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 FederalRegulations (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 (ACSs), 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.

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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 FAA ASIs 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.

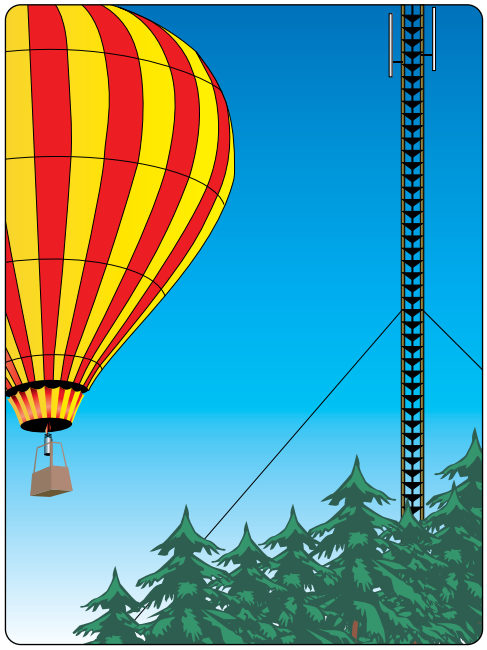

Figure 1-4. *When flying or landing, always be aware of the potential for collision with trees, powerlines, and other obstacles.*

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
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.	**Taking chances is foolish.**
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."	**Follow the rules. They are usually right.**
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."	**It could happen to me.**
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.	**Not so fast. Think first.**
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."	**I'm not helpless. I can make a difference.**

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

Stress Management

An important component of the ADM system is the ability to recognize stress. Stress is a term used to describe the body's nonspecific response to demands placed on it. Stress can be emotional, physical, or behavioral, and it is important for a pilot to become knowledgeable about stress and how to cope with it.

Risk Assessment Analysis

An examination of the National Transportation Safety Board (NTSB) reports and other accident research can help a pilot to assess risk more effectively. For example, studies indicate the types of flight activities that are most likely to result in the most serious accidents. For balloons, landing accidents consistently account for over 90 percent of the total number of accidents in any given year.

These accidents consistently account for the majority of injury to pilots and damage to balloons. Accidents are more likely during landing because the tolerance for error is greatly diminished and opportunities for pilots to overcome errors in judgment and decision-making become increasingly limited, particularly in high wind conditions. The most common causal factors for landing accidents include collision with obstructions in the intended landing area. Prior to a flight, a pilot should assess personal fitness. The "I'm Safe Checklist" helps a pilot determine their ability to fly. [*Figure 1-6*]

Figure 1-6. *Prior to flight, a pilot should assess personal fitness, just as they evaluate the balloon's airworthiness.*

Evaluating ADM Skills

The "What If" discussions an instructor pilot has with a student pilot are designed to accelerate development of decision-making skills by posing situations for the trainee to ponder. Research has shown that these types of discussions help build judgment and offset low experience. Once a student pilot has obtained their certification, it is important that they continue to evaluate flight decisions. To self-evaluate:

- Pose an open-ended question about the situation encountered during flight.
- Examine the decision made.
- Explore other ways to solve the problem.
- Evaluate whether or not the best solution was used.

Crew Resource Management (CRM)

ADM originated with the airline industry in an attempt to reduce human factors in aircraft accidents. The airlines developed a training program for flight crews called Crew Resource Management (CRM). It focuses on the effective use of all available resources to prevent accidents. While CRM focuses on pilots operating in crew environments, many of the concepts apply to single-pilot operations, but are not a "best fit" for balloon operations.

Single-Pilot Resource Management (SRM)

A variant of the CRM model that may be of more practical application to the balloon pilot is Single-Pilot Resource Management (SRM), which may be defined as "the art and science of managing all resources (both from on-board and external sources) available to the single-pilot (prior to and during flight) to ensure the successful outcome of the flight." Virtually all ballooning is done as a single-pilot operation; there is no "crew resource" available from the perspective of having a co-pilot to assist in workload management.

For any single pilot, the primary emphasis of SRM is to integrate the underlying thinking skills needed by the pilot to consistently determine the best course of action to take in response to a given set of circumstances. SRM integrates the following concepts:

- Human Resources.
- Risk Management.
- Situational Awareness.
- Training.
- Decision-Making Process.

Human Resources

Balloons differ from general aviation aircraft in the balloon pilot's reliance on diverse human resources for flight. Human resources include all groups working with pilots to ensure flight safety. A safe balloon flight includes, but is not limited to, a crew chief and ground crew, weather briefers, volunteers, spectators, "locals" with current and often unpublished information on roads and landing sites, landowners, and others who contribute assistance or information. Balloons differ from airplanes in their reliance on unlicensed, non-FAA-certified/recognized, and even first time volunteers to assemble and support ground handling of the balloon. Crew action—or inaction—at any stage of flight can contribute as much or more to flight safety than pilot input. Balloon flight safety often relies on many people beyond those onboard.

For example, a routine inflation on most balloons requires several sets of hands; moderate winds can quickly mean more help is needed. Having someone to handle a drop line offers a pilot landing site options inaccessible through onboard maneuvering. Added weight or "hands on" allows a pilot to choose a smaller landing site than when landing unassisted, or it can mean avoiding trees, power lines, or other obstacles

Crew members make important information contributions to flight safety because crew can access real time flight related information before a pilot. For example, precipitation is often visible on the chase vehicles long before it compromises a balloon's in-flight performance or gains a pilot's attention. The crew can also warn a pilot who is contour flying into the sun of power lines downwind or of livestock behind trees or buildings. A crew report on the current state of variable surface conditions can alert a pilot who is descending or landing into winds different from those of launch or flight. Crew action can easily mean the difference between a safe flight and an accident.

The essential and decisive roles crew and other human resources play in ballooning also create an ironic dilemma/dynamic between legal and operational realities. 14 CFR part 91 requires a pilot to act as the sole and final authority regarding operation of the balloon, yet every pilot also relies on crew who are not trained, certified, or even recognized by any governing body for a flight to occur. Each pilot thus leads an integral, yet legally invisible team on each flight. Overlooking, minimizing, or dismissing the crew's role opens the door to mishaps. Safety often lies in recognizing how the crew's skill, knowledge, and experience complement and enhance the pilot's own. While all final decisions and the responsibility for safety still rest with the pilot, this broader than usual SRM model recognizes the human resources upon which every pilot relies for safe flight planning and decision-making.

Risk Management

Flying involves risk. To stay safe, a pilot needs to know how to judge the level of risk, how to minimize it, and when to accept it. The risk management decision path is best seen through the Perceive-Process-Perform model [*Figure 1-7*] which offers a structured way to manage risk.

Figure 1-7. *The Perceive-Process-Perform model.*

Perceive hazards by looking at:

Aircraft—A pilot frequently bases decisions to fly on personal evaluations of the aircraft, such as its powerplant, performance, equipment, fuel state, or airworthiness. A situation to consider: en route to an oil rig an hour's flight from shore, having just passed the shoreline, the pilot notices the oil temperature at the high end of the caution range. Should the pilot continue out to sea or return to the nearest suitable heliport/airport?

- Aircraft performance, fuel.
- Environment (weather, terrain).
- External factors.

Process risk level by considering:

- Consequences posed by each hazard.
- Alternatives that eliminate hazards.
- Reality (avoid wishful thinking).
- External factors (get-home-itus).

Perform risk management:

- Transfer—can someone be consulted?
- Eliminate—can hazards be removed?

- Accept—do benefits outweigh risk?
- Mitigate—can the risk be reduced?

During each flight, pilots make decisions regarding events that involve interactions between the four risk elements—the pilot in command, the aircraft, the environment, and the operation. [*Figure 1-8*] One of the most important decisions a pilot in command makes is the go/no-go decision. Evaluating each of these risk elements can help a pilot decide whether a flight should be conducted or continued. Below is a review of the four risk elements and how they affect decision-making.

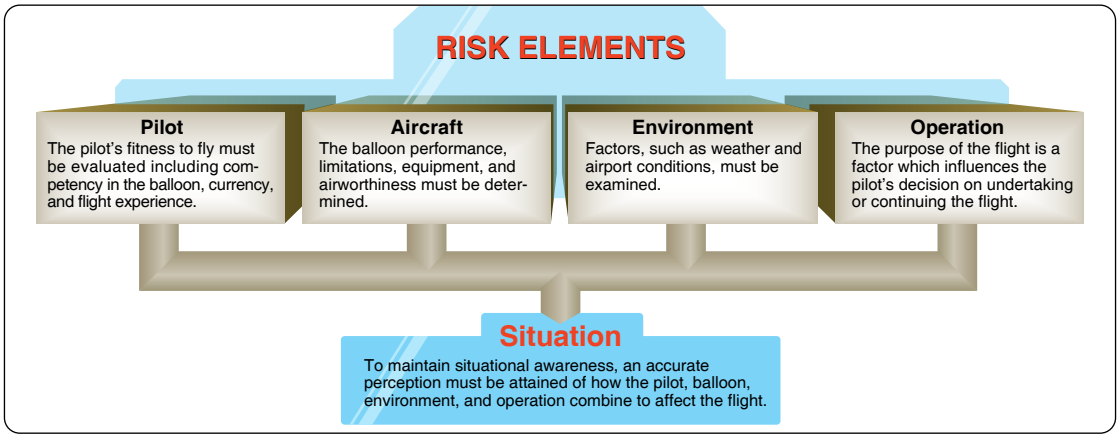

Figure 1-8. *When situationally aware, a pilot has an overview of the total operation and is not fixated on one perceived significant factor.*

- Pilot—a pilot continually makes decisions about their competency, condition of health, mental and emotional state, level of fatigue, etc. For example, a pilot may plan for an early morning flight after an all night drive, which means little sleep. Tired, achy, congested from the beginnings of a cold, is that pilot safe to fly?
- Balloon—a pilot frequently bases decisions on the evaluations of the balloon, such as performance, equipment, or airworthiness. A pilot is on an afternoon flight in a rural area. Landing areas are becoming sparse because the terrain is mostly swampland. The wind is decreasing and sunset is only half and hour away. Should they continue to fly over this terrain?
- Environment—this encompasses many elements not pilot or balloon related. It includes, but is not limited to, such factors as weather, terrain, launch and landing areas, and surrounding obstacles. Weather is one element that can change drastically over time and distance. During an afternoon flight with an indefinite ceiling, slight precipitation and the rumble of thunder is encountered. Should the pilot stay aloft, trusting the weather briefing's assertion that "there is no precipitation in the area," or land at the first available site as soon as possible?
- Operation—the interaction between the pilot, the balloon, and the environment is greatly influenced by the purpose of each flight operation. The pilot should evaluate the three previous elements to decide on the desirability of undertaking or continuing the flight as planned. It is worth asking why the flight is being made, how critical it is to maintain the original intent, and if the continuation of the flight is worth the risks?

Effective Situational Awareness

Situational awareness is the accurate perception and understanding of all the factors and conditions within the four fundamental risk elements that affect safety before, during, and after the flight. To maintain situational awareness, a pilot needs to understand the relative significance of these factors and their future impact on the flight. When a pilot is situationally aware, they have an overview of the total operation.

Some obstacles to maintaining situational awareness include (but are not limited to) fatigue, stress, and work overload; complacency; and classic behavioral traps such as the drive to meet or exceed flight goals. Situational awareness depends

on the ability to switch rapidly between a number of different, and possibly competing, information sources and tasks while maintaining a collective view of the environment. Experienced pilots are better able to interpret a situation because of their base of experience, but newer pilots can compensate for lack of experience with the appropriate fundamental core competencies acquired during initial and recurrent flight training. SRM training helps the pilot maintain situational awareness, which enables the pilot to assess and manage risk and make accurate and timely decisions. To maintain situational awareness, all of the skills involved in ADM are used.

The Decision-Making Process

Understanding the decision-making process provides a foundation for developing the necessary ADM skills. Some situations, such as an extinguished pilot light, require an immediate response using established procedures. While pilots are well trained to react to emergencies, they are not as prepared to make decisions that require a more reflective response. The ability to examine any changes that occur during a flight, gather information, and assess risk before reaching a decision constitutes the steps of the decision- making process.

Defining the Problem

Problem definition is the first step in the decision-making process. Defining the problem begins with recognizing a change has occurred or an expected change did not occur. A problem is perceived first by the senses and then is distinguished through insight and experience. This "gut" reaction, coupled with an objective analysis of all available information, determines the exact nature and severity of the problem.

Choosing a Course of Action

After the problem has been identified, the pilot should evaluate the need to react to it and determine the actions that need to be taken to resolve the situation in the time available. The expected outcome of each possible action should be considered and the risks assessed before deciding on a response to the situation.

Although a decision may be reached and a course of action implemented, the decision-making process is not complete. It is important to think ahead and determine how the decision could affect other phases of the flight. As the flight progresses, the pilot should continue to evaluate the outcome of the decision to ensure that it is producing the desired result.

The DECIDE Model

A common approach to decision-making for the last decade has been the rational choice model. This concept holds that good decisions result when a pilot gathers all the information related to a particular scenario, reviews it, analyzes the options available, and decides on the best course of action to follow.

The DECIDE Model, a six-step process intended to provide the pilot with a logical way of approaching decision-making, is an example of this concept. The six elements of the DECIDE Model represent a continuous loop process to assist a pilot in decision-making. If a pilot uses the DECIDE Model in all decision-making, it becomes natural and results in better decisions being made under all types of situations. [*Figure 1-9*]

DECIDE MODEL

Detect the fact that a change has occurred.

Estimate the need to counter or react to the change.

Choose a desirable outcome for the success of the flight.

Identify actions which could successfully control the change.

Do the action necessary to adapt to the change.

Evaluate the effect of the action.

Figure 1-9. *The DECIDE Model can provide a framework for effective decision-making.*

The OODA Loop

Colonel John Boyd, USAF (Retired), coined the term and developed the concept of the "OODA Loop" (Observation, Orientation, Decision, Action). [*Figure 1-10*] The ideas, words, and phrases contained in Boyd's briefings have penetrated not only the United States military services, but the business community and academia around the world. The OODA Loop is now used as a standard description of decision-making cycles.

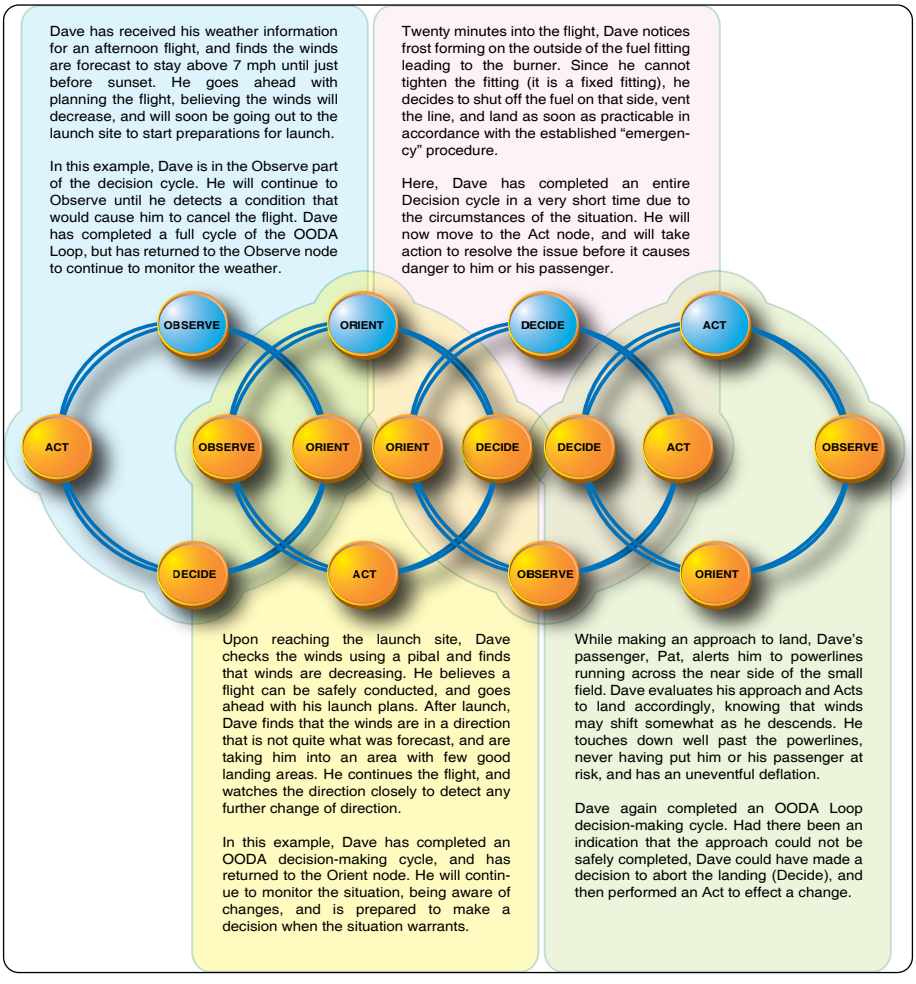

Figure 1-10. *Using the OODA Loop as a model, it is possible to have multiple decision-making cycles in progress, in different stages of completion. While these examples show a sequence, this is not always the case; the OODA Loop cycles may overlap in any stage of execution.*

The OODA Loop is an interlaced decision model which provides immediate feedback throughout the decision- making process. For SRM purposes, an abbreviated version of the concept [*Figure 1-11*] provides an easily understood tool for the balloon pilot.
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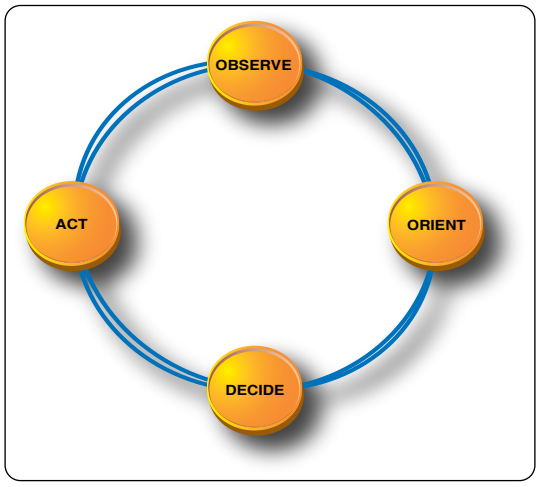

Figure 1-11. *The four nodes of OODA Loop decision-making.*

The first node of the OODA Loop, Observe, reflects the need for situational awareness. A balloon pilot needs to be aware of those things around them that may impact the flight. Continuous monitoring of wind, weather, ground track, balloon responses, and so forth provide a constant reference point by which the pilot knows their starting point on the loop. This permits the ability to immediately move to the next step.

Orient, the second node of the OODA Loop, focuses the pilot's attention on one or more discrepancies in the flight. For example, while contour flying over trees, the balloon passes the edge of the tree line and begins a gradual descent. The pilot is aware of this deviation and considers available options in view of potential hazards to continued flight.

The pilot then moves to the third node, Decide, in which they determine the action to create a specific desired effect. That decision is made based on experience and knowledge of potential results of a particular action. The pilot then Acts on that decision, making a physical input to cause the balloon to react in the desired fashion.

Once the OODA Loop has been completed, the pilot is once again in the Observe position. Assessment of the resulting action is added to the previously perceived aspects of the flight to further define the flight's progress. The advantage of the OODA Loop Model is that it may be cumulative. Also, multiple cycles in different stages of completion may be occurring at any given point in the flight. [*Figure 1-11*]

Balloon Certificate Eligibility Requirements

To be eligible to fly a balloon solo, an applicant must be at least 14 years of age and demonstrate satisfactory aeronautical knowledge on a test developed by a flight instructor. Flight training must be received and logged for the maneuvers and procedures in 14 CFR part 61 that are appropriate to the make and model of aircraft to be flown. Only after all of these requirements are met can a flight instructor endorse a student's certificate and logbook for solo flight.

Sport Pilot

To be eligible for a sport pilot certificate with a balloon endorsement, an applicant must be at least 16 years of age, complete the specific training and flight time requirements described in 14 CFR part 61, pass a knowledge test, and successfully complete a practical test. A sport pilot certificate with balloon endorsement authorizes piloting a balloon with a maximum takeoff gross weight of 1,320 pounds or less. Satisfactory proficiency and safety must also be demonstrated.

Private Pilot

To be eligible for a private pilot certificate with a balloon rating, an applicant must be at least 16 years of age, complete the specific training and flight time requirements described in 14 CFR part 61, pass a knowledge test, and successfully complete a practical test. A private pilot certificate allows a pilot to carry passengers, but they may not receive compensation. The FAA has specified the aeronautical knowledge and flight proficiency that must be demonstrated to earn a private certificate as listed below.

(a) General. A person who is applying for a private pilot certificate must receive and log ground training from an authorized instructor or complete a home- study course on the aeronautical knowledge areas of paragraph (b) of this section that apply to the aircraft category and class rating sought.

Aeronautical Knowledge, Private Pilot, 14 CFR Part 61, Section 61.105.

(b) Aeronautical knowledge areas.

1. Applicable Federal Aviation Regulations of this chapter that relate to private pilot privileges, limitations, and flight operations.
2. Accident reporting requirements of the National Transportation Safety Board.
3. Use of the applicable portions of the Aeronautical Information Manual and FAA Advisory Circulars.
4. Use of aeronautical charts for VFR navigation using pilotage, dead reckoning, and navigation systems.
5. Radio communication procedures.
6. Recognition of critical weather situations from the ground and in flight, windshear avoidance, and the procurement and use of aeronautical weather reports and forecasts.
7. Safe and efficient operation of aircraft, including collision avoidance, and recognition and avoidance of wake turbulence.
8. Effects of density altitude on takeoff and climb performance.
9. Weight and balance computations.
10. Principles of aerodynamics, powerplants, and aircraft systems.
11. Stall awareness, spin entry, spins, and spin recovery techniques for the airplane and glider category ratings.
12. Aeronautical decision-making and judgment.
13. Preflight action that includes:
    i. How to obtain information on runway lengths at airports of intended use, data on takeoff and landing distances, weather reports and forecasts, and fuel requirements; and
    ii. How to plan for alternatives if the planned flight cannot be completed or delays are encountered.

Flight Proficiency, Private Pilot, 14 CFR Part 61, Section 61.107

(a) General. A person who applies for a private pilot certificate must receive and log ground and flight training from an authorized instructor on the areas of operation of this section that apply to the aircraft category and class rating sought.

(b) Areas of operation.

Note: Steps 1–7 have been omitted from this reference. To view these steps, reference the regulation listed in the title of the section text.

8. For a lighter-than-air category rating with a balloon class rating:

1. Preflight preparation.
2. Preflight procedures.
3. Airport operations.
4. Launches and landings.
5. Performance maneuvers.
6. Navigation.
7. Emergency operations.
8. Postflight procedures.

Commercial Pilot

To be eligible for a commercial pilot certificate with a balloon rating, an applicant must be 18 years of age, complete the specific training requirements described in 14 CFR part 61, pass the required knowledge tests, and pass another practical test.

The FAA has specified the aeronautical knowledge and flight proficiency that must be demonstrated to earn a commercial certificate as listed below.

(a) General. A person who applies for a commercial pilot certificate must receive and log ground training from an authorized instructor, or complete a home- study course, on the aeronautical knowledge areas of paragraph (b) of this section that apply to the aircraft category and class rating sought.

Aeronautical Knowledge, Commercial Pilot, 14 CFR Part 61, Section 61.125.

(b) Aeronautical knowledge areas.

1. Applicable Federal Aviation Regulations of this chapter that relate to commercial pilot privileges, limitations, and flight operations.
2. Accident reporting requirements of the National Transportation Safety Board.
3. Basic aerodynamics and the principles of flight.
4. Meteorology to include recognition of critical weather situations, windshear recognition and avoidance, and the use of aeronautical weather reports and forecasts.
5. Safe and efficient operation of aircraft.
6. Weight and balance computations.
7. Use of performance charts.
8. Significance and effects of exceeding aircraft performance limitations.
9. Use of aeronautical charts and a magnetic compass for pilotage and dead reckoning.

10. Use of air navigation facilities.
11. Aeronautical decision-making and judgment.
12. Principles and functions of aircraft systems.
13. Maneuvers, procedures, and emergency operations appropriate to the aircraft.
14. Night and high-altitude operations.
15. Procedures for operating within the National Airspace System.
16. Procedures for flight and ground training for lighter-than-air ratings.

(a) General. A person who applies for a commercial pilot certificate must receive and log ground and flight training from an authorized instructor on the areas of operation of this section that apply to the aircraft category and class rating sought.

Flight Proficiency, Commercial Pilot, 14 CFR Part 61, Section 61.127.

(b) Areas of operation.

(8) For a lighter-than-air category rating with a balloon class rating:

1. Fundamentals of instructing.
2. Technical subjects.
3. Preflight preparation.
4. Preflight lesson on a maneuver to be performed in flight.
5. Preflight procedures.
6. Airport operations.
7. Launches and landings.
8. Performance maneuvers.
9. Navigation.
10. Emergency operations.
11. Postflight procedures.

Note: A commercial pilot with a balloon category and class rating may instruct, and is authorized to do so under the provisions of their certificate.

If a pilot currently holds a pilot certificate for a powered aircraft and wants to add a balloon category rating on that certificate, they are exempt from the knowledge test, but must satisfactorily complete the flight training and practical test. Balloon pilots exercising student, sport or private pilot privileges, and commercial balloon pilots conducting flight instruction are not required to hold a medical certificate in order to act as pilot in command within the United States. Balloon pilots exercising commercial pilot privileges for operations other than flight instruction are required to hold at least a second-class medical certificate in order to operate a balloon within the United States. Flights in foreign countries fall under the International Civil Aviation Organization (ICAO) regulations, and a medical certificate is generally required.

For private pilots working toward the commercial pilot certificate, the regulatory requirement is ten additional hours of flight training, per the provisions of 14 CFR part 61. Flight time logged as instructional time received towards the initial certification may not, under most circumstances, be counted towards that time, which meets the commercial rating requirements.

FAA WINGS Program

How well would professional athletes perform if they did not practice? How would doctors perform if they did not keep up with current health information? In many professions including flying, continuing education is essential to safety and success. The Path to Proficiency in the balloon doesn't end with a check-ride, it continues throughout a pilot's flying career. The FAA WINGS proficiency program is a convenient and effective tool available to pilots at every level. The FAA WINGS proficiency program increases confidence and comfort, expands horizons, and most importantly, keeps pilots who participate safe. WINGS proficiency can also count to keep a Flight Review up to date and assist pilots in receiving various flying insurance discounts. You can create a WINGS account at FAASafety.gov.

Introduction to IACRA

The Integrated Airman Certification and/or Rating Application (IACRA) is an online application system that allows for the issuance of student, private, and commercial certificates without generating paperwork; all certificate application and approval is done through the use of electronic signatures. IACRA interfaces with multiple databases to validate data and verify specific fields of information, and upon completion of the approval process, forwards the data automatically to the Airman Certification Branch.

In order to utilize the system, an applicant should first register with IACRA.

This registration process results in the issuance of an FAA Tracking Number (FTN). This number becomes the applicant's registration number for all future utilization of the system, so it is important to keep it for future reference and action.

Upon completion of all training requirements, the student pilot (which refers to both the student applying for a private certificate, as well as the private pilot upgrading to the commercial certificate) makes application through the IACRA website. The FAA Form 8710-1 is completed online in several steps. When complete, the form is submitted to the central server at the FAA Airman Certification Branch in Oklahoma City. If the form is accepted at the server, the applicant is issued an application ID number for future reference.

The instructor, who has previously enrolled in the IACRA system as a recommending instructor, uses the applicant's FTN to retrieve the application for review. It is also the responsibility of the instructor to attach the results of the student's written test to the IACRA file, using the Exam ID, which is usually found in the upper right portion of the printed results. Once the recommending instructor has reviewed the application, and the results are attached, the application is again sent to the central server at the Airman Certification Branch.

At the appropriate time, the examiner retrieves the applicant's application from the central server, verifies the individual's identification, and administers the practical test. IACRA has provisions for the issuance of a temporary airman certificate, notice of discontinuance, or notice of disapproval. When the evaluation is completed, and the examiner has completed the appropriate processing, the file is again returned to the Airman Certification Branch. Upon successful completion, the permanent certificate is prepared and forwarded to the pilot.

Chapter Summary

This chapter provides an overview of the FAA, the flight instructor, and DPE's roles in the qualification and licensing of lighter-than-air pilots. Additionally, the regulatory requirements for both ground and aeronautical training have been outlined.

The reader has also been given some basic information and techniques concerning flight safety practices and aeronautical decision-making. This information is not exhaustive; the student pilot would be well advised to avail himself or herself of other materials published by the FAA and other organizations.