

# Aviation Instructor's Handbook

Teaching Tips from Veteran Flight Instructors

video camera to rehearse preflight briefings until delivery is smooth. The instructor is worth \$100 per hour.

Provide a second or third opportunity for a PT is performing during critical phases of flight.

Set a high standard of performance.

Because it's legal, doesn't it? It's not. A high level of supervision is required.

Develop a safety-culture environment.

6 Assign organized, specific, appropriate homework after each flight lesson.

7 Use all available tools to supplement teaching and assignments: online sources, video, etc.

8 Know the background, credentials, security issues, medications, etc. of the PT.

9 Thoroughly and carefully document all training events as though the flight instructor is a Federal Aviation Administration (FAA) checkride is an excellent way to read them because they just might.

10 Flight after a Federal Aviation Administration (FAA) checkride is an excellent way to read them because they just might.

11 After a flight after a Federal Aviation Administration (FAA) checkride is an excellent way to read them because they just might.

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now are pushed away, to be dealt with at another time, or hopefully never because they faded away on their own accord. The level of repression can vary from temporarily forgetting an uncomfortable thought to amnesia, where the events that triggered the anxiety are deeply buried. Repressed memories do not disappear and may reappear in dreams or slips of the tongue (“Freudian slips”). For example, a student pilot may have a repressed fear of flying that inhibits his or her ability to learn how to fly.

### ***Denial***

Denial is a refusal to accept external reality because it is too threatening. It is the refusal to acknowledge what has happened, is happening, or will happen. It is a form of repression through which stressful thoughts are banned from memory. Related to denial is minimization. When a person minimizes something, he or she accepts what happened, but in a diluted form.

For example, the instructor finds a screwdriver on the wing of an aircraft the maintenance student was repairing and explains the hazards of foreign object damage (FOD). The student, unwilling to accept the reality that his or her inattention could have caused an aircraft accident, denies having been in a hurry the previous day. Or, the student minimizes the incident, accepting he or she left the tool but pointing out that nothing bad happened as a result of the action.

Other defense mechanisms include but are not limited to the following:

### ***Compensation***

Compensation is a process of psychologically counterbalancing perceived weaknesses by emphasizing strength in other areas. Through compensation, students often attempt to disguise the presence of a weak or undesirable quality by emphasizing a more positive one. The “I’m not a fighter, I’m a lover” philosophy can be an example of compensation. Compensation involves substituting success in a realm of life other than the realm in which the person suffers a weakness.

### ***Projection***

Through projection, an individual places his or her own unacceptable impulses onto someone else. A person relegates the blame for personal shortcomings, mistakes, and transgressions to others or attributes personal motives, desires, characteristics, and impulses to others. The student pilot who fails a flight exam and says, “I failed because I had a poor examiner” believes the failure was not due to a lack of personal skill or knowledge. This student projects blame onto an “unfair” examiner.

### ***Rationalization***

Rationalization is a subconscious technique for justifying actions that otherwise would be unacceptable. When true rationalization takes place, individuals sincerely believe in the plausible and acceptable excuses which seem real and justifiable. For example, a student mechanic performs poorly on a test. He or she may justify the poor grade by claiming there was not enough time to learn the required information. The student does not admit to failing to join the class study group or taking the computer quiz offered by the instructor.

### ***Reaction Formation***

In reaction formation a person fakes a belief opposite to the true belief because the true belief causes anxiety. The person feels an urge to do or say something and then actually does or says something that is the opposite of what he or she really wants. For example, a student may develop a who-cares-how-other-people-feel attitude to cover up feelings of loneliness and a hunger for acceptance.

### ***Fantasy***

Fantasy occurs when a student engages in daydreams about how things should be rather than doing anything about how things are. The student uses his or her imagination to escape from reality into a fictitious world—a world of success or pleasure. This provides a simple and satisfying escape from problems, but if a student gets sufficient satisfaction from daydreaming, he or she may stop trying to achieve goals altogether. Perhaps the transitioning pilot is having trouble mastering a more complex aircraft, which jeopardizes his or her dream of becoming an airline pilot. It becomes easier to daydream about the career than to achieve the certification. Lost in the fantasy, the student spends more time dreaming about being a successful airline pilot than working toward the goal. When carried to extremes, the worlds of fantasy and reality can become so confused that the dreamer cannot distinguish one from the other.

### ***Displacement***

This defense mechanism results in an unconscious shift of emotion, affect, or desire from the original object to a more acceptable, less threatening substitute. Displacement avoids the risk associated with feeling unpleasant emotions and puts them somewhere other than where they belong. For example, the avionics student is angry with the instructor over a grade received, but fears displaying the anger could cause the instructor to lower the grade. The student might choose to express the anger but redirects it toward another, safer person such as a spouse. Maybe the student yells at the spouse, but the student knows the spouse either forgives the

Perception involves more than the reception of stimuli from the five senses; it also involves a person giving meaning to sensations. People base their actions on the way they believe things to be. The experienced AMT, for example, perceives an engine malfunction quite differently than does an inexperienced student. This occurs because the beginning aviation student is overwhelmed by stimuli and often focuses on meaningless things, thus missing key information. It is important for the instructor to direct trainee's perceptions initially so that the student detects and perceives relevant information.

Real meaning comes only from within a person, even though the perceptions, which evoke these meanings, result from external stimuli. The meanings, which are derived from perceptions, are influenced not only by the individual's experience, but also by many other factors. Knowledge of the factors that affect the perceptual process is very important to the aviation instructor because perceptions are the basis of all learning.

### **Factors That Affect Perception**

Both internal and external factors affect an individual's ability to perceive:

- Physical organism
- Goals and values
- Self-concept
- Time and opportunity
- Element of threat

#### ***Physical Organism***

The physical organism provides individuals with the perceptual apparatus for sensing the world around them. Pilots, for example, must be able to see, hear, feel, and respond adequately while they are in the air.

#### ***Goals and Values***

Perceptions depend on one's values and goals. Every experience and sensation, which is funneled into one's central nervous system, is colored by the individual's own beliefs and value structures. Spectators at a ball game may see an infraction or foul differently depending on which team they support. The values of the student are important for the instructor to know, because this knowledge assists in predicting how the student interprets experiences and instructions.

Goals are also a product of one's value structure. Things that are more highly valued and cherished are pursued; those accorded less value and importance are not sought after.

#### ***Self-Concept***

Self-concept is a powerful determinant in learning. A student's self-image, described in such terms as "confident" or "insecure," has a great influence on the total perceptual process. If a student's experiences tend to support a favorable self-image, the student tends to remain receptive to subsequent experiences. If a student has negative experiences, which tend to contradict self-concept, there is a tendency to reject additional training.

A negative self-concept inhibits the perceptual processes by introducing psychological barriers, which tend to keep the student from perceiving. They may also inhibit the ability to properly implement what is perceived. That is, self-concept affects the ability to actually perform or do things unfavorably. Students who view themselves positively, on the other hand, are less defensive and more receptive to new experiences, instructions, and demonstrations.

#### ***Time and Opportunity***

It takes time and opportunity to perceive. Learning some things depends on other perceptions, which have preceded these learnings, and on the availability of time to sense and relate these new things to the earlier perceptions. Thus, proper sequence and time are necessary.

A student could probably stall an aircraft on the first attempt, regardless of previous experience. Stalls cannot really be learned, however, unless some experience in normal flight has been acquired. Even with such experience, time and practice are needed to relate the new sensations and experiences associated with stalls in order to develop a perception of the stall. In general, lengthening an experience and increasing its frequency are the most obvious ways to speed up learning, although this is not always effective. Many factors, in addition to the length and frequency of training periods, affect the rate of learning. The effectiveness of the use of a properly planned training syllabus is proportional to the consideration it gives to the time and opportunity factor in perception.

#### ***Element of Threat***

The element of threat does not promote effective learning. In fact, fear adversely affects perception by narrowing the perceptual field. Confronted with threat, students tend to limit their attention to the threatening object or condition. The field of vision is reduced, for example, when an individual is frightened and all the perceptual faculties are focused on the thing that has generated fear.

Flight instruction provides many clear examples of this. During the initial practice of steep turns, Beverly may focus

them meaningful only if they understand them well enough to apply them correctly to real situations. If an experience challenges the students, requires involvement with feelings, thoughts, memory of past experiences, and physical activity, it is more effective than a learning experience in which all the students have to do is commit something to memory.

It seems clear enough that the learning of a physical skill requires actual experience in performing that skill. Student pilots learn to fly aircraft only if their experiences include flying them; student AMTs learn to overhaul power plants only by actually performing that task. Mental habits are also learned through practice. If students are to use sound judgment and develop decision-making skills, they need learning experiences that involve knowledge of general principles and require the use of judgment in solving realistic problems.

### **Learning Is Multifaceted**

If instructors see their objective as being only to train their students' memory and muscles, they are underestimating the potential of the teaching situation. Students learn much more than expected if they fully exercise their minds and feelings. The fact that these items were not included in the instructor's plan does not prevent them from influencing the learning situation.

Psychologists sometimes classify learning by types, such as verbal, conceptual, perceptual, motor, problem-solving, and emotional. Other classifications refer to intellectual skills, cognitive strategies, and attitudinal changes, along with descriptive terms like surface or deep learning. However useful these divisions may be, they are somewhat artificial. For example, a class learning to apply the scientific method of problem-solving may learn the method by trying to solve real problems. But in doing so, the class also engages in verbal learning and sensory perception at the same time. Each student approaches the task with preconceived ideas and feelings, and for many students, these ideas change as a result of experience. Therefore, the learning process may include verbal elements, conceptual elements, perceptual elements, emotional elements, and problem-solving elements all taking place at once. This aspect of learning will become more evident later in this handbook when lesson planning is discussed.

Learning is multifaceted in still another way. While learning the subject at hand, students may be learning other things as well. They may be developing attitudes about aviation—good or bad—depending on what they experience. Under a skillful instructor, they may learn self-reliance. The list is seemingly endless. This type of learning is sometimes referred to as incidental, but it may have a great impact on the total development of the student.

### **Learning Is an Active Process**

Students do not soak up knowledge like a sponge absorbs water. The instructor cannot assume that students remember something just because they were in the classroom, shop, or aircraft when the instructor presented the material. Neither can the instructor assume the students can apply what they know because they can quote the correct answer verbatim. For students to learn, they need to react and respond, perhaps outwardly, perhaps only inwardly, emotionally, or intellectually.

### **Learning Styles**

Learning styles are simply different approaches or ways of learning based on the fact that people absorb and process information in different ways. Learning style is an individual's preference for understanding experiences and changing them into knowledge. It denotes the typical strategy a learner adopts in a learning situation. For example, information may be learned in a variety of ways: by seeing or hearing, by reflecting or acting, analyzing or visualizing, or it may be learned piecemeal or steadily. Just as people learn differently, they also have different teaching methods. Some instructors rely on lectures, others demonstrate, and others may prefer computer simulation training. Everyone has a mixture of strengths and preferences, not a single style or preference to the complete exclusion of any other. Please bear this in mind when using these ideas.

As mentioned in chapter 1 and the discussion of personality types and learning, underpinning the idea of learning style is the theory that everyone has an individual style of learning. According to this approach to learning, if the student and instructor work with that style, rather than against it, both benefit. Currently, 71 different theories of learning styles have been identified. These theories run from simple to complex, usually reflecting scientific research about how the brain processes information. While the scientific community may be surprised at how the research has been used, many educators and school systems have become advocates of applying learning style to teaching methods.

Another model for learning, the Approaches to Learning model, bases its theory on the student's learning intentions. For example, is the student interested in short-term memorization of the material or long-term knowledge? Does the student want a passing grade on a pop quiz or the ability to use the material learned to repair an engine? One feature of the Approaches to Learning is that the learner's approach to learning depends on his or her reasons for learning. This theory reflects the chapter 1 discussion of adult learners who come to aviation training with definite reasons for learning.

home, Bill attempts to generalize her new abilities and put yet a different spin on the same problem. He presents the low-fuel scenario, taking advantage of the fact that there are eight nearby airports. All of the airports are in plain view, and she must choose one.

Each of these scenarios taught Beverly something she needed to learn next, and made good use of the surroundings and available circumstances. As these examples illustrate, there is no list of “canned” scenarios that can be used for all students. Instructors must learn to devise their own scenarios by considering what each student needs to practice, and exploiting features of the local environment that allow them to do it.

### **The Learning Route to Expertise**

What does it take to successfully orchestrate all of the knowledge and skills the student has learned into what instructors, evaluators, and other pilots and mechanics would regard as true expertise? All evidence seems to point once again to the idea of practice. Just as the perfection of an individual skill seems to rely on repeated practice, so does the combination of knowledge and skills that make up our abilities to do the real-world job of pilot or mechanic.

How much practice does it take to become a true expert? In a study of expert performers in fields ranging from science to music to chess, one psychologist found that no performer had reached true expertise without having invested at least ten years of practice in his or her field. Experts have been found to use two tools to help them gain expertise in their field: cognitive strategies and problem-solving tactics.

### ***Cognitive Strategies***

The idea of cognitive strategies emerged over 50 years ago in the context of human information processing theory. Cognitive strategies refer to the knowledge of procedures or knowledge about how to do something in contrast with the knowledge of facts. They use the mind to solve a problem or complete a task and provide a structure for learning that actively promotes the comprehension and retention of knowledge. A cognitive strategy helps the learner develop internal procedures that enable him or her to perform higher level operations.

As students acquire experience, they develop their own strategies for dealing with problems that arise frequently. For example, a student develops the following strategy for avoiding inadvertent flight into instrument meteorological conditions (IMC) at night. He or she checks the weather prior to departure, obtains updates on the weather every hour, and plans to divert to an alternate destination at the first suspicion of unexpected weather ahead.

One approach to helping students develop cognitive strategies is to study and identify the strategies that experts use and then teach these strategies to the students. Expert strategies were identified by researchers who presented experts with problems to solve and asked them to think aloud as they attempted to solve the problems. These cognitive strategies can be taught to students, usually with successful results.

### ***Problem-Solving Tactics***

Problem-solving tactics are specific actions intended to get a particular result, and this type of knowledge represents the most targeted knowledge in the expert’s arsenal. For example, a student notices how easy it is to make a mistake with a takeoff distance chart after using it several times. She notices her finger drifts upward or downward when sliding it across a row of numbers on the chart, sometimes landing on the wrong number. The student formulates several tactics to ensure she obtains the correct figures: (1) work slowly and deliberately, (2) use a ruler, and (3) double-check the work.

But even the experts had to practice. In a study of violinists at a music academy in Berlin, researchers compared the “best” students to those who were regarded as merely “very good.” Using estimates of how many total hours each student had spent practicing during his or her lifetime, the researchers found that the best violinists had spent an average of 7,000 hours practicing, while the very good violinists had logged about 5,000 hours. The scientific study of expertise reiterates the adage: “Practice makes perfect.”

### **Awareness of Existence of Unknowns**

An important aspect of an expert’s knowledge is an awareness of what he or she does not know. This is not always the case with a student. It’s important that an instructor be aware of situations in which students have acquired “book” knowledge, but not yet acquired the more in-depth understanding that comes from association and experience. For example, after acquiring substantial knowledge of a single-engine training aircraft, students should understand that a four-seat aircraft by the same manufacturer should be approached with caution and not overconfidence.

### **Summary of Instructor Actions**

To help students exercise their knowledge and skills in a concerted fashion, the instructor should:

- Explain the two types of multitasking and give examples of each type.
- Ensure that individual skills are reasonably well-practiced before asking students to perform several tasks at once.

- Maintain high-order learning standards. Overlearning may be appropriate. The more thoroughly the students understand the material, the more likely they are to see its relationship to new situations. Avoid unnecessary rote learning, since it does not foster transfer.
- Provide meaningful learning experiences that build student confidence in their ability to transfer learning. This suggests activities that challenge them to exercise their imagination and ingenuity in applying their knowledge and skills.
- Use instructional material that helps form valid concepts and generalizations. Use materials that make relationships clear.

### **Habit Formation**

The formation of correct habit patterns from the beginning of any learning process is essential to further learning and for correct performance after the completion of training. Remember, primacy is one of the fundamental principles of learning. Therefore, it is the instructor's responsibility to insist on correct techniques and procedures from the outset of training to provide proper habit patterns. It is much easier to foster proper habits from the beginning of training than to correct faulty ones later.

Due to the high level of knowledge and skill required in aviation for both pilots and maintenance technicians, training has traditionally followed a building block concept. This means new learning and habit patterns are based on a solid foundation of experience and/or old learning. Everything from intricate cognitive processes to simple motor skills depends on what the student already knows and how that knowledge can be applied in the present. As knowledge and skill increase, there is an expanding base upon which to build for the future.

### **How Understanding Affects Memory**

The ability to remember is greatly affected by the level of understanding of what has been learned. Many studies have demonstrated a depth-of-processing effect on memory: the more deeply humans think about what they have learned, the more likely they are able to retrieve that knowledge later. Depth-of-processing is the natural result of the kinds of learning activities described earlier: beginning with memorized information and then elaborating upon it, making associations, constructing explanations, all in pursuit of furthering understanding.

The effects of depth of processing on memory are quite powerful and result from even the simplest attempts to elaborate on what has been learned. One study asked participants to memorize sentences such as "The pilot

arrived late." Half of the participants simply memorized the sentences as they were. The other participants were asked to develop an elaboration for the sentence such as "because of the bad weather."

When put to a test, participants who created elaborations were significantly better able to recall the sentences. When memories for sentences had decayed, it seems that remembered words from the elaborations helped people recall them.

### **Remembering During Training**

Remembering what is learned on a day-to-day basis is the first challenge students must meet. As students are presented with new knowledge each day, they must work to maintain that new knowledge plus all the knowledge they learned on previous days. Indeed, remembering during training is a challenge that increases in magnitude each day.

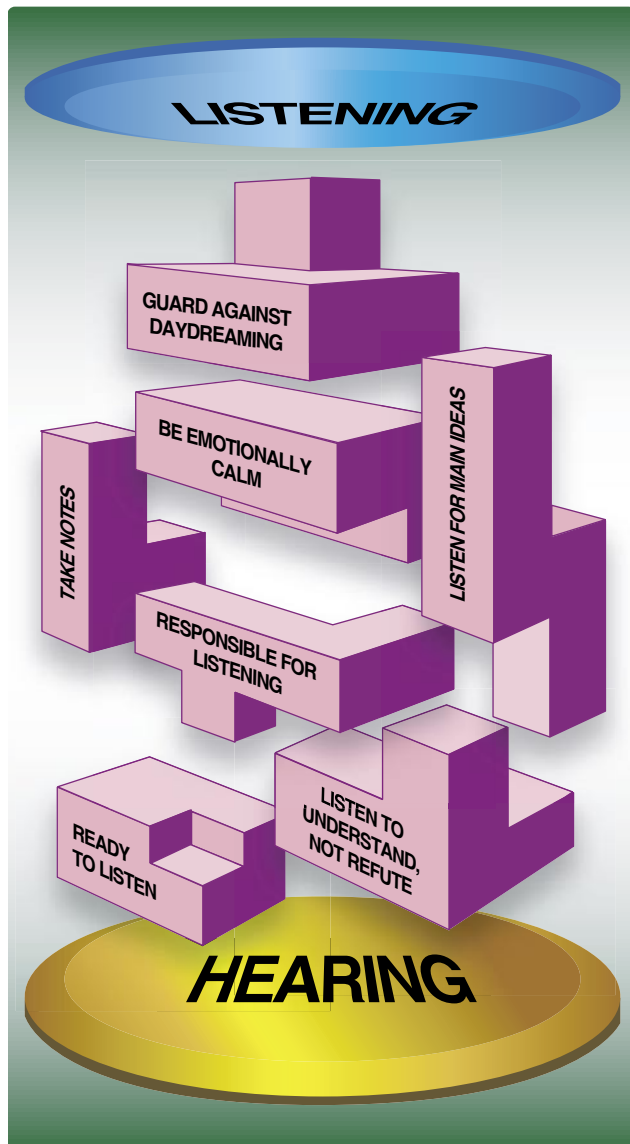
The first threat to newly acquired knowledge is a lack of frequent usage in the past. To address this threat, the student must engage in regular practice of what they have learned. Students often put off daily studying in favor of "cramming" the night before an evaluation. These students should be made aware that shorter and regularly spaced study sessions produce memory results that far exceed those obtained from cramming.

A second threat to newly acquired knowledge is a lack of understanding that might serve to assist the student in recalling it. It has been demonstrated that study practices that combine repetition of knowledge along with efforts to increase one's understanding of the knowledge lead to best results. The idea of reading with "study questions" in mind is one that has received much attention by memory researchers.

Experiments have found that not only does answering study questions lead to better memory, but so does the very act of creating study questions. In one experiment in which students read a text and were then tested on their comprehension, students who wrote their own study questions and then discarded them unanswered exhibited better recall than students who simply read the text.

### **Remembering After Training**

Students must leave the training environment with a sound understanding that a certificate is in no sense a guarantee that they will remember anything that they have learned. It seems that no one is exempt from the process of forgetting. Continued practice of their knowledge and skill is the only means of retaining what they learned, and practice is important after they become certificated pilots and mechanics as it is during their training.



**Figure 3-5.** Students can improve their listening skills by applying the steps to effective listening.

Listening for main ideas is another listening technique. Primarily a technique for listening to a lecture or formal lesson presentation, it sometimes applies to hands-on situations as well. People who concentrate on remembering or recording facts might very well miss the message because they have not picked up on the big picture. A listener must always ask, what is the purpose of what I am listening to? By doing this, the listener can relate the words to the overall concept.

The instructor must ensure that the student is aware of the danger of daydreaming. Most people can listen much faster than even the fastest talker can speak. This leaves room for the mind to get off onto some other subject. The listener who is aware of this problem can concentrate on repeating,

paraphrasing, or summarizing the speaker's words. Doing so uses the extra time to reinforce the speaker's words, allowing the student to retain more of the information.

Nobody can remember everything. Teaching a student to take notes allows the student to use an organized system to reconstruct what was said during the lesson. Every student has a slightly different system, but no attempt to record the lecture verbatim should be made.

In most cases, a shorthand or abbreviated system of the student's choosing should be encouraged. Notetaking is merely a method of allowing the student to recreate the lecture so that it can be studied. The same notetaking skills can be used outside the classroom any time information needs to be retained. For example, copying an instrument clearance word for word is very difficult. By knowing the format of a typical clearance, student instrument pilots can develop their own system of abbreviations. This allows them to copy the clearance in a useful form for read back and for flying the clearance. By incorporating all or some of these techniques, students retain more information. Instructors can vastly improve their students' retention of information by making certain their students have the best possible listening skills.

### Questioning

Good questioning can determine how well the student understands what is being taught. It also shows the student that the instructor is paying attention and that the instructor is interested in the student's response. An instructor should ask focused, open-ended questions and avoid closed-ended questions.

Focused questions allow the instructor to concentrate on desired areas. An instructor may ask for additional details, examples, and impressions from the student. This allows the instructor to ask further questions if necessary. The presentation can then be modified to fit the understanding of the student.

Open-ended questions are designed to encourage full, meaningful answers using the student's own knowledge and perceptions while closed-ended questions encourage a short or single-word answer. Open-ended questions, which typically begin with words such as "why" and "how" tend to be more objective and less leading than closed-ended questions. Often open-ended questions are not technically questions, but statements that implicitly ask for completion. An instructor's ability to ask open-ended questions is an important skill to develop.



**Figure 4-7.** *The attention element causes students to focus on the upcoming lesson.*

### ***Motivation***

The purpose of the motivation element is to offer the students specific reasons why the lesson content is important to know, understand, apply, or perform concepts of Thorndike's law of readiness. For example, the instructor may talk about an occurrence where the knowledge in the lesson was applied. Or the instructor may remind the students of an upcoming test on the material. This motivation should appeal to each student personally and engender a desire to learn the material.

### ***Overview***

Every lesson introduction should contain an overview that tells the group what is to be covered during the period. A clear, concise presentation of the objective and the key ideas gives the students a road map of the route to be followed. A good visual aid can help the instructor show the students the path that they are to travel. The introduction should be free of stories, jokes, or incidents that do not help the students focus their attention on the lesson objective. Also, the instructor should avoid a long apologetic introduction, because it only serves to dampen the students' interest in the lesson.

### ***Development***

Development is the main part of the lesson. Here, the instructor develops the subject matter in a manner that helps the students achieve the desired learning outcomes. The instructor must logically organize the material to show the relationships of the main points. The instructor usually shows these primary relationships by developing the main points in one of the following ways: from past to present, simple to complex, known to unknown, and most frequently used to least used.

### ***Past to Present***

In this pattern of development, the subject matter is arranged chronologically, from the present to the past or from the

past to the present. Time relationships are most suitable when history is an important consideration, as in tracing the development of radio navigation systems.

### ***Simple to Complex***

The simple-to-complex pattern helps the instructor lead the student from simple facts or ideas to an understanding of the phenomena or concepts involved. In studying jet propulsion, for example, the student might begin by considering the action involved in releasing air from a toy balloon and finish by taking part in a discussion of a complex gas turbine engine.

Do not be afraid to omit "less important" information at first in order to simplify the learning process. If Class D, E, and G airspace are the only airspace types being utilized by a student, save the discussion of A, B, and C airspace until they have operating familiarity with the other types. Less information at first is easier to absorb.

### ***Known to Unknown***

By using something the student already knows as the point of departure, the instructor can lead into new ideas and concepts. For example, in developing a lesson on heading indicators, the instructor could begin with a discussion of the vacuum-driven heading indicator before proceeding to a description of the radio magnetic indicator (RMI).

### ***Most Frequently Used to Least Used***

In some subjects, certain information or concepts are common to all who use the material. This fourth organizational pattern starts with common usage before progressing to the rarer ones. Even though most aircraft are equipped with some sort of navigational system, instructors should teach students the basics of navigation. For example, basic map reading is a perishable skill that should be practiced often. Another example is dead reckoning, which forces pilots to be aware of their surroundings at all times. Basic VOR/NDB radio navigation procedures are also perishable and could save lives if proficiency is maintained. Before using a global positioning system (GPS) as the sole means of navigation, students should be taught the basics.

Under each main point in a lesson, the subordinate points should lead naturally from one to another. With this arrangement, each point leads logically to and serves as a reminder of the next. Meaningful transition from one main point to another keeps the students oriented, aware of where they have been, and where they are going. This permits effective sorting or categorizing chunks of information in the working or short-term memory. Organizing a lesson so the students grasp the logical relationships of ideas is not an easy task, but it is necessary if the students are to learn

Likewise, it would be unfair to expect a maintenance student to safely and properly perform a compression check on an aircraft engine if the student received only e-learning.

Along with the many types of e-learning, there are a variety of terms used to describe the educational use of the computer. While there are subtle nuances to the different terms which include computer-assisted learning (CAL), computer-assisted instruction (CAI), computer-based training (CBT), and computer-based instruction (CBI), this handbook will use the term “computer-assisted learning” in the following discussion.

### **Computer-Assisted Learning (CAL) Method**

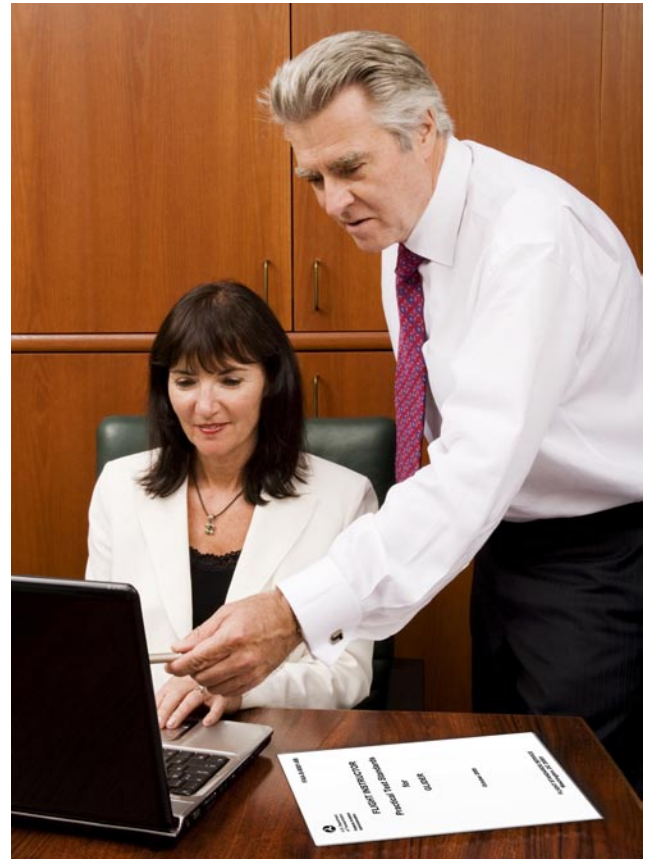
Computer-assisted learning (CAL) couples the personal computer (PC) with multimedia software to create a training device. For example, major aircraft manufacturers have developed CAL programs to teach aircraft systems and maintenance procedures to their employees, reducing the amount of manpower necessary to train aircrews and maintenance technicians on the new equipment. End users of the aircraft, such as the major airlines, can purchase the training materials with the aircraft in order to accomplish both initial and recurrent training of their personnel. Major advantages of CAL are that students can progress at a rate which is comfortable for them and are often able to access the CAL at their own convenience.

Another benefit of CAL is the test prep study guides, useful for preparation for the FAA knowledge tests. These programs typically allow the students to select a test, complete the questions, and find out how they did on the test. The student may then conduct a review of questions missed.

Some of the more advanced CAL applications allow students to progress through a series of interactive segments where the presentation varies as a result of their responses. If students wish to learn about a particular area, they do so by clicking the mouse on a particular portion of the screen. They can focus on the area they either need to study or want to study. For example, a maintenance student who wants to find information on the refueling of a specific aircraft could use a CAL program to access the refueling section, and study the entire procedure. If the student wishes to repeat a section or a portion of the section, it can be done at any time merely by clicking on the appropriate icon.

In teaching aviation students, CAL programs can be used by the instructor as another type of reference for students to study. Just as a student can reread a section in a text, a student can review portions of a CAL program until it is understood. The instructor must continue to monitor and evaluate the progress of the student as usual. This is necessary

to be certain a student is on track with the training syllabus. At times, instructors may feel that they are doing more one-on-one instruction than in a normal classroom setting, but repetitive forms of teaching may be accomplished by computer. This actually gives the instructor more time for one-on-one teaching. Remember, the computer has no way of knowing when a student is having difficulty, and it will always be the responsibility of the instructor to provide monitoring and oversight of student progress and to intervene when necessary. [Figure 4-13]



**Figure 4-13.** *The instructor must continually monitor student performance when using CAL, as with all instructional aids.*

Real interactivity with CAL means the student is fully engaged with the instruction by doing something meaningful which makes the subject of study come alive. For example, the student controls the pace of instruction, reviews previous material, jumps forward, and receives instant feedback. With advanced tracking features, CAL also can be used to test the student’s achievement, compare the results with past performance, and indicate the student’s weak or strong areas.

For most aviation training, the computer should be thought of as a valuable instructional aid and entrusting an entire aviation training program to a computer is not practical. Even airline simulator programs require tailoring and hands-

used for study, training, or testing in place of the real object, which is too costly or too dangerous, or which is impossible to obtain. The mock-up may emphasize or highlight elements or components for learning and eliminate nonessential elements.

Cut-aways, another type of model, are built in sections and can be taken apart to reveal the internal structure. Whenever possible, the various parts should be labeled or colored to clarify relationships.

Production and equipment costs are limiting factors to consider in developing and using models, mock-ups, and cut-aways. Depending on the nature of the representation, cost can vary. For instance, scale replicas are often very expensive. In general, if a two-dimensional representation will satisfy the instructor's requirement, it should be used.

## Test Preparation Material

Test preparation material applies to an array of paper, video, and computer software products that are designed by commercial publishers to help student applicants prepare for FAA tests. While test preparation materials may be effective in preparing students for FAA tests, the danger is that students may learn to pass a given test, but fail to learn other critical information essential to safe piloting and maintenance practices. In addition, FAA inspectors and designated examiners have found that student applicants often exhibit a lack of knowledge during oral questioning, even though many have easily passed the FAA knowledge test. A major shortcoming of test preparation materials is that the emphasis is on rote learning, which is the lowest of all levels of learning.

Test preparation materials, as well as instructors, that dwell on teaching the test are shortchanging student applicants. All instructors who use test preparation publications should stress that these materials are not designed as stand-alone learning tools. They should be considered as a supplement to instructor-led training.

## Future Developments

Electronic communications, including use of computer databases, voice mail, e-mail, Internet, World Wide Web, and satellite-based, wireless communications, are routine and this explosion of information access affects aviation training. It will be even more significant in the future.

Computer technology continues to advance in quantum leaps, challenging traditional ways of teaching. For example, voice-recognition technology, which lets computers accept spoken rather than keyed input, is highly effective for technical training.

Miniature electro-optical devices allow computer-aided information to be projected electronically on sunglass-style eye wear which is connected to a lightweight, belt mounted computer. Computer-aided information is particularly useful for aviation maintenance activities. For example, it would be possible for a technician's eyes to easily move back and forth from computer-generated technical data to the actual hardware while diagnosing and correcting a maintenance problem.

Trends in training indicate a shift from the typical classroom to more extensive use of a lab-type environment with computer work or study stations. Using simulation devices, computer networks, and multimedia programs, students become more actively involved and responsible for their own training. Aviation-related learning centers are usually associated with colleges, universities, and research centers. The airlines, as well as aeronautical programs at some colleges and universities, have used similar facilities for many years.

Another type of computer-based technology, virtual reality (VR), creates a sensory experience that allows a participant to believe and barely distinguish a virtual experience from a real one. VR uses graphics with animation systems, sounds, and images to reproduce electronic versions of real-life experience. Despite enormous potential, VR, in its current stage of development, has drawbacks. It is extremely expensive, and versions with a head-mounted display sometimes produce unfavorable side effects.

For those engaged in aviation training, the challenge is staying abreast of technological changes that apply to training and adopting those that are the most useful and cost effective. Since much of the new technology is based on computer technology, instructors with well-developed computer skills are in demand.

Although the explosion of training technology offers new opportunities, instructors must remember their main teaching goals and be selectively receptive to new possibilities. Electronic information on computer networks and bulletin boards is from commercial providers, as well as community, state, and national government agencies. There is no guarantee that all of this information is current, or even accurate.

## Chapter Summary

As indicated by this discussion, the teaching process organizes the material an instructor wishes to teach in such a way that the learner understands what is being taught. An effective instructor uses a combination of teaching methods as well as instructional aids to achieve this goal.

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compression test example, a criterion objective to measure the understanding level of learning might be stated as, “The student will demonstrate understanding of compression test procedures for reciprocating aircraft engines by completing a quiz with a minimum passing score of 70 percent.”

### **Develop Criterion-Referenced Assessment Items**

The last step is to develop criterion-referenced assessment items. The development of written test questions is covered in the reference section. While developing written test questions, the instructor should attempt to measure the behaviors described in the criterion objective(s). The questions in the exam for the compression test example should cover all of the areas necessary to give evidence of understanding the procedure. The results of the test (questions missed) identify areas that were not adequately covered.

Performance-based objectives serve as a reference for the development of test items. If the test is the pre-solo knowledge test, the objectives are for the student to understand the regulations, the local area, the aircraft type, and the procedures to be used. The test should measure the student’s knowledge in these specific areas. Individual instructors should develop their own tests to measure the progress of their students. If the test is to measure the readiness of a student to take a knowledge test, it should be based on the objectives of all the lessons the student has received.

Aviation training also involves performance tests for maneuvers or procedures. The flight instructor does not administer the practical test for a pilot certificate, nor does the aviation maintenance instructor administer the oral and practical exam for certification as an aviation maintenance technician (AMT). However, aviation instructors do get involved with the same skill or performance testing that is measured in these tests. Performance testing is desirable for evaluating training that involves an operation, a procedure, or a process. The job of the instructor is to prepare the student to take these tests. Therefore, each element of the practical test should be evaluated prior to sending an applicant for the practical exam.

Practical tests for maintenance technicians and pilots are criterion-referenced tests. The practical tests, defined in the Practical Test Standards (PTS), are criterion referenced because the objective is for all successful applicants to meet the high standards of knowledge, skill, and safety required by the regulations. The purpose of the PTS is to delineate the standards by which FAA inspectors, designated pilot examiners (DPEs), and designated maintenance examiners (DMEs) conduct tests for ratings and certificates. The standards are in accordance with the requirements of Title 14 of the Code of Federal Regulations (14 CFR) parts 61, 65,

91, and other FAA publications, including the Aeronautical Information Manual (AIM) and pertinent advisory circulars and handbooks.

The objective of the PTS is to ensure the certification of pilots and maintenance technicians at a high level of performance and proficiency, consistent with safety. The PTS for aeronautical certificates and ratings include areas of operation and tasks that reflect the requirements of the FAA publications mentioned above. Areas of operation define phases of the practical test arranged in a logical sequence within each standard. They usually begin with preflight preparation and end with postflight procedures. Tasks are titles of knowledge areas, flight procedures, or maneuvers appropriate to an area of operation. Included are references to the applicable regulations or publications. Private pilot applicants are evaluated in all tasks of each area of operation. Flight instructor applicants are evaluated on one or more tasks in each area of operation. In addition, certain tasks are required to be covered and are identified by notes immediately following the area of operation titles.

Since every task in the PTS may be covered on the practical test, the instructor must evaluate all of the tasks before recommending the maintenance technician or pilot applicant for the practical test. While this evaluation is not necessarily formal, it should adhere to criterion-referenced testing.

### **Critiques and Oral Assessments**

Used in conjunction with either traditional or authentic assessment, the critique is an instructor-to-student assessment. These methods can also be used either individually, or in a classroom setting.

As discussed earlier, the word critique sometimes has a negative connotation, and the instructor needs to avoid using this method as an opportunity to be overly critical of student performance. An effective critique considers good as well as bad performance, the individual parts, relationships of the individual parts, and the overall performance. A critique can and usually should be as varied in content as the performance being evaluated.

A critique may be oral, written, or both. It should come immediately after a student’s performance, while the details of the performance are easy to recall. An instructor may critique any activity a student performs or practices to improve skill, proficiency, and learning. A critique may be conducted privately or before the entire class. A critique presented before the entire class can be beneficial to every student in the classroom, as well as to the student who performed the exercise or assignment. In this case, however,

FLIGHT INSTRUCTION LOG (GLIDER)																	
Student:																Instructor:	
	Flight Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Lesson Number																
Glider Assembly																	
Preflight Inspection																	
Ground Handling																	
Takeoff (Normal)																	
Crosswind Takeoff																	
Tow (High-Tow & Low-Tow)																	
Boxing the Wake																	
Slack Line Recovery																	
Straight Glides																	
Turns (Shallow & Medium)																	
Steep Turns (50 to 60 Degrees of Bank)																	
Slow Flight & Minimum Controllable Airspeed																	
Straight-Ahead Stalls																	
Turning Stalls																	
Accelerated Stalls																	
Spin Recovery																	
Traffic Pattern																	
Use of Spoilers																	
Forward Slips (With & Without Spoilers)																	
Landings (Normal)																	
Crosswind Landings (Simulated)																	
Off-Airport Landings (Simulated)																	
Airspeed Control																	
Vigilance & Collision Avoidance																	
Judgment																	
Use of Checklists																	
	Flight Time (This flight)																
	Total Flight Time																

Figure 6-6. Glider training log.

instruction and identifies a useful lesson planning format. The decision of how to organize the lesson and the selection of suitable support material come next. The final steps include assembling training aids and writing the lesson plan outline. One technique for writing the lesson plan outline is to prepare the beginning and ending first. Then, complete the outline and revise as required. A lesson plan should be a working document that can and should be revised as changes occur or are needed.

The following are some of the important characteristics that should be reflected in all well-planned lessons.

Unity—each lesson should be a unified segment of instruction. A lesson is concerned with certain limited objectives, which are stated in terms of desired student learning outcomes. All teaching procedures and materials should be selected to attain these objectives.

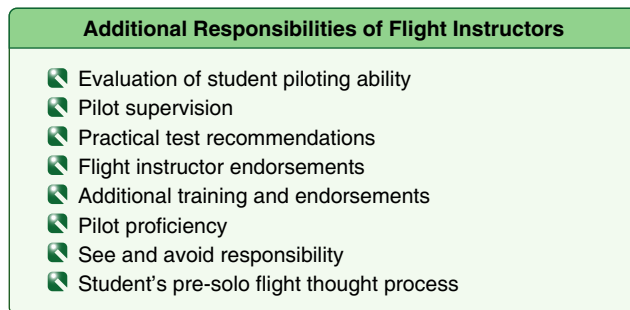
Content—each lesson should contain new material. However, the new facts, principles, procedures, or skills should be related to the lesson previously presented. A short review of earlier lessons is usually necessary, particularly in flight training.

becomes confused. The instructor’s philosophy and actions must be consistent.

Admit errors—no one, including students, expects an instructor to be perfect. The instructor can win the respect of students by honestly acknowledging mistakes. If the instructor tries to cover up or bluff, students are quick to sense it. Such behavior tends to destroy student confidence in the instructor. If in doubt about some point, the instructor should admit it.

## Flight Instructor Responsibilities

Learning to fly should provide students with an opportunity for exploration and experimentation. It should be a habit-building period during which students devote their attention, memory, and judgment to the development of correct habit patterns. All aviation instructors shoulder an enormous responsibility because their students will ultimately be flying, servicing, or repairing aircraft, but flight instructors have the additional responsibilities of evaluating student pilots and making a decision of when they are ready to solo. The flight instructor’s job is to “mold” the student pilot into a safe pilot who takes a professional approach to flying. Other flight instructor responsibilities can be found in Title 14 of the Code of Federal Regulations (14 CFR) part 61 and FAA advisory circulars (ACs). [Figure 7-5]



**Figure 7-5.** *The flight instructor has many additional responsibilities.*

Flight instructors must provide the most comprehensive ground and flight instruction possible. They should be current and proficient in the aircraft they use for flight instruction, encouraging each pilot to learn as much as he or she can and to continually “raise the bar.” Flight instructors have the responsibility of producing the safest pilots possible with the overall focus on education and learning. It is also important to convey an understanding of why pilots are trained to standards and how they are set.

Instructors should not introduce the minimum acceptable standards for passing the check ride when introducing lesson tasks. The minimum standards to pass the check ride should

be introduced during the “3 hours of preparation” for the check ride. Keep the PTS in the proper perspective, with emphasis on the Practical Test Standard (PTS) increasing later in the training.

## Physiological Obstacles for Flight Students

Although most student pilots have been exposed to air travel, they may not have flown in light, training aircraft. Consequently, students may react to unfamiliar noises or vibrations, or experience unfamiliar sensations due to G-force, or an uncomfortable feeling in the stomach. To teach effectively, instructors cannot ignore the existence of these negative factors, nor should they ridicule students who are adversely affected. These negative sensations can usually be overcome by understanding the nature of their causes. Remember, a sick student does not learn well.

## Ensuring Student Skill Set

Flight instructors must ensure student pilots develop the required skills and knowledge prior to solo flight. The student pilot must show consistency in the required solo tasks: takeoffs and landings, ability to prioritize in maintaining control of the aircraft, proper navigation skills, proficiency in flight, proper radio procedures and communication skills, and traffic pattern operation. Student pilots should receive instruction to ask for assistance or help from the ATC system when needed.

Mastery of the skill set includes consistent use and continued growth as well as increased accuracy of performance. The instructor determines when a student is ready for his or her first solo flight. Generally this determination is made when the instructor observes the student from preflight to engine start to engine shutdown and the student performs consistently, without need of instructor assistance.

Flight instructors need to provide adequate flight and ground instruction for “special emphasis” items listed in each PTS for airplane, helicopter, and light sport aircraft. The student needs to be knowledgeable in these special emphasis areas because examiners and authorized instructors place special emphasis upon areas considered critical to flight safety. Special emphasis items include, but are not limited to:

1. Positive aircraft control
2. Procedures for positive exchange of flight controls
3. Stall and spin awareness (if appropriate)
4. Collision avoidance
5. Wake turbulence and low-level wind turbulence and wind shear avoidance
6. Runway incursion avoidance

- During landing—conduct stabilized approaches, maintain desired airspeed on final, demonstrate good judgment for go-arounds, wake turbulence, traffic, and terrain avoidance. Use ADM to correct faulty approaches and landing errors. Make power-off, stall-warning blaring, on centerline touchdowns in the first third of runway.
- Always—remember safety is paramount.

Flight instructors have the responsibility of producing the safest pilots possible. For that reason, CFIs should encourage each student to learn as much as he or she is capable of and keep raising the bar. When introducing lesson tasks, flight instructors should not introduce the minimum acceptable standards for passing the checkride. The Practical Test Standard (PTS) is not a teaching tool. It is a testing tool. The overall focus of flight training should be on education, learning, and understanding why the standards are there and how they were set. The minimum standards to pass the checkride should not be introduced until the 3 hours of preparation for the checkride.

## Obstacles to Learning During Flight Instruction

Certain obstacles are common to flight instruction and may apply directly to the student's attitude, physical condition, and psychological make-up. These include but are not limited to:

- Feeling of unfair treatment
- Impatience to proceed to more interesting operations
- Worry or lack of interest
- Physical discomfort, illness, fatigue, and dehydration
- Apathy due to inadequate instruction
- Anxiety

### Unfair Treatment

Students who believe their instruction is inadequate, or that their efforts are not conscientiously considered and evaluated, do not learn well. In addition, their motivation suffers no matter how intent they are on learning to fly. Motivation also declines when a student believes the instructor is making unreasonable demands for performance and progress. [Figure 8-2]

Assignment of goals the student considers difficult, but possible, usually provides a challenge and promotes learning. In a typical flight lesson, reasonable goals are listed in the lesson objectives and the desired levels of proficiency for the goals are included in statements that contain completion standards.



**Figure 8-2.** *The assignment of impossible or unreasonable goals discourages the student, diminishes effort, and retards the learning process.*

### Impatience

Impatience is a greater deterrent to learning pilot skills than is generally recognized. For a student, this may take the form of a desire to make an early solo flight, or to set out on cross-country flights before the basic elements of flight have been learned.

The impatient student fails to understand the need for preliminary training and seeks only the ultimate objective without considering the means necessary to reach it. With every complex human endeavor, it is necessary to master the basics if the whole task is to be performed competently and safely. The instructor can correct student impatience by presenting the necessary preliminary training one step at a time, with clearly stated goals for each step. The procedures and elements mastered in each step should be clearly identified in explaining or demonstrating the performance of the subsequent step.

Impatience can result from instruction keyed to the pace of a slow learner when it is applied to a motivated, fast learner. It is just as important that a student be advanced to the subsequent step as soon as one goal has been attained, as it is to complete each step before the next one is undertaken. Disinterest grows rapidly when unnecessary repetition and drill are requested on operations that have already been adequately learned.

### Worry or Lack of Interest

Worry or lack of interest has a detrimental effect on learning. Students who are worried or emotionally upset are not ready to learn and derive little benefit from instruction. Worry or

operations. Before endorsing a student for solo flight, the instructor should require the student to demonstrate consistent ability to perform all of the fundamental maneuvers.

### **Dealing with Normal Challenges**

Instructors should teach students how to solve ordinary problems encountered during flight. Traffic pattern congestion, change in active runway, or unexpected crosswinds are challenges the student masters individually before being able to perform them collectively.

### **Visualization**

SBT lends itself well to visualization techniques. For example, have a student visualize how the flight may occur under normal circumstances, with the student describing how he or she would fly the flight. Then, the instructor adds unforeseen circumstances such as a sudden change in weather that brings excessive winds during final approach. Other examples of SBT can have the instructor adding undesired landing sites for balloon student pilots, rope breaks for glider students, and radio outages for instrument airplane students. Now, the student must visualize how he or she will handle the unexpected change.

During this visualization, the flight instructor can ask questions to check the student's thought processes. The job of the instructor is to challenge the student with realistic flying situations without overburdening him or her with unrealistic scenarios.

### **Practice Landings**

The FAA recommends that in all student flights involving landings in an aircraft, the flight instructor should teach a full stop landing. Full stop landings help the student develop aircraft control and checklist usage. Aircraft speed and control take precedence over all other actions during landings and takeoffs.

Stress landing in the first third of the runway to ensure there is stopping distance for the aircraft. If the student is unable to land in the first third, teach him or her to make an immediate go around. If the student bounces an airplane on landing, teach the student to make an immediate go around. By following these teaching guidelines, the student is better equipped to properly execute landings when he or she solos. Furthermore, by requiring the first solo flight to consist of landings to a full stop, the flight instructor has the opportunity to stop the flight if necessary.

In gliders, a low energy landing is the most desirable, based on current winds. This helps the student develop good off-field landings techniques. This is dependent on current weather, such as excess winds including crosswinds.

### **Practical Test Recommendations**

Provision is made on the airman certificate or rating application form for the written recommendation of the flight instructor who has prepared the applicant for the practical test involved. Signing this recommendation imposes a serious responsibility on the flight instructor. A flight instructor who makes a practical test recommendation for an applicant seeking a certificate or rating should require the applicant to demonstrate thoroughly the knowledge and skill level required for that certificate or rating. This demonstration should in no instance be less than the complete procedure prescribed in the applicable PTS.

When the instructor endorses the applicant for the practical test, his or her signature on the FAA Form 8710-1, Airman Certificate and/or Rating Application, is valid for 60 days. This is also true with the flight proficiency endorsement that is placed in the applicant's logbook or training record (Advisory Circular (AC) 61-65). These two dates should be the same.

Completion of prerequisites for a practical test is another instructor task that must be documented properly. Examples of all common endorsements can be found in the current issue of AC 61-65, Appendix 1. This appendix also includes references to 14 CFR Part 61, Certification: Pilots, Flight Instructors, and Ground Instructors, for more details concerning the requirements that must be met to qualify for each respective endorsement. The examples shown contain the essential elements of each endorsement. It is not mandatory, but recommended for all endorsements to be worded exactly as those in the AC. For example, changes to regulatory requirements may affect the wording, or the instructor may customize the endorsement for any special circumstances of the applicant. However, at a minimum, the instructor needs to cite the appropriate 14 CFR part 61 section that has been completed.

FAA inspectors and DPEs rely on flight instructor recommendations as evidence of qualification for certification, and proof that a review has been given of the subject areas found to be deficient on the appropriate knowledge test. Recommendations also provide assurance that the applicant has had a thorough briefing on the PTS and the associated knowledge areas, maneuvers, and procedures. If the flight instructor has trained and prepared the applicant competently, the applicant should have no problem passing the practical test.

A flight instructor who fails to ensure a student meets the requirements of regulations prior to endorsing solo flight or additional rating exhibits a serious deficiency in performance. The FAA holds him or her accountable. Providing a solo

# Risk Management

## Introduction

“Pull the throttle back!” Lenore, a Certificated Flight Instructor (CFI), ordered the student, Jennifer, as the revolutions per minute (rpm) climbed past 2,000 on engine start-up. “I did, I did!”

Both Jennifer and Lenore grabbed the mixture and pulled. The engine went from a deafening roar to silence. They looked at each other. “What happened?” asked Jennifer. “I don’t know. Let’s check the engine,” Lenore said.

Ten minutes later, they had removed the cowling from the Cessna 152. A quick engine check gave them the answer. The throttle rod-end was not connected to the carburetor arm—no bolt, no nut, just air between the rod-end and the arm. Jennifer looked at Lenore. “What if this had happened in flight?”

“What I want to know,” Lenore said, “is how this happened at all. The annual inspection was signed off yesterday.”

The previous day, the annual inspection had been signed off after a lengthy inspection by a local facility. Several mechanics had been involved in the inspection, including the owner/student who had installed a headliner. The mechanic with the Inspection Authorization (IA) who signed off the annual was supervising several annuals, so most of the maintenance was performed by other mechanics.

After the inspection, the engine had been run-up according to the usual post-inspection procedures. The student and instructor had flown the airplane for a half-hour familiarization flight. The next day’s engine start resulted in a runaway engine with the apparent cause due to the lack of the throttle rod-end hardware being safetied.

Types of Risk	
Total risk	The sum of identified and unidentified risks.
Identified Risk	Risk which has been determined through various analysis techniques. The first task of system safety is to identify, within practical limitations, all possible risks.
Unidentified Risk	Risk not yet identified. Some unidentified risks are subsequently identified when a mishap occurs. Some risk is never known.
Acceptable Risk	Risk which cannot be tolerated by the managing activity. It is a subset of identified risk that must be eliminated or controlled.
Acceptable Risk	Acceptable risk is the part of identified risk that is allowed to persist without further engineering or management action. Making this decision is a difficult yet necessary responsibility of the managing activity. This decision is made with full knowledge that it is the user who is exposed to this risk.
Residual Risk	Residual risk is the risk left over after system safety efforts have been fully employed. It is not necessarily the same as acceptable risk. Residual risk is the sum of acceptable risk and unidentified risk. This is the total risk exposure to the user.



		Severity			
Likelihood		Catastrophic	Critical	Marginal	Negligible
Probable	High	High	Serious		
Occasional	High	Serious			
Remote	Serious	Medium			Low
Improbable					

Complacency presents another obstacle to maintaining situational awareness. Defined as overconfidence from repeated experience on a specific activity, complacency has been implicated as a contributing factor in numerous aviation accidents and incidents. Like fatigue, complacency reduces the pilot's effectiveness in the flight deck. However, complacency is harder to recognize than fatigue, since everything is perceived to be progressing smoothly. Highly reliable automation has been shown to induce overconfidence and complacency. This can result in a pilot following the instructions of the automation even when common sense suggests otherwise. If the pilot assumes the autopilot is doing its job, he or she does not crosscheck the instruments or the aircraft's position frequently. If the autopilot fails, the pilot may not be mentally prepared to fly the aircraft manually. Instructors should be especially alert to complacency in students with significant flight experience. For example, a pilot receiving a flight review in a familiar aircraft may be prone to complacency.

Advanced avionics have created a high degree of redundancy and dependability in modern aircraft systems, which can promote complacency and inattention. During flight training, the CFI should emphasize that routine flight operations may lead to a sense of complacency, which can threaten flight safety by reducing situational awareness.

By asking about positions of other aircraft in the traffic pattern, engine instrument indications, and the aircraft's location in relation to references on a chart, the instructor can determine if the student is maintaining situational awareness. The instructor can also attempt to focus the student's attention on an imaginary problem with the communication or navigation equipment. The instructor should point out that situational awareness is not being maintained if the student diverts too much attention away from other tasks, such as controlling the aircraft or scanning for traffic. These are simple exercises that can be done throughout flight training, which help emphasize the importance of maintaining situational awareness.

## **Operational Pitfalls**

There are numerous classic behavioral traps that can ensnare the unwary pilot. Pilots, particularly those with considerable experience, try to complete a flight as planned, please passengers, and meet schedules. This basic drive to demonstrate achievements can have an adverse effect on safety, and can impose an unrealistic assessment of piloting skills under stressful conditions. These tendencies ultimately may bring about practices that are dangerous and sometimes illegal, and may lead to a mishap. Students develop awareness and learn to avoid many of these operational pitfalls through effective ADM training. The scenarios and examples provided by instructors during ADM instruction should involve these pitfalls. *[Figure 9-7]*

## **Single-Pilot Resource Management (SRM)**

Single pilot resource management (SRM) is defined as the art and science of managing all the resources (both onboard the aircraft and from outside sources) available to a single pilot (prior to and during flight) to ensure the successful outcome of the flight. SRM includes the concepts of ADM, Risk Management (RM), Task Management (TM), Automation Management (AM), Controlled Flight Into Terrain (CFIT) Awareness, and Situational Awareness (SA). SRM training helps the pilot maintain situational awareness by managing the automation and associated aircraft control and navigation tasks. This enables the pilot to accurately assess and manage risk and make accurate and timely decisions.

SRM is all about helping pilots learn how to gather information, analyze it, and make decisions. Although the flight is coordinated by a single person and not an onboard flightcrew, the use of available resources such as air traffic control (ATC) and automated flight service station (AFSS) replicates the principles of CRM.

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Middle name must be spelled out; if no middle name, the letters "NMN" must be indicated. DO NOT USE MIDDLE INITIAL.

Type or print in ink when filling out 8710-1.

Spell out color.

Must include city/county and state if within the U.S. Include city and country if outside the U.S.

Do not use P.O. Box or Rural Route, UNLESS a statement of physical location is provided.

Enter class shown on medical certificate (i.e., 1st, 2nd, 3rd), if required.

Flight time must be sufficient for certificate or rating.

Items U and V DO NOT apply to alcohol related offenses (DWI or DUI).

Ensure applicant signs form.

Date signed by applicant should be within 60 days prior to date of practical test.

Form Approved OMB No: 2120-0021 07/31/2007

### DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

## Airman Certificate and/or Rating Application

**TYPE OR PRINT ALL ENTRIES IN INK**

**I. Application Information**

Additional Rating  Student  Recreational  Private  Commercial  Airplane Transport  Instrument  
 Flight Instructor Initial  Airplane Single-Engine  Airplane Multiengine  Rotorcraft  Balloon  Airship  Glider  Powered-Lift  
 Medical Flight Test  Renewal  Reinstatement  Additional Instructor Rating  Ground Instructor  Other  
 Reexamination  Reliance of certificate

A. Name (Last, First, Middle) **Doe, John David** B. SSN (US Only) **223-45-6678** C. Date of Birth **11/25/1964** D. Place of Birth **Bakersfield, CA**

E. Address **1234 North Street** F. Citizenship **USA** G. Do you read, speak, write, & understand the English language?  Yes  No

City, State, Zip Code **Allentown, PA 62534** H. Height **68 in.** I. Weight **165 lbs.** J. Hair **Blonde** K. Eyes **Blue** L. Sex  Male  Female

M. Do you now hold, or have you ever held, an FAA Pilot Certificate?  Yes  No N. Grade Pilot Certificate **Student** O. Certificate Number **BB07138** P. Date issued **6-15-2000**

Q. Do you hold a Medical Certificate?  Yes  No R. Class of Certificate **Third** S. Date issued **6-15-2000** T. Name of Examiner **Thomas C. Smith, MD**

U. Have you ever been convicted for violation of any Federal or State statutes relating to narcotic drugs, marijuana, or depressant or stimulant drugs or substances?  Yes  No V. Date of Final Conviction

**II. Certificate or Rating Applied For on basis of:**

A. Completion of Required Test 1. Aircraft to be used (if flight test required) **Cessna 152** 2a. Total time in this aircraft / SIM / FTD **55 hours** 3. Pilot in command **24 hours**

B. Military 1. Service Number 2. Date Rated 3. Rating Grade and Service Number

C. Graduate of Approved Course 1. Name and Location of Training Agency or Training Center 2. Curriculum From Which Graduated 3. Date

D. Holder of Foreign License Issued By 1. Country 2. Grade of License 3. Number 4. Ratings

E. Completion of Air Carrier's Approved Training Program 1. Name of Air Carrier 2. Date 3. Which Curriculum  Initial  Upgrade  Transition

**RECORD OF PILOT TIME (Do not write in the shaded areas.)**

	Total	Instruction Received	Solo	Pilot in Command (PIC)	Cross Country Instruction Received	Cross Country Solo	Cross Country PIC	Instrument	Night Instruction Received	Night Take-Off Landings	Night PIC	Night Take-Off Landing PIC	Number of Flights	Number of Aero-Tows	Number of Ground Launches	Number of Powered Launches
Airplanes	55	31	24		5	12		3	4	12						
Rotorcraft																
Powered LIFT																
Glider																
Lighter Than Air																
Simulator Training Device																
PCATD																

IV. Have you failed a test for this certificate or rating?  Yes  No

V. Applicant's Certification -- I certify that all statements and answers provided by me on this application form are complete and true to the best of my knowledge and I agree that they are to be considered as part of the basis for issuance of any FAA certificate to me. I have also read and understand the Privacy Act statement that accompanies this form.

Signature of Applicant *John David Doe* John David Doe Date **04-12-2007**

FAA Form 8710-1 (4-00) Supersedes Previous Edition NSN: 0052-00-682-5007

Figure C-2. This sample FAA Form 8710-1 (front page) has been completed for a private pilot applicant.

# Appendix D

## Personal Minimums Checklist

**Pilot:** \_\_\_\_\_

**Date Revised:** \_\_\_\_\_

**Reviewed with:** \_\_\_\_\_

(if applicable)

### Your Personal Minimums Checklist—

- Is an easy-to-use, personal tool tailored to your level of skill, knowledge, and ability.
- Helps you control and manage risk by identifying even subtle risk factors.
- Allows you to fly with less stress and less risk. Practice “Conservatism Without Guilt.”

Each item provides you with either a space to complete a personal minimum or a checklist item to think about. Spend some quiet time completing each blank and consider other items that apply to your personal minimums. Give yourself permission to choose higher minimums than those specified in the regulations, aircraft flight manuals, or other rules.

### How To Use Your Checklist

Use this checklist just as you would use one for your aircraft. Carry the checklist in your flight kit. Use it at home as you start planning a flight and again just before you make your final decision to fly. Be wary if you have an item that’s marginal in any single risk factor category. But if you have items in more than one category, you may be headed for trouble. If you have marginal items in two or more risk factors/categories, do not go!

Periodically review and revise your checklist as your personal circumstances change, such as your proficiency, recency, or training. You should never make your minimums less restrictive unless a significant positive event has occurred. However, it is okay to make your minimums more restrictive at any time. And never make your minimums less restrictive when you are planning a specific flight, or else external pressures will influence you.

### Have a fun and safe flight!

#### PILOT

##### Experience/Recency

Takeoffs/landings..... \_\_\_\_\_ in the last \_\_\_\_\_ days

Hours in make/model ..... \_\_\_\_\_ in the last \_\_\_\_\_ days

Instrument approaches ..... \_\_\_\_\_ (simulated or actual) in the last \_\_\_\_\_ days

Instrument flight hours ..... \_\_\_\_\_ (simulated or actual) in the last \_\_\_\_\_ days

Terrain and airspace ..... familiar

##### Physical Condition

Sleep ..... \_\_\_\_\_ hours in the last 24 hours

Food and water ..... in the last \_\_\_\_\_ hours

Alcohol ..... None in the last \_\_\_\_\_ hours

Drugs or medication..... None in the last \_\_\_\_\_ hours

Stressful events ..... None in the last \_\_\_\_\_ days

Illnesses ..... None in the last \_\_\_\_\_ days

Practical test date must be within 60 days after date of recommendation.

Full printed name must be included with signature.

Instructor's certificate must be current on date of recommendation.

Instructor's Recommendation				
I have personally instructed the applicant and consider this person ready to take the test.				
Date	Instructor's Signature	(Print Name & Sign)	Certificate No.	Certificate Expires
4-11-2007	<i>James E. Jones</i>	James E. Jones	1234567 CFI	05-31-2007
Air Agency's Recommendation				
The applicant has successfully completed our _____ course, and is recommended for certification or rating without further _____ test.				
Date	Agency Name and Number		Officials Signature	
			Title	
Designated Examiner or Airman Certification Representative Report				
<input type="checkbox"/> Student Pilot Certificate Issued (Copy attached) <input checked="" type="checkbox"/> I have personally reviewed this applicant's pilot logbook and/or training record, and certify that the individual meets the pertinent requirements of 14 CFR Part 61 for the certificate or rating sought. <input type="checkbox"/> I have personally reviewed this applicant's graduation certificate, and found it to be appropriate and in order, and have returned the certificate. <input checked="" type="checkbox"/> I have personally tested and/or verified this applicant in accordance with pertinent procedures and standards with the result indicated below.				
<input checked="" type="checkbox"/> Approved -- Temporary Certificate Issued (Original Attached) <input type="checkbox"/> Disapproved -- Disapproval Notice Issued (Original Attached)				
Location of Test (Facility, City, State)			Duration of Test	
Allentown, PA			Ground	Flight
Certificate or Rating for Which Tested			Type(s) of Aircraft Used	Registration No.(s)
Private Pilot			Cessna 152	N12345
Date	Examiner's Signature	(Print Name & Sign)	Certificate No.	Designation Expires
4-12-2007	<i>Henry L. Smith</i>	Henry L. Smith	332345678	AE-01-1123 01-31-2008
Evaluator's Record (Use For ATP Certificate and/or Type Ratings)				
	Inspector	Examiner	Signature and Certificate Number	
Oral	<input type="checkbox"/>	<input type="checkbox"/>		
Approved Simulator/Training Device Check	<input type="checkbox"/>	<input type="checkbox"/>		
Aircraft Flight Check	<input type="checkbox"/>	<input type="checkbox"/>		
Advanced Qualification Program	<input type="checkbox"/>	<input type="checkbox"/>		
Date				
Aviation Safety Inspector or Technician Report				
I have personally tested this applicant in accordance with or have otherwise verified that this applicant complies with pertinent procedures, standards, policies, and/or necessary requirements with the result indicated below.				
<input type="checkbox"/> Approved -- Temporary Certificate Issued (Original Attached) <input type="checkbox"/> Disapproved -- Disapproval Notice Issued (Original Attached)				
Location of Test (Facility, City, State)			Duration of Test	
			Ground	Flight
Certificate or Rating for Which Tested			Type(s) of Aircraft Used	Registration No.(s)
<input type="checkbox"/> Student Pilot Certificate Issued <input type="checkbox"/> Certificate or Rating Based on <input type="checkbox"/> Examiner's Recommendation <input type="checkbox"/> Military Competence <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Foreign License <input type="checkbox"/> Reissue or Exchange of Pilot Certificate <input type="checkbox"/> Approved Course Graduate <input type="checkbox"/> Special Medical test conducted -- report forwarded to Aeromedical Certification Branch, AAM-330 <input type="checkbox"/> Other Approved FAA Qualification Criteria				
<input type="checkbox"/> Flight Instructor <input type="checkbox"/> Ground Instructor <input type="checkbox"/> Renewal <input type="checkbox"/> Reinstatement <input type="checkbox"/> Instructor Renewal Based on <input type="checkbox"/> Activity <input type="checkbox"/> Training Course <input type="checkbox"/> Test <input type="checkbox"/> Duties and Responsibilities				
Training Course (FIRC) Name		Graduation Certificate No.		Date
Date	Inspector's Signature	(Print Name & Sign)	Certificate No.	FAA District Office
Attachments:				
<input type="checkbox"/> Student Pilot Certificate (Copy) <input checked="" type="checkbox"/> Airman's Identification (ID)				
<input type="checkbox"/> Knowledge Test Report <input type="checkbox"/> Pennsylvania Driver's License				
<input checked="" type="checkbox"/> Temporary Airman Certificate      Form of ID				
<input type="checkbox"/> Notice of Disapproval      Number 223456678				
<input type="checkbox"/> Superseded Airman Certificate      Expiration Date 11-25-2007				
<input type="checkbox"/> Superseded Airman Certificate      Telephone Number				
<input type="checkbox"/> Superseded Airman Certificate      ID: _____				
<input type="checkbox"/> Superseded Airman Certificate      Name: _____				
<input type="checkbox"/> Superseded Airman Certificate      Date of Birth: _____				
<input type="checkbox"/> Superseded Airman Certificate      Certificate Number: _____				
<input type="checkbox"/> Superseded Airman Certificate      E-Mail Address: _____				
FAA Form 8710-1 (4-00) Supersedes Previous Edition			Electronic Version (Adobe)	
			NSN: 0052-00-682-5007	

Figure 7-10. This sample FAA Form 8710-1 (back page) has been completed for a private pilot applicant.

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