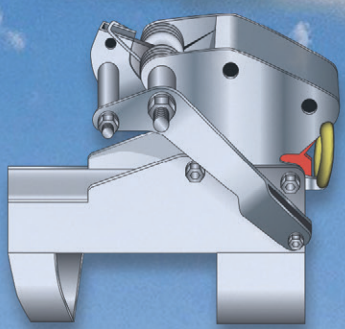
FAA-H-8083-13B

Glider Flying Handbook



U.S. Department of Transportation

Federal Aviation Administration

Glider Flying Handbook

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FEDERAL AVIATION ADMINISTRATION
Flight Standards Service

Preface

The Glider Flying Handbook is designed as a technical manual for applicants who are preparing for glider category rating and for currently certificated glider pilots who wish to improve their knowledge. Certificated flight instructors will find this handbook a valuable training aid, since detailed coverage of aeronautical decision-making, components and systems, aerodynamics, flight instruments, performance limitations, ground operations, flight maneuvers, traffic patterns, emergencies, soaring weather, soaring techniques, and cross-country flight is included. Topics such as radio navigation and communication, use of flight information publications, and regulations are available in other Federal Aviation Administration (FAA) publications.

The discussion and explanations reflect the most commonly used practices and principles. Occasionally, the word "must" or similar language is used where the desired action is deemed critical. The use of such language is not intended to add to, interpret, or relieve a duty imposed by Title 14 of the Code of Federal Regulations (14 CFR). Persons working towards a glider rating are advised to review the references from the applicable practical test standards. Resources for study include FAA-H-8083-25, Pilot's Handbook of Aeronautical Knowledge; FAA-H-8083-2, Risk Management Handbook; and FAA-H-8083-28, Aviation Weather Handbook, as these documents contain basic material not duplicated herein. All beginning applicants should refer to FAA-H-8083-25, Pilot's Handbook of Aeronautical Knowledge, for study and basic library reference.

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 on the FAA website. The current Flight Standards Service airman training and testing material and learning statements for all airman certificates and ratings can be obtained from the FAA website.

This handbook supersedes FAA-H-8083-13A, Glider Flying Handbook, dated 2013.

This handbook is available for download, in PDF format, from the FAA website.

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Chapter 1: Gliders & Sailplanes

Introduction

A modern glider, such as the one pictured below [*Figure 1-1*] can fly high and make long cross-country flights with a skilled pilot at the controls.

Figure 1-1. *A DG Flugzeugbau GmbH 800B-series glider.*

The Code of Federal Regulations (14 CFR part 1, section 1.1) states, “glider means a heavier-than-air aircraft, that is supported in flight by the dynamic reaction of the air against its lifting surfaces and whose free flight does not depend principally on an engine.” The term “glider” also designates the rating placed on a pilot certificate once an applicant successfully completes required glider training, has the requisite experience, passes any required knowledge test, and passes the appropriate practical test.

For a glider to fly, it needs a means to become airborne. Early gliders could only launch from the top of a hill. [*Figure 1-2*] and [*Figure 1-3*].

Figure 1-2. *Otto Lilienthal (the Glider King) in flight during the mid-1890s.*

Figure 1-3. *Orville Wright (left) and Dan Tate (right) launched the Wright 1902 glider off the east slope of the Big Hill, Kill Devil Hills, North Carolina, on October 17, 1902. Wilbur Wright was flying the glider.*

After development of powered flight, an airplane could tow a glider to altitude, and this became a common means to launch a glider. While early glider designs would only descend after tow and release, later designs could release and take advantage of natural rising air to continue to gain altitude. Some gliders that require a tow to altitude also have a sustainer engine for use in flight. The pilot can start and stop the powerplant while in flight, and in some models, the pilot may retract the propeller system into the body of the glider for increased aerodynamic efficiency. A self-launching motor glider can takeoff and climb to soaring altitudes without a tow. [*Figure 1-4*]

Figure 1-4. *An ASH 26 E self-launching motor glider with the propeller extended.*

Glider Pilot Training

How does a person obtain glider flight training? With a general location in mind, an individual may consider several options, including an FAA-approved glider school, privately owned commercial glider school, or college, university, or private soaring club. These will have FAA-certified flight instructors who can provide instruction. Published articles, soaring-related websites, and discussions with other pilots may help a prospective student create a list of items to look for in a training provider.

An interested person should consider the quality of training provided. Good instruction follows a structured syllabus and a building block approach. Prior to picking a school, visiting the training provider and talking with management, instructors, and other students can reveal the pros and cons of choosing a particular club or commercial school. Before making a commitment, the prospective student should take an introductory lesson. After deciding on a provider and making the necessary arrangements, training can begin. Individual commitment to a regular training schedule maximizes student progress and retention.

To be eligible to fly solo in a glider, unrated pilots need to obtain a student pilot certificate, be at least 14 years of age, and demonstrate satisfactory aeronautical knowledge on a pre-solo written test administered by their instructor. Before solo,

a student pilot also receives ground and flight training for the maneuvers and procedures listed in Title 14 of the Code of Federal Regulations (14 CFR) part 61, section 61.87(i). After a student pilot meets the administrative requirements and demonstrates satisfactory proficiency, the instructor may endorse the student's logbook for solo flight.

Note that rated airplane pilots can increase their overall knowledge, skill, and understanding of safety of flight by adding a glider rating. The addition of a glider rating enhances an airplane pilot's ability to manage flight without power should an engine malfunction occur.

Rating Eligibility

A student pilot 16 years of age or older or an existing FAA-rated pilot who meets the flight time requirements may take the practical test for a sport pilot certificate with a glider endorsement or the practical test for a private pilot certificate with a glider rating after accomplishing the training requirements listed in 14 CFR part 61 for the desired level of certification.

To be eligible for a commercial or flight instructor glider certificate, an individual must be 18 years of age and complete the specific training requirements described in 14 CFR part 61.

The applicable FAA Airman Certification Standards (ACS) or Practical Test Standards (PTS) contain the knowledge and skills required for pilot certification and describe the testing process. Applicants may also refer to FAA-G-ACS- 2, the ACS Companion Guide for Pilots, FAA Advisory Circular (AC) 60-22, Aeronautical Decision Making; the Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25); the Risk Management Handbook (FAA-H-8083-2); and the Aviation Weather Handbook (FAA-H-8083-28) to gain additional aviation-related information. For more information on the certification of gliders, refer to 14 CFR part 21, the European Aviation Safety Agency (EASA) Certification Specifications (CS) 22.221, and the Weight and Balance Handbook (FAA-H-8083-1).

Medical Eligibility

A person may exercise the privileges of a glider rating or those of an authorized instructor in a glider without holding a medical certificate. However, 14 CFR part 61, section 61.53 states, "...a person shall not act as pilot in command, or in any other capacity as a required pilot flight crewmember, while that person knows or has reason to know of any medical condition that would make the person unable to operate the aircraft in a safe manner."

FAA Wings Program

Rated pilots should compare continuous training and practice to 14 CFR part 61, section 61.56(c)(1) and (2), which allow for training and a sign-off within the previous 24 calendar months in order to act as a pilot in command. Many astute pilots realize that this regulation specifies a minimum requirement, and the path to enhanced proficiency, safety, and enjoyment of flying takes a higher degree of commitment such as available using 14 CFR part 61, section 61.56(e). For this reason, many pilots keep their flight review up to date using the FAA WINGS program. The program provides continuing pilot education and contains interesting and relevant study materials that pilots can use all year round.

A pilot may create a WINGS account to obtain current information concerning risk mitigation. The program provides a means to improve risk management skill as a means to increase safety. As an added bonus, completion of a phase of the Wings Program can count for a flight review and participants may receive a discount on certain flight insurance policies. The link to create an account is www.faasafety.gov.

Chapter Summary

Gliders include heavier-than-air aircraft that need a means to become airborne. In a modern glider and once aloft, pilots have a variety of means to sustain flight. To become a glider pilot, a prospective student should investigate training options and pick a suitable training provider.

Chapter 2: Components & Systems

Introduction

Glider Design

Glider airframes include a fuselage, wings, and empennage or tail section. [*Figure 2-1*]

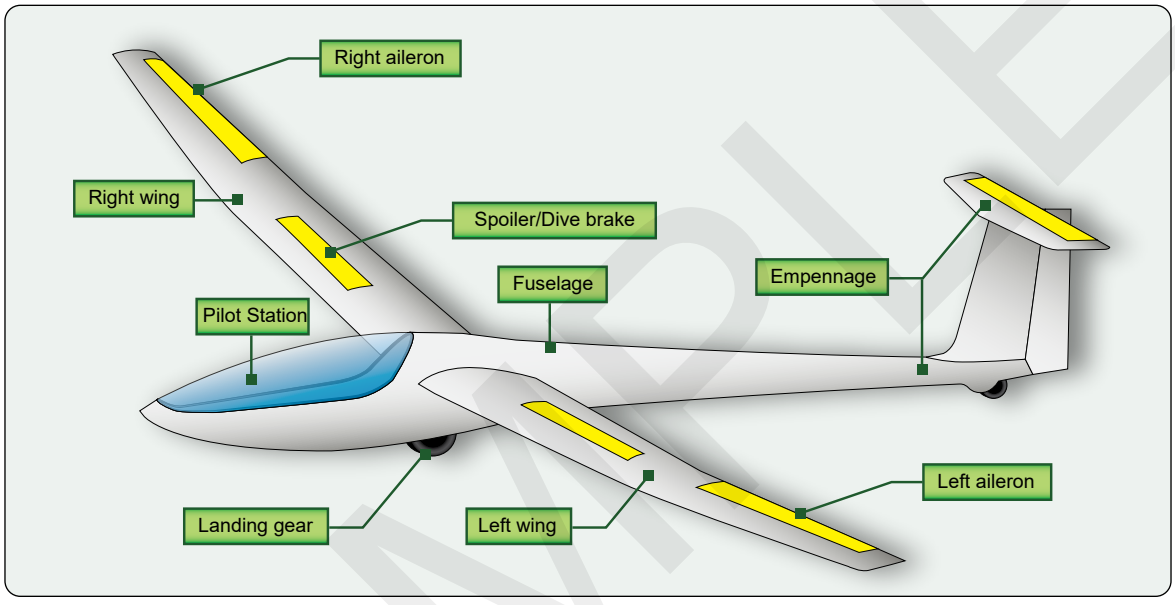

Figure 2-1. *Components of a glider.*

The Fuselage

The fuselage contains the controls for the glider, as well as a seat for each occupant. The wings and empennage attach to the fuselage. Manufacturers typically use composites, fiberglass, or carbon fiber, however in the past manufacturers used wood, fabric over steel tubing, aluminum, or a combination of these materials to build a fuselage.

Introduction

When air flows over the wings of a glider, the wings produce lift that allows the aircraft to stay aloft. Glider wing designs produce maximum lift with minimum drag.

Glider wings incorporate several components that help the pilot maintain the attitude of the glider and control lift and drag. These include ailerons and other lift and drag devices.

Ailerons

The ailerons attach to the outboard trailing edge of each wing. When the pilot moves the aileron control to the right of center, the right aileron deflects upward [*Figure 2-2*] and the left aileron deflects downward. In flight and with air flowing over the wings, these deflections result in increased lift on the left wing and decreased lift on the right wing. The increased lift on the left wing and decreased lift on the right wing apply a force to roll the glider to the right. Moving the aileron

control to the left of center deflects the right aileron down and the left aileron up. This applies a force to roll the glider to the left.

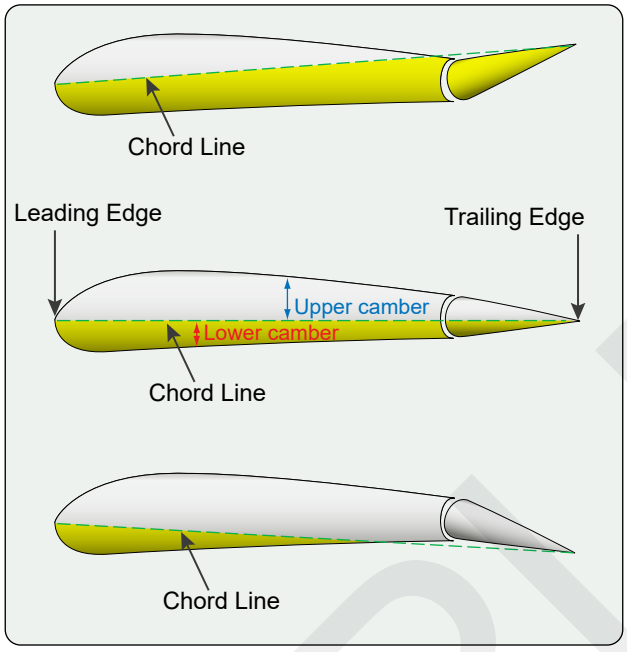

Figure 2-2. *The ailerons change the camber or curvature of the wing and increase or decrease lift.*

Lift/Drag Devices

Gliders may use other devices that modify the lift/drag of the wing. These high drag devices include spoilers, dive brakes, and flaps. [*Figure 2-3*] Spoilers extend from the upper surface of the wings, alter the airflow, and cause the glider to descend more rapidly. Dive brakes extend from both the upper and lower surfaces of the wing and increase drag. Some high-performance gliders have dive brake speed limitations to prevent structural damage.

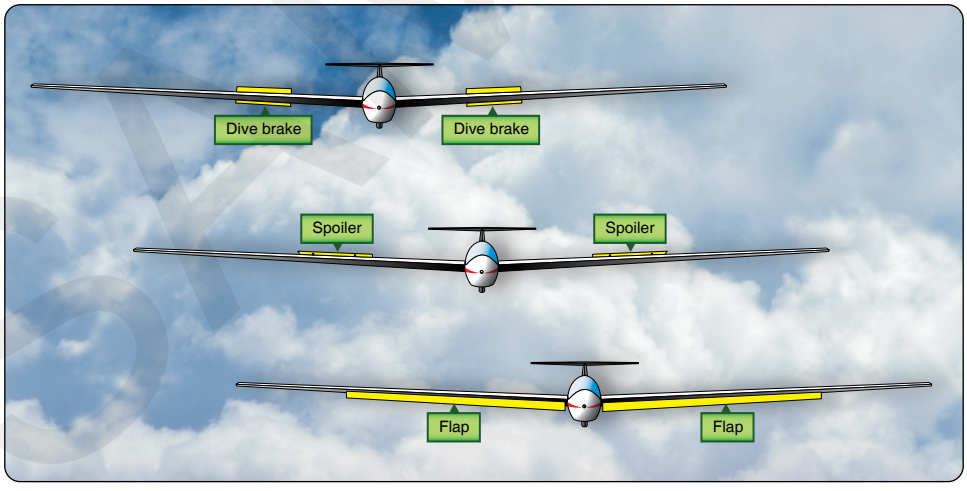

Figure 2-3. *Types of lift/drag devices.*

Some gliders have flaps installed on the trailing edge of each wing inboard of the ailerons, which can change lift, drag, and descent rate. The pilot can generally set flaps in three different positions, which are trail, down, or negative. [*Figure 2-4*] When the pilot sets the flaps to deflect downward in flight, the wing produces more lift and drag. On the other hand, a negative flap position results in reduced lift and drag.

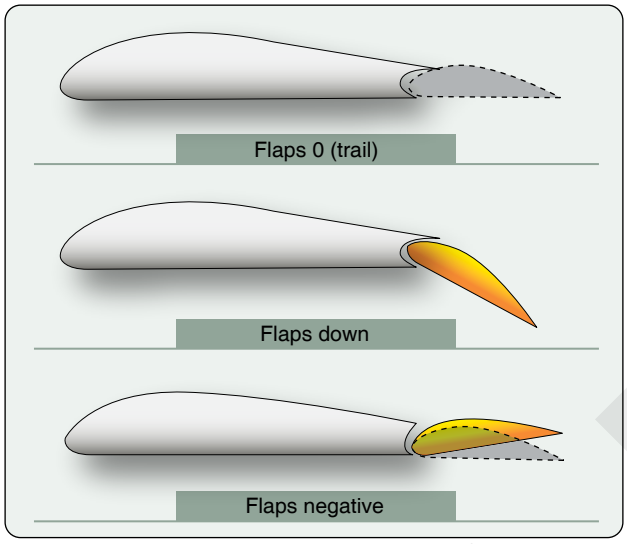

Figure 2-4. *Flap positions.*

Empennage

The empennage includes the entire tail section, consisting of the fixed surfaces, such as the horizontal stabilizer and vertical fin, and movable surfaces, such as the elevator or stabilator, rudder, and any trim tabs. The two fixed surfaces act like the feathers on an arrow to steady the glider and help maintain a straight path through the air. [*Figure 2-5*]

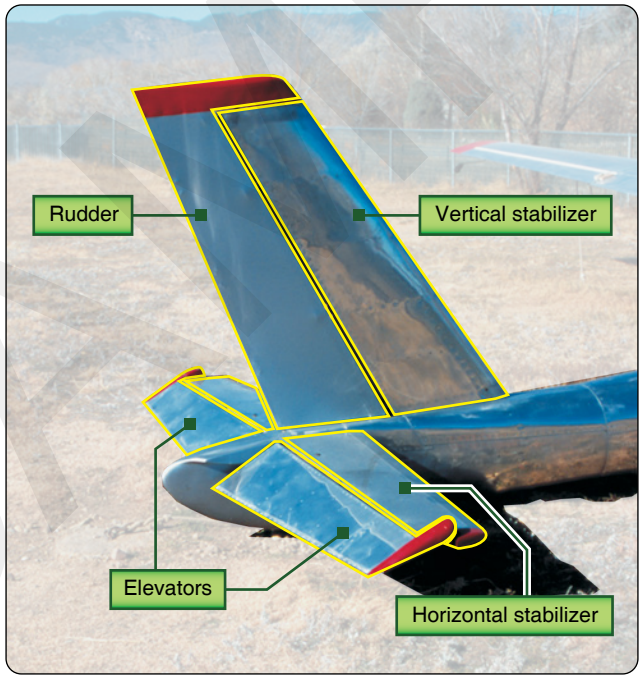

Figure 2-5. *Empennage components.*

The rudder attaches to the back of the vertical stabilizer, and the pilot deflects the rudder using foot pedals. The rudder controls yaw and turn coordination during flight.

During straight-and-level flight, pilot-controlled deflection of the elevator applies a force to move the glider's nose up and down relative to the horizon. Raising the nose results in lower airspeed while lowering the nose increases airspeed. Instead of a horizontal stabilizer and elevator, some gliders use a stabilator, where the entire horizontal tail surface pivots up and

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The FAA's *Glider Flying Handbook* introduces the basic pilot skills and knowledge essential for piloting gliders. Beneficial for student pilots just beginning their glider endeavors as well as pilots preparing for additional certificates or wanting to improve their flying proficiency, it is also a valuable tool for flight instructors engaged in teaching glider pilots of all skill levels.

This handbook provides the information and guidance required for pilot certification and offers a key reference for the FAA test standards. Dedicated chapters provide insight into gliders and sailplanes, components and systems, the aerodynamics of flight, flight instruments, glider performance, preflight and ground operations, launch and recovery procedures, flight maneuvers, abnormal and emergency procedures, soaring weather, soaring techniques, cross-country soaring, towing, and human factors.

As the official FAA source for learning to fly gliders, the *Glider Flying Handbook* is the basis for many of the test questions on the FAA Knowledge Exams for pilots. Complete with chapter summaries and illustrated throughout with detailed, full-color drawings and photographs, it also includes a glossary and index.

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