

Chapter 1

Introduction to Flight Training

PURPOSE OF FLIGHT TRAINING

The overall purpose of primary and intermediate flight training, as outlined in this handbook, is the acquisition and honing of **basic airmanship skills**. **Airmanship** can be defined as:

- A sound acquaintance with the principles of flight,
- The ability to operate an airplane with competence and precision both on the ground and in the air, and
- The exercise of sound judgment that results in optimal operational safety and efficiency.

Learning to fly an airplane has often been likened to learning to drive an automobile. This analogy is misleading. Since an airplane operates in a different environment, three dimensional, it requires a type of motor skill development that is more sensitive to this situation such as:

- **Coordination**—The ability to use the hands and feet together subconsciously and in the proper relationship to produce desired results in the airplane.
- **Timing**—The application of muscular coordination at the proper instant to make flight, and all maneuvers incident thereto, a constant smooth process.
- **Control touch**—The ability to sense the action of the airplane and its probable actions in the immediate future, with regard to attitude and speed variations, by the sensing and evaluation of varying pressures and resistance of the control surfaces transmitted through the cockpit flight controls.
- **Speed sense**—The ability to sense instantly and react to any reasonable variation of airspeed.

An airman becomes one with the airplane rather than a machine operator. An accomplished airman demonstrates the ability to assess a situation quickly and accurately and deduce the correct procedure to be followed under the circumstance; to analyze accurately the probable results of a given set of circumstances or of a proposed procedure; to exercise care and due regard for safety; to gauge accurately the performance of the airplane; and to recognize

personal limitations and limitations of the airplane and avoid approaching the critical points of each. The development of airmanship skills requires effort and dedication on the part of both the student pilot and the flight instructor, beginning with the very first training flight where proper habit formation begins with the student being introduced to good operating practices.

Every airplane has its own particular flight characteristics. The purpose of primary and intermediate flight training, however, is not to learn how to fly a particular make and model airplane. The underlying purpose of flight training is to develop skills and safe habits that are transferable to any airplane. Basic airmanship skills serve as a firm foundation for this. The pilot who has acquired necessary airmanship skills during training, and demonstrates these skills by flying training-type airplanes with precision and safe flying habits, will be able to easily transition to more complex and higher performance airplanes. It should also be remembered that the goal of flight training is a safe and competent pilot, and that passing required practical tests for pilot certification is only incidental to this goal.

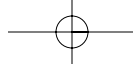
ROLE OF THE FAA

The Federal Aviation Administration (FAA) is empowered by the U.S. Congress to promote aviation safety by prescribing safety standards for civil aviation. This is accomplished through the Code of Federal Regulations (CFRs) formerly referred to as Federal Aviation Regulations (FARs).

Title 14 of the Code of Federal Regulations (14 CFR) part 61 pertains to the certification of pilots, flight instructors, and ground instructors. 14 CFR part 61 prescribes the eligibility, aeronautical knowledge, flight proficiency, and training and testing requirements for each type of pilot certificate issued.

14 CFR part 67 prescribes the medical standards and certification procedures for issuing medical certificates for airmen and for remaining eligible for a medical certificate.

14 CFR part 91 contains general operating and flight rules. The section is broad in scope and provides general guidance in the areas of general flight rules, visual flight rules (VFR), instrument flight rules (IFR), aircraft maintenance, and preventive maintenance and alterations.



Within the FAA, the Flight Standards Service sets the aviation standards for airmen and aircraft operations in the United States and for American airmen and aircraft around the world. The FAA Flight Standards Service is headquartered in Washington, D.C., and is broadly organized into divisions based on work function (Air Transportation, Aircraft Maintenance, Technical Programs, a Regulatory Support Division based in Oklahoma City, OK, and a General Aviation and Commercial Division). Regional Flight Standards division managers, one at each of the FAA's nine regional offices, coordinate Flight Standards activities within their respective regions.

The interface between the FAA Flight Standards Service and the aviation community/general public is the local Flight Standards District Office (FSDO). [Figure 1-1] The approximately 90 FSDOs are strategically located across the United States, each office having jurisdiction over a specific geographic area. The individual FSDO is responsible for all air activity occurring within its geographic boundaries. In addition to accident investigation and the enforcement of aviation regulations, the individual FSDO is responsible for the certification and surveillance of air carriers, air operators, flight schools/training centers, and airmen including pilots and flight instructors.

Each FSDO is staffed by aviation safety inspectors whose specialties include operations, maintenance, and avionics. General aviation operations inspectors are highly qualified and experienced aviators. Once accepted for the position, an inspector must satisfactorily complete a course of indoctrination training conducted at the FAA Academy, which includes airman evaluation and pilot testing techniques and procedures. Thereafter, the inspector must complete recurrent training on a regular basis. Among other duties, the FSDO inspector is responsible for administering FAA practical tests for pilot and flight



Figure 1-1. FAA FSDO.

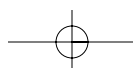
instructor certificates and associated ratings. All questions concerning pilot certification (and/or requests for other aviation information or services) should be directed to the FSDO having jurisdiction in the particular geographic area. FSDO telephone numbers are listed in the blue pages of the telephone directory under United States Government offices, Department of Transportation, Federal Aviation Administration.

ROLE OF THE PILOT EXAMINER

Pilot and flight instructor certificates are issued by the FAA upon satisfactory completion of required knowledge and practical tests. The administration of these tests is an FAA responsibility normally carried out at the FSDO level by FSDO inspectors. The FAA, however, being a U.S. government agency, has limited resources and must prioritize its responsibilities. The agency's highest priority is the surveillance of certificated air carriers, with the certification of airmen (including pilots and flight instructors) having a lower priority.

In order to satisfy the public need for pilot testing and certification services, the FAA delegates certain of these responsibilities, as the need arises, to private individuals who are not FAA employees. A designated pilot examiner (DPE) is a private citizen who is designated as a representative of the FAA Administrator to perform specific (but limited) pilot certification tasks on behalf of the FAA, and may charge a reasonable fee for doing so. Generally, a DPE's authority is limited to accepting applications and conducting practical tests leading to the issuance of specific pilot certificates and/or ratings. A DPE operates under the direct supervision of the FSDO that holds the examiner's designation file. A FSDO inspector is assigned to monitor the DPE's certification activities. Normally, the DPE is authorized to conduct these activities only within the designating FSDO's jurisdictional area.

The FAA selects only highly qualified individuals to be designated pilot examiners. These individuals must have good industry reputations for professionalism, high integrity, a demonstrated willingness to serve the public, and adhere to FAA policies and procedures in certification matters. A designated pilot examiner is expected to administer practical tests with the same degree of professionalism, using the same methods, procedures, and standards as an FAA aviation safety inspector. It should be remembered, however, that a DPE is not an FAA aviation safety inspector. A DPE cannot initiate enforcement action, investigate accidents, or perform surveillance activities on behalf of the FAA. However, the majority of FAA practical tests at the recreational, private, and commercial pilot level are administered by FAA designated pilot examiners.



ROLE OF THE FLIGHT INSTRUCTOR

The flight instructor is the cornerstone of aviation safety. The FAA has adopted an operational training concept that places the full responsibility for student training on the authorized flight instructor. In this role, the instructor assumes the total responsibility for training the student pilot in all the knowledge areas and skills necessary to operate safely and competently as a certificated pilot in the National Airspace System. This training will include airmanship skills, pilot judgment and decision making, and accepted good operating practices.

An FAA certificated flight instructor has to meet broad flying experience requirements, pass rigid knowledge and practical tests, and demonstrate the ability to apply recommended teaching techniques before being certificated. In addition, the flight instructor's certificate must be renewed every 24 months by showing continued success in training pilots, or by satisfactorily completing a flight instructor's refresher course or a practical test designed to upgrade aeronautical knowledge, pilot proficiency, and teaching techniques.

A pilot training program is dependent on the quality of the ground and flight instruction the student pilot receives. A good flight instructor will have a thorough understanding of the learning process, knowledge of the fundamentals of teaching, and the ability to communicate effectively with the student pilot.

A good flight instructor will use a syllabus and insist on correct techniques and procedures from the beginning of training so that the student will develop proper habit patterns. The syllabus should embody the "building block" method of instruction, in which the student progresses from the known to the unknown. The course of instruction should be laid out so that each new maneuver embodies the principles involved in the performance of those previously undertaken. Consequently, through each new subject introduced, the student not only learns a new principle or technique, but broadens his/her application of those previously learned and has his/her deficiencies in the previous maneuvers emphasized and made obvious.

The flying habits of the flight instructor, both during flight instruction and as observed by students when conducting other pilot operations, have a vital effect on safety. Students consider their flight instructor to be a paragon of flying proficiency whose flying habits they, consciously or unconsciously, attempt to imitate. For this reason, a good flight instructor will meticulously observe the safety practices taught the students. Additionally, a good flight instructor will carefully

observe all regulations and recognized safety practices during all flight operations.

Generally, the student pilot who enrolls in a pilot training program is prepared to commit considerable time, effort, and expense in pursuit of a pilot certificate. The student may tend to judge the effectiveness of the flight instructor, and the overall success of the pilot training program, solely in terms of being able to pass the requisite FAA practical test. A good flight instructor, however, will be able to communicate to the student that evaluation through practical tests is a mere sampling of pilot ability that is compressed into a short period of time. The flight instructor's role, however, is to train the "total" pilot.

SOURCES OF FLIGHT TRAINING

The major sources of flight training in the United States include FAA-approved pilot schools and training centers, non-certificated (14 CFR part 61) flying schools, and independent flight instructors. FAA "approved" schools are those flight schools certificated by the FAA as pilot schools under 14 CFR part 141. [Figure 1-2] Application for certification is voluntary, and the school must meet stringent requirements for personnel, equipment, maintenance, and facilities. The school must operate in accordance with an established curriculum, which includes a training course outline (TCO)

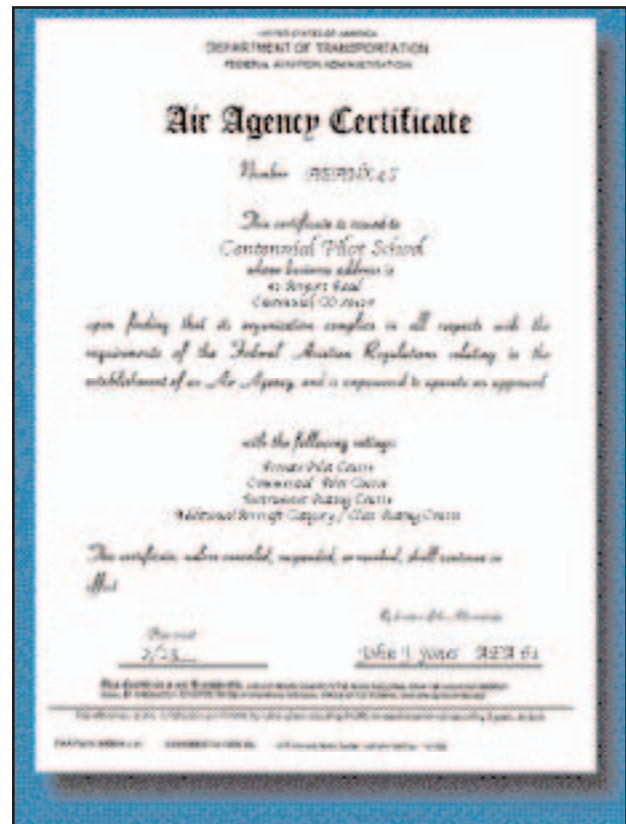
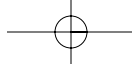


Figure 1-2. FAA-approved pilot school certificate.



approved by the FAA. The TCO must contain student enrollment prerequisites, detailed description of each lesson including standards and objectives, expected accomplishments and standards for each stage of training, and a description of the checks and tests used to measure a student's accomplishments. FAA-approved pilot school certificates must be renewed every 2 years. Renewal is contingent upon proof of continued high quality instruction and a minimum level of instructional activity. Training at an FAA certificated pilot school is structured. Because of this structured environment, the CFRs allow graduates of these pilot schools to meet the certification experience requirements of 14 CFR part 61 with less flight time. Many FAA certificated pilot schools have designated pilot examiners (DPEs) on their staff to administer FAA practical tests. Some schools have been granted examining authority by the FAA. A school with examining authority for a particular course or courses has the authority to recommend its graduates for pilot certificates or ratings without further testing by the FAA. A list of FAA certificated pilot schools and their training courses can be found in Advisory Circular (AC) 140-2, *FAA Certificated Pilot School Directory*.

FAA-approved training centers are certificated under 14 CFR part 142. Training centers, like certificated pilot schools, operate in a structured environment with approved courses and curricula, and stringent standards for personnel, equipment, facilities, operating procedures and record keeping. Training centers certificated under 14 CFR part 142, however, specialize in the use of flight simulation (flight simulators and flight training devices) in their training courses.

The overwhelming majority of flying schools in the United States are not certificated by the FAA. These schools operate under the provisions of 14 CFR part 61. Many of these non-certificated flying schools offer excellent training, and meet or exceed the standards required of FAA-approved pilot schools. Flight instructors employed by non-certificated flying schools, as well as independent flight instructors, must meet the same basic 14 CFR part 61 flight instructor requirements for certification and renewal as those flight instructors employed by FAA certificated pilot schools. In the end, any training program is dependent upon the quality of the ground and flight instruction a student pilot receives.

PRACTICAL TEST STANDARDS

Practical tests for FAA pilot certificates and associated ratings are administered by FAA inspectors and designated pilot examiners in accordance with FAA-developed practical test standards (PTS). [Figure 1-3] 14 CFR part 61 specifies the areas of operation in which knowledge and skill must be demonstrated by the applicant. The CFRs provide the flexibility to permit

the FAA to publish practical test standards containing the areas of operation and specific tasks in which competence must be demonstrated. The FAA requires that all practical tests be conducted in accordance with the appropriate practical test standards and the policies set forth in the Introduction section of the practical test standard book.

It must be emphasized that the practical test standards book is a testing document rather than a teaching document. An appropriately rated flight instructor is responsible for training a pilot applicant to acceptable standards in all subject matter areas, procedures, and maneuvers included in the tasks within each area of operation in the appropriate practical test standard. The pilot applicant should be familiar with this book and refer to the standards it contains during training. However, the practical test standard book is not intended to be used as a training syllabus. It contains the standards to which maneuvers/procedures on FAA practical tests must be performed and the FAA policies governing the administration of practical tests. Descriptions of tasks, and information on how to perform maneuvers and procedures are contained in reference and teaching documents such as this handbook. A list of reference documents is contained in the Introduction section of each practical test standard book.

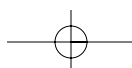
Practical test standards may be downloaded from the Regulatory Support Division's, AFS-600, Web site at <http://afs600.faa.gov>. Printed copies of practical test standards can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The official online bookstore Web site for the U.S. Government Printing Office is www.access.gpo.gov.

FLIGHT SAFETY PRACTICES

In the interest of safety and good habit pattern formation, there are certain basic flight safety practices and procedures that must be emphasized by the flight instructor, and adhered to by both instructor and student, beginning with the very first dual instruction flight. These include, but are not limited to, collision avoidance procedures including proper scanning techniques and clearing procedures, runway incursion avoidance, stall awareness, positive transfer of controls, and cockpit workload management.

COLLISION AVOIDANCE

All pilots must be alert to the potential for midair collision and near midair collisions. The general operating and flight rules in 14 CFR part 91 set forth the concept of "See and Avoid." This concept requires that vigilance shall be maintained at all times, by each person operating an aircraft regardless of whether the operation is conducted under instrument



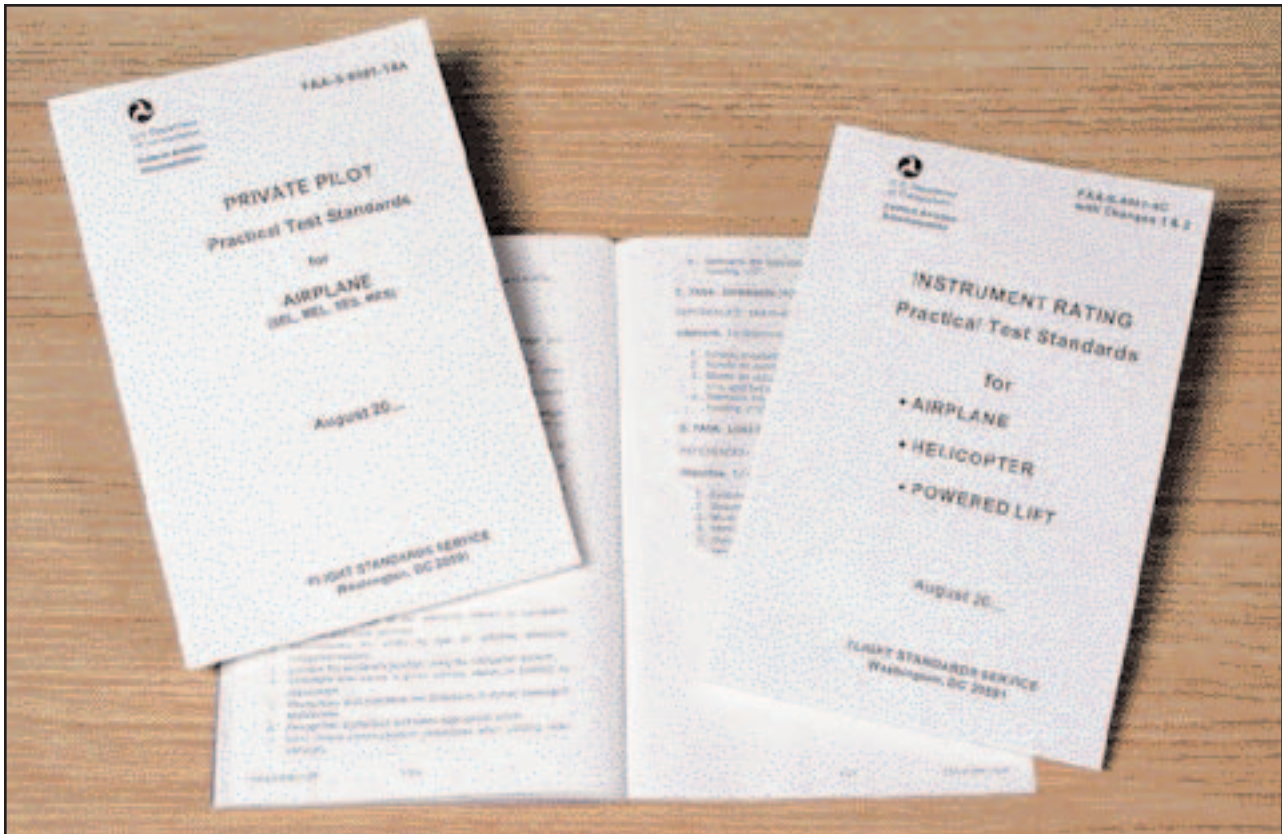


Figure 1-3. PTS books.

flight rules (IFR) or visual flight rules (VFR). Pilots should also keep in mind their responsibility for continuously maintaining a vigilant lookout regardless of the type of aircraft being flown and the purpose of the flight. Most midair collision accidents and reported near midair collision incidents occur in good VFR weather conditions and during the hours of daylight. Most of these accident/incidents occur within 5 miles of an airport and/or near navigation aids.

The “See and Avoid” concept relies on knowledge of the limitations of the human eye, and the use of proper visual scanning techniques to help compensate for these limitations. The importance of, and the proper techniques for, visual scanning should be taught to a student pilot at the very beginning of flight training. The competent flight instructor should be familiar with the visual scanning and collision avoidance information contained in Advisory Circular (AC) 90-48, *Pilots’ Role in Collision Avoidance*, and the *Aeronautical Information Manual* (AIM).

There are many different types of clearing procedures. Most are centered around the use of clearing turns. The essential idea of the clearing turn is to be certain that the next maneuver is not going to proceed into another airplane’s flightpath. Some pilot training programs have hard and fast rules, such as requiring two 90°

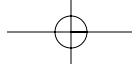
turns in opposite directions before executing any training maneuver. Other types of clearing procedures may be developed by individual flight instructors. Whatever the preferred method, the flight instructor should teach the beginning student an effective clearing procedure and insist on its use. The student pilot should execute the appropriate clearing procedure before all turns and before executing any training maneuver. Proper clearing procedures, combined with proper visual scanning techniques, are the most effective strategy for collision avoidance.

RUNWAY INCURSION AVOIDANCE

A runway incursion is any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of separation with an aircraft taking off, landing, or intending to land. The three major areas contributing to runway incursions are:

- Communications,
- Airport knowledge, and
- Cockpit procedures for maintaining orientation.

Taxi operations require constant vigilance by the entire flight crew, not just the pilot taxiing the airplane. This is especially true during flight training operations. Both the student pilot and the flight instructor need to be continually aware of the movement and location of



other aircraft and ground vehicles on the airport movement area. Many flight training activities are conducted at non-tower controlled airports. The absence of an operating airport control tower creates a need for increased vigilance on the part of pilots operating at those airports.

Planning, clear communications, and enhanced situational awareness during airport surface operations will reduce the potential for surface incidents. Safe aircraft operations can be accomplished and incidents eliminated if the pilot is properly trained early on and, throughout his/her flying career, accomplishes standard taxi operating procedures and practices. This requires the development of the formalized teaching of safe operating practices during taxi operations. The flight instructor is the key to this teaching. The flight instructor should instill in the student an awareness of the potential for runway incursion, and should emphasize the runway incursion avoidance procedures contained in Advisory Circular (AC) 91-73, Part 91 *Pilot and Flightcrew Procedures During Taxi Operations and Part 135 Single-Pilot Operations*.

STALL AWARENESS

14 CFR part 61 requires that a student pilot receive and log flight training in stalls and stall recoveries prior to solo flight. During this training, the flight instructor should emphasize that the direct cause of every stall is an excessive angle of attack. The student pilot should fully understand that there are any number of flight maneuvers which may produce an increase in the wing's angle of attack, but the stall does not occur until the angle of attack becomes excessive. This "critical" angle of attack varies from 16 to 20° depending on the airplane design.

The flight instructor must emphasize that low speed is not necessary to produce a stall. The wing can be brought to an excessive angle of attack at any speed. High pitch attitude is not an absolute indication of proximity to a stall. Some airplanes are capable of vertical flight with a corresponding low angle of attack. Most airplanes are quite capable of stalling at a level or near level pitch attitude.

The key to stall awareness is the pilot's ability to visualize the wing's angle of attack in any particular circumstance, and thereby be able to estimate his/her margin of safety above stall. This is a learned skill that must be acquired early in flight training and carried through the pilot's entire flying career. The pilot must understand and appreciate factors such as airspeed, pitch attitude, load factor, relative wind, power setting, and aircraft configuration in order to develop a reasonably accurate mental picture of the wing's angle of attack at any particular time. It is

essential to flight safety that a pilot take into consideration this visualization of the wing's angle of attack prior to entering any flight maneuver.

USE OF CHECKLISTS

Checklists have been the foundation of pilot standardization and cockpit safety for years. The checklist is an aid to the memory and helps to ensure that critical items necessary for the safe operation of aircraft are not overlooked or forgotten. However, checklists are of no value if the pilot is not committed to its use. Without discipline and dedication to using the checklist at the appropriate times, the odds are on the side of error. Pilots who fail to take the checklist seriously become complacent and the only thing they can rely on is memory.

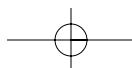
The importance of consistent use of checklists cannot be overstated in pilot training. A major objective in primary flight training is to establish habit patterns that will serve pilots well throughout their entire flying career. The flight instructor must promote a positive attitude toward the use of checklists, and the student pilot must realize its importance. At a minimum, prepared checklists should be used for the following phases of flight.

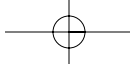
- Preflight Inspection.
- Before Engine Start.
- Engine Starting.
- Before Taxiing.
- Before Takeoff.
- After Takeoff.
- Cruise.
- Descent.
- Before Landing.
- After Landing.
- Engine Shutdown and Securing.

POSITIVE TRANSFER OF CONTROLS

During flight training, there must always be a clear understanding between the student and flight instructor of who has control of the aircraft. Prior to any dual training flight, a briefing should be conducted that includes the procedure for the exchange of flight controls. The following three-step process for the exchange of flight controls is highly recommended.

When a flight instructor wishes the student to take control of the aircraft, he/she should say to the student, "You have the flight controls." The student should acknowledge immediately by saying, "I have the flight controls." The flight instructor confirms by





again saying, "You have the flight controls." Part of the procedure should be a visual check to ensure that the other person actually has the flight controls. When returning the controls to the flight instructor, the student should follow the same procedure the instructor used when giving control to the student. The student should stay on the controls until the instructor says: "I have the flight controls." There should never be

any doubt as to who is flying the airplane at any one time. Numerous accidents have occurred due to a lack of communication or misunderstanding as to who actually had control of the aircraft, particularly between students and flight instructors. Establishing the above procedure during initial training will ensure the formation of a very beneficial habit pattern.

