

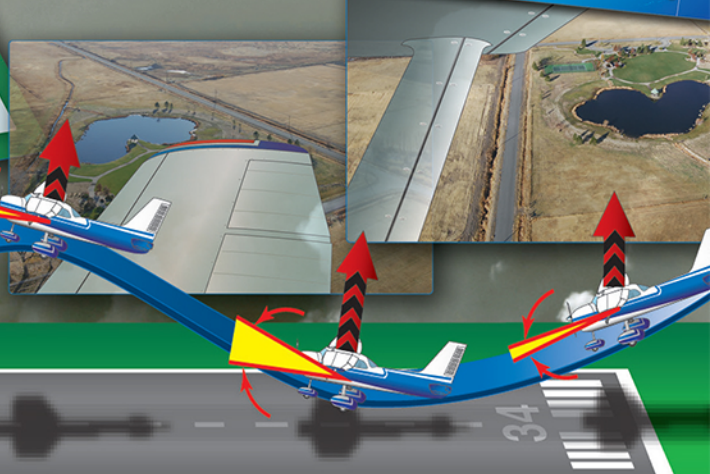
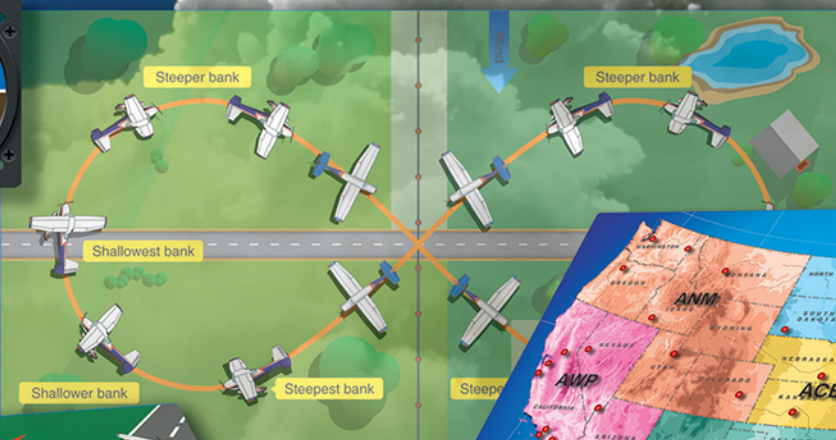


Airplane Flying Handbook

FAA-H-8083-3B



U.S. Department
of Transportation
**Federal Aviation
Administration**



Airplane Flying Handbook

2016

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

Preface

The Airplane Flying Handbook provides basic knowledge that is essential for pilots. This handbook introduces basic pilot skills and knowledge that are essential for piloting airplanes. It provides information on transition to other airplanes and the operation of various airplane systems. It is developed by the Flight Standards Service, Airman Testing Standards Branch, in cooperation with various aviation educators and industry. This handbook is developed to assist student pilots learning to fly airplanes. It is also beneficial to pilots who wish to improve their flying proficiency and aeronautical knowledge, those pilots preparing for additional certificates or ratings, and flight instructors engaged in the instruction of both student and certificated pilots. It introduces the future pilot to the realm of flight and provides information and guidance in the performance of procedures and maneuvers required for pilot certification. Topics such as navigation and communication, meteorology, use of flight information publications, regulations, and aeronautical decision making are available in other Federal Aviation Administration (FAA) publications.

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 to become familiar with and apply the pertinent parts of 14 CFR and the Aeronautical Information Manual (AIM). The AIM is available online at www.faa.gov. The current Flight Standards Service airman training and testing material and learning statements for all airman certificates and ratings can be obtained from www.faa.gov.

This handbook supersedes FAA-H-8083-3A, Airplane Flying Handbook, dated 2004.

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

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Comments regarding this publication should be sent, in email form, to the following address:

AFS630comments@faa.gov

A handwritten signature in black ink, reading "John S. Duncan", written over a horizontal line.

John S. Duncan
Director, Flight Standards Service

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Figure 1-1. Primary and intermediate flight training teaches basic airmanship skills and creates a good foundation for student pilots.

An accomplished pilot demonstrates the knowledge and ability to assess a situation quickly and accurately and determine the correct procedure to be followed under the existing circumstance. He or she is also able to analyze accurately the probable results of a given set of circumstances or of a proposed procedure; to exercise care and due regard for safety; to gauge accurately the performance of the airplane; to recognize personal limitations and limitations of the airplane and avoid approaching the critical points of each; and the ability to identify, assess, and mitigate risk. The development of airmanship skills requires effort and dedication on the part of both the student pilot and the flight instructor, beginning with the very first training flight where proper habit formation begins with the student being introduced to good operating practices.

Every airplane has its own particular flight characteristics. The purpose of primary and intermediate flight training; however,

is not to learn how to fly a particular make and model airplane. The underlying purpose of flight training is to develop the knowledge, experience, skills, and safe habits that establish a foundation and are easily transferable to any airplane. The pilot who has acquired necessary skills during training, and develops these skills by flying training-type airplanes with precision and safe flying habits, is able to easily transition to more complex and higher performance airplanes. It should also be remembered that the goal of flight training is a safe and competent pilot; passing required practical tests for pilot certification is only incidental to this goal.

Role of the FAA

The Federal Aviation Administration (FAA) is empowered by the U.S. Congress to promote aviation safety by prescribing safety standards for civil aviation. Standards are established



Figure 1-2. Good airmanship skills include sound knowledge of the principles of flight and the ability to operate an airplane with competence and precision.

for the certification of airmen and aircraft, as well as outlining operating rules. This is accomplished through the Code of Federal Regulations (CFR), formerly referred to as Federal Aviation Regulations (FAR). Title 14 of the CFR (14 CFR) is

titled Aeronautics and Space with Chapter 1 dedicated to the FAA. Subchapters are broken down by category with numbered parts detailing specific information. [Figure 1-3] For ease of

Title 14 Code of Federal Regulations	
Aeronautics and Space	
CHAPTER 1 Federal Aviation Administration, Department of Transportation	
Subchapter A	Definitions and General Requirements
Part 1	Definitions and Abbreviations
Subchapter B	Procedural Rules
Part 11	General Rulemaking Procedures
Part 17	Procedures for Protests and Contract Disputes
Subchapter C	Aircraft
Part 21	Certification Procedures for Products and Articles
Parts 23—31	Airworthiness Standards for Various Categories of Aircraft
Part 39	Airworthiness Directives
Part 43	Maintenance, Preventive Maintenance, Rebuilding and Alteration
Part 45	Identification and Registration Marking
Subchapter D	Airmen
Part 61	Certification: Pilots, Flight Instructors and Ground Instructors
Part 67	Medical Standards and Certification
Subchapter E	Airspace
Part 71	Designation of Class A,B,C,D and E Airspace Areas; Air Traffic Service Routes; and Reporting Points
Part 73	Special Use Airspace
Subchapter F	Air Traffic and General Operating Rules
Part 91	General Operating and Flight Rules
Part 97	Standard Instrument Procedures
Part 103	Ultralight Vehicles
Subchapter G	Air Carriers and Operators for Compensation or Hire: Certification and Operations
Part 110 - 139	General and Operating Requirements
Subchapter H	Schools and Other Certificated Agencies
Part 141	Pilot Schools
Part 142	Training Centers
Subchapter I	Airports
Part 150 - 169	
Subchapter J	Navigational Facilities
Part 170 - 171	
Subchapter K	Administrative Regulations
Part 183 - 193	



Figure 1-3. Title 14 CFR, Chapter 1, Aeronautics and Space and subchapters.

reference since the parts are numerical, the abbreviated pattern 14 CFR part ___ is used (e.g., 14 CFR part 91).

While the various subchapters and parts of 14 CFR provide general to specific guidance regarding aviation operations within the U.S., the topic of aircraft certification and airworthiness is spread through several interconnected parts of 14 CFR.

- 14 CFR part 21 prescribes procedural requirements for issuing airworthiness certificates and airworthiness approvals for aircraft and aircraft parts. A standard airworthiness certificate, FAA Form 8100-2, is required to be displayed in the aircraft. [Figure 1-4] It is issued for aircraft type certificated in the normal, utility, acrobatic, commuter or transport category, and for manned free balloons. A standard airworthiness certificate remains valid as long as the aircraft meets its approved type design, is in a condition for safe operation and maintenance, and preventative maintenance and alterations are performed in accordance with 14 CFR parts 21, 43, and 91.
- 14 CFR part 39 is the authority for the FAA to issue Airworthiness Directives (ADs) when an unsafe condition exists in a product, aircraft, or part, and the condition is likely to exist or develop in other products of the same type design.
- 14 CFR part 45 identifies the requirements for the identification of aircraft, engines, propellers,

certain replacement and modification parts, and the nationality and registration marking required on U.S.-registered aircraft.

- 14 CFR part 43 prescribes rules governing the maintenance, preventive maintenance, rebuilding, and alteration of any aircraft having a U.S. airworthiness certificate. It also applies to the airframe, aircraft engines, propellers, appliances, and component parts of such aircraft.
- 14 CFR part 91 outlines aircraft certifications and equipment requirements for the operation of aircraft in U.S. airspace. It also prescribes rules governing maintenance, preventive maintenance, and alterations. Also found in 14 CFR part 91 is the requirement to maintain records of maintenance, preventive maintenance, and alterations, as well as records of the 100-hour, annual, progressive, and other required or approved inspections.

While 14 CFR part 91 outlines the minimum equipment required for flight, the Airplane Flight Manual/Pilot's Operating Handbook (AFM/POH) lists the equipment required for the airplane to be airworthy. The equipment list found in the AFM/POH is developed during the airplane certification process. This list identifies those items that are required for airworthiness, optional equipment installed in addition to the required equipment, and any supplemental items or appliances.

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION-FEDERAL AVIATION ADMINISTRATION			
STANDARD AIRWORTHINESS CERTIFICATE			
1 NATIONALITY AND REGISTRATION MARKS N12345	2 MANUFACTURER AND MODEL Douglas DC-6A	3 AIRCRAFT SERIAL NUMBER 43219	4 CATEGORY Transport
5 AUTHORITY AND BASIS FOR ISSUANCE This airworthiness certificate is issued pursuant to 49 U.S.C. § 44704 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefore, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein. Exceptions: None			
6 TERMS AND CONDITIONS Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the FAA, this airworthiness certificate is effective as long as the maintenance, preventative maintenance, and alterations are performed in accordance with Parts 21, 43, and 91 of the Federal Aviation Regulations, as appropriate, and the aircraft is registered in the United States.			
DATE OF ISSUANCE 01/20/2000	FAA REPRESENTATIVE E.R. White E.R. White		DESIGNATION NUMBER NE-XX
Any iteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding \$1,000 or imprisonment not exceeding 3 years or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.			
FAA Form 8100-2 (04-11) Supersedes Previous Edition			

Figure 1-4. FAA Form 8100-2, Standard Airworthiness Certificate.

Figure 1-5 shows an example of some of the required equipment, standard or supplemental (not required but commonly found in the airplane) and optional equipment list for an aircraft. It is originally issued by the manufacturer and is required to be maintained by the Type Certificate Data Sheet (TCDS). An aircraft and its installed components and parts must continually meet the requirements of the original Type Certificate or approved altered conditions to be airworthy.

- 14 CFR part 61 pertains to the certification of pilots, flight instructors, and ground instructors. It prescribes the eligibility, aeronautical knowledge, flight proficiency training, and testing requirements for each type of pilot certificate issued.

- 14 CFR part 67 prescribes the medical standards and certification procedures for issuing medical certificates for airmen and for remaining eligible for a medical certificate.
- 14 CFR part 91 contains general operating and flight rules. The section is broad in scope and provides general guidance in the areas of general flight rules, visual flight rules (VFR), instrument flight rules (IFR), and as previously discussed aircraft maintenance, and preventive maintenance and alterations.

Flight Standards Service

Within the FAA, the Flight Standards Service (AFS) sets the aviation standards for airmen and aircraft operations

Sym:

Items in this listing are coded by a symbol indicating the status of the item. These codes are:

C Required item for FAA Certification.

S Standard equipment. Most standard equipment is applicable to all airplanes. Some equipment may be replaced by optional equipment.

O Optional equipment. Optional equipment may be installed in addition to or to replace standard equipment.

Qty: The quantity of the listed item in the airplane. A hyphen (-) in this column indicates that the equipment was not installed.

ATA Item	Description	SYM	QTY	Part Number	Unit Weight	Arm
34-08	GPS 1 Antenna	C	1	12744-001	0.4	136.2
34-09	GPS 2 Antenna	S	1	12744-001	0.4	110.3
34-10	Transponder Antenna	C	1	12739-001	0.1	105.0
34-11	VOR/LOC Antenna	C	1	12742-001	0.4	331.0
34-12	Turn coordinator, modified	C	1	11891-001	1.8	118.0
34-13	GMA 340 audio panel	S	1	12717-050	1.5	121.5
34-14	GNS 420 (GPS/COM/NAV)	O	1	12718-004	5.0	121.0
34-15	GNS 420 (GPS/COM/NAV)	C	1	12718-051	5.0	121.0
34-16	GNS 420 (GPS/COM/NAV)	O	1	12718-051	5.0	122.4
	EMax engine monitoring					
34-17	• Data acquisition unit	O	1	16692-001	2.0	118.0
34-18	• Monitor cabin harness	O	1	16695-005	2.0	108.0
	Sky watch option					
34-19	• Sky watch inverter	O	1	14484-001	0.5	118.0
34-20	• Sky watch antenna nsti	O	1	14480-001	2.3	150.5
34-21	• Sky watch track box	O	1	14477-050	10.0	140.0
	Stormscope option					
34-22	• Processor	O	1	12745-050	1.7	199.0
34-23	• Antenna	O	1	12745-070	0.9	191.0
	Transponder option					
34-24	• Mode A/C transponder	C	1	13587-001	1.6	124.9
34-25	• Mode S transponder	O	-	15966-050	2.6	121.0
	TAWS option					
34-26	• KGP 560 processor	O	1	15963-001	1.3	117.0
	XM satellite option					
34-27	• XM WX/radio receiver	O	1	16121-001	1.7	114.0
34-28	• XM radio remote control	O	1	16665-501	0.2	149.3
61	Propeller					
61-01	• Hartzell propeller installation	C	1	15319-00X	79.8	48.0
61-02	• McCauley propeller installation	O	1	15825-00X	78.0	50.0
61-03	• Propeller governor	C	1	15524-001	3.2	61.7
71	Power plant					
71-01	• Upper cowl	C	1	20181-003	10.5	78.4
71-02	• Lower cowl LH	C	1	20182-005	5.4	78.4
71-03	• Lower cowl RH	C	1	20439-005	5.4	78.4
71-03	• Engine baffling installation	C	1	15460-001	10.7	78.4

Figure 1-5. Example of some of the required, standard or supplemental and optional equipment for an aircraft.

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

The interface between AFS and the aviation community/general public is the local Flight Standards District Office (FSDO). The approximately ninety FSDOs are strategically located across the United States, each office having jurisdiction over a specific geographic area. [Figure 1-6] The individual FSDO is responsible for all air activity occurring within its geographic boundaries. The individual FSDOs are responsible for the certification and surveillance of air carriers, air operators, flight schools/training centers, airmen (pilots, flight instructors, mechanics and other certificate holders). Additional duties that are tasked to FSDO inspectors is accident investigation and enforcement actions. NOTE: Accident investigation and enforcement actions are a smaller part of a field inspectors job than surveillance and certification.

Each FSDO is staffed by Aviation Safety Inspectors (ASIs) whose specialties include operations, maintenance, and avionics. General Aviation ASIs are highly qualified and experienced aviators. Once accepted for the position, an inspector must satisfactorily complete indoctrination training conducted at the FAA Academy that includes airman evaluation and pilot testing techniques and procedures. Thereafter, the inspector must complete recurrent training on a regular basis. Among other duties, the FSDO inspector is responsible for administering FAA practical tests for pilot and flight instructor certificates and associated ratings. All questions concerning pilot certification (and/or requests for other aviation information or services) should be directed to the FSDO having jurisdiction in the particular geographic area. For specific FSDO locations and telephone numbers, refer to www.faa.gov.

Role of the Pilot Examiner

Pilot and flight instructor certificates are issued by the FAA upon satisfactory completion of required knowledge and practical tests. The administration of these tests is an FAA responsibility that the issuance of pilot and instructor certificates can be carried out at the FSDO level. In order to satisfy the public need for pilot testing and certification services, the FAA delegates certain responsibilities, as



Figure 1-6. Flight Standards District Office locations across the United States.

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

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

Role of the Flight Instructor

The flight instructor is the cornerstone of aviation safety. The FAA has adopted an operational training concept that places the full responsibility for student training on the authorized flight instructor. In this role, the instructor assumes the total responsibility for training the student pilot in all the knowledge areas and skills necessary to operate safely and competently as a certificated pilot in the National Airspace System (NAS). This training includes airmanship skills, pilot judgment and decision-making, hazard identification, risk analysis, and good operating practices. (See Risk Management Handbook, FAA-H-8083-2). [Figure 1-7]

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

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

A good flight instructor uses a syllabus and insists on correct techniques and procedures from the beginning of training so that the student will develop proper habit patterns. The syllabus should embody the "building block" method of instruction in which the student progresses from the known to the unknown. The course of instruction should be laid out so that each new maneuver embodies the principles involved in the performance of those previously undertaken. Consequently, through each new subject introduced, the student not only learns a new principle or technique, but broadens his or her application of those previously learned and has his or her deficiencies in the previous maneuvers emphasized and made obvious. [Figure 1-8]

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



Figure 1-7. The flight instructor is responsible for teaching and training students to become safe and competent certificated pilots.

Lesson	Stalls	Student	Date
Objective	<ul style="list-style-type: none"> To familiarize the student with the stall warnings and handling characteristics of the airplane as it approaches a stall. To develop the student's skill in recognition and recovery from stalls. 		
Content	<ul style="list-style-type: none"> Configuration of airplane for power-on and power-off stalls. Observation of airplane attitude, stall warnings, and handling characteristics as it approaches a stall. Control of airplane attitude, altitude, and heading. Initiation of stall recovery procedures. 		
Schedule	<ul style="list-style-type: none"> Preflight Discussion.....:10 Instructor Demonstrations.....:25 Student Practice.....:45 Postflight Critique.....:10 		
Equipment	<ul style="list-style-type: none"> Chalkboard or notebook for preflight discussion. 		
Instructor's actions	<ul style="list-style-type: none"> Preflight—discuss lesson objective. Inflight—demonstrate elements. Demonstrate power-on and power-off stalls and recovery procedures. Coach student practice. Postflight—critique student performance and assign study material. 		
Student's actions	<ul style="list-style-type: none"> Preflight—discuss lesson objective and resolve questions. Inflight—review previous maneuvers including slow flight. Perform each new maneuver as directed. Postflight—ask pertinent questions. 		
Completion standards	<ul style="list-style-type: none"> Student should demonstrate competency in controlling the airplane at airspeeds approaching a stall. Student should recognize and take prompt corrective action to recover from power-on and power-off stalls. 		

This is a typical lesson plan for flight training which emphasizes stall recognition and recovery procedures.

Figure 1-8. Sample lesson plan for stall training and recovery procedures.

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

Sources of Flight Training

The major sources of flight training in the United States include FAA-approved pilot schools and training centers, non-certificated (14 CFR part 61) flying schools, and independent flight instructors. FAA-approved schools are those flight schools certificated by the FAA as pilot schools under 14 CFR part 141. [Figure 1-9]

Application for certification is voluntary, and the school must meet stringent requirements for personnel, equipment,

maintenance, and facilities. The school must operate in accordance with an established curriculum that includes a training course outline (TCO) approved by the FAA. The TCO must contain student enrollment prerequisites, detailed description of each lesson including standards and objectives, expected accomplishments and standards for each stage of training, and a description of the checks and tests used to measure a student's accomplishments. FAA-approved pilot school certificates must be renewed every 2 years.

Renewal is contingent upon proof of continued high quality instruction and a minimum level of instructional activity. Training at an FAA-certificated pilot school is structured and because of this structured environment, the graduates of these pilot schools are allowed to meet the certification experience requirements of 14 CFR part 61 with less flight time. Many FAA-certificated pilot schools have DPEs on staff to administer FAA practical tests. Some schools have been granted examining authority by the FAA. A school with examining authority for a particular course(s) has the authority to recommend its graduates for pilot certificates or ratings