Flying with Water Ballast

Apart from basic training two seaters, most gliders have the ability to carry water ballast. The sole reason for carrying water ballast is to increase the cross country speed on a task. Water ballast achieves this by increasing the wing loading of the glider. A glider with a higher wing loading has the same polar curve one with a lower wing loading but the polar curve moves sideways along the higher speed range. This means a high wing loading gives the glider the same sink rate but at a higher cruising speed. For example, a glider with no water ballast might have a sink rate 0f 3 knots at 60 knots cruising speed. That same glider with full water would achieve the same sink rate but now at 70 knots. This in turn translates to a higher cross country speed in cruise.

As with all things though, you don't get something for nothing. While water ballast will increase cruise speeds, it will also decrease climb rates as the glider has more mass. So what is the point of using water ballast then? Glider pilots will only fill up with water ballast on "strong" days because a strong thermal will offset the negatives of a lower climb rate while still keeping the desirable higher cruise speeds.

Tail Ballast

Some gliders have tail ballast tanks fitted. These are used to counteract the centre of gravity change from the water ballast in the wings. Most gliders carry water ballast in the "D Box" section of the wing in front of the spar. This area is in front of the optimum Centre of Gravity and therefore brings the C of G forward. Because a glider usually handles better with an aft C of G the tail tank is used to bring it back to its original position. Note that the tail tank is only used to counteract the water ballast and not to counteract a heavy pilot. Only some gliders are structurally able to do this and a full understanding is required to know the correct amount. Too much in the tail tank can make the glider too unstable to fly safely.

How much Water to Use

Unfortunately there is no easy answer to this. Essentially, the pilot is trying to find a balance between cruising speed and climb rate which can be calculated by out expected thermal strengths, type of glider (and how well it "carries" it's water) and the gliders wing loading. Some pilots get very technical with working out what wing loading they need for a given day but the simple way is to divide the ballast by quarters. ¼ ballast, ½ ballast ¾ ballast and full ballast. The best way to find out how much to carry is to go out and try various ballast amounts on different days and see what works. To quote a Darling Downs local, three times world champion George Lee, "if it's a half decent day on the downs, you should be carrying full water.

Maximum Water Ballast

Just like maximum pilot weights, gliders also have a maximum all up weight. Max all up weight differs from glider to glider and is also affected by pilot weight as it is a combination of glider empty weight, pilot weight and wing/tail water ballast. What this means is a heavy pilot may only be able to carry ¾ of the gliders capacity while a light pilot may be able to fill the tanks full. Placards in the glider will give the amounts able to be carried for various pilot weights.

Flying with Ballast

Flying a glider with water ballast on board is not a big deal nor should it be a dawnting exercise. Although flying with water ballast should only be done once the pilot is familiar with the glider, the change in the way a ballasted glider is flown is minimal. Here are a number of points to remember.

Flight Manual

Be familiar with the gliders flight manual for any particulars.

On the flight line

Some gliders will leak water out of vents if they are left with one wing on the ground. Wing walkers will keep the wings level in this case. If the glider is able to have one wing down then shortly before takeoff make sure the wing runner holds the wings level for a moment to allow the water ballast to level in the wings otherwise the lowered wing may drop before positive control is gained. If carrying a large amount of water, alert the tug pilot as a higher towing speed may be needed. 10 knots extra is good for full water.

Takeoff

Due to the extra weight everything on the ground roll will happen slower so expect things like the tail to take longer to raise to the takeoff position. The ground run itself will be longer as well. Takeoff is usually the same for flapped gliders except that they may require more positive flap for the climb out. For the first flight with water it is recommended to tow to a higher altitude to give the pilot more chance to climb away.

Flying

While cruising speeds will have increased, so will have thermaling and stall speeds. Each glider is different but 10 knots higher with full water is a rough guide. Flap settings on flapped gliders will be at a higher speed as well.

Dumping Ballast

Be sure to fully dump water ballast before landing. The flight manual usually will give dump times but about 5 minutes for full water is a rough guide. Gliders are able to land with full water but because of higher stall speeds and extra weight it is not advised unless absolutely necessary.

Flying with water ballast can be rewarding with the result of higher cross country speeds when used in the right conditions and will allow the pilot to fly “further and faster”. Knowledge of water ballast along with some practical experience is required for a pilot to gain their open cross country rating also. Filling water ballast is an easy task which requires little extra time in the morning. Always remember that if the day is not as good as expected the pilot can always dump some or all of the ballast but the same cannot happen vice versa for those who have launched without water ballast.