

USE OF TRIM

Aim: To learn the function and use of the trim system fitted to the glider.

We have learnt and practiced control of the glider and are developing a good feel for the control inputs necessary to achieve the desired flight performance. You will have noticed that as we fly around, there is little load on the ailerons and rudder as they sit in their faired, neutral position, apart from when actually manoeuvring. On the other hand, the elevator has a load on it that changes for any desired change in speed / attitude and when turning... that backpressure required to hold the attitude. This loading can become tiring and relaxation of any load required leads to a change in attitude and an undesired speed excursion. To solve this problem, designers put a trim system on the elevator control that can be set by the pilot to relieve any load necessary to hold an attitude. The aim of all such systems is to therefore apply a force to the elevator that would otherwise be applied through the control column by the pilot.

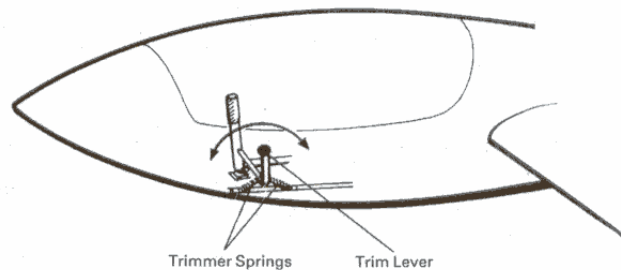
Trim Systems:

There are a few different ways of achieving a simple trim system for the pilot to relieve any control loads. They include:

- **Tab trimmer** – here a small aerodynamic tab is attached to the elevator and linked back to a lever in the cockpit in such a way that when the pilot has to apply a load to the control column, they can move the trim lever in the same sense until the load is neutralized. Back at the tab, it actually moves in the opposite direction to the elevator movement required and provides an aerodynamic force to hold the elevator in the desired position. See the diagram below.



- **Spring trimmer** – instead of having an external tab, a spring system is attached to the elevator control and the trim control in the cockpit simply adjusts the tension on the spring in order to hold the control column in the desired position. This system has the advantage of not incurring the drag of the external tab system and does not require lengthy control runs down the fuselage to the elevator. The system is now common on modern gliders.



- **Anti-balance devices** – anti balance devices are sometimes added to gliders with very light control loads to add some *feel* to the control. An anti balance tab moves in the same direction as the control surface and increases the load required by the pilot to hold a desired attitude. If fitted with a trim tab it can be set to relieve the load required on the control column.

All trimming systems will have a neutral position that is usually marked in the cockpit so as to provide a datum for the pilot to reference any setting to. This is useful when presetting the trim for takeoff. The takeoff begins with no airflow over the elevator so the pilot has no real feel for where to set the trim. The manufacturer will recommend a setting and your Instructor will also advise of where to preset the trim for takeoff with your combined weights and the type of launch. Once the launch is underway and speed has stabilised, the pilot is free to retrim to offload any residual loading. Remember, for every attitude and speed, there will be a corresponding trim setting to relieve the load on the control column.

Air Exercise:

Your Instructor will take you around your glider, showing you what sort of trim system is installed and how it works. Sit in the cockpit and look at where the trim lever / actuator is located, what colour it is (usually green) and practise moving it / setting it. You want to be able to look, identify and operate it in flight with minimum delay when desired. Check where it is to be set for takeoff.

Once off tow, the Instructor will set the glider up in a steady glide at 45 knots, in trim. Relaxing their hold on the control column, they will point out that there is no loading on the control column as evidenced by the pitch attitude not changing and the speed remaining constant. They will now give you control and get you to select a lower nose attitude which requires holding a forward pressure on the control column. Feel how much loading is required and imagine how easy it is to relax and allow the attitude to change back towards the higher nose attitude or how tiring it would be to have to hold that load for some time. Now, moving the trim lever in the same direction as the load required will gradually reduce the load required till it is fully removed. The glider is now trimmed for the new attitude. Relaxing our grasp of the control column will allow you to check that the glider does not want to pitch away from the desired attitude.

Now your Instructor will ask you to select an attitude for a slower speed, say 40 knots, and once it is achieved, to retrim to hold it with no load on the control column. So, we first ease back to pitch the nose up to the attitude we think will see the glider settle at 40 knots. Then move the trim lever back to reduce the backpressure we are holding on the control column. Check if it is correct by relaxing your hold on the control column. If the glider wants to pitch away from the desired attitude, reselect the attitude, hold it and retrim.

Next select an attitude for a higher speed, say 60 knots, and go through the trimming sequence:

Select the attitude, let the speed settle at the new speed of 60 knots, make a small attitude correction if necessary, sense the load required to hold the attitude and move the trim to relieve the load being held. Relax to check the load has been trimmed out, make a small attitude adjustment if required and again retrim and check. Simple as that!!

Your instructor will get you to practise some more so you will gradually get used to retrimming each time you wish to fly at a different speed.

We will now explore the power of the trim to see what speed range can be trimmed for. The Instructor will get you to accelerate to a higher speed, say 100 knots, and retrim the glider. At some point, the glider will not be able to be trimmed for the speed desired so flight at any higher speed will require holding the load. Similarly, the Instructor will ask you to reduce speed to just above the stall and try to trim the load required to hold it. Depending on the glider and the cockpit weight, the glider may not be able to be trimmed for this speed; that is, even with the trim set at full aft, the glider still wants to pitch nose down and accelerate if the stick is let go.

Tips:

Your Instructor will periodically check that you are flying *in trim*, that is, you are not holding any residual load on the control column for the desired speed. They will either take control to check or ask you to relax your hold on the control column to see if the glider pitches away from the desired attitude. Aim to always fly *in trim*. If just doing a single turn, it may not be worth retrimming as any backpressure required in the turn will only be for a short time. However, if circling for some time, like in lift, retrimming is a good idea.

Form the habit...change the attitude... retrim. It will become second nature... but in doing so, avoid leading with the trim. Accurate trimming greatly reduces pilot fatigue and improves your flying accuracy and performance. It also allows you to concentrate on tasks like lookout, checking outside for what's happening, checking instruments, changing radio frequencies... any such tasks that take us away from the primary task of controlling the glider.

Need To Know:

- How to trim the glider for hands free flight at varying speeds.
- How to recognise and correct out of trim situations.

Further Reading:

- The Glider Pilot's Manual; by Ken Stewart. Page 73. Info on trimming.