHAVIOR AND EFFECTIVE COMMUNICATION

REFERENCES

FAA-H-8083-9A - Aviation Instructor's Handbook - Chapters 1 and 3.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of the teaching process by describing:

1. Human behavior -
    a. control of human behavior.
    b. human needs.
    c. defense mechanisms.
    d. the flight instructor as a practical psychologist.

2. Effective communication -
    a. basic elements of communication.
    b. barriers of effective communication.
    c. developing communication skills.

STRATEGY

This task covers two concepts and therefore two Chapters in the Aviation Instructor's Handbook. It's about Human Behavior and Effective Communications. Study them as two separate concepts. Like Task I. A., when studying the appropriate chapter of the Aviation Instructor's Handbook, make sure to understand the terms and concepts used in the Elements of the Task. Use the Reference Document in Appendix 2 for a guide. Put a practical meaning to every term and concept. For example, when discussing what to do with "seriously abnormal" students, there are several options available. The best ones in my opinion are: 1) Go to the boss and ask him to look at the student. 2) Go to the local FSDO and ask for help. The bottom line is don't try to deal with the student on your own.

An outline of Chapter 1 and 3 of the Aviation Instructor's Handbook

Control of Human Behavior (Chapter 1-1)

- Definition of Human Behavior
  Personality Types
  Instructor and Student Relationship

Human Needs (Maslow's hierarchy of human needs) (Chapter 1-3)

- Physical Physiological)
- Safety (Security)
- Social (Belonging)
- Ego (Esteem)
- Cognitive and Aesthetic
- Self-fulfillment (Self-Actualization)

Defense Mechanisms (Human Factors That Inhibit Learning) (Chapter 1-6)

- Repression
- Denial
- Compensation
- Projection
- Rationalization
- Reaction formation
- Fantasy
- Displacement

The flight instructor as a practical psychologist (Student Emotional Reactions) (Chapter 1-8)

- Anxiety
- Normal reaction to stress
- Abnormal reactions to stress
- Flight Instructor actions regarding seriously abnormal students
- Teaching the Adult Student

Basic elements of communication (Chapter 3-2)

- The source
- The symbols
- The receiver

Barriers of effective communication (Chapter 3-4)

- Lack of common experience
- Confusion between the symbol and the symbolized object
- Overuse of abstractions
- Interference

Developing communication skills (Chapter 3-7)

- Role playing
- Instructional communications
- Listening
- Questioning
- Instructional Enhancements

TASK: I. C. THE TEACHING PROCESS

REFERENCES

FAA-H-8083-9A - Aviation Instructor's Handbook - Chapter 4 and **5.**

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of the teaching process by describing:
1. Preparation of a lesson for a ground or flight instructional period.
2. Presentation methods.
3. Application, by the student, of the material or procedure presented.
4. Review and evaluation of student performance.

STRATEGY

This task is all about the teaching process, or "How to teach."

When studying Chapter 4 of the Aviation Instructor's Handbook, focus on how lessons are prepared and developed. Focus on how lessons can be presented and how to review and evaluate students and their performance. Also make sure you can define "application" as used in this task.

This Task doesn't seem to involve much in the way of a list, which an Inspector could ask for. The only exception could be the term "Application."

Develop examples of any term or concept used in the Task. Having and using examples makes understanding and explaining easier. Use the Reference Document in Appendix 2 for a guide.

An outline of Chapter 4 and 5 of the Aviation Instructor's Handbook

Preparation of a lesson (for a ground or Flight Instructional Period) (Chapter 4-4)
- Training Objectives and Standards
- Performance-Based objectives
  - Description
  - Condition
  - Criteria
- The Importance of the PTS in Aviation Training
- Curricula
- Decision-Based Objectives
- Other Used of Training Objectives

Presentation methods (Chapter 4-8)
- Presentation of a Lesson
- Organization of Material
  - Introduction
  - Development
  - Overview

- Training Delivery Methods
  - Lecture method
  - Discussion Method
  - Guided Discussion Method
  - Problem-Based Learning
  - E-Learning
  - Cooperative or Group Learning method
  - Demonstration Performance method
  - Drill and Practice

Application, by the student, of the material or procedure presented (Chapter 4-22)

- Application of the Lesson
- Define it

Review and evaluation of student performance (Chapter 5-1)

- Assessment Terminology
- Purpose of Assessment
- General Characteristics of Effective Assessment
- Traditional Assessment
- Authentic Assessment
- Choosing an Effective Assessment Method
- Critiques and Oral Assessments

TASK: I. D. TEACHING METHODS

REFERENCES

FAA-H-8083-9A - Aviation Instructor's Handbook - Chapter 4 and 6.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of teaching methods by describing:

1. Material organization.
2. The lecture method.
3. The cooperative or group learning method.
4. The guided discussion method.
5. The demonstration-performance method.
6. Computer-based training method.

STRATEGY

This task is about methods of teaching. It is broken into two ideas. The first is about organizing the materials you teach. The second is about teaching methods.

Approach the material just that way, as two subjects.

Material Organization starts with the big picture, syllabus, blocks of lessons, then lesson plans. It then shifts to the layout of a lesson. Pay special attention to the concept of lesson development. This is critical to developing a strategy.

The second subject of this Task is the method used to teach. There is a list, which includes:

- The lecture method.
- The cooperative or group learning method.
- The guided discussion method.
- The demonstration-performance method.
- Computer-based training method.

It is important that the applicant understands each method. This might be a place where a spreadsheet would be of benefit.

Like other tasks in the Fundamentals of Instructing, I suggest working from the Reference Document in Appendix 2 as a guide.

Develop examples of any term or concept used in the Task. Having and using examples makes understanding and explaining easier. An example of lesson development would be **known to unknown.** An example of known to unknown would be explaining the technique of flying a Short Field Approach on the back side of the power curve by reminding the student of what it took to perform Maneuvering During Slow Flight.

An outline of Chapters 4. 5 and 6 of the Aviation Instructor's Handbook

Material organization (Chapter 6-1)

- Course of Training
- Blocks of Learning
- Training Syllabus
- Syllabus Format and Content
- How To Use a Training Syllabus

- Lesson Plans
- Purpose of the Lesson Plan
- Characteristics of a Well-Planned Lesson
- How To Use a Lesson Plan Properly
- Lesson Plan Formats

General layout of a lesson (Organization of Material) (Chapter 4-8)

- Introduction
  - Attention
  - Motivation
  - Overview
- Development
  - Past to present
  - Simple to complex
  - Known to unknown
  - Most frequently used to least used
- Conclusion

The lecture method (Chapter 4-10)

- Teaching Lecture
- Preparing the Teaching Lecture
- Suitable Language
- Types of Delivery
- Use of Notes
- Formal Versus Informal Lectures
- Advantages and Disadvantages of the Lecture

The cooperative or group learning method (Chapter 4-20)

- Conditions and Controls
  - Small, heterogeneous groups
  - Clear, complete instructions.
  - Student perception of targeted
  - The opportunity for student success
  - Student access to and comprehension of required information
  - Sufficient time for learning
  - Individual accountability
  - Recognition and rewards for group success
  - Time after completion of group tasks for systematically reflection

The guided discussion method (Chapter 4-13)

- Use of Questions in a Guided Discussion
- Planning a Guided Discussion
- Student Preparation for a Guided Discussion
- Guiding a Discussion - Instructor Technique
- Advantage

The demonstration-performance method (Chapter 4-21)

- Explanation Phase
- Demonstration Phase
- Student Performance and Instructor Supervision Phases
- Evaluation Phase

Computer-based training method (Electronic Learning) (Chapter 4-18) .

Computer-Assisted Learning (CAL) Method

Simulation, Role-Playing, and Video Gaming

TASK: I. E. CRITIQUE AND EVALUATION

REFERENCES

FAA-H-8083-9A - Aviation Instructor's Handbook - Chapter 2, 4 and 5.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of critique and evaluation by explaining:

1. Critique-
    a. purpose and characteristics of an effective critique.
    b. methods and ground rules for a critique.
2. Evaluation -
    a. characteristics of effective oral questions and what types to avoid.
    b. responses to student questions.
    c. characteristics and development of effective written questions.
    d. characteristics and uses of performance test, specifically, the FAA PTS.

STRATEGY

As the title of the Task says, this is about critiques and evaluations. To me a definition of the two terms is in order. Unfortunately the new FAA-H-8083-9A doesn't seem to have a short and snappy definition of either term. Webster's defines a critique as: "The act or art of criticizing." Criticizing is defined as: "To analyze and judge." Evaluation on the other hand is defined as: "To find the value or amount." For me a critique is more informational and less formal. An evaluation is usually formal and often has a grade associated. A simple way to remember the difference is that a critique is a ***+/A*** (plus/delta) which means, telling the student what is good and what needs improvement. On the other hand an evaluation is a +/- (plus/minus) which means what was right and what was wrong. Beyond the difference between a critique and an evaluation, the Task focuses on what makes an effective critique and what makes an effective evaluation.

Another problem is that the new Aviation Instructor's Handbook has introduced a "new" term, assessment. Where the PTS draws a distinction between critique and evaluation the Handbook muddies the water.

Chapter 5 of the new Aviation Instructor's Handbook is only eleven pages long. It is worth reading the whole chapter to answer the Task.

This is a Task where a spreadsheet might be helpful. Deciding what terms are important and then developing examples of terms and concepts is a must. Use the Reference Document in Appendix 2 for a guide. Put a practical meaning to every term and concept and develop examples. Having and using examples makes understanding and explaining easier.

An outline of Chapter 2, 4 and 5 of the Aviation Instructor's Handbook

Definition of Critique and Evaluation (Chapter 5-3 and 5-9)

Purpose and characteristics of an effective critique

• Purpose of a Critique (Assessment) (Chapter 5-2)

- Characteristics of an Effective Critique (Assessment) (Chapter 5-3)
  - Objective
  - Flexible
  - Acceptable
  - Comprehensive
  - Constructive
  - Organized
  - Thoughtful
  - Specific
- Methods and ground rules for a critique (Chapter 5-8)
  - Instructor/Student Critique
  - Student-Led Critique
  - Small Group Critique
  - Individual Student Critique by Another Student
  - Self-Critique
  - Written Critique
  - Oral Assessment
  - Characteristics of Effective Questions
  - Types of Questions to Avoid
  - Answering Student Questions

Characteristics of effective oral questions and what types to avoid (Chapter 5-10 and 5-11)

- Characteristics of Effective Questions
- Types of Questions to Avoid
  - Do you understand?
  - Do you have any questions?
  - Puzzle
  - Oversize
  - Toss-up
  - Bewilderment
  - Trick questions
  - Irrelevant questions

Responses to student questions (Chapter 5-11)

- Explain how to respond to student questions

Characteristics and development of effective written questions Assessment/Test (Chapter 5-4)

- Reliability
- Validity
- Usability
- Objectivity
- Comprehensiveness
- Discrimination

Characteristics and uses of performance test, specifically, the FAA practical test standards (Chapter 5-9)

- Explain the characteristics of a performance test
- Explain the use of a performance test
- Discuss the FAA practical test standards (Chapter 4-6)
- Describe the PTS layout
  - Define an Area of Operation
  - Define a Task
  - Define an Element

TASK: I. F. FLIGHT INSTRUCTOR CHARACTERISTICS AND RESPONSIBILITIES

REFERENCES:

FAA-H-8083-9A - Aviation Instructor's Handbook - Chapter 7
FAA-H-8083-3A - Airplane Flying Handbook - Chapters 11 through 15.
FAR Part 61 - Subpart C - Student Pilots.

OBJECTIVE:

To determine that the applicant exhibits instructional knowledge of the elements of flight instructor characteristics and responsibilities by describing:

1. Aviation instructor responsibilities in -
   a. providing adequate instruction.
   b. establishing standards of performance.
   c. emphasizing the positive.
2. Flight instructor responsibilities in -
   a. providing student pilot evaluation and supervision.
   b. preparing practical test recommendations and endorsements.
   c. determining requirements for conducting additional training and endorsement requirements.
3. Professionalism as an instructor by - (Chapter 7-6)
   a. explaining important personal characteristics.
   b. describing methods to minimize student frustration.

STRATEGY

> THIS IS A MANDATORY TASK. Like death and taxes, it will be part of the "oral."

This Task is about what makes a good Flight Instructor. It's about Instructor Responsibilities and Professionalism. For the most part this Task isn't about lists of terms; it's about concepts and how to do things. The only "list" of terms is found in Element 3. Those terms are pretty much self-explanatory.

Try to develop examples of any term or concept in the Task and develop explanations of those Elements that are concept driven. This will make learning and teaching the Elements easier.

Like other tasks in the Fundamentals of Instruction, I suggest working from the appropriate Reference Document in Appendix 2 (or one you developed for yourself). Because this is a mandatory Task I have included lots of suggestions under each Element.

An outline of Chapter 7 of the Aviation Instructor's Handbook

Aviation instructor responsibilities - (Chapter 7-2)

• providing adequate instruction

You need to define "adequate." Consider three ideas:

1. What the FARs require: for example there is a list of topics/maneuvers required to be taught before the first solo, before authorizing solo cross-country privileges and before endorsing a student for the practical test. You haven't provided adequate instruction until you have met your legal

obligations. Reviewing those requirements in Subpart C of FAR 61 would be well worth the time.

2. The quality of the instruction provided: how well the Instructor teaches, how thorough he or she is. You haven't provided adequate instruction until you have provided good thorough instruction.

3. The art of teaching: how well an Instructor communicates or connects with a student; the reason one Instructor gets through while another doesn't. You haven't provided adequate instruction until you have "gotten through" to your student.

- **establishing standards of performance (Chapter 7-3)**
  There are two trains of thought:
  The first is setting one standard (not the end goal) and upping it as the student progresses.

  The second, which I like, is to explain the standard in the PTS and critique the student's performance, accepting less than the PTS, but expecting better and better performance until the student is performing at the final level.

- **emphasizing the positive (Chapter 7-3)**
  Basically this is the "you can catch more flies with honey" approach. This is positive motivation.

Flight instructor responsibilities (Chapter 7-5)

- **providing student pilot evaluation and supervision**
  I do not believe in "evaluating" a student pilot's performance on a day to day basis. I prefer critiquing. There are times when an evaluation is appropriate, such as when you are getting a student ready to solo. In that case informally evaluate the student pilot in preparation for an endorsement.
  Regarding supervision, I believe your guidance and advice could be construed as supervision, but more formally, supervision is done through the student pilot endorsement system.

  Something most Instructors are not aware of, when the current FAR Part 61 was written the FAA gave an Instructor's Student Pilot endorsements the full force of the FARs. Read FAR 61.89 (a) (8).

- **preparing practical test recommendations and endorsements**
  Start by referring to Area of Operation II, Task L. It's all about practical test recommendations and endorsements.

  My best guess about where this sub-element is going is that before an Instructor signs an endorsement he has a responsibility to go to the regulation (Part 61) and make sure that the student has met the regulatory requirements.

- **determining requirements for conducting additional training and endorsement requirements**
  The FAA provides various documents that can aid an Instructor in determining the requirements for additional training. Chapters 11 through 15 of the Airplane Flying Handbook contain information about additional training and transitioning pilots to different types of aircraft.

  In addition to things such as complex aircraft checkouts and endorsements, there are Flight Reviews and company specific checkouts that allow rental of aircraft.

Mmil of those additional training requirements do not have regulatory U'HulmiiHinln Whore such requirements exist it behooves the Instructor to tin Ihnlr nr.ti,noli Regarding checkouts and training that don't have i»H)ulalory requirements, the Instructor can consult FAA documents, Instructors with experience, or owners of their FBO/school for guidance. In miy case the Instructor should develop a curriculum tailored to the student's specific experience level and needs.

Professionalism as an instructor (Chapter 7-6 and 7-9)

- **explaining important personal characteristics**

  You will reap what you sow. If you want any of the following characteristics in your students, you need to model them. It's just that simple.
  Sincerity
  Acceptance of the student
  Personal appearance and habits
  Demeanor
  Safety practices and accident prevention
  Proper language
  Self-improvement

- **describing methods to minimize student frustration (Chapter 7-4).**

  Motivate students
  Approach students as individuals
  Give credit where credit is due
  Criticize constructively
  Be consistent
  Admit errors

TASK: I. G. PLANNING INSTRUCTIONAL ACTIVITY

REFERENCES:

I AA-H-8083-9A - Aviation Instructor's Handbook - Chapter 6.

OBJECTIVE:

To determine that the applicant exhibits instructional knowledge of the elements of planning instructional activity by describing:

1. Developing objectives and standards for a course of training.
2. Theory of building blocks of learning.
3. Requirements for developing a training syllabus.
4. Purpose and characteristics of a lesson plan.

STRATEGY:

This Task is **NOT** about actually putting together a lesson plan. That is left for Area of Operation IV. This Task is about the theory of lesson planning. It Includes building blocks, developing a training syllabus, and lesson plans.

Start with the concept of a syllabus and then move to building blocks and finally lesson plans.

This is a Task where a spreadsheet might be helpful. Developing examples of terms and concepts is a must.

Use the Reference Document in Appendix 2 (or one you developed for yourself) for a guide. Put a practical meaning to every term and concept in each Element.

Develop examples of any term or concept used in the Task. Having and using examples makes understanding and explaining easier. Since you are most likely learning to become a CFI in some sort of a formal setting, ask for copies of the school's curriculum, syllabus and training course outline.

An outline of Chapter 6 of the Aviation Instructor's Handbook

Developing objectives and standards for a course of training

- Curriculum
- Syllabus
- Training course outline

Theory of building blocks of learning

- Explain the theory of building blocks

Requirements for developing a training syllabus

- Syllabus format and content
- How to use a training syllabus

Purpose and characteristics of a lesson plan

- Purpose of the lesson plan
- Characteristics of a well-planned lesson
  - Unity
  - Content
  - Scope
  - Practicality
  - Flexibility
  - Relation to Course of Training
  - Instructional Steps
- How to use a lesson plan properly
- Lesson plan formats

Section 3

Areas of Operation II and III
TECHNICAL SUBJECT AREAS AND PREFLIGHT PREPARATION

General

Section 3 is all about the "technical" subjects that make up Areas of Operation II. and III. Section 3. is what I would call "ground instruction." It's the technical subjects that an Instructor would teach a student.

What I have included in this section

This page of general information.

A reprint of each TASK in Areas of Operation II and III of the PTS.

An associated STRATEGY for each TASK.

Each TASK is divided into three sections, REFERENCES. OBJECTIVE and STRATEGY.

REFERENCES - Although the Task is a reprint of the PTS, the REFERENCES section as provided by the FAA is incomplete, providing only the document number. I have modified the references by including the corresponding name of the document and at least the chapter, section or FAR and when appropriate the page number(s).

OBJECTIVE - This includes the Elements (the questions) of the Task.

STRATEGY - This is the way I teach, describe or explain the Task. Often I will suggest an order to teach the material. This is also the place where I give suggestions about things I think are important. Most of these Tasks are complicated and require reading the Element with your best critical thinking skills. Because these Tasks involve teaching so much technical information, much more thought has to go into how to develop and teach the material in this section than Section 2. One thing that is different about the Strategy in this section is that each Element is addressed after a general strategy is covered.

This material is the basis for the information in your binder for Technical Subject Areas and Preflight Preparation.

Building the Binders - The First Divider

As I said in Section 1, you are going to build a reference binder. The second and third dividers will be devoted to Areas of Operation II and III. Label them AO II, Technical Subject Areas and AO III, Preflight Preparation. Behind divider II will be 12 tabs, one for each TASK. Behind divider III will be five tabs, one for each TASK

TASK - The first page behind each tab should be a reprint of the TASK as found in the PTS. Cut and paste it directly from FAA.GOV and then format it, as you like. Having this as the first page will allow it to be used as a quick reference without thumbing through a separate book.

STRATEGY - This should be the second page(s) behind each tab in this section of Iho binder.

This is the way **you** would teach, describe or explain the Elements of the Task. At first this may be a blank page. You should develop your strategy for each Task only after you have read the appropriate section of this Guide, the corresponding Task in the PTS, and all of the reference material related to the Task.

REFERENCE MATERIAL LIST - This should be the third page behind the Task Tab in this section of the binder. Think of it as an index for the reference materials you assemble. Your primary source will be the REFERENCES found in the specific TASKS that follow.

REFERENCE MATERIAL - These are the things that should go behind the Reference Material List. This section should include three items:

- ALL of the references cited in the REFERENCES section of the TASK.
- Any reference materials developed by the CFI student.
- Any other reference materials the student thinks are of value.

II. AREA OF OPERATION: TECHNICAL SUBJECT AREAS

NOTE: The examiner shall select TASK L and at least one other TASK.

TASK: II. A. AEROMEDICAL FACTORS

REFERENCES:

I AA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 16.
AIM - Chapter 8, Section 1.
FAA-S-8081-12B - Commercial PTS - AO I. Task J.
FAA-S-8081-14A - Private PTS - AO I. Task J.
FAA-H-8083-27A - Student Pilot Guide.
FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.
Flight Standards Information Management System 8900.1 Change 0 - 9/13/2007 Volume 5 Airman Certification Chapter 8, Conduct a Special Medical Test (FAA.GOV).

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to aeromedical factors by describing:
1. How to obtain an appropriate medical certificate.
2. How to obtain a medical certificate in the event of a possible medical deficiency.
3. The causes, symptoms, effects, and corrective action of the following medical factors -
    a. hypoxia.
    b. hyperventilation.
    c. middle ear and sinus problems.
    d. spatial disorientation.
    e. motion sickness.
    f. carbon monoxide poisoning.
    g. fatigue and stress.
    h. dehydration.
4. The effects of alcohol and drugs and their relationship to flight safety.
5. The effect of nitrogen excesses incurred during scuba dives and how this affects pilots and passengers during flight.

STRATEGY

This task has five Elements. They involve five related topics, which are not interdependent. There is no specific reason to teach the material in any particular order. Elements 3, 4, and 5 would be best taught using some sort of a matrix.

1. How to obtain an appropriate medical certificate.
You need to know how to send a Student Pilot to an Aviation Medical Examiner (AME) to get a combination Student Pilot Certificate and Medical Certificate. When he returns he should have a single piece of paper that is yellow or cream in color. You will also have to explain where to find a list of Aviation Medical Examiners and be able to give advice about what grade of Medical Certificate to apply for.

You will need to know what to do if the Student Pilot comes back with a white medical. This means he didn't get a Student Pilot Certificate, and you will now need to send him to either the FAA or a Designated Pilot Examiner to get a Student Pilot Certificate.

2. How to obtain a medical certificate in the event of a possible medical deficiency.

There are three outcomes after applying for a medical:
1. You get one without limitations other than glasses.
2. You do not get one at all.
3. You get one with "LIMITED TO STUDENT PILOT PRIVILEGES" or "NOT VALID FOR NIGHT FLYING OR BY COLOR SIGNAL CONTROL."

If the student comes back with a combination Student Pilot Certificate and Medical Certificate without any limitations other than, "Must wear glasses" you are ready to start training.

If the student comes back without a medical certificate because he has a medical deficiency, he is ineligible for a medical without further review by the FAA. (i.e., heart problems) In this case your task will be to help him work with the AME and the FAA's Aeromedical Branch in Oklahoma City as he attempts to provide information in order to qualify for a Medical Certificate.

The last option is if the student comes back with a medical certificate that reads, "LIMITED TO STUDENT PILOT PRIVILEGES" or "NOT VALID FOR NIGHT FLYING OR BY COLOR SIGNAL CONTROL." When this happens it is usually because the student has a medical deficiency that limits his flying. Examples are: color blindness, having only one eye, unable to read. In this case your task will be to help the student work with the AME to request authorization for a Special Medical Test. This is usually conducted by the local Flight Standards District Office (FSDO). Once the student gets a letter from Oklahoma City authorizing a Special Medical Test, you should call the FSDO and ask what the test will involve. More information can be found in FAA Order 8900.1, Flight Standards Information Management System (FSIMS), Volume 5, Chapter 8.

3. The causes, symptoms, effects, and corrective action of the following medical factors-

- **a. hypoxia.**
- **b. hyperventilation.**
- **c. middle ear and sinus problems.**
- **d. spatial disorientation.**
- **e. motion sickness.**
- **f. carbon monoxide poisoning.**
- **g. fatigue and stress.**
- **h. dehydration.**

Make a matrix - Factor - Cause - Symptom - Effects - Corrective action

Factor	Cause	Symptom	Effects	Corrective action
hypoxia.				
hyperventilation.				
middle ear and sinus problems.				
spatial disorientation				
motion sickness.				
carbon monoxide poisoning.				
fatigue and stress.				
dehydration.				

4. The effects of alcohol and drugs, and their relationship to flight safety.
One of my students suggested breaking this into two groups, alcohol and drugs and then breaking drugs into illegal, prescription and over-the-counter. Good idea. The answer for alcohol deals with the regulation and the effects of alcohol. The answer for illegal drugs is that they are illegal. The answer for other types of drugs (prescription and over-the-counter) is asking your DME, the AOPA or the Federal Air Surgeon if it is OK to take them.

5. The effect of nitrogen excesses incurred during scuba dives and how this affects pilots and passengers during flight.
This Element isn't about how to avoid nitrogen excesses per say. Instead it's about describing the effects of nitrogen excesses. How to avoid nitrogen excesses is simple: don't fly within a certain period of time after a dive. What the effects are is the real question. A student of mine that is both a pilot and a scuba diver suggested that having a good understanding of nitrogen excesses would be helpful. He also suggested that this is one time where the FAA material is a bit skimpy. He recommended http:www.scuba-doc.com/flyingaft.htm

TASK: II. B. VISUAL SCANNING AND COLLISION AVOIDANCE

REFERENCES

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 1, Pgs 1-4/5.
AC 90-48 - Pilots' Role in Collision Avoidance.
AIM:
- Chapter 4, Section 4.
- Chapter 8, Section 1.
- Chapter 5, Section 5.

FAA-S-8081-6C - Flight Instructor Practical Test Standards for Airplane:
- Special Emphasis Areas.
- Flight Instructor Responsibility.
- Examiner Responsibility.
- Unsatisfactory Performance.

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Unable to find a reference.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of visual scanning and collision avoidance by describing:
1. Relationship between a pilot’s physical condition and vision.
2. Environmental conditions that degrade vision.
3. Vestibular and visual illusions.
4. “See and avoid” concept.
5. Proper visual scanning procedure.
6. Relationship between poor visual scanning habits and increased collision risk.
7. Proper clearing procedures.
8. Importance of knowing aircraft blind spots.
9. Relationship between aircraft speed differential and collision risk.
10. Situations that involve the greatest collision risk.

STRATEGY:

This task has ten Elements. They involve ten related topics, which for the most part are not interdependent. I believe that the order of the Elements could be better arranged. My preference is to teach Element 4 first, followed by the rest of the Elements in their original order. I believe that "setting the stage" first by making sure that the student understands what "See and Avoid" is all about is a major benefit.

I have rearranged the Elements into slightly different subjects, teaching the Elements in the following order.

SUBJECT	ELEMENT
The "See and Avoid" concept.	4. “See and Avoid" concept.
How you see and what affects your vision.	1. Relationship between a pilot's physical condition and vision. 2. Environmental conditions that degrade vision. 3. Vestibular and visual illusions.
How to scan.	5. Proper visual scanning procedure. 6. Relationship between poor visual scanning habits and increased collision risk.
How to clear and knowing your aircraft's blind spots	7. Proper clearing procedures. 8. Importance of knowing aircraft blind spots
Risk management, be it closure rates or locations where mid-air collisions happen.	9. Relationship between aircraft speed differential and collision risk. 10. Situations that involve the greatest collision risk.

4. “See and avoid” concept.

Start by defining the "See and Avoid” concept. Make a list of all of the VFR flight regulations that makeup the basis for the "See and Avoid” concept. This list includes requirements when flying in the traffic pattern, right of way rules, and the hemispheric rule. Everything else falls into place once the student understands how extensive the "See and Avoid” concept is and how important scanning and clearing really are.

1. Relationship between a pilot’s physical condition and vision.
2. Environmental conditions that degrade vision.
3. Vestibular and visual illusions.

Describe how we see and what things effect our ability to see. Include the pilot's physical condition, environmental conditions and illusions.

5. Proper visual scanning procedure.
6. Relationship between poor visual scanning habits and increased collision risk.

Explain how to scan. Add where to scan. Then explain why there is an Increased collision risk when a pilot has poor visual scanning habits. I am a proponent of climbing to 1,000 feet AGL in the traffic pattern at best rate of climb airspeed. My logic is that my chances of a safe landing in the event of an engine failure are increased. Once at 1,000 feet AGL, however, I teach transitioning to a pitch attitude that allows the pilot to see over the cowling. I include climb profiles as they relate to scanning.

7. Proper clearing procedures
8. Importance of knowing aircraft blind spots

Next describe how to clear and how to clear in different types of aircraft with different types of blind spots. Explain the difference between high wing and low wing airplanes. Certainly focus on clearing before turning and clearing before performing various other maneuvers. Discuss how to clear at an uncontrolled airport, when entering, and when taking the runway. NOTE: This is also a good time to discuss what maneuvers are "clearing turns" by their very nature. Point out that clearing turns are an emphasis item in the PTS.

9. Relationship between aircraft speed differential and collision risk.
10. Situations that involve the greatest collision risk

It's all about risks. After all that's what being a pilot is all about, risk management. In this country we drive on the right side of the road. What side of the road do you fly on? Sounds simple, but there is a greater risk of hitting oncoming traffic if you fly on the wrong (left) side of the road than the right. Explain the risks of speed (closure rates) and areas of greatest risks (airports and over VORs). These are two different topics but similar in nature and easily combined.

TASK: II. C. PRINCIPLES OF FLIGHT

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge Chapters 3 and 4.
AC No.: 90-23F - Aircraft Wake Turbulence.
AIM - Chapter 7, Section 3.
FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of principles of flight by describing:
1. Airfoil design characteristics.
2. Airplane stability and controllability.
3. Turning tendency (torque effect).
4. Load factors in airplane design.
5. Wingtip vortices and precautions to be taken.

STRATEGY

This task is all about aerodynamics. It covers two chapters in the Pilot's Handbook of Aeronautical Knowledge. The first Element is the most confusing. There is no specific "heading" in either chapter that says exactly "Airfoil Design Characteristics." Our choices are "Airfoil Design" (Chapter 3) or “Design Characteristics" (Chapter 4). After reading and rereading, I am of the opinion that the heading "Airfoil Design" is the reference to use. Overall, this lesson is probably best taught in the order the Elements are presented. Some of the Elements require a little background material.

There are a lot of good pictures in these chapters. I would suggest enlarging the ones that best suit your style of teaching and have them ready for use.

NOTE: Although this is a lesson that does NOT require defining or listing terms, I suggest deciding which terms are important to the lesson, listing them on the whiteboard at the beginning of the lesson and making sure each is used and defined. Following are some terms; there are many more:

Airfoil
Cord
Leading Edge
Trailing Edge
Camber
Angle of Attack
Angle of Incidence
Flaps
Stall
Stagnation Point
Laminar Flow

1. Airfoil design characteristics.

There are 12 bold topics in Chapter 3 of the Pilot's Handbook of Aeronautical Knowledge. The ninth bold topic is titled Airfoil Design. I believe Airfoil Design is the heart of the Element. This Element centers on why a wing is designed the way it is. The Element is essentially all of Chapter 3.

Start with a brief explanation of the atmosphere (a fluid through which an airfoil moves), followed by a discussion of Newton's Law of Motion and Bernoulli's Principle of Pressure.

This will established a foundation and it will be easier to explain airfoil design characteristics of a General Aviation wing like a Cessna 172 or the Piper Arrow.

The Pilot's Handbook of Aeronautical Knowledge suggests " Perhaps the explanation can best be reduced to its most elementary concept bv stating that lift (flight) is simply the result of fluid flow (air) about an airfoil - or in everyday language, the result of moving an airfoil (wing), bv whatever means, through the air." (Emphasis on wing.)

Next draw a cross section of a wing, including all of the terms used to explain how it works and how airflow creates lift. Again this Element is essentially all of Chapter 2.

2. Airplane stability and controllability.

Stability and controllability is a stand-alone topic. It does have two facets, one, which is theoretical, and one that is more practical. I explain the theory of stability first and then explain what manufacturers do to insure stability. I also explain the relationship between stability, controllability and maneuverability. This will take the lesson to terms like dihedral, center of pressure, center of gravity, wash-in, wash-out, wingtwist, etc. You must be able to explain these terms.

THE RELATIONSHIP BETWEEN STABILITY, CONTROLLABILITY AND MANEUVERABILITY

Stability - the ability for the airplane to return to its flight state before being disturbed.

Controllability - the ease with which the pilot can make the airplane do what he wants it to do.

Maneuverability - the rate at which the airplane moves when a pilot input is made.

Stability t Controllability T Maneuverability 4-
Stability *I* Controllability 4. Maneuverability t

3. Turning tendency (torque effect).

Although related to previous topics this Element is also a stand-alone topic. Turning tendency is also referred to as "left turning tendency" or "torque effect." Teach this area by describing each tendency as an airplane takes off. Then re-explain the concepts of turning tendency by describing the effects of reducing power, descending and leveling off. One of my students came up with the following matrix:

	Pitch up	Level Pitch	Pitch Down	Power Off
Torque				
"P" Factor				
Gyroscopic Precession				
Slip Stream				

4. Load factors in airplane design.
This is a stand-alone topic. The Pilot's Handbook of Aeronautical Knowledge dedicates the better part of six pages to this topic. There are two important concepts that need to be explained. The first is the concept of Gs or loads on the airplane while maneuvering. The second is stall speeds and the fact that they increase with an increase in bank angle.

5. Wingtip vortices and precautions to be taken.
Again this is pretty much a stand-alone topic. It does need some review of high and low pressures about the wing so as to explain how the vortices are produced. The last part of this subject is the precautions to be taken when dealing with wingtip vortices. I always ask why taking off after a landing "heavy" creates the greatest problem.

TASK: II. D. AIRPLANE FLIGHT CONTROLS

REFERENCES

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3, Pg 3-1.
FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 5.
POH/AFM - Section 7.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the Elements related to the airplane flight controls by describing the purpose, location, direction of movement, effect, and proper procedure for use of the:
1. Primary flight controls.
2. Trim control(s).
3. Wing flaps.

STRATEGY

This task involves three separate "systems." There is no specific reason to teach the material in any particular order. I begin by writing a list of all of the terms that will be used on the whiteboard and use that list as a checklist. Next I draw an airplane with all of its flight controls labeled for reference. This is a place where a simple matrix might be useful.

Note: Under effect, I would draw the horizontal stabilizer with lines of airflow over and under it, showing the low and high-pressure areas. Then I add an elevator, deflected downward, showing lines of airflow with a low pressure area above the airfoil and a high pressure area below, presumably causing the tail to go up and the nose of the airplane to pitch down. Then I add a trim tab, deflected upward, relieving the control pressure, showing how the pressure under that part of the elevator/trim tab becomes lower thus causing the trim tab to move the elevator downward, thus moving the horizontal stabilizer up. Look at figure 4-16 in the Pilot's Handbook of Aeronautical Knowledge. Duplicate the three pictures, but turn them into a single drawing.

1. Describe the purpose, location, direction of movement, effect, and proper procedure for use of the primary flight controls, trim control(s) and wing flaps.

Make a matrix - purpose - location - direction of movement - effect - and proper procedure for use:

control	purpose	location	direction of movement	effect	procedure for use
primary flight controls					
trim					
wing flap					

NOTE: Somewhere in this Element the CFI student will need to explain how a stabilator works. (Assumes the checkride will be done in the PA-28-R201) Recognize that the stabilator is both part of the elevator and the trim systems.

TASK: II. E. AIRPLANE WEIGHT AND BALANCE

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 9.

FAA-H-8083-3A - Airplane Flying Handbook - Pgs.4-15/16 Intentional Spins, Weight and Balance Requirements.

FAA-H-8083-1 - Aircraft Weight and Balance Handbook.

Effect of weight and balance on performance matrix (Developed by the CFI student.)

FAA-S-8081-14A - Private PTS - AO I. F.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of airplane weight and balance by describing:

1. Weight and balance terms.
2. Effect of weight and balance on performance.
3. Methods of weight and balance control.
4. Determination of total weight and center of gravity and the changes that occur when adding, removing, or shifting weight.

STRATEGY

This task should probably be taught as one lesson, intermixing the Elements in order to insure a complete understanding of weight and balance. There is one Element that could be problematic and that is the second half of Element # 4.

Note: I have split Element 4 into two parts. The second half of task 4 could be interpreted as requiring the instructor to teach the student how to shift weight mathematically. Those words are not actually used. I interpret the Element to require you to teach how to recompute your weight and balance after you have relocated passengers and cargo.

Note: I teach from the perspective that a student should be able to visualize how moving weights will affect the CG. They should be able to look at a loading graph in the weight and balance section of a flight manual and tell what shifting weight will do. There is no reason to add fuel when you have a forward CG if doing so just moves the CG further forward. I am also not a fan of mathematically moving weights. I think that leads to mistakes. Teach the Elements of this Task in the following order: 1, 4 (first part), 2, 3, 4 (last part).

1. Weight and balance terms.

Start by listing all of the weight and balance terms you intend to use on the white board, checking them off as you teach the subject. There is no reason to simply define the terms, using them and defining them along the way seems better. If you miss any of them, you can go back when you are all done and check.

Next explain briefly why we teach weight and balance, covering performance, stability controllability and structural integrity. Remember there is an Element later on that goes into this in depth.

The real lesson starts by describing kids in the playground and how, regardless of their weights, they are able to balance the teeter-totter. Describe how they moved in and out from the center balancing point, depending on their weights in order to make it balance. Now give the kids some weights and then pick some distances that make each weight X arm = the same moment. Use this example to describe the basic concept of weight, arm, moment, datum and fulcrum.

4. Determination of total weight and center of gravity and the changes that occur when adding, removing, ~~or shifting~~ weight.

Now I do a hypothetical weight and balance problem in its most basic form. Include the Basic Empty Weight, a pilot, baggage and fuel. I don't use real numbers or real arms. In fact all my numbers are easy to use like 10 or 50. My goal is to end up with a center of gravity at some number of inches from whatever datum you used. Use a form like the sample that follows:

Item	Weight	Arm	Moment
Airplane	1,000	10	10,000
Pilot	200	5	1,000
Baggage	100	10	1,000
Fuel	100	10	1,000
	1,400	9.28	13,000

Next I take out the weight and balance information for the aircraft you will be using on the check ride and compute the real weight and balance exactly as loaded. I prefer to walk the student through a completed problem. It's nice to have the Inspector's weight beforehand and compute this in advance. Following is a sample of how I do weight and balance problems.

Item	Weight	Arm	Moment
Airplane	1,200	40	48,000
Pilot	200	45	9,000
Passenger	200	45	9,000
Baggage	100	60	6,000
Zero Fuel Weight	**1,800**	**41.11**	**74,000**
Fuel for the flight	200	38	7,600
Takeoff	**2,000**	**40.8**	**81,600**

With a completed weight and balance problem, refer to the weight and balance envelope and plot the takeoff and landing weights and arms. Then connect the dots with a straight line. This shows where the airplane is at takeoff and at landing and gives a good picture of what happens to the CG as the fuel is burned. In real life, when I get in a new airplane or get a new student, I do a problem with no fuel and full fuel to see what happens.

2. Effect of weight and balance on performance.

There are really three questions:

- What are the effects of weight?
- What is the effect of a forward CG?
- What is the effect of an aft CG?

NOTE: If you are asked; What is the effect of being out of CG? The only answer is "You are a test pilot."

Make a matrix - Stability - Controllability - Performance

Condition	Stability	Controllability	Performance
Heavy			
Forward CG			
AFT CG			

3. Methods of weight and balance control.

This Element is actually simpler than it seems. There are two reference documents, Page 9-4 of the Pilot's Handbook of Aeronautical Knowledge titled "Management of Weight and Balance Control" and Chapter 1 of FAA Handbook 8083-1 "Aircraft Weight and Balance Handbook." Both documents address how weight and balance is controlled from the time an airplane leaves the factory, through equipment changes in the field, to what the pilot is responsible for. Use these references to describe the basic concept of weight and balance control. Then drag out the Airplane Flight Manual and go to Chapter 6. Explain the method of weight and balance control used by your airplane's manufacturer.

Note: There are generally two common methods used by manufacturers.
1. Weight X Arm = Moment, where Weight and Center of Gravity are plotted.
2. Weight X Arm = Moment, where Weight and Moment are plotted.

4. ~~Determination of total weight and center of gravity and the changes that occur~~

There are basically two ways to address this Element. They are related directly to the two basic ways to add, remove or shift weight in the airplane in order to change the center of gravity. One method is to use a mathematical formula to compute any redistribution of weight and therefore the center of gravity. The other is to redo the weight and balance from scratch. **I don't want my students to use the mathematical approach;** instead, I want them to have a good understanding of the relationship between the datum line and the weights and arms, so as to be able to visualize the problem at hand. I only teach my students to recompute their weight and balance problem. I want my students to be able to look at the graphing and the envelope and be able to see where the center of gravity will move when weight is moved.

If asked to teach the mathematical method, my best answer is to be familiar with the process and refer to the reference material.

Note: I don't know of a requirement to do (teach) weight and balance for any airplane that uses a "formula" approach.

The Private and Commercial PTS requires the applicant to: "Computes weight and balance. Determines the computed weight and center of gravity is within the airplane's operating limitations and if the weight and center of gravity will remain within limits during all phases of flight." No mention is made of how the applicant accomplishes this Element.

TASK: II. F. NAVIGATION AND FLIGHT PLANNING

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 15.
FAR Part 91.103 - Preflight action.
Aeronautical Chart User's Guide.
AIM - Chapter 6.
Flight log with instructions.
Sectional.
A/FD.
POH/AFM - Section 5.
FAA-S-8081-14A - Private PTS - AO I. F.
FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of navigation and flight planning by describing:
1. Terms used in navigation.
2. Features of aeronautical charts.
3. Importance of using the proper and current aeronautical charts.
4. Method of plotting a course, selection of fuel stops and alternates, and appropriate actions in the event of unforeseen situations.
5. Fundamentals of pilotage and dead reckoning.
6. Fundamentals of radio navigation.
7. Diversion to an alternate.
8. Lost procedures.
9. Computation of fuel consumption.
10. Importance of preparing and properly using a flight log.
11. Importance of a weather check and the use of good judgment in making a "go/no-go" decisions.
12. Purpose of and procedure used in filing a flight plan.

STRATEGY

This task is pretty straightforward. There are twelve related, but for the most part, stand-alone Elements. The Task starts with terms and then moves through navigation and flight planning.

Let's consider what **isn't** in the list of Elements. Weather **isn't** really mentioned except for the considerations for a go-no-go decision. Therefore there is no need to enter into a lengthy discussion about how to obtain weather or what weather is. Because of that I make up winds for preparing a flight log. I like 360 at 10 knots with a standard temperature. Next thing that **isn't** in the list of Elements is the mention of filling out a flight log. Having said that, the best way to do Elements 2, 3, 4, 5 and 9 is to complete a short cross-country and to do that a flight log makes sense. **Fill out the flight log while preparing for this Task. Do not attempt to complete one while taking the oral.** If you try to do the flight log with the Inspector, you will be under a time crunch and too much pressure. I use Sacramento (SAC) to Santa Rosa (STS). This is about a 60 NM flight, has great checkpoints, and lets you reach top-of-climb before the first

checkpoint. It works well with winds from 360 at 10 knots. Completing a flight log is made simpler if you use the true airspeed from the aircraft flight manual, as well as the time distance and fuel to climb chart. I teach the Elements in the following order: 1,2, 3, 10, 5, 6, 4 (first half), 9, 4 (second half), 7, 8, 11 and 12.

NOTE: I have never found a “flight log” that **I** believe has all of the “blocks” for the information a student pilot needs. An example would be both TAS and IAS.

1. Terms used in navigation.

Start by listing all of the terms that apply to navigation and flight planning, found in Chapter 14 of the Pilot's Handbook of Aeronautical Knowledge, on the white board. Use the list like a checklist.

2. Features of aeronautical charts.

This Element shouldn't be about explaining every little detail in the margins of the Sectional. It’s about explaining the features of a chart. Take a long look at the margins of the Sectional for your area. Make a list of each of the legends or keys and use that list as a roadmap to cover all of the information provided. You can also use the FAA Aeronautical Chart User’s Guide to decode the minutia on the Sectional.

Note: Make sure you know what a MEF is.

One last idea, take an old chart and cut off the legends. Have your student follow along as you point out features on the Sectional. A good rule of thumb is "No matter what I do, it will be wrong." Translated this means no matter what features you explain, the Inspector will have ones he thinks are more important. Teach what you think is important and if he has questions take him to the key and teach him to look them up.

3. Importance of using the proper and current aeronautical charts.

Read and explain FAR 91.103 - Preflight Action. You can also explain what happens when you rely on information that is outdated and may not be accurate.

10. Importance of preparing and properly using a flight log.

This Element is more of a sales job than anything else. Your task is to explain the importance of preparing a flight log and the importance of properly using a flight log. You will need to explain why figuring out things like ground speed, wind correction angle and compass heading (CH) are important and how preparing a flight log will affect your flight path, fuel consumption, ETA, etc.

Note: There is no mention about actually filling out a flight log, but have one completed as part of your preparation for the Task. As I suggested earlier, I use a flight from Sacramento Executive (SAC) to Charles Schultz in Santa Rosa (STS). If you are not flying around Sacramento, find a short flight with a lot of good checkpoints that is about 60 NM long.

5. Fundamentals of pilotage and dead reckoning.

Start with the definitions of pilotage and dead reckoning. Explain how each has its place and how they work together during a cross-country flight. Selecting check points on the SAC to STS (or similar) cross-country will make navigating with the Sectional make sense.

6. Fundamentals of radio navigation.

Make a list of the different forms of radio navigation that a private pilot is likely to encounter and give a basic overview of each. Then explain how to use a VOR to: 1) figure out where you are, 2) find your location along a plotted route, and 3) figure out how to get somewhere.

4. Method of plotting a course, selection of fuel stops and alternates, and ~~appropriate actions in the event of unforeseen situations~~.

NOTE: Somewhere in this task we have to teach a student how to use the plotter and flight computer to plot a course, compute a wind correction angle, ground speed, time between checkpoints, ETA, etc. It might as well be here.

Use a cross-country flight that you have worked your way through well in advance of the Practical Test. Again, I like Sacramento (SAC) to Santa Rosa (STS) because it isn't to long. You can get to "top of climb" before the first good checkpoint. Flight following is readily available. Other than fog in the morning it has all of the things that make a first solo cross-country work for a student.

Work your way through a flight log. (One that is already completed.) Show your student how to plot a course, compute wind correction angles, compute ground speed, etc. Include fuel stops and alternates. With a good flight log, there is an order that makes sense. Figure it out and follow it.

Note: In real life it takes close to two hours to introduce a student to the concept of completing a flight log.

9. Computation of fuel consumption.

Explain this Element while using the aircraft flight manual, computer and flight log to determine fuel consumption. Do a real computation, but do one you have already figured out, such as the one on your pre-completed flight log.

appropriate actions in the event of unforeseen situations.

I have no idea what an unforeseen situation is. If it isn't a diversion or being lost, perhaps it could be "caught" VFR on top. I guess it could also be a landing short of your destination. When you have identified what you think an unforeseen situation is, explain the actions to be taken in its event. I am going with a landing short of my intended landing. So the question is not what do you do, but rather how do you plan for it? This may very well be a candidate for "no matter what I do. it will be wrong". Perhaps the FAA Inspector conducting the practical test has a definition we can use.

7. Diversion to an alternate.

I believe there are two ways to approach this Task. Read Area of Operation VII. C. of the Private Pilot PTS. In part is says; "To determine that the applicant: 2. Selects an appropriate alternate airport and route." This means that the applicant and not the Designated Pilot Examiner selects the appropriate airport to divert to. This also means that if the applicant has done his preflight planning properly, alternate airports should have already been selected. I suggest that you teach your students to select "alternate airports" while planning their flight and then either go forward or back to an enroute checkpoint, already on the flight log, and fly from there to the alternate. This means that the computations would

have been made during the preflight planning phase and not on the “fly” during the practical test.

The other way to approach this is to teach students how to use a VOR compass rose to quickly determine the approximate magnetic course, how to quickly estimate distance and how to convert an airspeed like 90 knots to one and a half miles a minute. Then explain the procedures used to proceed to a "new" destination. Regarding distance, I have an eight NM knuckle, and my thumb is about 6 NM wide. Everyone has something that can be used to make a rough estimate of distance.

8. Lost procedures.

Explain what to do in the event your student gets lost. One idea to drive home is that altitude is your friend. I tell my students to climb as high as necessary and contact a FAA Tower, Approach Control or Center in the general area. Flight Watch is another option.

One of my students suggested the 5 "Cs":

- Circle - stay where you are
- Climb - altitude is your friend
- Communicate - hopefully your student is already working with ATC
- Confess - tell them you are lost or at least a bit confused
- Calculate - use VORs to figure out where you are

11. Importance of a weather check and the use of good judgment in making a “go/no-go” decisions.

It might be a good idea to establish a list of "absolutes" for your student to follow to make sure it is OK to go. Actually it might be a better idea for you to make a list of "absolutes" for yourself. Consider five items for your student to use as go/no-go criteria:

- Minimum visibility
- Minimum ceiling
- Maximum surface wind velocity
- Minimum temperature/dewpoint spread
- Icing
- Turbulence

Point out that for students, the go/no-go decision is the instructor’s responsibility. When the Student Pilot becomes a Private Pilot, the go/no-go decision becomes his. **Have the student write these "absolutes" down in his logbook for future reference, the same place yours should go.** Explain the logic of doing critical thinking when you are not under pressure and then refer to it when you are.

12. Purpose of and procedure used in filing a flight plan.

Good time to hand your student a paper copy of a FAA Flight Plan. Explain the purpose of filing a flight plan, as well as how to file, open and close a flight plan. Don't forget to explain the importance of closing the flight plan.

TASK: II. G. NIGHT OPERATIONS

REFERENCES

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 10.
FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge; Pages 16-17 thru 16-20.
FAA-S-8081-12B - Commercial PTS - Unable to find a reference.
FAA-S-8081-14A - Private PTS - AO XI.
AIM Chapter 2, Sections 1 and 2.
FAR 1.1.- Definitions - Definitions and Abbreviations - Night.
FAR 61.57 Recent flight experience: Pilot in command.
FAR 91.205 Powered civil aircraft with standard category U.S. airworthiness certificates: Instrument and equipment requirements.
FAR 91.209 Aircraft lights.
POH/AFM - Section 6 (Equipment list).

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of night operations by describing:
1. Factors related to night vision.
2. Disorientation and night optical illusions.
3. Proper adjustment of interior lights.
4. Importance of having a flashlight with a red lens.
5. Night preflight inspection.
6. Engine starting procedures, including use of position and anticollision lights prior to start.
7. Taxiing and orientation on an airport.
8. Takeoff and climb-out.
9. In-flight orientation.
10. Importance of verifying the airplane's attitude by reference to flight instruments.
11. Night emergencies procedures.
12. Traffic patterns.
13. Approaches and landings with and without landing lights.
14. Go-around.

STRATEGY

This task is a conglomeration of information with "night" in its title. It runs the gambit from vision, to flashlights, to preflight procedures.

There doesn't seem to be any order that is better than another. I suggest that you follow the order as outlined in the task.

With the exception of Element 5, I have chosen to provide specific references as to where to find the subject of each Element as opposed to what or how to teach the material.

Regarding the reference materials, there are basically three documents that will be used to develop a lesson plan. They are Chapter 10 of the Airplane Flying Handbook, pages 16-17 thru 16-20 of Chapter 16 of the Pilot's Handbook of Aeronautical Knowledge, and Chapter 2 of the Aeronautical Information Manual

(AIM). The bulk of the information comes from the Airplane Flying Handbook. The thoroughness of what you teach for Elements 7, 9, 12 and 13 will be greatly enhanced by the information in the AIM. Chapter 2 of the AIM will cover lighting: lights that are used to land, identify airports, identify obstacles, etc.
I have also referenced a couple of FARs, mostly as they pertain to pilot currency and required equipment.

1. Factors related to night vision.

The reference material for this Element is **not** titled "Factors related to night vision." Instead this Element comes from the first section of Chapter 10 of the Airplane Flying Handbook titled "Night Vision." There are five sub-ideas under that heading. They are:

- The construction of the eyes and how the eye is affected by night.
- Night scanning.
- Adaptation to night vision.
- Temporary blindness caused by unusually bright light.
- Items that will aid in increasing night vision effectiveness.

2. Disorientation and night optical illusions.

Again this seems to come from the first section of Chapter 10 of the Airplane Flying Handbook titled "Night Vision". The heading is "Night Illusions."

3. Proper adjustment of interior lights.

A word search of the Airplane Flying Handbook titled "Night Vision", netted nothing about interior lights. Instead, Page 16-19 of the Pilot's Handbook of Aeronautical Knowledge, under the topic of "Night Vision" discusses the subject.

4. Importance of having a flashlight with a red lens.

The reference for this comes from the heading "Pilot Equipment" of Chapter 10 of the Airplane Flying Handbook.

5. Night preflight inspection.

A night preflight inspection is made up of two parts:

- A walk-around inspection. At night that may mean holding the flashlight in one hand and a checklist in the other.
- Making sure that the airplane is properly equipped for the flight.

The reference for this comes from the heading "Airplane Equipment and Lighting" of Chapter 10 of the Airplane Flying Handbook. It would also be useful to review the Aircraft Flight Manual and FAR 91.205 and FAR 91.209, as they apply to checklists and required equipment. You may want to answer the question: "What constitutes required equipment for night operations?"

You may also want to explain what a night walk-around looks like.

Frankly I think the reference material blows right past the meat of the issue. Perhaps that was necessary given the complexity of the material. The issue isn't just doing a walk-around. It has to include knowing that the airplane's equipment is working and if it isn't, can I fly?

To explain the problem I have to tell a story. One day I took a student out on the ramp to discuss aircraft lights. He was using terms like rotating beacon and navigation lights which are terms of art as opposed to those used in the

regulations. I thought we should see what lights were on the airplanes on the ramp and what nomenclature was used to describe them. My point was that the "rotating beacon" is really a "flashing beacon" and "navigation lights" are really "position lights" and that the regulation requires "anticollision lights" which appears to be an undefined term.

To make my point we walked up to a Cessna 172S model that had two pilots onboard who were about to start the airplane. I asked them if they would turn on the anticollision light system. (I wanted to see what they did.) The pilot in the left seat said that the rotating beacon wasn't working. I asked if that was legal. Immediately, before I could finish my sentence, he advised me that it wasn't required. After a short pause the fellow in the right seat added that the strobes were working so they could fly without the "flashing beacon." It was certainly an interesting exchange. I happen to know both gentlemen so this was a friendly exchange. As my student and I walked away we looked back to see the flashing light on the vertical stabilizer, flashing. Go figure. My message, read the regulations I have cited, with the POH/AFM in hand.

6. Engine starting procedures, including use of position and anticollision lights prior to start.

The reference for this comes from the heading "Starting, Taxiing and Run-up" of Chapter 10 of the Airplane Flying Handbook. FAR 91.209 will supplement this Element as it applies to aircraft lighting required during starting.

7. Taxiing and orientation on an airport.

The bulk of this topic also comes from the heading "Starting, Taxiing and Run-up" of Chapter 10 of the Airplane Flying Handbook. Chapter 2 of the AIM supplements it.

8. Takeoff and climb-out.

The reference for this comes from the heading "Takeoff and Climb" of Chapter 10 of the Airplane Flying Handbook.

9. In-flight orientation.

The reference for this comes from the heading "Orientation and Navigation" of Chapter 10 of the Airplane Flying Handbook. It is also worthwhile to review Chapter 2 of the AIM for lighting that can be used to assist in navigation and airport identification. This Element is about what the lights on the ground tell you about where you are.

10. Importance of verifying the airplane's attitude by reference to flight instruments.

The subject of the "Importance of verifying the airplane's attitude by reference to flight instruments" is found under the headings of "Night Illusions," "Takeoff and Climb" and "Approaches and Landings" of Chapter 10 of the Airplane Flying Handbook. These references and the importance of integrating instruments into the scan should round out the reference materials.

11. Night emergencies procedures.

The last heading of Chapter 10 of the Airplane Flying Handbook is "Night Emergencies." A little light humor; tell your students that if they experience an engine failure at night, when they get close to the ground and don't like what they

see to turn off the landing light. The Aircraft Flight Manual may also yield suitable reference material.

12. Traffic patterns.

The bulk of this topic comes from the heading "Approaches and Landings" of Chapter 10 of the Airplane Flying Handbook. Chapter 2 of the AIM supplements it, especially as it applies to airport lighting.

From a practical perspective, descending in the dark, close to the ground gives me the willies. I hate to turn away from the airport so as to re-enter on the 45 ° to the downwind. When I am at an uncontrolled airport I make it a matter of practice, to over fly the airport 2,000 feet AGL. Once I have everything figured out I fly over the runway flying the "wrong" way. When I get to the approach end of the runway, I turn away from the required downwind and fly an upwind. I stay at 2,000 feet AGL until I am on a wide crosswind and then descend. My logic is that I have lots of time to talk on the radio, look for traffic and stay near the runway.

I know it is a bit unorthodox, but it is in compliance with the regulations. All turns are to the left unless otherwise indicated.

13. Approaches and landings with and without landing lights.

Like the Element above, this topic comes from the heading "Approaches and Landings" of the Chapter 10 of the Airplane Flying Handbook. It is also supplemented by Chapter 2 of the AIM, as it applies to airport lighting, especially glide slope information. When you actually teach night landings, turn the landing lights out while you have runway lighting and turn the runway lights off when you have a landing light. Don't turn them both off at once, it can get very dark.

14. Go-around.

The only place this topic shows up is under the heading "Night Illusions" of Chapter 10 of the Airplane Flying Handbook.

TASK: II. H. HIGH ALTITUDE OPERATIONS

REFERENCES

FAR 91.211 Supplemental oxygen.
AC 61-107 - Operations of Aircraft at Altitudes Above 25,000 feet MSL.
FAA-S-8081-12B - Commercial PTS - AO X, Task A & B.
POH/AFM.
FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 6, pages 6-34 thru 6-37.

FAR 61.31 Type rating requirements, additional training, and authorization requirements.
AIM - Unable to find a reference.
FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of high altitude operations by describing:
1. Regulatory requirements for use of oxygen.
2. Physiological hazards associated with high altitude operations.
3. Characteristics of a pressurized airplane and various types of supplemental oxygen systems.
4. Importance of "aviators" breathing oxygen.
5. Care and storage of high-pressure oxygen bottles.
6. Problems associated with rapid decompression and corresponding solutions.
7. Fundamental concept of cabin pressurization.
8. Operation of a cabin pressurization system.

STRATEGY

This task is subject specific. Like other Tasks, there is no real pattern to follow. It seems to be all about pressurization and oxygen.

Chapter 5 of the Pilot's Handbook of Aeronautical Knowledge seems to cover the entire task. AC 61-107 is also an informative read.

There are two ways to approach this task. You could teach it in the order listed in the PTS, or you could teach it as two topics, oxygen and pressurization. I prefer the two-topic approach. Make a matrix, one for oxygen and one for Pressurization.

I have included references for each of the Tasks.

Oxygen
- Regulatory requirements.
- Characteristics of various types of supplemental oxygen systems.
- Importance of "aviators" breathing oxygen.
- Care and storage of high-pressure oxygen bottles.

Pressurization
- Physiological hazards associated with high altitude operations.
- Characteristics of a pressurized airplane.
- Problems associated with rapid decompression and corresponding solutions.

- Fundamental concept of cabin pressurization.
- Operation of a cabin pressurization system.

Suggestion: Take your student on a field trip. Go to the local FBO and find the person that services the turboprop airplanes and business jets. They will have oxygen systems for servicing oxygen. Get them to take you and your student around and explain how they store oxygen and service airplanes. It will be worth the time.

1. Regulatory requirements for use of oxygen.

This topic is covered by FAR 91.211 - Supplemental oxygen.

2. Physiological hazards associated with high altitude operations.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Pressurized Airplanes."

3. Characteristics of a pressurized airplane ~~and various types of supplemental oxygen systems~~.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Pressurized Airplanes."

3. Characteristics of ~~a pressurized airplane and~~ **various types of supplemental oxygen systems.**

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Oxygen Systems."

4. Importance of "aviators" breathing oxygen.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Oxygen Systems."

Note: The most important point to be made about "aviators" breathing oxygen is that it comes in a green bottle with the words aviators breathing oxygen stenciled on it.

5. Care and storage of high-pressure oxygen bottles.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Oxygen Systems."

6. Problems associated with rapid decompression and corresponding solutions.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Pressurized Airplanes."

7. Fundamental concept of cabin pressurization.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Pressurized Airplanes."

8. Operation of a cabin pressurization system.

The reference for this Element is found in Chapter 6 of the Pilot's Handbook of Aeronautical Knowledge under heading "Pressurized Airplanes."

TASK: II. I. FEDERAL AVIATION REGULATIONS AND PUBLICATIONS

REFERENCES

List of current Federal Aviation Regulations/with title - FAA.GOV.
FAR Part 1 - Definitions and Abbreviations.
FAR Part 61 - Certification: Pilots, Flight Instructors and Ground Instructors - Annotated Index.
FAR Part 91 - General Operating and Flight Rules - Annotated Index.
NTSB part 830
FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 1 and 8.
POH/AFM.
AIM - Introductory Information.
Sectional.
A/FD.
FAR Part 23 - Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes.
FAR Part 39 - Airworthiness Directives.
FAR Part 43 - Maintenance, Preventive Maintenance and Rebuilding and Alteration.
Advisory Circular list (FAA.GOV).
FAA Handbook list (FAA.GOV).
AC 00-2 - no longer exists (replaced by Advisory Circular list (FAA.GOV)).

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to Federal Aviation Regulations and publications:
1. Availability and method of revision of 14 CFR parts 1,61,91, and NTSB part 830 by describing-
    a. Purpose.
    b. General content.
2. Availability of flight information publications, advisory circulars, practical test standards, pilot operating handbooks, and FAA-approved airplane flight manuals by describing-
    a. Availability.
    b. Purpose.
    c. General content.

STRATEGY

There are basically two ways to teach this task. One way is to teach the student to use FAR Part 1,61,91, NTSB 830, AC 00-2, FAA-H-8083-25A; the aircraft's specific POH/AFM, and the AIM as stand alone documents. That's the wrong way! The second method is to treat the guidance material as a system that is interconnected and interrelated, to teach which documents cause other documents to exist and how to move between all of the guidance material in order to answer questions raised by the student. That's the right way! Yes, I have an opinion.

Following are some questions I would pose, to make the point. Why does a 1967 Cessna 150 have an Owner's Manual when the Cherokee Arrow has a FAA approved Airplane Flight Manual and the new Cessna 172 has a POH?

Why does the AC titled: Certification: Pilots and Flight and Ground Instructors start with the number AC 61-XX?

Can you mathematically compute the demonstrated crosswind component of the Cessna 172 we fly?

What is an anticollision light system? How do you identify the anticollision light system for the Cessna 172S?

Trust me there are a lot more questions that could be asked. The point is, what drives what? How does an FAR drive the content of a POH, the content of an endorsement, or the numbering strategy of the advisory circular?

For the most part, all of these publications are part of a greater whole; to be successful at teaching this task you must understand the construction of the documents and their interrelationship. In aviation there is too much information to memorize. The most important thing to teach is what reference material is available, what it is about, and where and how to find it.

Just about everything you need is available on the Internet. Much of what we need can be found at FAA.GOV.

This task is best taught using a matrix - where to get them, purpose, method of revision, general content, etc.

PUBLICATION	Where to get them	Purpose	Method of revision	General content
FAR 1				
FAR 61				
FAR 91				
FAR 23				
FAR 39				
FAR 43				
FAR 67				
NTSB 830				
Sectional				
A/FD				
PTS				
POH/AFM				
Advisory Circulars				

TASK: II. J. NATIONAL AIRSPACE SYSTEM

REFERENCES

FAR 91 - General Operating and Flight Rules:
- 91.126 Operating on or in the vicinity of an airport in Class G airspace.
- 91.127 Operating on or in the vicinity of an airport in Class E airspace.
- 91.129 Operations in Class D airspace.
- 91.130 Operations in Class C airspace.
- 91.131 Operations in Class B airspace.
- 91.133 Restricted and prohibited areas.
- 91.135 Operations in Class A airspace.
- 91.137 Temporary flight restrictions in the vicinity of disaster/hazard areas.
- 91.138 Temporary flight restrictions in national disaster areas in the State of Hawaii.
- 91.139 Emergency air traffic rules.
- 91.141 Flight restrictions in the proximity of the Presidential and other parties.
- 91.143 Flight limitation in the proximity of space flight operations.
- 91.144 Temporary restriction on flight operations during abnormally high barometric pressure conditions.
- 91.145 Management of aircraft operations in the vicinity of aerial demonstrations and major sporting events.

FAA-S-8081-12B - Commercial PTS - AO I. Task E.
FAA-S-8081-14A - Private PTS - AO I. Task E.
AIM - Chapter 3.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of the national airspace system by describing:
1. Basic VFR Weather Minimums - for all classes of airspace.
2. Airspace classes - the operating rules, pilot certification, and airplane equipment requirements for the following -
   a. Class A.
   b. Class B.
   c. Class C.
   d. Class D.
   e. Class E.
   f. Class G.
3. Special use airspace and other airspace areas.

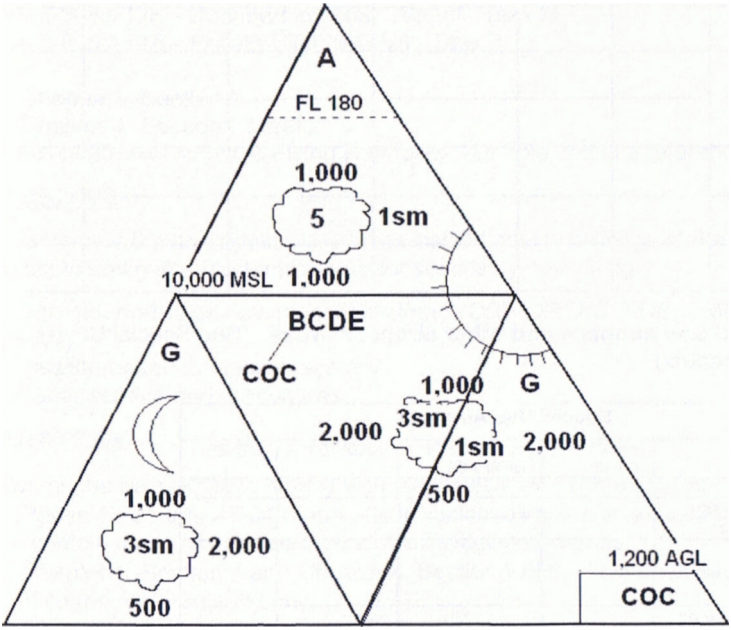
STRATEGY

This task involves two parts, the identification of different types of airspace and everything else you need to know about each type of airspace.

This Task is best taught using a matrix. Start with a list of all of the different airspace.

On a Sectional explain how to identify each type of airspace.

I have included a drawing one of my students uses to teach weather requirements.



1. Basic VFR Weather Minimums - for all classes of airspace. (See Airspace matrix)

On a Sectional find two airports, one with a broken magenta line around it and one with a broken blue line around it.

Explain what these airports have in common. Explain what it means to come out to fly at noon, at either of these airports, only to find the rotating beacon on.

For the rest of the Task refer to the matrix in Element 2.

2. Airspace classes - the operating rules, pilot certification, and airplane equipment requirements for the following - Class A, Class B, Class C, Class D, Class E, and Class G. (See Airspace matrix)

Airspace Matrix						
Type of Airspace	WX Mins	Com Reqs	Required Equipment	Operational Rules	Pilot Certificates	OTR
A						
B						
C						
D						
E						
G						

3. Special use airspace and other airspace areas. (See Special Use Airspace matrix)

Special Use Airspace				
TYPE AIRSPACE	ENTRY REQS	PURPOSE OF AIRSPACE	HAZARDS	OTHER
Prohibited				
Restricted Areas				
Warning areas				
Military Operations Areas (MOAs)				
Controlled Firing Areas (CFAs)				

Final Check - To see if the student understands the theory, using the Sectional, have him explain each type of airspace that could be encountered on a flight from Point "A" to point "B." Discuss how he would deal with each.

Start with the following weather conditions at your local **towered airport:**

- 6,000 feetovercast
- 2 1/2 miles visibility

TASK: II. K. NAVIGATION SYSTEMS AND RADAR SERVICES

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Pages 15-21 thru 15-34.
FAA-S-8081-12B - Commercial PTS - AO VII. Task B.
FAA-S-8081-14A - Private PTS - AO VII. Task B.
AIM:
Chapter 1, Section 1.
Chapter 4, Sections 1 and 2.
FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to navigation systems and radar service by describing:

1. One ground-based navigational system (VOR/VORTAC, NDB, DME, and LORAN).
2. Satellite-based navigation system.
3. Radar service and procedures.

STRATEGY

Perhaps the best place to start is with the references. There are four:

- Pages 15-21 thru 15-34 of the Pilot's Handbook of Aeronautical Knowledge contain a very basic overview of the navigation systems.
- Chapter 1, Section 1 and Chapter 4, Section 1 of the AIM goes much deeper into the required subjects.
- FAA-S-8081-12B - Commercial PTS tells you what a Commercial Pilot needs to know.
- FAA-S-8081-14A - Private PTS tells you what a Private Pilot needs to know.

This task is best taught using a matrix.

Type NAVAID	General Description	Limitations	Aircraft Instruments	Tracking Procedure
VOR				
VORTAC				
NDB				
DME				
LORAN				

TASK: II. L. LOGBOOK ENTRIES AND CERTIFICATE ENDORSEMENTS

REFERENCES (See appendix 3)

FAR Part 61 - Certification: Pilots, Flight Instructors and Ground Instructors:

61.189 Flight instructor records. (1)

61.87 Solo requirements for student pilots. (2)

61.89 General limitations. (2)

61.93 Solo cross-country flight requirements. (2)

61.39 Prerequisites for practical tests. (3.a., 3.b., and 3.c.)

61.96 Applicability and eligibility requirements - Recreational Pilots. (3a)

61.103 Eligibility requirements - Private Pilots. (3a)

61.123 Eligibility requirements - Commercial Pilots. (3a)

61.63 Additional aircraft ratings (other than on an airline transport pilot certificate. (3b) and (3c)

61.56 Flight review. (4)

61.189 Flight instructor records. (5)

61.31 Type rating requirements, additional training, and authorization requirements. (Soloing a certificated pilot.)

AC 61-65 - Certification: Pilots and Flight and Ground Instructors.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to logbook entries and certificate endorsements by describing:

1. Required logbook entries for instruction given.
2. Required student pilot certificate endorsements, including appropriate logbook entries.
3. Preparation of a recommendation for a pilot practical test, including appropriate logbook entry for-
   a. initial pilot certification.
   b. additional pilot certification.
   c. additional aircraft qualification.
4. Required endorsement of a pilot logbook for the satisfactory completion of the required FAA flight review.
5. Required flight instructor records.

STRATEGY

THIS IS A MANDATORY TASK. Like death and taxes, it will be part of the "oral."

This is not a subject you would really teach to a student, except one who is adding an Airplane rating to an existing CFI certificate. An Instructor might find a need to explain to a student why he needs your permission in the form of an endorsement to fly solo.

This is **not** a task that requires you to memorize the exact wording of the required endorsements. It is a task that requires you to know when you need to make a specific endorsement and what the ramifications of such endorsements are. Again, this is a task you will teach to an Inspector, and if there is any subject he or she knows cold, this is the one.

This task is all about the regulations. The Reference Materials list is very specific about the regulations you need to have a command of.

NOTE: You have an AC to use for wording. As an aside, my endorsements never look like the ones in the AC. I like mine to be complete, addressing each regulation with its own sentence.

This task is straightforward. It involves endorsements, which start with **anytime** you exercise your CFI certificate.

The order of these Elements is as good as any. The only thing you need to do extra is to make a list of endorsements. The list should include every endorsement from pre solo to post certification. This list should be the first item in your reference materials. Practice your list before the practical test and the minute you realize you are in Area of Operation II, Task L, write down your list, even if not requested to do so.

I cannot stress this enough, THERE IS A 100% CHANCE YOU WILL BE GRILLED ON THIS TASK. It's sort of like death and taxes.

Reference material - Because this is such an important subject. I have provided a digest of the regulations, by Element in Appendix 3.

Here is how I suggest you teach each of the 5 Elements.

1. Required logbook entries for instruction given.

This is pretty easy. Any time you give instruction you have an obligation to sign the person's logbook. As an aside, it's actually the student's/pilot's responsibility to complete their own logbook entries.

Reference - FAR 61.51 and FAR 61.189

2. Required student pilot certificate endorsements, including appropriate logbook entries.

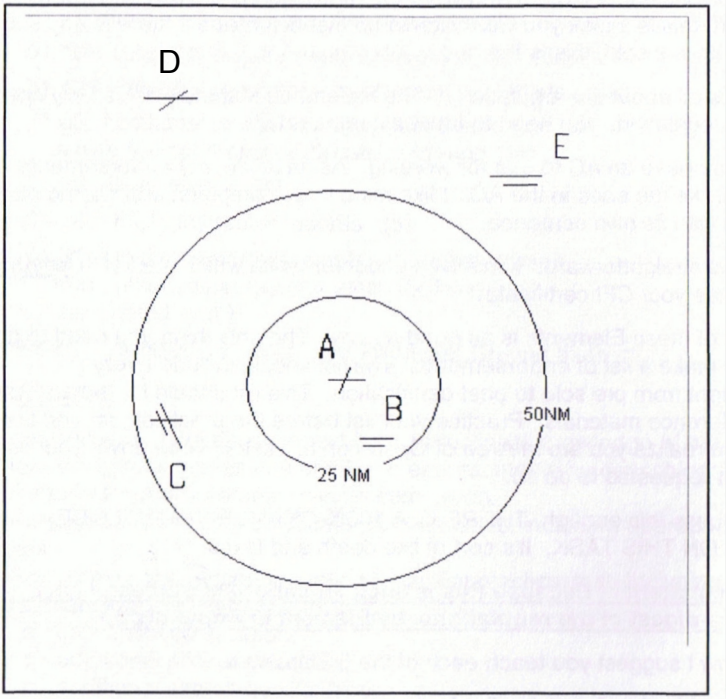
Start by drawing two circles on the whiteboard, one inside of the other. Label the inner circle "25 NM" and the outer circle "50 NM." Put five airports on the board. One is in the middle of the two circles. One is somewhere else in the 25 NM

circle. The third airport is located between the 25 NM and 50 NM circles, and the last two airports are outside the 50 NM circle.

Label the airports A, B, C, D and E. (see below) and start with an explanation as to when each endorsement is required.

Pre solo written - not required but makes everyone happy. It is also a logical place to put it should there be any questions.

- Solo at airport A only
- Solo at airport A and within 25 NM - no landing except at A
- Solo at A, to B and back to A
- Solo from A to C and back (repeated solo cross-country)
- Solo from A to D to E (one time, "long" cross-country)



Question: How can a student pilot make a solo flight that starts at airport "A" and includes a landing at airport "B" without the student's instructor having ever accompanied the student to airport "B?" If it's part of a "long" cross-country.

3. **Preparation of a recommendation for a pilot practical test, including appropriate logbook entry for-**

a. initial pilot certification. (First time at this certificate level)
Reference:

- 61.39 Prerequisites for practical tests.
- FAR 61.96 Applicability and eligibility requirements: General. (Recreational Pilot)
- FAR 61.103 Eligibility requirements: General. (Private Pilot)
- FAR 61.123 Eligibility requirements: General. (Commercial Pilot)

b. additional pilot certification. (Additional Category)

Reference

- FAR 61.39 Prerequisites for practical tests.
- FAR 61.63 (b) Additional aircraft ratings (other than on an airline transport pilot certificate).

c. additional aircraft qualification. (Additional Class)
Reference -

- FAR 61.39 (a) (6) i, ii, and iii
- FAR 61.63 (c) Additional aircraft ratings (other than on an airline transport pilot certificate).

4. Required endorsement of a pilot logbook for the satisfactory completion of the required FAA flight review.
Reference -

- FAR 61.56 Flight Review

Remember, you have no right to make an entry that says that the pilot to whom you just administered a Flight Review is incompetent, even if it true. Simply sign the logbook as dual given.

5. Required flight instructor records.
Reference -

- FAR 61.189 Flight instructor records.

III. AREA OF OPERATION: PREFLIGHT PREPARATION

NOTE: The examiner shall select at least one TASK

TASK: III. 3A. CERTIFICATES AND DOCUMENTS

REFERENCES:

FAR Part 43 - Maintenance, Preventive Maintenance and Rebuilding and Alteration.
FAR Part 61:
- Subpart D - Recreational Pilots
- Subpart E - Private Pilots
- Subpart F - Commercial Pilots
- 61.23 Medical certificates: Requirement and duration.
- 61.57 Recent flight experience: Pilot in command.
- 61.51 Pilot logbooks.

FAR Part 91 - General Operating and Flight Rules.
FAA-H-8083-3A - Airplane Flying Handbook.
FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 1.
FAA-S-8081-12B - Commercial PTS - AO I. Task A.
FAA-S-8081-14A - Private PTS - AO I. Task A.
POH/AFM - Unable to find a reference.

OBJECTIVE:

To determine that the applicant exhibits instructional knowledge of the elements related to certificates and documents by describing:
1. The training requirements for the issuance of a recreational, private, and commercial pilot certificate.
2. The privileges and limitations of pilot certificates and ratings at recreational, private, and commercial levels.
3. Class and duration of medical certificates.
4. Recent pilot flight experience requirements.
5. Required entries in pilot logbook or flight record.

STRATEGY:

This task is a mix of information regarding certificates and documents. There is no order to teach this that is better than another. The first Element is informational in nature and is nothing more than explaining to a student what he would need in the way of training in order to become a recreational, private, or commercial pilot. The next four Elements involve post certification information needed by a pilot to comply with the regulations.
Here is how I teach these Elements.

1. The training requirements for the issuance of a recreational, private, and commercial pilot certificate.

Walk the student through the requirements for the certificate he is interested in. Having said that, the references are FAR Part 61:

- Subpart D - Recreational Pilots
- Subpart E - Private Pilots
- Subpart F - Commercial Pilots

One important concept to keep in mind for this Element is that you do not need to memorize the requirements for each certificate. Partly because no one should be expected to know that much trivia and secondly, because memorizing the requirements of Part 61 wouldn't be good enough, you would also have to memorize the graduation requirements of every FAR Part 141 school in the country.

A better approach is being able to explain the construction of the Subparts and how they are broken into similar regulations:

- Applicability/ Eligibility Requirements - General
- Aeronautical Knowledge - The written/ground school
- Flight Proficiency - The Practical Test Standards
- Aeronautical Experience - Hours and types of flying

Start with the appropriate eligibility requirements (general) for the rating you are discussing. Focus on Aeronautical Knowledge (ground subjects), Flight Proficiency (flight maneuvers), and Aeronautical Experience (flight hours).

If asked to teach this Task, make sure you have the regulations opened to the appropriate Subpart of FAR Part 61. Do not do this with the commercially published FAR/AIM book. They contain too much superfluous material. Go to FAA.GOV and select the pertinent regulation, copy it to a file, cull out the portions that do not apply, and print it. You should have this in your reference material.

2. The privileges and limitations of pilot certificates and ratings at recreational, private, and commercial levels.

This Element is a great candidate for a matrix. I would use column one to list the type of pilot certificate. The second column would be privileges and the last column would be limitations. Address privileges and limitations in general terms and concepts. The Recreational Pilot represents a very limited certificate that requires a great deal of babysitting by a CFI. The Private Pilot is basically prohibited from being directly compensated for flying. The Commercial Pilot can be paid as a CFI. He can also be paid for flying involving carrying persons or property for compensation or hire but there are many limitations. In general most carriage of persons or property for compensation or hire requires an Air Carrier Certificate.

Certificate and/or rating	Privileges	Limitations
Recreational		
Private		
Commercial		

3. Class and duration of medical certificates.

This Element would also be a candidate for a matrix, albeit a very small one. I would be inclined to use three columns. The first column would be used for the class of medical. The second column would do well for the reason or limitations of the medical, and the third column could be used for duration. The reference for this is FAR 61.23, Medical certificates: Requirement and duration. The concept that I try to explain is how a medical can be good for up to either 24 or 60 months but at lesser classes. I call this concept “reversion."

Note: Although NOT a part of this Element, I suggest that you include the Student Pilot Certificate. The reason is that as an Instructor you may have to deal with a student that has an expired Student Pilot Certificate and yet has an unexpired Medical Certificate, all on one piece of paper.

Grade/class of certificate	Reason for this grade of certificate	Duration
1” Class		
2“ Class		
3™ Class		
Student Pilot Certificate		

4. Recent pilot flight experience requirements.

This Element is probably best taught right from FAR 61.57, Recent flight experience: Pilot in command. One important concept to explain is "passenger” vs. “required crewmember." Under FAR Part 61, a CFI can teach night flying without being current because the student isn't a passenger but rather a required crewmember.

5. Required entries in pilot logbook or flight record.

I hate to be redundant, but this Element is also best taught directly from the regulation. Go to FAA.GOV, copy, cull and print FAR Part 61.51, Pilot logbooks. Use that reference document to explain the required logbook entries. One concept to consider is that the requirement for a CFI to maintain most records is predicated on the fact that some sort of an endorsement is required.

TASK: III. B. WEATHER INFORMATION

REFERENCES

AC 00-6 - Aviation Weather For Pilots and Flight Operations Personnel.
AC 00-45 - Aviation Weather Services.
FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 11 and 12.
FAA-S-8081-12B - Commercial PTS - AO I. Task C.
FAA-S-8081-14A - Private PTS - AO I. TASK C.
FAR 91.103 - Preflight action.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to weather information by describing:
1. Importance of a thorough preflight weather briefing.
2. Various means and sources of obtaining weather information.
3. Use of real time weather reports, forecasts, and charts for developing scenario based training.
4. In-flight weather advisories.
5. Recognition of aviation weather hazards to include wind shear.
6. Factors to be considered in making a "go/no-go" decision.

STRATEGY

What is the focus of this task? Is it the mechanics of weather? Or is it how to get weather information and how to use it?

I don't see anything in this Task that says, "Tell me what makes fog." I don't see anything in the Task that says, "Explain the types of weather associated with a cold front."

What I do see are the following questions:
- "Why is a thorough briefing important?
- "Tell me where I can get a weather briefing?
- "How do we use real time weather in developing a scenario for training?
- How do I explain how to recognize aviation weather hazards?

If you agree with that concept, proceed as follows. If you don't see what I see as the "question," call your local Inspector and ask how he interprets this task.

1. Describe the importance of a thorough weather check

Here are some basic ideas you can build on.
- It's required by FAR 91.103 - "Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. To include, weather reports and forecasts."
- Obtaining a weather check is the first step in determining if a flight can be conducted.
- If you are aware of the current conditions and forecasts, you are better prepared for adverse weather and can better develop a plan of action.

2. Describe the various means of obtaining weather information.

Make a matrix. Consider the following list as the first column. Use the next column to describe when to use them and a third column to explain what they provide.

SOURCE	WHEN TO USE IT	INFORMATION PROVIDED
Local news weather		
The weather channel		
Internet WX sites		
Flight Service Station (FSS - Briefer or TIBS)		
Direct User Access Terminal System (DUAT or DUATS)		
National Weather Service (NWS)		
Private sources (Jeppesen, weather TAP)		
Flight Service Station (FSS)		
Enroute Flight Advisory Service (EFAS) - 122.0		
Hazardous In-Flight Weather Advisory Service (HIWAS)		
Transcribed Weather Broadcast (TWEB)		
ATIS		
ASOS		
AWOS		
Rotating Beacon		

3. Describe the use of real time weather reports, forecasts, and charts for developing scenario-based training.

We have great tools in DUAT, DUATS, 1-800 WX BRIEF and http://aviationweather.gov/std_brief/.

Teach your student to go to the website of **your** choice and printout a briefing for the cross-country you plan to use in Task II, F. Navigation and Flight Planning. Then have him call the FSS at 1-800 WX BRIEF and get a verbal briefing that coincides with the printed briefing. Have your students learn to compare the two briefings, recognizing that the Weather Briefer is skilled in interpreting the weather. If you use DUAT, DUATS, or http://aviationweather.gov/std_brief/, check “Both” in the "Briefing Output" selection box. That will get the briefing in both “FAA” code and plain “English.” Now you have a scenario based training tool to use.

4. Describe the in-flight weather advisories.

I don't see a big difference between this Element and Element #2. Use your matrix from Element #2.

Here are the in-flight weather advisories that come to mind.

- Flight Service Station (FSS) -122.2
- En Route Flight Advisory Service (EFAS) -122.0
- Hazardous In-Flight Weather Advisory Service (HIWAS) - selected VORs and NAVAIDS.
- Transcribed Weather Broadcast (TWEB)

5. Describe the recognition of aviation weather hazards to include wind shear.

This Element is the most subjective of the six. There are two ideas that I think are worth teaching. First, recognizing hazardous weather and second, the reports/forecasts available to the pilot that will alert him to weather hazards.

The approach I like is to list aviation weather hazards. For me that would be wind, low ceilings and poor visibility, icing and turbulence. Next make a list of weather forecasts and reports that a pilot could/should use to recognize aviation weather hazards with a brief explanation.

6. Describe the factors to be considered in making a "go/no-go" decision

Yogi Berra would describe this as "Deja Vu, all over again." Area of Operation II. Task F. Element 6 says, **Importance of a weather check and the use of good judgment in making a "go/no-go" decisions.**

I am going to assume this is a go/no-go decision based on weather. If you agree, then I would suggest that you develop your own criteria for making a go/no-go decision (VFR). With that as a model, develop a tool for helping a Private Pilot build his own model. Consider putting this list in your student's logbook.

- Wind
- Visibility
- Ceiling
- Temperature/Dewpoint Spread
- Turbulence markers that your students can use
- Icing/freezing level

TASK: III. C. OPERATION OF SYSTEMS

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapters 5 and 6.
FAA-H-8083-3A - Airplane Flying Handbook - Chapter 11.
FAA-S-8081-12B - Commercial PTS - AO I Task G.
FAA-S-8081-14A - Private PTS - AO I. Task G.
POH/AFM - Section 7 Airplane and Systems Description.
Web site for the propeller manufacturer - www.mccauley.Textron.com. (Great for basic propeller operation information.)
Web site for the GPS manufacturer.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to the operation of systems, as applicable to the airplane used for the practical test, by describing the following systems:

1. Primary flight controls and trim.
2. Flaps, leading edge devices, and spoilers.
3. ~~Water rudders (ASES).~~
4. Powerplant and propeller.
5. Landing gear.
6. Fuel, oil, and hydraulic.
7. Electrical.
8. Avionics.
9. Pitot static, vacuum/pressure and associated instruments.
10. Environmental.
11. Deicing and anti-icing.

STRATEGY

Start by going to Area of Operation XIII. Task B. While you are studying for this Task, study for that Task.

This task would appear to be aircraft specific. The objective says, "related to the operation of systems, as applicable to the airplane used for the practical test." One could therefore assume from that quote that all you need to read would be the POH. That's not all you need to do. It is true that you only need to know the systems of the airplane(s) you bring, but I suggest that you need a good understanding of the systems in your airplane in a general sense. That is, how do fuel systems work in general? How do elevators differ from stabilators or T tails? How do propeller systems work in general? There are four references that I would suggest you read.

- The Pilot's Handbook of Aeronautical Knowledge, for a general description of how systems work.
- The Airplane Flying Handbook.
- The POH, where you will learn as much as the manufacturer wants you to know about aircraft specific systems.
- The Internet, where you can find a more in-depth description of systems for topics like the propeller (McCauley) or the GPS (Garmin).

I would also like to suggest that you develop ten mini lessons, one for each system. Start with a general description of each system, followed by the specifics. Make sure that you include any equipment checks you would do as well as what the tolerances would be.

Experience says that the most complicated systems are:

The propeller - make sure you understand the interaction between oil pressure and spring/centrifugal force. You should also be able to explain what each of the propeller checks do and what the checks indicate.

The landing gear - make sure that you know where all of the micro switches are and how they interact with the gear lights and horn. It would be a good idea to understand how to perform an emergency gear extension. You should even do one or two.

Landing gear auto extend system - if you are unlucky enough to have one of these in your airplane, make sure that you know when it auto extends or when it won't let the gear go up. If you have an automatic gear retraction system, and you can't get it removed, you will need to be able to explain its operation.

Electrical system - know what to do if it catches on fire or if the generator fails, and know how long the battery is good for.

The GPS - each one is unique and you need to know how they work, at least for VFR operations.

If your airplane has a stabilator - know how it works, especially how the trim works. You should also be able to describe the difference between a stabilator and a "normal" horizontal stabilizer/elevator system.

Now to philosophy, what is the standard of knowledge, when it comes to systems? My opinion is that you need any information or understanding that you could use in the event of an emergency, like the amperage of the battery. If you have an alternator failure, that information will help you figure out what equipment you can use and for how long. You need to know the acceptable limits of any check you perform. An example would be the propeller governor check. You need to know what indications pulling the prop lever back will net you. Another example would be checking the carburetor heat. What kind of drop is normal and what if applying carburetor heat nets a rise in RPM? You do not need to be able to build an airplane.

THERE ARE SOME THINGS YOU DO NOT NEED TO KNOW. I do not think you need to be able to identify what the various antennas are for. Equally useless information would be the number of rivets in a wing. I also feel knowing information that is placarded doesn't require memorization. Knowing Va might be an exception.

Again, I want to suggest that you collect the information that you deem important about each system and write a mini lesson plan, explaining how the system works, including what checks the pilot must make and what satisfactory outcomes look like.

JUST READING THE SYSTEM DESCRIPTIONS ISN'T ENOUGH!

TASK: III. D. PERFORMANCE AND LIMITATIONS

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 10.
FAA-S-8081-12B - Commercial PTS - AO I. Task F.
FAA-S-8081-14A - Private PTS - AO I. Task F.
POH/AFM - Sections 5 and 6.
FAA-P-8740-2 - Density Altitude Koch Chart.
FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to performance and limitations by describing:
1. Determination of weight and balance condition.
2. Use of performance charts, tables, and other data in determining performance in various phases of flight.
3. Effects of exceeding airplane limitations.
4. Effects of atmospheric conditions on performance.
5. Factors to be considered in determining that the required performance is within the airplane's capabilities.

STRATEGY

This is a task that appears to have a mixed-up theme, but a careful examination of the Elements indicates that its focus is Section 5 of the "modern day" Pilot Operating Handbook (POH). My theory is that before you can go fly, you need to know what your airplane will do. This requires going to the performance section and calculating takeoff distance, landing distance, rate of climb, etc. Computing those numbers requires performing a weight and balance computation. Once you have your performance numbers, the next step is to decide if your airplane can takeoff and land on the selected runway(s), and if you can even climb over the mountains between your departure airport and your destination.

If you see the task as I do, then it would follow that you would do the Elements in the following order:

Step 1.

Element 1. Determination of weight and balance condition.

- Show your student how to do the weight and balance using the weight and balance section of the POH.
- NOTE: This is not teaching concepts, terms, etc. It is simply running the problem as the aircraft is loaded.

Step 2.

Element 2. Use of performance charts, tables, and other data in determining performance in various phases of flight and,

Element 4. Effects of atmospheric conditions on performance.

Show your student how to use the performance tables in the POH. This is also a good time to point out the effect of various atmospheric conditions on performance.

NOTE: This is not a performance lesson. This is the practical application of how to use the performance charts and an accompanying explanation about how the charts reflect the decrease in performance when it is either hot or high.

This might be a good time to take out a Koch Chart.

Step 3.

Element 5. Factors to be considered in determining that the required performance is within the airplane's capabilities.

Simply take out a sectional or A/FD, find the runway lengths and elevations, airport obstacles and desired cruise altitudes and compare those numbers with the performance figures from step 2.

Step 4.

Element 3. Effects of exceeding airplane limitations.

I have to be honest. Either this is a very simple Element, or I have no clue what it means. It seems to me that the answer is: "You need more runway than you have, don't try to takeoff or land." "You cannot climb over the mountain, either don't go or find another route." "Your service ceiling is lower than the cruise altitude, don't go."

Two concepts you could teach your students are waiting until the temperatures come down, assuming "hot" is the problem or leaving passengers behind if being "too heavy" is the problem. Either option would increase performance.

TASK: III. E. AIRWORTHINESS REQUIREMENTS

REFERENCES

FAR Part 39 - Airworthiness Directives.
FAR Part 43 - Maintenance, Preventive Maintenance and Rebuilding and Alteration.
FAA-S-8081-12B - Commercial PTS - AO I. Task B.
FAA-S-8081-14A - Private PTS - AO I. Task B.
POH/AFM - Sections 1 and 6.
FAA-H-8083-25A - Pilot's handbook of Aeronautical Knowledge - Chapter 8.
FAR 21.197 and Far 21.199 (Special Flight Permits).
FAR Part 91 - Subpart C. Equipment, Instrument, and Certificate Requirements.
FAR 91.213 - Inoperative instruments and equipment.
AC 91-67 - Minimum Equipment Requirements for General Aviation Operations Under FAR Part 91.
Single engine MMEL found at: http://www.opspecs.com/
http://www.opspecs.com/AFSData/MMELs/FINAL/Part_91/SER4AP91.DOC.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to required airworthiness by explaining:
1. Required instruments and equipment for day/night VFR.
2. Procedures and limitations for determining airworthiness of the airplane with inoperative instruments and equipment with and without a minimum equipment list (MEL).
3. Requirements and procedures for obtaining a special flight permit.
4. Airworthiness directives, compliance records, maintenance/ inspection requirements, and appropriate records.
5. Procedures for deferring maintenance on aircraft without an approved MEL.

STRATEGY:

This task consists of 5 related topics (I do not see a difference between the last part of Element 2 and Element 5) and is about how to determine if the airplane your student will be flying is airworthy. **It isn't about memorizing what instruments and equipment are required.** Mnemonics like T.O.M.A.T.O.E. F.L.A.M.E.S are great memory aids, but I would prefer that the student understand concepts and be able to do the research.

The material in this task could be taught as 5 mini lessons, or it could be taught as a concept and a process. The first way is probably the easiest. The latter will insure that your student really knows the subject matter.

If you choose to teach the material as a concept, it is worth recognizing that Element 3 is a stand-alone topic and really has no bearing on the day-to-day airworthiness of an airplane.

I start with a general explanation as to why this subject is important, saying something like: "Up until now, I have been responsible for making sure that the aircraft has been airworthy. Now it's time for you to participate in that responsibility."

Airworthiness means two things:

- The airplane is safe to fly.
- The airplane meets its original Type Design Certification (It is legal to fly.)

NOTE: If the airplane isn't legal you are betting your pilot's license. If the airplane isn't safe you are betting your life.

When it comes to determining if the airplanes I fly are safe and legal, the process I teach my students is the same one that I use. Make sure that:

- the airplane is properly equipped.
- all of the required equipment is functioning as designed.
- anything not required is either working, repaired or deferred.
- all of the required maintenance and/or inspections have been accomplished.

I do this using a four-step process:

Step 1. Is the airplane properly equipped?

The first time I fly an airplane I compare the physical airplane to three documents.

First. I look at the airplane equipment list (the one in the airplane) and make sure that everything that document requires to be installed is installed on the airplane.

Second. I look at FAR 91.205 - Powered Civil Aircraft with Standard Category U.S. Airworthiness Certificates: Instrument and Equipment Requirements, paragraphs (a), (b) and (c). I make sure that everything the regulation requires for Day VFR and Night VFR flight is installed on the airplane.

Third. I look over the Airworthiness Directive compliance document that should be part of the Annual Inspection and make sure that anything that document might require to be installed is installed on the airplane. (This is very uncommon.)

Now I look at the weight and balance paperwork (the one signed by the A&P) and note the date on the document. That date represents the last time any equipment was either added or removed. As long as the weight and balance has not changed (the date doesn't change) I believe I am safe to expect that the same equipment is still installed. I repeat this process every time I get in a new airplane or I a get a student ready for his check ride.

Remember the question - Does the aircraft I intend to fly have all of the equipment required for the type of operation(s) I intend?

Step 2. Has the airplane been Inspected as required by the FARs?

This is the time to decide how the airplane is "dispatched." I would look for one of two things, either the maintenance records (logbooks) or "dispatch documents." The school I teach at uses a dispatch system, where the company tells us when the next maintenance/inspection is due. The other option is to look at the logbooks prior to every flight. If you have to look at maintenance records, make sure that they reflect the following inspections and paperwork. Remember, under the right situation, only the annual and AD compliance may be required.

- Annual Inspection — Absolutely
- 100-Hour Inspection — Depends
- ELT Inspections Record — Depends
- Transponder Inspection Record — Depends
- AD Research and ComplianceRecords — Absolutely

If Iho school or operator where you get your airplane uses "dispatch records," I would make sure they indicated the aircraft's legality for flight. The school where I fly uses a "black book" that says: "DO NOT FLY AFTER", either a date or a Inch time. As long as the flight is finished before the date or tach time noted in Ihe dispatch document we are OK to go.

If I am checking Aircraft Maintenance Records (Logbooks), I determine if they reflect compliance with maintenance/ inspection requirements, for the intended flight. For example, if I were renting an airplane for personal use, I wouldn't care if the airplane had a current 100-hour Inspection. If I weren't going into Class B or C airspace I wouldn't need a current transponder inspection. I might need to inop the transponder if the inspection wasn't current, but I wouldn't need a current inspection. I would also determine when the next time (date or hour) that any required inspection/maintenance would be due, paying special attention to the AD compliance records to see when the next AD is due.

Remember the question - Do the aircraft maintenance records reflect compliance with all of the inspections required by the FARs?

Step 3. Is the required documentation onboard the airplane? Does all of the equipment onboard work?

Go to the airplane and look at the paperwork. Check to see if everything is there. Try ARROW. Next do a thorough preflight and see if everything is working.

Remember the questions -1. Is all of the required paperwork onboard and where it belongs? 2. Does everything that is installed work?

Step 4. Can I fly with equipment that isn't working?

If my preflight turns up any installed equipment that isn’t working, I have to determine if it is "required equipment."

I do that by going back to Step 1 and working my way through the requirements of:

- the Airplane Equipment List.
- FAR 91.205 - Powered Civil Aircraft with Standard Category U.S. Airworthiness Certificates: Instrument and Equipment Requirements, paragraphs (a), (b) and (c).
- the rest of FAR Part 91 - Subpart C.
- applicable Airworthiness Directives.

If the inoperative equipment is required, then it must be repaired or we cannot fly. If it isn't required then we can refer to FAR 91.213 - Inoperative Instruments and Equipment and determine the best course of action.

NOTE: If my airplane has a minimum equipment list then I would refer to it instead of FAR 91.213 to determine the best course of action.

Remember the question - Do I know how to work my way through FAR 91. 213 to determine what to do if something isn't working?

How the steps meet the requirements of the Elements.

Step 1.

- Element 1. To determine that the applicant exhibits instructional knowledge of the elements related to required airworthiness by explaining the required instruments and equipment for day/night VFR.

Step 2.

. Element 4. To determine that the applicant exhibits instructional knowledge of the elements related to required airworthiness by explaining airworthiness directives, compliance records, maintenance/ inspection requirements, and appropriate records.

Step 3 and 4.

- Element 2. To determine that the applicant exhibits instructional knowledge of the elements related to the procedures and limitations for determining airworthiness of the airplane with inoperative instruments and equipment with and **without a minimum equipment list (MEL).**
- Element 5. To determine that the applicant exhibits instructional knowledge of the elements related to the procedures for deferring maintenance on aircraft without an approved MEL. (Same as Element 2.)

The remaining Elements.

- Element 2. To determine that the applicant exhibits instructional knowledge of the elements related to the procedures and limitations for determining airworthiness of the airplane with inoperative instruments and equipment **with** ~~and without~~ **a minimum equipment list (MEL).**

If your aircraft has a minimum equipment list you need to read it very carefully. My step-by-step procedure will work, but in Step 4 you will need to refer to the MEL assigned to the airplane. Do that even if the equipment is “required.” This is important because a MEL constitutes a Supplemental Type Certificate and may change the list of “required equipment.”

If you want to read a MEL for a single engine general aviation piston powered airplane, go to FAA.GOV and in the search engine type MMEL. This should take you to http://www.opspecs.com/. When you get there, start with **MMEL,** then **Final,** then **MELs,** then **Part 91.** Go to the bottom of the list and select SE R5. Ft. 91 DOC. This will be the MMEL for single engine airplanes operated under Part 91.

Because there is no specific MEL for small single engine airplanes operated under FAR Part 91, the option is to take the general Single Engine Master Minimum Equipment List (MMEL) listed above and get authorization from the local FSDO to use it. If the owner or operator gets such authorization, then the language of the MMEL supersedes the FARs.

- Element 3. To determine that the applicant exhibits instructional knowledge of the Elements related to required airworthiness by explaining the requirements and procedures for obtaining a special flight permit.

The easiest way to learn this Element is either call the local FSDO an/d ask them to explain the process or talk to the A&P that maintains your school's airplanes. As a general rule a pilot cannot get a ferry permit. They are issued to the owner/operator.

The purpose of a ferry permit is to allow the movement of an airplane that is safe to fly but not airworthy, to a location where maintenance can be performed. An example of this might be the airplane is out of annual and needs to have its gear swung, and the shop doing the annual can't do the gear inspection.
Each ferry permit is unique. It has limitations on the route of flight, places where landings can be made, as well as who can be onboard.

Section 4
Area of Operation IV
PREFLIGHT LESSON ON A MANEUVER TO BE PERFORMED IN FLIGHT

IV. AREA OF OPERATION: PREFLIGHT LESSON ON A MANEUVER TO BE PERFORMED IN FLIGHT

NOTE: Examiner shall select at least one maneuver TASK from AREAS OF OPERATION VII through XIII and ask the applicant to present a preflight lesson on the selected maneuver, as the lesson would be taught to a student.

A. MANEUVER LESSON

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook

FAA-H-8083-9A - Aviation Instructor's Handbook

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge

FAA-S-8081-12B - Commercial Pilot Practical Test Standards

FAA-S-8081-14A - Private Pilot Practical Test Standards

POH/AFM.

OBJECTIVE:

To determine that the applicant exhibits instructional knowledge of the selected maneuver by:
1. Stating the purpose.
2. Giving an accurate, comprehensive oral description, including the Elements and common errors.
3. Using instructional aids, as appropriate.
4. Describing the recognition, analysis, and correction of common errors.

STRATEGY

Section 4 is about planning and preparing a lesson plan on a maneuver you should expect to teach in flight.

Somewhere, perhaps it's an urban legend, there is a rumor that says that a CFI applicant can prepare a specific lesson plan in advance for use in the "oral" portion of the Practical Test. I can't find any such language in the Practical Test Standards, and I do not know of any Inspector that will tell you what the maneuver to be taught on the ground will be before the practical test begins. But, even if there was such a proviso, it wouldn't make much sense. Each lesson is unique, and good Inspectors try to specify, not only the maneuver, but also the level of the student as well as other information, such as problems, misunderstandings, questions, etc., that would make a lesson prepared in advance difficult to use.

Translation, when assigned a lesson to plan (on the day of the test) and teach, ask the Inspector enough questions to decide where the student is in his training. Then go to your strategy, review it and write up a quick lesson plan. Take a look

at the sample form. This is the information required by the PTS. Under Elements develop an introduction, body and conclusion.

This page and the next go behind Divider IV.

Once you have developed strategies for Areas of Operation V through XIII, you should be able to use the basic lesson plan form to develop a specific lesson plan. One last step; you need to convert the information in your lesson plan to a usable training tool. I suggest using a whiteboard with erasable markers. It's a great place to list terms, purpose, standards, drawings of the maneuver and common errors.

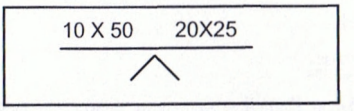
SAMPLE WHITEBOARD

Airplane Weight and Balance

Purpose: To have the student be able to accurately perform weight and balance computations, understand the terms and formulas associated with weight and balance and explain the effect of weight and balance on performance.

Terms:
CG
Datum
Licensed Empty Weight
Drawing(s)
Basic Empty Weight
Weight X Arm = Moment

Max allowable gross weight

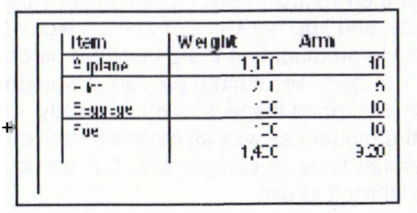


Standards:
datum

1. Determines the computed weight and center of gravity is within the airplane's operating limitations and if the weight and center of gravity will remain within limits during all phases of flight
2. Describes the effects of weight and balance on the airplane's performance
3. Demonstrates a mastery of the terms used when discussing weight and balance

Common Errors:
N/A

Instructional Aids:
Whiteboard/Markers
POH
Weight and Balance form++++++
+



SAMPLE LESSON PLAN

MANEUVER_____ **STUDENT**_____ **DATE**
_____

PURPOSE (Introduction)

STANDARDS

DESCRIPTION/ ELEMENTS OF THE MANEUVER

A LIST OF COMMON ERRORS

RECOGNITION, ANALYSIS AND CORRECTION OF COMMON ERRORS

INSTRUCTIONAL AIDS

Section 5
Areas of Operation V through XIV
MANEUVERS

General

Section 5 is all about Flight Maneuvers. Developing a strategy will be critical to learning how to teach each task. You will see numerous references to related maneuvers. You will also see references to the concept of building on previously taught lessons. During the Practical test you are going to be asked to teach a maneuver, let's say Soft Field Landings. I would not teach Soft Field Landings until I had taught a string of other maneuvers like Soft Field Takeoff, Normal Landings, Slow Flight and Stalls. Therefore, I would not start a lesson on Soft Field Landings without some review or reference to things the student should already know.

What I have included in this section

Two pages of general information

A reprint of each TASK in Areas of Operation V through XIV of the CFI PTS.

An associated STRATEGY for each TASK

A list of COMMON ERRORS for each TASK

A list of RELATED MANEUVERS for each TASK

Each TASK reprint is divided into three sections, REFERENCES. OBJECTIVE and STRATEGY.

Note: TASK = maneuver in Areas of Operations V through XIV.

REFERENCES - Although the Task is a reprint of the PTS, the REFERENCES section as provided by the FAA is incomplete, providing only the document number. I have modified the references by including the corresponding name of the document, at least the chapter, section or FAR, and when appropriate the page number(s).

OBJECTIVE - In general the OBJECTIVE is broken into four Elements. They are:

1. Exhibits instructional knowledge of the elements of..... by describing
2. Exhibits instructional knowledge of common errors related to..... by describing
3. Demonstrates and simultaneously explains.....from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to.....

STRATEGY - The way I approach the STRATEGY in this Section is a bit different from Sections 2 and 3. I have provided strategies in multiple areas. For some Areas of Operation I have provided a General Strategy. All of the Tasks have a Task specific strategy and many of the Elements have an Element specific strategy.

The STRATEGY is the way I would teach, describe or explain the Task. Your strategy may be different; in fact it should be different. The strategy I have provided here isn't always complete. Sometimes I include concepts that I feel are important in teaching the Task. In several cases I delve into information I believe is important to understanding the basis or background of a Task. Where applicable, I have tried to dispel myths or suggest better ways of doing the Task.

One of the reasons I don't always provide a complete strategy is that the flight maneuvers are pretty well developed in the Airplane Flying Handbook. In addition, the Private and Commercial Practical Test Standards provide relatively clear parameters that can be followed to develop most strategies providing you read them carefully

COMMON ERRORS - Following each STRATEGY is a reference regarding COMMON ERRORS. This is generally different from the common errors found in the OBJECTIVE. My preference is to provide a specific page(s) in the Airplane Flying Handbook. If none exist I provide a note to that effect.

I don't spend an inordinate amount of time or text covering COMMON ERRORS because there is almost always a list at the end of the maneuver description in the Airplane Flying Handbook.

Note: I spend no time discussing "Demonstrates and simultaneously explains" or "Analyzes and corrects" as they are parts of developing your strategy. They are important and warrant learning and understanding, but they are simply part of a bigger whole.

RELATED MANEUVERS - This is a list of the maneuvers I believe are related to the Task at hand. Refer to them when you develop your strategy. The reason I have include related maneuvers is that a good instructor starts an instructional period with, "So far we have done this or that. Now we are going to learn this. This maneuver is just like that maneuver EXCEPT..... "

Almost every flight maneuver is taught within the framework of the building block approach. This means the maneuver you are teaching is one of a group of related maneuvers. If you take that approach you should be able to refer to the teaching of an earlier maneuver as part of teaching the current maneuver.

I recommend teaching related maneuvers as much alike as possible. It enhances positive transfer. I think we teach Power Off Stalls to help a student understand what happens during an approach and landing. If you accept that premise, then it stands to reason that the more the set-up for the stall and the stall look like the real approach to landing, the easier it will be to transfer what happens during the Power Off Stall to the Normal and Crosswind Approach and Landing.

This material is the basis for the information in your binder for the Maneuvers.

Building the Binders - Dividers V through XIV

As I said in Section 1, you are going to build a reference binder. Dividers V through XIII will be devoted to Areas of Operation V through XIV. I would label them with the appropriate AO number and title.

Behind dividers V through XIV will be one tab for each TASK.

TASK - The first page behind each tab should be a reprint of the TASK as found in the PTS. Cut and paste it directly from FAA.GOV and then format it as you like. Having this as the first page will allow it to be used as a quick reference without thumbing through a separate book.

STRATEGY - This should be the second page(s) behind each tab in this section of the binder.

This is the way **you** would teach, describe or explain the Elements of the Task. At first this may be a blank page. You should develop your strategy only after you have read this section of the Certificated Flight instructor

Preparation Guide, the Area of Operation in the PTS and all of the associated reference material.

In the case of Areas of Operation V through XIV, YOUR STRATEGY should include a list of common errors and a step-by-step description of how to perform the TASK.

REFERENCE MATERIAL LIST - This should be the third page behind the Task Tab in this section of the binder. Think of it as an index for the reference materials you assemble. Your primary source will be the REFERENCES found in the specific TASKS that follow.

REFERENCE MATERIAL - These are the things that should go behind the Reference Material List. This section should include three items:

- ALL of the references cited in the REFERENCES section of the TASK.
- Any reference materials developed by the CFI student.
- Any other reference materials the student thinks are of value.

My last thought for this section is the 3 X 5 card. Condense your in-flight instructional description to a single card. Use that card to practice "instructing." Remember, when you demonstrate a maneuver you will be expected to talk, describing the maneuver before you demonstrate it, while you are performing it, and after you have finished it. Call it your shtick, monologue, spiel or routine. Practice it until it becomes natural and easy to do, second nature.

Following is a sample:

Chandelle

- This is a maximum performance maneuver.
- From above it looks like a 180° change in heading.
- The first half of the maneuver is spent at 30° of bank while steadily increasing pitch.
- The second half of the maneuver is spent holding the pitch we achieved at the 90° point while steadily rolling out of our bank, ending up at the 180° point, wings level and just above a stall.
- In this airplane we start at our practice area cruise airspeed of 90 KIAS.
- After clearing the area, we will select a heading using the N/S E/W fencerows
- Once we are stabilized on our heading and airspeed, we will roll into a 30° bank, begin increasing pitch, and add full power.
- Once we reach our 180° point we will hold our pitch attitude momentarily and then level out holding our altitude.
- We will then accelerate back to our practice area cruise airspeed.

NOTE: In the Sacramento Valley where I teach, 3,000 feet MSL is also 3,000 feet AGL. At worst there is a difference of about 50 feet between them. I try to do most all of my maneuvering at or above 3,000 feet AGL. When assigning altitudes I use 3,000 feet MSL and also consider that to be 3,000 AGL.

V. AREA OF OPERATION: PREFLIGHT PROCEDURES

NOTE: The examiner shall select at least one TASK.

This is NOT an Area of Operation with "maneuvers" that will require development of Lesson Plans as required by Area of Operation IV. That doesn't mean you won't have to teach these Tasks; it means you will more than likely teach them as you do them. They will be the first "maneuvers" the Inspector will see, which means even though they are relatively simple Tasks, how you perform here will go a long way in making a first impression. Therefore, you will need to develop strategies that are usable in the "field." Keep them simple and to the point.

TASK: V. A. PREFLIGHT INSPECTION

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Pgs. 2-1 through 2-6
FAA-S-8081-12B - Commercial PTS - AO II. Task A
FAA-S-8081-14A - Private PTS - AO II. Task A
POH/AFM - Sections 1, 2, and 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a preflight inspection, as **applicable to the airplane** used for the practical test, by describing-
   a. reasons for the preflight inspection, items that should be inspected, and how defects are detected.
   b. importance of using the appropriate checklist.
   c. how to determine fuel and oil quantity and contamination.
   d. detection of fuel, oil, and hydraulic leaks.
   ~~e. inspection of the oxygen system, including supply and proper operation (if applicable).~~
   g. detection of visible structural damage.
   h. removal of tie-downs, control locks, and wheel chocks.
   i. removal of ice and frost.
   j. importance of the proper loading and securing of baggage, cargo, and equipment.
   k. use of sound judgment in determining whether the airplane is airworthy and in condition for safe flight.
2. Exhibits instructional knowledge of common errors related to a preflight inspection by describing-
   a. failure to use or the improper use of checklist.
   b. hazards which may result from allowing distractions to interrupt a visual inspection.
   c. inability to recognize discrepancies to determine airworthiness.
   d. failure to ensure servicing with the proper fuel and oil.
   e. failure to ensure proper loading and securing of baggage, cargo, and equipment.

3. Demonstrates and simultaneously explains a preflight inspection from an instructional standpoint.

STRATEGY

This is a Task with two parts, the theory and the practical. I would prefer to start this task while walking to the airplane and once there, finish up actually putting my hands on the airplane, while doing it.

Element Strategies

1. a. reasons for the preflight inspection, items that should be inspected, and how defects are detected.

Talk This borders on common sense, however, the POH/AFM should have a section on both the reason and the "what and why" of a preflight inspection.

1. b. importance of using the appropriate checklist.

Talk Explain the three types of checklists: read and do, do and read or verify, and memory. Explain how you use them.

Do Show your student the checklist and explain how it is used. This would be a good time to show him how to perform the preflight by carrying the checklist. Have him read each item and then perform the check. (Read and do) You could also walk him around the airplane without the checklist in hand and then go back to the cockpit and read the items one by one to make sure that each was done. (Do and read)

GUMPS is an example of a memory checklist.

1. c. how to determine fuel and oil quantity and contamination.

Do Show how to determine oil quantity using the oil dipstick.

Show how to determine fuel quantity using a commercially available fuel stick.

Show how to determine fuel quantity using the tab system if your airplane has one.

Show how to drain fuel tanks to determine if the fuel is contaminated.

Show what "normal" fuel should look like and then add some water to it so he can see what contamination looks like. Bring your water bottle along.

Since some of us drain fuel from the low point sump onto the ground, you may want to pour some of your water on it to show what the mixture looks like on the ground.

This is also a good time to explain what having fuel, but not knowing how much, feels like. The quantity is below the tabs, but how far, and there is no dipstick available for the airplane.

1. d. detection of fuel, oil, and hydraulic leaks.

Talk Again, this borders on common sense, however, the POH/AFM should have a section on how to detect leaks during the preflight inspection.

Do The best way to make your point is to show the student what an oil leak looks like. There is usually at least one on an average airplane.

1. f. inspection of the flight controls.

Do You just can't beat showing a student where the flight controls are, how moving the yoke and rudder pedals move the control surfaces and which way they should move.

1. g. detection of visible structural damage.

Do You just can't beat showing a student a dent, nick or a crack. Unless the airplane you are flying is just off the assembly line, chances are there will be some wear and tear.

Talk This is a good time to **tr^** to explain what acceptable damage is.

1. h. removal of tie-downs, control locks, and wheel chocks.

Do Show your student when, where, and how to do this, including storage of the control lock. Check with your school for their policy.

1. i. removal of ice and frost.

Talk You have to start with the POH/AFM. I don't know of any General Aviation airplanes that can be operated with ice or frost. Flow you teach this depends on where you live. Flere in sunny California, I suggest waiting.

1. j. importance of the proper loading and securing of baggage, cargo, and equipment.

Talk Go to the POFI/AFM and see what it says. Other than that, explain why you don't want flying objects flying around in a flying airplane.

Do Take the time to secure any baggage, cargo or equipment.

1. k. use of sound judgment in determining whether the airplane is airworthy and in condition for safe flight.

Talk It seems that after doing a preflight and making sure that everything looks correct and is working you shouldn't need to take this step. Being serious when you perform the preflight and not dismissing questions about why this is OK but that isn't, will go a long way. It might be worth having the local A&P come in and explain what he looks for during an inspection.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

There really aren't any related maneuvers.

TASK: V. B. SINGLE-PILOT RESOURCE MANAGEMENT

REFERENCES

FAA-H-8083-3A - Airplane Flying Handbook - Page 2-7
FAA-S-8081-12B - Commercial PTS - AO II. Task B
FAA-S-8081-14A - Private PTS - AO II. Task B
POH/AFM - Section 4
91.107 Use of safety belts, shoulder harnesses, and child restraint systems. (Emphasis on paragraph b.)

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the Elements of single-pilot resource management by describing -
   a. proper arranging and securing of essential materials and equipment in the cockpit.
   b. proper use and/or adjustment of cockpit items such as safety belts, shoulder harnesses, rudder pedals, and seats.
   c. occupant briefing on emergency procedures and use of safety belts.
   d. proper utilization of all resources required to operate a flight safely, dispatchers, weather briefers, maintenance personnel, and air traffic control.
2. Exhibits instructional knowledge of common errors related to single-pilot crew resource management by describing -
   a. failure to place and secure essential materials and equipment for easy access during flight.
   b. failure to properly adjust cockpit items, such as safety belts, shoulder harnesses, rudder pedals, and seats.
   c. failure to provide proper adjustment of equipment and controls.
   d. failure to provide occupant briefing on emergency procedures and use of safety belts.
   e. failure to utilize all resources required to operate a flight safely.
3. Demonstrates and simultaneously explains single-pilot crew resource management from an instructional standpoint.

STRATEGY

This Task is pretty straightforward. Just go down the list of Elements.

Element Strategies

1. a. proper arranging and securing of essential materials and equipment in the cockpit.

Suggest to your student to get a kneeboard of some kind. A steno pad with a bungee cord will work. You can also suggest places to stow things like a checklist or sectional. They will need this organizational skill more when they fly cross-country, but consider introducing the kneeboard and sectional on the second or third flight.

1. b. proper use and/or adjustment of cockpit items such as safety belts, shoulder harnesses, rudder pedals, and seats.

Show your student how to use his belts and harness. Pay special attention to how the harness clips to the belt. The little plastic “ring” on the seat belt is what keeps the shoulder harness attached. No ring, no fly. Next is the adjustment of the rudder pedals and the seat. Most General Aviation airplanes do not have adjustable pedals, so it's all about putting the seat in the right place.

Now to the question of who has to wear what. Go to FAR 91.107. Make sure you read paragraph b.

1. c. occupant briefing on emergency procedures and use of safety belts.

Explain the regulation about belts and harnesses. Get your students used to giving the briefing early in training. Start on the second or third lesson.

1. d. proper utilization of all resources required to operate a flight safely, dispatchers, weather briefers, maintenance personnel, and air traffic control.

Before too many flights go by, make sure your student knows who is who and what they do. Explain their roles. Start early with weather and TFRs. Get them registered on DUAT or DUATS and have them call the FSS before each flight. Take a trip to the tower if possible and introduce the student to the mechanic that works on your airplane.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

There really aren't any related maneuvers.

TASK: V. C. ENGINE STARTING

REFERENCES

FAA-H-8083-25A - Page 6-18
AC 91-13 - Cold Weather Operation of Aircraft
AC 91-55 - Reduction of Electrical System Failures Following Aircraft Engine Starting
FAA-H-8083-3A - Airplane Flying Handbook - Page 2-7
FAA-S-8081-12B - Commercial PTS - AO II, Task C
FAA-S-8081 -14A - Private PTS - AO, Task C
POH/AFM - Section 1,2, and 4

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of engine starting, as appropriate to the airplane used for the practical test, by describing -
   a. safety precautions related to starting.
   b. use of external power.
   c. effect of atmospheric conditions on starting.
   d. importance of following the appropriate checklist.
   e. adjustment of engine controls during start.
   f. prevention of airplane movement during and after start.
   g. safety procedures for hand propping an airplane.

2. Exhibits instructional knowledge of common errors related to engine starting by describing -
   a. failure to properly use the appropriate checklist.
   b. failure to use safety precautions related to starting.
   c. improper adjustment of engine controls during start.
   d. failure to assure proper clearance of the propeller.

3. Demonstrates and simultaneously explains engine starting from an instructional standpoint.

STRATEGY

Similarly to Preflight Inspection, this is a task with two parts. Instead of the theory and the practice, I would approach this as normal engine starting and other. I would also describe the Task as being checklist dependent.

Elements Strategies

1. a. safety precautions related to starting.

Keep an eye out for people walking around. Teach the student to look and then call out "clear" prior to starting. I also suggest calling out "switch on" when turning the Master Switch on. Other things to consider are brakes and throttle.

Most General Aviation trainers have keys. I insist that during the walk around, they be put on the top of the instrument panel where they can be seen from outside. I do not want to experience the effects of a hot magneto.

1. b. use of external power.

In sunny California, using external power is not the norm. If I had to start an airplane using external power because of a dead battery, I wouldn't fly the airplane until I was sure I had a good battery. The only way I know to do that is to start the engine using just the battery. If you live where external power is used to assist in starting, I suggest you talk to the folks where you fly and see what their procedures are.

If I used external power because of the cold, I would teach my students to get out the appropriate checklist and follow it.

1. c. effect of atmospheric conditions on starting.

I did a word search in all of the reference materials listed for this Task. Nothing came up when I entered “effect of atmospheric conditions on starting.” The only document that had anything pertinent was AC-91 -13C - Cold Weather Operation of Aircraft. My suggestion is to refer to the airplane checklist and AC-91-13C.

1. d. importance of following the appropriate checklist.

This is a time for a read and do checklist. It needs to be followed to make sure nothing is missed.

1. e. adjustment of engine controls during start.

Have your student get in the habit of pointing out the oil pressure gauge and tachometer before they start the engine. I like to have them touch them. These are the two instruments they will need to look at right after turning the key. They won't have time to find them during the starting procedure. Teach your student to "brief the start, explaining what he plans to do with the engine controls.

1. f. prevention of airplane movement during and after start.

There are different ways to approach this. When flying large aircraft, the parking brake is always used. There are also two pilots on the flight deck. Small airplanes are generally flown by a single pilot. I hold the brakes; other instructors set the parking brake. Teach it as you like; just be able to explain your logic.

1. g. safety procedures for hand propping an airplane.

I won't teach this, period, end of discussion. It's dangerous and should be done only by folks that have to, because of the airplane they fly. I DO NOT WANT A STUDENT EVEN THINKING HAND PROPPING IS OK.

NOTE: If you have to hand prop an airplane equipped with a starter, you should ask why? Then ask; “Is the airplane airworthy?” Can you legally fly an airplane with a dead battery or an inoperative starter?

3. Demonstrates and simultaneously explains engine starting from an instructional standpoint.

I would take out the checklist and follow it until getting to turning the key. At that point I would verbally give the student a list of things to do:

- Locate and touch the oil pressure gauge and tell me what to look for immediately after the start.
- Locate and touch the tachometer and tell me what to look for immediately after the start.
- Look outside for people.
- Call out "Clear."
- Look for people again.
- Turn the key.
- Adjust the throttle/mixture.
- Verify oil pressure and appropriate RPM.
- Make sure the airplane isn't moving

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

There really aren't any related maneuvers. Not much comes before this lesson.

TASK: V. D. TAXIING

REFERENCES

FAA-H-8083-3A - Airplane Flying Handbook Pgs. 2-9 - 2-11
FAA-S-8081-12B - Commercial PTS - AO II, Task D
FAA-S-8081-14A - Private PTS - AO II, Task D
POH/AFM - Section 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of landplane taxiing by describing
    a. proper brake check and correct use of brakes.
    b. compliance with airport/taxiway surface marking, signals, and ATC clearances or instructions.
    c. how to control direction and speed.
    d. flight control positioning for various wind conditions.
    e. procedures used to avoid other aircraft and hazards.
2. Exhibits instructional knowledge of common errors related to landplane taxiing by describing-
    a. improper use of brakes.
    b. improper positioning of the flight controls for various wind conditions.
    c. hazards of taxiing too fast.
    d. failure to comply with airport/taxiway surface marking, signals, and ATC clearances or instructions.
3. Demonstrates and simultaneously explains landplane taxiing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to landplane taxiing.

STRATEGY

This maneuver is all about what you tell a student before he starts to move out of the parking spot. After getting ATIS and taxi clearance/instructions and **discussing** what runway is in use and how to get to it, **I** take the time to remind the student of the things that are most critical to accomplish, between the parking spot and the run-up area.

My list includes:

- Make sure you have a taxi clearance.
- Double check that your clearance takes you all the way to the correct runway without crossing an active runway.
- A brake check for both of us - never check the brakes where you might need them. (If I am parked in a row, with airplanes in front of me, I turn and head down the alleyway and then check my brakes.)
- Taxi Speed - no faster than a brisk walk.
- Straddle the yellow line.
- Flight controls in the correct position for the wind.
- Visually clear all crossing runways - just in case.
- Check flight instruments enroute to the run-up area.

I use the list to explain the major items to be performed during the taxi to the runway. In later lessons I use the list as a memory jogger if my student doesn't complete all of the items before reaching the run-up area.

During the first taxi to the runway I let the student simply taxi using the rudders, brakes and the throttle. Not exactly trial and error, but they get to see how things work. On the way to the active runway I take the time to explain the brake check, airport surface markings, speed, and control positioning.

Obviously you will want to tell your student why they do what they do and what the hazards are for not doing them correctly.

RULE OF THUMB FOR TAXIING WITH WIND:
- DIVE FROM a tail wind
- TURN TOWARDS a headwind

Element Strategies

1. a. proper brake check and correct use of brakes.

Always check the brakes before taxiing too far. This means both the student's and the Instructor's. Never check the brakes where you might need them. (If I am parked in a row, with airplanes in front of me, I turn and head down the alleyway and then check my brakes.)

Try this experiment. Taxi down a taxiway. Find a prominently marked spot and tell your student to stop but also tell him the brakes have failed. See how long it takes him to figure out that reducing power alone won't do any good. Have him pull the mixture and see how many feet it takes to stop.

The point, never taxi faster than a brisk walk and never faster than safe.

1. b. compliance with airport/taxiway surface marking, signals, and ATC clearances or instructions.

Compliance is not optional. Because there is a lot going on during a flight training session, never taxi without being absolutely sure you have been cleared. There isn't anything wrong with calling the tower a second time and asking if you have been cleared to the active runway.

1. c. how to control direction and speed.

I teach that the throttle is an extension of the brakes and visa versa. When you want to brake, the throttle should be closed first. Do not taxi with the brakes applied. Rudder pedals generally control nose wheel steering.

Read the POH/AFM to see exactly how steering is accomplished.

1. d. flight control positioning for various wind conditions.

RULE OF THUMB FOR TAXIING WITH WIND:
• DIVE FROM a tail wind
. TURN TOWARDS a headwind

1. e. procedures used to avoid other aircraft and hazards.

Taxi speeds, following taxiway lines and shadows. If you taxi slow when around other aircraft and obstacles your chances of hitting something is reduced. If you follow the taxiway lines your chances of hitting something is reduced. If you watch the shadows cast by your airplane, other airplanes and obstacles your chances of hitting something is reduced.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

Crosswind Takeoff
Crosswind Landing
Soft field Takeoff
Soft field Landing

TASK: V. G. BEFORE TAKEOFF CHECK

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook Page 2-11
FAA-S-8081-12B - Commercial PTS - AO II, Task F
FAA-S-8081-14A - Private PTS - AO II, Task F
POH/AFM - Section 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of the before takeoff check by describing -
   a. positioning the airplane with consideration for other aircraft, surface conditions and wind.
   b. division of attention inside and outside the cockpit.
   c. importance of following the checklist and responding to each checklist item.
   d. reasons for assuring suitable engine temperatures and pressures for run-up and takeoff.
   e. method used to determine that the airplane is in a safe operating condition.
   f. importance of reviewing takeoff performance airspeeds, expected takeoff distances, and emergency procedures.
   g. method used for assuring that the takeoff area or path is free of hazards.
   h. method of avoiding runway incursions and ensures no conflict with traffic prior to taxiing into takeoff position.
2. Exhibits instructional knowledge of common errors related to the before takeoff check by describing -
   a. failure to properly use the appropriate checklist.
   b. improper positioning of the airplane.
   c. improper acceptance of marginal engine performance.
   d. an improper check of flight controls.
   e. hazards of failure to review takeoff and emergency procedures.
   f. failure to avoid runway incursions and to ensure no conflict with traffic prior to taxiing into takeoff position.
3. Demonstrates and simultaneously explains a before takeoff check from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a before takeoff check..

STRATEGY

I treat this subject very much like the discussion I have with my student just before we start to taxi.

A lot of the before takeoff check is simply a matter of reading and following the checklist step by step. When it is time to perform the "run-up" there is too much going on to teach and "Read and Do." I stop the process and using the checklist, go over the magneto check, carburetor heat check, prop check, etc.

After I explain what to check and what to look for to make sure the airplane is functioning properly, I let the student read the checklist and do the checks.

I describe the:

- Carburetor heat check
- Magneto check
- Prop check
- Vacuum check
- Alternator/generator check
- Fuel pump check

I use this list to explain the major things to be considered during the run-up. In later lessons I use it as a memory jogger.

During the first Before Takeoff Check, I let the student head to the run-up area and wait to see what he does. Without exception the student gets to the area and asks what I want him to do. Get him to turn the airplane into the wind and then explain proper positioning of the airplane, what checks we will be doing and how to do them. Finally as we are ready to call the tower, discuss the normal takeoff.

I also subscribe to a pre-takeoff briefing. This includes what to do if a problem occurs prior to rotation, prior to “no more usable runway,” prior to 500 feet AGL, prior to 1,000 feet AGL and after 1,000 feet AGL. My takeoff briefing also includes the type of takeoff to be performed and takeoff configuration and speeds.

Element Strategies

1. a. positioning the airplane with consideration for other aircraft, surface conditions and wind.

I describe this as a matter of compromise. There are two considerations: 1) position the airplane into the wind for the run-up, 2) don't blow dust and debris all over other airplanes and/or other things near the run-up area. Hope you can do both.

1. b. division of attention inside and outside the cockpit.

Teach your student that while paying attention to the run-up, pay attention to the environment outside of the airplane. Moving when you think the brakes are set or being held is an example of NOT paying attention inside and outside the cockpit.

1. c. importance of following the checklist and responding to each checklist item.

My explanation: there is simply too much to remember and too many things to miss. Teach your student to read and respond to the checklist out loud.

1. d. reasons for assuring suitable engine temperatures and pressures for run-up and takeoff.

I would refer to the POH/AFM for specific information. The reason, it’s the prudent thing to do if you want a safe and properly operating airplane.

1. e. method used to determine that the airplane is in a safe operating condition.

There is a manufacturer's checklist and an expanded procedure section in the POH/AFM. I believe manufacturer's know what they want checked and what the tolerances are. Teach your student to respect them.

1. f. importance of reviewing takeoff performance airspeeds, expected takeoff distances, and emergency procedures.

This is a very interesting Element. I do not teach this on the first lesson. Before the second or third lesson it is time to explain the concept of a pre-takeoff briefing. I suggest you develop one for yourself and commit it to writing. They aren't very complicated. Make sure you address things like:

- Calling out "airspeed alive."
- Calling out "Vr" or "rotate."_____.
- Calling out "Vy."_____ .
- If you have gear, calling out "positive rate" and "no more usable runway," before retracting the landing gear.
- If we have a problem with usable runway we will land straight ahead and

- If we have an engine failure after there is no more usable runway we will

- If we are above_____ or we have made a 90° turn we will_____ .
- If we are above_____ we will_____.

NOTE: **I** haven't filled in the specifics of **YOUR** procedure. You need to do that. **I** have some ideas.

- If you have made a 90° turn your ability to get back to the airport **(not necessarily the runway)** greatly increases.
- In general, I would rather land on the airport, even if I can't make a runway, than between houses.
- Google Earth can give you a great look at your most common departure paths and the options you will have as you depart.
- I climb to 1,000 feet AGL using Vy unless there is a **compelling** reason to do something otherwise.
- Read, discuss and **discourage** "The Impossible Turn."

1. g. method used for assuring that the takeoff area or path is free of hazards.

Could this be look both ways before you take the runway and try not to takeoff into the cow?

1. h. method of avoiding runway incursions and ensures no conflict with traffic prior to taxiing into takeoff position.

First things first. Since this PTS was written there are fewer and fewer "taxi into position and hold" clearances being issued. Now it's either "hold short" or "cleared for takeoff."

The best way to avoid runway incursions is to make double sure you understand what you have been cleared to do and where you are going. Air Carriers are required to have and use an airport diagram. You should teach your student to do the same. If I have any question about the clearance or active runway, I call ATC for verification before crossing any runway. I started doing this when I started teaching, after I retired. It took a while for the guys in the tower to get used to it and stop giving me a hard time. I simply explained that I was getting old.

I teach my students that it is better to stop and ask than taxi onto an active runway by accident.

Explain what “Taxi to runway X” actually means.

At uncontrolled airports my best suggestion is to talk and listen on the appropriate frequency and look carefully before taking the runway. Again, I have a tip. Before you take the active, make a 360° turn. Make it in the same direction as the traffic. That way you will be looking where traffic shouldn't be first, then on the upwind, crosswind, downwind, base and finally on final.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

Other than the concept of using a checklist, there really aren't any related maneuvers. The before takeoff check is a stand-alone lesson.

VI. AREA OF OPERATION: AIRPORT OPERATIONS

NOTE: The examiner shall select at least one TASK.

This Area of Operation only has three Tasks. They all center on the airport. In a lot of ways it's AIM, AIM, AIM.

TASK: VI. A RADIO COMMUNICATIONS AND ATC LIGHT SIGNALS

REFERENCES

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 13.
FAA-H-8083-3A - Airplane Flying Handbook - Chapter 7.
FAA-S-8081-12B - Commercial PTS - AO III. Task A.
FAA-S-8081-14A - Private PTS - AO III. Task A.
AIM - Chapter 4 and 5.
FARs-

91.123 Compliance with ATC clearances and instructions.
91.125 ATC light signals.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of radio communications and ATC light signals by describing—
   a. selection and use of appropriate radio frequencies.
   b. recommended procedure and phraseology for radio communications.
   c. receipt, acknowledgement of, and compliance with, ATC clearances and instructions.
   d. interpretation of, and compliance with, ATC light signals.
2. Exhibits instructional knowledge of common errors related to radio communications and ATC light signals by describing-
   a. use of improper frequencies.
   b. improper procedure and phraseology when using radio communications.
   c. failure to acknowledge, or properly comply with, ATC clearances and instructions.
   d. failure to understand, or to properly comply with, ATC light signals.
3. Demonstrates and simultaneously explains radio communication procedures from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to radio communications and ATC light signals..

STRATEGY

Since this is a "flight maneuver" as opposed to a technical subject, I believe this is mostly about doing. In this case it is about determining and selecting the appropriate frequency, talking on the radio, knowing what a clearance and an instruction is and what to do with them. It also includes ATC light signals.

I would approach this from the standpoint that you are in the airplane and you are in need of communicating with ATC or other aircraft at an uncontrolled airport.

Element Comments

1. a. selection and use of appropriate radio frequencies.

Start with where and when pilots have to and should communicate with ATC and other pilots, sort of an overview. Then I would refer to the sectional and show the student how to find the appropriate radio frequencies.

Find an example of every frequency used on the sectional, including symbol/location.

- Emergency
- Tower

. ATIS

- Ground
- Unicom

. CTAF

- Standard FSS Frequencies
- Unique FSS Frequencies

. AWOS

. ASOS

- Approach Control

. RCO

- VOR with voice
- VOR without voice

. NDB

- Special Use Airspace frequencies.

Where do you get the ground control frequency on the sectional?

1. b. recommended procedure and phraseology for radio communications.

I discuss the layout of radio communications, the patterns like: Who am I talking to? Who am I? Where am I? What do I want to do? and other information.

1. c. receipt, acknowledgement of, and compliance with, ATC clearances and instructions.

This Element is a mix of phraseology and regulation. This includes the difference between a clearance and an instruction and about establishing two-way radio communications and receiving a clearance. It's about when is a clearance a clearance and when is an instruction an instruction. Make sure you know the difference.

1. d. interpretation of, and compliance with, ATC light signals.

I am sure you have the light gun signals memorized. If not you should have a card in your pocket or a decal in your airplane, on your clipboard or as I do, on my student's checklist. There are only a few places where I buy into memorizing information, but this is one of them.

If you have a mnemonic, I would love to see it.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Flandbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

There really aren't any related maneuvers.

TASK: VI. B. TRAFFIC PATTERNS

REFERENCES

FAA-H-8083-25A Pilot's Handbook of Aeronautical Knowledge Chapter 13.
FAA-H-8083-3A - Airplane Flying Handbook Chapters 7 and 8.
AC 90-42 Traffic Advisory Practices at Airport Without Operating Control Towers.
AC 90-66 Recommended Standard Traffic Patterns for Aeronautical Operations at Airports Without Operating Control Towers.
FAA-S-8081-12B - Commercial PTS - AO III. B.
FAA-S-8081-14A - Private PTS - AO III. B.
AIM - Chapter 4, Section 3.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of traffic patterns by describing—
    a. operations at airports with and without operating control towers.
    b. adherence to traffic pattern procedures, instructions, and rules.
    c. how to maintain proper spacing from other traffic.
    d. how to maintain the desired ground track.
    e. wind shear and wake turbulence avoidance procedures.
    f. orientation with the runway or landing area in use.
    g. how to establish a final approach at an appropriate distance from the runway or landing area.
    h. use of checklist.
2. Exhibits instructional knowledge of common errors related to traffic patterns by describing—
    a. failure to comply with traffic pattern instructions, procedures, and rules.
    b. improper correction for wind drift.
    c. inadequate spacing from other traffic.
    d. poor altitude or airspeed control.
3. Demonstrates and simultaneously explains traffic patterns from an instructional standpoint.

4. Analyzes and corrects simulated common errors related to traffic patterns.

STRATEGY

Without a doubt, this is my favorite maneuver of all time. I can learn more from watching one traffic pattern and asking questions about how the pilot flys it, than almost anything else I can do.

I can determine if the pilot understands the Performance Section of the POH/AFM. I can find out if he understands airspeed selection and usage. I can find out if the pilot understands how to use the drag components of the airplane. I can find out if he understands how to clear for traffic, talk on the radio, use pitch and power and judge distance.

For me the traffic pattern starts at 50 feet above the ground at the departure end of the runway and ends at 50 feet from the ground at the arrival end of the same runway. It also has an entry from an enroute phase, which needs to be included too.

The first questions I ask are, “What is your airspeed on final?’’ and “What is your airspeed on the downwind?" When I get the answers, I ask "Why?”

My next question is, “Where do you reduce power, apply flaps or extend gear?" Again, I ask "Why?"

I like to know how far from the runway the pilot flys the downwind, where they turn base and in what order they reduce power, add flaps or extend the gear.

I also like to ask "What is the purpose of gear?" and "What do flaps really do?"

Here is how I teach traffic patterns.

Note: You must read about the lift/drag demo that **I** have a new student perform as part of Fundamentals of Flight, for some of this to make sense.

For this discussion I will use a C-172N.

I start by selecting two airspeeds. The first is my downwind airspeed, and the second is my full flaps, final approach airspeed.

My criteria for final approach airspeed is the airspeed called for by the Performance Chart (Short Field). Dollars to donuts, it's pretty close to 1.3 X Vso in KCAS.

My criterion for downwind airspeed is a little more complicated. There are three considerations:

1. It must be compatible with other general aviation aircraft.
2. It would be nice if it were below the maximum flap extension airspeed.
3. It would be nice if there was a ratio between the downwind and final airspeeds and flap settings, like 10 knots per notch.

With those numbers in mind, let's look at a Cessna 172N POH. The maximum flap extension airspeed for the first notch of flaps is 110 KIAS. For more than the first notch of flaps the maximum flap extension airspeed is 85 KIAS. 90 KIAS meets all of my criterion.

The POH/AFM specifies 61 KIAS as the short field approach airspeed. 1.3 X Vso is 62 KIAS. 60 KIAS will do.

With 90 KIAS as the downwind speed and 60 KIAS as our final approach airspeed, let's lay out our traffic pattern:

1. Enter the traffic pattern at 90 KIAS on a 45° angle to the middle of the downwind leg of the traffic pattern. The information from the lift/drag demo tells us that 2,250 RPM works pretty well to provide us the desired airspeed of 90 KIAS.
2. Fly the downwind leg approximately 1/2 mile from the runway and at about 90 KIAS. Perform a pre-landing check. GUMPS works well even in a C-172N.
3. Abeam the approach end of the runway, reduce power by 500 RPM and apply carburetor heat. This assumes no other aircraft in the pattern.
4. Hold altitude and apply the first notch of flaps.
5. Decelerate to 80 KIAS and then begin a descent at 80 KIAS.
6. Descend at about 500 FPM.
7. Trim the airplane.
8. Fly to the 45° point (key point) and turn base. I like to extend the flaps as I turn. The extension of flaps tends to cause the nose to raise and the turn tends to cause a nose down pitching motion. They counter each other.

If the airplane is properly trimmed, the second notch of flaps should slow the airplane to 70 KIAS and continue a consistent descent.

9. Turning final, apply full flaps. The airplane should continue the stabilized approach and slow to 60 KIAS.
10. With 60 KIAS and a stabilized approach I have the student aim the airplane at the end of the runway (pitch) and control the airspeed with power. (Just like an ILS approach.)
11. I also have the student do a "duck test." At 60 knots it should take 30 seconds to fly from the turn to final to the touchdown point (1/2 mile). If the rate of descent is about 500 FPM the airplane should be at about 250 feet AGL at a 1/2 mile. If the rate of descent is 600 FPM the airplane should be about 300 feet AGL at a 1/2 mile. The "duck test." If it looks like a duck, smells like a duck, it must be a duck.

NOTE: If the downwind leg is wider than 1/2 mile, and a 45° key point is used, the base leg will also be wider. In addition, the distance to the runway from the final turn will also be longer. The altitude at the 1/2 mile point should still be about 250 to 300 feet AGL if the airspeed and rate of descent is the same.

Now let's move to the other end of the runway. The airplane is off the runway and climbing through 50 feet AGL.

1. I teach my student to climb out at Vy. This gets me away from the ground as fast as the airplane can carry me, a good thing in case of an engine failure.

2. I want the student to turn to the crosswind leg at 500 feet AGL.

I suggest that he roll his wings level when he has turned 90°, look downwind long enough to clear the area and get his bearings, and roll back into a 30° bank turn to the downwind. (This combination of 30° bank turns along with a crosswind leg long enough to clear the downwind, "auto spaces" the downwind leg, regardless of the aircraft size or speed.)

When the student reaches 1,000 feet AGL (actually about 50 feet before) I suggest that he begins to pitch over to level of. Shortly thereafter, I expect him to reduce power to 2,250 RPM, trim the airplane, and do his pre-landing checklist (GUMPS).

Note: If you find your student crowds the runway on downwind, have him take a bit longer on the crosswind, perhaps a 3 count or even a 5 count.

That's pretty much the whole picture when it comes to flying the traffic pattern.

Element Strategies

1. a. operations at airports with and without operating control towers

Explain how to interface with ATC or communicate on multicom. Obviously when flying at a towered airport the pilot has to follow clearances or instructions unless doing so is unsafe. At non-towered airports the pilot should follow the regulations regarding direction of turns and follow good operating procedures regarding communications. Generally the more communications the better. Early and often is also a good procedure.

1. b. adherence to traffic pattern procedures, instructions, and rules

Explain to your students how to anticipate as well as follow ATC clearances or comply with FAR Part 91.126 when operating on or in the vicinity of an airport without an operating tower.

Make sure you teach your students the regulations as they apply to "all turns" in a traffic pattern at an uncontrolled airport.

Make sure you teach your students to listen to what others have to say on the radio. If they do they will know what is about to happen before it does.

1. c. how to maintain proper spacing from other traffic

Explain how to judge the speed and distance of another airplane and compensate for it if necessary. I prefer that low time pilots widen their patterns if they think they are too close. Another option is to slow down and fly at slow flight.

One rule is not to turn from the downwind lea to the base leg until the preceding traffic passes you headed inbound.

1. d. how to maintain the desired ground track.

Hopefully this is a lesson you can adapt from teaching Ground Reference Maneuvers. It's all about crabbing.

1. e. wind shear and wake turbulence avoidance procedures.

This is also a lesson that was previously taught in Area of Operation II. Task C, Principles of Flight.

1. f. orientation with the runway or landing area in use.

Try teaching everything associated with landing in reference to the runway. Help the student visualize the runway. Go to Google Earth and print out a bird's eye view of the runway. Have your students get used to using the runways' length as a measuring tool.

If the runway is 2,500 feet long and you want your student to fly a downwind that is one-half mile from the runway then his downwind should be one runway's length from the runway. His turn to final should be done at one runway's length from the end of the runway. If you are told to report two miles from the airport then the student should use four runway lengths to determine the reporting point.

1. g. how to establish a final approach at an appropriate distance from the runway or landing area.

If you are at 1,000 feet AGL and you look down to the ground at a 45° angle, you are as far from the object as you are above the surface. In this case that's 1,000 feet or just shy of a quarter mile. If you look down at a 20° angle you are about one half mile. I fly my downwind at about a half mile. If my downwind is a half mile, and I fly to the key point which is a 45° angle back to the approach end of the runway, I have flown one half mile from my abeam point. I will fly about a half mile on the base leg to final and also have about a half mile to go to the runway. Voila, you have a half mile final.

1. h. use of checklist

There is a time and a place for everything, including checklists. I suggest written checklists enroute and on the ground. I subscribe to GUMPS in the pattern.

I supplement that with some rules. When you put the gear down, do not take your hand off the gear handle until you have "three green." Make a visual check of the gear if possible. On short final, confirm, "three green over the fence."

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in Element 2 of the Task.

RELATED MANEUVERS

Rectangular Pattern
Tracking along a road
Slow flight
Radio communications and ATC light signals

TASK: VI C. AIRPORT, RUNWAY AND TAXIWAY SIGNS, MARKINGS, AND LIGHTING

REFERENCES

FAA-H-8083-25A Pilot's Handbook of Aeronautical Knowledge.
Chapter 13.
FAA-S-8081-12B - Commercial PTS - AO III. Task C.
FAA-S-8081-14A - Private PTS - AO III. Task C.
FAA/ASY-20 95/001 - Pilot Guide to Airport Signs and Markings.
AIM - Chapter 2, Section 3.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements of airport/seaplane base, runway and taxiway signs, markings, and lighting by describing:

1. Exhibits instructional knowledge of the elements of airport runway and taxiway signs, markings, and lighting by describing-
    a. identification and proper interpretation of airport runway and taxiway signs and markings with emphasis on runway incursion avoidance.
    b. identification and proper interpretation of airport runway and taxiway lighting with emphasis on runway incursion avoidance.
2. Exhibits instructional knowledge of common errors related to airport, runway and taxiway signs, markings, and lighting by describing-
    a. failure to comply with airport, runway and taxiway signs and markings.
    b. failure to comply with airport runway and taxiway lighting.
    c. failure to use proper runway incursion avoidance procedures.
3. Demonstrates and simultaneously explains airport runway and taxiway signs, markings, and lighting from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to airport runway and taxiway signs, markings, and lighting.

STRATEGY

This is all about **Signs and Markings.** It's all about Chapter 2, Section 3 of the AIM and some of Chapter 13 of the Pilot's Handbook of Aeronautical Knowledge. There isn't a lot more to say. For your student it's about reading the book. For you it's about assembling the information and presenting it.

Design your lesson around the signs and markings seen while taxiing to and from the most commonly used runway at your airport. Explain why signs are colored the way they are and what the coloring means. Explain why signs are placed where they are and explain what the pavement markings mean, include their orientation.

One last thing. It looks like ATC is going to start issuing very specific taxi instructions. Where I fly it sounds like this: "Taxi to runway 20 via Hotel, Alpha and Mike." Since Air Carriers have had to have an Airport Diagram in front of them during ground operations for some time, it might be a good idea to start off your students with a copy of the Airport Diagram in front of them, on their first flight.

I have no specific Element Strategies.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in the Objectives section.

RELATED MANEUVERS

There really aren't any related maneuvers

VII. AREA OF OPERATION: TAKEOFFS, LANDINGS, AND GO-AROUNDS

NOTE: The examiner shall select at least two takeoffs and two landings TASKs.

I believe that before an Instructor teaches takeoffs and landings, he must have a good understanding of the following information and teach it to the student:

1. The Performance Section of the AFM/POH for the particular airplane you are using with emphasis on the Takeoff and Landing Charts.
2. The angle of bank versus stall speed chart. How does any given angle of bank degrade the stall protection of the airspeeds you use in the traffic pattern?
3. The educational series by the FAA called "On Landings." (I know that this publication is "outside the sandbox," but it is written by the FAA and doesn't conflict with the FAA material.)
4. Pitch for Power by Simon Wheaton-Smith. (I also know that this publication is "outside the sandbox," but it doesn't conflict with the FAA material, is a good read, and helps explain the concept of pitch and power.)
5. Traffic pattern, including airspeeds, flap settings, bank angles and their interrelationships.
6. Pitch attitudes used to achieve desired airspeeds for rotations, climbs, descents and flares.

With this background, the Instructor can begin to explain and demonstrate takeoffs and landings.

There are a couple of things that I cannot sav often enough about takeoffs and landings.

- Teach your student to review the performance charts for each takeoff and landing, with special emphasis on configuration and airspeeds. Because airspeeds and flap settings can be different for every takeoff, have your student get in the habit of doing this while in the run-up area. Airspeeds can also change from year to year, model to model, and weight to weight.
- Unless there is an obstacle, always climb at Vy until reaching 1,000 feet AGL. The reason, gaining altitude is like putting money in the bank. If an engine fails, altitude gives you more options to deal with the problem than does airspeed. After reaching 1,000 feet AGL, climb at a pitch attitude that allows you to see over the instrument panel. If that isn't possible, lower the nose periodically to see what is coming at you, or make turns in both directions to clear the path in front of you. This is risk management at its simplest. The risk for the first 1,000 feet of climb is an engine failure. The risk above 1,000 feet AGL is being the other part of a mid-air collision.
- Unless the manufacturer absolutely requires it, do not change the power until reaching at least 1,000 feet AGL. Power changes are commonly associated with engine failures.
- When on a stabilized approach for a normal landing, pitch controls glideslope and power controls airspeed. (How do you stay on the glideslope of an ILS?)

For Short-field Approaches **(the back side of the power curve)** pitch controls airspeed and power controls rate of descent or glideslope. The slower you go the better this works.

- It is far easier to fly **up to or into** the desired glideslope from below than chase it on the way down.
- Consistency is the key to good landings.
- Never do touch and goes.

A NOTE ABOUT Vref: Somewhere there needs to be a discussion of the concept of Vref, here is as good a place as any. While there are differences between large and small aircraft the concept of Vref applies to both. Simply put, in modern airplanes, Vref provides a 30% buffer on stall speed. It should be clear that the extension of flaps lowers the airplane's stall speed. Therefore there is a clear connection between the extension of flaps and flying at a lower airspeed. I teach my students, that when they are transitioning from the downwind leg of a traffic pattern to the approach phase of the traffic pattern when possible to, lower flaps first and then slow to a designated airspeed. In the C-172N that pattern is: clean at 90 KIAS, 10° at 80 KIAS, 20° at 70KIAS and full flaps at 60KIAS. Doing this does two things. It pairs airspeeds with flap settings in a logical manner and it always insures at least a 30% buffer on stall speeds.

<u>If you have retractable landing gear:</u>

- Do not touch anything after you have touched down, until you have stopped, and if not doing stop and goes, do not touch anything until clear of the runway.
- When you put the gear down, keep your hand on the gear handle until you have three green lights, or one green light if that's all your airplane has.
- The last gear check is "three in the green over the fence."
- There is only one reason to put down landing gear. You plan to taxi. Do not use it to slow you down or get you down. If you need it for that, you failed to plan properly.
- If there is a horn blaring in your ear, listen to it; you probably forgot something.

TASK: VII. A. NORMAL AND CROSSWIND TAKEOFF AND CLIMB

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 5.
FAA-S-8081-12B - Commercial PTS - AO VII. Task A.
FAA-S-8081-14A - Private PTS - AO VII. Task A.
POH/AFM - Sections 4 and 5.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a normal and crosswind takeoff and climb by describing-
   a. procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance.
   b. normal and crosswind takeoff and lift-off procedures.
   c. difference between a normal and a glassy-water takeoff.
   d. proper climb attitude, power setting, and airspeed (VY).
   e. proper use of checklist.
2. Exhibits instructional knowledge of common errors related to a normal and crosswind takeoff and climb by describing—
   a. improper runway incursion avoidance procedures.
   b. improper use of controls during a normal or crosswind takeoff.
   c. inappropriate lift-off procedures.
   d. improper climb attitude, power setting and airspeed (VY).
   e. improper use of checklist.
3. Demonstrates and simultaneously explains a normal or a crosswind takeoff and climb from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a normal or a crosswind takeoff and climb.

STRATEGY

Start by teaching your student to read the POH/AFM and determine what the manufacturer either requires or suggests regarding a normal takeoff. This includes rotation speed, liftoff speed, climb speeds, and so on.

Make sure the student gets used to using a checklist. Explain the importance of the checklist.

Get them used to performing a meaningful takeoff briefing. Make sure you explain what the takeoff looks like. Explain how they should break it into pieces that make sense like:

- What to do if there is an emergency before rotation.
- What to do if there is an emergency after rotation but before 500 feet AGL.
- What to do if there is an emergency above 500 feet AGL, but below 1,000 feet AGL.
- What to do if there is an emergency above 1,000 feet AGL.

Describe a normal takeoff in terms of how to use ailerons and rudder. Describe turning tendencies, and control effectiveness as airspeed increases.

Describe a normal takeoff in terms of airspeeds. Teach them to call out "airspeed alive," rotation, as well as Vy (or Vx).

If possible, show your student what the proper pitch attitude looks like before starting the engine. (In a Cessna 152 or 172,1 push down on the tail with the student seated in the airplane so they can see what a "nose on the horizon" pitch attitude looks like.) If you can't show the pitch attitude, describe it.

Be patient and simply let your student perform every takeoff they can, while talking them through the procedures.

Somewhere we need to discuss flap and gear retraction as part of the normal takeoff procedure. I suggest you retract the flaps upon reaching Vy, with two exceptions.

1) The manufacturer **requires** otherwise.

2) You have taken off with flaps and are still low over the trees and are climbing away from the earth OK. In that case I suggest that you wait a bit. I do not like the sensation of settling over trees or uneven terrain.

Regarding gear, I suggest that you teach your students to only retract the gear when two requirements have been met:

1) The student has confirmed a positive rate of climb.

2) There is no more usable runway. I also teach my students to verbalize "positive rate of climb" before retracting gear.

Element Strategies.

1. a. procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance.

Before taking the active, make sure your are cleared to do so and/or that it is safe. If you are at a controlled field make sure you have an ATC clearance **and** that final is clear. At an uncontrolled field meet your obligation by advising traffic of your intention and then perform a **clearing turn** on the ground to make sure it is safe to taxi onto the runway.

1. b. normal and crosswind takeoff and lift-off procedures.

This is about describing what happens from the time your student lines up on the runway for takeoff and the time he becomes airborne. Try breaking the procedure into parts; the use of the rudder and the aileron during a takeoff, the airspeeds used for takeoff, and the proper procedure for rotating during liftoff.

I teach that the rudder aims the airplane, and the aileron controls drift caused by a crosswind. I suggest that you teach your student to start with full deflection of the aileron, towards the wind, reducing the control input as the ailerons become more and more effective. Teach that, in theory, the airplane should come off the ground at the prescribed lift-off speed and with one wing low. Think of this as a slip, just like a landing.

At the same time teach that the rudder will keep the airplane pointed down the runway and compensate for turning tendencies.

Regarding airspeeds, I teach my students to call out, "airspeed alive" and "rotate," and "Vy."

Rule of thumb - Rudder controls heading, aileron controls drift.

Element Strategies

1. d. proper climb attitude, power setting, and airspeed (VY).

Consult the AFM/POH first. Find out what the manufacturer recommends in the way of airspeeds and power settings. Then hope you can teach the following:

- Rotate to a pitch attitude that will allow a Vy climb.
- Climb at Vy all the way to 1,000 feet AGL.
- Do not change any power settings until reaching at least 1,000 feet AGL.

1. e. proper use of checklist.

Teach your student to use the checklist but also teach them to think. There is no question that the checklist represents a sequenced list of things to do or check. There is one problem. It is not the last word. In the case of the Normal and Crosswind Takeoff and Climb checklist, there is a lot of vagueness in the wording. Instead of a climb at Vx or Vy it calls for "70 to 80 knots." My best suggestion is to use the checklist but write all over it or develop one of your own. If you do, make sure you don't omit anything from the manufacturer's checklist.

COMMON ERRORS - Airplane Flying Handbook, Page 5-4

RELATED MANEUVERS

Normal Takeoff
Crosswind Takeoff
Short-field Takeoff
Soft-field Takeoff
Go-around
Recovery from Slow Flight

TASK: VII. B. SHORT-FIELD TAKEOFF AND MAXIMUM PERFORMANCE CLIMB

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 5.
FAA-S-8081-12B - Commercial PTS - AO VII. Task E.
FAA-S-8081-14A - Private PTS - AO VII. Task E.
POH/AFM - Section 4.
POH/AFM - Section 5 - Performance Chart.
FAR 23.53 Takeoff performance.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a short-field takeoff and climb by describing -
   a. procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance.
   b. short-field takeoff and lift-off procedures.
   c. initial climb attitude and airspeed (Vx) until obstacle is cleared (50 feet/16 meters AGL).
   d. proper use of checklist.
2. Exhibits instructional knowledge of common errors related to a short-field takeoff and climb by describing -
   a. improper runway incursion avoidance procedures.
   b. improper use of controls during a short-field takeoff.
   c. improper lift-off procedures.
   d. improper initial climb attitude, power setting, and airspeed (Vx) to clear obstacle.
   e. improper use of checklist.
3. Demonstrates and simultaneously explains a short-field takeoff and climb from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a short-field takeoff and climb.

STRATEGY

Take a moment to read Element 1. c. It defines the maneuver. The Task is to perform a takeoff and cross a 50-foot obstacle. At that point the Short-field Takeoff is over. Let's focus on just that, the first 50 feet. If there is a specific climb that is necessary, it starts after 50 feet.

To begin with, I haven't found many POHs/AFMs that use the Vx published in the front of Section 4, for the Short-field Takeoff. The reason is that Short-field Takeoffs are all about duplicating what the manufacturer's test pilot did during the airplane's certification flight tests. Our task is to teach our student's to do exactly what the test pilot did and that is what is contained in the "conditions" section and the computation section of the Short-field Performance Chart. Sounds complicated; it isn't.

Look at the Cessna 172N. Go to the Short-field Takeoff performance chart. In the upper left corner there is a section titled "Conditions." That is a list of conditions that must be met when performing a Short-field Takeoff. Now look at

the tabulation part of the same chart. You can bet that the manufacturer's Flight Test Pilot conformed to each of these conditions and procedures during the company's demonstration of the airplanes performance to the FAA. He also applied each of the figures in the tabulation portion of the Short-field performance chart during flight-testing. As an Instructor all you need to do is to teach your student to read the chart (preferable just before each Short-field Takeoff) and comply with the chart.

The only concept I would add is, "What is the right pitch for a Short-field Takeoff?" My answer, start with the nose on the horizon. If that doesn't net the right airspeed, pick another pitch attitude on the next takeoff. When you finally find the right pitch attitude, make a note and refer to it when you perform subsequent Short-field Takeoffs. Another important concept, you don't want to be adjusting your pitch attitude during a Short-field Takeoff. You should teach your student to pitch the airplane to the predetermined attitude for takeoff starting about 2 or 3 knots before "lift-off' airspeed. If you do that the airplane should lift off at the prescribed airspeed, and while maintaining that pitch attitude, accelerate to and cross the 50 foot obstacle at the prescribed airspeed.

After crossing the obstacle it is a matter of pitching for the right attitude so as to climb at the desired airspeed.

Element Strategies

1. a. procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance.

Before taking the active, make sure you are cleared to do so, and it is safe. If you are at a controlled field make sure you have an ATC clearance **and** that final is clear. At an uncontrolled field meet your obligation by advising traffic of your intention and then perform a **clearing turn** on the ground to make sure it is safe to taxi onto the runway.

1. b. short-field takeoff and lift-off procedures.

Refer to the Short-field Takeoff chart. Duplicate the established procedure. Note: I did not say to refer to Section 4 of the POH/AFM. You may find the information in Section 4 to be confusing and even in apparent conflict with the conditions set forth in the Short-field Takeoff chart.

1. c. initial climb attitude and airspeed (Vx) until obstacle is cleared (50 feet/16 meters AGL).

Caution, the airspeed called for at 50 feet probably isn't a published Vx. I believe you have to duplicate the procedure used by the manufacturer to develop the chart.

1. d. proper use of checklist.

Teach your student to use the checklist, but also teach him to think. There is no question that the checklist represents a sequenced list of things to do or check. There is one problem. It is not the last word. In the case of the Short-field Takeoff, there are three references: the checklist, the expanded normal procedure, and the performance chart(s). What I teach my students to do is to follow the flow of the checklist, BUT, verify each item against the performance chart. Example, the Cessna 172S model performance chart says to LIFT-OFF AT 51 KNOTS WITH A SPEED OF 56 KNOTS AT 50 FEET. The checklist says

nothing about lift-off speed, instead calling for ELEVATOR CONTROL - SLIGHTLY TAIL LOW and a CLIMB SPEED - 56 KNOTS (until the obstacle is cleared). Where as 56 knots is the correct speed for 50 feet, it is only correct for a weight of 2,550 lbs. There are two other takeoff performance charts for lesser weights.

Review of the Piper PA28-161 POH/AFM indicates inconsistencies in language and numbers in all three sources, the expanded procedure, the checklist and the performance chart. I teach my students to start with the language or conditions in the performance charts, then look at the checklist and/or expanded procedures. **I always give the Performance Charts priority.**

The performance charts have their foundation in FAR Part 23 (or old CAR 3). I have no idea what the basis is for the other "procedures" in the POH/AFM.

Somehow you have to translate the conflicts for your students. You can edit the checklist provided by the manufacturer or you could write your own. If you do, make sure you don't omit anything from the manufacturer's checklist.

Someone told me the performance charts are written and proven by engineers and the checklist and expanded procedures are written by attorneys.

COMMON ERRORS - Airplane Flying Handbook, Page 5-9

RELATED MANEUVERS

Normal Takeoff
Crosswind Takeoff
Short-field Takeoff
Soft-field Takeoff
Go-around
Recovery from Slow Flight

TASK: VII. C. SOFT-FIELD TAKEOFF AND CLIMB

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 5.
FAA-S-8081-12B - Commercial PTS - AO VII. Task C.
FAA-S-8081-14A - Private PTS - AO VII. Task C.
POH/AFM - Sections 4 and 5.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a soft-field takeoff and climb by describing-
    a. procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance.
    b. soft-field takeoff and lift-off procedures.
    c. initial climb attitude and airspeed, depending on if an obstacle is present.
    d. proper use of checklist.
2. Exhibits instructional knowledge of common errors related to a soft-field takeoff and climb by describing-
    a. improper runway incursion avoidance procedures.
    b. improper use of controls during a soft-field takeoff.
    c. improper lift-off procedures.
    d. improper climb attitude, power setting, and airspeed (VY) or (VX).
    e. improper use of checklist.
3. Demonstrates and simultaneously explains a soft-field takeoff and climb from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a soft-field takeoff and climb.

STRATEGY

This takeoff is all about patience, pitch attitude, and technique. There is the usual discussion about not using brakes and keeping the weight on the mains as much as possible. That is important, but it is the act of applying power and letting the nose come up to the desired pitch attitude and remain there that is the signature of a Soft-field Takeoff.

Instructors tell their students to taxi with aft elevator control. Instead, I tell mine to taxi with the yoke all the way back against the control stop. I want to hear the clunk, clunk of it touching the limit stop. Teach your student that as power is applied the nose will come up lifting the nose wheel off the ground. When the nose gear comes off the ground, mentally record the airplane's pitch attitude (everyone's sight picture is different) and relax the backpressure to keep it there.

As the airplane accelerates, continue to relax the backpressure to keep the desired sight picture and wait. The airplane will come off the ground when it is ready. Push the nose over so as to keep the airplane in ground effect.

Effective ground effect is about one half a wingspan from the ground. Do not allow the airplane to climb above that height above the ground until it has accelerated to Vy. When Vy is reached, begin a climb and clean up the flaps. If you have a complex airplane, raise the gear when you have a positive rate of climb and no more usable runway. Suggestion: Refer to the AFM/POH but do not lose sight of the Performance Chart and its requirements.

Element Strategies

1. a. procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance.

Before taking the active, make sure you are cleared to do so, and it is safe. If you are at a controlled field make sure you have an ATC clearance **and** that final is clear. At an uncontrolled field meet your obligation by advising traffic of your intention and then perform a **clearing turn** on the ground to make sure it is safe to taxi onto the runway.

1. b. soft-field takeoff and lift-off procedures.

Start the takeoff role with full aft yoke. When the nose reaches the proper pitch attitude relax the back pressure to hold it where you want it. Let the airplane come off the ground when it is ready. When Vy is reached, clean up the flaps. If you have a complex airplane, raise the gear when you have a positive rate of climb and no more usable runway

1. c. initial climb attitude and airspeed, depending on if an obstacle is present.

This Element requires a discussion very much like the one regarding proper use of checklist in Task VII. B.

Think about how you would perform a Soft-field Takeoff, over an obstacle. Sounds simple, do a normal Soft-field Takeoff, accelerate to Vx in ground effect and then pitch up and climb. What's Vx with 10° of flaps? Let's start with the BIG QUESTION. How many feet will it take to get over the obstacle? I have no way of even guessing. I certainly have no way of accurately computing that figure, and if the manufacturer does, it hasn't shared that information with you or me. DO EVERYTHING POSSIBLE NOT TO MIX A SOFTFIELD TAKEOFF WITH AN OBSTACLE. My recommendation, accelerate to Vy (whatever that is in the Soft-field configuration) clean up the airplane and climb out at that airspeed UNTIL well above the terrain. If there is an obstacle, use the manufacturer's procedure and ADD LOTS OF DISTANCE TO ANY COMPUTATION you may do. Another suggestion, let someone in a similar airplane go first.

1. d. proper use of checklist.

Teach your student to use the checklist but also teach them to think. There is no question that the checklist represents a sequenced list of things to do or check. There is one problem. It is not the last word. In the case of the Soft-field Takeoff, there may be no specific checklist. Example, the Cessna 172N model only has Normal and Short-field Takeoff checklists. My best suggestion is to use one of them and edit it to fit the Soft-field Takeoff. If you do, make sure you don't omit anything from the manufacturer's checklist.

COMMON ERRORS - Airplane Flying Handbook, Page 5-11

RELATED MANEUVERS

Normal Takeoff
Crosswind Takeoff
Short-field Takeoff
Soft-field Takeoff
Go-around
Recovery from Slow Flight

TASK: VII. F. NORMAL AND CROSSWIND APPROACH AND LANDING

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 8.
FAA-S-8081-12B - Commercial PTS - AO VII. Task B.
FAA-S-8081 -14A - Private PTS - AO VII. Task B.
POH/AFM - Sections 4 and 5.
On Landings Part 1 - P-8740-48 (www.faasafety.gov).
On Landings Part 2 - P-8740-49 (www.faasafety.gov).
On Landings Part 3 - P-8740-50 (www.faasafety.gov).
www.illustratingshadows.com/PitchPower.pdf.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a normal and a crosswind approach and landing by describing-
   a. how to determine landing performance and limitations.
   b. configuration, power, and trim.
   c. obstructions and other hazards, which should be considered.
   d. a stabilized approach at the recommended airspeed to the selected touchdown area.
   e. coordination of flight controls.
   f. a precise ground track.
   g. wind shear and wake turbulence avoidance procedures.
   h. most suitable crosswind procedure.
   i. timing, judgment, and control procedure during roundout and touchdown.
   j. directional control after touchdown.
   k. use of brakes (landplane).
   L. use of checklist.
2. Exhibits instructional knowledge of common errors related to a normal and a crosswind approach and landing by describing-
   a. improper use of landing performance data and limitations.
   b. failure to establish approach and landing configuration at appropriate time or in proper sequence.
   c. failure to establish and maintain a stabilized approach.
   d. inappropriate removal of hand from throttle.
   e. improper procedure during roundout and touchdown.
   f. poor directional control after touchdown.
   g. improper use of brakes.
3. Demonstrates and simultaneously explains a normal or a crosswind approach and landing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a normal or crosswind approach and landing.

STRATEGY

Somewhere I read that the average student pilot spends less than 30 minutes actually landing an airplane by the time he has his Private Pilot certificate.

There is just too much to discuss in this strategy, but I believe there are a couple of key ideas to keep in mind.

Good normal and crosswind approaches and landings (all landings for that matter) start from a well thought out and **consistent** traffic pattern. It's all about getting on the glideslope and establishing a properly stabilized approach.

I teach students to aim at a point short of where they want to touchdown and "fly a string" or a line of sight and adjust airspeed with power. If you shoot a handgun, it's sort of like shooting at tin cans.

Every Instructor describes how to judge being on and staying on the desired approach angle a little differently. I see it as the flatness of the runway and the lack of its movement. On pages 8-8 and 8-9 in the Airplane Flying Handbook there is a pretty good description and some pictures. It says that when you are on a stabilized approach the runway's shape does not change. If the approach becomes shallower, however, the runway will appear to shorten and become wider. Conversely, if the approach is steepened, the runway will appear to become longer and narrower.

The best place to explain/show this is with a runway that has a VASI. Keep in mind that your touchdown will not be at the numbers.

Another thing to impress upon your student is airspeed control. Somewhere I read that 1 knot of excess airspeed is worth 100 feet of float. 5 knots is good for 500 feet.

I have my students fly the final approach at 1.3 times Vso. I figure that the old fashioned way; stall speed in the dirty configuration in Knots Calibrated Airspeed (KCAS) X 1.3. Then I confirm my computed airspeed with the one recommended in the manufacturer's Short-field Landing Performance Chart.

Don't forget the "duck test." At 60 knots it should take 30 seconds to fly from the turn to final to the touchdown point (1/2 mile). If the rate of descent is about 500 FPM the airplane should be at about 250 feet AGL at a 1/2 mile. If the rate of descent is 600 FPM the airplane should be about 300 feet AGL at a 1/2 mile.

Element Strategies

1. a. how to determine landing performance and limitations.

Let’s start with a clarification. There is no way to determine landing performance for a normal landing. There are only performance charts for a Short-field Landing. Regarding landing limitations there aren't many if any when it comes to General Aviation training airplanes. There generally aren't any weight limitations other than max allowable gross weight. There are flap application limits and sometimes "recommendations" about the use of slips.

I teach my students to make every approach using the Short-field approach airspeed and flap settings, just without the steep approach.

1. b. configuration, power, and trim.

According to the Airplane Flying Handbook, configuration applies to the position of the landing gear and flaps. Absent winds beyond the demonstrated crosswind velocity, I recommend that gear be extended when intercepting the glideslope (generally abeam the numbers) and a metered application of flaps resulting in a

full flap landing. Regarding the use of trim, use it to reduce control pressure and not to fly the airplane.

1. c. obstructions and other hazards, which should be considered.

If you are making a "normal" landing at a public airport, I would think you have an obstacle free approach. I would expect something like a 3° approach path that is free of trees, fences and power lines. If you suspect something else, then make a low approach and take a look. If you are landing at a private field or an unimproved strip, enter a normal traffic pattern and descend to an altitude like 500 feet AGL and take a closer look. If you still have questions, fly down the runway at 100 feet AGL or so and look some more but don't land. If all looks well, make your approach and land. If there are any questions go somewhere else.

1. d. a stabilized approach at the recommended airspeed to the selected touchdown area.

It is relatively simple to answer this question. Behind every good landing is a stabilized approach.

I cannot stress enough reading Pitch for Power by Simon Wheaton-Smith. A stabilized approach at the recommended airspeed can't be stressed enough either.

1. e. coordination of flight controls.

I teach “PITCH FOR GLIDE SLOPE AND POWER FOR AIRSPEED” for all approaches except for a Short-field approach. I wouldn't do an ILS any other way, so why would I want to fly a normal approach any other way? (This assumes a stabilized approach.)

1. f. a precise ground track.

I like to crab down final and at the last minute rudder the nose into alignment with the runway centerline, apply aileron to control drift (just enough), flare, and land. Translated, that's a crab followed by a sideslip.

1. g. wind shear and wake turbulence avoidance procedures.

Refer to Area of Operation VI. B.

1. h. most suitable crosswind procedure.

I have only one technique when it comes to landing, that's with or without wind, and we always have wind.

I like to crab down final and at the last minute rudder the nose into alignment with the runway centerline, apply aileron to control drift (just enough), flare, and land. Translated, that's a crab followed by a sideslip.

1. i. timing, judgment, and control procedure during roundout and touchdown.

The Airplane Flying Handbook says that the roundout is the transition from the approach to the landing. I think of it as depleting the energy developed as a result of the descending approach and using that energy to slow the rate of descent, while slowing the airplane to a stall airspeed, just above the runway. Either way, it is the success of the timing that becomes the successful roundout and landing. Again, the Airplane Flying Handbook says that at between 10 to 20 feet above the ground, the roundout or flare should be started, and should be a continuous process until the airplane touches down on the ground.

The question is how to do this. I would suggest that you go back to the pitch attitude you used for takeoff and incorporate that into the idea of how much back elevator is just right for the flare and landing. Think of the flare or roundout like a balancing act. It's a matter of compensating for speed, rate of descent, height of initiation, as well as rate of control input. Sound like mumbo jumbo? Perhaps, so I suggest reading the Airplane Flying Handbook, page 8-5. Too much energy equals too much float. Not enough energy equals a carrier landing.

Note: Carrier landings are not all that good for normal landings, but they are great for Short-field Landings where you don't want much, if any, float.

1. j. directional control after touchdown.

I think of landing as the inverse of taking off. Rudder points the airplane, ailerons control drift. Additionally, if you teach your student not to do anything after landing except slow the airplane down straight ahead and then taxi clear of the runway before cleaning up the airplane, directional control gets a lot easier.

1. k. use of brakes.

Flap retraction improves brake efficiency, so does gear retraction. Teach your students to land with their feet off the brakes and apply them after they land. Do not skid the tires. Do not brake excessively. Judicious use of aft elevator can improve brake effectiveness.

Do not retract the flaps except in the case of an emergency.

1. l. use of checklist.

Teach your student to use the checklist but also teach them to think. My opinion is that a pilot shouldn't do anything that isn’t **absolutely necessary** after landing until the airplane is stopped and preferably is off the runway. This includes flap retraction.

Stop the airplane, taxi off the runway, drag out the checklist and clean up the airplane.

COMMON ERRORS - Airplane Flying Handbook, Page 8-10

RELATED MANEUVERS

Normal Landing
Crosswind Landing
Short-field Landing
Soft-field Landing
Taxiing
Go-around
Slow Flight

TASK: VII. G. SLIP TO A LANDING

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 8.
FAA-S-8081-14A - Private PTS - AO VII. Task K.
POH/AFM - Sections 4 and 5.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of a slip (forward and side) to a landing by describing-
   a. configuration, power, and trim.
   b. obstructions and other hazards, which should be considered.
   c. a stabilized slip at the appropriate airspeed to the selected touchdown area.
   d. possible airspeed indication errors.
   e. proper application of flight controls.
   f. a precise ground track.
   g. wind shear and wake turbulence avoidance procedures.
   h. timing, judgment, and control procedure during transition from slip to touchdown.
   i. directional control after touchdown.
   j. use of brakes.
   k. use of checklist.
2. Exhibits instructional knowledge of common errors related to a slip (forward and side) to a landing by describing-
   a. improper use of landing performance data and limitations.
   b. failure to establish approach and landing configuration at appropriate time or in proper sequence.
   c. failure to maintain a stabilized slip.
   d. inappropriate removal of hand from throttle.
   e. improper procedure during transition from the slip to the touchdown.
   f. poor directional control after touchdown.
   g. improper use of brakes (landplane).
3. Demonstrates and simultaneously explains a forward or sideslip to a landing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a forward or sideslip to a landing.

STRATEGY

As Element 1 indicates, there are two types of slips, the **forward slip** and the **sideslip**

Aerodynamically they are the same. The major difference is how you enter them and why you select one over the other.

The forward slip is entered by applying rudder, I prefer right rudder and then opposite aileron. This moves the nose to the right of runway centerline. Opposite aileron causes the airplane to slip to the left. If the two control movements are balanced the airplane tracks the runway centerline with the fuselage pointing to the right while the approach angle steepens. The forward slip is primarily used to steepen the approach angle. Think of it as "more flaps."

For the sideslip, just enough aileron is applied to keep the airplane from drifting off the runway centerline. At the same time opposite rudder is applied to keep the airplane from turning. The airplane's longitudinal axis will remain aligned with the runway centerline while slipping into the wind. Too much aileron (not enough rudder) and the airplane moves towards the wind; too much rudder (not enough aileron) it drifts the other way. The sideslip is primarily used to keep the fuselage aligned with the runway so as not to touchdown sideways during the flare.

Note: When you teach a crosswind takeoff, isn't applying aileron into the wind to control drift and applying rudder to maintain alighment with the centerline of the runway a sideslip, just going up instead of down?

One other thought about forward slips. The primary reason for a forward slip is to steepen an approach. I generally use the following sequence of adding drag/steepening an approach; full flaps, power off, maneuvering (s-turns) slips. I look at a forward slip as a "last option." Not that there is anything wrong or unsafe about it, I just save it for last. Now go to the C-172 flight manual. There is a placard listed in the Limitations Section that says, **"Avoid Slips with Flaps."** Not all C-172s have this placard. Think about its implications. In my opinion, it doesn't say "DO NOT SLIP WITH FLAPS." It says to avoid them with flaps. If I use a forward slip last in my arsenal of tools for steepening my approach, I believe I have complied with the intent of the placard. So when I need to slip, I slip.

Element Strategies

1. a. configuration, power, and trim.

According to the Airplane Flying Handbook, configuration applies to the position of the landing gear and flaps. Absent winds beyond the demonstrated crosswind velocity, I recommend that gear be extended when intercepting the glideslope (generally abeam the numbers) and a metered application of flaps resulting in a full flap landing. Regarding the use of trim, use it to reduce control pressure and not to fly the airplane

1. b. obstructions and other hazards, which should be considered.

If you are making a "normal" landing to a public airport, I would think you have an obstacle free approach. I would expect something like a 3° approach path that is free of trees, fences and power lines. If you suspect other, then make a low approach and take a look. If you are landing at a private airport on an unimproved strip, enter a normal traffic pattern and descend to an altitude like 500 feet AGL and take a closer look. If you still have questions, fly down the runway at 100 feet AGL or so, but don't land. If all looks well, make your approach and land. If there are any questions go somewhere else.

1. c. a stabilized slip at the appropriate airspeed to the selected touchdown area.

Before I can address this Element, I have to tell you how I use slips during a landing.

Sideslip

If I am on a stabilized approach and on glide path, I crab into the wind to maintain runway centerline. During the flare, I rudder the nose of the airplane into alignment with the runway and apply aileron to control drift. If I am lucky, I touch down on both mains at the same time, just as the nose of the airplane is aligned with the centerline of the runway. Luckier yet, my wings end up level with the

ground while I touch down. That's a stabilized approach transitioning to a sideslip during the flare, but I wouldn't call the transition to the sideslip, the flare or the actual sideslip, stabilized.

Forward slip

If I find myself too high on an approach, and I have used all of my drag items and the engine is at idle, I put the airplane into an aggressive forward slip to lose altitude as fast as I can. That way I will intercept my desired glide path as far from the intended touchdown point as possible. Then I re-establish a stabilized approach, using a crab into the wind to maintain runway centerline. During the flare, I rudder the nose of the airplane into alignment with the runway and apply aileron to control drift. If I am lucky, I touch down on both mains at the same time, just as the nose of the airplane is aligned with the centerline of the runway. Luckier yet, my wings end up level with the ground while I touch down. That's a stabilized approach transitioning to a sideslip during the flare, but I wouldn't call the transition to the sideslip, the flare or the actual sideslip, stabilized.

Now to the concept of "a stabilized slip at the appropriate airspeed to the selected touchdown area." I don't think that "slipping" is consistent with "stabilized." I wouldn't sideslip during an approach if I could crab, and any forward slip I might use would be for a relatively short period of time to correct for a high approach. My point is that "stabilized" means being at something for an extended period of time. I do not see either of the slips being used for an extended period of time.

Now to the question of the "appropriate airspeed." You enter the flare from a stabilized approach at 1.3 X Vso and after that your airspeed is never stabilized.

1. d. possible airspeed indication errors.

I wouldn't use the term possible. Instead I would count on the airspeed indicator not being accurate. From my experience, it will read lower than your real airspeed. The way to deal with this is with pitch attitude and aircraft feel. If your pitch attitude was giving you the right airspeed before you enter the slip it should continue to do so after you are in the slip providing you do not change your pitch attitude. The other part of the equation is control feel. The slower you go the mushier the controls feel. Lastly, see what airspeed you get right after entering the slip. Keeping that airspeed should get you close to what you had when you entered the slip.

1. e. proper application of flight controls.

See my description of forward and sideslips in my Strategy.

1. f. a precise ground track.

I like to crab down final and at the last minute rudder the nose into alignment with the runway centerline, apply aileron to control drift (just enough), flare, and land. Translated, that's a crab followed by a sideslip. Why would anyone ever want to go through the pain of holding opposite rudder and aileron, for an extended period of time, when they could simply point the nose into the wind?

1. g. wind shear and wake turbulence avoidance procedures.

Refer to Area of Operation VI. B. Element e.

1. h. timing, judgment, and control procedure during transition from slip to touchdown.

The Airplane Flying Handbook says that the roundout is the transition from the approach to the landing. I think of it as depleting the energy developed as a result of the descending approach and using that energy to slow the rate of descent, while slowing the airplane to a stall airspeed just above the runway. Either way, it is the success of the timing that becomes the successful roundout and landing. Again, the Airplane Flying Handbook says that at between 10 to 20 feet above the ground, the roundout or flare should be started, and should be a continuous process until the airplane touches down on the ground.

The question is how to do this. I would suggest that for the flare and landing you go back to the pitch attitude you used for takeoff and incorporate that into the idea of how much back elevator is just right. Think of the flare or roundout like a balancing act. It's a matter of compensating for speed, rate of descent, height of initiation, as well as rate of control input. Sound like mumbo jumbo? Perhaps, so I suggest reading the Airplane Flying Handbook, page 8-5. One thought, too much energy equals too much float. Not enough energy equals a carrier landing.

Note: Carrier landings are not all that good for normal landings, but they are great for Short-field Landings where you don't want much, if any, float.

1. i. directional control after touchdown.

I think of landing as the inverse of taking off. Rudder points the airplane, ailerons control drift. Additionally, if you teach your student not to do anything after landing except slow the airplane down straight ahead and then taxi clear of the runway before cleaning up the airplane, directional control gets a lot easier.

1. j. use of brakes.

Flap retraction improves brake efficiency, so does gear retraction. Teach your students to land with their feet off the brakes and apply them after they land. Do not skid the tires. Do not brake excessively. Judicious use of aft elevator can improve brake effectiveness.

Do not retract the flaps except in the case of an emergency.

1. k. use of checklist.

Teach your student to use the checklist but also teach them to think. My opinion is that a pilot shouldn't do anything that isn't **absolutely necessary** after landing until the airplane is stopped and preferably is off the runway. This includes flap retraction.

Stop the airplane, taxi off the runway, drag out the checklist and clean up the airplane.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in the Objectives section.

RELATED MANEUVERS

Crosswind takeoffs
Crosswind landings
Cross-controlled stalls
Forward slips/Sideslips

TASK: VII. H GO-AROUND/REJECTED LANDING

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 8.
FAA-S-8081-12B - Commercial PTS - AO VII. Task L.
FAA-S-8081-14A - Private PTS - AO VII. Task L.
POH/AFM - Section 4 and 5.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a go-around/rejected landing by describing-
   a. situations where a go-around/rejected landing is necessary.
   b. importance of making a prompt decision.
   c. importance of applying takeoff power immediately after the go-around/rejected landing decision is made.
   d. importance of establishing proper pitch attitude.
   e. wing flaps retraction.
   f. use of trim.
   g. landing gear retraction.
   h. proper climb speed.
   i. proper track and obstruction clearance.
   j. use of checklist.
2. Exhibits instructional knowledge of common errors related to a go-around/rejected landing by describing-
   a. failure to recognize a situation where a go-around/rejected landing is necessary.
   b. hazards of delaying a decision to go-around/rejected landing.
   c. improper power application.
   d. failure to control pitch attitude.
   e. failure to compensate for torque effect.
   f. improper trim procedure.
   g. failure to maintain recommended airspeeds.
   h. improper wing flaps or landing gear retraction procedure.
   i. failure to maintain proper track during climb-out.
   j. failure to remain well clear of obstructions and other traffic.
3. Demonstrates and simultaneously explains a go-around/rejected landing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a go-around/rejected landing.

STRATEGY

Unfortunately this Task, comes before Area of Operation XI Slow Flight, Stalls and Spins in the PTS. That is where I discuss the similarities between Stalls, Slow Flight and Go-Around/Rejected Landings. What that means is you need to read the Introduction to Area of Operation XI before reading the rest of this strategy. Go there now and read it!

Here is how I perform a Go-Around/Rejected landing. **I add power and adjust the airplane's pitch attitude all at once.** I do that because, from experience, I know that when it comes to BAD landings you are real close to a stall or losing control. In those cases adding power first won't resolve the problem quickly

enough. You also have to reduce the pitch attitude to keep flying or from hitting too hard.

Back to the Go-Around/Rejected Landing, once the student has applied power, adjusted the airplane's pitch attitude (simultaneously), and the airplane is flying, its time to clean it up. This is the configuration step.

Make sure that your student knows that there is no reason to be in a hurry to climb or clean up the airplane. He needs to be "exact" for sure, but he should not rush. In fact once his airspeed is in the green arc, he is really back to a normal takeoff and climb.

The configuration step is a matter of cleaning-up the airplane one item at a time, insuring that the airspeed is such that the airplane will sustain flight. Make sure your student is conscious of the green arc as flaps are raised and climb airspeed is achieved.

NOTE: Far too many students fail their checkrides because they chase a bad approach or landing to the ground. Then during the debrief they say, "I didn't know I could go around." Make sure they know they can and should go around, just not around and around and around.

Elements Strategies

1. a. situations where a go-around/rejected landing is necessary.

Teach your student that anytime they do not like the outcome of the approach to do a go-around/ rejected landing. There are other times when a go-around/rejected landing is appropriate, such as when ATC tells them to do so.

1. b. importance of making a prompt decision.

The sooner the better, when it comes to a go-around.

Consider teaching students to pre-select spots on final approach where go/no-go decisions can be made. For example at the 1/2 mile point, altitude should be about 250 to 300 feet AGL. If the student's altitude is too far from the appropriate altitude he should think about making a go-around/rejected landing, especially if the glide slope isn't changing for the better. At 1/4 mile I would want my student to be around 125 to 150 feet AGL. If the approach altitude is much higher than that, a go-around/rejected landing should be seriously considered. If airspeed is either too fast or too slow in the last 100 feet or so, this would be another reason to initiate a go-around. Lastly if the flare is high or low or out of control, this is yet another place where a go-around would be appropriate.

Rather than letting the student make bad landings or salvage bad landings, use the go-around/rejected landing as a way of saying "your landing has to be right or not at all."

1. c. importance of applying takeoff power immediately after the go-around/rejected landing decision is made.

The object of a go-around is to go-around. Part of that is to climb. In general you can't climb without power. Probably the real reason that you want your student to add power is that he is more than likely very slow or in a descent or both.

1. d. importance of establishing proper pitch attitude.

In my general strategy I suggested that you read my strategy for Area of Operation XI. If you did that then, you know that I believe it is necessary to deal

with pitch and power simultaneously. The reason we address pitch during a Go-Around/Rejected Landing is either to stop an unwanted descent or to keep from stalling. In both cases we are trying NOT to hit the ground. Look to a normal takeoff and the pitch attitude we use there. This is the best place to start when trying to explain the proper pitch attitude for the go-around.

1. e. wing flaps retraction.

This is a good time to look at what the manufacturer recommends. In general it would be pitch and power, accelerate to Vy, and clean up the airplane. In general terms I would expect to teach retracting one notch of flaps at a time and gear somewhere along the way. Without guidance from the manufacturer, I would retract the first notch of flaps when I had at least leveled off and in the green arc. I would then accelerate to Vy and once there, I would bring up the next notch of flaps. If the airplane had gear, I would retract the gear when I had no more usable runway and a positive rate of climb. Then I would retract the last of my flaps. Again, read what the manufacturer recommends.

1. f. use of trim.

As a CFI applicant you will have to demonstrate a "Trim Stall." One of the places a trim stall can happen is during a go-around/rejected landing. Teach your student to trim the airplane as early in the go-around/rejected landing as is reasonable and safe.

1 g. landing gear retraction.

After you have a positive rate of climb and no more usable runway, retract the landing gear.

1. h. proper climb speed.

The general answer is Vy. Getting away from the ground is getting away from the ground. If there is an obstacle then use Vx, but why would you be below 50 feet messing around with a go-around while trying to get into a short field? I know it happens but it shouldn't. This Element takes us back to the "importance of making a prompt decision."

1. i. proper track and obstruction clearance.

As far as I am concerned this should be dealt with just like a takeoff, with one exception. It takes more distance to takeoff and clear an obstacle than to land having cleared an obstacle.

1. j. use of checklist.

Teach your student to use the checklist but also teach them to think. My opinion is that a pilot shouldn't be pulling out a checklist during a go-around/rejected landing. While a go-around/rejected landing isn’t an emergency per say, it does warrant memorizing the procedures such that once at a reasonable altitude, the checklist can be used to confirm that everything that needed to be done has been done.

COMMON ERRORS - Airplane Flying Handbook, Page 8-13

RELATED MANEUVERS

Recovery from stalls
Recovery from maneuvering during Slow Flight
Takeoffs

TASK: VII. I. SHORT-FIELD APPROACH AND LANDING

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 8.
FAA-S-8081-12B - Commercial PTS - AO VII. Task F.
FAA-S-8081-14A - Private PTS - AO VII. Task F.
POH/AFM - Section 4 and Section 5 - Short-field Landing Performance Chart.
FAR 23.75 Landing distance.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a short-field approach and landing by describing-
   a. how to determine landing performance and limitations.
   b. configuration and trim.
   c. proper use of pitch and power to maintain desired approach angle.
   d. obstructions and other hazards which should be considered.
   e. effect of wind.
   f. selection of touchdown and go-around points.
   g. a stabilized approach at the recommended airspeed to the selected touchdown point.
   h. coordination of flight controls.
   i. a precise ground track.
   j. timing, judgment, and control procedure during roundout and touchdown.
   k. directional control after touchdown.
   L. use of brakes.
   m. use of checklist.
2. Exhibits instructional knowledge of common errors related to a short-field approach and landing by describing-
   a. improper use of landing performance data and limitations.
   b. failure to establish approach and landing configuration at appropriate time or in proper sequence.
   c. failure to establish and maintain a stabilized approach.
   d. improper procedure in use of power, wing flaps, and trim.
   e. inappropriate removal of hand from throttle.
   f. improper procedure during roundout and touchdown.
   g. poor directional control after touchdown.
   h. improper use of brakes.
3. Demonstrates and simultaneously explains a short-field approach and landing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a short-field approach and landing.

STRATEGY

I think it is worth discussing what a Short-field Landing and Approach is. I have three different definitions. There is the one specified in FAR Part 23.75 (or old CAR 3), which is the approach and landing that the airplane manufacturer demonstrated to the FAA to validate the Short-field Landing Performance Chart. There is a "real" Short-field approach and landing, done in the field by a highly skilled bush pilot. There is the Short-field approach and landing required by the Private and Commercial Pilot PTS.

The Short-field approach and landing demonstrated by the manufacturer is flown as specified by FAR 23.75. In the case of the Cessna 172N that means the test pilot met all of the "conditions" (not the notes) found on the performance chart. (I know this because I read FAR Part 23.75 and CAR 3, and I spoke with a couple of FAA flight test pilots.)

The Short-field approach and landing performed by the bush pilot is generally performed at an airspeed closer to 1.2 X Vso than 1.3 X Vso, often involves some sort of obstacle, a steeper than normal approach angle, and a relatively short, unimproved field.

The maneuver required for the Private or Commercial Pilot practical test is performed at a manufacturer's recommended approach speed, usually a knot or two above 1.3 X Vso, has no mandated obstacle to fly over, and therefore can be done with a normal or less than normal approach angle. (No angle is specified in any PTS.) In addition it is most often done on a long, wide runway. The maneuver in the PTS is predicated on the accuracy of the touchdown point and not the clearance of an obstacle.

Having read my explanation above, go to the PTS and with your critical thinking cap on, read the Task. See what you think of my description. Here are a few key points, both listed and NOT LISTED in the PTS.

- Establishes the recommended approach and landing configuration and airspeed; adjusts pitch attitude and power as required.
- Maintains a stabilized approach and recommended approach airspeed, or in its absence, not more than 1.3 X Vso, +10/-5 knots, with wind gust factor applied.
- Makes smooth, timely, and correct control application during the roundout and touchdown.
- Touches down smoothly at minimum control airspeed.
- Touches down at or within 200 feet (60 meters) beyond a specified point, with no side drift, minimum float, and with the airplane's longitudinal axis aligned with and over the runway center/landing path.
- Applies brakes, as necessary, to stop in the shortest distance consistent with safety.
- No mention is made regarding the retraction of flaps after landing
- No mention is made about an obstacle.
- No mention is made about the angle (steepness) of the approach.

Now to teaching the maneuver.

I introduce this maneuver whenever possible, with a real 50 foot obstacle, which in my case is a large oak tree. I teach my students to fly the approach at 1.3 X Vso, or as recommended by the manufacturer, which is usually very close to 1.3 X Vso. (Actually, I prefer to be on the slow side of 1.3 X Vso in as much as the PTS allows +10/-5 knots) I try to teach the idea of aligning the top of the oak tree with a spot on the field, sort of a home made VASI. I tell them to watch that relationship to control our approach angle. If they can see more runway between the spot on the runway and the tree, then they are steeper than what they initially set up for. If the spot disappears behind the tree, then the approach is getting shallower than originally desired. Then I teach my students to control their glide slope by controlling airspeed with pitch, just like Slow Flight, and to use the throttle as an elevator handle, again just like Slow Flight.

At the obstacle, I use the terminology used in the Cessna 172 POH, "progressively reduce power.” This allows the student to increase the rate of descent without increasing airspeed and land safely in the shortest possible distance.

There is one problem with this concept; it really isn't what the PTS calls for. Besides runway alignment, control of wind drift, control of airspeed and applying brakes as necessary to stop in the shortest distance consistent with safety, the big-ticket item is touches down at or within 200 feet (60 meters) beyond a specified point,

Having registered my complaint about the maneuver, as specified in the Private and Commercial Pilot PTS, this is what I suggest.

Start by teaching your student to control airspeed with pitch and rate of descent with power. The best place is Maneuvering During Slow Flight. Once that concept makes sense, transition to Short-field approaches at 1.3 X Vso. Use pitch to control airspeed and power like an elevator handle. Have the student do this using a VASI, and when he is looking in the tower cab (50 feet AGL) have him "progressively reduce power", pitch over, and just above the runway, flare. Don't worry about an obstacle or an overly steep approach. Have him aim for a spot that will allow him to touchdown in the desired landing area. Once on the ground teach your student to aggressively apply the brakes but do not allow the tires to skid. Once firmly on the ground, aft elevator will make braking more effective.

Next thing, let’s look at the traffic pattern that you use to get to the stabilized approach for the Short-field Approach and Landing. Experience shows that the folks that draw instrument procedures know more than we give them credit for. When shooting an ILS, the vectoring altitude always allows the pilot to fly into the glideslope rather that down to it. It’s hard to chase the glide slope and then correct for the excessive rate of descent; same goes for Short-field approaches. Teach your student, when he is too high, to make a deliberate power reduction (consider idle) to get down to the glideslope, then return to the approach power setting and fly a stabilized approach. Better yet, set up to be below the glideslope and fly into it. Best of all, be on the desired glide slope from the beginning.

When I introduce Short-field approaches I like to use a long final, often as much as a mile. The student gets to see and fly the approach that much longer.

One last thing. There is no mention in the Private or Commercial PTS about retracting flaps after landing. I know that it is a common practice, and that in Section 4 of most POHs, there is a statement that says something like, "for maximum brake effectiveness after all wheels are on the ground retract the flaps," but that is neither a condition that is part of the performance chart nor is it a habit pattern that should be fostered. Like touch and goes, retracting flaps after landing is a great example of negative transfer. Besides that, it just complicates the landing.

One more thing about NOT retracting flaps after landing. The last paragraph of After Landing Roll on page 8-7 of the Airplane Flying Handbook makes the FAA's position very clear about flap retraction before coming to a stop. Highlight it in your reference material.

It is a fact that retracting the landing gear immediately after landing will increase braking effectiveness and reduce the landing roll, but I do not recommend the practice.

Element Strategies.

1. a. how to determine landing performance and limitations.

This is a relatively straightforward Element. Primarily it is about selecting the proper performance chart or graph and performing the calculations. I would suggest that if you want your students to do these calculations regularly, make the process as simple and meaningful as possible. The best way to accomplish this is to make it quick and simple. The question you want them to answer is; "Do I have enough runway?" NOT; "How many feet and inches do I need to clear a 50 foot obstacle?" The way I do this is to **USE THE NEXT HIGHER VALUE** If the chart has weight lines for 2,200 lbs and 2,400 lbs and the airplane weighs 2325 lbs, use the 2,400 lb weight line. If the temperature or altitude falls between charted values, I suggest using the next higher value. That way the calculations are fast and easy and on the conservative side. If those calculations do not show enough runway then I would run an exact calculation. Note: If it becomes necessary to run exact calculations, I would also suggest that the student reconsider the takeoff or landing.

1. b. configuration and trim.

According to the Airplane Flying Handbook, configuration applies to the position of the landing gear and flaps. Absent winds beyond the demonstrated crosswind velocity, I recommend that gear be extended when intercepting the glideslope (generally abeam the numbers) and a metered application of flaps resulting in a full flap landing. Regarding the use of trim, use it to reduce control pressure and not to fly the airplane

1. c. proper use of pitch and power to maintain desired approach angle.

You will be flying on the backside of the power curve. This means pitch controls airspeed and power controls glideslope or rate of descent (when on a stabilized approach).

1. d. obstructions and other hazards which should be considered.

If you are making a real Short-field Landing there is probably an obstruction or other hazard. After all, this probably isn't a "normal" landing to a public airport. I suggest that you teach your student to do a high altitude (traffic pattern altitude) flyby, a lower level flyby (500 feet AGL), and if there are still any questions, fly down the runway at 100 feet AGL or so and off to one side and take yet another look. If all looks well, make your approach and land. If there are any questions, go somewhere else.

1. e. effect of wind.

This seems so basic. Given everything being the same except the wind, if you have a head wind the approach will be steeper, the landing speed in reference to the ground will be slower, and the ground roll will be less. If there is a tail wind then all of the figures will be greater than with no wind or a head wind. Likewise,

if there is a crosswind, the aircraft will be blown off course without a crab or a slip.

1. f. selection of touchdown and go-around points.

There really isn't any "selection" in this Element. It's more like we will agree where the touchdown point (area) is and hit it.. The touchdown point is specified as an area that is either 100 feet (Commercial) or 200 feet (Private) in length. The go-around point is anytime the airplane will not be touching down within those areas. My hope would be that the applicant will recognize a miss when he sees one and not wait until the flare to make the decision.

1. g. a stabilized approach at the recommended airspeed to the selected touchdown point.

It is relatively simple to answer this question. Behind every good landing is a stabilized approach.

I cannot stress reading Pitch for Power by Simon Wheaton-Smith enough. A stabilized approach at the recommended airspeed can't be stressed enough either.

Note: If the approach is stabilized at a **maximum** of 1.3 X Vso there should be little or no float. My preference is to make my final approach at 1.2 X Vso. If you take advantage of the airspeed tolerances in the PTS of -5 knots you should be pretty close.

Remember, the flare is where you trade forward airspeed for deceleration, both vertical and horizontal. If you have excess airspeed you will float. If you are at the right speed you will transition to a touchdown with no float; a perfect Short-field Landing.

1. h. coordination of flight controls.

I teach PITCH FOR GLIDE SLOPE AND POWER FOR AIRSPEED for all approaches **except** for a short field. For the Short-field Approach and Landing those rules are reversed. Just like Slow Flight, PITCH CONTROLS AIRSPEED AND POWER CONTROLS GLIDE SLOPE. THINK OF THE THROTTLE LIKE AN ELEVATOR HANDLE TO CONTROL THE GLIDE SLOPE OR RATE OF DESCENT. (This assumes a stabilized approach.)

1. a precise ground track.

I like to crab down final and at the last minute rudder the nose into alignment with the runway centerline, apply aileron to control drift (just enough), flare, and land. Translated, that's a crab followed by a sideslip.

1. j. timing, judgment, and control procedure during roundout and touchdown.

The Airplane Flying Handbook says that the roundout is the transition from the approach to the landing. I think of it as depleting the energy developed as a result of the descending approach and using it to slow the rate of descent while slowing the airplane to a stall just above the runway. Either way it is the success of the timing that becomes the successful roundout and landing. Again, the Airplane Flying Handbook says that at between 10 to 20 feet above the ground, the roundout or flare should be started, and should be a continuous process until the airplane touches down on the ground.

The question is how to do this. I would suggest that you go back to the pitch attitude you used for takeoff and incorporate that into the idea of how much back elevator is just right. The flare or roundout is like a balancing act. It's a matter of compensating for speed, rate of descent, height of initiation, as well as rate of control input. Sound like mumbo jumbo? Perhaps, so I suggest reading the Airplane Flying Handbook, page 8-5. One thought, too much energy equals too much float. Not enough energy equals a carrier landing.

Note: In the case of a Short-field Landing less is better. Less airspeed equals steeper approach speed. Less airspeed equals less float. Less airspeed also equals less time in the roundout before the touchdown.

1. k. directional control after touchdown.

I think of landing as the inverse of taking off. Rudder points the airplane, ailerons control drift. Additionally, if you teach your student not to do anything after landing except slow the airplane down straight ahead and then taxi clear of the runway before cleaning up the airplane, directional control gets a lot easier.

1. l. use of brakes.

Flap retraction improves brake efficiency, so does gear retraction. Teach your students to land with their feet off the brakes and apply them after they land. **Do not skid the tires Do not brake excessively** Judicious use of aft elevator can improve brake effectiveness.

Do not retract the flaps after a landing except in the case of an emergency or if the manufacturer **explicitly** requires you to do so as either part of the limitations section or the performance charts.

1. m. use of checklist.

Teach your student to use the checklist, but also teach them to think.

My opinion is that a pilot shouldn't do anything that isn't **absolutely necessary** after landing until the airplane is stopped and preferably is off the runway. This includes flap retraction.

Stop the airplane, taxi off the runway, drag out the checklist and clean up the airplane.

COMMON ERRORS - Airplane Flying Handbook, Page 8-19

RELATED MANEUVERS

Recovery from stalls
Recovery from maneuvering during Slow Flight
Takeoffs

TASK: VII. J. SOFT-FIELD APPROACH AND LANDING

REFERENCES:

FAA-H-8083-3A - Airplane Flying Flandbook - Chapter 8.
FAA-S-8081-12B - Commercial PTS - AO IV. Task F.
FAA-S-8081 -14A - Private PTS - AO IV. Task F.
POH/AFM.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a soft-field approach and landing by describing-
   a. how to determine landing performance and limitations.
   b. configuration and trim.
   c. obstructions and other hazards which should be considered.
   d. effect of wind and landing surface.
   e. selection of a touchdown area.
   f. a stabilized approach at the recommended airspeed to the selected touchdown area.
   g. coordination of flight controls.
   h. a precise ground track.
   i. timing, judgment, and control procedure during roundout and touchdown.
   j. touchdown in a nose-high pitch attitude at minimum safe airspeed.
   k. proper use of power.
   L. directional control after touchdown.
   m. use of checklist.
2. Exhibits instructional knowledge of common errors related to a soft-field approach and landing by describing-
   a. improper use of landing performance data and limitations.
   b. failure to establish approach and landing configuration at proper time or in proper sequence.
   c. failure to establish and maintain a stabilized approach.
   d. failure to consider the effect of wind and landing surface.
   e. improper procedure in use of power, wing flaps, or trim.
   f. inappropriate removal of hand from throttle.
   g. improper procedure during roundout and touchdown.
   h. failure to hold back elevator pressure after touchdown.
   i. closing the throttle too soon after touchdown.
   j. poor directional control after touchdown.
   k. improper use of brakes.
3. Demonstrates and simultaneously explains a soft-field approach and landing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a soft-field approach and landing.

STRATEGY

This maneuver typifies the phrase, "It's just like X, except for. .."

This maneuver is just like a normal approach and landing except:
• You want a higher than normal pitch attitude at touchdown. There is no specified landing criteria, other than softly and only on the mains.

- You want to allow the nose wheel to "fall" when it can no longer stay off the ground because of the aerodynamics of having a higher than normal pitch attitude during the touchdown.
- You want a lower than normal rate of descent at touchdown.

This might be a good reason for a slightly shallower approach than normal, while not dragging it in. A shallower rate of descent means less of a transition from approach to flare to touchdown.

Here is how I teach this landing. I emphasize that it is all about pitch attitude. I suggest that the student look at the pitch attitude they use for a Soft-field Takeoff. The Soft-field Landing should be the reverse of the takeoff. If I am in a Cessna 152 or 172, I get the student in the airplane, seated, behind the controls and push the tail down until the tie down ring hits the ground. I get two benefits, the student hears what a tail strike sounds like, but more importantly, they see what the highest pitch attitude they can get without striking the tail looks like. Then I let the tail up a bit and show them what I think a Soft-field Takeoff or landing pitch attitude looks like.

Once the student has a pitch attitude in mind we go fly. I always, without exception, teach Soft-field Takeoffs before Soft-field Landings. I want the student to be comfortable with a nose high pitch attitude near the ground. After they have "mastered" the Soft-field Takeoff, we shift to the landing. Now describing the proper pitch attitude and the fact that the controls get less and less effective the slower and slower they get, becomes easier.

Element Strategies

1. a. how to determine landing performance and limitations.

Let's start with a clarification. There is no way to determine landing performance for a Soft-field Landing. There are only charts for a Short-field Landing. Regarding landing limitations there aren't many if any when it comes too a GA training airplane. There generally aren't any weight limitations other than max allowable gross weight. There are flap application limits and sometimes "recommendations" about the use of slips.

1. b. configuration and trim.

According to the Airplane Flying Handbook, configuration applies to the position of the landing gear and flaps. Absent winds beyond the demonstrated crosswind velocity, I recommend that gear be extended when intercepting the glideslope (generally abeam the numbers) and a metered application of flaps resulting in a full flap landing. Regarding the use of trim, use it to reduce control pressure and not to fly the airplane

1. c. obstructions and other hazards which should be considered.

If you are making a real Soft-field Landing there may or may not be an obstruction or other hazards. By its definition a Soft-field approach and landing isn't made to a paved, dry, level runway. If there is an obstruction, hope it doesn't penetrate in the "normal" glide slope. If it does you may want to consider landing performance issues. Once it has been decided that a landing is safe, considering landing distance issues. Focus on obstacles and hazards from the standpoint of not hitting them. I suggest that you teach your student to do a high altitude (traffic pattern altitude) flyby, a lower level flyby (500 feet AGL), and if there are still any questions, fly down the runway at 100 feet AGL or so and off to one side and take yet another look. If all looks well, make your approach and land. If there are any questions, go somewhere else.

1. d. effect of wind and landing surface.

There are two questions in this Element, the effect of wind and the effect of the landing surface.

Regarding wind, if wind is the only variable, with a head wind the approach will be steeper, the landing speed in reference to the ground will be slower, and the ground roll will be less. If there is a tail wind then all of these figures will be greater than with no wind or a head wind. Likewise, if there is a crosswind, the aircraft will be blown off course without a crab or a slip.

Regarding the landing surface, we are talking about a "soft" field, we just don't know how soft. The major consideration is digging into the mud or soft dirt and damaging the nose gear or worse, flipping the airplane over. Translation, land on the mains, touching down with a minimum rate of descent. Let the nose wheel touchdown only when you can not hold if off the ground any longer.

The real problem is that you will more than likely teach Soft-field Landings from the hypothetical perspective, never having actually been into a Soft-field yourself. I recommend, if you get the chance, get some real time instruction landing on at least a grass strip.

1. e. selection of a touchdown area.

If you read the Private or Commercial Pilot Airplane PTS, there is no requirement for a specific landing spot. The emphasis is on landing softly and slowly. This means that accuracy isn't a criteria for a check ride. It is a criteria for landing on a real soft field, which more than likely will also be short.

I would suggest teaching some sort of go/no go process. Start by knowing your ground roll for a Short-field Landing. It isn't perfect, but it is a starting point. Use that number in reference to the runway length to decide where you have to touchdown and still have enough runway to stop on. For example, let's say the Short-field Landing roll is 680 feet and your runway is 1,700 feet long. If you are on the ground by the half way point you have 850 feet to stop. If that doesn't seem like enough, divide the runway into thirds. If you are on the ground by the end of first third of the runway, you have about 1,100 feet in which to stop. In either case if you aren't on the ground by point X go around.

1. f. a stabilized approach at the recommended airspeed to the selected touchdown area.

It is relatively simple to answer this question. Behind every good landing is a stabilized approach.

I cannot stress reading Pitch for Power by Simon Wheaton-Smith enough. A stabilized approach at the recommended airspeed can't be stressed enough either.

1. g. coordination of flight controls.

I teach PITCH FOR GLIDE SLOPE AND POWER FOR AIRSPEED for all approaches except for a short field. I wouldn't do an ILS any other way, so why would I want to fly a normal approach any other way? A Soft-field approach is a normal approach. (This assumes a stabilized approach.)

1. h. a precise ground track.

I like to crab down final and at the last minute rudder the nose into alignment with the runway centerline, apply aileron to control drift (just enough), flare, and land. Translated, that's a crab followed by a sideslip.

1. i. timing, judgment, and control procedure during roundout and touchdown.

The Airplane Flying Handbook says that the roundout is the transition from the approach to the landing. I think of it as depleting the energy developed as a result of the descending approach and using that energy to slow the rate of descent while slowing the airplane to a stall just above the runway. Either way it is the success of the timing that becomes the successful roundout and landing. Again, the Airplane Flying Handbook says that at between 10 to 20 feet above the ground, the roundout or flare should be started and should be a continuous process until the airplane touches down on the ground.

The question is how to do this. I would suggest that you go back to the pitch attitude you used for takeoff and incorporate that into the idea of how much back elevator is just right. The flare or roundout is like a balancing act. It's a matter of compensating for speed, rate of descent, height of initiation, as well as rate of control input. Sound like mumbo jumbo? Perhaps, so I suggest reading the Airplane Flying Handbook, page 8-5. One thought, too much energy equals too much float. Not enough energy equals a carrier landing.

Note: Floating isn't normally a bad thing during a Soft-field Landing since where you touchdown isn't a major consideration.

1. j. touchdown in a nose-high pitch attitude at minimum safe airspeed.

I believe the Soft-field Landing is the inverse of the Soft-field Takeoff. The nose-high pitch attitude that is used during the takeoff is basically the same as the one used for the Soft-field Landing. That's a good reason to teach the Soft-field Takeoff before the Soft-field Landing. During the Soft-field Takeoff you let the airplane come off the ground when it was ready. Do the inverse for a Soft-field Landing. Let it touch down when it is ready.

1. k. proper use of power.

Soft and slow are the most important parts of a Soft-field Landing. Using power reduces the stall speed of the airplane while at the same time reducing the rate of descent of the landing airplane.

1. l. directional control after touchdown.

I think of landing as the inverse of taking off. Rudder points the airplane, ailerons control drift. Additionally, if you teach your student not to do anything after landing except slow the airplane down straight ahead and then taxi clear of the runway before cleaning up the airplane, directional control gets a lot easier.

Remember, the only thing your student should be doing after touchdown is to control the airplane.

1. m. use of checklist.

Teach your student to use the checklist, but also teach them to think.

My opinion is that a pilot shouldn't do anything that isn't **absolutely necessary** after landing until the airplane comes to a stop. In the case of a Soft-field Landing this shouldn't happen until well clear of the runway and perhaps in the parking area.

COMMON ERRORS - Airplane Flying Handbook, Page 8-20

RELATED MANEUVERS

Normal Approach and Landing
Soft-field Takeoff
Slow Flight

TASK: VII. K. 180° POWER-OFF ACCURACY APPROACH AND LANDING

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 8
FAA-S-8081-12B - Commercial PTS - AO VII, Task K
POH/AFM - Section 4 and 5

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a 180° power-off accuracy approach and landing by describing—
   a. configuration and trim.
   b. effects of wind and selection of a touchdown area.
   c. the key points in the pattern.
   d. a stabilized approach at the recommended airspeed to the selected touchdown area.
   e. coordination of flight controls.
   f. timing, judgment, and control procedure during roundout and touchdown.
   g. directional control after touchdown.
   h. use of checklist.
2. Exhibits instructional knowledge of common errors related to a 180° power-off accuracy approach and landing by describing-
   a. failure to establish approach and landing configuration at proper time or in proper sequence.
   b. failure to identify the key points in the pattern.
   c. failure to establish and maintain a stabilized approach.
   d. failure to consider the effect of wind and landing surface.
   e. improper use of power, wing flaps, or trim.
   f. improper procedure during roundout and touchdown.
   g. failure to hold back elevator pressure after touchdown.
   h. poor directional control after touchdown.
   i. improper use of brakes.
3. Demonstrates and simultaneously explains a 180° power-off accuracy approach and landing from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a 180° power-off accuracy approach and landing.

STRATEGY

First, this is a Commercial Pilot maneuver. A Private Pilot is only expected to hit the runway.

There are two basic concepts that are central to a successful 180° Power-off Accuracy Approach and landing. The first is **consistency.** The second is understanding **what controls how far an airplane glides.**

Regarding consistency, this means closing the throttle and if the airplane has retractable gear, lowering the gear at the same place every time. It means maintaining altitude until the airplane decelerates to the desired airspeed and holding that airspeed during the descent. It means determining where to turn base (approximately at a 30° key point instead of the usual 45° key point) and so

on. Everything in the early stage of the approach must be done exactly the same way every time.

Part of the argument for consistency is the selection of an airspeed. The Airplane Flying Handbook suggests the use of either the manufacturer's recommended glide speed, or 1.4 Vso. If I have a choice I would take the higher of the two for a better stall speed buffer. Whatever airspeed is used, it must be held until somewhere on short final.

The idea of what controls glide is the tool that you have to teach a student so he will consistently hit the selected point. There are only three things a pilot can do when it comes to a glide:

1. Accept what he has and allow the airplane to touch down where it will.

2. Extend the point where the airplane will touch down. (This is not generally extending the glide distance.) It is almost always maneuvering so as to touchdown further down the runway, cutting the corner from base to final. There is a second option which glider pilots use. It is adding 50% of the headwind to the glide speed. This will actually shallow the glide angle thus extending the glide distance and allow a touchdown further down the runway.

3. Shorten where the airplane will land. This may or may not be steepening the glide angle, it may be extending the ground track, overshooting final or S-turns on final, adding flaps or slipping.

How to use these techniques. A pilot with consistent habit patterns will select a "turn to base" (30° key point) location that, if unchanged, will allow the airplane to land a bit long. Then with the addition of flaps, shortened ground track, and a slip, the glide distance (impact point) can be shortened.

If for some "unknown" reason the pilot thinks the landing will be short, cutting the corner from base to final will allow for a landing further down the runway. If there is a headwind, 50% of the wind velocity can be added to the airplane's airspeed and that will maximize the airplane's gliding distance.

Another idea worth teaching your student is what I call a "brisk" turn to base. My experience tells me that the sooner I am on base, the sooner I can accurately judge whether I am going to be high or low. Dilly-dallying around on the turn from base to final is counterproductive. I want to see a 30° bank turn with an aggressive roll in and roll out. I think it makes the decision making process much easier.

Element Strategies.

1. a. configuration and trim.

The only configuration that is mandatory is the extension of landing gear. All other "configurations" are dependent upon how the approach plays out. There is no requirement to land with flaps extended. The only things that must happen are extend the gear and touch down within the specified landing area. I do suggest that gear be extended right after closing the throttle. Regarding trim, establishing the desired airspeed before descending is also critical, and trimming will simply make the maneuver that much easier to fly.

1. b. effects of wind and selection of a touchdown area.

Depending on the glide ratio of the airplane you are flying, wind can be a big problem. In the Cessna 172 it isn't as big of a consideration as in the Piper PA-28 R201. The best way to deal with wind is to practice the approach and landing with different winds. Then establish some guidelines as to when there is too much wind to make a turn at the 30° point work.

1. c. the key points in the pattern.

I think there are four key points in the traffic pattern, abeam the numbers, the 30° key point, the point where you roll out wings level on base and the touchdown point. The abeam point is where everything starts and of course the touchdown point is where it all ends. The 30° key point is a mechanical point similar to the abeam point. Wings level on base is where you make your decision of high, low, fast, slow. In other words what do I need to do to hit the point.

1. d. a stabilized approach at the recommended airspeed to the selected touchdown area.

A stabilized approach is a must. As far as what airspeed is used that is less important than always using the same one. I also fly helicopters. Autorotations are pretty steep, but a 180° autorotation is within the capability of most helicopters if you start high enough and turn soon enough. So it goes for airplanes. Certainly use the manufacturer's recommended airspeed if there is one or 1.4 X Vso. Just make sure you use the same airspeed every time and hold that airspeed throughout the glide.

1. e. coordination of flight controls.

Once the throttle is closed and the landing gear extended (if applicable), the only flight controls that need coordination are the aileron and rudder, and pitch for airspeed.

1. f. timing, judgment, and control procedure during roundout and touchdown.

The Airplane Flying Handbook says that the roundout is the transition from the approach to the landing. I think of it as depleting the energy developed as a result of the descending approach and using the energy to slow the rate of descent while slowing the airplane to a stall just above the runway. Either way it is the success of the timing that becomes the successful roundout and landing. Again, the Airplane Flying Handbook says that at between 10 to 20 feet above the ground, the roundout or flare should be started, and should be a continuous process until the airplane touches down on the ground.

The question is how to do this. I would suggest that you go back to the pitch attitude you used for takeoff and incorporate that into the idea of how much back elevator is just right. The flare or roundout is like a balancing act. It's a matter of compensating for speed, rate of descent, height of initiation, as well as rate of control input. Sound like mumbo jumbo? Perhaps, so I suggest reading the Airplane Flying Handbook, page 8-5. One thought, too much energy equals too much float. Not enough energy equals a carrier landing.

1. g. directional control after touchdown.

I think of landing as the inverse of taking off. Rudder points the airplane, ailerons control drift. Additionally, if you teach your student not to do anything after landing except slow the airplane down straight ahead and then taxi clear of the runway before cleaning up the airplane, directional control gets a lot easier.

1. h. use of checklist.

Teach your student to use the checklist but also teach them to think. My opinion is that a pilot shouldn't do anything that isn't **absolutely necessary** after landing until the airplane is stopped and preferably is off the runway. This includes flap retraction.

Stop the airplane, taxi off the runway, drag out the checklist and clean up the airplane.

COMMON ERRORS - Airplane Flying Handbook, Page 8-24

RELATED MANEUVERS

Emergency Approach and Landing

VIII. AREA OF OPERATION: FUNDAMENTALS OF FLIGHT

NOTE: The examiner shall select at least one TASK.

General Strategy

Let me start by pointing out the similarity between Areas of Operations VIII Fundamentals of Flight and XII Basic Instrument Maneuvers. I believe the way you teach one is the same way you should teach the other.

Between the two Areas of Operation, there are eight maneuvers, four maneuvers from Fundamentals of Flight and four from

Basic Instrument Maneuvers. The individual Tasks are:

Fundamentals of Flight	**Basic Instrument Maneuvers**
Straight-and-Level Flight	Straight-and-LevelFlight
Level Turns	same as Turns to Headings?
Straight Climbs and Climbing Turns	a lot like Constant Airspeed Climbs?
Straight Descents and Descending Turns	a lot like Constant Airspeed Descents?

Basic Instrument Maneuvers	**Fundamentals of Flight**
Straight-and-Level Flight	Straight-and-LevelFlight
Constant Airspeed Climbs	a lot like Straight Climbs and Climbing Turns?
Constant Airspeed Descents	a lot like Straight Descents and Descending Turns?
Turns to Headings	same as Level Turns?

To be successful at teaching either of these Areas of Operation you must clearly define three concepts:

1. The definition of "What you want the student to do."
2. What a primary instrument is, what a secondary/supporting instrument is and what a transition instrument is.
3. What a crosscheck (also called an instrument scan) is and what it should look like.

Let's begin with what you want the student to do. As the Instructor you have to clearly define the objective. I have found that if the student has a clear understanding of what is expected, he will do his best to do what he is asked to do. If he is unclear about the task he will flounder, and you may not catch on to what is happening. For our discussion, we will use **straight and level flight, at 3,000 feet MSL, on a heading of 360° and at an airspeed of 90 knots** Clearly stating or defining those parameters represents the first concept: "What you want the student to do."

Next you will need to define what a primary instrument is, what a secondary/supporting instrument is, and what a transition instrument is. Still using the example of **straight and level flight, at 3,000 feet MSL, on a heading of 360° and at an airspeed of 90 knots,**

your primary Instruments are:

What you want the student to do	Primary "Instrument" (Integrated Method)	Primary Instrument (Basic Instruments)
3,000 feet MSL	Altimeter	Altimeter
Heading of 360°	Road or prominent point	Directional Gyro
Airspeed of 90 knots	Airspeed Indicator	Airspeed Indicator

your secondary/supporting instruments are:

What you want the student to do	Secondary/Supporting "Instrument"(Integrated Method)	Secondary/Supporting Instruments (Basic Instruments)
	Airplane's attitude with reference to natural horizon Altimeter	Attitude Indicator
	Seat of your pants	The turn and bank indicator
	The tachometer/manifold gauge	The tachometer/manifold gauge
	The vertical speed indicator	The vertical speed indicator

In this case there isn't a transition instrument. If you were transitioning from or to straight and level flight,

your transition instrument would be:

	Transition "Instrument" (Integrated Method)	Transition Instrument (Basic Instruments)
	Airplane's attitude with reference to natural horizon Altimeter	Attitude Indicator

- **A primary instrument is the only instrument that will confirm that "you are doing what you want to be doing."**
- **A secondary/supporting instrument will be that instrument that helps the pilot achieve the desired objective but doesn't actually confirm that "you are doing what you want to be doing."**
- **A transition instrument is an instrument you use to transition from one flight regime to another, from straight and level to a 30° bank turn, from a climb to level flight. The artificial horizon (or the real one in concert with the airplane) is almost always the transition instrument.**

NOTE: I consider the relationship between the airplane (either the nose/cowling or the wing tips) and the natural horizon to be an "Instrument" just the same as the attitude indicator (also called an artificial horizon).

Now to the concept of crosscheck. I teach Basic Instrument Maneuvers using the hub-and-spoke method. The hub is the artificial horizon. I also teach Fundamentals of Flight using the hub-and-spoke method. In that case the artificial horizon is replaced with the real horizon. In the case of Basic Instrument Maneuvers a set of aluminum wings is compared to the gyro driven artificial horizon to give you a picture of the airplane's attitude. In the case of Fundamentals of Flight the top of the airplane's instrument panel (airplane's attitude) and tips of real aluminum wings are compared to the real horizon to give you a picture of the airplane's attitude.

I teach each of these Areas of Operations the same way, but let me be specific as to how I teach Fundamentals of Flight. First, I define the "what" of what we are trying to do. Then I remind the student of what the primary instruments are and then guide them through crosschecking the natural horizon and the instruments as applicable.

Here is how I introduce Fundamentals of Flight, starting with lesson one. To begin with I do most of my teaching in the air. The majority of my ground instruction on this subject happens after we get back, and the student can digest what they saw and did. Introducing the whole concept really takes two or more lessons.

The only preparation I do on the ground is a brief description of the flight, including how the basic flight controls work. I explain what trim is and does and that he can make the airplane do what he wants by comparing the top of the instrument panel and the end of the wings with the horizon. After that description, which I do as we look at the airplane for the first time, we go flying.

I teach this subject by letting the student fly the airplane. As I said, I have discussed the flight controls and what they do. In flight I constantly point out the relationship between the top of the instrument panel and the wings and the earth's natural horizon. I introduce this concept as we are taxiing to the run-up area on the first flight. I start off by allowing the student to perform the takeoff. I explain enough of the takeoff that he knows about "airspeed alive" and what "rotation airspeed" is all about. Then I explain the concept of pulling back on the yoke enough to achieve the desired pitch attitude by aligning the top of the instrument panel with the horizon. In almost every case this gets us off the ground and climbing at a safe airspeed, usually not too far off best rate of climb.

I have the student climb and suggest that he fly toward some object in plain sight. I also tell him that we will be climbing to 3,000 feet on the altimeter. I AWAYS TELL THE STUDENT EXACTLY WHAT I WANT HIM TO DO AND WHAT REFERENCE WILL HELP HIM DO WHAT I HAVE ASKED HIM TO DO.

I simply allow the student to fly and feel the airplane. I try not to assist him if at all possible, and I try not to interfere. Mostly, I point out what he should be looking for. **I think of myself as being his scan or crosscheck.**

During the climb, I watch and see how much effort he is having to use to make the top of the airplane's instrument panel stay even with the horizon. I start off by having him try to trim the pressure off. If I don't think I am being successful in making that a part of his flying, I ask him to gently let go of the yoke so we can see what the airplane does. This is the best way I know to show the student

what control pressures are and what trim does. Make sure it is clear that the **trim relieves pressure** and isn't used to fly the airplane. Having the student let go of the controls is a good tool to use throughout his training.

When we get close to 3,000 feet MSL, I have the student adjust his attitude by lowering the nose of the airplane and pulling the power back to a setting that I know will give him practice area cruise. Then I remind him that I want to hold 3,000 feet. This request takes us into a discussion of what I want the student to do and what will tell the student that he is doing what I want him to do. It also gets us to how to perform the crosscheck.

I make it clear that I want his altitude to remain at 3,000 feet MSL. I make it clear that I want a specific heading, usually flying down the fence rows as opposed to using the directional gyro, and that I want him at 90 knots. This constitutes the "What I want the student to do" part of Fundamentals of Flight. Now I ask the student what he is trying to do. I want to make a connection between what I have asked the student to do and the student's knowing what he is trying to do.

If that is a bit confusing, ultimately I want the student to make the connection between **what I want the student to do** and **what to look at to make sure the airplane is doing what he wants it to do** Notice I have just introduced the concept of primary instrument/reference.

I believe the clear understanding of what you want the airplane to do and what the primary instrument or visual reference is, represents the key to both Fundamentals of Flight and Basic Instrument Maneuvers.

Basic Concepts.....
- What I want to do.
- What will tell me that I am doing what I want to do?

Heading
- 360° - directional gyro/compass
- Northerly - Straight down the road - the relationship between the cowling and the road, the wing tips and the horizon
- Fly to the mountain - the relationship between the cowling and the mountain, the wing tips and the horizon

Altitude/glideslope
- 3,000 feet MSL - the altimeter
- 3° glide slope - the VASI

Airspeed/rate of descent
- 90 knots - the airspeed indicator
- 500 FPM rate of descent - vertical speed indicator

Bank or rate of turn
- 30° bank - the attitude indicator
- 30° bank - the relationship between the strut and the ground
- 30° bank - the relationship between the top if the instrument panel and the horizon
- standard rate of turn - turn needle or 15% of the airspeed on the attitude indicator

Coordinated flight
- The inclinometer (the ball in the smiley face)
- The seat of the pants

The crosscheck(scan).....

Next I explain the concepts of scanning, using both the flight instrument and outside references.

As I indicated earlier, I am a proponent of the hub-and-spoke method. Under the hood, the attitude indicator serves as the hub. When flying with outside references (Fundamentals of Flight), the relationship between the airplane and the natural horizon serves as the hub. As to the spokes, the primary instruments are the major spokes and supporting instruments are smaller spokes. Spokes is spokes whether flying with the natural horizon or the artificial one.

As we fly around I have the student control the airplane's attitude by comparing the airplane with the natural horizon, and then I have him take a sneak peek at the altimeter for altitude. Next I have him compare the airplane with the horizon and then take a sneak peek at the airspeed indicator for airspeed. Next we go back to the airplane and the horizon and on to the directional gyro for his heading. When it looks like this is getting through, I add in the secondary instruments like the tachometer, the turn and slip indicator, and the vertical speed indicator. I have even been known to have them close their eyes and listen to the engines RPM.

The lift-drag demo.....

I only do the lift-drag demo as part of Fundamentals of Flight; however, I use the information we learn for both Fundamentals of Flight; and Basic Instrument Maneuvers. I start the lift-drag demo at or above 3,000 feet MSL. Sacramento is at sea level. Therefore 3,000 feet AGL is just about the same as 3,000 feet MSL

I start out at the airspeed I want to use on the downwind leg of a traffic pattern. This airspeed should be below the top of the white arc (which doesn't always work out) and yet be compatible with normal traffic. In the Cessna 172N, the airspeed is 90 knots.

I have the student figure out what power setting will give him the desired airspeed in the clean configuration. He does this by maintaining altitude and heading and adjusting the throttle. It ends up being about 2,250 RPM. When the student gets the airplane stabilized at exactly 90 knots I have him note the power setting, and we write it down. Next, I want the student to determine the effect flaps have on aircraft performance. I would like to do this at 90 knots, but unfortunately you can't do this in the Cessna 172N. (In the Cessna 172N you can extend the first notch of flaps at 90 knots but no more. The rest of the flaps cannot be extended until the airspeed is below the top of the white arc which is 85 knots. Because of this we have to do the flap portion of the lift drag demo at 80 knots.) To take advantage of the change of airspeed, I have the student reduce power and establish 80 knots. We make note of the new power requirement. The benefit of this is that we can determine the difference between the power needed to maintain 80 knots and 90 knots and therefore have a good idea of the effect of a power reduction on airspeed.

Once stabilized at 80 knots, I have the student apply the first notch of flaps and do whatever is necessary to maintain 80 knots. I tell the student to expect that the airplane will pitch up a bit because of extending flaps and to expect the airplane to want to descend because of the increased drag. I also tell the student that maintaining altitude is no longer our goal; it is maintaining 80 knots. I have the student record our rate of descent. Be patient, this may take some time. In the Cessna 172N, I would expect about 50 FPM rate of descent. Without losing too much altitude, I have the student apply the second notch of flaps and continue to maintain 80 knots airspeed. This usually nets a rate of descent of about 200 FPM. Then I have the student apply full flaps, and we see about a 500 FPM rate of descent. When all of that has been recorded, I have the student add full power and I walk him through cleaning up the airplane as we climb back to 3,000 feet MSL.

Once stabilized at 3,000 feet MSL, I have the student adjust the pitch attitude of the airplane, reduce the power back to whatever power setting we recorded for 90 knots (I would expect approximately 2,250 RPM), and maintain 90 knots. Now I have the student reduce the power by 500 RPM and hold exactly 90 knots and begin yet another descent. We record that rate of descent. If I had an airplane with gear, I would repeat the process extending the gear and recording our rate of descent. When all of this is accomplished our notes generally look as follows:

Cessna172N

2,250 RPM = 90 knots
2,050 RPM = 80 knots
1 st notch of flaps = 50 FPM descent
2nd notch of flaps = 200 FPM descent
Full flaps = 500 FPM descent
A reduction of 500 RPM = 500 FPM descent

Note: Remember that power increases as we descend, so if you don't stay around the same altitude for all of the lift/drag demo, your numbers won't be accurate. If your student ends up descending more that 500 feet, just help him climb back to the starting altitude and continue the rest of the demo.

The purpose of this demo is for the student to begin to find things in the cockpit and understand the effects of power and drag on performance. It is also done to teach him that the airplane's performance can be predicted. This means that when we do things like leveloff we can pretty much go directly to a specific power setting for a specific airspeed. Additionally, if we want a 500 FPM descent, we can reduce our power by a specific amount and be assured we will not have to "look around" for what we need.

Another Note: In this demo we introduced Straight-and-Level Flight, Level Turns, Straight Climbs, Straight Descents, Constant Airspeed Climbs, Constant Airspeed Descents, Constant Rate Descents, and Turns to Headings. Not too bad for the first lesson. Yes, I realize you have to help the student through all of this, over and over and over.

I also do this maneuver for every Flight Review and all aircraft checkouts.

Getting from one flight regime to another.....

This may sound like an afterthought and perhaps it is, but there is one concept that seems to be missing from all of the tasks in this Area of Operation; how to get there, the transition, the going from one flight regime to another. I am sure it is assumed that to teach turns, you must teach the student to bank the airplane, coordinate the controls, apply a bit of back pressure to keep the airplane from descending, neutralize the controls, and trim. Sounds easy; my point is, when you develop your strategy, remember that you got from one flight regime to another. You got to straight and level from a climb or a descent or a turn or a combination of these maneuvers. Make sure you include the transition (to and from) as part of your strategy.

NOTE: During my discussion of Fundamentals of Flight I use the term "Natural Horizon" when describing pitch and bank. Replace that term with "Artificial Horizon" if performing the same maneuver under the hood.

TASK: VIII. A. STRAIGHT-AND-LEVEL FLIGHT

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3.
FAA-H-8083-15A - Instrument Flying Handbook - Chapters 4 or 5.
FAA-S-8081-14A - Private PTS - no reference could be found.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of straight-and-level flight by describing-
   a. effect and use of flight controls.
   b. the Integrated Flight Instruction method.
   c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.
   d. trim procedure.
   e. methods that can be used to overcome tenseness and over-controlling.
2. Exhibits instructional knowledge of common errors related to straight-and-level flight by describing—
   a. failure to crosscheck and correctly interpret outside and instrument references.
   b. application of control movements rather than pressures.
   c. uncoordinated use of flight controls.
   d. faulty trim procedure.
3. Demonstrates and simultaneously explains straight-and-level flight from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to straight-and-level flight.

STRATEGY

Somewhere in one of the FAA books we are told that straight and level flight is nothing more than constantly correcting back to straight and level flight from all of the deviations you have allowed to occur. That is probably very true. No one holds any heading, altitude or airspeed perfectly.

The way I teach straight and level flight is to align the airplane's cowling with the natural horizon and check my primary instruments to see if what I selected for an attitude works. If it doesn't, then I correct my outside picture and re-trim until it holds the parameters I was assigned.

The specific strategy of "straight and level."

I define straight and level as:
1. A specific heading.
2. A specific altitude.
3. A specific airspeed.

Therefore the primary instruments are:
1 Directional gyro (could be a mountain or a road).
2. The altimeter.
3 The airspeed indicator.

The secondary/supporting instruments are:

Attitude indicator.
Turn and bank indicator.
Vertical speed indicator (great for trends).
The tachometer.

Element Strategies.

a. effect and use of flight controls.

Explain to your student how each flight control works and what they make the airplane do. Explain the concept of applying pressure to the controls and not just movement. Explain neutralizing the controls as the desired flight attitude is reached.

b. the Integrated Flight Instruction method.

Explain to your student that the most important thing he can do is to control the airplane by what he sees as the comparison between the airplane (cowling, instrument panel wings, etc.) and the natural horizon. Explain that he should then use the flight instruments, in a logical manner to confirm that his desired relationship between the airplane and the natural horizon. I call that the hub-and-spoke method.

c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.

Wow, that's a mouthful. I think the folks that wrote the CFI PTS want you to describe in a step by step method how to fly straight and level, climb, make turns, descend, etc. See the specific strategy of straight and level flight.

d. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

e. methods that can be used to overcome tenseness and over-controlling.

Patience, pry his cold numb fingers from the controls, suggest two fingers, tell him to be light, show him. Make sure the airplane is in trim.

COMMON ERRORS - Airplane Flying Handbook, Page 3-6

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers
Lift Drag Demo

TASK: VIII. B. LEVEL TURNS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3.
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 or 5.
FAA-S-8081-14A - Private PTS - no reference could be found.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of level turns by describing—
   a. effect and use of flight controls.
   b. the Integrated Flight Instruction method.
   c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.
   d. trim procedure.
   e. methods that can be used to overcome tenseness and over-controlling.
2. Exhibits instructional knowledge of common errors related to level turns by describing—
   a. failure to crosscheck and correctly interpret outside and instrument references.
   b. application of control movements rather than pressures.
   c. uncoordinated use of flight controls.
   d. faulty altitude and bank control.
3. Demonstrates and simultaneously explains level turns from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to level turns.

STRATEGY

I think this Task is more about how to enter or exit a turn, how to coordinate the turn and what to expect, than about being in the turn. All of this translates into first using the airplane cowling in reference to the natural horizon as a transition instrument and once in the turn using the relationship between the cowling and the natural horizon as a primary instrument to maintain a specific bank.

Teach the student to start the turn with the aileron, coordinate the turn with rudder. Explain that it is normal for the nose to drop and that there will be a need to increase pitch to compensate for loss of lift. Teach the student how to judge bank angle with parts of the airplane, like a wing strut, instrument panel, or the windshield.

Explain control forces and neutralizing controls to maintain a specific bank as well as rolling out of a turn being the inverse of rolling into one. Last, teach any rules of thumb, like leading the desired roll out heading by 50% of the bank angle.

The specific strategy of "level turns."

I define level turns as:

1. Maintain entry airspeed, just close is close enough. (Generally under 30° of bank)
2. Maintain altitude
3. Roll into a specific banked turn. (Generally under 30° of bank)
4. Maintaining a specific bank angle.
5. Rolling out on a specific heading, leading the roll out heading by 50% of the bank angle.
6. Returning to straight flight.

Therefore the primary/transition instruments are:

1. The airspeed indicator.
2. The altimeter.
3. Aircraft attitude in relationship to the horizon (transition instrument).
4. Aircraft attitude in relationship to the horizon (primary instrument).
5. Aircraft attitude in relationship to the horizon (transition instrument).
6. The directional gyro or object on the ground or horizon.

The secondary/supporting instruments are:

The inclinometer (for coordination).
Vertical speed indicator (to help with pitch, remember it's a trend instrument).
The tachometer (don't let it change).

Element Strategies.

a. effect and use of flight controls.

Explain to your student how each flight control works and what they make the airplane do. Explain the concept of applying pressure to the controls and not just movement. Explain neutralizing the controls as the desired flight attitude is reached.

b. the Integrated Flight Instruction method.

Explain to your student that the most important thing he can do is to control the airplane by what he sees as the comparison between the airplane (cowling, instrument panel wings, etc.) and the natural horizon. Explain that he should then use the flight instruments, in a logical manner to confirm that his desired relationship between the airplane and the natural horizon. I call that the hub-and-spoke method.

c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.

Wow, that's a mouthful. I think the folks that wrote the CFI PTS want you to describe in a step by step method how to fly straight and level, climb, make turns, descend, etc. See the specific strategy of level turns.

d. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

e. methods that can be used to overcome tenseness and over-controlling.

Patience, pry his cold numb fingers from the controls, suggest two fingers, tell him to be light, show him. Make sure the airplane is in trim.

COMMON ERRORS Airplane Flying Handbook Page 3-12

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers
Lift Drag Demo

TASK: VIII. C STRAIGHT CLIMBS AND CLIMBING TURNS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook. - Chapter 3.
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 or 5.
FAA-S-8081-14A - Private PTS - no reference could be found.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of straight climbs and climbing turns by describing—•
   a. effect and use of flight controls.
   b. the Integrated Flight Instruction method.
   c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.
   d. trim procedure.
   e. methods that can be used to overcome tenseness and over-controlling.
2. Exhibits instructional knowledge of common errors related to straight climbs and climbing turns by describing—
   a. failure to crosscheck and correctly interpret outside and instrument references.
   b. application of control movements rather than pressures.
   c. improper correction for torque effect.
   d. faulty trim procedure.
3. Demonstrates and simultaneously explains straight climbs and climbing turns from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to straight climbs and climbing turns.

STRATEGY

Let's start by dividing this maneuver into two sub Tasks, climbs (straight ahead) and climbs (with a turn).

Divide climbs into constant airspeed climbs and constant pitch climbs.

I will only discuss the climb straight ahead. If a turn is to be incorporated into a climb, teach the straight climb and the turn separately, then teach them together.

In general all climbs are made with full power or perhaps a climb power setting. We either climb at a specific airspeed, most commonly best rate of climb airspeed, or we climb at a pitch attitude that lets you see over the horizon. I guess you could climb at a specific rate of climb, but that isn't all that common. In any case it is all about pitch attitude. Your student should have a pretty good idea of the two pitch attitudes I use because he climbed out after taking off at best rate of climb, getting to 1,000 feet AGL and at a safe pitch attitude from 1,000 feet AGL until he reached cruise or practice altitude. (Safe pitch attitude is the one that lets me look over the cowling and see what is going to hit me before it does.)

A climb is generally started with the application of full power. This is followed immediately by a change in pitch attitude. Next the airspeed is allowed to slow to the desired airspeed and when it is reached, maintain a stabilized climb.

Note: Teach your student to begin to leveloff approximately 10% of the rate of climb before reaching assigned altitude. If he is climbing at 500 FPM, he should begin his leveloff 50 feet before reaching the desired altitude.

The specific strategy of climbs (straight ahead).

I define straight climbs as:

1. Apply full power (or cruise power).
2. Adjust pitch attitude to establish a climb.
3. Maintain a specified airspeed or rate of climb.
4. Maintain a specified heading.
5. Leveloff approximately 10% of the rate of climb before reaching assigned altitude.
6. Return to cruise airspeed.
7. Maintain assigned altitude

Therefore the primary instruments are:

1. Tachometer.
2. Aircraft attitude in relationship to the horizon (transition instrument).
3. The airspeed indicator or VSI.
4. The directional gyro or object on the ground or horizon.
5. Aircraft attitude in relationship to the horizon (transition instrument).
6. Tachometer for power setting/airspeed indicator for airspeed.
7. Altimeter

The secondary/supporting instruments are:

The inclinometer (for coordination).
Vertical speed indicator (to help with pitch).
Aircraft attitude in relationship to horizon (supporting instrument) to help with pitch.

Element Strategies.

a. effect and use of flight controls.

Explain to your student how each flight control works and what they make the airplane do. Explain the concept of applying pressure to the controls and not just movement. Explain neutralizing the controls as the desired flight attitude is reached.

b. the Integrated Flight Instruction method.

Explain to your student that the most important thing he can do is to control the airplane by what he sees as the comparison between the airplane (cowling, instrument panel wings, etc.) and the natural horizon. Explain that he should then use the flight instruments, in a logical manner to confirm his desired relationship between the airplane and the natural horizon. I call that the hub-and-spoke method.

c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.

Wow, that's a mouthful. I think the folks that wrote the CFI PTS want you to describe in a step by step method how to fly straight and level, climb, make turns, descend, etc. See the specific strategy of straight climbs and climbing turns.

d. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

e. methods that can be used to overcome tenseness and over-controlling.

Patience, pry his cold numb fingers from the controls, suggest two fingers, tell him to be light, show him. Make sure the airplane is in trim.

COMMON ERRORS Airplane Flying Handbook Page 3-15

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers
Lift Drag Demo

TASK: VIII. D. STRAIGHT DESCENTS AND DESCENDING TURNS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3.
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 or 5.
FAA-S-8081-14A - Private PTS - no reference could be found.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of straight descents and descending turns by describing -
   a. effect and use of flight controls.
   b. the Integrated Flight Instruction method.
   c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.
   d. trim procedure.
   e. methods that can be used to overcome tenseness and over-controlling.
2. Exhibits instructional knowledge of common errors related to straight descents and descending turns by describing -
   a. failure to crosscheck and correctly interpret outside and instrument references.
   b. application of control movements rather than pressures.
   c. uncoordinated use of flight controls.
   d. faulty trim procedure.
   e. failure to clear engine and use carburetor heat, as appropriate.
3. Demonstrates and simultaneously explains straight descents and descending turns from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to straight descents and descending turns.

STRATEGY

Let's start by dividing this maneuver into two sub Tasks, descents (straight ahead) and descents (with a turn).

Divide descents into constant airspeed descents and constant rate descents.

I will only discuss the descent straight ahead. If a turn is to be incorporated into a descent, teach the straight descent and the turn separately, then teach them together.

If you got nothing else out of my general strategy, I hope you figured out that, in general, a decrease in power of 100 RPM or 1 inch of manifold pressure will net approximately 100 FPM rate of descent.

I would expect my student to make most descents, under power and with a reduction of 500 RPM. That along with carburetor heat should net about a 500 FPM rate of descent. If a greater rate of descent is desired, then more power should be reduced. This formula assumes maintaining the original airspeed.

Note: Teach your student to begin to leveloff approximately 10% of the rate of descent before reaching assigned altitude. If he is descending at 500 FPM, he should begin his leveloff 50 feet before reaching the desired altitude.

The specific strategy of straight descents and descending turns.

I define straight descents as:

1. Reduce power.
2. Adjust pitch attitude to establish a descent.
3. Maintaining a specific airspeed or rate of descent.
4. Maintain a specified heading.
5. Leveloff approximately 10% of the rate of descent before reaching assigned altitude
6. Return to cruise airspeed
7. Maintain assigned altitude

Therefore the primary instruments are:

1. Tachometer.
2. Aircraft attitude in relationship to the horizon, (transition instrument)
3. The airspeed indicator or VSI..
4. The directional gyro or object on the ground or horizon.
5. Aircraft attitude in relationship to the horizon, (transition instrument).
6. The airspeed indicator.
7. Tachometer.

The secondary/supporting instruments are:

The inclinometer (for coordination).
Vertical speed indicator (to help with pitch) during a constant airspeed descent, or,
airspeed indicator (to help with pitch) during a constant rate of descent.
The tachometer (don't let it change).

Element Strategies.

a. effect and use of flight controls.

Explain to your student how each flight control works and what they make the airplane do. Explain the concept of applying pressure to the controls and not just movement. Explain neutralizing the controls as the desired flight attitude is reached.

b. the Integrated Flight Instruction method.

Explain to your student that the most important thing he can do is to control the airplane by what he sees as the comparison between the airplane (cowling, instrument panel wings, etc.) and the natural horizon. Explain that he should then use the flight instruments, in a logical manner to confirm that his desired relationship between the airplane and the natural horizon. I call that the hub-and-spoke method.

c. outside and instrument references used for pitch, bank, and power control; the crosscheck and interpretation of those references; and the control procedure used.

Wow, that's a mouthful. I think the folks that wrote the CFI PTS want you to describe in a step by step method how to fly straight and level, climb, make turns.

descend, etc. See the specific strategy of “straight descents and descending turns."

d. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

e. methods that can be used to overcome tenseness and over-controlling.

Patience, pry his cold numb fingers from the controls, suggest two fingers, tell him to be light, show him. Make sure the airplane is in trim.

COMMON ERRORS Airplane Flying Handbook Page 3-19

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers
Lift Drag Demo

IX. AREA OF OPERATION: PERFORMANCE MANEUVERS

NOTE: The examiner shall select at least TASKs A or B and C or D.

TASK: IX. A. STEEP TURNS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 9.
FAA-S-8081-12B - Commercial PTS - AO V. Task A.
FAA-S-8081-14A - Private PTS.
POH/AFM.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of steep turns by describing-
    a. relationship of bank angle, load factor, and stalling speed.
    b. over-banking tendency.
    c. torque effect in right and left turns.
    d. selection of a suitable altitude.
    e. orientation, division of attention, and planning.
    f. entry and rollout procedure.
    g. coordination of flight and power controls.
    h. altitude, bank, and power control during the turn.
    i. proper recovery to straight and level flight.
2. Exhibits instructional knowledge of common errors related to steep turns by describing-
    a. improper pitch, bank, and power coordination during entry and rollout.
    b. uncoordinated use of flight controls.
    c. improper procedure in correcting altitude deviations.
    d. loss of orientation.
3. Demonstrates and simultaneously explains steep turns from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to steep turns.

STRATEGY

This is actually a pretty mechanical maneuver. Once you have determined how much power to add to compensate for the loss of lift (reduction of airspeed), it's mostly flying around in a 45° bank for a Private Pilot applicant or 55° for a Commercial Pilot applicant. Note: There is a little quirk in the Commercial Pilot PTS regarding this maneuver. The bank tolerance is no steeper than 60° and no shallower than 50°. For simplicity sake, use 55° plus or minus 5°.

The hardest part of the maneuver is coordination and pitch control.

Since this is an outside maneuver, I want my students to figure out what the proper pitch attitude looks like. This is the relationship between the horizon and the instrument panel. With this determined, the trick is to keep checking on your outside attitude while checking on your altitude. The altimeter is the primary instrument for that, but don't discount the vertical speed indicator. It is key to

what's happening. It tells you your trend and that will help immensely in holding altitude.

Remember this is an outside maneuver.

Element Strategies.

1. a. relationship of bank angle, load factor, and stalling speed.

The steeper the angle of bank, the greater the load factor and the greater the stall speed.

1. b. over-banking tendency.

Steep turns are generally defined as 45° or more of bank. This isn't exactly correct. A steep turn is really a turn where the bank of the airplane will continue to increase if aileron isn't applied to prevent it. In any given airplane a steep turn could be more or less than 45° of bank.

1. c. torque effect in right and left turns.

Torque is always there. It increases if power is increased and decreases if power is decreased. If the pilot has the right amount of rudder to counteract torque it isn't a major issue. If just before entering a steep turn a large amount of power is added, torque could be a consideration.

1. d. selection of a suitable altitude.

I use 3,000 feet AGL for all of my "upper airwork." I select this altitude for its extra margin of safety. Remember, a common statement in the Private and Commercial PTS is, “Selects an altitude that will allow the maneuver to be performed no lower than 1,500 feet AGL.” 3,000 feet AGL does that, plus some.

1. e. orientation, division of attention, and planning.

For orientation I use fence rows. I like the fact that I can keep track of my turn in 90° increments. Seems like I miss my rollout heading less often when I can watch the roads go by.

This is an outside/inside maneuver. By that I mean I want my student to figure out what the proper pitch attitude looks like. This is the relationship between the horizon and the instrument panel. With this determined, the trick is to keep checking on your outside attitude while checking on your altitude. The altimeter is the primary instrument for that, but don't discount the vertical speed indicator. It is key to what's happening. It tells you your trend and that will help immensely in holding altitude.

I plan my roll out such that I start about half of my angle of bank before the desired heading.

1. f. entry and rollout procedure.

I enter this maneuver by establishing myself on the desired heading and at the desired airspeed and altitude. Once everything is stable, I add power, generally 100 RPM to 200 RPM and then briskly roll into the turn, ending up at the desired angle of bank.

I plan my roll out such that I start about half of my angle of bank before the desired heading. Once at the desired heading I either roll into a steep turn in the other direction or reduce my power back to practice area cruise.

1. g. coordination of flight and power controls.

My preference is to add power before starting the steep turn. It seems easier to do it that way as opposed to starting the turn and while transitioning to the desired bank add power. Simpler is better.

1. h. altitude, bank, and power control during the turn.

I have an old Civil Aeronautics Administration (CAA) Flying Handbook that described the conflict between maintaining altitude and airspeed during a turn as "lift loss" The idea is that when you turn an airplane you cannot hold both altitude and airspeed without adding power. The trick is to figure out in advance what power is needed to do both. Once that is a known quantity all that you have to do is apply the power before you need it.

1. i. proper recovery to straight and level flight.

I plan my roll out such that I start about half of my angle of bank before the desired heading. Once at the desired heading, I either roll into a steep turn in the opposite direction or reduce my power back to practice area cruise. One note, a Private Pilot applicant doesn't have to roll from one turn to the other. This means that he will have to deal with power a bit differently if he only pauses between turns. I suggest the student either does one turn immediately followed by another like a Commercial Pilot or totally recovers from the first steep turn before starting the second.

COMMON ERRORS Airplane Flying Handbook Page 9-2

RELATED MANEUVERS

Level turns

TASK: IX. B. STEEP SPIRALS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 9.
FAA-S-8081-12B - Commercial PTS - AO V. Task B.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of steep spirals by describing—
    a. selection of entry altitude.
    b. entry airspeed and power setting.
    c. selection of a proper ground reference point.
    d. division of attention and planning.
    e. coordination of flight controls.
    f. maintenance of constant radius around selected point.
    g. maintenance of constant airspeed throughout maneuver.
2. Exhibits instructional knowledge of common errors related to steep spiral by describing—
    a. improper pitch, bank, and power coordination during entry or completion.
    b. uncoordinated use of flight controls.
    c. improper planning and lack of maintenance of constant airspeed and radius.
    d. failure to stay orientated to the number of turns and the rollout heading.
3. Demonstrates and simultaneously explains a steep spiral from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to steep spirals.

STRATEGY

Everyone has an explanation as to how to use this maneuver in an emergency. I don't have one. I wouldn't use it in case of a pressurization problem and I wouldn't use it if I had an engine failure at a high altitude. I wouldn't use it if I was on fire. I would use a steep descending turn but not "around a point" while holding a constant radius. So learn what you can and apply it where you can.

For me the most important consideration is airspeed. This is based on your selected bank. I used to think that this maneuver had to be done with at least 45° of bank. After all it is a "steep" spiral. I had a young CFI student tell me otherwise, so I made a telephone to an Inspector in Oklahoma City, OK, who is responsible for the CFI PTS. His comment was: "Well the angle of bank isn't stipulated in the objective. I think it should be 45° at the steepest point but that's not what is says."

When you select your bank, make sure your airspeed provides enough protection from stalls. I use 1.3 X Vsl and then a multiple appropriate for the angle of bank. As an example, if you use a 45° bank, I would select an airspeed that is Vsl KCAS X 1.3 X 1.2. If I used a 30° bank I would use Vsl KCAS X 1.3 X 1.1. Translated, that means in a Cessna 172S with a clean stall speed of 48 KIAS, my

math would be 48 KIAS = 54 KCAS X 1.3 = 70 X 1.2 (45° bank) = 84 KCAS = 88 KIAS. A 30° bank would figure out to about 90 KIAS.

I always want an airspeed that is at least 30% above the stall speed.

I would also temper my airspeed selection with Va.

Having explained how to select an airspeed, the next step is to select an entry altitude. The steeper your bank, the higher the airspeed and also the greater the rate of descent. The higher the rate of descent the higher you must start the maneuver to complete 3 turns by 1,000 feet AGL. The higher the entry altitude, the harder it is to see the point and maintain a constant radius. Hopefully that explains why I now teach my students to perform the Steep Spirals at 30 ° of bank.

Now to the hardest part of the maneuver, selecting a point and remembering that you need to demonstrate this maneuver to the left so your student can benefit from your masterful flying skills. When you select a point for this maneuver I would prefer to find two very long straight roads that intersect, thus identifying the point. I would like these roads to extend at least 100 miles in all directions, be 2 lanes per side and be jet black. Anything less than that will just make it harder, as I try to line up to enter and fly around a point I cannot see.

The reason I want an intersection is that when I am in the right seat unable to see the point, I can use the road in front of me to judge my distance laterally from the point, while using the road I will cross to let me know when I am abeam the point. I also use my distance from the road I will cross to determine where I will close the throttle. I like to be established in my glide about one quarter mile from the abeam point.

Now let’s talk about entry heading. Like Turns Around A Point, an entry heading isn't specified. The Airplane Flying Handbook "strongly suggests" that the entry heading for all ground reference maneuvers be down wind. The reason is that the angle of bank will be the steepest where the ground speed is the greatest.

I agree that entering on a downwind is one way to control your steepest angle of bank. When I had no way to predict the difference between the steepest and shallowest angles of bank, I used the downwind entry technique. Since figuring out how to predict the difference, I don’t much care what my entry heading is. Actually that isn't exactly true. I would actually prefer entering upwind where my bank angle is the shallowest and gradually steepen it during the first 180° of turn. What your student needs to care about is his ability to explain the relationship between ground speed and bank angle. I think you should be able to explain how to determine the radius of turn needed for any bank angle you select. I also believe a student should be able to predict the effect of the observed wind on bank angle.

NOTE: At 90 knots airspeed, every knot of wind is equal to one degree of bank difference between steepest and shallowest bank in a ground reference maneuver. In other words, if you perform the Steep Spiral at 90 knots and believe the wind is about ten knots, your upwind bank angle of 30° will net you a 40° bank on the downwind.

Also, at 90 knots airspeed (no wind), a 30° bank will require about a 1,300 foot radius turn. A 45° bank turn requires less than a 1,000 feet.

If you don't like math, enter downwind.

So what to do for an entry. Teach your student, in a Cessna 172, to us a 30° bank at the steepest point. Have them enter at about 4,000 feet AGL, about a quarter mile from the point, using 90 knots. Of course I advocate trying this out well before the checkride to see how it works.

Element Strategies.

1. a. selection of entry altitude.

This has to be done by trial and error. The Airplane Flying Handbook calls for the maneuver to be completed by 1,000 feet AGL. The Commercial Pilot PTS is silent on the tolerances. Perhaps the most important part of altitude selection is considering where the CFI applicant sits: the right seat. This means you can't see the point very well if at all. In general, the higher you go the harder it is to see the point. Perhaps shallower and lower is better.

1. b. entry airspeed and power setting.

Again this is part of how the entry altitude gets selected. Of course the airplane configuration is clean, with the throttle reduced to idle. Remember, the faster you fly the more altitude you lose during the maneuver.

1. c. selection of a proper ground reference point.

Point selection can be difficult if you do not teach your student to communicate its description clearly. There is nothing worse than telling the student to use the corner of the green field for the point. Which green field?

1. d. division of attention and planning.

It's an inside maneuver for speed and perhaps checking altitude, but the rest is outside.

1. e. coordination of flight controls.

Yes! That's a great idea. Other than applying enough aileron for the desired bank and enough rudder to center the ball, there isn't much to say about coordination. Turning tendencies, left or right do not really exist during a gliding spiral.

1. f. maintenance of constant radius around selected point.

Too high, and it's magic. I suggest that you read my strategy for Turns Around A Point for this.

1. g. maintenance of constant airspeed throughout maneuver.

This is like Element d. It's an inside maneuver for speed and perhaps checking altitude, but the rest is outside.

COMMON ERRORS Airplane Flying Handbook Page 9-4

RELATED MANEUVERS

Turns Around a Point

TASK: IX. C. CHANDELLES

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 9.
FAA-S-8081-12B - Commercial PTS - AO V. Task C.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of chandelles by describing-
    a. selection of entry altitude.
    b. entry airspeed and power setting.
    c. division of attention and planning.
    d. coordination of flight controls.
    e. pitch and bank attitudes at various points during the maneuver.
    f. proper correction for torque effect in right and left turns.
    g. achievement of maximum performance.
    h. completion procedure.
2. Exhibits instructional knowledge of common errors related to chandelles by describing-
    a. improper pitch, bank, and power coordination during entry or completion.
    b. uncoordinated use of flight controls.
    c. improper planning and timing of pitch and bank attitude changes.
    d. factors related to failure in achieving maximum performance.
    e. a stall during the maneuver.
3. Demonstrates and simultaneously explains chandelles from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to chandelles.

STRATEGY

I have to get up on my soapbox. The Chandelle isn't a maximum performance climbing turn. It nets you neither the best rate nor angle of climb and not the tightest turn radius possible. If you think it does, explain why a P-51 Mustang and a Cessna 152 would use the same angle of bank to perform the maneuver.

The Chandelle is a great training maneuver that requires the student to think about all of the flight regimes, including power and coordination, at the same time.

So how do we teach this maneuver. Start by drawing it from above. It's a 180° turn. Draw it from the side. It's a climbing turn.

Now chop it up into parts, the entry, the 90° point, and the 180° point.

Explain what happens. It's a 180° "maximum performance," climbing turn. In a Cessna 172 it is started from 90 knots, practice area cruise (which is below Va). We roll into a 30° bank turn, begin to pitch up and apply full power. We spend the first 90° of the maneuver at 30° of bank while constantly increasing pitch until we reach our highest pitch attitude at 90° of turn. We now spend the next 90° of the maneuver at the pitch attitude we achieved at the 90° point, while constantly rolling out our bank to wings level at the 180° point, and at an airspeed just above a stall. We will hold that pitch attitude momentarily and then recover,

accelerating back to straight and level flight, back to our entry airspeed and power setting.

Element Strategies.

1. a. selection of entry altitude.

I do all of my "upper air" maneuvering at or above 3,000 feet AGL.

1. b. entry airspeed and power setting.

I suggest practice area cruise.

1. c. division of attention and planning.

It's an outside maneuver with some inside references.

1. d. coordination of flight controls.

CFI applicants are often asked, "Does a cross-controlled condition ever exist when performing a Chandelle?" The answer is, it depends on how you define cross-controlled. If you mean the pilot is applying left aileron while applying right rudder, then yes, that can happen. If you mean the pilot is applying left aileron while applying right rudder and the aircraft is out of trim, then no.

1. e. pitch and bank attitudes at various points during the maneuver.

Already addressed.

1. f. proper correction for torque effect in right and left turns.

Go to Area of Operation II, Task C, Element 3.

1. g. achievement of maximum performance.

I do not think maximum performance is achieved given the specific entry requirements, most specifically the requirement of 30° of bank.

1. h. completion procedure.

Already addressed.

COMMON ERRORS Airplane Flying Handbook Page 9-5

RELATED MANEUVERS

Climbing turns
Slow Flight

TASK: IX. D. LAZY EIGHTS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 9.
FAA-S-8081-12B - Commercial PTS - AO V. Task D.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of lazy eights by describing-
    a. selection of entry altitude.
    b. selection of suitable reference points.
    c. entry airspeed and power setting.
    d. entry procedure.
    e. orientation, division of attention, and planning.
    f. coordination of flight controls.
    g. pitch and bank attitudes at key points during the maneuver.
    h. importance of consistent airspeed and altitude control at key points during the maneuver.
    i. proper correction for torque effect in right and left turns.
    j. loop symmetry.
2. Exhibits instructional knowledge of common errors related to lazy eights by describing-
    a. poor selection of reference points.
    b. uncoordinated use of flight controls.
    c. unsymmetrical loops resulting from poorly planned pitch and bank attitude changes.
    d. inconsistent airspeed and altitude at key points.
    e. loss of orientation.
    f. excessive deviation from reference points.
3. Demonstrates and simultaneously explains lazy eights from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to lazy eights.

STRATEGY

I cannot stress enough my thoughts that this is an outside maneuver. From above it looks like two 180° turns. From the side it looks like a profile of a bowl, up and down, but from inside the cockpit it looks like you are painting an eight on the horizon. Now I don't want to seem all teary-eyed about this maneuver, but it's more an artful maneuver than any other we require of a Commercial Pilot. If you approach it like that you can break the code, it's the painting of the eight on the horizon that's the key to this maneuver. It is where it gets its name.

There is a second Element that is almost as important, patience. I describe this as an old man's maneuver. You can't be in a hurry.

When you teach this maneuver start with that concept. Then explain it as two 180° turns that are identical, but in opposite directions.

Now break it into 45° points along the flight path. You start from practice area cruise, in straight and level flight and on a specific heading. You begin to pitch up and bank the airplane so that at 45° of turn, the airplane is at its steepest pitch up attitude and has achieved half of its steepest bank angle. The next point is the 90° location. You are now flying the airplane to that spot where you will be at

30° of bank, and the nose slices its way through level flight and is headed for the 135° point. At the 135° point the airplane is once again at half of it steepest bank and at its lowest pitch attitude below the horizon. From this point the airplane's pitch is increased, bringing it back to the original starting altitude, straight and level and at the starting airspeed.

All of this is done outside the airplane.

Element Strategies.

1. a. selection of entry altitude.

I do all of my maneuvering at or above 3,000 feet AGL.

1. b. selection of suitable reference points.

I am a proponent of fence rows or section lines. I know some suggest a prominent point like a small mountain on the horizon, but a single point makes it harder to define each of the 45° points.

1. c. entry airspeed and power setting.

I use practice area cruise.

1. d. entry procedure.

This maneuver is started from straight and level flight. I do suggest that increasing pitch has priority over adding bank. If you listen very carefully, you will hear my students say pitch pitch bank, pitch pitch bank, pitch pitch bank.

1. e. orientation, division of attention, and planning.

As I said in my introduction, this is an outside maneuver. If you pick good outside reference lines you can keep track of where you are and what you should be doing.

1. f. coordination of flight controls.

I am not sure what to say here: coordination is coordination. Flying the airplane through its various degrees of pitch and bank is the key. It's a matter of feeling what the airplane is telling you and responding accordingly.

1. g. pitch and bank attitudes at key points during the maneuver.

Addressed in my strategy.

1. h. importance of consistent airspeed and altitude control at key points during the maneuver.

No doubt this is critical. It's what makes the maneuver symmetrical.

1. i. proper correction for torque effect in right and left turns.

Coordination is critical. If you remain coordinated you will be making the proper corrections for torque, "P" factor and so on. I think this is a maneuver that the pilot must "feel."

1. j. loop symmetry.

No doubt symmetry is paramount. It's not a Lazy eight unless the two halves of each half are symmetrical.

COMMON ERRORS - Airplane Flying Handbook, Page 9-8

RELATED MANEUVERS

Climbs and turns

X. AREA OF OPERATION: GROUND REFERENCE MANEUVERS

NOTE: The examiner shall select TASK D and one other TASK.

The following list contains the Ground Reference Maneuvers I teach. The bold titles are the ones listed in the PTS. I use the others to teach concepts and skills.

- Track a Road
- Wind Circle
- **Turns Around a Point**
- **Rectangular Course**
- **S-Turns Across a Road**
- Turn Around a Pylon (one pylon)
- **Eights on Pylons**
- **Steep Spiral**

When I teach ground reference maneuvers I start with tracking down a road. I would prefer two roads that form an intersection. This will let us fly in two directions helping the student determine where the wind is coming from.

Then I teach the wind circle, having the student make a 360° turn with 30° of bank. I then tell the student that if he draws a line from where he entered the turn to where he rolled wings level, he can tell where the wind is coming from.

I do these two maneuvers to help the student understand drift and how to correct for it. This is also a good time to point out smoke, dust, flags, windsocks and the calm side of a body of water for indications of the wind direction and velocity at the surface.

After introducing wind indicators and the effects of wind, I move to Turns Around a Point. I teach this maneuver first because I like to talk about crab and angle of bank. I had a student explain a turn around a point as an infinite number of cross-country flights each intersecting the outside edge of the Turn Around a Point circle. Then he explained that the crab angle necessary to fly those cross-country flights would be the same as the crab necessary to fly around a point while holding a constant radius. Try drawing a circle, intersecting cross-country courses and wind, draw in the crabs you would need and you should see what he means. His idea is dead on, the problem is that even though correct, it just doesn't work. Instead we control our radius by changing our bank angle. We teach that **the greater the ground speed the greater the angle of bank** Doing so will give us an infinite number of crab angles around the circle. By the way, when you teach Turns Around a Point, draw in the crab angle at least every 90° around the circle.

The next maneuver I teach student pilots is the Rectangular Course. The last one is S-Turns Across a Road.

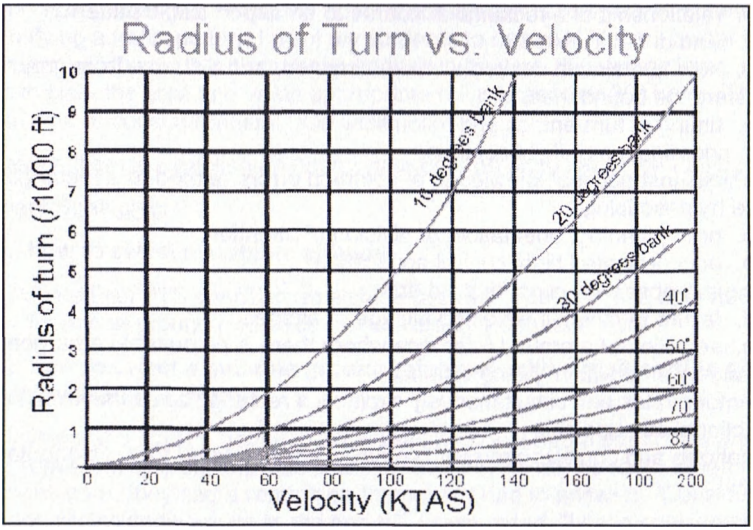
For Commercial Pilots we also teach The Steep Spirals and Eights on Pylons. Since I addressed Steep Spirals in Area of Operation IX there is no reason to talk about it here, except to say that it really isn't much more than a gliding Turn Around a Point.

When teaching Eights on Pylons, I like to start with a "turn on a pylon." It’s like a turn around a point except it has a pivotal altitude. The idea is to teach the concept of controlling the pivotal altitude before we start dealing with entry headings, site selection and so on.

There is one statement I heard more than anything else when I gave CFI checks. When doing a Turn Around a Point, you always enter down wind. Hearing that made my heart go pitter-patter. I considered that to be "code" for, "I understand the relationship between bank and groundspeed." "When I started teaching, I started to wonder why I cared. When I read the Private Pilot PTS with a critical eye, I had even more questions.

There is only one ground reference maneuver, the Rectangular Course, which has a entry specified in the PTS. This maneuver requires an entry on a 45° to the downwind leg just like a "proper" traffic pattern entry. There is also only one ground reference maneuver that has any specified angle of bank, and that's Eights on Pylons which must be between 30° and 40° of bank at the steepest point.

So why do we make such a big fuss about entering ground reference maneuvers downwind? My memory tells me that older Flight Test Guides specified maximum angles of bank, and the only recognized way to control the bank was to start downwind knowing that everything else would be shallower.



I have a new idea. What if I said you can predict the bank angles used in a ground reference maneuver? You can. As an example, at 90 knots, the difference in bank between steepest bank and shallowest bank is equal to 1° of bank for every knot of wind. This means that at 90 knots airspeed, with a ten knot wind, if you entered the Turn Around a Point at 20°, upwind, the downwind bank angle would be 30°. Play with the chart above.

At the same time see what your radius would be at 90 knots and 30° of bank.

I believe that the most difficult part of any ground reference maneuver is finding a point to your student's liking and communicating its location. The next hardest part is determining where the wind is from and figuring out how to enter it.

NOTE: Because I teach Turns Around A Point first. I would suggest that you read my thoughts about it out of sequence. After reading about Turns Around a Point, read the rest.

TASK: X. A. RECTANGULAR COURSE

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 6.
FAA-S-8081-14A - Private PTS - AO VI. Task A.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of a rectangular course by describing-
   a. how to select a suitable altitude.
   b. how to select a suitable ground reference with consideration given to emergency landing areas.
   c. orientation, division of attention, and planning.
   d. configuration and airspeed prior to entry.
   e. relationship of a rectangular course to an airport traffic pattern.
   f. wind drift correction.
   g. how to maintain desired altitude, airspeed, and distance from ground reference boundaries.
   h. timing of turn entries and rollouts.
   i. coordination of flight controls.
2. Exhibits instructional knowledge of common errors related to a rectangular course by describing-
   a. poor planning, orientation, or division of attention.
   b. uncoordinated flight control application.
   c. improper correction for wind drift.
   d. failure to maintain selected altitude or airspeed.
   e. selection of a ground reference where there is no suitable emergency landing area within gliding distance.
3. Demonstrates and simultaneously explains a rectangular course from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a rectangular course.

STRATEGY

I teach tracking down a road and Turns Around a Point first. This way I put what the student learned from those maneuvers to use in learning the Rectangular Course.

I introduce this maneuver by doing it exactly as it would be done in a traffic pattern at an uncontrolled airport; I just stay at 1,000 feet AGL. I pick a field that is longer than wide and enter the maneuver on what would be a 45° angle to the downwind. Remember, this is the only around reference that has a required entry. Start there for the first demonstration. Next, fly the downwind and abeam the corner of the field, fly a constant radius turn around that corner of the field. Then, fly what would be the base leg, turning at the next corner and so on.

The hardest part of this, for me, is to get the student to actually recognize the "constant radius" that has to be maintained during the turns. That's why I teach turns around a point before Rectangular Patterns.

Tracking, using a crab is generally pretty obvious to a student, but changing ban! angle to compensate for wind velocity is much tougher. I teach the student to draw the quarter circle that makes up the turn from one leg to another, on the ground. Then I have him pick points to maneuver over, maintaining a constant radius. I have him keep track of his bank angle as he flys around the corners of the field.

There really isn't much more to be said about this maneuver, unless I introduced it as the first ground reference maneuver. In that case, there needs to be a careful discussion about ground speed and angle of bank.

Now let's talk about using the standard traffic pattern as the showing of the Rectangular Course. Substituting one maneuver for another is allowed if the Examiner believes he can see in one maneuver what he needs to see in another. The problem is how you teach a student to make his turns while flying the traffic pattern.

In a Rectangular Course I teach flying a constant radius, changing bank as ground speed changes. This isn't how I teach a student to fly a traffic pattern. When flying a traffic pattern I want my students to use a 30° bank. I want them tc enter and exit the turns with purpose and when they roll their wings level, I want them to clear the area and when appropriate roll into another 30° bank. That doesn't net a "constant radius." Oh well!

I do teach them to establish an appropriate crab on each leg of the traffic pattern.

Element Strategies

1. a. how to select a suitable altitude.

The Private Pilot PTS specifies an altitude between 600 feet AGL and 1,000 feet AGL. I teach all ground reference maneuvers at 1,000 feet AGL.

1. b. how to select a suitable ground reference with consideration given to emergency landing areas.

Many years ago I built a house in the snow country. I had a porch that was going to be wiped out by a big snowfall when it came sliding off the roof. When I got the plans back, they had a remark on them that I had to answer: "Consider the damage sliding snow will do to the porch." I responded, "1 have considered that and will replace the porch as necessary." The same goes for "consideration given to emergency landing areas."

There is always a balancing act going on in aviation and so it is with the selection of a good ground reference location and the hazards on the ground. Using 1,000 feet AGL gives the applicant a lot of flexibility. One of my favorite locations is very near some large high voltage transmission lines. I use the area anyway. I just teach my students to factor their location into any decisions they make if they have an emergency. Again, at 1,000 feet AGL there are a lot of options available.

NOTE: A landing in a Cessna 172N with a 10 knot tailwind will increase the landing roll by 50%. At worst, this will only increase the landing roll by 400 feet.

I MIGHT HAVE TO TURN AWAY FROM THE POWER LINES AND LAND DOWNWIND.

1. c. orientation, division of attention, and planning.

This is an outside maneuver. Like most such maneuvers it's a matter of looking inside for the things that only the instruments can tell us, like altitude, and looking outside for the things that the horizon and the ground can tell us, like where we are, what our heading should be and when we should start and stop a turn. Teach your student to spend the bulk of his time outside as he flys a Rectangular Course.

1. d. configuration and airspeed prior to entry.

If you teach a practice area cruise with the same speed and power settings as the one you use for the downwind leg of the traffic pattern, this is simplified.

1. e. relationship of a rectangular course to an airport traffic pattern.

These maneuvers are virtually identical. The major difference is how turns are made. The rectangular pattern requires constant radius turns where a normal traffic pattern is usually made with a constant bank turn. I prefer 30° bank turns.

1. f. wind drift correction.

Wind drift correction is what Ground Reference Maneuvers are all about. Corrections are made by adjusting bank angle. Seeing a crab at the crosswind is an outcome of using proper bank angles.

1. g. how to maintain desired altitude, airspeed, and distance from ground reference boundaries.

This is mostly an outside maneuver. Instruments will provide altitude and airspeed but looking outside is the only way to judge ground track and turn radius.

1. h. timing of turn entries and rollouts.

Timing is an interesting concept. I teach my students to crab along the straight legs of the pattern and when they are abeam the corner of the field (not when the wing is pointing at the corner), roll into the turn.

1. i. coordination of flight controls.

The turns in a rectangular course are simply that, turns. Other than changing bank angle there is nothing special about them; apply aileron and coordinate with rudder.

COMMON ERRORS - Airplane Flying Handbook, Page 6-6

RELATED MANEUVERS

Track a Road
Wind Circle
Turns Around a Point
S-Turns Across a Road
Traffic Pattern

TASK: X. B. S-TURNS ACROSS A ROAD

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 6
FAA-S-8081-14A - Private PTS AO VI, Task B

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of S-turns across a road by describing-
   a. how to select a suitable altitude.
   b. how to select a suitable ground reference line with consideration given to emergency landing areas.
   c. orientation, division of attention, and planning.
   d. configuration and airspeed prior to entry.
   e. entry procedure.
   f. wind drift correction.
   g. tracking of semicircles of equal radii on either side of the selected ground reference line.
   h. how to maintain desired altitude and airspeed.
   i. turn reversal over the ground reference line.
   j. coordination of flight controls.
2. Exhibits instructional knowledge of common errors related to S-turns across a road by describing-
   a. faulty entry procedure.
   b. poor planning, orientation, or division of attention.
   c. uncoordinated flight control application.
   d. improper correction for wind drift.
   e. an unsymmetrical ground track.
   f. failure to maintain selected altitude or airspeed.
   g. selection of a ground reference line where there is no suitable emergency landing area within gliding distance.
3. Demonstrates and simultaneously explains S-tums across a road from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to S-turns across a road.

STRATEGY

In my mind there isn't a lot of difference between S-turns Across a Road and Turns Around a Point except that there is a road, and you need to try to orient the road perpendicular to the wind. You also need to pick at least one point and perhaps two or five points along the road. Too many points?

How many points do you need to perform a S-turn Along a Road? It's like how many drunks do you need to screw in a light bulb? In this case, the answer is it depends. I have a place where there are five long driveways that intersect a long straight country road. The driveways are 1/4 mile apart. The road is almost always perpendicular to the wind; convenient. I have my students start over one driveway, turn around the next driveway, cross over the third driveway, turn around driveway number four and finish the last turn over the last driveway.

Sounds complicated; it can be. I had a Flight Instructor student that came to me from a school in the Northwest where they picked a road, and a point; just one point. He crossed the road, turned around the point and when he crossed the road the second time looked the other way, picked a second point and turned around it. There wasn't any planning involved in picking the second point. There is yet another school of thought.

Pick two points and split the difference so that after the first 180° turn the student is midway between the two points and then turns the other direction.

This takes us to an earlier statement that **I** made. **The most difficult part of any ground reference maneuver is determining where the wind is from, setting up the maneuver, and figuring out how to enter it.**

Here is the answer to the question: How many points do you need to perform a S-turn Along a Road? The PTS lets the applicant select the point(s), the bank and the radius.

Teach the maneuver as you think is best; just be sure you can explain your logic.

Element Strategies

1. a. how to select a suitable altitude.

The Private Pilot PTS specifies an altitude between 600 feet AGL and 1,000 feet AGL. I teach all ground reference maneuvers at 1,000 feet AGL, which is the most common traffic pattern altitude where I fly.

1. b. how to select a suitable ground reference line with consideration given to emergency landing areas.

There is always a balancing act going on in aviation, and so it is with the selection of a good ground reference location and the hazards on the ground. Using 1,000 feet AGL gives the applicant a lot of flexibility. I teach my students to factor their location into any decisions they make if they have an emergency. Again, at 1,000 feet AGL there are a lot of options available.

1. c. orientation, division of attention, and planning.

This is an outside maneuver. Like most such maneuvers it's a matter of looking inside for the things that only the instruments can tell us, like altitude, and looking outside for the things that the horizon and the ground can tell us, like where we are, what our heading should be and when we should start and stop a turn. Teach your student to spend the bulk of his time outside as he flys a S-Turns Across a Road.

1. d. configuration and airspeed prior to entry.

Do the maneuver clean and at practice area cruise.

1. e. entry procedure.

Once you select the road, the logic says the entry must be perpendicular to it. Now the only choice is upwind or downwind. I would enter in the direction that was most efficient considering my clearing turns and where I was coming from. Entering downwind is the most common entry.

1. j. coordination of flight controls.

The turns in a s-turn are simply that, turns. Other than varying bank angles to maintain a constant radius and changing direction between halves, which is unique to s-turns, there is nothing special about the turns. It's apply aileron and coordinate with rudder.

1. f. wind drift correction.

Wind drift correction is what Ground Reference Maneuvers are all about. Corrections are made by adjusting bank angle. Seeing a crab at the crosswind is an outcome of using proper bank angles.

1. g. tracking of semicircles of equal radii on either side of the selected ground reference line.

Read my remarks in the introduction of this Area of Operation about points and point selection.

h. how to maintain desired altitude and airspeed.

The tolerance on airspeed is +/-10 knots. If you fly the maneuver at banks around 30°, airspeed shouldn't be an issue. That leaves altitude. I don't have any great insight into this. Like most maneuvers this is a process of looking inside for the things that only the instruments can tell us, like altitude and looking outside for the things that the horizon and the ground can tell us like pitch attitude and ground track.

1. i. turn reversal over the ground reference line.

Equal semicircles and course reversal is the essence of this maneuver. The key to course reversal is coordination. If the banks you teach aren't too steep this should be relatively easy with practice. Relate it to Steep Turns at the Commercial level.

COMMON ERRORS - Airplane Flying Handbook, Page 6-7

RELATED MANEUVERS

Track a Road
Wind Circle
Turns Around a Point
Rectangular Course
Traffic Patterns

TASK: X. C. TURNS AROUND A POINT

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 6.
FAA-S-8081-14A - Private PTS AO VI. Task C.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of turns around a point by describing-
   a. how to select a suitable altitude.
   b. how to select a suitable ground reference point with consideration given to emergency landing areas.
   c. orientation, division of attention, and planning.
   d. configuration and airspeed prior to entry.
   e. entry procedure.
   f. wind drift correction.
   g. how to maintain desired altitude, airspeed, and distance from reference point.
   h. coordination of flight controls.
2. Exhibits instructional knowledge of common errors related to turns around a point by describing-
   a. faulty entry procedure.
   b. poor planning, orientation, or division of attention.
   c. uncoordinated flight control application.
   d. improper correction for wind drift.
   e. failure to maintain selected altitude or airspeed.
   f. selection of a ground reference point where there is no suitable emergency landing area within gliding distance.
3. Demonstrates and simultaneously explains turns around a point from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to turns around a point.

STRATEGY

I would give you big money that this maneuver will be the "other" maneuver from Area of Operation X. This maneuver is the easiest one to have an applicant teach and be able to determine if he knows his way around the theories of ground reference maneuvers.

I wouldn't be surprised if this maneuver was the one selected for Area of Operation IV, Preflight Lesson on a Maneuver to be Performed in Flight.

To be sure we are talking about the same maneuver, this is the one where you pick a point on the ground, fly around that point about a quarter mile away, while maintaining a constant distance and a constant altitude.

I would teach Turns Around A Point by explaining two concepts and a few simple rules of thumb. The first concept that has to be clearly understood is the relationship between ground speed and angle of bank. **The faster the groundspeed, the steeper the angle of bank.**

The second concept is the relationship between the direction of the wind and the heading of the airplane, which requires a crab or wind correction angle. **The more perpendicular your heading is to the wind, the greater the crab angle or wind correction angle will be.**

When this maneuver is taught in the classroom it is almost always done with a point, a circle and a wind arrow. My preference is to put the point in the middle o an intersection of two roads. The circle is drawn around the point and a wind arrow is drawn to represent the wind.

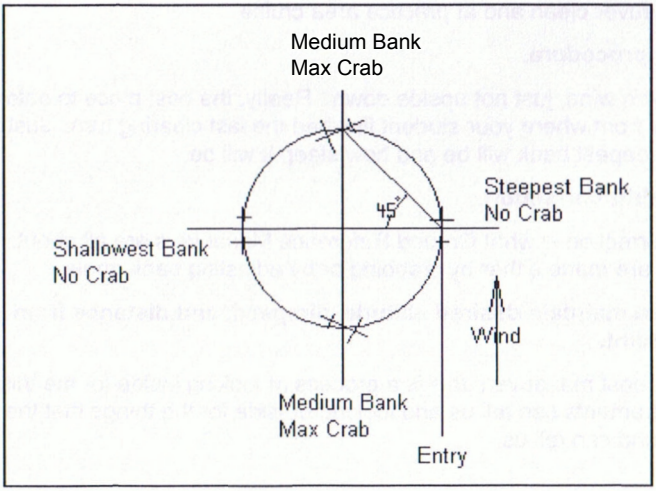
The next step is to label the four points where the circle crosses a road. For argument sake, the wind is from the south, the bottom of the white board. The first point, which is directly down wind (3:00 o'clock), is labeled as the steepest point and no crab. The next point is at the top of the circle where it intersects with the next road. That is where you should label a medium bank and max crab The next point is the upwind side of the circle where the label says shallowest bank and no crab. The bottom of the circle gets labeled medium bank and max crab and the next point is where the maneuver started.

No matter what else, you must say and believe that the greater the ground speed, the greater the angle of bank, and the more perpendicular to the wind you are, the greater the crab.

The "Why? of the relationship between ground speed and angle of bank can be found starting with the last paragraph of page 6-2 of the Airplane Flying Handbook. I think of it as what bank angle do I need for a given ground speed to maintain the desired radius of turn. Take the time to go to the Radius of Turn vs. Velocity chart in the introduction to this Area of Operation and compute various angles of bank for different ground speeds.

Now to how to teach the maneuver in the air. Start with the airspeed you use and the maximum angle of bank you want your student to use. Let's use 90 knots and about 30° at the steepest point. That means a radius of about a quarter mile. (Look at the chart if you don't believe me.) That's not very far from the point. It happens to be about 300 feet farther from the airplane's ground path than airplane's altitude.

This is a good time to discuss the "45° rule." Look at the drawing below.



I think it is part of the Pythagorean Theorem. If you are 1,000 feet AGL and you look at the ground at a 45° angle, the point you are looking at is 1,000 feet laterally from your flight path. This rule can help guesstimate your distance from the point or a runway. Likewise, if you want to get an idea of where you will cross the next road (remember I prefer to use a point in the middle of an intersection of two roads) use a 45° angle to look ahead in your circle 90°. You should be able to pick a point on the ground such, that if you fly over it, your ground track will continue to be a constant distance from the point.

Note: This rule also works for traffic patterns and the 45° key point.

Element Starteaies

1. a. how to select a suitable altitude.

The Private Pilot PTS specifies an altitude between 600 feet AGL and 1,000 feet AGL. I teach all ground reference maneuvers at 1,000 feet AGL. 1,000 feet AGL is the normal traffic pattern altitude.

1. b. how to select a suitable ground reference point with consideration given to emergency landing areas.

There is always a balancing act going on in aviation and so it is with the selection of a good ground reference location and the hazards on the ground. Using 1,000 feet AGL gives the applicant a lot of flexibility. I teach my students to factor their location into any decisions they make if they have an emergency. Again, at 1,000 feet AGL there are a lot of options available.

1. c. orientation, division of attention, and planning.

This is an outside maneuver. Like most such maneuvers it's a matter of looking inside for the things that only the instruments can tell us, like altitude, and looking outside for the things that the horizon and the ground can tell us, like where we are, what our heading should be and when we should start and stop a turn. Teach your student to spend the bulk of his time outside as he flys a Turns Around a Point.

1. d. configuration and airspeed prior to entry.

Do the maneuver clean and at practice area cruise.

1. e. entry procedure.

Up wind, down wind, just not upside down. Really, the best place to enter the maneuver is from where your student finished the last clearing turn. Just know where the steepest bank will be and how steep it will be.

1. f. wind drift correction.

Wind drift correction is what Ground Reference Maneuvers are all about. Corrections are made either by crabbing or by adjusting bank angle.

1. g. how to maintain desired altitude, airspeed, and distance from reference point.

I guess like most maneuvers this is a process of looking inside for the things that only the instruments can tell us and looking outside for the things that the horizon and the ground can tell us.

1. h. coordination of flight controls.

There is nothing special about Turns Around a Point when it comes to coordination. Seems it's apply aileron and coordinate with rudder.

The faster the groundspeed, the steeper the angle of bank.

The more perpendicular your heading is to the wind, the greater the crab angle into the wind.

COMMON ERRORS - Airplane Flying Handbook, Page 6-9

RELATED MANEUVERS

Track a Road
Wind Circle
Turns Around a Point
Rectangular Course
S-Turns Across a Road
Traffic Patterns

TASK: X. D. EIGHTS ON PYLONS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 6.
FAA-S-8081-12B - Commercial PTS - AO VI.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of eights on pylons by describing-
   a. how to determine the approximate pivotal altitude.
   b. how to select suitable pylons with consideration given to emergency landing areas.
   c. orientation, division of attention, and planning.
   d. configuration and airspeed prior to entry.
   e. relationship of groundspeed change to the performance of the maneuver.
   f. pilot's "line-of-sight" reference to the pylon.
   g. entry procedure.
   h. procedure for maintaining "line-of-sight" on the pylon.
   i. proper planning for turn entries and rollouts.
   j. how to correct for wind drift between pylons.
   k. coordination of flight controls.
2. Exhibits instructional knowledge of common errors related to eights on pylons by describing-
   a. faulty entry procedure.
   b. poor planning, orientation, and division of attention.
   c. uncoordinated flight control application.
   d. use of an improper "line-of-sight" reference.
   e. application of rudder alone to maintain "line-of-sight" on the pylon.
   f. improper planning for turn entries and rollouts.
   g. improper correction for wind drift between pylons.
   h. selection of pylons where there is no suitable emergency landing area within gliding distance.
3. Demonstrates and simultaneously explains eights on pylons from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to eights on pylons.

STRATEGY

Get to the right altitude and put the tip of your wing on the point. If you are higher than you should be, **dive to the point,** and if you are lower than you should be, **climb from the point.** Now let's put those rules to use. The first thing we need to do is determine the pivotal altitude. This is determined by taking your airspeed and doing some math. There's even a formula that can be used. I prefer going to page 6-14 of the Airplane Flying Handbook and use the chart. The number you get is your pivotal altitude in calm wind. Do we ever really have calm wind? I think not, so I use groundspeed. I take airspeed and add about half of the reported winds and use that as the basis for **estimating** my altitude. No matter what formula you use, it will be wrong. Remember, if you are higher than you should be, **dive to the point,** and if you are lower than you should be, **climb from the point.**

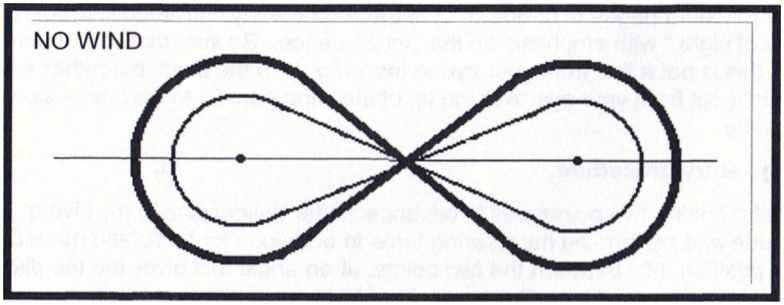
Any idea why I use only half of the wind? It's simple; if you set up your pylons on a road perpendicular to the wind, you will never be 100% downwind. At best your flight path is 45° to the wind.

Now to the biggest problem. Like all ground reference maneuvers, it's the set up The Airplane Flying Handbook suggests that this maneuver be entered at an angle to a road that is perpendicular to the wind. This means you need to find a road that is perpendicular to the wind with two points on it that are the right distance apart. Since a 30° bank nets about a quarter mile radius, I use something over a half mile between the points. As to entry, I try to fly between the points at an angle on the shallow side of 45°. I also enter downwind.

When my line of sight is lined up with the point, I roll the airplane in the direction of the point and begin the correction process, **dive to the point** or **climb from the point.**

NOTE: Read pages 6-12 and 6-13 of the Airplane Flying Handbook regarding "line of sight," with emphasis on the last sentence. Be sure that you understand that this is not a line from your eye to the wing tip to the point, but rather a line straight out from your eye over the tip of the wing parallel to the lateral axis of the airplane.

A little something about the bank you want. The distance between the points doesn't necessarily control the steepness of the bank; it can, but generally it's the angle that you use to approach the point. Notice that the same points are used for both dark and light Eights on Pylons, in the drawing below. The angle of interception of the darker line is closer to a 45° angle and therefore requires a shallower angle of bank around the point. The lighter line represents a shallower interception angle and therefore a steeper bank angle around the point. Angle of bank around the pylons is not per se a criteria but is an important consideration when performing and turning maneuver.



Element Strategy

1. a. how to determine the approximate pivotal altitude.

Look at page 6-14 of the Airplane Flying Handbook.

1. b. how to select suitable pylons with consideration given to emergency landing areas.

Regarding suitable pylons; find a road that is perpendicular to the wind. Find two points that you can describe to your student. "See the tree on that road down there," doesn't work. Try for points that are about 3/4 of a mile apart. (Once you think you have two points you like and work well, go to Google Earth, find them

and measure the distance between them.) My guess is that you will be as low as 700 feet AGL. When you pick your points consider the "lower than normal" altitude. I would make sure you are over an uncongested area.

Regarding consideration given to emergency landing areas; there is always a balancing act going on in aviation and so it is with the selection of a good ground reference location and the hazards on the ground. Remember your altitude will be closer to 700 feet AGL than 1,000 feet AGL. Your emergency landing area may very well be straight ahead. Factor your lower altitude into any site selection.

1. c. orientation, division of attention, and planning.

This is an outside maneuver. Like most such maneuvers it's a matter of looking inside for the things that only the instruments can tell us, mostly coordination, and looking outside for the the airplane's relationship to the pylons. Teach your student to spend the bulk of his time outside as he flys Eights on Pylons.

1. d. configuration and airspeed prior to entry.

Do the maneuver clean and at practice area cruise.

1. e. relationship of groundspeed change to the performance of the maneuver.

You are never 100% downwind. Therefore you can never use your airspeed + 100% of the wind in the formula. Your airspeed changes throughout the maneuver, except perhaps during the straight and level section when crossing the road. When you climb to reach pivotal altitude your airspeed slows down, and the inverse happens when you descend. Nothing is totally predictable.

1. f. pilot's "line-of-sight" reference to the pylon.

NOTE: Read pages 6-12 and 6-13 of the Airplane Flying Handbook regarding "line of sight," with emphasis on the last sentence. Be sure that you understand that this is not a line from your eye to the wing tip to the point, but rather a line straight out from your eye over the tip of the wing parallel to the lateral axis of the airplane.

1. g. entry procedure.

I prefer finding two points well in advance. After descending to my pivotal altitude and performing my clearing turns to both look for traffic and maneuver into position, I fly between the two points, at an angle that gives me the distance from the first pylon I want for the angle of bank I want.

Now to the question: do I enter upwind or downwind? The norm is a downwind entry. Your answer is: Do I want to descend or climb when I start to pivot around the point? Enter downwind!

1. h. procedure for maintaining "line-of-sight" on the pylon.

Dive to the point or climb from the point.

1. i. proper planning for turn entries and rollouts.

Turns start and stop when your "line of sight" is on the pylon.

1. j. how to correct for wind drift between pylons.

Keeping the "line of sight" on the pylon is all you have to do during the turns. Crabbing between turns takes care of the rest.

k. coordination of flight controls.

Of all of the ground reference maneuvers, this is the one that pilots tend to try to "rudder around" the most. Don't let your student get in that habit.

COMMON ERRORS - Airplane Flying Flandbook, Page 6-16

RELATED MANEUVERS

Track a Road
Wind Circle
Turns Around a Point
Rectangular Course
S-Turns Across a Road
Turn Around a Pylon (one pylon)

XI. AREA OF OPERATION: SLOW FLIGHT, STALLS, AND SPINS

NOTE: The examiner must select at least one proficiency stall (TASK B or C). At least one demonstration stall (TASK D, E, F, or H) and TASK G.

Maneuvers
- Maneuvering During Slow Flight
- Power-On Stalls (Proficiency)
- Power-Off Stalls (Proficiency)
- Crossed-Control Stalls (Demonstration)
- Elevator Trim Stalls (Demonstration)
- Secondary Stalls (Demonstration)
- Spins
- Accelerated Maneuver Stalls (Demonstration)

An Instructor MUST have a good understanding of why we teach these maneuvers as well as what they relate to. With that basic information, what we teach will make a lot more sense to the student.

To begin there are two classes of maneuvers in this Area of Operation, those that we teach a student and expect the student to master, and those that we demonstrate to help make a point. We teach the first class of maneuvers because we want our students to be able to recognize and recover from certain situations. We demonstrate the second class of maneuvers to make a point about something that has caused problems or accidents.

The first class of maneuvers includes:
- Maneuvering During Slow Flight
- Power-On Stalls
- Power-Off Stalls

The second class of maneuvers includes:
- Crossed-Control Stalls (Demonstration)
- Elevator Trim Stalls (Demonstration)
- Secondary Stalls (Demonstration)
- Accelerated Maneuver Stalls (Demonstration)
- Spins

A bit about recoveries from stalls, Slow Flight, and Go Arounds/Rejected Landings. I teach all of these the same. That isn't exactly right according to the Airplane Flying Handbook.

The Airplane Flying Handbook makes the following statements.

Stalls
- First, at the indication of a stall, the pitch attitude and angle of attack must be decreased positively and immediately.
- Second, the maximum allowable power should be applied to increase the airplane's airspeed and assist in reducing the wing's angle of attack.
- Third, straight-and-level flight should be regained with coordinated use of all controls.

Slow Flight
- The handbook is silent on how to recover from or return to cruise from Slow Flight. The reality is if you are slow enough that you are really on the backside of the power curve, you have to lower the nose to increase

airspeed and add power to accelerate. If you do not reduce pitch you will have difficulty accelerating, but without power you will lose altitude. You have to modulate these two control inputs to both maintain altitude and increase airspeed back to cruise.

Go arounds/rejected landings

- Power is the pilot's first concern. The instant the pilot decides to go around, ***full*** or ***maximum allowable takeoff*** power must be applied smoothly and without hesitation, and held until flying speed and controllability are restored.
- Attitude is always critical when close to the ground, and when power is added, a deliberate effort on the part of the pilot will be required to keep the nose from pitching up prematurely.
- In cleaning up the airplane during the go-around, the pilot should be concerned first with flaps and secondly with the landing gear (if retractable).

Given the information in the Airplane Flying Handbook and my comment on Slow Flight, how do I argue in favor of doing all of these recoveries the same? Mostly, I want a student to react without thinking. I want his action to be automatic and most importantly, I want his reaction to be correct.

Let's look at when the language in the Airplane Flying Handbook has the potential of failing us. Your student has just crossed over the approach end of the runway and is flaring. The airplane is about 10 feet above the runway and is very slow. It begins to drift off the runway. The stall warning horn can be heard. Do you apply power first or push the nose forward? Another scenario: your student has decided he is high crossing the 50 foot obstacle and pushes the nose forward, real hard. You yell, "Go-around." Do you want your student to apply full power?

Here are my thoughts on consistent recovery techniques from stalls, Slow Flight, go-around/rejected landings and reality. There are too many variables to consider if you want to teach an absolute like pitch first, power second or power first, pitch second. If instead, you teach doing both at the same time and with understanding, I do not think that approach will ever fail you.

Maneuver	Airplane Flying Handbook	My Reality	Objective
Stalls	Attitude, Power, Configuration	Attitude and Power are accomplished simultaneously	The object is to reduce the angle of attack. This can be done two ways, move the cord line or move the relative wind.
Slow Flight	Silent on this topic	Attitude and Power are accomplished simultaneously	The object is to transition from the "back side of the power curve" to cruise flight.
Go-around/ rejected landings	Power, Attitude, Configuration	Attitude and Power are accomplished simultaneously	To transition from either an approach or a bad landing. In the case of an approach I am most likely in a descent with approach airspeed. If I am performing a bad landing I am slow and perhaps wallowing near a stall. In either case I want to keep from hitting the ground and transition to a climb.

NOTE: If you are performing a stall straight ahead, with no turn and in coordinated flight, I hope you agree that the nose drops straight ahead, vertically towards the center of the earth. Translated, it drops straight down and parallel to the vertical axis of the airplane. So how does an airplane stall in a turn? Same way, parallel to the vertical axis of the airplane. This assumes the airplane is in coordinated flight.

TASK: XI. A. MANEUVERING DURING SLOW FLIGHT

REFERENCES:

AC 61-67 Stall and Spin Awareness Training.
FAA-H-8083-3A - Airplane Flying Flandbook - Chapter 4.
FAA-S-8081-12B - Commercial PTS - AO VIII. A.
FAA-S-8081-14A - Private PTS - AO VIII. A.
POFI/AFM - Sections 2 and 4.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of maneuvering during slow flight by describing-
   a. relationship of configuration, weight, center of gravity, maneuvering loads, angle of bank, and power to flight characteristics and controllability.
   b. relationship of the maneuver to critical flight situations, such as go-around.
   c. performance of the maneuver with selected landing gear and flap configurations in straight-and-level flight and level turns.
   d. specified airspeed for the maneuver.
   e. coordination of flight controls.
   f. trim technique.
   g. re-establishment of cruise flight.
2. Exhibits instructional knowledge of common errors related to maneuvering during slow flight by describing-
   a. failure to establish specified gear and flap configuration.
   b. improper entry technique.
   c. failure to establish and maintain the specified airspeed.
   d. excessive variations of altitude and heading when a constant altitude and heading are specified.
   e. rough or uncoordinated control technique.
   f. improper correction for torque effect.
   g. improper trim technique.
   h. unintentional stalls.
   i. inappropriate removal of hand from throttles.
3. Demonstrates and simultaneously explains maneuvering during slow flight from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to maneuvering during slow flight.

STRATEGY

I am sure there are many reasons to teach maneuvering during Slow Flight. The most common reason expressed is to show the student how the flight controls respond at slower than cruise airspeeds. When I started out, we called the maneuver "Flight at Minimum Controllable Airspeed." Somewhere along the way the FAA changed the name of the maneuver to Slow Flight, and now it is called Maneuvering During Slow Flight. The definition of minimum controllable airspeed is that speed where any further increase in angle of attack, increase in load factor, or reduction in power would result in an immediate stall. Slow Flight is any speed higher than minimum controllable airspeed but not as fast as cruise.

A second reason we teach maneuvering during Slow Flight is that you have to go through it to get into stalls. Your students should be comfortable there.

Lastly, understanding Slow Flight will help your student understand the concept of flying on the backside of the power curve and therefore how to perform Short-field approaches.

I teach the entry into Slow Flight just like I do a traffic pattern.

After performing clearing turns, I have my students select a heading, usually aligned with fencerows. Then I have them follow the same pattern they would use in the traffic pattern except don't descend.

If I want a student to perform Slow Flight in the clean configuration, I ask him not to extend flaps or gear. When the airplane's airspeed approaches stall speed I would expect the student to take over with power and fly the airplane as slow as possible without stalling.

I treat a recovery from flight at minimum controllable airspeed the same as a recovery from a bad landing, a go-around, or a stall.

I expect him to **simultaneously** adjust the pitch attitude and apply full power, then readjust the pitch attitude, accelerate, and clean up the airplane. In the case of flight at minimum controllable airspeed, I expect the student to continue to maintain altitude and return to practice area cruise.

Element Strategy

1. a. relationship of configuration, weight, center of gravity, maneuvering loads, angle of bank, and power to flight characteristics and controllability.

A forward CG location will often cause the stalling AOA to be reached at a higher airspeed.

As the weight of the airplane is increased, the stall speed increases.

As the angle of bank increases, the stall speed will increase.

Stall speeds decrease with power.

1. b. relationship of the maneuver to critical flight situations, such as go-around.

As I indicated they are essentially the same.

1. c. performance of the maneuver with selected landing gear and flap configurations in straight-and-level flight and level turns.

This is a matter of setting up the configuration the same way they would in a traffic pattern, either clean or with some or all of the flaps.

1. d. specified airspeed for the maneuver.

What I am about to suggest requires a clear explanation so that a student doesn't get caught in the middle of figuring out the stall speed of an airplane and the parameters of the PTS. The current PTS does not allow the applicant to stall the airplane during a demonstration of maneuvering during Slow Flight. A long time ago it did, providing it was "intentional." I don't know when it changed, but it is no longer allowed. My point is, what is the stall speed during any specific configuration of flaps, gear, weight or CG? I don't know. But if I stall an airplane

and then add 5 knots or so to the airspeed that I stalled at, I am truly at the right airspeed.

There is a common concept that I hear over and over. Just add 5 knots to the bottom of the white arc and you have minimum controllable airspeed in the dirty configuration. This is not true. I can fly all of our trainers at an airspeed below the bottom of the white arc and not be in a stall. Remember, the bottom of the white arc represents the stall speed in the landing configuration without power. Power decreases the stall speed.

1. e. coordination of flight controls.

I like to address coordination this way:

- A good pilot should be able to feel a slip or a skid.
- Flight at minimum controllable airspeed is an incipient stall.
- A stall with the ball to the left or right of center is an incipient spin.
- A stall close to the ground is very bad.
- An uncoordinated stall close to the ground is fatal.

Coordination is simply applying the correct amount of rudder for the aileron being used and/or for some or all of the turning tendencies as applicable. Teach your student to keep the wings level or at the prescribed bank angle and also keep the ball centered with rudder. The biggest issue is probably control effectiveness. Remember, at slow speeds it takes more movement to attain the same effect you would get at cruise.

1. f. trim technique.

Teach your student to trim the pressures off and do it with patience.

1. g. re-establishment of cruise flight.

It's pitch and power, remembering you are on the back side of the power curve.

COMMON ERRORS - Airplane Flying Handbook, Page 4-2

RELATED MANEUVERS

Stalls
Go-arounds
Short-field Approach
Normal Traffic Patterns

TASK: XI. B. POWER-ON STALLS (PROFICIENCY)

REFERENCES:

AC 61-67 Stall and Spin Awareness Training
FAA-H-8083-3A - Airplane Flying Handbook - Chapter 4
FAA-S-8081-12B - Commercial PTS - AO VIII, Task C
FAA-S-8081-14A - Private PTS - AO VIII, Task C
POH/AFM - Sections 2 and 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of power-on stalls, in climbing flight (straight or turning), with selected landing gear and flap configurations by describing-
   a. aerodynamics of power-on stalls.
   b. relationship of various factors such as landing gear and flap configuration, weight, center of gravity, load factor, and bank angle to stall speed.
   c. flight situations where unintentional power-on stalls may occur.
   d. entry technique and minimum entry altitude.
   e. performance of power-on stalls in climbing flight (straight or turning).
   f. coordination of flight controls.
   g. recognition of the first indications of power-on stalls.
   h. recovery technique and minimum recovery altitude.
2. Exhibits instructional knowledge of common errors related to power-on stalls, in climbing flight (straight or turning), with selected landing gear and flap configurations by describing-
   a. failure to establish the specified landing gear and flap configuration prior to entry.
   b. improper pitch, heading, and bank control during straight-ahead and turning stalls.
   c. improper pitch and bank control during turning stalls.
   d. rough or uncoordinated control procedure.
   e. failure to recognize the first indications of a stall.
   f. failure to achieve a stall.
   g. improper torque correction.
   h. poor stall recognition and delayed recovery.
   i. excessive altitude loss or excessive airspeed during recovery.
   j. secondary stall during recovery.
3. Demonstrates and simultaneously explains power-on stalls, in climbing flight (straight or turning), with selected landing gear and flap configurations, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to power-on stalls, in climbing flight (straight or turning), with selected landing gear and flap configurations.

STRATEGY

Let me start with a bold statement. A stall is a stall is a stall. The same thing causes them all; you have exceeded the critical angle of attack. Therefore, isn't a stall recovery a stall recovery a stall recovery?

As far as why we teach stalls, we do that so our students will never stall an airplane inadvertently. Our obligation is to draw that picture for them so they won't find out what a stall is the hard way.

The reason we teach a Power on Stall is so the student won't stall the airplane during the takeoff or the takeoff climb. In the old days it was called a Takeoff and Departure Stall.

If you buy into that explanation, then we should try to do this stall in the takeoff and/or the departure phases of flight and in the configurations a student would encounter in those phases of flight.

In the Cessna 172 that would be clean, or with 10° of flaps. It is generally done simulating a rotation, at rotation airspeed, but it could be done in a climb starting at Vy or Vx or in a climbing turn.

I will describe a Power on Stall that starts at rotation airspeed. After performing clearing turns, I have my students select a heading, usually aligned with fencerows. Then I have them follow the same basic pattern they would use in the traffic pattern except don't descend and do not extend the flaps. (GUMPS, reduce power 500 RPM, hold altitude, slow to Vr)

NOTE: In general an applicant could be asked to extend the flaps appropriate for any of the takeoffs listed in the specific aircraft's AFM/POH.

Once they have established takeoff configuration I have them hold altitude until they get to rotation speed. At the rotation airspeed I have them increase pitch and "rotate." I generally suggest that they increase pitch a bit before the application of power so as not to climb to the moon.

Recovery from a power on stall begins "after the stall occurs." I have the students call out "horn, buffet, and break," at which time I want them to recover.

Recovery from a Power on Stall should include confirming they have full power and adjusting pitch to break the stall, simultaneously. The pitch shouldn't have to go below the horizon and generally to a pitch attitude near Vy. When the stall is broken, the airplane should be accelerated to Vy (it could also be Vx), and once in the green arc begin to clean-up the airplane. Climb to an altitude agreed to before the stall was started.

Upon reaching the assigned altitude, return to practice area cruise.

Element Strategies

1. a. aerodynamics of power-on stalls.

I had to think about this for a while. The only thing that is unique about a Power on Stall is power. This means accentuated turning tendencies. More torque, more "P' factor, and more slip stream; therefore more right rudder.

1. b. relationship of various factors such as landing gear and flap configuration, weight, center of gravity, load factor, and bank angle to stall speed.

A forward CG location will often cause the stalling AOA to be reached at a higher airspeed.

As the weight of the airplane is increased, the stall speed increases.

As the angle of bank increases, the stall speed will increase.

Stall speeds decrease with power.

1. c. flight situations where unintentional power-on stalls may occur.

Takeoffs and departures.

1. d. entry technique and minimum entry altitude.

The entry technique was described in the general strategy. Regarding minimum entry altitude, 3,000 feet AGL.

1. e. performance of power-on stalls in climbing flight (straight or turning).

Absolutely, the student should be comfortable doing these stalls straight and while turning.

1. f. coordination of flight controls.

I like to address coordination this way:

- A good pilot should be able to feel a slip or a skid.
- Flight at minimum controllable airspeed is an incipient stall.
- A stall with the ball to the left or right of center is an incipient spin.
- A stall close to the ground is very bad.
- An uncoordinated stall close to the ground is fatal.

Coordination is simply applying the correct amount of rudder for the aileron being used and/or for some or all of the turning tendencies as applicable. Teach your student to keep the wings level or at the prescribed bank angle and also keep the ball centered with rudder. The biggest issue is probably control effectiveness. Remember, at slow speeds it takes more movement to attain the same effect you would get at cruise.

1. g. recognition of the first indications of power-on stalls.

This should be a no brainer if you teach your students to call out "horn, buffet, and break," when they practice stalls.

h. recovery technique and minimum recovery altitude.

We are talking about a Power on Stall, correct? This means full power and a very high pitch attitude. I do not think there should be any loss of altitude. Recovery is a matter of applying power that should already be fully applied and reducing the airplane's pitch attitude. I propose that the "new" pitch attitude should never be below the horizon, and generally it should be close to a best rate of climb pitch attitude.

COMMON ERRORS - Airplane Flying Handbook, Page 4-12

RELATED MANEUVERS

Stalls
Go-arounds
Normal Takeoff and Climb
Normal Traffic Patterns

TASK: XI. C. POWER-OFF STALLS (PROFICIENCY)

REFERENCES:

AC 61-67 Stall and Spin Awareness Training
FAA-H-8083-3A - Airplane Flying Flandbook - Chapter 4
FAA-S-8081-12B - Commercial PTS - AO VIII, Task B
FAA-S-8081-14A - Private PTS - AO VIII, Task B
POH/AFM - Sections 2 and 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of power-off stalls, in descending flight (straight or turning), with selected landing gear and flap configurations by describing-
   a. aerodynamics of power-off stalls.
   b. relationship of various factors, such as landing gear and flap configuration, weight, center of gravity, load factor, and bank angle to stall speed.
   c. flight situations where unintentional power-off stalls may occur.
   d. entry technique and minimum entry altitude.
   e. performance of power-off stalls in descending flight (straight or turning).
   f. coordination of flight controls.
   g. recognition of the first indications of power-off stalls.
   h. recovery technique and minimum recovery altitude.
2. Exhibits instructional knowledge of common errors related to power-off stalls, in descending flight (straight or turning), with selected landing gear and flap configurations by describing-
   a. failure to establish the specified landing gear and flap configuration prior to entry.
   b. improper pitch, heading, and bank control during straight-ahead stalls.
   c. improper pitch and bank control during turning stalls.
   d. rough or uncoordinated control technique.
   e. failure to recognize the first indications of a stall.
   f. failure to achieve a stall.
   g. improper torque correction.
   h. poor stall recognition and delayed recovery.
   i. excessive altitude loss or excessive airspeed during recovery.
   j. secondary stall during recovery.
3. Demonstrates and simultaneously explains power-off stalls, in descending flight (straight or turning), with selected landing gear and flap configurations, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to power-off stalls, in descending flight (straight or turning), with selected landing gear and flap configurations.

STRATEGY

Let me start with a bold statement. A stall is a stall is a stall. The same thing causes them all, you have exceeded the critical angle of attack. Therefore isn't a stall recovery a stall recovery a stall recovery?

As far as why we teach stalls, we do that so our students will never stall an

airplane inadvertently. Our obligation is to draw that picture for them so they won't find out what a stall is the hard way.

The reason we teach a Power Off Stall is so the student won't stall the airplane during a landing, except during the flare. In the old days it was called an approach to landing stall. Same stall, different name? I think so. But "Approach to Landing" sets a tone that is important.

If you buy into that explanation, then we should try to do this stall just like it would happen in an approach to landing, let's say at 100 feet AGL, while trying to stretch the glide.

In the Cessna 172 that would be with full flaps. It could also be done clean.

I will describe a Power off Stall that starts in a glide, at final approach airspeed, in the landing configuration. Start the maneuver at 3,000 feet AGL.

After performing clearing turns, I have my students select a heading, usually using fencerows and have them perform a prelanding checklist. Then I have them follow the same pattern they would use in the traffic pattern except there is no need to descend until they slow to final approach airspeed with full flaps and gear. Once they have established a 60 knot approach, I have them reduce power to idle and level off at a specified altitude. As the airspeed decreases, I have them call out "horn, buffet, and brake," at which time I want them to recover. Recovery from a power off stall begins "after the stall occurs." I expect them to simultaneously reduce the angle of attack, apply full power, (level the wings if they were in a turn), return to a straight and-ievel flight attitude with a minimum loss of altitude. Next I expect them to both accelerate and climb. Once in the green arc, I expect them to begin cleaning up the airplane, climbing at Vy (Vx is also an option) and finish retracting the flaps.

The demonstration is over when they reach the assigned altitude and return to practice area cruise.

Element Strategies

1. a. aerodynamics of power-off stalls.

If you were in a glider there wouldn't be much to talk about other than the excessive angle of attack and reducing it to recover from the stall. In the case of an airplane, all of the aerodynamics are the same until we add power and have to deal with turning tendencies.

1. b. relationship of various factors, such as landing gear and flap configuration, weight, center of gravity, load factor, and bank angle to stall speed.

A forward CG location will often cause the stalling AOA to be reached at a higher airspeed.

As the weight of the airplane is increased, the stall speed increases.

As the angle of bank increases, the stall speed will increase.

Extended flaps reduces the stall speed; they also increase drag.

Stall speeds decrease with power.

Extended landing gear tends to stabilize an airplane.

1. c. flight situations where unintentional power-off stalls may occur.

Power off stalls occur either during a normal approach or during a power off glide. In either case, I would look to "stretching the glide" as the situation where

unintentional power-off stalls may occur. You should also look to a student's inability or unwillingness to "push the nose over" when short of the runway and close to the ground.

1. d. entry technique and minimum entry altitude.

The entry technique has already described in the general strategy. Regarding minimum entry altitude, 3,000 feet AGL.

1. e. performance of power-off stalls in descending flight (straight or turning).

Absolutely, the student should be comfortable doing these stalls straight and while turning.

1. f. coordination of flight controls.
I like to address coordination this way:
- A good pilot should be able to feel a slip or a skid.
- Flight at minimum controllable airspeed is an incipient stall.
- A stall with the ball to the left or right of center is an incipient spin.
- A stall close to the ground is very bad.
- An uncoordinated stall close to the ground is fatal.

Coordination is simply applying the correct amount of rudder for the aileron being used and/or for some or all of the turning tendencies as applicable. Teach your student to keep the wings level or at the prescribed bank angle and also keep the ball centered with rudder. The biggest issue is probably control effectiveness. Remember, at slow speeds it takes more movement to attain the same effect you would get at cruise.

1. g. recognition of the first indications of power-off stalls.

This should be a no brainer if you teach your students to call out "horn, buffet, and break," when they practice stalls.

1. h. recovery technique and minimum recovery altitude.

The stall recovery for this stall is basically the same as any stall, lower the pitch attitude to lower the angle of attack and apply power to assist in changing the angle of attack as well as provide lift to turn the descent into a climb. The big difference with this stall is that we are generally in a descent and close to the ground; that's why it used to be called an Approach to Landing Stall

Recovering from any stall is a matter of lowering the pitch attitude enough to break the stall. In this case that pitch attitude may very well be below the horizon, at least long enough to regain flying speed. The trick is to lower it enough to break the stall and not lose too much altitude. I suggest that there should be a relatively quick transition between pitching down enough to break the stall and raising the pitch up to begin a climb at Vy (or Vx). The next step is to clean up the airplane once in the green arc.

COMMON ERRORS - Airplane Flying Handbook, Page 4-12

RELATED MANEUVERS

Stalls
Go-arounds
Normal Approach and Landing
Normal Traffic Patterns

TASK: XI. D. CROSSED-CONTROL STALLS (DEMONSTRATION)

REFERENCES

AC 61-67 Stall and Spin Awareness Training
FAA-H-8083-3A - Airplane Flying Handbook - Chapter 4
FAA-S-8081-12B - Commercial PTS - None
FAA-S-8081-14A - Private PTS - None
POH/AFM - Sections 2 and 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of crossed-control stalls, with the landing gear extended by describing-
   a. aerodynamics of crossed-control stalls.
   b. effects of crossed controls in gliding or reduced airspeed descending turns.
   c. flight situations where unintentional crossed-control stalls may occur.
   d. entry procedure and minimum entry altitude.
   e. recognition of crossed-control stalls.
   f. recovery procedure and minimum recovery altitude.
2. Exhibits instructional knowledge of common errors related to crossed-control stalls, with the landing gear extended by describing-
   a. failure to establish selected configuration prior to entry.
   b. failure to establish a crossed-control turn and stall condition that will adequately demonstrate the hazards of a crossed-control stall.
   c. improper or inadequate demonstration of the recognition and recovery from a cross-control stall.
   d. failure to present simulated student instruction that emphasizes the hazards of a cross-control condition in a gliding or reduced airspeed condition.
3. Demonstrates and simultaneously explains a crossed-control stall, with the landing gear extended, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a crossed-control stall with the landing gear extended..

STRATEGY

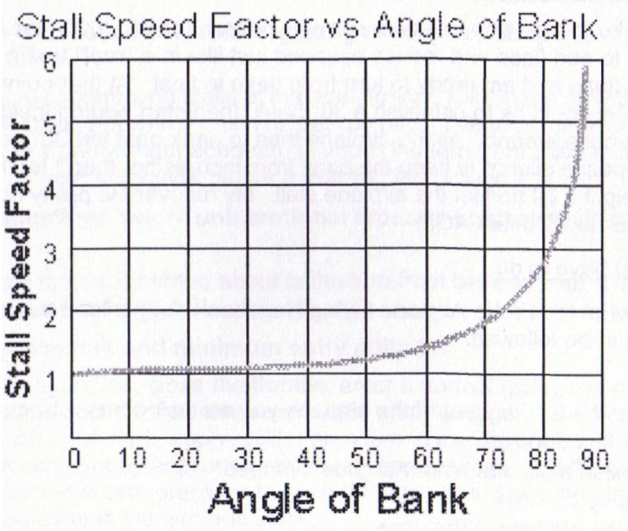
This is a demonstration stall.

I refer to this stall as **"the Instructor caused stall."** The Instructor tells the student two conflicting things and with vehemence: never bank more than 30° in the traffic pattern and never fly through the extended centerline. If Instructors would stop telling students these lies, we wouldn't need this demonstration.

Before I tell you how I demonstrate this maneuver, let me tell you what I do to keep it from happening. I teach my students to understand the concept of Vref. I teach them to apply flaps and then slow to a predetermined airspeed. Then I teach them what the effect of a bank is on stall speed.

If we were flying in a Cessna 172, we would fly the downwind at 90 knots. Abeam the numbers we would reduce power approximately 500 RPM and apply carburetor heat. Next we would hold altitude and apply the first notch of flaps. Then we would slow to 80 knots and trim. We would hold 80 knots until we applied the second notch of flaps and then, and only then, would we slow to 70

knots. We would hold 70 knots until we applied full flaps, and then we would slow to 60 knots. This concept assures that we always have at least a 30% buffer on our stall speed, 1.3 X Vso. If my bank is 30° my new stall speed will be about 7% higher than 0° bank. I have consumed about 25% of my buffer. If my bank reaches 45° my stall speed is increased by 19%. I have consumed about 65% of my buffer.



So here is what I tell my students. "If you ever cross-control an airplane to keep from overshooting final, I will come back from my grave and haunt you.'' Remember why you extend flaps and then slow down; it provides you with stall protection. Rather than cross-controlling, steepen your bank. Up to 45° of bank is better than pushing the airplane around the turn with the rudder. If 45° of bank isn't enough to keep you from going through final, call the tower if you have conflicting traffic.

Bank angle	Cosine	Load factor needed [wing loading increase]	Vs multiplier [increase]
10°	0.98	1.02g [+2%]	1.01 [+1%]
15°	0.965	1.04g [+4%]	1.02 [+2%]
20°	0.94	1.06g [+6%]	1.03 [+3%]
30°	0.87	1.15g [+15%]	1.07 [+7%]
40°	0.77	1.30g [+30%]	1.14 [+14%]
45°	0.71	1.41g [+41%]	1.19 [+19%]
50°	0.64	1.56g [+56%]	1.25 [+25%]
54°	0.59	1.70g [+70%]	1.3 [+30%]
60°	0.50	2.00g [+100%]	1.41 [+41%]

Now as to how I do this demonstration. Like the situation that causes the stall, demonstrating it also has a conflict. I prefer to demonstrate the stall in the context of a traffic pattern and a turn from base to final. This means when we reach 30° of bank we add rudder while adding opposite aileron and increasing our pitch until we stall.

What I would like to do

I would like to start from a standard traffic pattern but at 3,000 feet AGL. I would then like to add flaps and reduce airspeed just like in a "real" traffic pattern until I have full flaps and am ready to turn from base to final. At that point my preference would be to establish a 30° bank, then start adding inside rudder to push the nose around. As the airplane tries to bank past the 30° point, I would apply opposite aileron to keep the bank from increasing, then I let the nose come up, or help it a bit and let the airplane stall. My recovery is pretty normal and we climb back to 3,00 feet AGL.

What you have to do

Here is what the FAA's Airplane Flying Handbook suggests. I think it has merit and should be followed.

Entry

- Lower the landing gear if the airplane you are using has retractable gear.
- Close the throttle.
- Establish a glide at a normal glide airspeed.
- Flaps up.
- Trim the airplane in the glide.
- Roll into a 30° bank.
- Apply excessive inside rudder.
- Apply opposite aileron to keep a 30° bank.
- Increase back pressure to keep the nose from lowering.
- Increase rudder, aileron and elevator until the airplane stalls.

Recovery

- Release control pressures and,
- Apply power as necessary

Note about the actual stall

- There may be very little warning of the stall.
- The nose may drop.
- The inside wing may drop suddenly.
- The airplane may roll inverted.
- Consider this to be the beginning of a spin.

Now for the problems

Modern airplanes are built so that cross-controlled stalls won’t happen, especially with flaps extended. If you do the stall clean you may very well get a snap and a roll. If you don't agree with my choice of 3,000 feet AGL for "upper air" maneuvers, believe me on this one. If you are inexperienced with this maneuver, you may even want to start at 4,000 feet AGL. Recognize that if your airplane will stall during the demonstration, there is a chance you will end up in a spiral or a spin. Don’t forget this is a stall that is performed in an uncoordinated turn.

Element Strategies

1. a. aerodynamics of crossed-control stalls.

Make sure you understand the aerodynamics of a cross-controlled stall. Read page 4-10 and 4-11 of the Airplane Flying Handbook. My explanation is that the airplane stalls with excessive rudder on the inside of a forced turn and rolls over into a spin.

1. b. effects of crossed controls in gliding or reduced airspeed descending turns.

The effect of cross-controlled stalls is that the airplane rolls in the direction of the rudder, like all stalls, but with a much higher roll rate. The airplane also pitches down excessively and without adequate altitude (the turn from base to final) the pilot may not be able to recover before impacting the ground.

1. c. flight situations where unintentional crossed-control stalls may occur.

The one we are most concerned about is the turn from base to final, which is generally less than 500 feet AGL.

1. d. entry procedure and minimum entry altitude.

In the clean configuration, close the throttle, enter a normal glide, and roll the airplane into a medium-banked turn to simulate a turn to final. To simulate trying not to fly through centerline, apply rudder pressure in the direction of the turn. Hold the bank constant by applying opposite aileron pressure. At the same time, increase the back-elevator pressure to keep the nose from lowering. Increase all of these pressures until the airplane stalls.

1. e. recognition of crossed-control stalls.

The Airplane Flying Handbook says that the roll rate may be so fast that the bank may be vertical or past vertical before it can be stopped. This may be true in some airplanes, but I haven't experienced it. Nonetheless, I perform all stalls at or above 3,000 feet AGL. Until you have mastered this stall you might consider at or above 4,000 AGL. Other than a roll rate that is faster than other stalls, all of the other indications are the same as other stalls.

1. f. recovery procedure and minimum recovery altitude.

As I indicate above I do not do stalls below 3,000 feet AGL. That means my recovery altitude is generally well above 2,500 feet AGL. Again, I have to refer you to the Airplane Flying Handbook, which says that this stall may occur with little warning. Once the stall is recognized though, the recovery is the same as other stalls, except you may be recovering from a spin. If the airplane does not roll excessively, treat the stall as any other. If you experience an excessive roll rate you are effectively entering into a spin. **The airplane Flying Handbook recommends releasing the control pressures and applying power as necessary.**

COMMON ERRORS - Airplane Flying Handbook, Page 4-12

RELATED MANEUVERS

Stalls
Go-arounds
Normal Approach and Landing
Normal Traffic Patterns

TASK: XI E. ELEVATOR TRIM STALLS (DEMONSTRATION)

REFERENCES

AC 61-67 Stall and Spin Awareness Training
FAA-H-8083-3A - Airplane Flying Handbook - Chapter 4
FAA-S-8081-12B - Commercial PTS - None
FAA-S-8081-14A - Private PTS - None
POH/AFM - Sections 2 and 4

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of elevator trim stalls, in selected landing gear and flap configurations by describing-
   a. aerodynamics of elevator trim stalls.
   b. hazards of inadequate control pressures to compensate for thrust, torque, and up-elevator trim during go-around and other related maneuvers.
   c. entry procedure and minimum entry altitude.
   d. recognition of elevator trim stalls.
   e. importance of recovering from an elevator trim stall immediately upon recognition.
2. Exhibits instructional knowledge of common errors related to elevator trim stalls, in selected landing gear and flap configurations by describing-
   a. failure to present simulated student instruction that adequately emphasizes the hazards of poor correction for torque and up-elevator trim during go-around and other maneuvers.
   b. failure to establish selected configuration prior to entry.
   c. improper or inadequate demonstration of the recognition of and the recovery from an elevator trim stall.
3. Demonstrates and simultaneously explains elevator trim stalls, in selected landing gear and flap configurations, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to elevator trim stalls in selected landing gear and flap configurations.

STRATEGY

This is a demonstration stall.

I do this maneuver **exactly the same way I do a Power On Stall, except with full aft trim.** As the airplane slows down towards rotation airspeed, roll in aft trim. When you get to rotation airspeed, simply add full power, let the nose come up on its own and let the airplane stall. **(If** the airplane won't pitch up quite enough to stall on its own, help it, but no more than is absolutely necessary.)

If at all possible, try to make it obvious that the airplane is pitching up on its own because of too much trim.

Recovery should be the same as the Power On Stall, but keep in mind that you have excessive aft trim to fight and remove.

Element Strategies

1. a. aerodynamics of elevator trim stalls.

Other than excessive aft trim the aerodynamics of this stall are the same as a power on stall.

1. b. hazards of inadequate control pressures to compensate for thrust, torque, and up-elevator trim during go-around and other related maneuvers.

Recognize that there are more than likely two mistakes happening at one time. The trim isn't set properly, and the pilot isn't recognizing the situation he is in and is caught unaware. Regarding compensating for thrust and torque, it should be the same as a power on stall.

1. c. entry procedure and minimum entry altitude.

Same as a Power on Stall.

1. d. recognition of elevator trim stalls.

Same as a Power on Stall.

1. e. importance of recovering from an elevator trim stall immediately upon recognition.

You are slow, and you are close to the ground.

COMMON ERRORS - Airplane Flying Handbook, Page 4-12

RELATED MANEUVERS

Stalls
Go-arounds
Normal Takeoff and Climb
Normal Traffic Patterns

TASK: XI. F. SECONDARY STALLS (DEMONSTRATION)

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 4
FAA-S-8081-12B - Commercial PTS
FAA-S-8081-14A - Private PTS
POH/AFM.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of secondary stalls, in selected landing gear and flap configurations by describing—
    a. aerodynamics of secondary stalls.
    b. flight situations where secondary stalls may occur.
    c. hazards of secondary stalls during normal stall or spin recovery.
    d. entry procedure and minimum entry altitude.
    e. recognition of a secondary stall.
    f. recovery procedure and minimum recovery altitude.
2. Exhibits instructional knowledge of common errors related to secondary stalls, in selected landing gear and flap configurations by describing—
    a. failure to establish selected configuration prior to entry.
    b. improper or inadequate demonstration of the recognition of and recovery from a secondary stall.
    c. failure to present simulated student instruction that adequately emphasizes the hazards of poor procedure in recovering from a primary stall.
3. Demonstrates and simultaneously explains secondary stalls, in selected landing gear and flap configurations, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to secondary stalls in selected landing gear and flap configurations.

STRATEGY

This is a demonstration stall.

Among my various ratings, I am lucky to include gliders. The importance of that is flying without power and out of necessity recovering from stalls without power.

Since this is a demonstration stall, I like to do it without power, and I like to recover without power.

This may be the only time a student gets to do stalls like this.

Recovering from a stall using only pitch has an added benefit, of showing the student that it is reducing the angle of attack that breaks the stall and that reducing the angle of attack can be done with pitch alone.

After performing clearing turns and a GUMPS check (for habit), I simply reduce the power to idle and start a glide at best glide airspeed and in the clean configuration. When the proper airspeed is stabilized, all you have to do is increase pitch gently and hold altitude. When the stall occurs I push the nose over and recover back to best glide airspeed. I do not apply power. Next I repeat the maneuver, but this time I break the stall with pitch and then re-increase the pitch almost immediately. This results in a secondary stall.

Remember this is a demonstration stall only. Your task is to get a point across, not make the student proficient in the maneuver. Having said this, let the student try one.

Here is a variation of this stall that the FAA used to do at the Academy. It's called the “Falling Leaf’ maneuver. Start about 4,000 feet AGL if you want to incorporate this into the secondary stall demonstration. After you let the student do a power off stall and then recover too soon, let them do a power off stall and do not recover. Instead hold the controls full aft and let the plane oscillate in and out of the stall. The benefit of this is to experience stalls for an extended period of time and to see the effect of rudder. The biggest problem the student will face is keeping the ball centered.

Element Strategies

1. a. aerodynamics of secondary stalls.

Recovering from a stall is all about reducing the angle of attack. In this case the pilot accomplished that, but then increased it, perhaps even accelerating it such that the airplane re-stalls. Nothing else about this stall is unique.

1. b. flight situations where secondary stalls may occur.

Any of the stalls are candidates for a secondary stall. It is simply a matter of reintroducing an excessive angle of attack right after a recovery.

1. c. hazards of secondary stalls during normal stall or spin recovery.

Think of this as an injury that is aggravated. Chances are the second time around will be worse.

1. d. entry procedure and minimum entry altitude.

I do all of my stalls at or above 3,000 feet AGL. Read my thoughts on this stall in the general strategy section above.

1. e. recognition of a secondary stall.

I would like to say that this is a no brainer since you teach your students to call out "horn, buffet, and break,” when they practice stalls. The cause of a secondary stall is a student overreacting because of panic. If they experience a secondary stall it is because they didn’t recover completely from the first stall. Perhaps the best way to approach this problem is by teaching a proper recovery technique.

1. f. recovery procedure and minimum recovery altitude.

This is tough. We are talking about a recovery from a botched recovery and the question is proper procedure and minimum recovery altitude. Proper recovery is adjusting pitch so as to regain flying speed without re-stalling the airplane and diving to the ground. My only answer to the minimum recovery altitude question is 1,500 feet AGL, but then I start at or above 3,000 feet AGL.

COMMON ERRORS - Airplane Flying Handbook, Page 4-12

RELATED MANEUVERS

Stalls
Power off Glides

TASK: XI. G. SPINS

NOTE: At the discretion of the examiner, a logbook record attesting applicant instructional competency in spin entries, spins, and spin recoveries may be accepted in lieu of this TASK. The flight instructor who conducted the spin instruction shall certify the logbook record.

REFERENCES

14 CFR part 23
Type Certificate Data Sheet
AC 61-67
FAA-H-8083-3A - Airplane Flying Handbook - Chapter 4
POH/AFM.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of spins by describing-
    a. anxiety factors associated with spin instruction.
    b. aerodynamics of spins.
    c. airplanes approved for the spin maneuver based on airworthiness category and type certificate.
    d. relationship of various factors such as configuration, weight, center of gravity, and control coordination to spins.
    e. flight situations where unintentional spins may occur.
    f. how to recognize and recover from imminent, unintentional spins.
    g. entry procedure and minimum entry altitude for intentional spins.
    h. control procedure to maintain a stabilized spin.
    i. orientation during a spin.
    j. recovery procedure and minimum recovery altitude for intentional spins.
2. Exhibits instructional knowledge of common errors related to spins by describing-
    a. failure to establish proper configuration prior to spin entry.
    b. failure to achieve and maintain a full stall during spin entry.
    c. failure to close throttle when a spin entry is achieved.
    d. failure to recognize the indications of an imminent, unintentional spin.
    e. improper use of flight controls during spin entry, rotation, or recovery.
    f. disorientation during a spin.
    g. failure to distinguish between a high-speed spiral and a spin.
    h. excessive speed or accelerated stall during recovery.
    i. failure to recover with minimum loss of altitude.
    j. hazards of attempting to spin an airplane not approved for spins.
3. Demonstrates and simultaneously explains a spin (one turn) from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to spins..

STRATEGY

A couple of things pop in my mind when I discuss spins.

The first is the certification requirements for non-aerobatic airplanes. The manufacturer is only required to demonstrate a single turn. Do more than that, and you are a test pilot. I don't get paid to be a test pilot, I don't go around more

than once. Actually, **I** want my students to go around **exactly** once and recover on the same heading where they started.

Next are definitions. Slow Flight can be defined as an incipient stall, and a stall performed incorrectly can be defined as an incipient spin. So what turns an otherwise fine stall into a spin? It's a lack of coordination, too much rudder. So how do you force an airplane into a spin? Read the manufacturer's manual, read the Airplane Flying Handbook and stall the airplane with too much rudder. My preference: full left rudder.

By the way, start these at 4,500 feet AGL or above.

You can read all about spins to answer the questions of Element 1. I will limit my Element specific strategies to Element 1. i.

1. i. orientation during a spin.

I strongly suggest that you perform one turn spins. To do that accurately, I prefer fencerows. I roll into the spin on one set of fencerows and count the intersecting fencerows one at a time, 90°, 180°, 270°, and roll out on the entry heading.

COMMON ERRORS - Airplane Flying Handbook, Page 4-12

RELATED MANEUVERS

Stalls
Slow Flight

TASK: XI. H. ACCELERATED MANEUVER STALLS (DEMONSTRATION)

NOTE: This TASK shall be completed by oral examination or demonstration at discretion of examiner.

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 4
POH/AFM.

OBJECTIVE

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of accelerated maneuver stalls by describing—
    a. aerodynamics of accelerated maneuver stalls.
    b. flight situations where accelerated maneuver stalls may occur.
    c. hazards of accelerated stalls during stall or spin recovery.
    d. entry procedure and minimum entry altitude.
    e. recognition of the accelerated stall.
    f. recovery procedure and minimum recovery altitude.
2. Demonstrates and simultaneously explains accelerated maneuver stall, from an instructional standpoint—
3. Exhibits instructional knowledge of common errors related to accelerated maneuver stalls by describing—
    a. failure to establish proper configuration prior to entry.
    b. improper or inadequate demonstration of the recognition of and recovery from an accelerated maneuver stall.
    c. Failure to present simulated student instruction that adequately emphasizes the hazards of poor procedures in recovering from an accelerated stall.
4. Analyzes and corrects simulated common errors related to accelerated stalls.

STRATEGY

This is a demonstration stall.

There is one major reason why we demonstrate Accelerated Maneuver Stalls. It is to show a student, no, to prove to a student, that an airplane will stall at a higher airspeed in a bank (or with an accelerated pull up) than in straight and level flight.

The question is how do we do this. The answer is simple. Do it like a scientist proving a theory and have only one variable, the angle of bank.

Start while on the ground with a look at the Stall Speed Factor vs. Angle of Bank chart. Figure out what your stall speed should be straight and level at 45° of bank. Write them down and take them with you to the airplane.

Perform this stall series at 3,000 feet AGL and in the clean configuration. Reduce the power such that the airplane will not be able to sustain flight without stalling, but do not reduce the power completely. In a Cessna 172, try reducing

power by 500 RPM and apply carburetor heat. Maintain altitude until the airplane stalls. Have your student record the following things: altitude, power setting, the airspeed when the horn is first heard, the airspeed when the airplane buffets, and the airspeed when the stall breaks.

Next recover, returning to the exact same altitude, power setting, and entry airspeed. Now reduce the power as you did before, but at an airspeed about 60% higher than the previous stall airspeed, roll into a 45° bank while maintaining altitude. Have your student record the following things: altitude, power setting, the airspeed when the horn is first heard, the airspeed when the airplane buffets, and the airspeed when the stall breaks.

XII. AREA OF OPERATION: BASIC INSTRUMENT MANEUVERS

NOTE: The examiner shall select at least one TASK.

General Strategy

The last NOTE in Area of Operation, VIII Fundamentals of Flight was: **During my discussion of Fundamentals of Flight I use the term "Natural Horizon" when describing pitch and bank. Replace that term with "Artificial Horizon" if performing the same maneuver under the hood.**

In Area of Operation VIII Fundamentals of Flight, I started by pointing to the similarity between that Area of Operation and Area of Operation XII Basic Instrument Maneuvers. I said that I believe the way you teach the two Areas of Operation was the same. Keep what I said there in mind as you read this strategy. Here I will address the strategy of teaching Basic Instrument Maneuvers.

Between the two Areas of Operation, there are eight maneuvers, four maneuvers from Fundamentals of Flight and four from Basic Instrument Maneuvers. The individual Tasks are:

Basic Instrument Maneuvers	**Fundamentals of Flight**
Straight-and-Level Flight	Straight-and-Level Flight
Constant Airspeed Climbs	a lot like Straight Climbs and Climbing Turns?
Constant Airspeed Descents	a lot like Straight Descents and Descending Turns?
Turns to Headings	same as Level Turns?

Fundamentals of Flight	**Basic Instrument Maneuvers**
Straight-and-Level Flight	Straight-and-Level Flight
Level Turns	same as Turns to Headings?
Straight Climbs and Climbing Turns	a lot like Constant Airspeed Climbs?
Straight Descents and Descending Turns	a lot like Constant Airspeed Descents?

To be successful at teaching either of these Areas of Operation you must clearly define three concepts:

1. The definition of "What you want the student to do."
2. What a primary instrument is, what a secondary/supporting instrument is and what a transition instrument is.
3. What a crosscheck (also called an instrument scan) is and what it should look like.

Let's begin with what you want the student to do. As the Instructor you have to clearly define the objective. I have found that if the student has a clear understanding of what is expected, he will do his best to do what he is asked to do. If he is unclear about the task he will flounder, and you may not catch on to what is happening. For our discussion, we will use **straight and level flight, at 3,000 feet MSL, on a heading of 360° and at an airspeed of 90 knots.** Clearly stating or defining those parameters represents the first concept: "What you want the student to do."

Next you will need to define what a primary instrument is, what a secondary/supporting instrument is, and what a transition instrument is. Still using the example of **straight and level flight, at 3,000 feet MSL, on a heading of 360° and at an airspeed of 90 knots;**

your primary Instruments are:

What you want the student to do	Primary Instrument (Basic Instruments)	Primary "Instrument" (Integrated Method)
3,000 feet MSL	Altimeter	Altimeter
Heading of 360°	Directional Gyro	Road or prominent point
Airspeed of 90 knots	Airspeed Indicator	Airspeed Indicator

your secondary/supporting instruments are:

What you want the student to do	Secondary/Supporting Instruments (Basic Instruments)	Secondary/Supporting "Instrument" (Integrated Method)
	Attitude Indicator	Airplane's attitude with reference to natural horizon Altimeter
	The turn and bank indicator	Seat of your pants
	The tachometer/manifold gauge	The tachometer/manifold gauge
	The vertical speed indicator	The vertical speed indicator

In this case there isn't a transition instrument. If you were transitioning from or to straight and level flight,

your transition instrument would be:

	Transition Instrument (Basic Instruments)	Transition "Instrument" (Integrated Method)
	Attitude Indicator	Airplane's attitude with reference to natural horizon Altimeter

- **A primary instrument is the only instrument that will confirm that "you are doing what you want to be doing."**
- **are doing what you want to be doing."**
- **A secondary/supporting instrument will be that instrument that helps the pilot achieve the desired objective but doesn't actually confirm that "you are doing what you want to be doing."**
- **A transition instrument is an instrument you use to transition from one flight regime to another, from straight and level to a 30° bank turn, from a climb to level flight. The artificial horizon (or the real one in concert with the airplane) is almost always the transition instrument.**

Now to the concept of crosscheck. I teach Basic Instrument Maneuvers using the hub-and-spoke method. I define the "what" of what we are trying to do. Next I remind the student of what the primary instruments are and then guide him through crosschecking the instruments or the natural horizon and the instruments as applicable. I become his crosscheck, at least until he becomes proficient with his own.

Here is how I **introduce** Basic Instrument Maneuvers, starting with lesson two or three. Once at altitude, generally 3000 feet MSL, I have the student put on the hood while I fly the airplane. Once under the hood, I tell him what our airspeed, altitude, and heading are, and I give him back the controls. I ask him to continue flying straight and level. Just like Fundamentals of Flight I do most of the teaching in the air. I teach this by letting the student fly the airplane. I try to relate what he is doing under the hood with what he did with the natural horizon. I start with straight and level flight and progress to turns to and from specific headings. As the student's crosscheck gets better we move to descents, still at practice area cruise and with a 500 FPM rate of descent. Finally we move to climbs and climbing turns which we do with full power.

I constantly remind the student of: what I want him do, and what will tell the student that he is doing what I want him to do. Again it is important to say that I am his crosscheck for the time being.

I believe the clear understanding of what you want the airplane to do and what the primary instrument or visual reference is, represents the key to both Fundamentals of Flight and Basic Instrument Maneuvers.

Teaching these Basic Instrument Maneuvers takes place for about 10 to 20 minutes per lesson until the student has logged about 2 hours under the hood.

Basic Concepts.....

- What I want to do!
- What will tell me that I am doing what I want to do?

Heading

- 360° - directional gyro/compass

Altitude/glideslope

- 3,000 feet MSL - the altimeter

Airspeed/rate of descent

- 90 knots - the airspeed indicator
- 500 FPM rate of descent - vertical speed indicator

Bank or rate of turn

- 30° bank - an attitude indicator
- standard rate of turn - turn needle/15% of stall speed on attitude indicator

Coordinated flight

- The inclinometer (the ball in the smiley face)

The cross check (scan).....

Next I explain the concepts of scanning, primary instruments, secondary/supporting instruments, using both the flight instrument and outside references.

As I indicated earlier, I am a proponent of the hub-and-spoke method. Under the hood, the attitude indicator serves as the hub. As to the spokes, the primary instruments are the major spokes and supporting instruments are smaller spokes. Spokes is spokes whether flying with the natural horizon of the artificial one.

As we fly around I have the student control the airplane's attitude by referring to the attitude indicator and taking peeks at the airspeed indicator for airspeed, the directional gyro for heading, and the altimeter for altitude. When it looks like this is getting through, I add in the secondary instruments like the tachometer, the turn and slip indicator, and the vertical speed indicator.

The lift drag demo.....

I do not do the lift drag demo as part of Area of Operation XII, Basic Instrument Maneuvers. Instead I have a modified version of an old instrument procedure called pattern "A" and pattern "B" that I like to use. Mostly it is designed to help with scanning techniques. You can make up your own pattern, just give it some thought.

NOTE: The information gained by this demonstration makes flying much more systematic.

NOTE: The reason for teaching a student BASIC INSTRUMENT MANEUVERS IS TO IMPROVE HIS ABILITY TO FLY VFR AND IN THE EVENT OF NON VFR CONDITIONS SURVIVE THE EXPERIENCE. WE ARE NOT TRYING TO MAKE HIM AN INSTRUMENT RATED PILOT.

TASK: XII. A. STRAIGHT-AND-LEVEL FLIGHT

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3.
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 and 5.
FAA-S-8081-14A - Private PTS - AO IX. Task A.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of straight-and-level flight solely by reference to instruments by describing -
    a. instrument crosscheck, instrument interpretation, and aircraft control.
    b. instruments used for pitch, bank, and power control, and how those instruments are used to maintain altitude, heading, and airspeed.
    c. trim procedure.
2. Exhibits instructional knowledge of common errors related to straight-and level flight solely by reference to instruments by describing—
    a. “fixation,” “omission," and “emphasis" errors during instrument crosscheck.
    b. improper instrument interpretation.
    c. improper control applications.
    d. failure to establish proper pitch, bank, or power adjustments during altitude, heading, or airspeed corrections.
    e. faulty trim procedure.
3. Demonstrates and simultaneously explains straight-and-level flight, solely by reference to instruments, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to straight-and level flight, solely by reference to instruments.

STRATEGY

Somewhere in one of the FAA books we are told that straight and level flight is nothing more than constantly correcting back to straight and level flight from all of the deviations you have allowed to occur. This is probably very true. No one holds any heading, altitude, or airspeed perfectly.

The way I teach straight and level flight is to align the "wings" on the attitude indicator with the artificial horizon and check my primary instruments to see if what I selected for an attitude works. If my selected attitude isn't working, then I adjust my pitch using the attitude indicator until I find the one that holds the parameters I was assigned.

The specific strategy of straight and level flight.

I define straight and level as:
1. A specific heading
2. A specific altitude
3. A specific airspeed

Therefore the primary instruments are:
1. Directional gyro (heading)
2. The altimeter (altitude)
3. The airspeed indicator (airspeed)

The secondary/supporting instruments are:

- Attitude indicator (pitch and bank)
- Turn and bank indicator (coordination and rate of turn)
- Vertical speed indicator (great for trends)
- The tachometer (power)

Element Strategies.

1. a. instrument crosscheck, instrument interpretation, and aircraft control.

I am a proponent of the hub-and-spoke method. The attitude indicator serves as the hub. The primary instruments are the major spokes, and supporting instruments are smaller spokes.

1. b. instruments used for pitch, bank, and power control, and how those instruments are used to maintain altitude, heading, and airspeed.

See STRATEGY above.

1. c. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

COMMON ERRORS - Instrument Flying Handbook, Page 4-11

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers
Lift Drag Demo

TASK: XII. B. CONSTANT AIRSPEED CLIMBS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 and 5
FAA-S-8081-14A - Private PTS - AO IX, Task B

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of straight and turning, constant airspeed climbs, solely by reference to instruments by describing-
   a. instrument crosscheck, instrument interpretation, and aircraft control.
   b. instruments used for pitch, bank, and power control during entry, during the climb, and during level off, and how those instruments are used to maintain climb heading and airspeed.
   c. trim procedure.
2. Exhibits instructional knowledge of common errors related to straight and turning, constant airspeed climbs, solely by reference to instruments by describing—
   a. “fixation,” “omission,” and “emphasis” errors during instrument crosscheck.
   b. improper instrument interpretation.
   c. improper control applications.
   d. failure to establish proper pitch, bank, or power adjustments during heading and airspeed corrections.
   e. improper entry or level-off procedure.
   f. faulty trim procedure.
3. Demonstrates and simultaneously explains a straight and turning, constant airspeed climb, solely by reference to instruments, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to straight and turning, constant airspeed climbs, solely by reference to instruments.

STRATEGY

Let’s start by dividing this maneuver into two sub-Tasks, climbs straight ahead and climbs with a turn.

I will only discuss the climb straight ahead. If a turn is to be incorporated into a climb, teach the straight climb and the turn separately. Then teach them together.

In general all climbs are made with full power or perhaps a climb power setting. Under the hood we generally climb at a specific airspeed, most commonly some sort of a "cruise" airspeed. For our purposes let’s use practice area cruise. In a Cessna 172N that would be 90 KIAS. With 90 KIAS and full power, it's all about pitch attitude. Your student should have a pretty good idea of the proper pitch attitude from working in the practice area.

A climb is generally started with the application of full power. This is followed immediately by a change in pitch attitude. Since we will be climbing at our practice area cruise there is no need to adjust airspeed.

Note: Teach your student to begin their level off approximately 10% of the rate of climb before reaching assigned altitude.

Now to the specific strategy of climbs.

I define straight climbs as:

1. Apply full power (or cruise power)
2. Adjust pitch attitude to establish a climb
3. Maintain a specified airspeed
4. Maintain a specified heading
5. Level off approximately 10% of the rate of climb before reaching assigned altitude
6. Achieve cruise airspeed
7. Reduce power back to practice area cruise airspeed
8. Maintain cruise altitude

Therefore the primary instruments are:

1. Tachometer - (full or climb power)
2. Attitude Indicator (transition instrument to initiate the climb)
3. The airspeed indicator (constant airspeed)
4. The directional gyro (heading)
5. Attitude Indicator (transition instrument to initiate the level off)
6. The airspeed indicator (cruise airspeed)
7. Tachometer - (cruise power)
8. Altimeter (cruise altitude)

The secondary/supporting instruments are:

- The inclinometer (for coordination)
- Vertical Speed indicator (to help with pitch) during a constant airspeed climbs
- The tachometer (don't let it change)

Element Strategies

1. a. instrument crosscheck, instrument interpretation, and aircraft control.

I am a proponent of the hub-and-spoke method. The attitude indicator serves as the hub. The primary instruments are the major spokes and supporting instruments are smaller spokes.

1. b. instruments used for pitch, bank, and power control during entry, during the climb, and during level off, and how those instruments are used to maintain climb heading and airspeed.

See STRATEGY above.

1. c. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

COMMON ERRORS - Instrument Flying Handbook, Page 4-11

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers

Lift Drag Demo

TASK: XII. C. CONSTANT AIRSPEED DESCENTS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 and 5
FAA-S-8081-14A - Private PTS - AO IX, Task C

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of straight and turning, constant airspeed descents, solely by reference to instruments by describing-
   a. instrument crosscheck, instrument interpretation, and aircraft control.
   b. instruments used for pitch, bank, and power control during entry, during the descent, and during level off, and how those instruments are used to maintain descent heading and airspeed.
   c. trim procedure.
2. Exhibits instructional knowledge of common errors related to straight and turning, constant airspeed descents, solely by reference to instruments by describing-
   a. “fixation," “omission,” and “emphasis" errors during instrument crosscheck.
   b. improper instrument interpretation.
   c. improper control applications.
   d. failure to establish proper pitch, bank, or power adjustments during heading and airspeed corrections.
   e. improper entry or level-off procedure.
   f. faulty trim procedure.
3. Demonstrates and simultaneously explains a straight and turning, constant airspeed descent, solely by reference to instruments, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to straight and turning, constant airspeed descents, solely by reference to instruments.

STRATEGY

Let’s start by dividing this maneuver into two sub-Tasks, descents straight ahead and descents with a turn.

I will only discuss the descent straight ahead. If a turn is to be incorporated into a descent, teach the straight descent and the turn separately. Then teach them together.

If you learned nothing else out of my general strategy in Area of Operation VIII Fundamentals of Flight, I hope you remember that, in general, a decrease in power of 100 RPM or 1 inch of manifold pressure will net approximately 100 foot per minute rate of descent.

I would expect my student to make most descents, under power and with a reduction of 500 RPM. This along with carburetor heat should net about a 500 FPM rate of descent and at the same airspeed being used for straight and level flight. If a greater rate of descent is desired, then more power should be reduced. This formula assumes maintaining the original airspeed.

Note: Teach your student to begin his level off approximately 10% of the rate of descent before reaching assigned altitude.

Now to the specific strategy of descents.

I define straight descents as:

1. Reduce power
2. Adjust pitch attitude to establish a descent
3. Maintaining a specific airspeed
4. Maintain a specified heading
5. Level off approximately 10% of the rate of descent before reaching assigned altitude
6. Adjust power to cruise power setting
7. Return to cruise airspeed
8. Maintain cruise altitude

Therefore the primary instruments are:

1. Tachometer - (descent power)
2. Attitude Indicator (transition instrument to initiate the descent
3. The airspeed indicator (constant airspeed)
4. The directional gyro (heading)
5. The airspeed indicator (cruise airspeed)
6. Tachometer - (cruise power)
7. The airspeed indicator (cruise altitude)
8. Altimeter (cruise altitude)

The secondary/supporting instruments are:

- The inclinometer (for coordination)
- Vertical Speed indicator (to help with pitch) during a constant airspeed descent
- The tachometer (don't let it change)

Element Strategies.

1. a. instrument crosscheck, instrument interpretation, and aircraft control.

I am a proponent of the hub-and-spoke method. The attitude indicator serves as the hub. The primary instruments are the major spokes, and supporting instruments are smaller spokes.

1. b. instruments used for pitch, bank, and power control during entry, during the descent, and during level off, and how those instruments are used to maintain descent heading and airspeed.

See STRATEGY above.

1. c. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

COMMON ERRORS - Instrument Flying Handbook, Page 4-11

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers

Lift Drag Demo

TASK: XII. D. TURNS TO HEADINGS

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 and 5
FAA-S-8081-14A - Private PTS - AO IX, Task D

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of turns to headings, solely by reference to instruments by describing-
   a. instrument crosscheck, instrument interpretation, and aircraft control.
   b. instruments used for pitch, bank, and power control during turn entry, during the turn, and during the turn rollout, and how those instruments are used.
   c. trim procedure.
2. Exhibits instructional knowledge of common errors related to turns to headings, solely by reference to instruments by describing-
   a. "fixation," "omission," and "emphasis" errors during instrument crosscheck.
   b. improper instrument interpretation.
   c. improper control applications.
   d. failure to establish proper pitch, bank, and power adjustments during altitude, bank, and airspeed corrections.
   e. improper entry or rollout procedure.
   f. faulty trim procedure.
3. Demonstrates and simultaneously explains a turn to a heading, solely by reference to instruments, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to turns to headings, solely by reference to instruments.

STRATEGY

This Task is about how to enter or exit a turn, how to coordinate the turn, and what to expect during the turn. All of this translates into using attitude indicator as a transition instrument.

Teach the student to start the turn with the aileron, coordinate the turn with rudder, expect the nose to drop, and the need to increase pitch to compensate for loss of lift.

Teach the student how to split his attention between the attitude indicator and the altimeter so as to achieve the right angle of bank without deviating from the assigned altitude.

Explain control forces and neutralizing controls to maintain a specific bank as well as rolling out of a turn being the inverse of rolling into one. Last, teach any rules of thumb, like leading the desired roll out heading by 50% of the bank angle.

Now to the specific strategy of turns to headings.

I define a level turn as:

1. Rolling into a specific angle of bank to change heading
2. Maintain a standard rate turn
3. Maintaining a specific altitude
4. Maintaining a specific airspeed. (I do not advocate applying power to maintain the exact original airspeed, when turning at a standard rate of turn.)
5. Roll out on a specific heading, leading the roll out heading by 50% of the bank angle.
6. Return to straight flight

Therefore the primary/transition instruments are:

1. Attitude indicator (transition instrument for entering the turn) (15% of the airspeed = standard rate turn)
2. Turn and bank instruments (coordination and standard rate of turn)
3. The altimeter (altitude)
4. The airspeed indicator (airspeed)
5. Attitude Indicator (transition instrument for exiting the turn)
6. The directional gyro (heading)

The secondary/supporting instruments are:

- The inclinometer (for coordination)
- Vertical speed indicator (to help with pitch, remember it's a trend instrument)
- The tachometer (don't let it change)

Element Strategies.

1. a. instrument crosscheck, instrument interpretation, and aircraft control.

I am a proponent of the hub-and-spoke method. The attitude indicator serves as the hub. The primary instruments are the major spokes, and supporting instruments are smaller spokes.

1. b. instruments used for pitch, bank, and power control during turn entry, during the turn, and during the turn rollout, and how those instruments are used.

See STRATEGY above.

1. c. trim procedure.

Put the nose where you want it and relieve the pressure with the trim. Never fly the airplane with the trim.

COMMON ERRORS - Instrument Flying Handbook, Page 4-11

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers

Lift Drag Demo

TASK: XII. E. RECOVERY FROM UNUSUAL FLIGHT ATTITUDES

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 3
FAA-H-8083-15A Instrument Flying Handbook - Chapters 4 and 5
FAA-S-8081-14A - Private PTS - AO IX, Task E

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of recovery from unusual flight attitudes by describing—
   a. conditions and situations that may result in unusual flight attitudes.
   b. the two basic unusual flight attitudes—nose-high (climbing turn) and nose-low (diving spiral).
   c. how unusual flight attitudes are recognized.
   d. control sequence for recovery from a nose-high attitude and the reasons for that sequence.
   e. control sequence for recovery from a nose-low attitude and the reasons for that sequence.
   f. reasons why the controls should be coordinated during unusual flight attitude recoveries.
2. Exhibits instructional knowledge of common errors related to recovery from unusual flight attitudes by describing—
   a. failure to recognize an unusual flight attitude.
   b. consequences of attempting to recover from an unusual flight attitude by "feel" rather than by instrument indications.
   c. inappropriate control applications during recovery.
   d. failure to recognize from instrument indications when the airplane is passing through a level flight attitude.
3. Demonstrates and simultaneously explains a recovery from nose-high and a nose-low flight attitude from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to recovery from unusual flight attitudes.

STRATEGY

This maneuver is all about teaching your student to be able to recover from an unusual attitude solely by reference to flight instruments.

Start by reading pages 5-26 thru 5-28 in the Instrument Flying Handbook. Once you have that information digested ask your student two questions.

What are you generally most concerned about when you have a high pitch attitude and/or low airspeed?

What are you generally most concerned about when you pull up from a dive?

The answer to the first question is a stall. The answer to the second question is ripping the wings off.

So, how do we recover from an unusual attitude?

First, we assess the situation by looking at the flight instruments. Look at indications of rate and movement. Use the attitude indicator but recognize that in extreme attitudes it may be worse than no help; it may be wrong. Back it up with what you see on the altimeter, vertical speed, and airspeed indicators.

Next we decide whether we are near a stall or in a dive.

If near a stall (high pitch attitude) I would recover just like I recover from a stall, pitch down, add power and level the wings. Your task is to get to straight and level flight so remember what the primary instruments for that are.

PITCH-POWER-WINGS

If in or near a dive (lower than normal pitch attitude) I would roll my wings level, reduce power, and pull up,

WINGS - POWER - PITCH

The point of my first two questions is to set the stage. Rather than memorizing a particular tactic, I want there to be some understanding. Actually I would prefer some correlation.

Here are some ideas about setting the stage for unusual attitudes. This doesn't have to be a radical process. I prefer that the student put himself into the situation. Have him close his eyes and fly the airplane as you ask. It won't take long before he thinks he is turning left when he is turning right, or he thinks he is diving when he is climbing.

Element Strategies

1. a. conditions and situations that may result in unusual flight attitudes.

Basically you can assume that the pilot experiencing an "unusual attitude" is either in the clouds or has little or no visual contact with the ground. He is also more than likely a non-instrument rated pilot.

1. b. the two basic unusual flight attitudes—nose-high (climbing turn) and nose-low (diving spiral).

See STRATEGY above.

1. c. how unusual flight attitudes are recognized.

As I indicated in Element 1. a. we have to assume that the pilot experiencing an "unusual attitude" is either in the clouds or has little or no visual contact with the ground. Therefore the only way to recognize the unusual attitude is by observing the flight instruments. As a general rule, I would look at the attitude indicator first. I have to qualify that statement by saying you need to teach your student to verify its accuracy with other "more reliable" instruments.

A nose-high attitude is indicated by the rate and direction of movement of the altimeter, vertical speed indicator, and the airspeed indicator, as well as the attitude Indicator.

The same instruments indicate a nose-low attitude, except in an opposite direction. Turns are indicated by the directional gyro and/or the turn and bank indicator.

1. d. control sequence for recovery from a nose-high attitude and the reasons for that sequence.

See STRATEGY above.

1. e. control sequence for recovery from a nose-low attitude and the reasons for that sequence.

See STRATEGY above.

1. f. reasons why the controls should be coordinated during unusual flight attitude recoveries.

A stall is disastrous enough if under the hood and seemingly out of control. A stall that is uncoordinated is likely to become a spin. An uncontrolled recovery increases the potential of a spin.

COMMON ERRORS - Instrument Flying Handbook, Page 5-28

RELATED MANEUVERS

Straight-and-Level Flight - Fundamentals of Flight
Level Turns - Fundamentals of Flight
Straight Climbs and Climbing Turns - Fundamentals of Flight
Straight Descents and Descending Turns - Fundamentals of Flight

Straight-and-Level Flight - Basic Instrument Maneuvers
Constant Airspeed Climbs - Basic Instrument Maneuvers
Constant Airspeed Descents - Basic Instrument Maneuvers
Turns to Headings - Basic Instrument Maneuvers

Lift Drag Demo

XIII. AREA OF OPERATION: EMERGENCY OPERATIONS

NOTE: The examiner shall select at least TASKs A and B.

This is a very interesting Area of Operation. It's one of those listed in Task IV, so it could be used as the Preflight Lesson on a Maneuver to be Performed in Flight. It is most often glossed over both by the Inspector and the Student's instructor. The importance of this Task is found in FAR 61.87. It is part of the list of maneuvers, Emergency Procedures and Equipment Malfunctions, to be taught to a student before being allowed to solo.

By the way, you may run across an Inspector that closes the throttle at say 2,500 feet AGL and then says, "Teach me an Emergency Approach and Landing." I do not know what to tell you; perhaps do the best you can. I would land at the next airport and let the Inspector walk home. It violates everything the CFI Practical Test is all about. THIS IS NOT A COMERCIAL TEST! If you don't feel comfortable with an answer that is as radical as mine, at least let your CFI know and consider complaining to the FSDO.

Inspectors that "test" like that do not understand the concepts of testing "Instructional Knowledge."

Like death and taxes this Task is required.

TASK: XIII. A. EMERGENCY APPROACH AND LANDING (SIMULATED)

NOTE: The examiner shall **NOT simulate a power failure by placing the fuel selector to the "off" position or by placing the mixture control in the "idle-cutoff" position.** No simulated emergency approach shall be continued below 500 feet AGL, unless over an area where a safe landing can be accomplished in compliance with 14 CFR section 91.119.

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 16.
FAA-S-8081-12B - Commercial PTS - AO X. Task A.
FAA-S-8081-14A - Private PTS - AO X. Task A.
POH/AFM - Sections 3.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements related to an emergency approach and landing by describing-

a. prompt establishment of the best glide airspeed and the recommended configuration.
b. how to select a suitable emergency landing area.
c. planning and execution of approach to the selected landing area.
d. use of emergency checklist.
e. importance of attempting to determine reason for the malfunction.

f. importance of dividing attention between flying the approach and accomplishing emergency checklist.
g. procedures that can be used to compensate for undershooting or overshooting selected emergency landing area.

2. Exhibits instructional knowledge of common errors related to an emergency approach and landing by describing-
   a. improper airspeed control.
   b. poor judgment in the selection of an emergency landing area.
   c. failure to estimate the approximate wind speed and direction.
   d. failure to fly the most suitable pattern for existing situation.
   e. failure to accomplish the emergency checklist.
   f. undershooting or overshooting selected emergency landing area.
3. Demonstrates and simultaneously explains an emergency approach with a simulated engine failure from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to an emergency approach with a simulated engine failure.

STRATEGY

This maneuver is a matter of priorities. A couple of my students and I were going over this Task trying to decide how to approach it. We decided that if we made a list of the things we would need to do in the event of an engine failure and put them in their order of priority, we would have a good starting point. Next we decided that if time permitted we could get through the whole list.

Here is the list:

1. Get to best glide speed
2. Pick a place to land
3. Make a quick radio call (don't keep talking)
4. Troubleshoot
5. Attempt a restart
6. Pull out the checklist and go through it.

If you go back and read the Elements, you may notice that the order used there is very close to our list.

So here is how to teach this.

You cannot teach this Task without some reference to altitude. It is your altitude that defines where you will attempt to go and how far you will get through the list.

If the engine fails at less that 500 feet AGL, what you see is what you get. There is a relatively small area in front of the pilot where he can safely attempt to maneuver and land, generally no more than 45° left or right of the current heading. This is especially true right after takeoff. This may sound drastic, so modify my explanation as you see fit, but I am pretty direct about turning back to the runway below 500 feet AGL. It is called the "impossible turn" for a reason and that is because the likelihood of getting back to the runway, under control is basically impossible. I tell my students "if they try they will die!"

At 1000 feet AGL, there are lots of options. A 180° turn is well within the capability of both the pilot and the airplane. After all we teach 180° dead stick

landings all of the time. The one limitation at 1000 feet AGL is time. How far a student gets through the list will vary and depends on lots of things.

Above 3000 feet there is very little reason that a student can't get through the list as well as select and successfully find a field and land.

One thing that MUST be stressed. **FLY THE AIRPLANE**

The list should be modified as below:

1. **Fly the airplane**
2. Get to best glide speed
3. **Fly the airplane**
4. Pick a place to land
5. **Fly the airplane**
6. Make a quick radio call (don't keep talking)
7. **Fly the airplane**
8. Troubleshoot
9. **Fly the airplane**
10. Attempt a restart
11. **Fly the airplane**
12. Pull out the checklist and go through it
13. **Fly the airplane**

Once you have explained the relationship between what to do, how much to do, and where to go, you can move on to the rest of the Elements.

> **NOTE:** Go back and reread the note following Task XIII. A. Emergency Approach and Landing (simulated).
>
> The note has two concepts. The first concept deals with how an Inspector can simulate an engine failure; **the throttle only** The second concept deals with how close to the ground a simulated emergency approach can go. The specific language says, **"No simulated emergency approach shall be continued below 500 feet AGL, unless over an area where a safe landing can be accomplished in compliance with 14 CFR section 91.119."** That suggests you should read FAR 91.119. That regulation, "Minimum Safe Altitudes: General" makes it pretty clear that you should not descend below 500 feet AGL, while performing an Emergency Approach and Landing (simulated) without a real runway to land on. You can look at the language in two ways:
>
> 1. to continue below 500 feet AGL without a runway to land on is unsafe, or
> 2. that you need to be either 500 feet above the surface or 500 feet from persons, vessels, vehicles, or structures, your choice.

Element Strategies

1. a. prompt establishment of the best glide airspeed and the recommended configuration.

Teach your student to hold altitude until reaching best glide speed, trim the airplane, and then begin the descent.

1. b. how to select a suitable emergency landing area.

Discuss what fields look like, the concerns with selecting roads, vineyards, freshly plowed fields, and so on. You might want to drag out the POH/AFM and show your student the difference in the landing distance with a 10-knot headwind and a 10-knot tailwind. It will provide a perspective about how important (or not) landing into the wind is.

1. c. planning and execution of approach to the selected landing area.

Read my discussion about 180° Accuracy Landings and especially about adjusting your glide so as to hit a spot. Those ideas apply here. Because it is roughly 4 times easier to shorten a glide than extend it, I suggest that a student select a field and aim, without flaps extended, at a line that is 2/3rds from the approach end of the field. When the pilot is sure he can hit that spot, then start applying flaps, s-turning or slip the airplane, thus shortening the approach and subsequent landing. With this concept, the pilot should land in the first third of the selected field.

1. d. use of emergency checklist.

It's the last thing on the list, at least the written one. Make sure your student has a good understanding of the "flow" to be used to troubleshoot or attempt a restart. Use the written checklist last and only if you have time.

1. e. importance of attempting to determine reason for the malfunction.

This is the fourth or fifth most important thing on the list. It falls right after fly the airplane, find a landing site, and make a quick radio call. Even though it is down the list a bit, it is important because it might keep the student from proving just how good a pilot he is.

1. f. importance of dividing attention between flying the approach and accomplishing emergency checklist.

Fly the airplane, that's the most important thing to do. Landing in a very poor field, under control is far better than crashing out of control at the intersection of two paved runways.

1. g. procedures that can be used to compensate for undershooting or overshooting selected emergency landing area.

Read my discussion about 180° Accuracy Landings, especially about adjusting your glide so as to hit a spot.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in the Objectives section.

RELATED MANEUVERS

Normal traffic Patterns
180° power-off accuracy approach and landing

TASK: XIII. B. SYSTEMS AND EQUIPMENT MALFUNCTIONS

NOTE: The examiner shall not simulate a system or equipment malfunction in a manner that may jeopardize safe flight or result in possible damage to the airplane.

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 16.
FAA-S-8081-12B - Commercial PTS - AO X. Task B.
FAA-S-8081-14A - Private PTS - AO X. Task B.
POH/AFM - Sections 3.

OBJECTIVE

Exhibits instructional knowledge of at least five (5) of the equipment malfunctions, appropriate to the airplane used for the practical test by describing recommended pilot action for:

1. Smoke, fire, or both, during ground or flight operations.
2. Rough running engine or partial power loss.
3. Loss of engine oil pressure.
4. Fuel starvation.
5. Engine overheat.
6. Hydraulic malfunction.
7. Electrical malfunction.
8. Carburetor or induction icing.
9. Door or window opening in flight.
10. Inoperative or "runaway" trim.
11. Landing gear or flap malfunction.

STRATEGY

We need a qualifier. What does "appropriate to the airplane used for the practical test" mean? To me, it means look in the airplane you are using for the practical test and see what equipment is installed. This eliminates the pressurization malfunction and perhaps the runaway trim. This leaves 10 systems you will need to know and teach. You need to be able to teach what to do in the event of a malfunction. Obviously that means you also need to know how the systems work. You already needed to know this information for Area of Operation III, Task C. Operation of Systems.

There is a whole chapter in the Airplane Flying Handbook about systems emergencies and malfunctions. This is a pretty good place to start. From there I would go to the AFM/POH and read what the manufacturer suggests for each type of system in the event of an emergency or equipment malfunction.

The way I would teach this Task is to cover one system at a time. I would start by describing how the system works. Then I would explain how to deal with the malfunction in general terms. Next I would refer to the AFM/POH and go over the abnormal or emergency checklist, explaining each step.

Here is an example. You have an electrical fire. You can tell by the acrid smell of burning wiring.

In general, I would turn off the Master Switch and see what happens. If the smoke is too thick I would open a vent and try to get the smoke out or have the air blow in my face so I could breath clean air. If the fire goes out and the smoke subsides, I would look for a place to land. If I didn't need anything electrical I would leave the Master Switch off. If I needed something electrical, I would turn off every switch I could and pull every breaker I could get to. Next I would turn the Master Switch back on. If I had smoke, I would turn it off and be without electrical power. If there wasn't any new smoke I would turn on the system(s) I needed and check for smoke. If I didn't get any smoke I would continue. If I got smoke, the system would be turned back off.

After that explanation I would make a simple drawing of the electrical system. I would get out the AFM/POH and go to Section 3, find the appropriate checklist and/or amplified procedure, and explain what it tells the pilot to do.

I don't have any Element Strategies for this Task.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in the Objectives section.

RELATED MANEUVERS

There aren't really any related maneuvers

TASK: XIII. C. EMERGENCY EQUIPMENT AND SURVIVAL GEAR

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Unable to find a reference.
FAA-S-8081-12B - Commercial PTS - AO X. Task C.
FAA-S-8081-14A - Private PTS - AO X. Task C.
POH/AFM.

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to emergency equipment and survival gear appropriate to the airplane used for the practical test by describing:
1. Equipment and gear appropriate for operation in various climates, over various types of terrain, and over water.
2. Purpose, method of operation or use, servicing and storage of appropriate equipment.

STRATEGY

Like Task B in this Area of Operation we need a qualifier. What does "appropriate to the airplane used for the practical test" mean? To me, this means look in the airplane you are using for the practical test and see what emergency equipment and survival gear is in it. Then be able to do what Elements 1 and 2 require.

The airplanes I fly don't have any survival equipment. In general they don’t have any emergency equipment unless you consider the transponder, ELT or checklists to fit that requirement.

I don’t have any Element Strategies for this Task.

COMMON ERRORS

None could be located.

RELATED MANEUVERS

There aren't really any related maneuvers

TASK: XIII. D. EMERGENCY DESCENT

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 16.
FAA-S-8081-12B - Commercial PTS - No reference.
FAA-S-8081-14A - Private PTS - No reference.
POH/AFM - Section 3 (Assumes there is a manufacturers recommended procedure.)

OBJECTIVE

To determine that the applicant exhibits instructional knowledge of the elements related to emergency descents appropriate to the airplane flown by describing:

1. Exhibits instructional knowledge of the elements related to an emergency descent by describing -
    a. situations that require an emergency descent.
    b. proper use of the prescribed emergency checklist to verify accomplishment of procedures for initiating the emergency descent.
    c. proper use of clearing procedures before initiating and during the emergency descent.
    d. procedures for recovering from an emergency descent.
    e. manufacturer's procedures.
2. Exhibits instructional knowledge of common errors related to an emergency descent by describing -
    a. the consequences of failing to identify reason for executing an emergency descent.
    b. improper use of the prescribed emergency checklist to verify accomplishment of procedures for initiating the emergency descent.
    c. improper use of clearing procedures before initiating and during the emergency descent.
    d. improper procedures for recovering from an emergency descent.
3. Demonstrates and simultaneously explains an approach and landing with a simulated inoperative engine from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to an approach and landing with an inoperative engine.

STRATEGY

Like Task B in this Area of Operation we need a qualifier. What does "appropriate to the airplane used for the practical test" mean? To me this means look in the POH/AFM and see what the manufacturer says. This becomes the procedure. But what if the manufacturer doesn't have a procedure? In that case you have to go to the Airplane Flying Handbook, Chapter 16, page 16-6.

Airplane Flying Handbook says:

- Use a bank of between 30 to 45°
- Reduce the power to idle
- Place the propeller control (if equipped) in the low pitch
- Extend the landing gear
- Flaps should be extended as recommended by the manufacturer
- Do not exceed VNE, VLE, or VFE, as applicable
- Do not exceed VA if in turbulent air
- The descent should be made at the maximum allowable airspeed consistent with the procedure used

I can only suggest that you and your Instructor design your own procedure.

Element Strategies.

1. a. situations that require an emergency descent.

There just aren't that many emergencies that require an emergency descent in a small single engine airplane. You aren't high enough to have rapid decompression so that leaves a wing fire, electrical fire, and an engine fire. Figure out some logical way to package this.

1. b. proper use of the prescribed emergency checklist to verify accomplishment of procedures for initiating the emergency descent.

I would approach this as memory items and checklist items. Teach the procedure with the idea that some things require immediate attention and others can wait for the checklist..

1, c. proper use of clearing procedures before initiating and during the emergency descent.

Imagine you are in a Boeing 737, and you have just experience rapid decompression at FL 350. You retard the power levers, assume the prescribed speed, and perform a 180° turn while declaring an emergency. The real problem is how much "clearing" do you really do if you have to make an emergency descent. I would teach the 180 degree turn, looking before you turn, and call ATC.

1. d. procedures for recovering from an emergency descent.

As I see this we have just come screaming out of the sky, and your airspeed is probably well above Va. Treat it the same way you would an unusual attitude. Roll wings level, reduce power, and level off or slow down whichever applies.

1. e. manufacturer's procedures.

My best answer is read them, think about them, and teach them to your student.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in the Objectives section.

RELATED MANEUVERS

Perhaps the steep spiral

XIV. AREA OF OPERATION: POSTFLIGHT PROCEDURES

NOTE: The examiner shall select at least TASK A.

TASK: XIV. A. POSTFLIGHT PROCEDURES

REFERENCES:

FAA-H-8083-3A - Airplane Flying Handbook - Chapter 2.
FAA-S-8081-12B - Commercial PTS - AO XIV. Task A.
FAA-S-8081-14A - Private PTS - AO XII. Task A.
POH/AFM.

OBJECTIVE

To determine that the applicant:
1. Exhibits instructional knowledge of the elements of postflight procedures by describing-
   a. parking procedure.
   b. engine shutdown and securing cockpit.
   c. deplaning passengers.
   d. securing airplane.
   e. postflight inspection.
   f. refueling.
2. Exhibits instructional knowledge of common errors related to postflight procedures by describing—
   a. hazards resulting from failure to follow recommended procedures.
   b. poor planning, improper procedure, or faulty judgment in performance of postflight procedures.

STRATEGY

I guess we can look at this like Preflight Procedures in reverse. I would teach it mostly by following the checklist.

There are a couple of things that stick out. One is the engine shutdown. I teach my students to do a grounding check. If you do that (I recommend it very strongly) you should be ready to explain why you do it ,and what you are checking, and what a "P" lead is.

Something I don't do is a postflight inspection, not that it’s not a good idea, I just don't do one. If your school doesn't do them, be sure you know how you would do one. By the way, I couldn't find a checklist that includes a postflight inspection. The best I see is "securing airplane" checklist.

Finally, there is refueling. For my entire flying career someone else did this for me. I might have stood there and watched, making sure they did it right, but I never touched the refueling equipment except in the Army. If my Crew Chief had a long day and needed a break, I pitched in and fueled the helicopter. In that case he stood there and made sure I did it right. The school where I work has its Instructors/renters fuel their own airplanes; it’s cheaper. The problem is we do it before we go flying so we can control weight and balance. Depending on where you fly, you may need to sit down and think about how to teach this.

I can only suggest that you and your Instructor design your own procedure.

Element Strategies

1. a. parking procedure.

This is usually nothing more that lining up with the parking spot. I do teach one concept about estimating distances from other aircraft, poles, etc. Look at the shadows. If they aren't overlapping, then you should be OK.

1. b. engine shutdown and securing cockpit.

Follow the checklist, including a grounding check.

1. c. deplaning passengers.

Tell them to never deplane with a turning propeller, period.

1. d. securing airplane.

Tie it down, chalk it, and install the control lock(s).

1. e. postflight inspection.

Use the "securing airplane" checklist.

1. f. refueling.

Follow your school's procedure.

COMMON ERRORS

There are no common errors mentioned in the Airplane Flying Handbook. Work with the ones listed above in the Objectives section.

RELATED MANEUVERS

Preflight procedure

APPENDIX 1.

<u>These are is an example of the first three pages, the Task. Strategy, and Reference Materials List</u>

Page 1. - Task

II. AREA OF OPERATION: TECHNICAL SUBJECT AREAS

E. TASK: AIRPLANE WEIGHT AND BALANCE

REFERENCES: FAA-H-8083-1, FAA-H-8083-3A, FAA-H-8083-25A.

Objective.

To determine that the applicant exhibits instructional knowledge of the elements of airplane weight and balance by describing:

1. Weight and balance terms.

2. Effect of weight and balance on performance.

3. Methods of weight and balance control.

4. Determination of total weight and center of gravity and the changes that occur when adding, removing, or shifting weight.

Page 2. - Strategy - Fora maneuver Task, COMMON ERRORS and RELATED MANEUVERS would come after STRATEGY.

STRATEGY

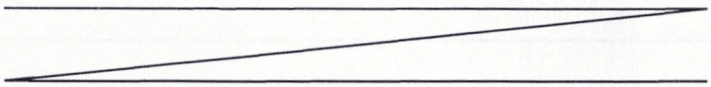
This task should probably be taught as one lesson intermixing the elements in order to insure a complete understanding of weight and balance. There is one element that could be problematic and that is the second half of element # 4.

Note: I have split element 4 into two parts. The second half of task 4 could be interpreted as requiring the instructor to teach the student how to shift weight mathematically. Those words are not actually used. I interpret the element to require you to teach how to recompute your weight and balance after you have relocated passengers and cargo.

Note: I teach from the perspective that a student should be able to visualize how moving weights will affect the CG. They should be able to look at a loading graph in the weight and balance section of a flight manual and tell what shifting weigh will do. There is no reason to add fuel when you have a forward CG if doing so just moves the CG forward. I am also not a fan of mathematically moving weights. I think that leads to problems.

1. Weight and balance terms.

Start by listing all of the weight and balance terms you intend to use on the white board, checking them off as you teach



If asked to teach the mathematical method, be familiar with the process and refer to the reference material.

REFERENCE MATERIAL LIST

FAA-H-8083-25A - Pilot's Handbook of Aeronautical Knowledge - Chapter 8

FAA-H-8083-3A - Airplane Flying Handbook - Pgs.4-15/16 Intentional Spins, Weight and Balance Requirements

FAA-H-8083-1 - Aircraft Weight and Balance Handbook

Effect of weight and balance on performance matrix

Sample weight and balance form

APPENDIX 2

Task Outline - Fundamental of Instruction

Reference Document for 1A The Learning Process

Learning Theory
- Behaviorism
- Cognitive theory

Characteristics of Learning
- Learning is Purposeful
- Learning is the Result of Experience
- Learning is Multifaceted
- Learning is an Active Process.

Principles of Learning (Thorndike and the Laws of Learning)
- Readiness
- Effect
- Exercise
- Primacy
- Intensity
- Recency

Levels of Learning
- Rote
- Understanding
- Application
- Correlation

Learning Physical Skills (Acquiring Skill Knowledge)
- Stages of Skill Acquisition
    - Cognitive Stage
    - Associative Stage
    - Automatic Response Stage
    - Knowledge of the results
    - How to Develop Skills
    - Learning plateaus
- Types of Practice
    - Deliberate Practice
    - Blocked Practice
    - Random Practice

Memory
- Sensory Memory
- Short-Term Memory
- Long-Term memory
- Remembering What Has Been Learned
- How Usage Affects Memory
- Forgetting
    - Retrieval Failure
    - Fading
    - Interference
    - Repression or Suppression

- Retention of Learning
    - Praise Stimulates Remembering
    - Recall is Prompted by Association
    - Favorable Attitudes Aid Retention
    - Learning With All Senses is Most Effective
    - Meaningful Repetition Aids Recall
    - Mnemonics

Transfer of Learning

- General definition
- Positive transfer
- Negative transfer

APPENDIX 2.

Task Outline - Fundamental of Instruction

Reference Document for 1B Human Behavior and Effective Communication

Control of Human Behavior

- Definition of Human Behavior
  - Personality Types
  - Instructor and Student Relationship

Human Needs (Maslow's hierarchy of human needs)

- Physical Physiological)
- Safety (Security)
- Social (Belonging)
- Ego (Esteem)
- Cognitive and Aesthetic
- Self-fulfillment (Self-Actualization)

Defense Mechanisms (Human Factors That Inhibit Learning)

- Repression
- Denial
- Compensation
- Projection
- Rationalization
- Reaction formation
- Fantasy
- Displacement

The flight instructor as a practical psychologist (Student Emotional Reactions)

- Anxiety
- Normal reaction to stress
- Abnormal reactions to stress
- Flight Instructor actions regarding seriously abnormal students
- Teaching the Adult Student

Basic elements of communication

- The source
- The symbols
- The receiver

Barriers of effective communication

- Lack of common experience
- Confusion between the symbol and the symbolized object
- Overuse of abstractions
- Interference

Developing communication skills

- Role playing
- Instructional communications
- Listening
- Questioning
- Instructional Enhancements

APPENDIX 2.

Task Outline - Fundamental of Instruction

Reference Document for 1C The Teaching Process

Preparation of a lesson (for a ground or Flight Instructional Period)

- Training Objectives and Standards
- Performance-Based objectives
  - Description
  - Condition
  - Criteria
- The Importance of the PTS in Aviation Training
- Curricula
- Decision-Based Objectives
- Other Used of Training Objectives

Presentation methods

- Presentation of a Lesson
- Organization of Material
  - Introduction
  - Development
  - Overview
- Training Delivery Methods
  - Lecture method
  - Discussion Method
  - Guided Discussion Method
  - Problem-Based Learning
  - E-Learning
  - Cooperative or Group Learning method
  - Demonstration Performance method
  - Drill and Practice

Application, by the student, of the material or procedure presented

- Application of the Lesson
- Define it

Review and evaluation of student performance

- Assessment Terminology
- Purpose of Assessment
- General Characteristics of Effective Assessment
- Traditional Assessment
- Authentic Assessment
- Choosing an Effective Assessment Method
- Critiques and Oral Assessments

APPENDIX 2.

Task Outline - Fundamental of Instruction

Reference Document for 1D Teaching Methods

Material organization

- Course of Training
- Blocks of Learning
- Training Syllabus
- Syllabus Format and Content
- How To Use a Training Syllabus
- Lesson Plans
- Purpose of the Lesson Plan
- Characteristics of a Well-Planned Lesson
- How To Use a Lesson Plan Properly
- Lesson Plan Formats

General layout of a lesson (Organization of Material)

- Introduction
  - Attention
  - Motivation
  - Overview
- Development
  - Past to present
  - Simple to complex
  - Known to unknown
  - Most frequently used to least used
- Conclusion

The lecture method

- Teaching Lecture
- Preparing the Teaching Lecture
- Suitable Language
- Types of Delivery
- Use of Notes
- Formal Versus Informal Lectures
- Advantages and Disadvantages of the Lecture

The cooperative or group learning method

- Conditions and Controls
  - Small, heterogeneous groups
  - Clear, complete instructions.
  - Student perception of targeted
  - The opportunity for student success
  - Student access to and comprehension of required information
  - Sufficient time for learning
  - Individual accountability
  - Recognition and rewards for group success
  - Time after completion of group tasks for systematically reflection

The guided discussion method

- Use of Questions in a Guided Discussion
- Planning a Guided Discussion
- Student Preparation for a Guided Discussion
- Guiding a Discussion - Instructor Technique
- Advantage

The demonstration-performance method

- Explanation Phase
- Demonstration Phase
- Student Performance and Instructor Supervision Phases
- Evaluation Phase

Computer-based training method (Electronic Learning)

- Computer-Assisted Learning (CAL) Method
- Simulation, Role-Playing, and Video Gaming

APPENDIX 2.

Task Outline - Fundamental of Instruction

Reference Document for 1E Critique and Evaluation

Purpose and characteristics of an effective critique

- Purpose of a Critique (Assessment)
- Characteristics of an Effective Critique(Assessment)
  - Objective
  - Flexible
  - Acceptable
  - Comprehensive
  - Constructive
  - Organized
  - Thoughtful
  - Specific
- Methods and ground rules for a critique
  - Instructor/Student Critique
  - Student-Led Critique
  - Small Group Critique
  - Individual Student Critique by Another Student
  - Self-Critique
  - Written Critique
  - Oral Assessment
  - Characteristics of Effective Questions
  - Types of Questions to Avoid
  - Answering Student Questions

Characteristics of effective oral questions and what types to avoid

- Characteristics of Effective Questions
- Types of Questions to Avoid
  - Do you understand?
  - Do you have any questions?
  - Puzzle
  - Oversize
  - Toss-up
  - Bewilderment
  - Trick questions
  - Irrelevant questions

Responses to student questions

- Explain how to respond to student questions

Characteristics and development of effective written questions Assessment/T est

- Reliability
- Validity
- Usability
- Objectivity
- Comprehensiveness
- Discrimination

Characteristics and uses of performance test, specifically, the FAA practical test standards

- Explain the characteristics of a performance test
- Explain the use of a performance test
- Discuss the FAA practical test standards
- Describe the PTS layout
    - Define an Area of Operation
    - Define a Task
    - Define an Element

APPENDIX 2.

Task Outline - Fundamental of Instruction

Reference Document for 1F Flight Instructor Characteristics and Responsibilities

Aviation instructor responsibilities in

a. providing adequate instruction
- Explain this idea

b. establishing standards of performance
- Explain this idea

c. emphasizing the positive
- Explain this idea

Flight instructor responsibilities in

a. providing student pilot evaluation and supervision
- Explain this idea

b. preparing practical test recommendations and endorsements
- Explain this idea

c. determining requirements for conducting additional training and endorsement requirements
- Flight reviews
- Aircraft checkouts
- Transition training

Professionalism as an instructor by

a. explaining important personal characteristics
- Sincerity
- Acceptance of the student
- Personal Appearance and habits
- Demeanor
- Safety Practices and accident prevention
- Proper language
- Self improvement

b. describing methods to minimize student frustration
- Motivate students
- Approach students as individuals
- Give credit where credit is due
- Criticize Constructively
- Be consistent
- Admit errors

APPENDIX 2.

Task Outline - Fundamental of Instruction

Reference Document for 1G Planning Instructional Activity

Objectives and standards for a course of training.
- Curriculum
- Syllabus
- Training course outline

Theory of building blocks of learning.
- Explain the theory of building blocks

Requirements for developing a training syllabus.
- Syllabus format and content
- How to use a training syllabus

Purpose and characteristics of a lesson plan.
- Purpose of the lesson plan
- Characteristics of a well-planned lesson
  - Unity
  - Content
  - Scope
  - Practicality
  - Flexibility
  - Relation to Course of Training
  - Instructional Steps
- How to use a lesson plan properly
- Lesson plan formats

APPENDIX 3.

Reference Material - logbook entries and certificate endorsements
Following each Element is the FAR reference

1. Required logbook entries for instruction given.

61.189 Flight instructor records.

(a) A flight instructor must sign the logbook of each person to whom that instructor has given flight training or ground training.

(b) A flight instructor must maintain a record in a logbook or a separate document that contains the following:

(1) The name of each person whose logbook or student pilot certificate that instructor has endorsed for solo flight privileges, and the date of the endorsement; and

(2) The name of each person that instructor has endorsed for a knowledge test or practical test, and the record shall also indicate the kind of test, the date, and the results.

61.189 Flight instructor records.

(c) Each flight instructor must retain the records required by this section for at least 3 years.

61.51 Pilot logbooks.

(a) ***Training time and aeronautical experience.*** Each person must document and record the following time in a manner acceptable to the Administrator:

(1) Training and aeronautical experience used to meet the requirements for a certificate, rating, or flight review of this part.

(2) The aeronautical experience required for meeting the recent flight experience requirements of this part.

(h) ***Logging training time.***

(1) A person may log training time when that person receives training from an authorized instructor in an aircraft, flight simulator, or flight-training device.

(2) The training time must be logged in a logbook and must:

(i) Be endorsed in a legible manner by the authorized instructor; and

(ii) Include a description of the training given, the length of the training lesson, and the authorized instructor's signature, certificate number, and certificate expiration date.

(h) ***Logging training time.***

(1) A person may log training time when that person receives training from an authorized instructor in an aircraft, flight simulator, or flight-training device.

(2) **The training time must be logged in a logbook and must:**

(i) Be endorsed in a legible manner by the authorized instructor; and

(ii) Include a description of the training given, the length of the training lesson, and the authorized instructor's signature, certificate number, and certificate expiration date.

(i) ***Presentation of required documents.***

(1) Persons must present their pilot certificate, medical certificate, logbook, or any other record required by this part for inspection upon a reasonable request by—

(i) The Administrator;

(ii) An authorized representative from the National Transportation Safety Board; or

(iii) Any Federal, State, or local law enforcement officer.

(2) A student pilot must carry the following items in the aircraft on all solo cross-country flights as evidence of the required authorized instructor clearances and endorsements—

(i) Pilot logbook;

(ii) Student pilot certificate; and

(iii) Any other record required by this section.

2. Required student pilot certificate endorsements, including appropriate logbook entries.

SOLO FLIGHTS WITHIN 25 NM

61.87 Solo requirements for student pilots (Takeoff, land and fly within 25NM of the authorized airport)

General - A student pilot may not operate an aircraft in solo flight unless that student has met the requirements of this section.

A student pilot must demonstrate satisfactory aeronautical knowledge on a knowledge test that meets the requirements of this paragraph

At the conclusion of the test, review all incorrect answers with the student before authorizing that student to conduct a solo flight. **(You might as well make an endorsement in his logbook as proof.)**

Limitations on student pilots operating an aircraft in solo flight - A student pilot may not operate an aircraft in solo flight unless that student pilot has received:

An **endorsement from an authorized instructor on his or her student pilot certificate** for the specific make and model aircraft to be flown; and

An endorsement **in the student's logbook** for the specific make and model aircraft to be flown by an authorized instructor, who gave the training within the 90 days preceding the date of the flight.

61.93 **Solo cross-country flight requirements.** (Within 25 NM from authorized airport)

Solo flights may be made to another airport that is within 25 nautical miles from the airport where the student pilot normally receives training, provided

(i) An authorized instructor has given the student pilot flight training at the other airport, and that training includes flight in both directions over the route, entering and exiting the traffic pattern, and takeoffs and landings at the other airport;

(ii) The authorized instructor who gave the training **endorses the student pilot's logbook authorizing the flight;**

(iii) The student pilot has current solo flight endorsements in accordance with 61.87 of this pari;

(iv) The authorized instructor has determined that the student pilot is proficient to make the flight; and

(v) The purpose of the flight is to practice takeoffs and landings at that other airport.

61.89 General limitations.

A student pilot may not act as pilot in command of an aircraft in a manner contrary to any limitations placed in the pilot's logbook by an authorized instructor.

SOLO FLIGHTS MORE THAN 25 NM

General - Any cross-country flight greater than 25 NM

61.93 Solo cross-country flight requirements - Authorization to perform certain solo flights and cross-country flights. (Fly more than 25 NM from authorized airport)

Solo cross-country endorsement on the **student pilot certificate** from the authorized instructor who conducted the training any flight greater than 25 nautical miles from the airport from where the flight originated.

Solo cross-country **endorsement in the logbook** from an authorized instructor that is placed in the student pilot's logbook for the specific make and model of aircraft to be flown.

Repeated flights more than 25 NM but less that 50 NM

Repeated specific solo cross-country flights may be made to another airport that is within 50 nautical miles of the airport from which the flight originated, provided the authorized instructor has given the student flight training in both directions over the route, including entering and exiting the traffic patterns, takeoffs, and landings at the airports to be used.

The authorized instructor who gave the training has **endorsed the student's logbook** certifying that the student is proficient to make such flights.

Cross-country flights more than 25 NM (Not repeated)

A student pilot must have the endorsements prescribed in this paragraph for each cross-country flight:

For each cross-country flight, the authorized instructor who reviews the cross-country planning must **make an endorsement in the person's logbook** after reviewing that person's cross-country planning, stating that the student is prepared to make the flight safely under the known conditions, including any limitations required by the student's authorized instructor are met.

OTHER STUDENT PILOT ENDORSEMENTS

Within Class B airspace

61.95 Operations in Class B airspace and at airports located within Class B airspace.

A student pilot may not operate an aircraft on a solo flight **in Class B airspace** unless:

The logbook of that student pilot has been endorsed by the authorized instructor who gave the student pilot flight training, and the endorsement is dated within the 90-day period preceding the date of the flight in that Class B airspace area.

To, from, or at an airport located within Class B airspace

A student pilot may not operate an aircraft on a solo flight **to, from, or at an airport located within Class B airspace** pursuant to §91.131(b) of this chapter unless;

The logbook of that student pilot has been endorsed by an authorized instructor who gave the student pilot flight training, and the endorsement is dated within the 90-day period preceding the date of the flight at that airport.

Night

61.87 Solo requirements for student pilots

Limitations on student pilots operating an aircraft in solo flight at night.

A student pilot may not operate an aircraft in solo flight at night unless that student pilot has received AN endorsement in the student's logbook for the specific make and model aircraft to be flown for night solo flight by an authorized instructor who gave the training within the 90-day period preceding the date of the flight.

3.a. Preparation of a recommendation for a pilot practical test, inclndinu appropriate logbook entry for initial pilot certification. (Initial issuance of Recreational. Private. Commercial pilot certificates)

General - all flight checks

61.39 Prerequisites for practical tests.

(a) Except as provided in paragraphs (b) and (c) of this section, to be eligible for a practical test for a certificate or rating issued under this part, an applicant must:

(6) Have an endorsement, if required by this part, in the applicant's logbook or training record that has been signed by an authorized instructor who certifies that the applicant -

(i) **Has received and logged training time within 60 days preceding the date of application** in preparation for the practical test;

(ii) **Is prepared** for the required practical test; and

(iii) Has **demonstrated satisfactory knowledge of the subject areas in which the applicant was deficient on the airman knowledge test;** and

(7) Have a completed and signed application form.

61.96 Applicability and eligibility requirements: General. (Recreational Pilot)

(b) To be eligible for a recreational pilot certificate, a person who applies for that certificate must:

(3) Receive a logbook endorsement from an authorized instructor who—

(i) Conducted the training or reviewed the applicant's home study on the aeronautical knowledge areas listed in §61 97(b) of this part that apply to the aircraft category and class rating sought; and

(ii) Certified that the applicant is prepared for the required knowledge test.

(5) Receive flight training and a logbook endorsement from an authorized instructor who—

(i) Conducted the training on the areas of operation listed in §61.98(b) of this part that apply to the aircraft category and class rating sought; and

(ii) Certified that the applicant is prepared for the required practical test.

61.103 Eligibility requirements: General. (Private Pilot)

To be eligible for a private pilot certificate, a person must:

(d) Receive a logbook endorsement from an authorized instructor who:

(1) Conducted the training or reviewed the person's home study on the aeronautical knowledge areas listed in **61.105(b)** of this part that apply to the aircraft rating sought; and

(2) Certified that the person is prepared for the required knowledge test,

(f) Receive flight training and a logbook endorsement from an authorized instructor who:

(1) Conducted the training in the areas of operation listed in **61.107(b)** of this part that apply to the aircraft rating sought; and

(2) Certified that the person is **prepared** for the required practical test.

61.123 Eligibility requirements: General. (Commercial Pilot)
To be eligible for a commercial pilot certificate, a person must:

(c) Receive a logbook endorsement from an authorized instructor who:

(1) Conducted the required ground training or reviewed the person's home study on the aeronautical knowledge areas listed in §61.125 of this part that apply to the aircraft category and class rating sought; and
(2) Certified that the person is prepared for the required knowledge test that applies to the aircraft category and class rating sought.

(e) Receive the required training and a logbook endorsement from an authorized instructor who:

(1) Conducted the training on the areas of operation listed in **§61.127(b)** of this part that apply to the aircraft category and class rating sought; and
(2) Certified that the person is **prepared** for the required practical test.

3.b. Preparation of a recommendation for a pilot practical test, including appropriate logbook entry for additional pilot certification. (Adding a Category to the pilot certificate.)
3.c. Preparation of a recommendation for a pilot practical test, including appropriate logbook entry for additional aircraft qualification. (Adding a Class rating to a pilot certificate.)
General - all flight checks

61.39 Prerequisites for practical tests.
To be eligible for a practical test for a certificate or rating issued under this part, an applicant must:

(6) Have an endorsement, if required by this part, in the applicant's logbook or training record that has been signed by an authorized instructor who certifies that the applicant -

(1)Has received and logged training time within 60 days preceding the date of application in preparation for the practical test;
(ii) **Is prepared** for the required practical test; and
(iii) Has **demonstrated satisfactory knowledge of the subject areas in which the applicant was deficient on the airman knowledge test;** and

(7) Have a completed and signed application form.

61.63 Additional aircraft ratings (other than on an airline transport pilot certificate).

(a) General. To be eligible for an additional aircraft rating to a pilot certificate, for other than an airline transport pilot certificate, an applicant must meet the appropriate requirements of this section for the additional aircraft rating sought.

NOTE: This applies to 3.b.

(b) Additional category rating (Glider to Airplane) An applicant who holds a pilot certificate and applies to add a category rating to that pilot certificate:

(2) Must have an **endorsement in his or her logbook** or training record from an authorized instructor, and that endorsement must attest that the applicant has been found **competent in the aeronautical knowledge areas** appropriate to the pilot certificate for the aircraft category and, if applicable, class rating sought;

(3) Must have an **endorsement in his or her logbook** or training record from an authorized instructor, and that endorsement must attest that the applicant has been found **proficient on the areas of operation** that are appropriate to the pilot certificate for the aircraft category and, if applicable, class rating sought;

NOTE: This applies to 3.c.

(cl Additional class rating. (Airplane MEL to Airplane SEL) Any person who applies for an additional class rating to be added on a pilot certificate:

(1) Must have an **endorsement in his or her logbook** or training record from an authorized instructor and that endorsement must attest that the applicant has been found **competent in the aeronautical knowledge** areas appropriate to the pilot certificate for the aircraft class rating sought;

(2) Must have an **endorsement in his or her logbook** or training record from an authorized instructor, and that endorsement must attest that the applicant has been found **proficient in the areas of operation** appropriate to the pilot certificate for the aircraft class rating sought;

4. Reguired endorsement of a pilot logbook for the satisfactory completion of the reguired FAA flight review.

61.56 Flight review.

(a) Except as provided in paragraphs (b) and (f) of this section, a flight review consists of a minimum of 1 hour of flight training and 1 hour of ground training. The review must include:

(1) A review of the current general operating and flight rules of part 91 of this chapter; and

(2) A review of those maneuvers and procedures that, at the discretion of the person giving the review, are necessary for the pilot to demonstrate the safe exercise of the privileges of the pilot certificate.

(c) Except as provided in paragraphs (d), (e), and (g) of this section, no person may act as pilot in command of an aircraft unless, since the beginning of the 24th calendar month before the month in which that pilot acts as pilot in command, that person has—

(1) Accomplished a flight review given in an aircraft for which that pilot is rated by an authorized instructor and

(2) **A logbook endorsed from an authorized instructor who gave the review certifying that the person has satisfactorily completed the review.**

5. Reguired flight instructor records.

61.189 Flight instructor records.

(a) A flight instructor must **sign the logbook of each person to whom that instructor has given flight training or ground training.**

(b) A flight instructor must **maintain a record in a logbook** or a separate document that contains the following:

(1) The name of **each person whose logbook or student pilot certificate that instructor has endorsed for solo flight privileges,** and the date of the endorsement; and

(2) The name of **each person that instructor has endorsed for a knowledge test or practical test,** and the record shall also indicate the kind of test, the date, and the results.

(c) Each flight instructor must retain the records required by this section for at least **3 years.**

Just a little extra information!

Solo flight when the student is already a certificated pilot.

61.31 Type rating requirements, additional training, and authorization requirements.

(d) Aircraft category, class, and type ratings: Limitations on operating an aircraft as the pilot in command. To serve as the pilot in command of an aircraft, a person must—

(1) Hold the appropriate category, class, and type rating (if a class rating and type rating are required) for the aircraft to be flown;

(2) Be receiving training for the purpose of obtaining an additional pilot certificate and rating that are appropriate to that aircraft, and be under the supervision of an authorized instructor; or

(3) Have received training required by this part that is appropriate to the aircraft category, class, and type rating (if a class or type rating is required) for the aircraft to be flown, and <u>have received the required endorsements from an instructor who is authorized to provide the required endorsements for solo flight in that aircraft.</u>

APPENDIX 4.

Mini Lessons/Special Topics

Here are some subject areas and questions that I think deserve special preparation. They are included because, in my opinion, over the years CFI Applicants haven't been able to teach these subjects.

1. Explain Adverse Yaw.
2. Explain Dihedral.
3. Explain the “Stagnation Point.”
4. Explain the Separation Point.
5. Explain the Drag versus Speed Diagram.
6. What is "The Backside of the Power Curve?"
7. What is Ground Effect?
8. Explain Wing Tip Vortices.
9. Explain Stall speed versus angle of bank
10. What is Vref?
11. What is 1.3 X Vso all about?
12. How do you compute 1.3 X Vso?
13. Define cross controlling and cross-controlled and explain the difference.
14. Explain Wash-in, Wash-out, and Wing twist.
15. Explain the relationship between Center of Gravity and Center of Pressure.
16. Explain how to fly over an uncontrolled airfield at 1,500 AGL and transition to a 45° entry to the downwind.
17. Explain what Special VFR is with emphasis at an uncontrolled airport (dotted magenta line around the airport).
18. What is Maneuvering speed? What happens to Va with a change weight?
19. Does an applicant have to enter any ground reference maneuver downwind?
20. Who determines the angle of bank for a Turn Around A Point?
21. Does a Steep Spiral have to be performed at a steep angle of bank?
22. Does an applicant have to retract flaps after a Short-field Landing?Should they?
23. When can an applicant stall an airplane during Maneuvering During Slow Flight and still pass the flight check?
24. Does an applicant have to actually stall the airplane when demonstrating a stall?
25. How many times must you stall the airplane during the Accelerated Maneuver Stalls?
26. If a Chandelle were a maximum performance climbing turn, why would a P51 Mustang and a J3 Cub both use a maximum of 30 degrees of bank during the maneuver?
27. Regarding pitch and power, is there a difference between flying an ILS glideslope and a VASI.
28. During a takeoff, why does the airplane weathervane into the wind at rotation?

APPENDIX 5.

Timetable for a CFI Checkride

Let's do a little math about the oral and the flight portions of the CFI Practical Test. I figure the FAA Inspector gets about three to three and a half hours to conduct the "oral" part of the practical test. Accepting that the Inspector can do just about anything he wants to, there are still some rules he has to follow. There are no less than six Areas of Operations or Tasks that MUST be covered during the Practical Test. In reality the bulk of them must be done during the "oral." In addition the Inspector has to cover Area of Operation XIII. Task B. This requires you to teach at least five systems malfunctions. The PTS requires the Inspector to cover every Element within those Tasks. This figures out to about 25 to 30 minutes per mandatory TASK.

The flight check day probably starts at 8:00 A.M. and ends around 4:00 PM with 30 minutes for lunch. This leaves 7 hours and 30 minutes for the practical test. This assumes that the Inspector isn't interrupted, doesn't take a long lunch, or doesn't have to travel too far from the office to the airplane.

Meet at the FSDO, sign-in,complete IACRA, briefing		0.5hrs
"Oral"		3.5hrs
Lunch		0.5hrs
Preflight airplane		0.5hrs
Flight portion of test		2.0hrs
Post-flight, complete IACRA, debrief		0.5hrs
	Total	7.5hrs

APPENDIX 6.

Tracking Checklist

[I] [T] [S]

I. FUNDAMENTALS OF INSTRUCTING

[ ][ ][ ] A. The Learning Process
[ ][ ][ ] B. Human Behavior and Effective Communication
[ ][ ][ ] C. The Teaching Process
[ ][ ][ ] D. Teaching Methods
[ ][ ][ ] E. Critique and Evaluation.
[ ][ ][ ] F. Flight Instructor Characteristics and Responsibilities
[ ][ ][ ] G. Planning Instructional Activity

II. TECHNICAL SUBJECT AREAS

[ ][ ][ ] A. Aeromedical Factors
[ ][ ][ ] B. Visual Scanning and Collision Avoidance
[ ][ ][ ] C. Principles of Flight
[ ][ ][ ] D. Airplane Flight Controls
[ ][ ][ ] E. Airplane Weight and Balance
[ ][ ][ ] F. Navigation and Flight Planning
[ ][ ][ ] G. Night Operations
[ ][ ][ ] H. High Altitude Operations
[ ][ ][ ] I. Federal Aviation Regulations and Publications
[ ][ ][ ] J. National Airspace System
[ ][ ][ ] K. Navigation Systems and Radar Services
[ ][ ][ ] L. Logbook Entries and Certificate Endorsements

III. PREFLIGHT PREPARATION

[ ][ ][ ] A. Certificates and Documents
[ ][ ][ ] B. Weather Information
[ ][ ][ ] C. Operation of Systems
[ ][ ][ ] D. Performance and Limitations
[ ][ ][ ] E. Airworthiness Requirements

IV. PREFLIGHT LESSON ON A MANEUVER TO BE PERFORMED IN FLIGHT

[ ][ ][ ] A. Maneuver Lesson

V. PREFLIGHT PROCEDURES

[ ][ ][ ] A. Preflight Inspection
[ ][ ][ ] B. Single-Pilot Crew Resource Management
[ ][ ][ ] C. Engine Starting
[ ][ ][ ] D. Taxiing - Landplane
[ ][ ][ ] E. Before Takeoff Check

VI. AIRPORT AND SEAPLANE BASE OPERATIONS

[ ][ ][ ] A. Radio Communications and ATC Light Signals
[ ][ ][ ] B. Traffic Patterns
[ ][ ][ ] C. Airport, Runway and Taxiway Signs Markings, and Lighting

I = Introduced by Instructor
T = Taught by CFI Applicant
S = Satisfactory performance and teaching

[I][T][S]

VII. TAKEOFFS, LANDINGS, AND GO-AROUNDS

[][][] A. Normal and Crosswind Takeoff and Climb
[][][] B. Short-Field Takeoff and Maximum Performance Climb
[][][] C. Soft-Field Takeoff and Climb
[][][] F. Normal and Crosswind Approach and Landing
[][][] G. Slip to a Landing
[][][] H. Go-Around/Rejected Landing
[][][] I. Short-Field Approach and Landing
[][][] J. Soft-Field Approach and Landing
[][][] K. Power-Off 180° Accuracy Approach and Landing

VIII. FUNDAMENTALS OF FLIGHT

[][][] A. Straight-and-Level Flight
[][][] B. Level Turns
[][][] C. Straight Climbs and Climbing Turns
[][][] D. Straight Descents and Descending Turns

IX. PERFORMANCE MANEUVERS []

[][][] A. Steep Turns
[][][] B. Steep Spirals
[][][] C. Chandelles
[][][] D. Lazy Eights

X. GROUND REFERENCE MANEUVERS

[][][] A. Rectangular Course
[][][] B. S-Turns Across a Road
[][][] C. Turns Around a Point
[][][] D. Eights on Pylons

XI. SLOW FLIGHT, STALLS, AND SPINS

()[][] A. Maneuvering During Slow Flight
[][][] B. Power-On Stalls (Proficiency)
[][][] C. Power-Off Stalls (Proficiency)
[][][] D. Crossed-Control Stalls (Demonstration)
[][][] E. Elevator Trim Stalls (Demonstration)
[][][] F. Secondary Stalls (Demonstration)
[][][] G. Spins
[][][] H. Accelerated Maneuver Stalls (Demonstration)

XII. BASIC INSTRUMENT MANEUVERS

[][][] A. Straight-and-Level Flight
[][][] B. Constant Airspeed Climbs
[][][] C. Constant Airspeed Descents
[][][] D. Turns to Headings
[][][] E. Recovery from Unusual Flight Attitudes

XIII. EMERGENCY OPERATIONS

[][][] A. Emergency Approach and Landing (Simulated)
[][][] B. Systems and Equipment Malfunctions
[][][] C. Emergency Equipment and Survival Gear
[][][] D. Emergency Descent

XIV. POSTFLIGHT PROCEDURES

[][][] A. Postflight Procedures

I = Introduced by Instructor
T = Taught by CFI Applicant
S = Satisfactory performance and teaching