How to Get Better at F3F

By John Treble

I don't know for sure, but I think the most frequent response to the question: 'How can I get better at F3F flying?' is 'Practise'. There is truth in this, but it is far from the whole truth, and it begs the question: 'Practise what?' In this article, I'd like to try to explain how I managed an unusually large reduction in my personal best time at F3F flying. On 15th March this year, I reduced my personal best three times. It was 41.25 at the beginning of the comp, 40.43 after round 5, 39.79 after round 6, and 38.38 after round 8. I went home feeling rather pleased with myself. I had been trying to figure out how to fly sub-40's for several years having been stuck at 43.x for a long time, so I was a bit astonished when the 28th April rolled around, and I logged a 31.67 in round 6, making a future sub-30 a possible rather than an impossible dream.

Personal best times are not, however, a particularly good measure of one's rate of improvement. F3F is not a game of pure chance, but it does have a large element of luck in it. The 31.67 was made possible by the arrival of a megathermal, just at the right time. It is true that I had the skill to take advantage of it, but there were several pilots on the hill that day who would have improved on that time if they had been offered the same air. Furthermore, at the back end of 2014, there were at least two occasions when I had put in what seemed to me to be possible sub-40's. On both occasions bad luck struck: the timing gear failed and what the actual times were no one will ever know.

Nonetheless, I will not deny that my flying has improved. Indeed, my main reason for starting competitive flying in the first place was to improve my flying generally. I have never been particularly interested in competition for its own sake, but I do like to do things well.

What's it all about, Alfie?

It helps to know what you are aiming to do, what tools you have available to achieve your aim, and what difficulties stand in the way.

Aim: Traverse a 100m course 10 times in as little time as possible.

Tools: A competitive glider, transmitter and other equipment; a suitable set-up; piloting skills.

Difficulties: The slope; the weather conditions.

The elements in this little list all interact in complicated ways. What time is 'as little time as possible' is determined partially by the slope and the weather conditions, and is different depending on whether the phrase applies to anyone, or just you. Having a competitive glider is obviously not much use without some piloting skills, but less

obvious is the fact that which skills are effective vary according to the slope and the weather. Writing down the list is useful though because one important thing has been gained: The only element in the list that can be worked on is the set of tools. You can't choose the weather, and you have to turn up to the slope where the competition is being held. You can't choose to vary the task. You can choose what plane you fly, you can change its setup, and you can develop your piloting skills.

It don't mean a thing if it ain't got that swing

As in any other sport, a good F3F run has rhythm. If you watch the best flyers, you will see that while they might all have different styles and use different turns, with very few exceptions their best runs are rhythmic. This is, in my view, the most important thing to develop while practising. A good run should be rhythmic and elegant, with equal timings between turns, turns placed accurately and with similar shapes. In all your practising, you should be aiming at this, even if the runs are not particularly fast. In other words, F3F is a variety of aerobatics, performed across wind, with the main goal of speed.

This gives a first clue as to how one might start to develop one's skills: fly crosswind aerobatic manoeuvres. It doesn't really matter which manoeuvres, but your aim should always be to do them with maximum accuracy, and a minimum of control movements. Cuban eights, double Immelmanns, le humptybump tiré….anything that isn't a stalled manoeuvre.

Here's an example: fly in a straight line along the horizon. Sounds simple? Just try it the next time you are out. Then try and do it without applying any control inputs. If you can't, your model isn't set up right. Assuming it flies straight, you probably need to change the elevator centring. If it doesn't, adjust your ailerons.

Here are two others which I still find useful and challenging:

This was suggested by my son, Mark: Fly crosswind loops of consistent placing and diameter. If the sun is in a suitable place you can try doing the loops around it. That way you suffer a penalty (i.e. get blinded) if you make a mistake. The point of the exercise is that crosswind flying requires constant corrections to stop the plane drifting downwind. In order to have the plane behave consistently relative to the ground, it needs to describe a corkscrew motion relative to the air. Practise this until you are either blind, mad, or can do it for at least three consecutive loops.

The second is my own: Find a slope with a fence along the edge. (I do this at Musbury in East Devon, but only with foamies.) Fly along the fence away from you. Turn around and fly back. Turn around. Repeat until it is time for a cup of tea. When you've had your cup of tea, do it again, only this time make the turns in such a way to ensure that the plane follows the top of the fence with no control inputs.

If you can do any of these tasks reasonably satisfactorily, you will have already developed a good sense of rhythm, and will be well on the way to faster F3F runs.

Location, location, location

One virtue of the exercises described above is that they force you to place your plane where you want it. In the exercises, 'where you want it' is well defined: You fly along the horizon, around the sun, or along the fence. When you get to flying an F3F course, you will have to choose exactly where you should fly to maximise your speed. This won't be chosen for you. Obviously you need to go back and forth between the bases, but will the run be quicker if you fly close in, far out, high or low?

Experience on a particular slope is helpful in making these decisions, but what do you do if you are at a competition on a slope that is new to you? One important thing to do is to watch other flyers. At every competition, no one wants to be the first to fly, and everyone (even pilots familiar with the slope) watches as the first pilot struts his stuff. This is because every slope is different from every other slope, and no slope is exactly the same as it was yesterday. A slope's characteristics depend not only on its shape and that of the surrounding terrain, but also on the strength and exact direction of the wind. The success or failure of the first pilot to fly can provide valuable information as to how a particular slope is behaving at any particular time.

Knowing where to place your run relative to the slope is one of the most important skills in F3F flying, but it is hard (for me at least) to give any universal rules as to how to read a slope. If a slope has a well-defined edge, then near it there will usually be a compression zone, where the air flowing over it is more energetic than elsewhere. In order to go as fast as possible, a pilot needs to exploit the compression zone as much as possible. This is why F3F runs often look to be dangerously close to the edge of the hill. By flying in the compression zone, its energy can be transferred to the plane, and doing this effectively can make significant improvements in flight times.

The classic pattern of an F3F run has the plane close in to the slope at the centre with turns being performed further away. Although all pilots have their own turn styles, they are all variants of the following three styles: i) bank and yank; ii) reversals; and iii) energy-management (EM) turns.

i. Bank-and-yank is a quarter roll, followed by half an inside loop, and a quarter roll, leaving the plane the right way up and travelling in the opposite direction.

ii. A full reversal is a climb out from the centre, and a half roll, followed by half an inside loop. The plane is left the right way up, travelling in the opposite direction, and (all being well) lined up for the next traversal.

iii. An EM turn is more complicated than the other two, and different flyers perform them differently. The classic EM turn has a climb out from the centre, followed by

an eighth roll (or thereabouts), the rudder is then used to complete the turn, followed by a small application of aileron to straighten up if necessary.

How do you get to Carnegie Hall?

Whichever style of turn you are flying it is necessary to fly smoothly. I remember clearly the day I first realised that yanking on the elevator doesn't help you get around the corner faster. You may appear to get around the corner more sharply, but sharp and fast are not the same thing. Usually the effect of a very sharp turn is that the plane's energy is dissipated by elevator drag, so your plane will come out of the turn slowly, and usually stay flying slowly for the rest of the run. The easiest way to avoid excessive elevator movements is to have your plane set up to prevent them. In order to achieve this you need to practise! Try flying a few runs with the elevator throw however you've got it at the moment. Then lower the throw by 10%. You should find that your turns are almost automatically smoother, and that your runs are faster. This is because there's less drag. Many people think that a large elevator movement is necessary to get the plane round the corner. This is true if you are flying slowly, but the faster you are flying the more powerful your elevator becomes, and the less movement you need to get round the corners. By progressively lowering elevator throw 10% at a time, you create a virtuous circle in which lower throws give lower drag, lower drag gives faster speeds, faster speeds give more effective elevator, and more effective elevator enables lower throws. The same is true of ailerons. In both cases, you will find that there is a limit to the extent to which the throws can be lowered, but if you haven't tried it before, you will be amazed at how low you can go, and still have a perfectly controllable aeroplane.

If your plane will fly fast, it will be easier to make it fly rhythmically. Many discussions of F3F concentrate on flying the straight segments of the course, or on flying the turns. In my view, once you've figured out how to fly straight with minimal control movements, and you've figured out how to go round corners in at least one of the styles listed above, your next important task is to tie the two together. The way you handle straight runs affects what you can do in the turn. The way you manage your turns affects what happens in the next straight run.

The easiest turn style to start practising these transitions with is the reversal, because you need only deviate from a full reversal by a small amount to find that your plane is automatically lined up for the next lap. Thus reversals in F3F are rarely full reversals. Stopping the roll just before the wings are horizontal compensates for the fact that wind is blowing it back towards the slope all the time. You should practise doing just the right amount of roll to enable you to enter your next straight without having to apply any course corrections after emerging from the half inside loop. It is for this reason that it is

worthwhile practising crosswind loops. They give you a feel for how much correction is necessary.

Knitting straights and turns together for the other two turn styles is harder because both styles involve the plane being pushed away from the line you want to take on the straight. With bank and yank the plane flies away from the slope, and you have to figure out how to get it back on line. This will usually involve doing a turn of more than 180^0, and then rolling out as the plane flies towards you (and the slope). This is best practised at some distance from the slope to avoid accidents. As you get better you can bring your straights closer in to the slope until you are exploiting the compression to the full. With EM turns, the plane gains height, as well as flying away from the slope. The height gives you a good start for the next straight, because it can be used to gain speed, but once again it will be necessary to figure out how to straighten out a plane that is flying towards you at some speed. Some people claim to be able to do this using rudder only, but I don't know how. I have always found an application of aileron necessary. This can actually be a good thing, because it starts a roll away from the slope that can be maintained until it becomes the start of the next turn.

Ultimately, of course, you want to be able to fly straight, turn, straight, turn, straight, turn, straight, turn, straight, turn, straight, turn, straight, turn, straight, turn, straight, turn, straight while losing as little energy from the initial climb out as possible, and gaining as much energy from the slope as is available. Being able to string a straight and a turn together is a good start for this, but as should be clear from above you also need to be able to string a turn and a straight together. It is a good idea to practise these two things separately. I have many times set out for a practice session intending to concentrate on one or the other of these, and usually found that things have got a little better as a result. When you have made significant progress, you will start to think in terms of the whole run, rather than its constituent parts. It will become a complete song, rather than a collection of verses.

Setting up

I have said nothing so far about set up. This is because there is little to add to Kevin Newton's excellent article 'How to set up a racing glider'. Kevin describes how to set aileron differential and snapflap. I have only three things to add to what Kevin has to say:

i. Kevin shies away from any discussion of setting your CG. Many pilots use the dive test, but I have found that it is not as precise as one would like. It seems there are many different CG positions that are consistent with a plane put into a dive remaining in the same attitude. I have taken to using the behaviour of the plane when inverted as my main indicator of a good CG position. With a good turn of speed, roll the plane inverted. If the CG is good, it should continue to fly straight and level without any down elevator input for a substantial amount of

time.
Once CG is set up like this, you may want to try moving it back a little. This has two effects: it makes your controls more responsive, and it makes your plane less controllable. The first of these is a good thing: you can reduce your throws a bit more, and take another turn on the virtuous circle. The second isn't: a plane that is prone to flicking is no fun, and often broken. Only you can decide where you want to settle this trade-off.

ii. Kevin discusses setting snapflap, but his discussion contains no suggestions as to how one might test whether your settings are working. I have to admit that I am not a master of the art myself, except to the extent that I know that most models fly better with some snapflap than none. Like Kevin, I know of no simple tests to apply that will help in getting it right. The purpose of snapflap is to increase the wing's camber in a turn. The 'right' setting is elusive. It varies between pilots, between planes, and between styles of turn. Asking for advice from experienced flyers compounded this beginner's confusion, and I still remain largely in the dark as to how to proceed. Nonetheless, the following is an account of what I did, and it seems to have helped me, so perhaps it will help you:
Set up snapflap so that it comes in all at once. If you don't do this you have to choose from an infinite array of different configurations, and you could spend your entire life failing to find one that works. If it all comes in at once, you have only two parameters to worry about: how much, and when. Different planes seem to be quite different in their responses, and you can find out where your plane likes it to come in by using a bracketing procedure. Have a switch programmed with 'early' and 'late' snapflap modes. Initially set 'early' at, say 10% of stick movement, and 'late' at 90%. Set the snapflap volume at 3mm, or any other amount you think might be good. Fly round some corners switching between the two settings until you can decide which is better for you and your plane. Then, reset the worse one so that it is less extreme. Repeat. Once you've found a good setting change the volume of movement (you can bracket this in a similar way). Then go back to the timing, and repeat the whole thing. Repeat until you have found a pair of settings that go well with each other. If this sounds like a pain in the arse, it is because it is. Greater experience will possibly lead you to better settings, and even setting up curves, but for first steps in snapflap, this is something that worked reasonably well for me.
I think there is only one thing that is certain about snapflap: you do not want it coming in if you are making a minor course correction in the straight. That's why I suggest starting the bracketing at 10%.

iii. Kevin's title (but not so much his text) suggests that setting up a plane is a once-for-all thing. It isn't. I have snapflap volume on a slider on my transmitter, so that I can vary it easily with conditions. (Specifically, the amount of ballast I'm

carrying.) Setting up your plane is a continuous process. If you ever try a new slope you will want to change your setup. Ditto if the wind strengthens during a session.

Other things

Learning to fly F3F almost inevitably means breaking models. You are all the time having to push your performance beyond things you are comfortable with. This often involves flying at speeds you are not used to, closer to the ground than you are comfortable with, and inevitably on occasion you will make a misjudgement. I had virtually no experience with moulded models when I first started, although I had been making balsa ones since I was 11. This means that I was learning two skills at once, which was certainly one too many while I was working, and would probably be one too many even now that I am retired. Anyway, I got into a cycle in which I would break a model, fix it badly, then as a result break it again. Even when I started to be better at fixing, I still found it difficult to fly confidently because I would be scared of breaking the model.

After a while, I decided that the only way I would be able to make progress would be by having two models. I hoped that I would have two in a flyable condition, but I have only very recently achieved this blessed state. It also helps if the models are the same. Learning to fly F3F requires constant comparison of performance at different slopes and in different weather conditions. Confusing the issue with different planes doesn't help make things clearer at all. In fact, in the end, I have wound up buying new models rather than fixing them myself. This way, I have reached a kind of equilibrium in which it is unlikely that I'll be without a model when a competition day comes around. (I understand that I am way up in the UK income distribution, and that buying a new model just because you've crashed one is not a luxury that everyone can afford, but that's life, as Esther Rantzen used to say.)

I have said a lot about practice, but nothing much about competition. I approach competitions now in a much different way from the way I used to. I am getting on a bit, and get tired more easily than I used to. I have adopted the tactic of driving to competitions on the day before, and staying overnight. As well as ensuring a reasonable state of well-being in the morning, I can often have a bit of practice in the afternoon before the comp. I try now not to change anything on my planes, apart from ballast and snapflap, during a competition. For me a competition is not only a test of my thumbs on the day, it is also a test of the work I have put in on my planes' setups since the last one. The acid test is always whether or not the plane seems generally better behaved than before, or, to put it more bluntly, is it going faster than it used to? Each new setup deserves a fair trial, and while subjective evidence in practice sessions is useful, the objective measure given by timed flying over a fixed course, with the luxury of being able

to compare with the performance of other pilots, is in the end the only way to give it one. Fiddling about with it in mid-trial is not the way to give it a fair assessment.

Since I've mentioned the fact that the course is fixed, I'll throw in another little hint here. The one aspect of F3F flying that is hard to practise on one's own is getting the length of the course right. But it is necessary to acquire this skill. Too long and you add seconds, too short and you add lots of seconds. So you need a friend, compadre or companion with a whistle. You also need a means of measuring 50 metres. Have the friend stand this distance from you as you fly F3F runs, and ask him or her to blow the whistle as your plane passes. If they are particularly willing, you can ask them to blow it on the way back as well. This will give you a good idea of how much time you are losing in the turns. Those of you fortunate enough to have two friends, compadres or companions, could have one at each end. I have also found that, particularly in winter, clothes can be important. Hats shouldn't blow off, and gloves should expose as little bare skin to the elements as possible. In the winter league, I nearly always wear silk longjohns and a long sleeved silk vest. These are light, comfortable, breathe well, and are warm. If, like me, you can't see without glasses, they are important, too. I use a pair of wraparound prescription sunglasses. They keep the wind out of my eyes as well as glare, but they are not cheap. A cheaper alternative that may work for you is ski goggles that are large enough to fit over an everyday pair of specs.

Finally, I have found my partner Denise's encouragement and support impeccably encouraging and supportive. She has celebrated my few triumphs and has smoothed over my many despairs. She's not for sharing, though!

John Treble (GBSRA most improved pilot of the year 2015!)