CHAPTER 1: GLIDER FAMILIARIZATION

The glider (also referred to as a sailplane) is the piece of equipment that enables your transformation into a soaring pilot. In this chapter, you will learn about its design, parts, and limitations so that you can develop confidence in its ability to keep you aloft.

1.1 The Glider

Gliders vary in size, shape, configuration, construction material, and the number of occupants that they can carry. However, most gliders are more alike than different. The standard configuration is that of a long, relatively narrow wing, a fuselage with passenger compartment in front of the wing, stabilizing fins and control surfaces at the tail, a main wheel centered near the balancing point of the glider, and a tow hook located somewhere between the nose and the main wheel.

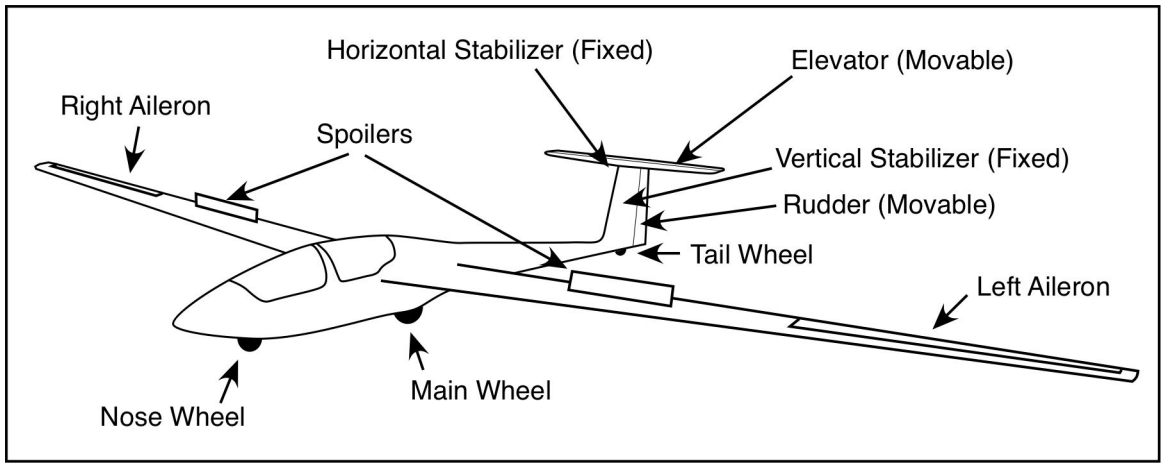

Figure 1.1 – Parts of a typical glider

The wing provides lift for the glider. The tail provides stability. The elevator provides pitch (nose up and down) control, the rudder provides yaw (nose side to side) control, and the ailerons provide roll control. The fuselage holds the various parts together and gives the pilot a place to sit. The tow hook and landing gear are necessary for getting the glider in the air and back on the ground.

While the parts of any glider are basically the same, there are several possible configurations for those parts.

Wing Configurations

The wing is one of the most important components of the glider; it determines the glider's performance, strength, as well as its aesthetics. Many variables go into wing design. Here we will consider two: wing placement and the aspect ratio.

Wing Placement

Glider wings are usually of a "mid-wing" configuration, meaning that the spar of the wing runs through the center of the fuselage. A few gliders use a "high-wing" configuration in which the wing is mounted at the top of the fuselage.

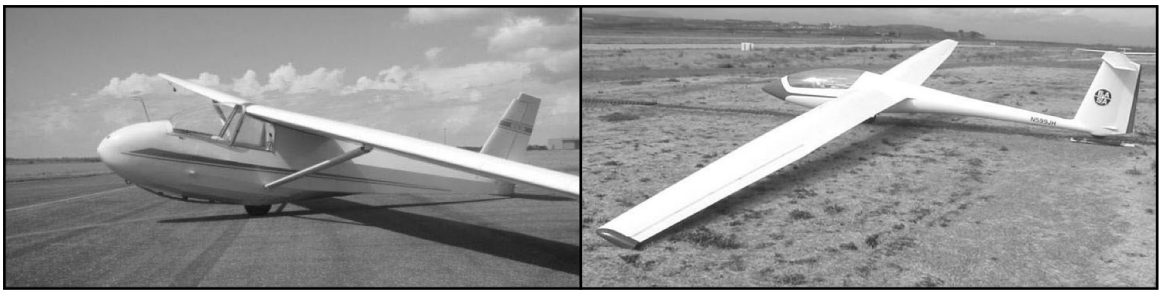

Figure 1.2 – A high wing glider with struts (left) and a mid-wing glider (right)

Often, high-wing gliders have struts that brace the wings. This allows the wings to be relatively light; however, struts contribute to drag, making the glider less efficient.

Aspect Ratio

The aspect ratio is a measure of how "long and skinny" a wing is. It is the ratio of the wingspan to the average chord of the wing. Wings with a high aspect ratio have lower induced drag (see Chapter 3: Aerodynamics) and are therefore more efficient.

Tail Configurations

There are three basic styles of glider tails: conventional, T-tail, and V-tail. The conventional tail, in which the vertical and horizontal stabilizers intersect the fuselage, has the advantage of simplicity. Its main disadvantage is that at certain flight attitudes, the wake from wing can interfere with the flow over the tail control surfaces, thus decreasing their effectiveness. Additionally, the horizontal stabilizer, being close to the ground, can be damaged by brush or boulders in an off-field landing.

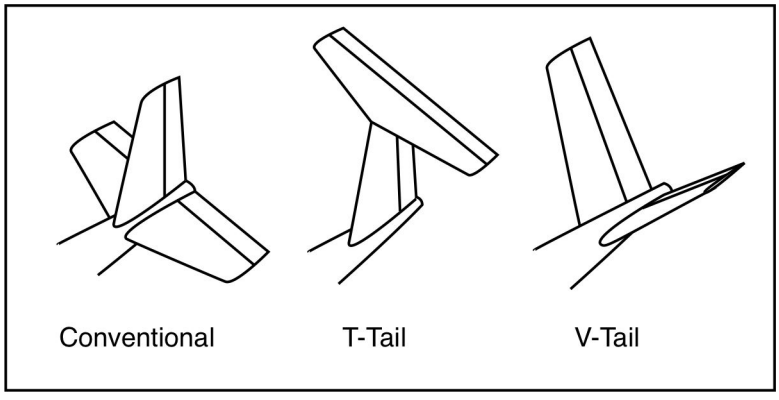

Figure 1.3 – Tail Configurations

In a T-tail, the horizontal stabilizer sits on top of the vertical stabilizer and is thus both out of the wake of the wing and out of harm's way in the case of an off-field landing. The disadvantage of this configuration is that the vertical stabilizer, as well as the rear of the fuselage, must be stronger, and thus heavier.

The V-tail configuration has the advantage of having most of the tail surface away from the ground; this minimizes the risk of damage in an off-field landing. The disadvantage is that the pitch and yaw controls must be mixed: both control surfaces deflect in the same direction, up or down, for pitch control, and in opposite directions for yaw control.

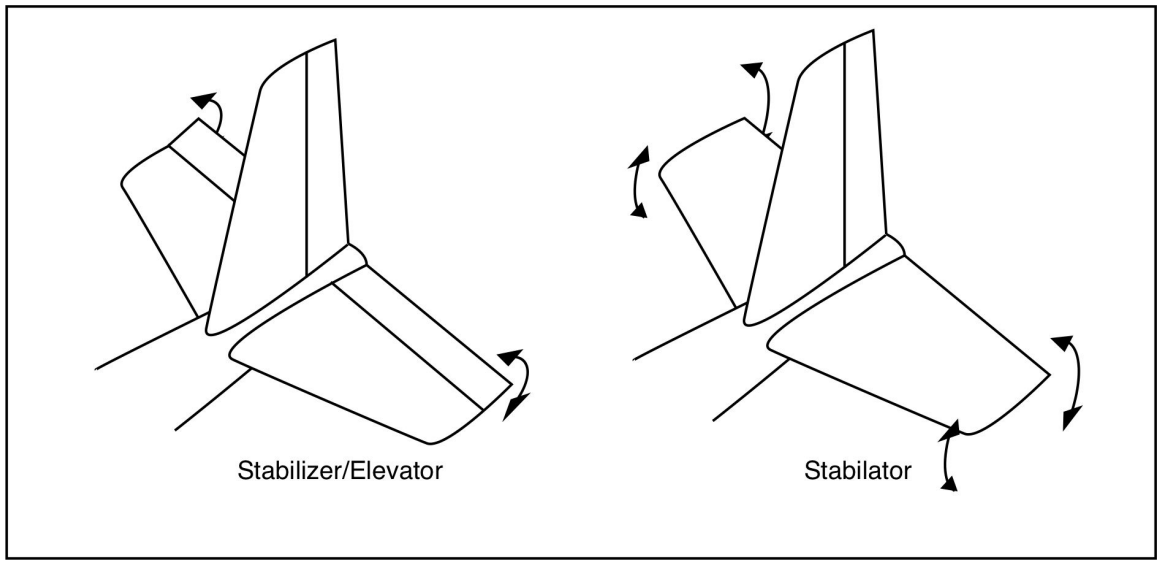

Figure 1.4 – Elevator/stabilator

On conventional or T-tailed gliders, there is also an option of how the pitch control surface works. On most gliders, there is a fixed horizontal stabilizer and a movable elevator. On other gliders, the entire horizontal surface pivots; this is known as a "stabilator".

Tow Hook Configurations

Tow hooks are usually located either very near or at the nose of the glider (nose hooks), or further back on the fuselage, near the center of gravity of the glider (C.G. hooks).

Either a C.G. or nose hook can be used for aerotowing. However, only a C.G. hook can be used for ground launching (e.g. winch, bungee, or auto-tow).

Many gliders have more than one tow hook installed. In this case, you should use the nose hook for aerotowing and the C.G. hook for ground launching.

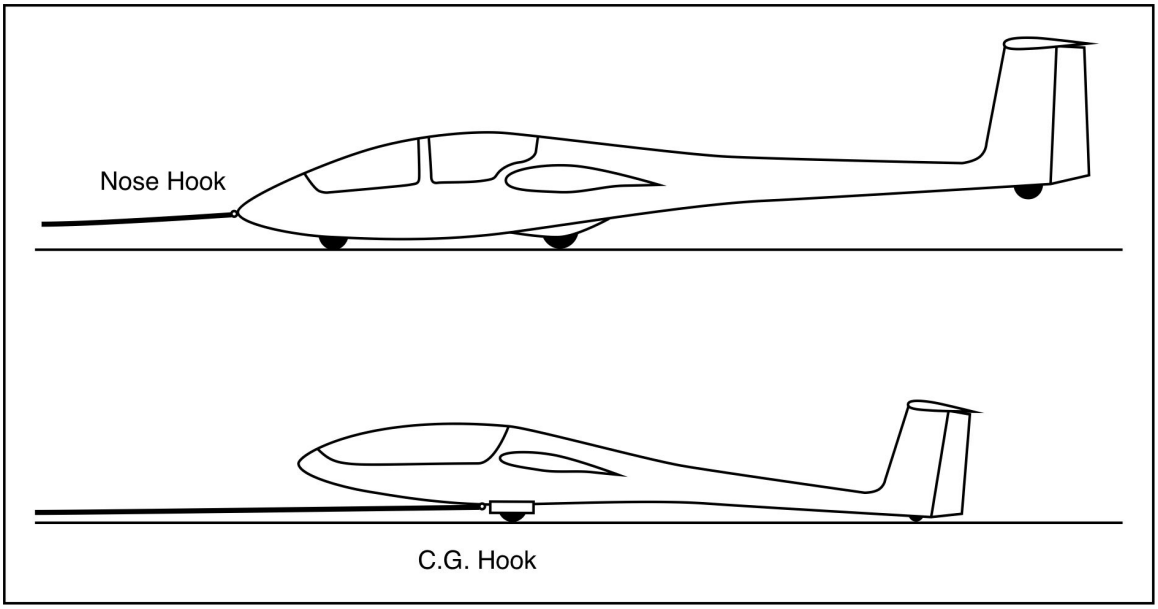

Figure 1.5 – Tow hook locations

The farther forward the tow hook is, the more stable the glider will be on aerotow. When aerotowing with a C.G. hook, you must be careful not to over-control the glider.

Wheel/Skid Configurations

Most gliders have at least two wheels: a main wheel and a tail wheel. Many also have a nose wheel (or skid) and wheels at the tips of the wings. Wheels naturally add drag, so it is desirable to have them faired as opposed to hanging in the wind. Of course, the best way to minimize drag is to use retractable landing gear.

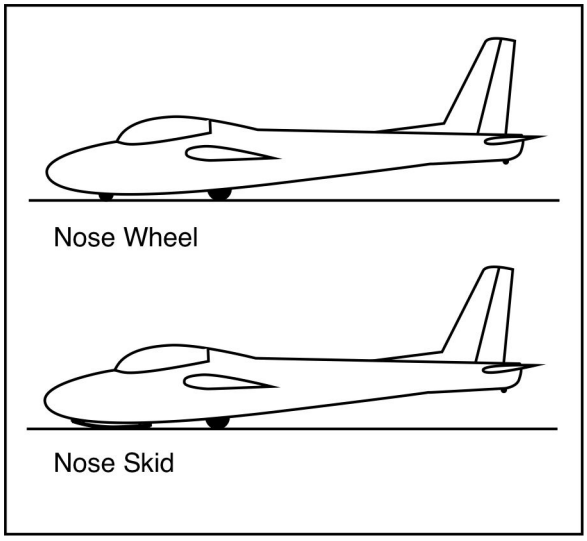

Figure 1.6 – Wheel/skid configurations

Many gliders have a tail dolly with swivel wheel that attaches to the rear of the fuselage to make them easier to move around on the ground.

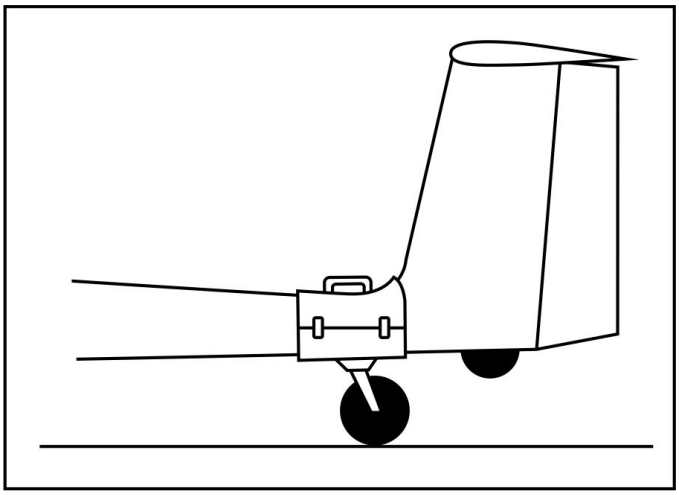

Figure 1.7 – Tail dolly

Because the tail dolly allows the glider to pivot freely, a glider should not be left unattended with the tail dolly attached.

Of course, the tail dolly must be removed before flight.

Glide Slope Control

All gliders need a way to control their glide slope (angle of descent) when coming in for a landing. High drag devices are used for this purpose. The terms "airbrakes", "dive brakes", and "spoilers" are often used interchangeably to describe these devices. Specifically, dive brakes are deployed from both the top and the bottom of the wing, while spoilers are deployed only from the top.

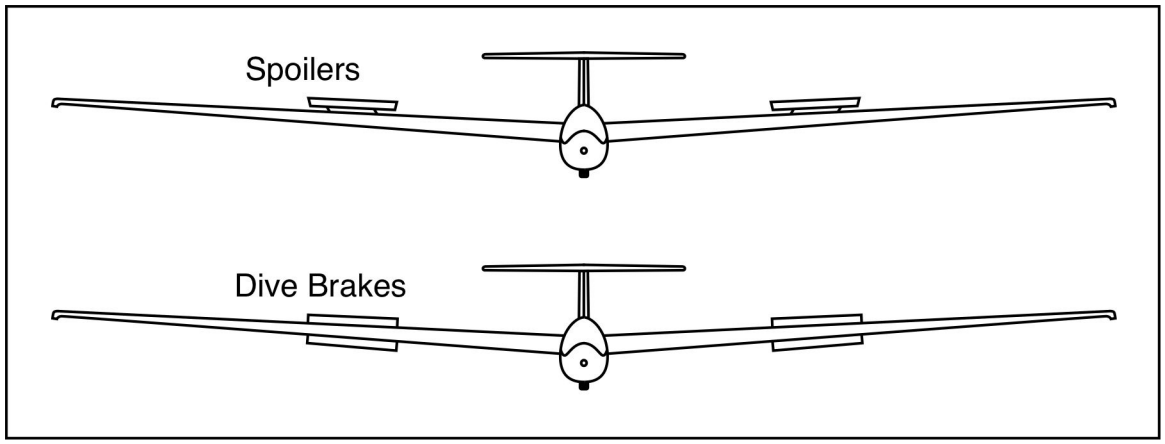

Figure 1.8 – Spoilers/dive brakes.

The advantage of dive brakes is that they create more drag, but since they extend below the wing, they are more likely to be damaged in an off-field landing.

Flaps

Additionally, some gliders have flaps. These control surfaces are attached to the tailing edge of the wings and move in unison. The flaps are lowered to decrease the stall speed, allowing the glider to slow down more before landing or to fly in tighter circles when thermaling. Lowering the flaps increases the drag of the glider, allowing it to descend more steeply without increasing the airspeed. Raising the flaps slightly ("negative flaps") can make the glider more efficient at high speeds.

1.2 Flight Manual

Each glider comes with a flight manual, or Pilot Operating Handbook (POH), provided by the manufacturer. The manual will include such things as preflight checklists, and information on airspeed limitations, spin recovery techniques, and assembly/disassembly procedures specific to that glider.

Airspeeds

There are several airspeeds that you should memorize for the glider that you will use for training. Be aware that performance speeds will vary according to the total weight of the glider (see Chapter 4: Performance). You should learn these speeds for the weight of the glider with both you and your instructor onboard, and for the weight of the glider when you are flying solo. The airspeeds that you should memorize include the limit speeds—such as the maximum aerotow speed, the stall speed (Vs), the maneuvering speed (Va), and the never-exceed speed (Vne)—as well as the performance speeds, which are the minimum sink speed and best-glide speed. These speeds will be explained in Chapter 3: Aerodynamics and Chapter 4: Performance. If applicable, you should also know the maximum speed to operate the flaps, spoilers, or landing gear.

Stall/Spin Recovery Procedures

Most gliders call for similar stall and spin recovery techniques. However, some gliders have unique stall or spin characteristics that require specific recovery methods. You should study the flight manual of the glider which you are using for training and learn its particular recovery technique.

Preflight Checklist

A preflight inspection checklist developed by the manufacturer should be included in the glider's flight manual. Often, the owner of a glider will develop an additional checklist that is carried in the glider. If this is the case, you should verify that the preflight checklist in the glider is at least as comprehensive as the one in the flight manual.

Assembly/Disassembly Instructions

The first step in assembling or disassembling a glider is to read the instructions! If the proper procedures are not followed in the proper order, at the very least the process will be frustrating and difficult; at worst, the glider may be damaged.