First and foremost, I am by no means a master at what I have done, or do, in hlg or the class. I am fortunate enough to have been encouraged by my parents and stepfather to fly the class as I have always had a “good arm”. By good arm I mean, I know I can throw and throw very hard, however, all that throwing to extremes has taught me a vital lesson, its not how hard you throw, its all in the technique and strength only has a little to do with the launch. It’s almost as if I have finally learned that by not throwing so hard and backing off, I throw smarter and more controlled. So, it’s not down to power, it’s down to technique and a well-trimmed airplane. However, its getting to that stage of having a well trimmed model that we need to get to and by offering various scenarios in this text, I hope to reproduce the problems that can be found and how to resolve them all.

The expressions used and understanding them.
I would say that the main thing about the airplane and trimming is that you are going to be putting warps into the wood, bending this way, that way, using expressions such as wash in, wash out, finger tabs, rudder etc. It helps if we have an idea about what these do so when they are used in the examples, you understand better.

**Wash in.** Imagine a sheet of wood that is flat. There is the leading edge and the trailing edge. If we want the sheet of wood to rise on one side when the wood is in flight, then we would bend the trailing edge down at certain points. Look at a full size airplane, if it wants to get more lift at slower speeds, then its flaps are dropped to give that added airfoil shape. With the wind underneath this, it effectively pushes up that wing. This is the same with gliders. In order to make a wing lift, as hlg's have a flat bottom on the wing, one bends the trailing edge down.

**Wash out.** Ok, so you want to make the wing be pushed down, so the same in reverse applies. Wash out is when the trailing edge is bent upwards and therefore, the air going over the top forces the wing down. Easy huh!

However, if you watch a full size airplane turn, or even these radio models, they have ailerons and you can make an airplane turn by increasing the amount of wash in and wash out it has. If you are flying straight and level and want the airplane to turn right – you move the control stick right and away she slides. However, to achieve this, the right wing must drop down and the left wing up. Referring to the thought process above – the right wing would not need that much lift and needs forcing down, so the ailerons go up (wash out) and the left wing needs forcing up, so the flap goes
down (wash in). To stop the turn, the pilot would resume back to straight and level flight with no wash in or out on either wing.

So, by understanding this, wash in and wash out can have the effect of being able to turn an airplane as well as making it more stable as we shall see later. If you can understand this part, the rest is simplicity itself. As a lot of what we do involves wash in and out, it’s really quite easy from here onwards.

It’s important to visualize that the wing sits on a length of wood we call the pylon. There is the fin at the back and another flying surface called the tail plane or stab (short for stabilizer which will become apparent why later).

In order for this airplane to fly, it needs the wing, fin, stab and a fuselage (fuze). On a lot of the modern airplanes, the part that separates that stab and wing is called the tail boom. It’s just a word that means that it’s something that separates the wing and the stab. If you did not have a stab and fin and just threw the wing and fuselage, the model would dive to the ground and go no place – hence why the tail plane is there and is known as the stabilizer. Its job is to assist the stabilization of the airplane in flight. The fin provides a means of turning the aircraft in slow flight and is covered later.

However, by having all these parts on an aircraft, we get a long way to achieving safe flight.

**Centre of gravity (C of G)**

Imagine a sheet of wood and you hold it between your two hands and resting at opposite ends on your fingertips. As you move the fingers closer and closer, eventually they will meet and you will have found the centre. The weight is even on both sides and should be the middle of it. If one finger was removed, one side would be heavier and therefore, your other index finger would need to find the centre again and move slightly to balance it. This is the centre of gravity or C of G. Our gliders need a C of G about 70% from the leading edge of the wing. So if you have a wing that is 100 mm wide – then at 70mm, that’s where the C of G would be. This figure can and does change model to model –design to design – however, I have always said approximately 2/3 of the width of the wing and you are onto a winner. If the model has a C of G too far forward, one thing it will do is dive.

So, what causes a model to dive and how can we correct it?
**Diving – why?**

Fact 1 – the model is lightweight and made of wood. It wants to glide. Fact 2 – the ground is hard, unforgiving and has no consideration to you wanting to keep your model in the air. So, we need to stop a dive.

A diving airplane is not a good sign that things are well, entirely the opposite. What causes it? First, it could be down to balance or the location of the C of G (centre of gravity). I mentioned earlier that the glider needs a C of G at approximately 70 per cent or two thirds. If you were to add nose weight – i.e. putty to the nose of your glider, you would make the nose heavier. Therefore, if you were to find the C of G again, it would mean that this would have moved forward. It may now be at 50 per cent or half way across the wing. This is not good. The airplane is nose heavy and needs adjusting, so let’s keep the C of G at the correct point and if its diving and the weight is wrong – then it needs checking.

Assuming the C of G is correct – excellent. However, there are other factors that contribute to making an airplane dive. The word “incidence” is one that comes to mind immediately and one I have learned a lot about through my trials and broken airplanes.

**Incidence** – definition, the angle the wing is against that of the stab. If the wing is flat along the pylon and not down at the front and up at the back, or vice versa, then great. However, if you were to draw a line from the underside of the wing along the plan, then draw a line for the top of the stab, it should all be straight – no stab pointing up at the front, down or any other direction.

If you look at your airplane and the wing at the leading edge is in some way down a little – even 1/64 – anything other than perfectly flat – it has to be cut and glued again. I don’t mind a little of what is called positive incidence – it’s often very helpful but the maximum should be 1/16 leading edge higher than the trailing edge.

Assuming you have it lower at the leading edge, as the model attempts to glide, the airflow is pushing the wing down and as I said before, the ground tends to not take any prisoners, so get it so its perfectly flat – or just a little “up” at the front and re-glue. I will stress here that no amount of throwing it is going to do any good, it won’t change, you will hurt your arm and it needs changing desperately.

**Still diving? No problem…..**

Lets look at the line that we drew from under the wing. Assuming that the front end under the wing is perfect, excellent, what about the back? In a perfect world, you need a nice straight imaginary
line. However, what if the stab is down at the back? Well, the first thing this is going to make the model want to do is point its nose down. The wind under the wing is great and is helping it fly, but if the stab is down, we are effectively, forcing the back end up, pushing the nose down and in she goes. So let’s keep that wing and stab flat in a line and no variations will do. Nice line, no problems. Now do a few test glides and a few throws, nothing strenuous mind you.

Ok, it’s gliding, but now when I throw it, it dives and keeps turning until it hits the ground.

It still dives huh?? Its one thing after another isn’t it? HLgs are all about small corrections making a large impact on an airplane. How many times have we heard it when we were learning to drive, small corrections, and not huge turns of the wheel. It’s the same here.

Ok, we have eliminated the C of G; there is a flat line between underside of wing and stab, so all is good. Take the model in your hand and launch it flat from about head height. Does it glide away in a nice left gentle turn? This needs to be a large floating glide. Is it a small sharp turn? Too sharp? Not good. Time to look at the fin and the part known as the rudder. A rudder helps turn the airplane at slower speeds. Looking at the fin – is it perfectly straight? If not, take it off and get a new one on. No ~ shapes will do here – it has to be straight. At the part where the rudder is thought to be, you need to bend that last few mm to the left. You don’t need the whole rudder bent and it only needs very tiny movement. Wet the balsa with your saliva, then bend gently and breathe it dry. Even breathe the turn in; the moisture from your breath is adequate for this. Once dry, again, try the glide, if everything is now correct, the balance, incidence etc, the glide should be floaty and away from you. One of the possible problems of a spiral dive is that the rudder is over powering the turn and as the model tightens its turn in a thermal, it becomes terminal and down she comes. So, reducing the amount of turn will help this.

So, a small amount of rudder – max 1/16 is great, no more needed and by now, you should not be diving anymore.

So take the model to the field and start throwing it. First – nice straight pushes – just to the left of the wind. If the model is balanced correctly and she glides in a nice left turn – then, time to take it up a step and start launching steeper and steeper. There is one more possible reason that the airplane can dive now assuming there are no warps in the stab and that’s the angle that the model is launched at. If you launch the model vertical, unfortunately, this means that the nose is pointing upwards. As speed lowers, the model will stall and then start a dive down. If you don’t have enough height, the model will drop its nose and head towards the ground. You need to lessen the angle of the climb a
lot – this way the model will climb out right in a large right turn and then as the speed is bled off, the airplane levels out and she glides smoothly away and into a left turn.

Finally - Altering things on the tail plane – well, the next option would be to add a little “up” on the tail plane. By up I mean wash out. This is sometimes needed on models and is a great help for small adjustments. This is just a case of wetting the tail plane right next to where it joins the fuze and bending it a little upwards. Not too much and bear in mind that by doing this, you are altering the incidence a little and therefore, the nose may need a little plasticine again to add a little weight.

That I believe covers diving – so let’s cover the turn a little more.

**Turning**

These gliders need to climb in a right turn and then glide left. Why? Well, if you throw right and have right rudder, the model is going fast away from you and with the extra right rudder; it makes the whole thing terminal. The extra turn off the rudder will force the model right and into the ground. However, I will stress that this can be controlled somewhat to a degree with warps – but not advisable. Lets keep the airplane safe and do it right left.

So, to turn it, breathe in a maximum of 1/16 turn at the end of the fin. This needs to be done from the base of the fin end to the top. Again, very small movements pay dividends with these airplanes. Too much and the ground takes no prisoners. Too little, the model will not turn into the thermal as quickly and the walks are long collecting them. So, just a tiny movement.

One of my best suggestions to help with a rudder is to change the angle that the grain of the wood is. In my models, I have the grain of 2/3 of the fin at about 45 degrees to the fuze. Then, I change the rudder and do it the opposite way. It’s meant that the rudder has stayed in the correct angle and also has stayed warp free. If you have the whole fin vertical, sooner or later, it will snake and then you need to replace it.

The other way of being able to turn the model is to mount the fin at the correct angle and skew it – personally, I don’t do it at all and would not recommend it. If you need to change things, it’s not easy on these gliders at all and therefore, keep it straight and correct things gradually.

**Launch**

One of the main problems that folks have is that they get the launch wrong and things go wrong in this. The model flies out of their hand into a large left turn and its perfect. Then they come to throw it and it’s all wrong.
The perfect launch – run, pull glider back, throw to just right of wind, model climbs, right wing down, speed bleeds off, transition, and then left turn. No loss of height – so what happens when it don’t work this way.

**Problem** - Model climbs too flat and gains little height.
Not throwing steep enough – increase angle of launch

**Problem** – on climb – model starts going straight instead of climb right.
The rudder is counteracting the throw – too much left rudder. Decrease it.

**Problem** - The model rolls fully on the climb to the right.
The airplane has a warp on the right side of the stab – wash out, decrease it. Also, add a small amount, and that’s very small, wash in the opposite side on the stab.

**Problem** - Model loops.
Too much incidence, if you do not have an adjustment screw, then where the stab joins the fuze, bend this down.

**Problem** – model climbs straight up and then turns left.
Not enough right bank – increase bank on launch.

**Problem** – model climbs straight up and then stalls. Often terminal!
Increase the bank, if it stalls, then add a small amount of left turn. Add a small amount of weight. Also, remember, to launch to the right of the wind. Left is a no-no!

**Problem** - Model dives to the right on climb.
Too much right bank on throw, add a little wash out to the left wing tip to help push it down on climb.

Ok. So there are flat stabs and there are V tail stabs and these need slightly different trimming. My chosen model for many years was Mick Page’s Butterfly 2. This man is a real gent and one of the nicest hlg fliers I have ever had the pleasure to meet. He’s not the tallest on the field, but he’s the one with the biggest heart.

For months and years I flew against him and watched him. He’s smaller as I say, however, he picks air like no one I know. Max after max. My throws were all over the place and I watched in awe at this man winning.

Eventually, on a thing that I ain’t gonna learn if I don’t ask, I went and sought his advice. He became one of my idols that day and is still a real great bloke.
Butterfly has a V tail. In other words – it’s not flat as what we talked about. This model needs trimming slightly different as the dihedral at the centre of the stab makes things a bit livelier. Basically, build the model as per the plan (it still wins these days) and then go from these directions, which I plagiarised from his article.

Launch problems with a V tail.

**Problem** – model barrel rolls to the left, comes out of the transition very fast and then spiral sin.
**Solution** – reduce left rudder. Wash out right hand tip of the stab also increase wash out on right side of the wing. More right bank on launch.

**Problem** – model rolls on climb to the left entering a very tight circle. This is a great idea for catching the thermals but real bad in the wind.
**Solution** – this time add a little wash in on the left hand inner part of the stab – near the fuze. That’s the best place.

**Problem** – model performs a vertical loop – Runnnnnn as it follows you and panic!
**Solution** – reduce left rudder, add down on left hand side inner panel of stab, increase wash out on right wing tip and more right bank.

Stop running and panic for another reason instead

**Problem** – Model turns and loops to the right, however, finishes nose up and drops in and usually after a 90° turn.
**Solution** – More wash out to the right side of the right wing tip, take off some left rudder, little more negative incidence to the stab.

**Problem** – as above but model pulls out from dive too quick.
**Solution** – reduce left rudder, more wash out on right wing tip, more bank on launch.

**Problem** – as above but model completes a minimum of 180 degrees – i.e. a banked loop
**Solution** - more left rudder, reduce right wash out on right side of stab, less bank in launch

So that’s all there is to it or so I am told. It’s all through many years of flying the classes that I can now write a bit about them and give something back and what I hope is of use to you.

My flying continues, albeit restricted in hlg. The old shoulder is not what it used to be anymore and following a serious car accident and subsequent surgery, I am unable to throw these marvels of the air. However, I am always more than happy to help where I can – by e-mail or what ever other method you so choose. Please feel free to contact me on keyfreeflight1@aol.com or
I assure you I don’t bite and will happily try and help you as much as I can and get your aircraft trimmed and you sharing the air with your mates.

If not on the field, then you will find me with the other gliders I fly at Burn Gliding Club, however, these ones I can’t throw that well – more fun just sat there alone going round in lazy circles and riding the thermals. Now I wonder if I could get a finger grip in the end of the ASK 21 and use it as a DLG…!!!!

All the best,

Kevin Moseley