Aviation Instructor's Handbook (FAA-H-8083-9)

Chapter 9: Techniques of Flight Instruction

Introduction

Flight instructor Daniel decides his learner, Mary, has gained enough confidence and experience that it is time for her to develop personal weather minimums. While researching the subject at the Federal Aviation Administration (FAA) website, he locates several sources that provide background information indicating that weather often poses some of the greatest risks to general aviation (GA) pilots, regardless of their experience level. He also finds charts and a lesson plan he can use.

Daniel's decision to help Mary develop personal weather minimums reflects a key component of the flight instructor's job: providing the learner with the tools to ensure safety during a flight. What does "safety" really mean? How can a flight instructor ensure the safety of flight training activities, and also train clients to operate their aircraft safely after they leave the relatively protected flight training environment?

According to one definition, safety is the freedom from conditions that can cause death, injury, or illness; damage to loss of equipment or property, or damage to the environment. FAA regulations are intended to promote safety by eliminating or mitigating conditions that can cause death, injury, or damage. These regulations are comprehensive but instructors recognize that even the strictest compliance with regulations may not guarantee safety. Rules and regulations are designed to address known or suspected conditions detrimental to safety, but there is always the possibility that a combination of hazardous circumstances will arise.

The recognition of aviation training and flight operations as a system led to a "system approach" to aviation safety. This chapter discusses some of the practices found to make flight safer on a systemic basis including—aeronautical decision-making (ADM), risk management, situational awareness, and single-pilot resource management (SRM). These components should be included in a modern flight training program.

Practical Flight Instructor Strategies

During all phases of flight training, instructors should remember that individuals learn through observing others; therefore, the instructor needs to model safe and professional behavior. The flight instructor should demonstrate good operational sense at all times:

- Before the flight—discuss safety and the importance of a proper preflight and use of the checklist.
- During flight—prioritize the tasks of aviating, navigating, and communicating. Instill importance of aircraft control, "see and avoid," situational awareness, and workload management in the learner.
- During landing—conduct stabilized approaches, maintain desired airspeed on final, demonstrate good judgment for go-arounds, wake turbulence, traffic, and terrain avoidance. Correct faulty approaches and landings. Make touchdowns on the centerline in the first third of the runway.
- After the flight—review or discuss flight events and choices using ADM principles. Plan a remediation if trends indicate an inadequate skill, a hazardous attitude, or inadequate knowledge of risk mitigation.

Flight instructors should produce safe pilots. For that reason, instructors should encourage each learner to learn as much as possible. When introducing lesson tasks, flight instructors should not focus on the minimum acceptable standards for passing the checkride. The ACS/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 completion standards for each lesson should gradually reach or exceed those in the ACS/PTS before final preparation for the checkride.

Integrating Instruction Techniques

A flight instructor uses many instructional techniques during ground instruction, when using simulation, and during hands-on aircraft training. Since flight training costs are high and new aircraft are more complex than in the past, the total training experience should provide a solid base of knowledge and maximize the learner's time without sacrificing the quality of the end product. This section looks at teaching techniques in greater detail.

Ground Instruction

Ground instruction can be highly effective if it follows an overall plan designed to prepare the learner for flight. In Chapter 7, Planning Instructional Activity, *Figure 7-2* shows a ground lesson that includes clear objectives. However, ground training objectives should be related to flight training objectives whenever possible. When elements are taught on the ground (as theory), their practice and application is also experienced in the air. The instructor should point out the connection between the theory and practice to maximize the benefit from integrated ground and flight instruction. *[Figure 9-1]*

Additionally, ground instruction need not be in the classroom for maximum effectiveness. For example, conduct a preflight using an actual aircraft although initially taught in an academic setting. Additionally, when airspace is being taught an invaluable reinforcement of training includes taking the learners to ATC facilities where they can see management of the National Airspace System (NAS) from another perspective.

Figure 9-1. *The learner prepares to execute a power-off stall maneuver in-flight that was taught in ground school.*

Studies have shown that a mix of instructional elements provides the best balance during ground instruction. Learners who use electronic media extensively are generally not as well trained as those who receive a balanced mix of ground teaching methods that include e-learning, class, and one-on-one instruction integrated with technological tools that support the instruction versus replacing it.

Ground instruction is a key element that sets the foundation and is critical to learner pilots becoming well educated and successfully transitioning into the flight environment. It should be deliberative, supportive of the learner's interwoven flight education, and highly rewarding to both the learner and instructor(s) alike.

Use of Flight Simulation Training Devices

The FAA separates flight simulation trainers into three specific categories:

- Full Flight Simulator (FFS)
- Flight Training Device (FTD)
- Aviation Training Device (ATD)

The National Simulator Program located in Atlanta, GA provides for the evaluation and qualification of FFSs and FTDs. 14 CFR part 60 provides the criteria for the qualification of FFSs *[Figure 9-2]* and FTDs *[Figures 9-3 and 9-4]* and further divides these qualifications as FFS Level A-D and FTD Level 4-7. A qualification letter is provided annually by the FAA to the operator and identifies the level of qualification. The level of approval affects what maneuvers or tasks may be accomplished in an FFS or FTD. These FAA-qualified trainers are collectively described in part 60 as Flight Simulation Training Devices (FSTD). Each device requires sponsorship by a part 119 certificate holder (part 135/121 operators), or a part 141/142 Pilot School/Training Center, and are most often used by the airlines or aviation colleges/universities. All training accomplished in FFSs and FTDs is part of an FAA-approved training program.

Figure 9-2. *A Level C simulator.*

The General Aviation and Commercial Division located in Washington, DC provides for the evaluation and approval of ATDs. Advisory Circular AC 61-136, *FAA Approval of Aviation Training Devices and Their Use for Training and Experience* provides the criteria for ATD approvals and use, and further divides them into two categories; Basic or Advanced ATD approvals (BATD/AATD). The letter of authorization provided by the FAA to the manufacturer specifies the training credits or experience requirements that can be acquired using that model trainer. These training devices are predominately used by general aviation flight schools providing flight training under 14 CFR part 61 or part 141 regulations. ATDs cannot be used for airman practical tests or type rating training requirements.

Figure 9-3. *An example of a Level 6 Flight Training Device (FTD).*

Integrated Training Curricula

An integrated training curriculum can use an FFS, FTD, or ATD to provide seamless training from the classroom to the aircraft. An instructor initially provides the required knowledge in a classroom environment and then follows with procedural training in the simulator. For example, when utilizing an integrated ground and flight-training program, an authorized instructor would initially teach the required knowledge specific to instrument landing system (ILS) design, and the associated flight operations through ground and classroom training. The instructor then provides instruction on aircraft flight procedures and details specific to operations in national airspace system. After the learner has gained the required knowledge and understands the procedures, the instructor then adds practicing the psychomotor skills of the task in the simulator. The instructor would then demonstrate and teach the instrument approach task to the learner simulating the flight environment in a FAA-qualified trainer. When the student becomes proficient with the instrument procedure in the simulator, the instruction would then transition to the aircraft to verify proficiency and reinforce the airman certification standards. Most operational tasks and procedures for private pilot certificates, instrument ratings, commercial pilot certificates, and airline transport pilot certificates can be initially taught in an FFS, FTD, or ATD.

Logging Training Time and Experience

Instructors or pilots logging time in an FFS or FTD should log and record the FAA ID number or serial number of the device being used for training. FSTDs are re-qualified on an annual basis and users should verify the qualification is current and valid. When logging training time in an ATD, pilot time is logged as a basic aviation training device (BATD) or advanced aviation training device (AATD) time, and the pilot record should identify the manufacturer and model of the ATD trainer. Letters of authorization (LOAs) for ATD's are valid for five years and a copy of the LOA should be retained by the pilot in training.

Pilot time logged in an FFS, FFS, or ATD must be recorded as prescribed in 14 CFR part 61, section 61.51(h). The maximum credit permitted for certificates and ratings is identified in part 61 and 141. However, there is no limit on how much time can be logged in an FFS, FTD, or ATD. The FAA recommends that training should continue in the simulator until the required tasks are accomplished successfully, before attempting the same tasks in an aircraft.

Figure 9-4. *A level 4 FTD used for procedure training.*

On-Aircraft Training

On-aircraft training is the continuation of work that is initiated on the ground and part of the integrated training process. As indicated in Chapter 7, Planning Instructional Activity, the instructor must plan the flight given to the learner to the same extent as the learner who prepares for it. Just as it is important to have objectives for ground instruction, it is equally important that the flight instruction have objectives and a syllabus paired with previous instruction given on the ground (to include academic training). Flight training is not a one size fits all and often must be tailored for the individual. For example, satisfactory progress in learning stalls through flight instruction "only" would be diminished as compared to discussing them on the ground; inclusive of the types, stalls, and their aerodynamic basis. Just because the learner has received ground school instruction on a particular aspect, the instructor should always review that same task with the learner before flight to reinforce the learning process as necessary. *[Figure 9-5]*

Figure 9-5. *Reinforcing what the learner was taught on the ground is critical to learner knowledge.*

On-aircraft training is integrated with ground instruction and not autonomously separate and distinct. By pairing flight and ground instruction together, the learner will advance further, faster, and attain more of the educational goals the instructor tries to impart.

Demonstration-Performance Training Delivery Method

The demonstration-performance training delivery method was discussed briefly in Chapter 5, The Teaching Process, but the following in-depth discussion is geared to the flight instructor. This training method has been in use for a long time and is very effective in teaching kinesthetic skills so flight instructors find it valuable in teaching procedures and maneuvers. The demonstration-performance method is divided into four phases: explanation, demonstration, learner performance with instructor supervision, and evaluation. *[Figure 9-6]*

Explanation Phase

The flight instructor needs to be well prepared and highly organized to teach complex maneuvers and procedures effectively. The learner should be intellectually and psychologically ready for the learning activity. The explanation phase is accomplished prior to the flight lesson with a discussion of lesson objectives and completion standards, as well as a thorough preflight briefing. The instructor presents clear and pertinent objectives of the particular lesson to be presented, based on the known experience and knowledge of the learner. Instructors need to provide details on the lesson content, performance expectations and evaluation measures. When teaching a skill, the instructor conveys the precise actions the learner will perform. In addition to the necessary steps, the instructor should describe the end result of these efforts. The explanation phase also should include coverage of appropriate safety procedures. Before leaving this phase, the instructor should encourage learners to ask questions about any step of the procedure that they do not understand.

Demonstration Phase

The instructor demonstrates the actions necessary to perform a skill and may describe the actions simultaneously. The instructor avoids extraneous activity as much as possible so that learners get a clear understanding of the task. If, due to some unanticipated circumstances, the demonstration does not closely conform to the explanation, this deviation should be immediately acknowledged and explained.

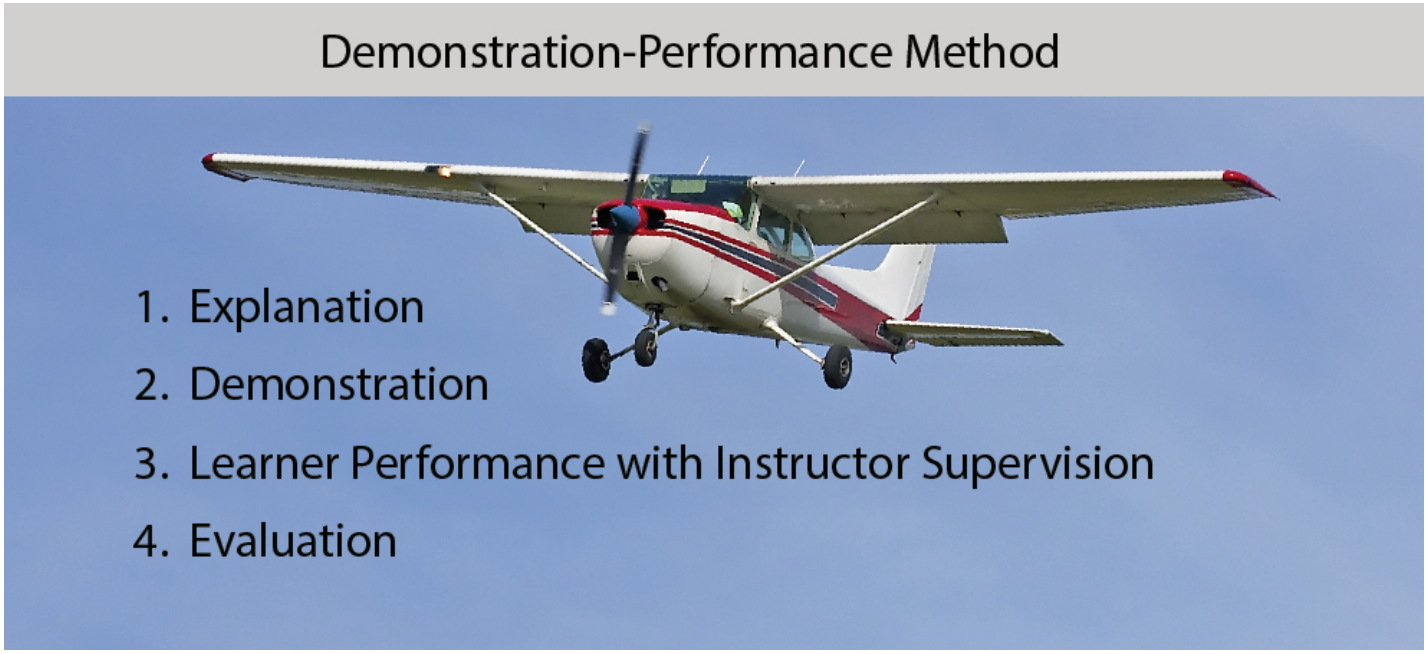

Figure 9-6. *The demonstration-performance method of teaching has four essential phases.*

Learner Performance and Instruction Supervision Phases

As discussed in Chapter 5, The Teaching Process, these two phases involve separate actions that are performed concurrently. The first of these phases is the learner's performance of the physical or mental skills that have been explained and demonstrated. The second activity is the instructor's supervision.

Learner performance requires learners to act and do. To gain skills, learners must practice. The instructor must, therefore, allot enough time for meaningful activity. Through doing, learners can follow correct procedures and reach established standards. It is important that learners be given an opportunity to perform the skill as soon as possible after a demonstration.

Then, the instructor reviews what has been covered during the instructional flight and determines to what extent the learner has met the objectives outlined during the preflight discussion. The instructor should be satisfied that the learner is well prepared and understands the task before starting. The instructor observes as the learner performs, and then makes appropriate comments.

Evaluation Phase

In this phase, the instructor traditionally evaluates learner performance, records the learner's performance, and verbally advises the learner of the progress made toward the objectives. Regardless of how well a skill is taught, there may still be performance deficiencies. When pointing out areas that need improvement, offer concrete suggestions that help. If possible, avoid ending the evaluation on a negative note.

As discussed in Chapter 6, Assessment, collaborative assessment (or learner centered grading (LCG)) is a form of authentic assessment currently used in aviation training with problem-based learning (PBL). PBL structures the lessons to confront learners with problems that are encountered in real life and forces them to reach real-world solutions. Scenario-based training (SBT), a type of PBL, uses a highly structured script of real-world experiences to address aviation training objectives in an operational environment. Collaborative assessment is used to evaluate whether certain learning criteria were met during the SBT.

Collaborative assessment includes two parts—learner self-assessment and a detailed assessment by the flight instructor. The purpose of the self-assessment is to stimulate growth in the learner's thought processes and, in turn, behaviors. The self-assessment is followed by an in-depth discussion between the instructor and the learner which compares the instructor's assessment to the learner's self-assessment.

The Telling-and-Doing Technique

The demonstration-performance method can be applied to the telling-and-doing technique of flight instruction in three steps. However, the telling-and-doing technique includes specific variations for flight instruction. *[Figure 9-7]*

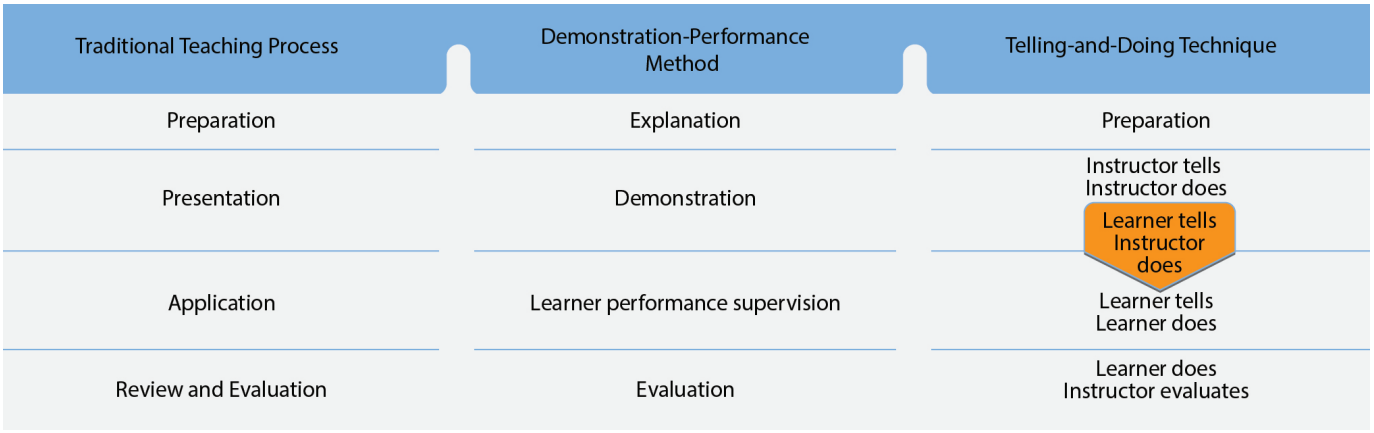

Figure 9-7. *This comparison of steps in the teaching process, the demonstration-performance method, and the telling-and-doing technique highlights similarities as well as differences. The main difference in the telling-and-doing technique is the important transition, learner tells—instructor does, which occurs between the second and third step.*

Instructor Tells—Instructor Does

First, the flight instructor gives a carefully planned demonstration of the procedure or maneuver with accompanying verbal explanation. While demonstrating inflight maneuvers, the instructor should explain the required power settings, aircraft attitudes, and describe any other pertinent factors that may apply. This is the only step in which the learner plays a passive role. It is important for the demonstration to conform to the explanation as closely as possible. In addition, it should be demonstrated in the same sequence in which it was explained so as to avoid confusion and provide reinforcement. Since learners generally imitate the instructor's performance, the instructor needs to demonstrate the skill exactly the way the learners are expected to practice it, including all safety procedures that should be followed. As previously explained, if the demonstration does not closely conform to the explanation, this deviation should be immediately acknowledged and explained.

Most physical skills lend themselves to a sequential pattern where the skill is explained in the same step-by-step order normally used to perform it. When the skill being taught relates to previously learned procedures or maneuvers, the known to unknown strategy may be effective. When teaching more than one skill at the same time, the simple-to-complex strategy works well. By starting with the simplest skill, a learner gains confidence and is less likely to become frustrated when building skills that are more complex.

Another consideration in this phase is the language used. Instructors should attempt to avoid unnecessary jargon and technical terms that their learners do not know. Instructors should also take care to clearly describe the actions learners are expected to perform. Communication is the key. It is neither appropriate nor effective for instructors to try to impress learners with their expertise by using language that is unnecessarily complicated.

As an example, a level turn might be demonstrated and described by the instructor in the following way:

- Use outside visual references and monitor the flight instruments.
- After clearing the airspace around the aircraft, add power slightly, turn the aircraft in the desired direction, and apply a slight amount of back pressure on the yoke to maintain altitude. Maintain coordinated flight by applying rudder in the direction of the turn.
- Remember, the ailerons control the roll rate, as well as the angle of bank. The rate at which the aircraft rolls depends on how much aileron deflection is used. How far the aircraft rolls (steepness of the bank) depends on how long the ailerons are deflected, since the aircraft continues to roll as long as the ailerons are deflected. When the desired angle of bank is reached, neutralize the ailerons, and trim as appropriate.
- Lead the roll-out by approximately one-half the number of degrees of the angle of bank. Use coordinated aileron and rudder control pressures. Simultaneously begin releasing the back pressure so aileron, rudder, and elevator pressures are neutralized when the aircraft reaches the wings-level position.
- Leading the roll-out heading by one-half the bank angle is a good rule of thumb for initial training. However, keep in mind that the required amount of lead really depends on the type of turn, turn rate, and roll-out rate. As a pilot gains experience, he or she will develop a consistent roll-in and roll-out technique for various types of turns. Upon reaching a wings-level attitude, reduce power and trim to remove control pressures.

Learner Tells—Instructor Does

Second, the learner tells as the instructor does. In this step, the learner actually plays the role of instructor, telling the instructor what to do and how to do it. Two benefits accrue from this step: the learner, being freed from the need to concentrate on performance of the maneuver and from concern about its outcome, is able to organize his or her thoughts regarding the steps involved and the techniques to be used. In the process of explaining the maneuver as the instructor performs it, perceptions begin to develop into insights. Mental habits begin to form with repetition of the instructions previously received. Plus, the instructor is able to evaluate the learner's understanding of the factors involved in performance of the maneuver.

According to the principle of primacy, it is important for the instructor to make sure the learner gets it right the first time. The learner should also understand the correct sequence and be aware of safety precautions for each procedure or maneuver. If a misunderstanding exists, it can be corrected before the learner becomes absorbed in controlling the aircraft.

Learner Tells—Learner Does

Application is the third step in this method. This is where learning takes place and where performance habits are formed. If the learner has been adequately prepared and the procedure or maneuver fully explained and demonstrated, meaningful learning occurs. The instructor should be alert during the learner's practice to detect any errors in technique and to prevent the formation of faulty

At the same time, the learner should be encouraged to think about what to do during the performance of a maneuver, until it becomes habitual. In this step, the thinking is done verbally. This focuses concentration on the task to be accomplished, so that total involvement in the maneuver is fostered. All of the learner's physical and mental faculties are brought into play. The instructor should be aware of the learner's thought processes. It is easy to determine whether an error is induced by a misconception or by a simple lack of motor skills. Therefore, in addition to forcing total concentration on the part of the learner, this method provides a means for keeping the instructor aware of what the learner is thinking. The learner is not only learning to do something, but he or she is also learning a self-teaching process that is highly desirable in development of a skill.

The exact procedures that the instructor should use during learner practice depend on factors such as the learner's proficiency level, the type of maneuver, and the stage of training. The instructor should exercise good judgment to decide how much control to use. With potentially hazardous or difficult maneuvers, the instructor should be alert and ready to take control at any time. This is especially true during a learner's first attempt at a particular maneuver. On the other hand, if a learner is progressing normally, the instructor should avoid unnecessary interruptions or too much assistance.

A typical test of how much control is needed often occurs during a learner's first few attempts to land an aircraft. The instructor must quickly evaluate the learner's need for help, and not hesitate to take control, if required. At the same time, the learner should be allowed to practice the entire maneuver often enough to achieve the level of proficiency established in the lesson objectives. Since this is a learning phase rather than an evaluation phase of the training, errors or unsafe practices should be identified and corrected in a positive and timely way. In some cases, the learner is not able to meet the proficiency level specified in the lesson objectives within the allotted time. When this occurs, the instructor should be prepared to schedule additional training.

Positive Exchange of Flight Controls

Positive exchange of flight controls is an integral part of flight training. It is especially critical during the demonstration-performance method of flight instruction. Due to the importance of this subject, the following discussion provides guidance on the recommended procedure to use for the positive exchange of flight controls between pilots when operating an aircraft.

Background

Incident/accident statistics indicate a need to place additional emphasis on the exchange of control of an aircraft by pilots. Numerous accidents have occurred due to a lack of communication or misunderstanding regarding who had actual control of the aircraft, particularly between learners and flight instructors. Establishing the following procedure during initial training will ensure the formation of a habit pattern that should stay with learners throughout their flying careers.

Procedure

During flight training, there should always be a clear understanding between learners and flight instructors about who has control of the aircraft. The preflight briefing should include procedures for the exchange of flight controls. A positive three-step process in the exchange of flight controls between pilots is a proven procedure and one that is strongly recommended. When an instructor is teaching a maneuver to a learner, the instructor normally demonstrates the maneuver first, then has the learner follow along on the controls during a demonstration and, finally, the learner performs the maneuver with the instructor following along on the controls. *[Figure 9-8]*

Flight instructors should always guard the controls and be prepared to take control of the aircraft. When necessary, the instructor should take the controls and calmly announce, "I have the flight controls." If an instructor allows a learner to remain on the controls, the instructor may not have full and effective control of the aircraft. Anxious learners can be incredibly strong and usually exhibit reactions inappropriate to the situation. If a recovery is necessary, there is absolutely nothing to be gained by having the learner on the controls and having to fight for control of the aircraft. Learners should never be allowed to exceed the flight instructor's limits. Flight instructors should not exceed their own ability to perceive a problem, decide upon a course of action, and physically react within their ability to fly the aircraft.

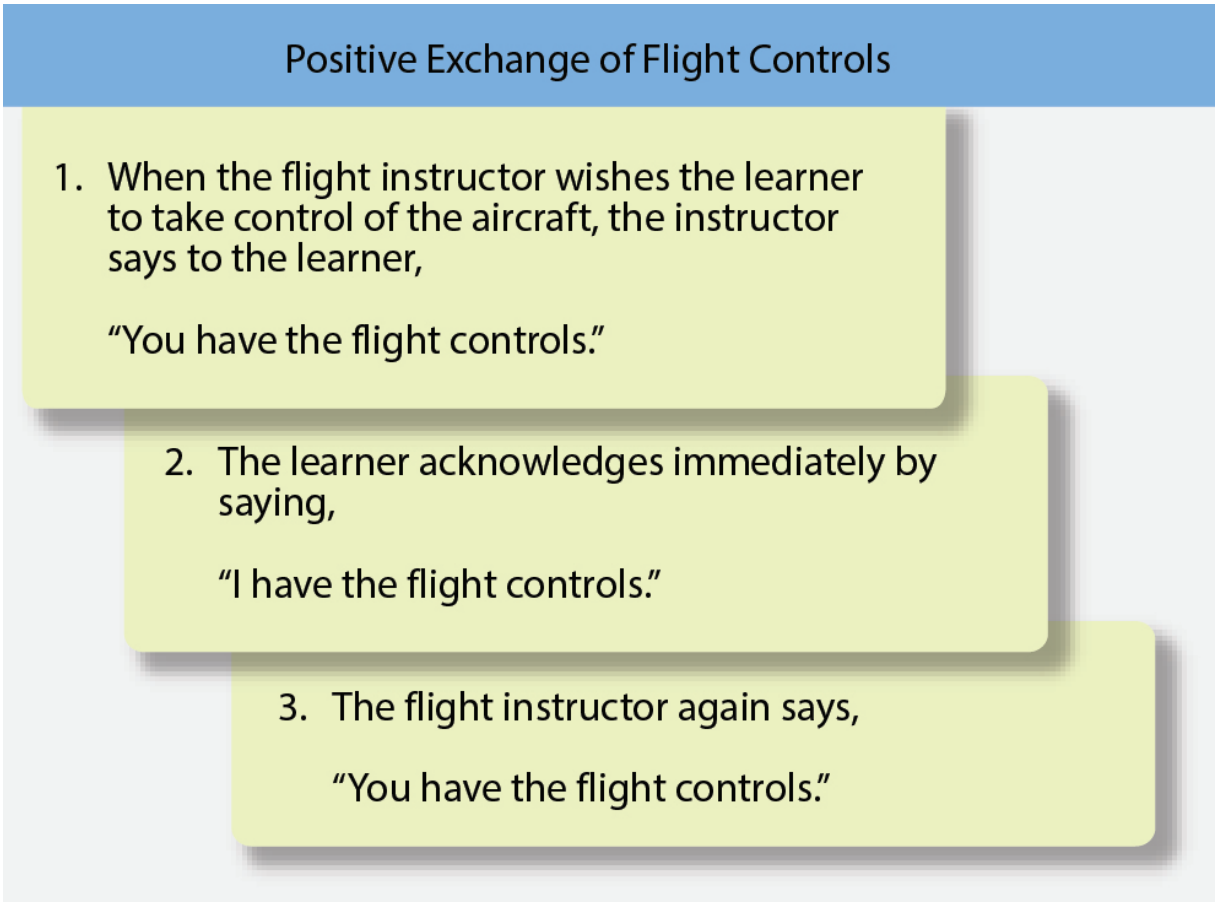

Figure 9-8. *During this procedure, a visual check is recommended to see that the other person actually has the flight controls. When returning the controls to the instructor, the learner should follow the same procedure the instructor used when giving control to the learner. The learner should stay on the controls and keep flying the aircraft until the instructor says, "I have the flight controls." There should never be any doubt about who is flying the aircraft.*

Sterile Flight Deck Rule

Commonly known as the "sterile flight deck rule," Title 14 of the Code of Federal Regulations (14 CFR) part 121, section 121.542 requires airline flight crewmembers to refrain from nonessential activities during critical phases of flight. As defined in the regulation, critical phases of flight are all ground operations involving taxi, takeoff, and landing, and all other flight operations below 10,000 feet except cruise flight. Nonessential activities include such activities as eating, reading a newspaper, or chatting. A series of aircraft accidents caused by flight crews who were distracted from their flight duties during critical phases of the flight caused the FAA to propose the rule. While the regulation grew out of accidents in the airline industry, it holds true for the entire aviation community. Pilots can improve flight safety significantly by reducing distractions during critical phases of flight. It is important the flight instructor not only teach the concept of a sterile flight deck but also model such behavior during flight instruction.

Use of Distractions

National Transportation Safety Board (NTSB) statistics reveal that most stall/spin accidents occurred when the pilot's attention was diverted from the primary task of flying the aircraft. Sixty percent of stall/spin accidents occurred during takeoff and landing, and twenty percent were preceded by engine failure. Preoccupation inside or outside the flight deck while changing aircraft configuration or trim, maneuvering to avoid other traffic, or clearing hazardous obstacles during takeoff and climb could create a potential stall/spin situation. The intentional practice of stalls and spins seldom resulted in an accident. The real danger was inadvertent stalls induced by distractions during routine flight situations.

Pilots at all skill levels should be aware of the increased risk of entering into an inadvertent stall or spin or the possibility of an upset while performing tasks that are secondary to controlling the aircraft. The FAA has established a policy for use of certain distractions on practical tests for pilot certification. The purpose is to determine that applicants possess the skills required to cope with distractions while maintaining the degree of aircraft control required for safe flight. The most effective training is the simulation of scenarios that can lead to inadvertent stalls by creating distractions while the learner is practicing certain maneuvers.

Instructor responsibilities include teaching the learner to divide his or her attention between the distracting task and maintaining control of the aircraft. The following are examples of distractions that can be used for this training:

- Drop a pencil. Ask the learner to pick it up.
- Ask the learner to determine a heading to an airport using a chart.
- Ask the learner to reset the clock.
- Ask the learner to get something from the back seat.
- Ask the learner to read the outside air temperature.
- Ask the learner to compute true airspeed with a flight computer.
- Ask the learner to identify terrain or objects on the ground.
- Ask the learner to identify a field suitable for a forced landing.
- Have the learner climb 200 feet and maintain altitude, then descend 200 feet and maintain altitude.
- Have the learner reverse course after a series of S-turns.

It is a flight instructor's responsibility to teach the learner how to take charge during a flight. A pilot in command (PIC) must know when to tell any passengers, even a Designated Pilot Examiner (DPE), when the PIC finds actions in the aircraft that distract and interfere with the safe conduct of the flight.

Integrated Flight Instruction

Integrated flight instruction is flight instruction during which learners are taught to perform flight maneuvers both by outside visual references and by reference to flight instruments. For this type of instruction to be fully effective, the use of instrument references should begin the first time each new maneuver is introduced. No distinction in the pilot's operation of the flight controls is permitted, regardless of whether outside references or instrument indications are used for the performance of the maneuver. When this training technique is used, instruction in the control of an aircraft by outside visual references is integrated with instruction in the use of flight instrument indications for the same operations.

Development of Habit Patterns

It important for the learner to establish the habit of observing and relying on flight instruments from the beginning of flight training. It is equally important for the learner to learn the feel and sounds of the airplane while conducting maneuvers, such as being able to sense when the airplane is out of trim or in a nose-high or nose-low attitude. Learners who have performed all normal flight maneuvers by reference to instruments, as well as by outside references, develop the habit of continuously monitoring their own and the aircraft's performance. The early establishment of the habits of instrument cross-check, instrument interpretation, and aircraft control is highly useful to the learner. The habitual attention to instrument indications leads to improved landings because of more precise airspeed control. Effective use of instruments also results in superior cross-country navigation, better coordination, and generally, a better overall pilot competency level.

General aviation accident reports provide ample support for the belief that reference to flight instruments is important to safety. The safety record of pilots who hold instrument ratings is significantly better than that of pilots with comparable flight time who have never received formal flight training for an instrument rating. Pilots in training who are asked to perform all normal flight maneuvers by reference to instruments, as well as by outside references, will develop the habit of continuously monitoring their own and the aircraft's performance. . The habits formed at this time also give the learner a firm foundation for later training for an instrument rating.

Operating Efficiency

As learners become more proficient in monitoring and correcting their own flight technique by reference to flight instruments, the performance obtained from an aircraft increases noticeably. This is particularly true of modern, complex, or high-performance aircraft, which are responsive to the use of correct operating airspeeds.

The use of correct power settings and climb speeds and the accurate control of headings during climbs result in a measurable increase in climb performance. Holding precise headings and altitudes in cruising flight definitely increases average cruising performance.

The use of integrated flight instruction provides the learner with the ability to control an aircraft in flight for limited periods if outside references are lost. In an emergency, this ability could save the pilot's life and those of the passengers.

During the conduct of integrated flight training, the flight instructor needs to impress on the learners and ascertain they understand that the introduction to the use of flight instruments does not prepare them for operations in marginal weather or instrument meteorological conditions (IMC). According to NTSB accident data, inflight encounters with weather (attempting VFR flight into IMC) is one of the most common causes of fatalities.

Procedures

Integrated flight instruction begins with the first briefing on the function of the flight controls. This briefing includes the instrument indications to be expected, as well as the outside references to be used to control the attitude of the aircraft.

Each new flight maneuver is introduced using both outside and instrument references with learners developing the ability to maneuver an aircraft equally as well by instrument or outside references. They naturally accept the fact that the manipulation of the flight controls is identical, regardless of which references are used to determine the attitude of the aircraft. This practice should continue throughout the flight instruction for all maneuvers. To fully achieve the demonstrated benefits of this type of training, the use of visual and instrument references must be constantly integrated throughout the training. Failure to do so lengthens the flight instruction necessary for the learner to achieve the competency required for a private pilot certificate.

See and Avoid

From the start of flight training, the instructor ensures learners develop the habit of looking for other air traffic at all times. If learners believe the instructor assumes all responsibility for scanning and collision avoidance procedures, they do not develop the habit of maintaining a constant vigilance, which is essential to safety. Any observed tendency of a learner to enter flight maneuvers without first making a careful check for other air traffic needs to be corrected immediately. Recent studies of midair collisions determined that:

- Flight instructors were onboard the aircraft in 37 percent of the accidents in the study.
- Most of the aircraft involved in collisions are engaged in recreational flying not on any type of flight plan.
- Most midair collisions occur in VFR weather conditions during weekend daylight hours.
- The vast majority of accidents occurred at or near nontowered airports and at altitudes below 1,000 feet.
- Pilots of all experience levels were involved in midair collisions, from pilots on their first solo, to 20,000 hour veterans.
- Most collisions occur in daylight with visibility greater than 3 miles.

It is imperative to introduce 14 CFR part 91, section 91.113 "right-of-way" rules to the learner. Practice the "see and avoid" concept at all times regardless of whether the training is conducted under VFR or instrument flight rules (IFR). For more information on how to reduce the odds of becoming involved in a midair collision, see Advisory Circular 90-48 (as amended).

Assessment of Piloting Ability

Assessment is an essential component of the teaching process and determines how, what, and how well a learner is learning. A well-designed assessment provides a learner with something constructive upon which he or she can work or build. An assessment should provide direction and guidance to raise the level of performance. Learners must understand the purpose of the assessment; otherwise, they will be unlikely to accept the evaluation offered and little improvement will result. There are many types of assessment but the flight instructor generally uses the review, collaborative assessment (LCG), written tests, and performance-based tests to ascertain knowledge or practical skill levels. Refer to Chapter 6 for an in-depth discussion of the types of assessment available to the flight instructor.

An assessment can also be used as a tool for reteaching. Although not all assessments lend themselves to reteaching, the instructor should be alert to the possibility and take advantage of the opportunity when it arises. If the instructor observes a deficiency and determines a task needs reteaching, the instructor demonstrates the maneuver, allows the learner to practice the maneuver under direction, and finally evaluates learner accomplishment by observing the performance.

Demonstrated Ability

Assessment of demonstrated ability during flight instruction must be based upon established standards of performance, suitably modified to apply to the learner's experience and stage of development as a pilot. The assessment must consider the learner's mastery of the elements involved in the maneuver, rather than merely the overall performance.

In order for a learner to be signed off for a solo flight, the instructor needs to determine that the learner is qualified and proficient in the flight tasks necessary for the flight. The instructor bases this assessment on the learner's ability to demonstrate consistent proficiency on a number of flight maneuvers. Pilot skill evaluations occur during the conduct of courses at FAA-approved schools, and teaching instructors should verify that learners meet the proficiency requirements prior to sending them for any stage check.

Postflight Evaluation

In assessing piloting ability, it is important for the flight instructor to keep the learner informed of progress. This may be done as each procedure or maneuver is completed or summarized during postflight critiques. Postflight critiques should be in a written format, such as notes to aid the flight instructor in covering all areas that were noticed during the flight or lesson. Traditionally, flight instructors explained errors in performance, pointed out elements in which the deficiencies were believed to have originated and, if possible, suggested appropriate corrective measures. Traditional assessment depends on a grading scale of "excellent, good, fair, poor" or "exceeds standards, meets standards, needs more training" which often meets the instructor's needs but not the needs of the learner.

With the advent of SBT, collaborative assessment is used whenever the learner has completed a scenario. As discussed in Chapters 5, The Teaching Process, and Chapter 6, Assessment, SBT uses a highly structured script of real-world experiences to address aviation training objectives in an operational environment. During the postflight evaluation, collaborative assessment is used to evaluate whether certain learning criteria were met during the SBT.

Collaborative assessment includes learner self-assessment and a detailed assessment by the aviation instructor. The purpose of the self-assessment is to stimulate growth in the learner's thought processes and, in turn, behaviors. The self-assessment is followed by an in-depth discussion between the instructor and the learner which compares the instructor's assessment to the learner's self-assessment.

First Solo Flight

During the learner's first solo flight, the instructor needs to be present to assist in answering questions or resolving any issues that arise during the flight. To ensure the solo flight is a positive, confidence-building experience for the learner, the flight instructor needs to consider time of day when scheduling the flight. Time of day is a factor in traffic congestion, possible winds, sun angles, and reflection.

If possible, the flight instructor needs access to a portable radio during any supervised solo operations. A radio enables the instructor to terminate the solo operation if he or she observes a situation developing. The flight instructor needs should use good judgment when communicating with a solo learner. Keep all radio communications to a minimum. Do not talk to the learner on short final of the landing approach.

Post-Solo Debriefing

During a post-solo debriefing, the flight instructor discusses what took place during the learner's solo flight. It is important for the flight instructor to answer any questions the learner may have as result of a solo flight. Instructors need to be involved in all aspects of the flight to ensure the learner utilizes correct flight procedures. It is very important for the flight instructor to debrief a learner immediately after a solo flight. With the flight vividly etched in the learner's memory, questions about the flight will come quickly.

Correction of Learner Errors

Correction of learner errors does not include the practice of taking over from learners immediately when a mistake is made. Safety permitting, it is frequently better to let learners progress part of the way into the mistake and find a way out. For example, in a weight-shift control aircraft the bar is moved right to turn left. A learner may show an initial tendency to move the bar in the direction of the desired turn. This tendency dissipates with time, but allowing the learner to see the effect of his or her control input is a valuable aid in illustrating the stability of the aircraft. It is difficult for learners to learn a maneuver properly if they seldom have the opportunity to correct an error.

On the other hand, learners may perform a procedure or maneuver correctly and not fully understand the principles and objectives involved. When the instructor suspects this, learners should be required to vary the performance of the maneuver slightly, combine it with other operations, or apply the same elements to the performance of other maneuvers. Learners who do not understand the principles involved will probably not be able to do this successfully.

Pilot Supervision

Flight instructors have the responsibility to provide guidance and restraint with respect to the solo operations of their learners. This is by far the most important flight instructor responsibility. The flight instructor is the only person in a position to make the determination a learner is ready for solo operations. Before endorsing a learner for solo flight, the instructor should require the learner to demonstrate consistent ability to perform all of the fundamental maneuvers.

Dealing with Normal Challenges

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

Visualization

SBT lends itself well to visualization techniques. For example, have a learner visualize how the flight may occur under normal circumstances, with the learner describing the progress of 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 learner pilots, rope breaks for glider learners, and radio outages for instrument airplane learners. Now, the learner gets to visualize how to handle the unexpected change.

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

Practice Landings

Aircraft speed and control take precedence over other actions during landings and takeoffs. Full stop landings help the learner develop aircraft control, allow for careful checklist use, and allow time for detailed instruction.

Instructors should stress touching down in the first third of the runway to ensure stopping before the end of the runway. This means teaching learners to go-around if they do not touch down within that distance. Instructors should also stress the need for a go-around if the landing develops an oscillation or results in a significant bounce. These techniques equip a learner for safe solo. Furthermore, requiring the learner to make full stop landings during the first solo gives the instructor the opportunity to stop the flight if necessary.

When instructing in a glider (other than a motor glider), a go-around will not be possible. Instructors should teach learners to make low energy landings based on current weather and wind conditions. This technique prepares learners to make an off-field landing if or when necessary.

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 thoroughly demonstrate 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 ACS/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.

Instructors need to document completion of prerequisites for a practical test. Examples of all common endorsements can be found in the current issue of AC 61-65, Appendix A. The appendix in the AC also includes references to 14 CFR part 61 for more details concerning the respective endorsements. The examples shown contain the essential elements of each endorsement. It is not necessary 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 to accommodate any special circumstances concerning 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 ACS/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.

If a flight instructor fails to ensure a learner pilot or additional rating pilot meets the requirements of regulations prior to making endorsements to allow solo flight or additional rating, that instructor is exhibiting a serious deficiency in performance. The FAA may hold that instructor accountable. Providing a solo endorsement for a learner pilot who is not proficient for solo flight operations, or providing an endorsement for an additional rating for a pilot not meeting the appropriate regulatory requirements also represents a breach of faith with the learner or applicant.

Chapter Summary

This chapter discussed the demonstration-performance and telling-and-doing training delivery methods of flight instruction, SBT techniques, practical strategies flight instructors can use to enhance their instruction, integrated flight instruction, positive exchange of flight controls, use of distractions, simulators and flight training devices, obstacles to learning encountered during flight training, and how to evaluate learners. Additional information on recommendations and endorsements can be found in Appendix C, Certificates, Ratings, and Endorsements.