FLIGHT SCHOOL with Stephen Green

Flying RC after 26 years of full size

By Ron Grosser Cessna 172 owner

Romeo India Victor, our C172 at home on the farm.

My interest in Aviation started about 50 years ago when I attended a machinery Field Day on a farming property near Kimba in South Australia. In those days Rossair from Adelaide would bring a new Cessna 172 over to take joyrides and hope to make a sale.

The official opening had just started when I heard an aeroplane looked up to see a Robbys Aerial Services Beaver flying down towards the crowd, with a deafening roar of the big radial the pilot pulled her up near vertical did a 180 and flew back to make his landing approach back towards the crowd. The first approach was his strip inspection in true Ag pilot style. After watching the impressive aerial spraying demo later in the day I decided to go for a ride in the new 172 only to find the pilot of the Beaver in the left seat. I was able to get the other front seat and after takeoff was handed the controls. The pilot was a New Zealander by the name of Fred Schraftt whom a couple of years later while doing my pilot training I got to know quite well.

The De Havilland Beaver aircraft used by Robbys for spraying and spreading operations during the 60s and 70s made a lasting impression on me and I have a 1.6 metre span model waiting for completion which I intend to power with a .61 4 stroke glow motor. I completed my flying training and obtained my unrestricted PPL on the 24th August 1969 only 6 days before our wedding. I held a current PPL for 40 years and purchased VH-RIV, a Cessna172 D in 1981. I was able to prepare an airstrip on our property at Arno Bay in the paddock adjacent to the farm house and built a hanger to house the aeroplane for the next 26 years.

While I thoroughly enjoyed my years of flying this aeroplane my wife Wendy and our family gave me a surprise Christmas present about 20 years ago.It was a .25 size high wing RC trainer complete with JR. Quattro radio and .25 Enya motor. It was the best Christmas present ever but due to my lack of knowledge and busy life it laid around for a long time. It was my thoughts that with my aeronautical experience I would be able to fly it on our salt pans at Arno Bay. My son assured me I would prang it and he would have been right.

While in Adelaide around the year 2000 my son Troy visited Modelflight and brought home an electric Aero Bird Extreme for me to try. He thought this might bounce a bit better than the balsa trainer. Being Mode 1, it did not seem logical to me until we found the smaller Challenger was Mode 2 which I eventually mastered. Another Christmas present was an electric powered Super Cub, and I remember taking the grandkids for a fly around the farm in the 172, after landing I noticed the wind had dropped so hurried back into Arno Bay to get down on the swamp with my Super Cub.

The next few years was a steep learning curve into electric models with some doubtful radio gear and foam models however a move to 2.4 and a new radio system from Modelflight eliminated the interference I was experiencing with cheap 36 meg. gear and I began to progress. Next the transition back to the little nitro trainer after light foam overpowered electrics that would leap into the air after a few metres was like start all over again. However one Easter Holliday when my daughter and family were over from Adelaide I was able to fly the little trainer, many years after receiving it.

My son assured me I would prang it

Due to decreasing use mainly and having to drive 16 kilometres to the farm to go for a fly we decided to sell VH-RIV in December 2007. The end of an era.I now enjoy flying my models as much as I can and especially every Saturday at our Port Lincoln Model Aerosport Club for the flying and camaraderie of the other members. I now fly mostly nitro models at our club and get a real thrill out of flying warbirds in a scale fashion. I have tried to encourage some of my full size mates to get into models

Mode 1 did not seem logical to me

Can you fly that?

soon, as the transition is not easy but very satisfying and rewarding when you get there.

I had a friend who flys his full size RV6 looking at my Hanger 9, RV 8 and his question was can you fly that to his surprise my answer was yes. In summary while I enjoyed my 40 years flying full size aeroplanes I am probably enjoying flying models more, because it is easy to go and fly a foamy in a park, or a larger aeroplane at our club and a wide variety of aircraft types and I enjoy helping and encouraging newcomers to our great hobby. One big difference to flying full size is as a model pilot we are able to observe our own flying ability to precisely control the aircraft, which is not possible when you are sitting inside the cockpit.
Ron Grosser. SA.

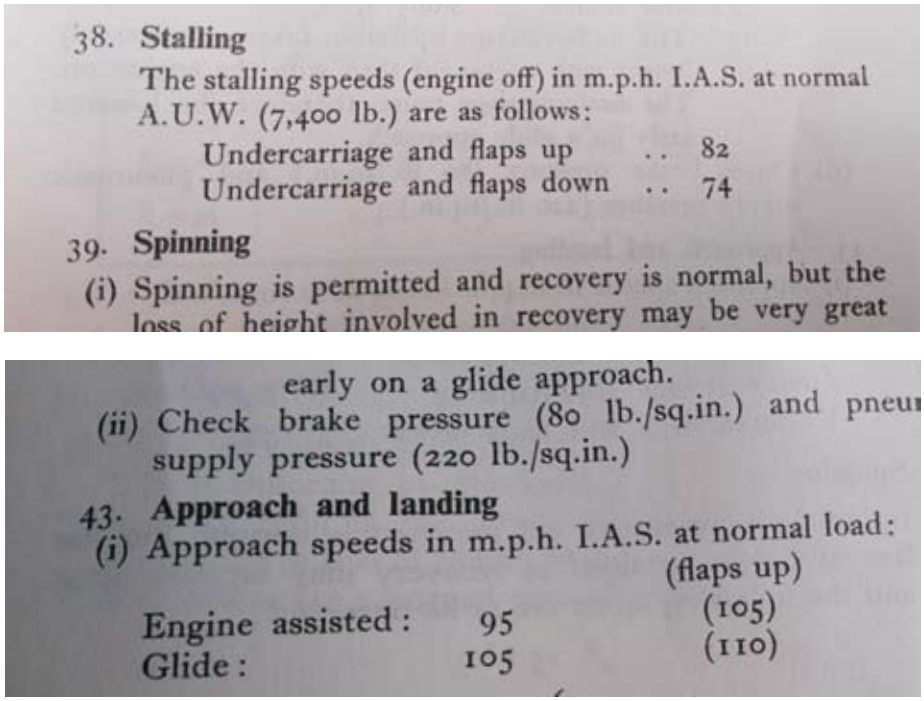
Two foamies led to this. (*Hobby Shops and Model Clubs take note. ED)*

(Thanks very much Ron. When I started flying full size, I suspended my model knowledge in an effort to learn as much as possible)

V is Velocity - S is for Stall

VS1.3 is a full size term seen in Pilot Operating Handbooks, such as this example for the Griffon powered Spitfire FX11. Approach

This is a tried and true formula which I first read about in a 1930s book



38. **Stalling**

The stalling speeds (engine off) in m.p.h. I.A.S. at normal A.U.W. (7,400 lb.) are as follows:

Undercarriage and flaps up ..	82
Undercarriage and flaps down ..	74

39. **Spinning**

(i) Spinning is permitted and recovery is normal, but the loss of height involved in recovery may be very great

early on a glide approach.

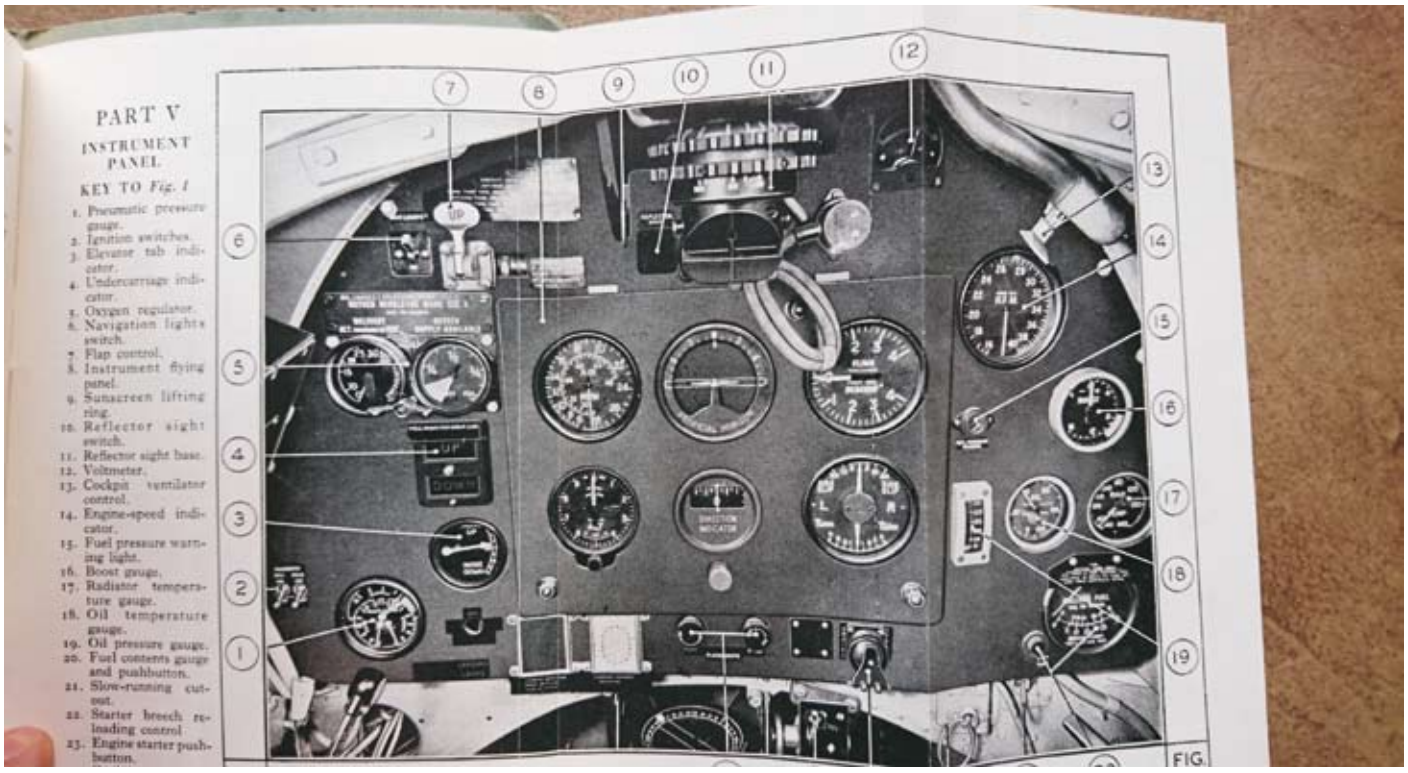
(ii) Check brake pressure (80 lb./sq.in.) and pneu supply pressure (220 lb./sq.in.)

43. **Approach and landing**

(i) Approach speeds in m.p.h. I.A.S. at normal load:

		(flaps up)
Engine assisted :	95	(105)
Glide :	105	(110)

Approach speed is approx 1.3 times the stall speed



A limited panel is now available for RC, with VOX

Stick n Rudder. There are always exceptions but the only real difference from then and now are the glide ratios in the event of an engine failure. That book covered biplanes. Monoplanes will glide much further. Easy enough to fly 1.3 when your are in the cockpit. Look at the airspeed indicator and look out the window.

An age old saying but a good landing does start with a good approach. How does one approximate VS1.3 flying from the ground? Expressed succinctly into a few words was more time consuming than first thought. How much up elevator is one indicator, but I will have to take a raincheck until next issue and work on a few throttle settings and trim configurations of models in my fleet.

In the meantime a look at another vital factor in landing and taking off is warranted.

Understanding Undercarriages

Model weights have been on the increase for a many years now. Ever reducing cost therefore affordability and availability of larger ARFs more modellers are flying with Heavy Model Permits. (7- 25kg) Recently MAAA changed the requirements for models over 25 KG and the trend to bigger and heavier models is gathering pace.

What you get away with landing a 2 -5kg model does not necessarily translate to 10kg. An attempt to avoid running off the end of the strip after landing too fast by swerving to perform a high speed U turn (ground loop) often works, up to 5kg. The undercarriage can usually take it. At higher weights incorrect technique is much more likely to result in propellers, undercarriage and structures breaking. Props are the first to go. Every increase in engine capacity comes at a cost. Cost of props starts to mount up. Incorrect technique you ask? Landing too fast. Many aeromodellers land way too fast, which is a reflection of flight training.

Maintenance and various setups of this vital component are subjects that we mention regularly in ARF reviews. Always file a flat on the axle for the wheel collar grub screw to grip. That sort of thing. This topic is in Flight School because it is related to handling various configurations in the most critical phases of flight. Take off and landing. When looking for a new model, location of the undercarriage is important. The correct position for a conventional undercarriage (tail dragger) is for a quarter of the wheel to be in front of the leading edge. High wing, mid wing, low wing it doesn't matter. Ditto for bipes, just average out the wing chord. Too far back, (Spitfire - ME 109) takes a lot of juggling. Too much power too early? Equals a nose over. Hold full up and slowly advance the power. A perfect setup, like the Ryan STA, is much easier. So easy I used two models like this as a basic trainer in my flying school. Hold a quarter up and a quarter right rudder. Get full power on within two seconds and watch. That technique usually produces pretty good results. Plus or minus the odd rudder correction of course.

When it comes to tail draggers many ARFs compromise the ideal position to lower production cost. Not so much with high wingers as the engineering to place it in the right location is simple.

As you gain flying experience, choosing a model where the undercarriage is not ideal becomes less of a problem. As mentioned the ideal position for a taildragger is to see about 1/4 of

Little Toni - Wheels in the correct position

Cheaper to build equals cheaper to buy. Wheels too far forward, guarranteed to bounce

the wheel poking in front of the leading edge. As depicted in the previous issue the two .40 size racing models above are similar, yet, operating on and off the ground safely, they are poles apart. Low wing with relatively small (normal) size control surfaces both are fitted with a stiff alloy plate undercarriage

The white model is a 1980s FAI Pylon racer. It is actually a 70s kit of a Little Toni, made famous by Californian pylon guru Terry Prather. Professionally built by Bob Hirst for Cliff McIver this model is good for 250 kph. Throttle is digital. Power is either on or off, courtesy of a Dubro 2-56 kwiklink wire hooked around the soft silicon fuel line plumbed to the venturi, With only full power available, exceptionally high power to rate ratio makes take off technique very specific. Full up elevator and full right rudder. In an actual race, this is further assisted by an almighty shove. Members of the Doncaster Aeromodellers Club might be interested to leant know that this model was flown at the annual Doncaster Airshow. (Different times) It was advertised as a 300 kph speed model. Which it probably achieved in a dive. I flew it the first time and misjudged the approach, hence the slight scuff on the wing. Cliff flew it the following year. So, landing is deadstick.

Getting the approach speed right is important. Whilst it may look fancy, three pointing the thing has it dangers. A bounce at low speed leaves precious little control response for recovery. A lesson learnt my me, in front of that crowd. Bolt a normal sport 46 two stoke in it transforms into a lovely well mannered aeroplane.

I bought the ARF for a speed comparison at Sandown 2015. The idea was to put together a look alike of my Father's 1970s Goodyear pylon racer Digitaire for Speed. Powered by the loop scavenged OS 40P pylon engine it held the Australian record of 2 minutes 28 seconds, for ten laps of the 400 metre FAI Pylon Course. Cliff's Little Toni is good for 1 minute 30 seconds. Chris Callow's FAI World record was recently lowered to the low 54 seconds. The replica was to go up first, followed by the Little Toni then Chris Callow. On the day this was done by Glenn Matthews with a Viper. Which was a better idea, and just as well.

Glenn Matthews put this Great Planes Viper together for a Speed Comparison against FAI World Champ Chris Callow

Test flight was a touchy affair. Long grass, wheel spats, small wheels, way too much rudder and elevator throw, a very nasty tip stall and an engine not quite ready to idle reliably. Needed an FAI Pylon launch to get it off. Engine quit, bounced, tip stalled two feet up. Recovered that with rudder and avoided the cartwheel. The two piece undercarriage then split the ply mount block in half. Collected the undercarriage to take back to the workshop. Replaced the block with aircraft grade ply and went out for another go. Sorted out the throws and CofG but one problem remains.

It's a nice model particularly the engine installation that hides the muffler. Two piece wing, it's all there. However, the location of the undercarriage is way too far forward. What does this means for take off? Once established in the flying position, if left on the ground too long it will start to kangaroo hop. The trick is to always hold a little up elevator. I do this with all models anyway but this takes on more importance with this config. Landing with an expectation there will be no bounce is unrealistic.

There is just no way around it. There is a correct speed to land but even then, as soon as the wheels touch, the long moment is such that the force applied will push the nose way up. Increased lift. Chances are up she goes again, for another go.

Off topic, but choice of wing section is another factor. It may be the Horner style wing tips but the tip stall is quite pronounced. The Little Toni

Choice of wing section is another factor

is lovely, proving yet again that thin wing sections don't automatically mean hard to fly. Nice looking, this lookalike is a bit of a handful. This model would sort out quick smart your skills at stall recovery. I had a basic trainer like that, the Aeroflyte Invader Mk11. Tipstall was a shocker. High aspect ratio wings such as De-Havilland Comet, Douglas DC3 and gliders are can use up quite some altitude recovering from a stall.

On to trike gear. Aircraft attitude when sitting on the ground and location of the main undercarriage is important. In the workshop measure the distance from the leading edge (from its centre) to the floor. Same for the trailing edge. If the trailing edge is closer to the floor, that wing is in a nose high attitude. As speed increases on take off the tailplane will try to elevate itself into the flying position. The model will start to bunny hop. Holding a quarter stick of up elevator or thereabouts will help prevent this and when the model is ready to fly it should just lift off.

Where possible my preference is always to reset the wing incidence on the ground to zero. Easy enough with fixed gear. This can be done by lowering the length of the nose gear wire or strut, fitting a smaller nose wheel

Mains are a little further back than ideal nevertheless the undercart on the Apprentice is very well engineered

or larger mains. The reason is simple. It improves landing. A nose high attitude makes it that the model has to be held off until the speed is quite low, otherwise it will just bounce. Also in case of a deadstick, forcing the model onto the ground if the landing speed is too high often ends up in tears. You will see both bouncy bouncy scenarios played out time and time again at jet meetings.

Location of the main gear makes a huge difference. With a trike, the further back (aft of the centre of gravity) it is the more elevator power is required to raise the nose on take off.

Rolling resistance from wheels, wet grass, long grass, small wheels on short grass, even big wheels on long grass, this is a factor. Not critical with a propeller as prop wash provides plenty of oomph over the control surfaces right from when power is applied. Compared to a single, twins often have reduced prop wash over the tail. Whether it be a gas turbine or ducted fan, jet propulsion offers no such assistance. Undercart back further is typical. The plus side is more weight on the nose wheel, means more grip. This provides more nose gear steering power. Handy for turning crosswind on bitumen.

Little elevator power until airspeed is well and truly alive is why many jet designs have the undercarriage setup with a nose high attitude. This is further complicated by the oleo strut as that compresses when full thrust is applied. If it compresses to produce a negative angle of attack on the ground often a bump is required to bounce the nose up. An old trick for ducted fans as the approached the end of the runway was to kill the power for a second. Power comes off, load on nose leg reduced, nose raises, model starts flying. Power back on. flies. Not desirable but it worked. Throttle lag of turbines makes this a bit of a problem.

The F-100 Super Sabre has a nose high attitude on the ground. Rolling

Fly a jet is somewhat akin to putting brick into a Scanner? After two intentional 100 mph landings I can say with some authority that the undercart and structure is up to the job

F-100 is set on the ground in nose up attitude. Too much speed on the runway and the tail will try to lift into the flying position. Kangaroo hops result

down the runway and holding some up elevator works fine for any of the jets I've flown. My BD5 has a very high thrustline and this requires full up elevator. Twenty degrees of flap helps a lot too. When ready, they just fly off. Timing the reduction of up elevator varies with type.

Another potential problem to be aware of is excessive nose wheel

Undercart in the perfect position. Byron Simpson's Ryan STA has no suspension but the flying qualities are so good the chance of a dumper is reduced. Provide you don't have too much control throw

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1kg FunCub, land how ever you like

At quarter scale you are handling 6kg, one has to have to be a bit more careful. Don't you Brian? (Loaned my Cub to another Brian, not my Dad)

Excellent suspension on Greg Lepp's 8kg Supercub

At One third scale,(15kg) the decision to go round after a bounce is often a good idea

Kevin Hay (Tas) holds off the one half scale Pitts Special very nicely

No second chance above 25kg. Full size characterisics such as torque on take off and roll interia are much more apparent in giant scale models like this fantastic 250cc powered Lysander by Ken Lawson (Tas)

Quality wire is often skimped cheap 1kg models but not here

No elevator or flap - pitch trim is fixed

steering throw. Most prop jobs get away with a few degrees either way on the take off roll. The 180 degree turn to line up after back tracking the runway is greatly assisted by prop wash over the rudder. Pressure on the nose wheel (grip) can also be increased or decreased using elevator. This also applies to tailwheels.

Jet aircraft require something in the order of 45 degrees to do a reasonably tight turn on the ground. This can be a problem when rolling at high speed. More so on bitumen. Once rudder authority is established, large control deflections through the nose gear at high speed are not desirable. Expotential on nose gear steering is the way to soften the response. Enough steering to taxi and turn and soft response at high speed. A fancy enhancement to expo is an offset mixer to reduce the steering throw when the throttle advances past a third. Or one half. You could even set another offset that steering remains soft below half throttle for landing. Offset comes in when full flap is selected. Steering remains soft on the landing roll, until flap is selected up.

Landing

Provided the setup is correct, trikes are easy. Just land. Didn't correct the drift? Main gear behind the CofG provides instant straightening. Ditto if too fast. Main wheels touch, automatically lowers the nose. Sport and scale models setup like the Ryan STA are almost as easy. Narrow track is a feature of most high wing mid wind and bipes. This goes with the territory and require a bit more finesse. Until comfortable on type the safest way is to wheel the model on. Most modellers are taught to land way too fast. Taildraggers compound this problem. The sudden snatch as the wheels touch requires the force to be countered by up elevator. Too much. Guess what happens? Back up into the air. Not enough, can tip it over.

Higher performance designs

Higher wing loading and a double tapered wing, which usually come as a matched pair, go hand in hand with advanced design. Once you have got past the initial intimidation, being able to think ahead of the aeroplane reveals they are much easier to land than the trainer or sport model you've been flying. There is one caveat. Stuff it up and things break.

Retractable undercarriage has come along way since the Kraft Multicons in the Northerner. They were the first electric retracts. Dad won the Nats at Strathablyn (SA) few years before with a hand built set of mechanicals.

How to land a jet

Don't have one going at present so I just referred to the E Flite Apprentice before we replaced the tailplane. Not having an elevator suits this a topic to a tee. Rather than go over old ground, I don't mean any disrespect to this model. It's great, otherwise it would not have been recommended in my teach yourself to fly book. Of all the aircraft types in this article, the hardest one to land, nicely, is the red/white Digitaire for Speed look alike. A Piper Cub on a windy day can be a handful. Biplanes or a floatplane are similar in that they also have to be flown in with a bit of power. All that drag.

Dad was the first in Australia to use retractable undercarriage in aerobatics at the Nationals

1kg.	**Anything. Chuck together an approach. Cut the throttle. Land**
7kg.	**Piper Cub. Approach at 1/4 throttle. Cut power a few feet up. Land**
18 kg	**Jet with flap and gear down Slow down early get nose up. Set slight nose up attitude with flap elev pitch trim mix Vary approach path with power**

Jets are actually a lot easier than some people would have you believe. These aircraft are more of a point and shoot affair. To demonstrate an approach check out the Apprentice footage on the (RCM News You Tube Channel) https://www.youtube.com/watch?v=LmtOGC_nMXw

This was done in a couple of takes. Model is rigged out of the box so that if flies straight and level just below half throttle. Start falling short, apply a touch of power. Too high, reduce power slightly. Time too flare? Naturally with elevator, one cuts the power and pulls in a little up. No elevator? A dab of throttle at the right time (on then off will momentarily pop the nose up. Works easily with a prop.

What has just been described is in fact an emergency technique should the elevator stop working. In this instance it demonstrates how to fly down a glide slope using power to adjust the attitude. Not entirely correct because with each adjustment comes anther three to maintain a very accurate glide slope. We aren't doing ILS approaches but it serves the purpose to make the point here. Of course this 1kg model lands at 25 kph. The F-100 Super Sabre scoots in at 80. Undercarriage is the first component to protest if you get that wrong.

Aerobatics

Assuming the model can be flown into the wind, loops are done into wind. Rolls downwind. Before getting into the nitti gritti, the pre-requisite for flying good manoeuvres and looking like you know what you are doing starts with the approach. You have to be able to consistently position the model in front of yourself, from either direction. That way it all starts to look the same. Mistakes are easier to see. And correct.

Most importantly, if you become disoriented the model is not too far away. So, the first thing to master is being able to fly a straight line, from both directions. Not too close. Not too far away. Which depends of the size of the model.

On my Olympus there is some misalignment between the wing tailplane and canaliser. Before you spend time and effort to realign the flying surfaces pause to consider your ultimate aim with aerobatics. This model is capable of performing many if not most of the complex manoeuvers in FAI F3a aerobatic schedules. Rolling loops, rolling circles and shapes that commence from knife edge. If you intend having your flying judged by entering Sportsman or advanced pattern competition, it might be worth your while to set up the airframe to be as symmetrical as possible in trim.

Having said "might be," I advanced from Novice to Expert class by winning the Novice Aerobatics at a Nationals. The fin on the model was constructed from two pieces of balsa with thin ply (1/6th) laminated in between. (Imperial measurement was legal back then) After what seemed an eternity of sanding to a 16 year old to prepare for paint, I noticed the fin was warped at the top. It was warped to the left. The thought of going through more sanding and filling left me cold. Didn't tell Dad and I finished the model. Pulling through the first ninety degrees of inside loops it needed a quarter stick of right rudder. Left rudder for outsides. In strong crosswind it sometimes ran out of rudder authority and I learnt to keep the loop diameter down. Higher airspeed over the top.

Bruce Price from the DARCS Club (now PDARCS) and I were neck and neck the entire competition. What got me over the line was a bit of showmanship. Learnt from Dad. Landing closest the spot inside two circles was judged back then. A higher K factor was applied to the score for the smaller circle. Flew the rectangular circuit which was also judged, rolled out onto final gear still up. Cut the engine to get the judges' attention. Dangled the Dunlops and nailed a nice landing inside circle, each time. Those landing points were the difference.

My FMS Olympus flies extremely well as it is. If your model is the same you could use this as an opportunity to learn to compensate with rudder. Why? There is always wind and more often than not it won't be straight down the runway. So, you will be doing that anyway. Manoeuvres are best performed sixty metres out. A good distance for the size and speed of this model. Best trimmed to fly around three quarter throttle.

Low set undercarriage on F3a models like this FMS Olympus will leift off when ready, no matter how much up elevator you hold. Expect an 18 metre take off and landing roll on short grass

FMS Olympus Control throws. Aileron 12mm each way, Elev 16mm, Rudder 15mm. measured at the tip or top of the control surface