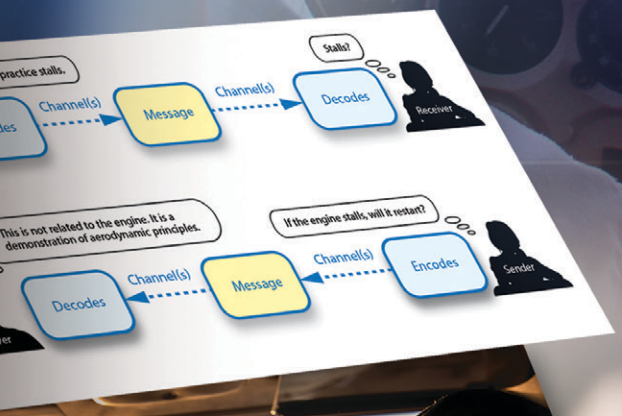
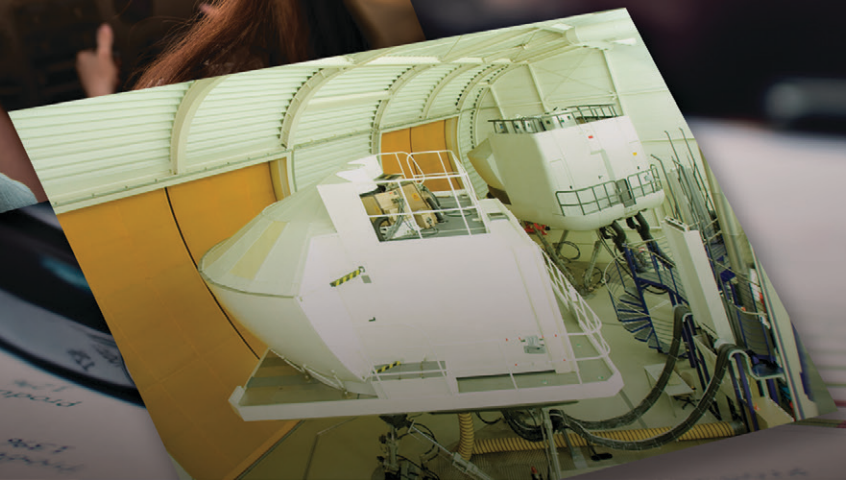
FAA-H-8083-9B

Aviation Instructor's Handbook





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Aviation Instructor's Handbook

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Acknowledgments

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Preface

Designed for ground instructors, flight instructors, and aviation maintenance instructors, the Aviation Instructor's Handbook was developed by the Flight Standards Service, Airman Testing Standards Branch, in cooperation with aviation educators and industry to help beginning instructors understand and apply the fundamentals of instruction. This handbook provides aviation instructors with up-to-date information on learning and teaching, and how to relate this information to the task of teaching aeronautical knowledge and skills to learners. Experienced aviation instructors will also find the updated information useful for improving their effectiveness in training activities.

This handbook supersedes FAA-H-8083-9A, Aviation Instructor's Handbook, dated 2008.

This handbook is available for download, in PDF format, from www.faa.gov.

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

The contents of this handbook do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

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Chapter 1: Risk Management and Single-Pilot Resource Management

Introduction

"Pull the throttle back!" Lenore, a flight instructor, ordered the learner, Jennifer, as the revolutions per minute (rpm) climbed past past 2,000 on engine start. "I did, I did!"

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

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

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

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

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

Three deficient areas in this annual inspection were identified by a round-table discussion group of aircraft and powerplant (A&P) mechanics and the learner. These areas were:

- Lack of responsibility
- Checklist misuse
- Complacency

Lack of responsibility—no one took responsibility for the entire inspection. The chances of something being overlooked increase with an increase in the number of mechanics involved in an inspection. The responsible person is removed from the actual procedure. The learner remembers hearing the IA ask one of the engine mechanics about the throttle. However, the question was vague, the answer was vague, and the rod-end was not safetied.

Checklist misuse—Perhaps the throttle rod-end had been disconnected for maintenance after the IA had signed off the control inspection and marked that item as complete on the maintenance checklist. In that case, a discrepancy should have been entered onto the discrepancy sheet stating, "reconnect and safety throttle rod-end."

Complacency—an insidious and hard-to-identify attitude. Each of the mechanics involved in the incident thought someone else had inspected the throttle rod-end. The IA signed off the annual inspection after asking the mechanics about the items on the checklist, making frequent visits to the airplane, inspecting some of the various items, and deciding that was good enough. Complacency crippled the mechanics' quality of work by removing any thoughts of double-checking each other's work.

While a definite answer to the question of what happened remains a matter of speculation, professional mechanics heed warning signs of potential problems. The combination of a lengthy inspection, numerous technicians, an overworked supervisor, a poor checklist, and vague communication raise a red flag of caution.

This scenario underscores the need for safety risk management at all levels of aviation. Safety risk management, a formal system of hazard identification, assessment, and mitigation, is essential in keeping risk at acceptable levels. Part of this process is selecting the appropriate controls to mitigate the risk of the identified hazard. The primary objective of risk management is accident prevention, which is achieved by proactively identifying, assessing, and eliminating or mitigating safety-related hazards to acceptable levels.

This chapter discusses safety risk management in the aviation community, looking at it as preemptive, rather than reactive. The principles of risk management and the tools for teaching risk management in the flight training environment are addressed in Chapter 9, Techniques of Flight Instruction.

Defining Risk Management

Risk is defined as the probability and possible severity of accident or loss from exposure to various hazards, including injury to people and loss of resources. *[Figure 1-1]* All Federal Aviation Administration (FAA) operations in the United States involve risk and benefit from decisions that include risk assessment and risk management. Risk management, a formalized way of thinking about these topics, is the logical process of weighing the potential costs of risks against the possible benefits of allowing those risks to stand uncontrolled.

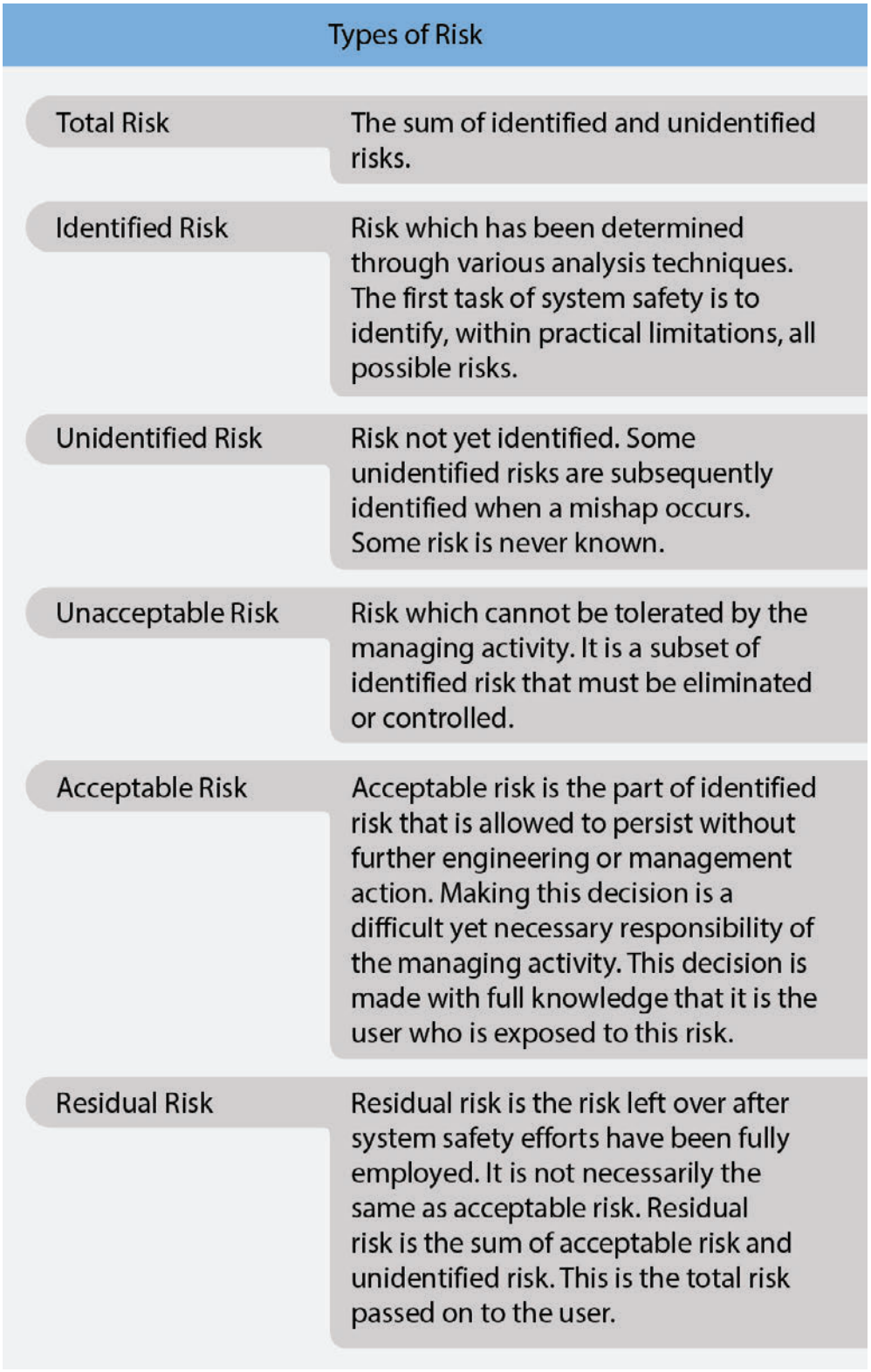

Figure 1-1. *Types of risk.*

Risk management is a decision-making process designed to identify hazards systematically, assess the degree of risk, and determine the best course of action. Key terms are:

- Hazard—a present condition, event, object, or circumstance that could lead to or contribute to an unplanned or undesired event, such as an accident. It is a source of danger. For example, a nick in the propeller represents a hazard.

- Risk—the future impact of a hazard that is not controlled or eliminated. It is the possibility of loss or injury. The level of risk is measured by the number of people or resources affected (exposure); the extent of possible loss (severity); and likelihood of loss (probability).

- Safety—freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment. Note that absolute safety is not possible because complete freedom from all hazardous conditions is not possible. Therefore, safety is a relative term that implies a level of risk that is both perceived and accepted.

Principles of Risk Management

The goal of risk management is to proactively identify safety-related hazards and mitigate the associated risks. Risk management is an important component of decision-making. When a pilot follows good decision-making practices, the inherent risk in a flight is reduced or even eliminated. The ability to make good decisions is based upon direct or indirect experience and education. It is important to remember the four fundamental principles of risk management:

Accept No Unnecessary Risk

Unnecessary risk is that which carries no commensurate return in terms of benefits or opportunities. Everything involves risk. The most logical choices for accomplishing a flight are those that meet all requirements with the minimum acceptable risk. The corollary to this axiom is "accept necessary risk" required to complete the flight or task successfully. Flying is impossible without risk, but unnecessary risk comes without a corresponding return. If flying a new airplane for the first time, a flight instructor might determine that the risk of making that flight in low instrument flight rules (IFR) conditions is unnecessary.

Make Risk Decisions at the Appropriate Level

Anyone can make a risk decision. However, risk decisions should be made by the person who can develop and implement risk controls. In a single-pilot situation, the pilot makes the decision to accept certain levels of risk, so why let anyone else—such as ATC or your passengers—make risk decisions for you? In the maintenance facility, an aviation maintenance technician (AMT) may need to elevate decisions to the next level in the chain of management upon determining that those controls available to him or her will not reduce residual risk to an acceptable level.

Accept Risk When Benefits Outweigh the Costs

All identified benefits should be compared against all identified costs. Even high-risk endeavors may be undertaken when there is clear knowledge that the sum of the benefits exceeds the sum of the costs. For example, in any flying activity, it is necessary to accept some degree of risk. A day with good weather, for example, is a much better time to fly an unfamiliar airplane for the first time than a day with low instrument flight rules (IFR) conditions.

Integrate Risk Management into Planning at All Levels

Risks are more easily assessed and managed in the early planning stages of a flight. Changes made later in the process of planning and executing may become more difficult, time consuming, and expensive. However, safety enhancement occurs at any time appropriate and effective risk management take place.

Risk Management Process

Risk management is a simple process which identifies operational hazards and takes reasonable measures to reduce risk to personnel, equipment, and the mission. During each flight, the pilot makes many decisions under hazardous conditions. To fly safely, the pilot needs to identify the risk, assess the degree of risk, and determine the best course of action to mitigate the risk.

Step 1: Identify the Hazard

A hazard is defined as any real or potential condition that can cause degradation, injury, illness, death, or damage to or loss of equipment or property. Experience, common sense, and specific analytical tools help identify risks. Once the pilot determines that a hazard poses a potential risk to the flight, it may be further analyzed.

Step 2: Assess the Risk

Each identified risk may be assessed in terms of its likelihood (probability) and its severity (consequences) that could result from the hazards based upon the exposure of humans or equipment to the hazards. An assessment of overall risk is then possible, typically by using a risk assessment matrix, such an online Flight Risk Awareness Tool (FRAT). This process defines the probability and severity of an accident.

Step 3: Mitigate the Risk

Investigate specific strategies and tools that reduce, mitigate, or eliminate the risk. High risks may be mitigated by taking action to lower likelihood and/or severity to lower levels. For serious risks, such actions may also be taken. Medium and low risks do not normally require mitigation. Effective control measures reduce or eliminate the most critical risks. The analysis may consider the overall costs and benefits of remedial actions, providing alternative choices when possible.

Implementing the Risk Management Process

The following principles allow for maximum benefit from series of steps described above that form a risk mitigation strategy:

- Apply the steps in sequence—each step is a building block for the next and should be completed before proceeding to the next. If a hazard identification step is interrupted to focus on the control of a particular hazard, more important hazards may be overlooked. Until all hazards are identified, the remainder of the process is not effective.

- Maintain a balance in the process—all steps are important. Allocate the time and resources to perform all.

- Apply the process in a cycle—the "supervise and review" step should include a brand-new look at the operation being analyzed to see whether new hazards can be identified.

- Involve people in the process—ensure that risk controls are mission supportive, and the people who do the work see them as positive actions. The people who are exposed to risks usually know best what works and what does not.

Identifying Risk

Hazards and their associated risks can either be obvious or harder to detect. You should methodically identify and classify risks to a proposed or ongoing flight by maintaining constant situational awareness. To assist this process, it is helpful to apply the simple acronym PAVE to your risk management process. The acronym stands for Pilot, Aircraft, Environment, External pressures. Use the following guidelines and questions to identify risk using the PAVE acronym.

The Pave Checklist

By incorporating the PAVE checklist into all stages of flight planning, the pilot divides the risks of flight into four categories: Pilot in command (PIC), Aircraft, enVironment, and External pressures (PAVE), which form part of a pilot's decision-making process.

With the PAVE checklist, pilots have a simple way to remember each category to examine for risk prior to each flight. Once a pilot identifies the risks of a flight, he or she needs to decide whether the risk or combination of risks can be managed safely and successfully. If not, the flight should be cancelled. If the pilot decides to continue with the flight, he or she should develop strategies to mitigate the risks. One way a pilot can control the risks is to set personal minimums for items in each risk category. These are limits unique to that individual pilot's current level of experience and proficiency.

For example, the aircraft may have a maximum crosswind component of 15 knots listed in the aircraft flight manual (AFM), and the pilot has experience with 10 knots of direct crosswind. It could be unsafe to exceed a 10 knot-crosswind component without additional training. Therefore, the 10 knots crosswind experience level should be that pilot's personal limitation until additional training with a flight instructor provides the pilot with additional experience for flying in crosswinds that exceed 10 knots.

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Subjects covered include risk management and single-pilot resource management, human behavior, the learning process, effective communication, the teaching process, assessments, planning instructional activity, instructor responsibilities and professionalism, and techniques of flight instruction. Appendices include a comprehensive bibliography of references, information on how to develop a test item bank, certificates and ratings endorsements, and a personal minimums checklist.

This new edition expands and updates the existing material, including scenario-based training relative to assessments, the submission process of an Airman Certificate and/or Rating application through IACRA, and endorsements. It also incorporates new areas of safety concerns and technical information not previously covered, such as referencing the Airman Certification Standards (ACS) alongside the Practical Test Standards (PTS), teaching practical risk management during flight instruction, and information for Remote Pilots.

This book is the official FAA source for teaching flight and many test questions for the FAA Knowledge Exams for instructors come from this reference. Complete with chapter summaries; detailed, full-color drawings and photographs throughout; and a glossary and index.

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