‘B’ Prepared

UP INTO THE STALL TURN AND BEYOND, ANDY ELLISON RIPS SOME MORE NOTES FROM HIS GUIDE TO PASSING THE BMFA ‘B’ CERTIFICATE

So far in this series we’ve looked at many aspects of the BMFA ‘B’ Certificate, from selection of a model through pre-flight checks and onto many of the flight manoeuvres required in the test. These have so far been all at moderate flying speed, but now we move into that part of the flight envelope near to (or at the point of) the stall as we explore the stall turn and the ever-tricky spin and recovery.

In the last part we’d just completed our two opposing downwind rolls and were continuing to fly in a downwind direction on the correct height and line at little more than our preset cruising speed. I made the observation that it’s highly likely an examiner will ask you to go straight into the next manoeuvre, the stall turn, as there should be no reason to turn into wind or waste more time flying an interim circuit; the model is ideally positioned, the stall turn doesn’t need to be executed on the centreline in front of the pilot, and the run out of the two rolls will provide a little thinking time and allow the examiner to communicate his intentions to you. So let’s go for it.

h.) Complete a stall turn either left or right. The reason that ‘either left or right’ is stipulated is to account for the direction your model may be travelling having completed the two rolls and the fact that the manoeuvre must see the model turned away from an imaginary display crowd line (Fig. 1). If flying from left to right in front of you, for instance, the only way to perform the stall turn at the end of the circuit would be to the left. A stall turn to the right would direct the model towards the crowd and incur a fail. Likewise a run from right to left will see a stall turn being performed to the right as the model reaches the apogee of the climb. Let’s break the manoeuvre down.

From standard height and line (following the rolls) the model should be flown past the pilot to the extremes of the established circuit, perhaps 100 yards or so off to the side. Pay particular attention to this height and line as you’ll shortly be flying back past yourself in the opposing direction through the same key points when the manoeuvre is complete.

The examiner isn’t looking for absolute excellence in this manoeuvre but he is looking for a recognisable stall turn. There are a number of things that can go wrong here and we’ll look at the more common ones in turn, however, timing is the key to performing a stall turn correctly and practice is required to get it right. The stall turn is shown in Fig. 2.

With the model at the desired position towards the end of the circuit, up elevator should be applied as if entering a fairly tight loop - a loop with a smaller radius to that flown earlier in the test but not so tight that the model loses significant forward speed. When a vertical line has been established, elevator should be managed to ensure that the model continues up this vertical line for a short way.

Imperfections in the model’s lateral balance will manifest themselves with a dropped wing as the aircraft makes the tight quarter loop and a subsequent deviation from the vertical line towards the heavy wing. You should endeavour to trim this out with balance weights before you undertake the test. Likewise, incorrect motor side thrust will manifest itself with a steady pull in the yaw axis and a deviation of the model in the vertical line, which will need management with rudder to straighten. This too should be

A few valuable seconds between manoeuvres will allow your examiner time to communicate his intentions to you.

Wind direction is critical to the way you fly the ‘B’ Certificate.

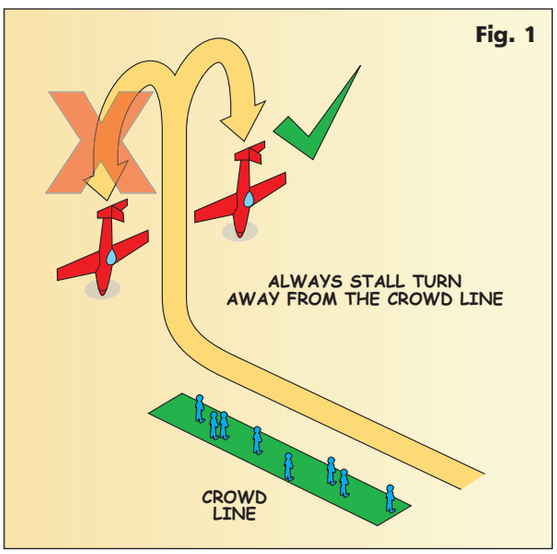

Fig. 1

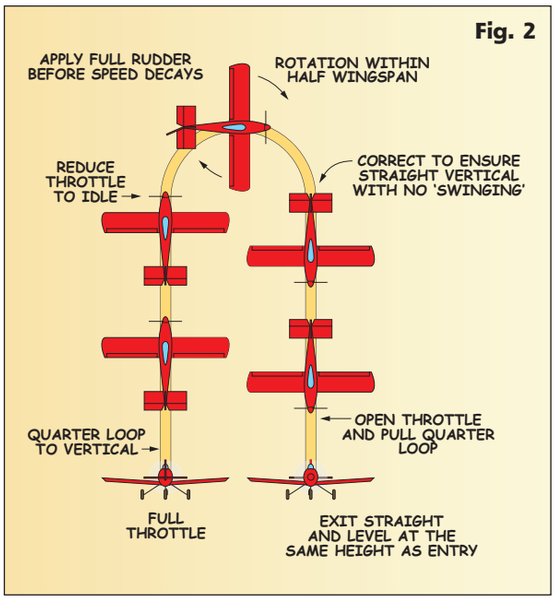

Fig. 2

TOP RIGHT: A perfect 'B' Certificate model such as this Speed Air 40 will fly all the required manoeuvres with ease.

trimmed out of the model before undertaking the test.

Good throttle control is essential, and many pilots make a rod for their own back by trying to prolong the period that the model is in the vertical line to the point where major rudder control is required to hold it straight as the airspeed and inertia from the entry dies off. I find it best to establish a vertical climb after completion of the quarter loop and immediately shut off power to idle and let the inertia of the model carry it upwards to the stall. This vertical line should be wind adjusted, i.e. as the model rises, the up line should be perpendicular to the floor. This may mean that the model itself is not actually vertical (see Fig. 3).

At the top of the vertical up line some pilots like to add a burst of power to increase the airflow over the rudder and help drive the model around the turn.

Timing now comes into play. Application of rudder with too high an airspeed will see the model 'wing over' the top due to its excessive airspeed above the stall. Apply rudder too late and the model won't turn over the top but simply flop into a deep stall, requiring an emergency recovery probably way off the desired line.

A perfect stall turn will see the model almost rotate about its own length to head straight back down the exact same line it just flew up. It's more likely, however, that it will appear to fly around a 180° arc as if pivoting around one wing tip before gravity begins to accelerate it along the down line. Some pilots prefer a little blip of power as the model flies over the top; this isn't enough to accelerate the model but merely a coax to increase the airflow over the rudder and help drive the model around as the last of the forward speed rapidly decays.

Ensure that the vertical up line of your stall turn is wind adjusted to ensure that it remains perpendicular.

Once over the top with flying speed rapidly increasing it's vital that the pilot gets on the elevator to keep the model on the down line, wind adjusting if necessary. At the end of the rotation it may even be necessary to add a little stab of opposite rudder to stop the model fishtailing along the down line as its inertia in the yaw axis decays and airspeed increases. This isn't very common, though, and more often than not the pilot can concentrate on balancing the elevator to a point where he can recover from the stall turn with the same radius quarter loop as was used for entry.

A common mistake is to pull out from the manoeuvre too high. This is usually a result of an initial prolonged climb and should be avoided. Entry and exit points should be close together, in common with many flight patterns in the 'B' Certificate schedule.

Throttle should be increased through the last looped quadrant to see the model exiting along the standard line and height at cruising speed, to fly back past the pilot's position once again. Now we need to think about gaining height and perhaps changing direction to get into wind at altitude for the next manoeuvre, the spin.

i.) Gain height and perform a three-turn spin. The initial heading and the recovery heading must be into wind and the model must fall into the spin, i.e. no 'flick' entry. There's really only one way to correctly perform the 'B' Certificate spin (Fig. 4), and success in the first part lies in getting the aircraft slow enough to properly stall into the entry instead of flicking over the top through excessive airspeed. If there's any hint of an upward pitch and roll as the model enters the spin the examiner must fail you.

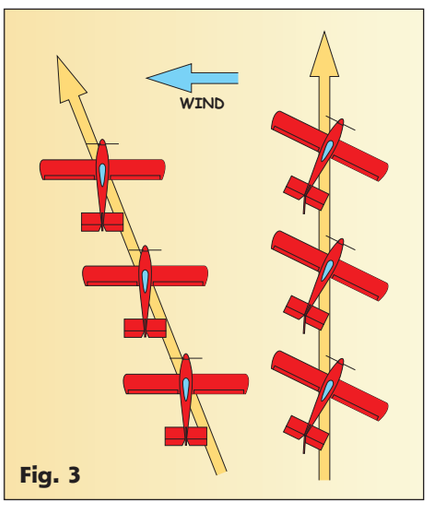

Fig. 3

Just before you commence the spin your model should be flying slowly, in a nose high attitude and not climbing.

As with most of the other flight patterns the spin must be performed on the established centreline, but as the model will be significantly higher up for safety, the line may be further out in front of the pilot.

So, how do you get up there neatly and quickly, yet give yourself enough time to achieve the correct position, and bleed off speed to get to the stall in the right part of the sky? If you went straight into the stall turn from your second set of rolls you'll now be coming back into wind and you can simply fly a long and lazy climbing circuit to position your model at the right sort of altitude for the spin. If you did your stall turn at the upwind end of the circuit you'll now be flying downwind and will need to turn around. You may consider swapping through the circuit with a half figure of eight climbing as you go, but this may look a little rushed off the back of the stall turn. You might even consider flying down to the downwind end of the circuit and performing a large and extended Immelmann turn (roll off the top) to gain the height and line for the spin. The problem with this is that you'll not have much time to get the line correct and drop the speed, unless, perhaps, it's quite windy.

I find it is best to fly out of the stall turn to the downwind end of the circuit and begin a wide but climbing procedure turn just as we did between the loop and the bunt. This way you can take your time getting to altitude, and as you'll be climbing steadily throughout, your speed will only be moderate. The turn itself can be exited on the correct line for the run in to the stall point of the spin. Whichever method you use, you should ensure that you gain height smoothly and in a neat manner.

With the model now at altitude and running slowly into wind you should close the throttle and hold your altitude with increasing elevator input. Juggling the elevator to get the model to the right position in the sky at the right stalling speed and still on line is one of the trickiest parts of the spin, and practice is required. Here the model should be slow and nose high, but not climbing.

At the start of the spin, rudder should be applied in your preferred direction and the speed of the model should be low enough to ensure that application of this rudder input stalls the inner wing. This is where lightly loaded fun-fly or 3D models fall down, especially so in windy conditions as it's very difficult to force them to a properly stalled attitude without climbing. The model should not first stall and then spin, rather the entry should be smooth and transitional.

Ailerons can be used, but you shouldn't apply them until the model has started to fall. The prohibited flick entry manifests itself by one wing of the model rising as the spin is begun, and the examiner will be watching very closely for an opportunity to fail you here.

Three rotations are complete when the model has spun back around to the into-wind heading three times. It sounds obvious I know, but at the time three turns are completed you have to stop the spin. That's not to say you should wait until three turns are finished and then stop the spin during a fourth. Rather, you must stop the spin bang on completion of the third rotation. Tricky to do, and many models won't simply stop spinning on the correct heading when you release the controls, especially if you've used aileron to aid rotation. You may however find it sufficient to release the controls as the third rotation approaches its end and then apply a swift input of opposite aileron to stop any continuing rotation dead in its tracks.

Some small allowance can be made for the heading of the model to be slightly off, but no more than, say, 10 to 15°. The model can also drop

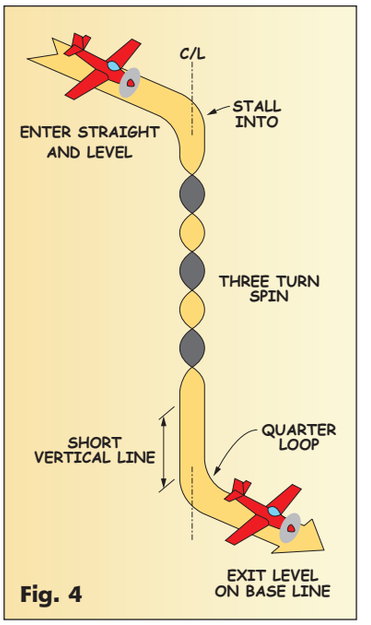

Fig. 4

Many trainers are 'B' certificate capable although there are some that determinedly refuse to spin. If this is the case, you should consider using another model.

If you claim your model is too fragile to spin then you clearly didn't select it properly before the test and will need to find another.

from the spin rotation to a vertical diving line before recovering onto the correct heading with elevator input only, back to straight and level flight. Note that you can't end the spin in a vertical dive 90° out of shape and quarter roll on this down line to adjust your heading - this would be a fail. The spin finishes with the model flying straight and level into wind.

VARIATION

The BMFA allows a variation on the spin, but it's not an option that the pilot can choose prior to the test. For aircraft that will not spin, a spin attempt resulting in a spiral dive (not necessarily of three turns) will be acceptable. A tricky one, this. As an Area Chief Examiner I don't like to see spiral dives in a 'B' Certificate flight, and indeed they are rare. It may be that the model a candidate is using simply will not spin without fundamental changes to its set-up, and it's not the model that the examiner is testing. The examiner may only accept a spiral dive before the start of the test if he can satisfy himself (perhaps even by flying the model) that the aircraft will not spin. If the spiral dive results from a correct spin entry as described earlier, the examiner is well within his rights to ask you to try again until he's absolutely sure that the model isn't going to spin despite your correctly stalled entry, correct control inputs throughout and best efforts to make it do so. Your exit from the spiral dive must be exactly the same as for the spin with the model ending its rotation on a heading into wind, recovering to straight and level flight into wind on the correct line.

The reason a spiral dive may not be permitted to complete three full turns is due to the dramatic loss of height (at speed) this manoeuvre uses in comparison to a correctly flown spin. If you claim your model is too fragile to spin, you didn't select it properly before the test and shouldn't be using it.

Next month we'll start bringing the model down towards the ground as we look at the overshoots, opposite hand circuits and landing. The test is nearly over now - how are you doing with swotting up those safety codes?