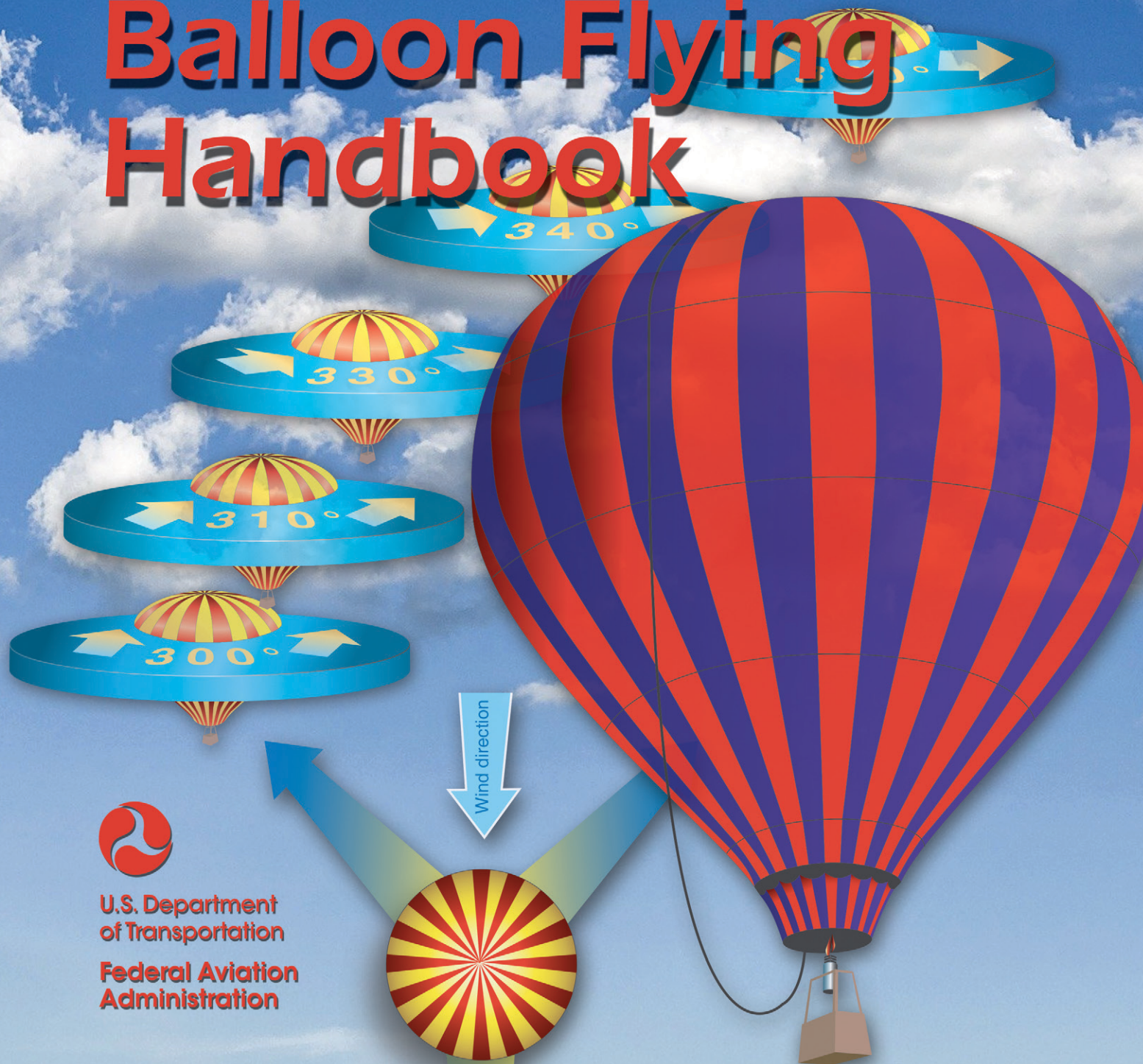




FAA-H-8083-11B

Balloon Flying Handbook



U.S. Department of Transportation
Federal Aviation Administration

AX6	AX7	AX8	AX8	AX9
49'	55'	57'	60'	66'
54K	77K	90K	105K	141K
50'	57'	60'	63'	69'

Balloon Flying Handbook

2024

**U.S. Department of Transportation
FEDERAL AVIATION ADMINISTRATION
Flight Standards Service**

Preface

This Balloon Flying Handbook introduces the basic pilot knowledge and skills that are essential for piloting balloons. It introduces pilots to the broad spectrum of knowledge that will be needed as they progress in their pilot training. This handbook is for student pilots, as well as those pursuing more advanced pilot certificates.

Student pilots learning to fly balloons, certificated pilots preparing for additional balloon ratings or who desire to improve their flying proficiency and aeronautical knowledge, and commercial balloon pilots teaching balloon students how to fly should find this handbook helpful. This book introduces the prospective pilot to the realm of balloon flight and provides information and guidance to all balloon pilots in the performance of various balloon maneuvers and procedures.

This handbook conforms to pilot training and certification concepts established by the Federal Aviation Administration (FAA). There are different ways of teaching, as well as performing flight procedures and maneuvers, and many variations in the explanations of aerodynamic theories and principles. This handbook adopts a selective method and concept to flying balloons. The discussions and explanations reflect the most commonly used practices and principles. Occasionally, the word “must” or similar language is used where the desired action is deemed critical. The use of such language is not intended to add to, interpret, or relieve a duty imposed by Title 14 of the Code of Federal Regulations (14 CFR).

It is essential for persons using this handbook also to become familiar with and apply the pertinent parts of 14 CFR and the Aeronautical Information Manual (AIM). Performance standards for demonstrating competence required for pilot certification are prescribed in the appropriate balloon practical test standard.

This handbook supersedes FAA-H-8083-11A, Balloon Flying Handbook, dated 2008.

This handbook is available for download, in PDF format, from the [FAA website](#).

This handbook is published by the United States Department of Transportation, Federal Aviation Administration, General Aviation & Commercial Division, Training & Certification Group (AFS-810), Testing Standards Section, P.O. Box 25082, Oklahoma City, OK 73125.

Comments regarding this publication should be emailed to AFS630comments@faa.gov.

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Chapter 1: Introduction to Balloon Flight Training

Purpose of Balloon Flight Training

As outlined in this handbook, the purpose of balloon training is to learn, develop, and refine basic balloon flight skills. These skills include:

- Knowledge of the principles of flight.
- The ability to launch, operate, and land a balloon with competence and precision.
- The use of good judgment that leads to optimal operational safety and efficiency.

Learning to fly a balloon requires a specific set of motor skills:

- Coordination—the ability to take physical action in the proper sequence to produce the desired results while launching, flying, and landing the balloon.
- Timing—the application of muscle coordination at the proper time to make the flight, and all maneuvers incident to it, a constant smooth process.
- Control touch—the ability to interpret, evaluate, and predict the actions and reactions of the balloon with regard to attitude and speed variations, by interpreting and evaluating varying visual cues and instrument readings.
- Situational awareness—the ability to sense instantly any reasonable variation of altitude, airspeed, and directional change, as well as a constant perception of relative position to ground-based structures and planned flight track.

A skilled pilot becomes one with the balloon and learns to assess a situation quickly and accurately. They also develop the ability to select the proper procedure to follow in a situation, to predict the probable results of the selected procedure, and to exercise safe practices. In addition, a skilled pilot learns to gauge the performance of the balloon being flown and to recognize not only personal limitations, but also the limitations of the balloon. This knowledge helps the pilot to avoid reaching personal or machine critical points.

Developing the skills needed to fly a balloon requires time and dedication on the part of the student pilot, as well as the flight instructor. Each balloon has its own particular flight characteristics, and it is not the purpose of balloon flight training to learn how to fly a particular model balloon. The purpose of balloon flight training is to develop skills and safety habits that can be transferred to any balloon. The pilot who acquires the necessary flight skills during training, and demonstrates these skills by flying with precision and safe flying habits, easily transitions to different model balloons. Student pilots should also remember that the goal of flight training is to develop a safe and competent pilot. To that end, it is important for the flight instructor to insure the student pilot forms the proper flying habits by introducing them to good operating practices from the first training flight.

Role of the FAA

The United States Congress has empowered the Federal Aviation Administration (FAA) to promote aviation safety by establishing safety standards for civil aviation. The FAA accomplishes this goal through the Code of Federal Regulations (CFR). 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 defines the eligibility, aeronautical knowledge, flight proficiency, as well as training and testing requirements for each type of pilot certificate issued.

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 promotes safe air transportation by setting the standards for certification and oversight of airmen, air operators, air agencies, and designees. It also promotes safety of flight of civil aircraft and air commerce by:

- Accomplishing certification, inspection, surveillance, investigation, and enforcement.
- Setting regulations and standards.
- Managing the system for registration of civil aircraft and all airmen records.

The focus of interaction between the FAA Flight Standards Service and the aviation community and general public is the Flight Standards District Office (FSDO). [Figure 1-1] The FAA has approximately 130 FSDOs. These offices provide information and services for the aviation community. FSDO phone numbers are listed in the blue pages of the telephone directory under United States Government Offices, Department of Transportation, Federal Aviation Administration. Another convenient method of finding a local office is to use the [FSDO locator](#) available on [faa.gov](#).



Figure 1-1. Atlanta Flight Standards District Office (FSDO).

In addition to accident investigation and the enforcement of aviation regulations, the FSDO is also responsible for the certification and surveillance of air carriers, air operators, flight schools and/or training centers, and airmen including pilots and flight instructors. Each FSDO is staffed by aviation safety inspectors (ASIs) who play a key role in making the United States aviation system safe. They administer and enforce safety regulations and standards for the production, operation, maintenance, and/or modification of aircraft used in civil aviation. They also specialize in conducting inspections of various aspects of the aviation system, such as aircraft and parts manufacturing, aircraft operation, aircraft airworthiness, and cabin safety. ASIs complete a training program at the FAA Academy in Oklahoma City which includes airman evaluation and pilot testing techniques and procedures. Inspectors also receive extensive on-the-job training and they receive recurrent training on a regular basis. The FAA has approximately 3,700 inspectors located in its FSDO offices. All questions concerning pilot certification (and/or requests for other aviation information or services) should be directed to the local FSDO.

Role of the Pilot Examiner

Among other duties, ASIs are responsible for administering FAA practical tests for pilot and flight instructor certificates and associated ratings. The administration of these tests is normally carried out at the FSDO level, but the agency's highest priority is making air travel safer by inspecting aircraft that fly in the United States. To satisfy the need for pilot testing and certification services, the FAA delegates certain responsibilities to private individuals who are not FAA employees, but designated pilot examiners (DPEs).

A DPE is an individual, appointed in accordance with 14 CFR part 183, section 183.23, who meets the qualification requirements of FAA Order 8710.3, Pilot Examiner's Handbook, and who:

- Is technically qualified.
- Holds all pertinent category, class, and type ratings for each aircraft related to their designation.
- Meets the requirements of 14 CFR part 61, sections 61.56, 61.57, and 61.58, as appropriate.
- Is current and qualified to act as pilot-in-command (PIC) of each aircraft for which they are authorized.
- Maintains at least a third-class medical certificate, if required.
- Maintains a current flight instructor certificate, if required.

Designated as a representative of the FAA Administrator to perform specific pilot certification tasks on behalf of the FAA, a DPE may charge a reasonable fee. 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. The majority of FAA practical tests at the private and commercial pilot level are administered by FAA DPEs, following FAA-provided practical test standards (PTSs) or Airman Certification Standards (ACSSs), as applicable.

Only highly qualified individuals are accepted as DPEs. DPE candidates have good industry reputations for professionalism, integrity, a demonstrated willingness to serve the public, and adhere to FAA policies and procedures in certification matters. The FAA expects the DPE to administer practical tests with the same degree of professionalism, using the same methods, procedures, and standards as an FAA ASI.

Since there are few DPEs for balloon pilot certification, it is important to determine early in flight training the availability of a DPE in a particular area. It may be necessary to make arrangements through the local FSDO for an appropriately rated FAA ASI to administer the test for a pilot certificate.

Role of the Flight Instructor

Unlike the rest of the aviation community, ballooning has no certificated flight instructor. This role is filled by commercially rated balloon pilots who choose to instruct and meet the provisions of 14 CFR part 61, Commercial Pilot Privileges and Limitations for a Balloon. In this discussion, the term "flight instructor" is understood to mean a commercial balloon pilot who provides instruction.

The flight instructor is the cornerstone of aviation safety and the FAA places full responsibility for student training on the authorized flight instructor. It is the job of the instructor to train the student pilot in all the knowledge areas and teach the skills necessary for the student pilot to operate safely and competently as a certificated pilot in the National Airspace System (NAS). The training includes airmanship skills, pilot judgment and decision-making, and good operating practices.

A pilot training program depends on the quality of the ground and flight instruction the student pilot receives. The flight instructor should possess a thorough understanding of the learning process, knowledge of the fundamentals of teaching, and the ability to communicate effectively with the student pilot. They use a syllabus and teaching style that embodies the "building block" method of instruction. In this method, the learner progresses from the known to the unknown via a course of instruction laid out in such a way that each new maneuver embodies the principles involved in the performance of

maneuvers previously learned. Thus, with the introduction of each new subject, the learner not only learns a new principle or technique, but also broadens their application of those principles or techniques previously learned. Insistence on correct techniques and procedures from the beginning of training by the flight instructor ensures that a learner develops proper flying habit patterns. Any deficiencies in the maneuvers or techniques get corrected immediately.

A flight instructor serves as a role model for the student pilot who observes the flying habits of their flight instructor during flight instruction, as well as when the instructor conducts other pilot operations. Thus, the flight instructor becomes a model of flying proficiency for the student who, consciously or subconsciously, attempts to imitate the instructor. For this reason, a flight instructor should observe recognized safety practices, as well as regulations during all flight operations.

The student pilot who enrolls in a pilot training program commits considerable time, effort, and expense to achieve a pilot certificate. Many times a student judges the effectiveness of the flight instructor and the success of the pilot training program based on their ability to pass the requisite FAA practical test. A competent flight instructor stresses to the student that practical tests are a sampling of pilot ability compressed into a short period of time. The goal of a flight instructor is to train the “total” pilot.

Sources of Flight Training

Flight training in the United States is conducted by FAA- approved pilot schools and training centers, non-certificated (14 CFR part 61) flying schools, and independent flight instructors. There are a limited number of part 141 balloon training programs in the United States with most balloon flight training being conducted by certificated commercial balloon pilots authorized to instruct under the authority of 14 CFR section 61.133 (a)(2)(ii)(a).

FAA-approved schools are 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 needs to meet stringent requirements for personnel, equipment, maintenance, and facilities; and teach an established curriculum which includes a training course outline (TCO) approved by the FAA. A list of FAA certificated pilot schools and their training courses can be found [here](#).

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Air Agency Certificate

Number TG00R68L

This certificate is issued to
SAFETY RESEARCH CORPORATION OF AMERICA
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upon finding that its organization complies in all respects
with the requirements of the Federal Aviation Regulations
relating to the establishment of an Air Agency, and is
empowered to operate an approved Pilot School.

with the following ratings:

- Private Pilot Certification Course (Examining Authority-Flight Test Only)
- Commercial Pilot Certification Course (Examining Authority-Flight Test Only)
- Instrument Rating Course (Examining Authority-Flight Test Only)
- Airline Transport Pilot Certification Course
- Additional Aircraft Rating Course
- Flight Instructor Certification Course

This certificate, unless canceled, suspended, or revoked,
shall continue in effect UNTIL MARCH 31, 2007

Date issued
FEBRUARY 28, 2001

JOHN Q. SMITH
MANAGER, ALABAMA NORTHWEST FLORIDA FSDO

REISSUED MARCH 22, 2005

This Certificate is not Transferable, and any MAJOR CHANGE in the SCHOOL, FACILITY, OR in the LOCATION THEREOF,
SHALL BE IMMEDIATELY REPORTED TO THE APPROPRIATE REGIONAL OFFICE OF THE FEDERAL AVIATION ADMINISTRATION.

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both

FAA Form 8000-4 (1-01) SUPERSEDES FAA FORM 336. AFS Electronic Form System - v2.2

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

As noted above, the major source of balloon flight training in the United States is conducted by certificated commercial balloon pilots. Many of these individuals offer excellent training and meet or exceed the standards required of FAA-approved pilot schools, but not all flight instructors are equal. It is important for a student pilot to choose a flight instructor wisely, because a balloon flight training program is dependent upon the quality of the ground and flight instruction the student pilot receives.

Practical Test Standards (PTS)

The FAA has developed Practical Test Standards (PTS) [Figure 1-3] for FAA pilot certificates and associated ratings. Practical tests are administered by FAAASIs and DPEs. 14 CFR part 61 specifies the areas of operation in which knowledge and skill the applicant demonstrates to qualify for a certificate or rating. Since the FAA requires that all practical tests be conducted in accordance with the appropriate PTS and the policies set forth in the introduction section of the PTS, the pilot applicant should become familiar with this document during training.



Figure 1-3. Practical Test Standards.

The PTS is a testing document and not intended to be a training syllabus. An appropriately rated flight instructor is responsible for training the pilot applicant to acceptable standards in all subject matter areas, procedures, and maneuvers. 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 PTS.

The PTSs for lighter-than-air aircraft are the FAA-S-8081-17 (Private Pilot) and FAA-S-8081-18 (Commercial Pilot). Copies may be obtained by downloading them from the [FAA's Airman Testing website](#).

Flight Safety Practices

In the interest of safety and the development of good flight habits, the flight instructor and student pilot should follow certain basic flight safety practices and procedures in every flight operation. These include, but are not limited to, collision avoidance procedures including proper scanning techniques, use of checklists, runway incursion avoidance and other airspace operations, positive transfer of controls, and workload management.

Collision Avoidance

All pilots should 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. Pilots should also keep in mind their responsibility for continuously maintaining a vigilant lookout regardless of the type of balloon 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.

With regards to balloon operations, the argument can be made that any discussion of collision avoidance applies when dealing with operations close to the ground. When contour flying, or during an approach to a landing site, the potential of collision with trees, power lines, and other obstacles is increased. [Figure 1-4] The techniques used in collision avoidance can be extremely valuable, particularly in the evolution of a balloon flight, as the pilot is perhaps exposed more to the dangers of collision than any other aircraft.



Figure 1-4. *When flying or landing, always be aware of the potential for collision with trees, powerlines, and other obstacles.*

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 AC 90-48, Pilot’s Role in Collision Avoidance, and the Aeronautical Information Manual (AIM).

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 with an aircraft taking off, landing, or intending to land.

Most balloon flight operations are conducted away from an airport or at airports without an operating control tower. There may be circumstances that require the use of airport property, either for launch or landing and recovery of the balloon. These activities can be safely conducted at an airport, if the balloon pilot remains aware of the movement and location of other aircraft and ground vehicles, and also complies with standard operating procedures and practices. The absence of an operating airport control tower creates a need for increased vigilance on the part of any pilot operating at those airports.

Planning, clear communications, and enhanced situational awareness during airport surface operations reduces the potential for surface incidents. Safe balloon operations can be accomplished and incidents eliminated if the pilot is properly trained early on and, throughout their flying career, complies with standard operating procedures and practices when operating on airport property. This requires the development of the formalized teaching of safe operating practices during ground 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.

Use of Checklists

Checklists are the foundation of pilot standardization and safety. Checklists aid the memory and help ensure that critical items necessary for the safe operation of the balloon are not overlooked or forgotten. Checklists have no value if they are not used. Pilots who fail to use checklists at the appropriate times are relying instead on memory, become complacent, and increase the odds of making a mistake.

The consistent use of checklists in primary flight training establishes habit patterns that will serve the pilot well throughout their flying career. It is important that the flight instructor promote a positive attitude toward the use of checklists so the student pilot recognizes their importance. At a minimum, prepared checklists should be used for the following phases of flight:

- Crew Briefing and Preparation.
- Layout and Assembly.
- Preflight Inspection.
- Inflation.
- Passenger Briefing.
- Prelaunch Check.
- Emergency Procedures.
- Postlanding.
- Recovery, Deflation, and Packing.

Checklists are covered in greater detail in Chapter 6, Layout to Launch.

Positive Transfer of Controls

It is imperative that a clear understanding exists between the student and flight instructor of who has control of the balloon during flight training. The flight instructor should conduct a briefing prior to any dual training flight that includes the procedure for the exchange of flight controls. The following three-step process for the exchange of flight controls is highly recommended.

1. When a flight instructor wishes the student to take control of the balloon, they should say “You have the flight controls.”
2. The student acknowledges immediately by saying, “I have the flight controls.”
3. The flight instructor confirms transfer of controls by saying, “You have the flight controls.”

Both the flight instructor and student pilot should make a visual check to ensure the designated person actually has the flight controls. When the student pilot wishes to return the controls to the flight instructor, they follow the same procedure and stays on the controls until the flight instructor says, “I have the flight controls.” There should never be any doubt as to who is in control of the balloon. The establishment of positive transfer of control during initial training ensures the formation of a good flying habit.

Aeronautical Decision-Making (ADM)

Aeronautical decision-making (ADM) is a systematic approach to the mental process used by pilots to consistently determine the best course of action in response to a given set of circumstances. Learning effective ADM skills can help a

pilot offset the one unchanging factor that remains despite all the changes in improved flight safety—the human factor. It is estimated that 90 percent of balloon accidents are human factors related.

ADM builds on the foundation of conventional decision- making, but enhances the process to decrease the probability of pilot error. ADM provides a structure to analyze changes that occur during a flight and determine how these changes might affect a flight’s safe outcome. This process includes identifying personal attitudes hazardous to safe flight, learning to recognize and cope with stress, developing risk assessment skills, and evaluating the effectiveness of one’s ADM skills.

Hazardous Attitudes & Antidotes

A hazardous attitude, which contribute to poor pilot judgment, can be effectively counteracted by redirecting that hazardous attitude so that correct action can be taken. Recognition of a hazardous thought is the first step toward neutralizing it. After recognizing a thought as hazardous, the pilot should label it as hazardous, then state the corresponding antidote. The antidotes for each hazardous attitude should be memorized so it automatically comes to mind when needed. Each hazardous attitude with its appropriate antidote or learning modification is shown in *Figure 1-5*.

HAZARDOUS ATTITUDES	ANTIDOTES
<p>Macho—Brenda often brags to her friends about her skills as a pilot and wants to impress them with her abilities. During her third solo flight she decides to take a friend for a balloon ride.</p>	<p>Taking chances is foolish.</p>
<p>Anti-authority—In the air, she thinks “It’s great to be up here without an instructor criticizing everything I do. His do-it-by-the-book attitude takes all of the fun out of flying.”</p>	<p>Follow the rules. They are usually right.</p>
<p>Invulnerability—Brenda soon realizes that the winds are much stronger than she had thought and in a different direction than forecast. But she feels confident that her skill will still allow a long flight from the launch site so she can show her friend the countryside. She thinks, “It’s no more difficult than many of the flights with my instructor.”</p>	<p>It could happen to me.</p>
<p>Impulsivity—While flying low over a neighborhood preparing to land, Brenda notices a number of adults and children in the middle of the street watching the balloon pass overhead. She decides to descend even lower, to rooftop level, to impress both the spectators and Sarah, her passenger. As she levels out, she notices the power lines running just below the treetops and narrowly misses one of them.</p>	<p>Not so fast. Think first.</p>
<p>Resignation—At the end of a local flight, Brenda does not adequately plan for a fast, hard landing. She fails to vent sufficiently on touchdown, and ends up draping the balloon envelope over the trees on the far edge of the landing area, with no damage. As she and her passenger exit the balloon, she says to herself, “Oh well, it’s all part of learning to fly.”</p>	<p>I’m not helpless. I can make a difference.</p>

Figure 1-5. A pilot should be able to identify hazardous attitudes and apply the appropriate antidote when needed.



U.S. Department
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**Federal Aviation
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Balloon Flying Handbook

FAA-H-8083-11B

The FAA's *Balloon Flying Handbook* introduces the basic pilot skills and knowledge essential for piloting balloons and leads pilots into the broad spectrum of information that will be needed as they progress in their pilot training. This handbook is for student pilots as well as those pursuing more advanced pilot certificates and helpful for flight instructors engaged in teaching balloon pilots of all skill levels.

Providing the facts and guidance required for pilot certification, this handbook is a key reference for the FAA test standards. An introduction to balloon flight training is followed by chapters dedicated to hot air balloon design, systems and theory, preflight planning, weather theory and reports, the national airspace system, balloon layout to launch, inflight maneuvers, landing and recovery,

aeromedical factors, the instructional process, and the gas balloon. Appendices are included for the vapor pressures of LP (liquid petroleum) gases, a pibal (pilot balloon) plotting grid, a balloon flight checklist, pibal velocity versus size, logbook endorsement formats, and a lift table for helium and hydrogen at standard temperatures and pressures.

The *Balloon Flying Handbook* is the official FAA source for learning to fly balloons and for many of the test questions on the FAA Knowledge Exams for pilots. Complete with chapter summaries and illustrated throughout with detailed, full-color drawings and photographs, the handbook also includes a glossary of balloon-related terms.

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