

Aerobatic

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**BRITISH MODEL FLYING ASSOCIATION
THE R/C ACHIEVEMENT SCHEME**

**TEST STANDARDS for CHIEF and CLUB
EXAMINERS**

GUIDANCE for TEST CANDIDATES

**THE 'C' CERTIFICATE
(AEROBATICS)**

2023 ISSUE

(Mar 2023)

Achievement Scheme Information & Communication

The BMFA Achievement Scheme provides every RC flyer the opportunity to set themselves an achievement target to aim for, and then have their progress assessed and confirmed by an examiner.

It is important that All those involved in training, examining and preparing for the tests, are well informed and up to date with all that the scheme has to offer. To this end, and to aid communication, important information regarding scheme developments, as well as details of all of the tests and their associated guidance documents, are made available to everyone via a number of sources, which include:-

- The Achievement Scheme website - <http://achievements.bmfa.org>
- The BMFA website - <http://bmfa.org>
- The BMFA News
- The Achievement Scheme closed Facebook group

It's important to appreciate that **ALL** of the scheme documents are reviewed and updated on an annual basis. Whichever document you are using, you will know if you have the right one, simply by looking at the date on the front cover. If it's not dated with the current year, it's the wrong one !

Most BMFA Clubs have Club Instructors/Examiners who will be familiar with the scheme and what is expected of anyone thinking of participating. If your club does not have a club examiner then each BMFA Area has an Achievement Scheme Coordinator (contact details can usually be found on the BMFA Area website) who can usually help in coordinating tests, or answering queries about tests etc. All BMFA Areas have Area Chief Examiners who would normally undertake Club Examiner tests, but are also available to help out with club tests, if requested. Importantly, they are also very knowledgeable about the scheme and its requirements. Area coordinators can often find an ACE that is close to your club, if you are having difficulty arranging for a test.

All BMFA Achievement Scheme & training documents are available to download from the BMFA Achievement Scheme website <http://achievements.bmfa.org>. You can also register your email address with the Achievement Scheme website and receive email notification of any news flashes, notification of scheme events and updates to documentation etc. as soon as they are published.

The Achievement Scheme also has a closed Facebook group (you just have to apply to be included) where comment and queries can be posted and examiners/instructors and members of the Achievement Scheme Review Committee can answer questions, or offer clarification.

If you have any query about the scheme or constructive comment on the scheme you can contact the Power/Silent Flight Scheme Controller (RCPAS@bmfa.org), or the Achievement Scheme Review Committee, via the BMFA Office.

General

The Achievement Scheme is run by the BMFA as a National Scheme and it is open to all model flyers. Where a non-member wishes to participate in the achievement scheme the examiner who will be conducting the test must inform the BMFA office via email or telephone no later than the day prior to the test being carried out of the non-member's full name, address and the date that the test will be conducted. This enables the BMFA to extend insurance at suitable levels for the day of the test. If this procedure is not followed the test will be invalid.

The 'C' Certificate (Aerobatics) has been designed to give a pilot who has already attained a 'B' Certificate an opportunity to take a further test to show more advanced skills. The 'C(AE)' Certificate is not a substitute for the 'B' but is a personal achievement level that will be shown as an endorsement on the pilot's BMFA membership card.

The examination for a 'C' (Aerobatics) Certificate may be taken on application to your Area Achievement Scheme Co-ordinator. The examination will be carried out by either one Area Chief Examiner and one Club Examiner, both of whom must be Fixed Wing qualified, or two Chief Examiners, one of whom must be Fixed Wing qualified. The lead Chief Examiner involved in a test will be appointed by the PAS Controller.

To apply to take the 'C' Certificate (Aerobatics), the candidate must already hold the 'B' Certificate (Fixed Wing).

The 'C' Certificate (Aerobatics) is not a 'show licence' but is a way to encourage the development of more advanced personal flying skills by meeting, and being tested to, a recognised national standard.

The candidate for the 'C' Certificate (Aerobatics) should have studied the BMFA handbook and have a considerable depth of knowledge of model flying in general.

Legal Responsibilities

Only pilots with a suitable model that are operating legally are eligible to take the test.

There are clearly defined legal requirements for the operation of Small Unmanned Aircraft (model aircraft), from passing a CAA (or BMFA) legal & safety knowledge test before piloting a model, to registering with the CAA as an SUA Operator (can also be done via the BMFA) if the pilot is also the owner and operator of the model aircraft, then ensuring the SUA Operator identity number is appropriately attached to the model. There are also restrictions on where a model can be flown and the heights and distances from people, property, vehicles or structures that the model can be operated. Finally, there is a legal requirement to operate the model safely e.g. ensuring the model is 'fit for safe flight' and the pilot is in a fit state to undertake that flight, as well as the site and weather conditions being suitable.

The Model

The candidate for the 'C(AE)' Certificate will need to fly a model that is capable of aerobatics but that does not necessarily mean a competition aerobatic model. In fact, the test can be performed with many four channel fixed wing models. The options allowed in the test mean that, although a basic trainer will not be suitable, a strong and agile high wing aileron trainer could probably cope if adequately powered, with adequate rudder authority, well-trimmed and, above all, well flown.

Having said this, on no account may the candidate use the performance of the model as an excuse for a poor performance on their part. For instance, a candidate flying a model with a slim fuselage through a knife edge manoeuvre accurately deserves the credit but one who makes a mess of the manoeuvre with the same type of model cannot say that it is the fault of the model. You should make no allowances on this point; the selection of the model to do the manoeuvres selected in the test is the responsibility of the pilot and it is the pilot you are testing, not the model.

The minimum weight of the model will be 2.5 kg.

Similarly, the type of model presented cannot be used as an excuse for not completing certain manoeuvres. A pilot cannot turn up with a twin, for instance, and then say that the spin is too dangerous because the model would not pull out of it.

Another important point to remember is that the candidate is not expected to build or even own the model they use. There is no reason why a flyer who does not own a suitable model could not borrow one from a friend or clubmate.

The use of a gyro or autopilot is not allowed during the test. If any such system is fitted to the model it must be disabled during the test and you should check that this has been done.

Buddy Box Systems

Buddy leads and other dual control training aids must not be used during any achievement scheme test.

Height and Speed

The 'C(AE)' certificate candidate should be a confident pilot and this should show in the height and speed at which they fly the test. The circuit height for the majority of the test should be consistent and should be between 50 and 100 feet (that is roughly one and a half to three houses high) and the pilot should make intelligent use of the throttle throughout the flight. This is an important factor and you should particularly watch out for it. A pilot who flies at take-off power throughout the whole flight should not pass; they are not thinking.

Consistency

The combination of appropriate heights and good use of the throttle should mean that, although the model will be flying at various heights throughout the test, these heights will be flown in a steady and consistent manner and you should note if the height flown varies significantly when it doesn't need to.

It is a requirement that "all manoeuvres are carried out in front of the pilot" with the implication that the model will be crossing in front of the pilot just beyond the take-off and landing area on several occasions during the flight. Care should be taken by the pilot that the line of approach each time is consistent and you should take particular note if it is not.

Unnecessary varying of height and inconsistent lines are valid reasons to fail a candidate at this level as they give a good indication of the flyers general level of competence and they

should strongly influence your final decision. Poorly flown height or lines are a sure sign that the flyer has either not practised the test or has not reached the required standard of flying and are legitimate reasons to fail them.

Crossing Distance

The distance out from the pilot is also extremely important. Any crossing manoeuvres during any one flight should be performed at a consistent distance out from the pilot and this should be between 50 and 80 metres, depending on the size of the model being used to take the test, and you should establish this with the candidate prior to the test. Flying closer in or further out than this should be brought to the attention of the pilot and if he does not then comply with the requested crossing distance he must fail. Remember that 50 metres is the width of a standard RAF runway.

Continuity

Although the manoeuvres are set out in such a way that they can be flown one after the other as a schedule, this is **ABSOLUTELY NOT** what is expected. The candidate can opt to fly the test in this way but it is not mandatory. However, the manoeuvres must be flown in the order specified for the test i.e. (a), (b), (c) etc. – see test checklist. Most flights will have a combination of direct transitions and positioning circuits between manoeuvres and will help if you discuss this with the candidate before the flight. You, of course, should be watching any extra circuits just as carefully as the rest of the flight as they can tell you a lot about the competence of the flyer.

A pilot who transitions directly from one manoeuvre to the next is not to be penalised as this is quite acceptable but watch out for the pilot who hasn't practised enough. Trying to fly the test in this way can get them into some very awkward positions.

The 'C(AE)' certificate allows an intermediate landing. The exact wording of the rule that appears in the member's handbook is - 'The test must be completed in one flight. Exceptionally, at a pre-determined point in the flight an intermediate landing may be permitted for the sole purpose of refuelling or the fitting of a freshly charged battery. This landing may only be made with the prior consent of the Examiners.

This obviously makes it easier to take the 'C(AE)' with electric powered models although in exceptional circumstances it could apply to any model. You should be aware of the possibility of such an intermediate landing but under no circumstances must you allow an unscheduled landing to be passed under the rule. It must be applied exactly as written and any landing must take place at the point in the test agreed prior to the flight.

Trim

It is expected that the candidate will start the test with a model that has been trimmed out previously. Any fine trimming carried out by the pilot during the flight should not be obvious to the Examiners.

Nerves

Quiet competence is what you are looking for during the flight but some candidates will be nervous and you may make a minor allowance for this. If the flyer is very nervous you should seriously consider abandoning the test as they are obviously not ready to be tested to 'C' certificate level.

A Caller

The candidate is allowed to have a caller standing with him during the flight. The caller's only duty is to remind the pilot of the manoeuvre to be flown next. No prompting of the pilot during manoeuvres is allowed and the caller may not discuss any matters with either the candidate

or the Examiners during the flight. Failure to abide by this will mean that the candidate fails the test.

Repeating Manoeuvres

At 'C' certificate level the candidate should be competent to fly the test with very few errors. If you see any major faults the test must be failed. It may be, however, that the candidate will make a **minor** mistake on a manoeuvre and if you are not fully satisfied with what you have seen you should consider asking for the manoeuvre to be repeated.

Some judgement is called for on your part here. A major mistake is grounds for failing the candidate, especially if loss of control has occurred or a dangerous situation has arisen. You should definitely **not** let them have two or three attempts at each manoeuvre until they get it right but you must give yourself the best chance of assessing the competence of the pilot you are testing.

You should consider what you have seen the model do and if you think to yourself "could be better" then a request that the manoeuvre be repeated may be considered. Be extremely careful about using this option, however, as you could be degrading the worth of the test. It must not under any circumstances degenerate into a series of 'practice' manoeuvres.

Repeating the Test

The rules allow two attempts at the test in a day. If the candidate fails the first of these you must consider their performance in deciding what to do next. Many failures are generally good pilots and the failure could be a borderline case. In these circumstances it might be appropriate to offer one or two coaching flights and then a repeat of the test. Remember that some of the candidates may be unfamiliar with flying under pressure and might do very well on the second test.

On the other hand, it will probably be obvious to you on many occasions that the pilot you are testing is simply not ready for the test they are taking. In this situation it is better that you tell them so quite clearly. Some may have a lack of understanding of the manoeuvres and positioning. The offer of a little coaching may be far more useful to everyone than simply telling the candidate that they have failed.

Interruptions to the Test

A possibility that may occur during a test is an engine failure part way through which could very well lead to a damaged model. If this is the case then the test obviously cannot continue and you should invoke the rule that the test should be performed in one flight and count the flight as one of the two attempts allowed during the day.

Genuine engine trouble or even engine-out situations during the test may be dealt with in one of three ways.

If the test was being generally flown in a satisfactory manner and the problem can be rectified quickly then the candidate may be allowed to continue the test from the start of the manoeuvre in which the problem occurred.

If the problem cannot be rectified quickly but you consider that it was a genuine unforeseen occurrence, you may annul the test and not count it as one of the two attempts.

If the test up to the point of failure was not satisfactory, you have the option to cancel the rest of the test and count the flight as one of the two attempts allowed during the day.

Obviously, you will have to use your judgement on this matter as there will rarely be black and white situations but how they handled the emergency should be of great interest to you when you come to review the candidate's overall standard of flying.

Standards of Examining

The standard of judging applied by the Examiners during a 'C(AE)' certificate test should be based on the standard required of the examiner during a 'B' certificate test. The manoeuvres are not to be judged as they would be in an aerobatic competition, the manoeuvres are not required to be flown as a schedule and no marking will take place.

The main point of judging will be that all the manoeuvres flown should be recognisable and flown within the criteria laid down in this Standards booklet. Accuracy and safety will be a requirement and the opinions of the two Examiners involved, based on their experience, will be the main factor in the decision to pass or fail the candidate.

They will expect to see a controlled, accurate, safe and well thought out flight with considerable piloting skill on display. Unsafe or 'flashy' flying will not impress – cool judgement and smooth flying will.

In fact, the 'C' should be flown and judged just like a 'B' certificate.

Helpers for Disabled Candidates, Young Candidates and Others Who have Requested Help During the Test

When disabled or young candidates present themselves for the test it may be that they will not physically be able to perform all the actions that most candidates can. At times, other candidates may also request help with certain physical aspects during the test (they may, for instance, have an injured finger). There will be times when you, as an Examiner, will think 'how much can I relax the test requirements for this person'.

Some Examiners make the decision to make no allowances at all but this effectively bars many people from attempting the tests. If we think of the achievement scheme as a true national scheme then we must consider how we can accommodate candidates, not how we can stop them from participating.

The answer, of course, is that you, as an Examiner, must make on-the-spot decisions about what you will allow during the test and, in such cases, you are within your authority to take such decisions. The guidelines set out below may help but at all times the two items at the end of this section must take precedence. They are not negotiable and mean that, whoever the candidate is, they have to convince you that they know what they are doing or what is happening for the full duration of the test.

For instance, a disabled flyer may have difficulty handling the model and may not be able to carry it out to the strip or retrieve it after the flight. The sensible use of a helper is certainly allowable in such cases but it is essential that they only do what the candidate asks them to do. Pre-flight checks and engine starting may be another problem area that can be overcome by a helper but you should expect the candidate to do as much of the work as possible themselves and they should be able to talk you through anything that the helper does for them. Be sure to discuss all this with the candidate before starting the test.

All of these comments can apply to younger flyers too but there is an added complication with engine starting. Many parents are very unhappy about letting their children near a running engine and will not allow them to start their own engines. This is a perfectly valid view and, again, is a case where a helper can be used. If this situation does occur with the younger candidates, however, you should insist that they do all the pre-flight and preparation work themselves, up to applying the starter to the engine. If they cannot do this then they should not pass.

After engine start, the helper can adjust engine controls and carry the model but only on the instructions of the candidate.

In all cases:

(1) If, at any time, the helper takes over the decision making process from the candidate then the candidate must fail.

(2) You can make no allowances whatsoever for anyone during the flying of the test. The candidate can either perform the flight manoeuvres as specified or they can't. If they can't then they must not be passed.

Make sure in your briefing that both the candidate and the helper are fully aware of both of these points.

Administration

There are specific forms for Examiners to use during the Aerobic 'C' test, and if you do not have one then a call to the BMFA Leicester office will have some in the post to you by return.

Completed forms should be sent to the Leicester office within seven days of the test and, whilst they must be filled in by the Examiner, they may be sent in to the office by either the Examiner or the Candidate. Pass forms can also be submitted online by examiners via the Achievement Scheme website at <https://achievements.bmfa.uk/> under the menu item "The Tests". Passwords for the Achievement Scheme Website form submission are available to current registered examiners from the BMFA Office. You should take great care that all the details are filled in correctly, especially the successful candidates **NAME** and their **BMFA number** (this can save a great deal of confusion). If the candidate is not a BMFA member then it is especially important that you get their name and address correct and in full.

This is very important as what is seen on the pass form is what will appear on the final certificate. It is embarrassing for you to have to send one back to be re-done and it gives the candidate a definite impression of sloppy work by someone.

The Test

(a) Carry out pre-flight checks as required by the BMFA safety codes and demonstrate an understanding of 'SWEETS'.

The candidate must demonstrate their understanding of risk assessing a site for flying by talking through SWEETS as described in the Member's Handbook. A candidate must be expected to be able to demonstrate how they have come to the decision it is safe to fly at the location, which must still be applied even if the site is an established flying site.

The candidate must demonstrate the model's failsafe, which as a minimum should be set as 'throttle to idle' upon loss of control signal. The candidate must ensure this is done safely following the guidance in the Member's Handbook. A candidate must be failed immediately if the candidate does not make the model 'safe' by means of either a suitable restraint or removing components that might spin uncontrollably such as propellers or blades.

If the failsafe does not work when tested for any reason, then the test must be considered a failure.

The pre-flight checks are laid out clearly in the BMFA handbook. Ask the candidate to go through their checks as if the test flight was their first flight of the day. Particular attention should be given to airframe, propeller, control linkages and surfaces.

Points to look for are that the candidate has a steady and regular ground routine, especially when starting and tuning the engine. Nothing less than a competent performance is acceptable, the candidate must be fully in control of what they are doing when preparing their aircraft for flight.

A neat ground layout is essential and is to be expected from 'C' certificate candidates.

A poor performance in this area is grounds for failing the candidate. However, you should be making mental notes of all aspects of the candidates competence; even a good performance may have some faults and this might have an effect on a 'borderline' case in other areas.

Pay particular attention to the way the candidate uses the local frequency control system and make sure that they fully understand it and use the correct sequence appropriate to their model. For 35 MHz, this is usually 'get the peg, Tx on, Rx on'. For 2.4 GHz, the candidate should be aware of any local transmitter usage limitations and if a flight peg is required, it must be obtained before the usual Tx on, Rx on sequence. Some radio equipment and, occasionally, a specific model requirement requires that the Rx be switched on first and, if this is the case, the candidate should explain this clearly to you.

With electric powered models, take note that the candidate is aware that the model is 'live' as soon as the flight battery is plugged in and that they take appropriate safety precautions. If a separate receiver battery is fitted, the candidate should have the opportunity to check the operation of the radio equipment before the flight battery is plugged in.

Watch carefully and take note that the transmitter controls, trims and switches are checked by the pilot.

All candidates are required to be aware of the local the frequency control system and anyone who is required to use it but switches their radio on before doing so should be failed on the spot.

(b) Take off and join the circuit in whichever direction is appropriate for the conditions.

The model must taxi out from a safe position in front of the pits/pilots area. **Taxying out of the pits is an instant fail.** Prior to taxying out the pilot should inform other pilots flying that his model is going out onto the active area.

Take off must be done with the model a safe distance from the pits area and on a line which does not take the model towards the pits, other people or any other danger area. The pilot must stand in the pilot's area during the take off. If the pilot has to stand out on the strip (behind the model when it starts its run) then he is not ready to take this test.

Take off should be straight with the model not being pulled off the ground too soon. Abandoning the take-off for genuine reasons should not be penalised. It's far better that the candidate shows that they are thinking about what they are doing rather than trying to coax a model with a sick engine into the air. If a take-off is aborted in a safe manner you should immediately reassure the candidate that they will not be penalised for taking correct actions, even though these may conflict with what the test requires.

Climb out should be at a steady angle and straight until operational height is reached when the model should be levelled, the throttle brought back to cruise power and the model established in the circuit.

The type of circuit is not stated so either racetrack, rectangular or circular is acceptable. This choice of circuit type applies to the rest of the flight as well except when a type of circuit is specified for a manoeuvre.

On completion of the circuit, the model will be flying into wind past the front of the pilot and, for safety reasons, just beyond the far edge of the take off area. Tell the candidate prior to the flight the line that you want them to be following.

You must make sure that the candidate is clear on this, the line will be set by the model flying across in front of them on a heading which should be agreed before the flight (usually, but not always, into wind) and passing over a set point. This first pass in front of the pilot is extremely important as it sets the standard height and line for the rest of the test and this standard height and line will be referred to often in these notes.

(c) Perform a slow roll in either direction.

The manoeuvre should be flown at standard height and line. The centre point of the roll should occur as the model passes in front of the pilot. The roll should be of at least four seconds duration and the application of both elevator and rudder control at the appropriate times must be obvious to the examiners.

Throughout the duration of the roll, the heading and height of the model should not deviate substantially although minor deviations are acceptable.

(d) Fly Inverted straight flight for a minimum of 5 seconds below 30 feet (10m) with one roll from inverted to inverted.

Run-in line should be standard, descending to about 30 feet and the manoeuvre should be performed with the centre of the roll positioned exactly in front of the pilot. If the initial run-in is upright the model must be half rolled to inverted before the 5 seconds run commences.

The roll must not be a 'twinkle roll' but must be slow enough to demonstrate to the examiners that at least the elevator has been used at the appropriate point in the manoeuvre.

After the manoeuvre, the initial climb-out may be either upright or inverted.

Throughout the duration of the manoeuvre, the heading and height of the model should not deviate substantially although minor deviations are acceptable. Note that 30 ft is roughly the height of a standard house.

Note that this manoeuvre is NOT a slow roll from inverted to inverted. It is a period of straight inverted flight with a standard speed roll at the centre.

(e) Perform an inverted 2 ½ turn spin, exit to inverted reverse heading.

The spin should be performed in front of the pilot but a little further out than the other manoeuvres. The height should be appropriate to the type of model being flown and the pilot should gain that height in a smooth and neat manner.

The model must be flown inverted into wind and decelerated smoothly following a horizontal flight path, until the spin is entered at a point approximately in front of the pilot. The model may be lined up on the initial approach upright and then rolled to inverted once on the correct heading.

Ailerons may be used in the spin (and some models will not stay in a spin without aileron being used) but they must **NOT** be applied until the model has begun to fall. Note that this does not mean that the model must actually be **spinning** before the ailerons are applied but it must at least be **falling** into the spin.

A 'flick' entry, which is not allowed, will always result in one wing of the model **rising** as the manoeuvre is entered and part of the first rotation will take place in the horizontal plane instead of the vertical. In most cases it will then be very difficult to decide exactly when to start counting the turns of the spin, especially if the manoeuvre has been entered at too high a speed. Look carefully for all these points and insist on a correct low speed 'falling' entry to the manoeuvre.

After an appropriate time (depending on the model) controls must be centralised, any anti-spin actions taken (sometimes necessary) and the model recovered inverted onto the opposite heading it had when the manoeuvre was started. After the manoeuvre, the initial climb-out may be either upright or inverted.

Allowances should be made for the heading of the model to be slightly off line (no more than ten or fifteen degrees) as the spin finishes but this should be corrected during the pull out. Do not accept a manoeuvre which requires more correction than this during the pull out.

If the pilot cannot take the model at least through the beginning of the spin in a competent fashion it is a sure sign that they have not practised the manoeuvre. If they make a good job of the entry but are not accurate enough on the exit, you might consider allowing another attempt at the manoeuvre as the spin can, on some occasions, be a difficult manoeuvre to predict, depending sometimes on the model as much as the pilot.

If the model shows a genuine inability to spin you should fail the candidate on the basis of attempting the test with an inappropriate model.

Do not accept any excuses from the pilot that his model is too fragile to spin; the section on the suitability of models applies.

(f) Perform a square loop with ½ roll on both vertical legs.

This should be performed from standard height and line. Each leg should be of approximately equal length and all corners should be of approximately equal radius.

The half rolls should be positioned half way up or down the vertical legs although slight deviation from this is acceptable. The top leg should be level, not climbing or descending.

Throughout the duration of the manoeuvre, the heading of the model through the horizontal legs and the line through the vertical legs should not deviate substantially although minor deviations are acceptable.

(g) Stall turn with ¼ rolls on the ascent and descent, exit upright. Stall turn to be done with underside of model towards the pilot.

This should be flown from standard height and line and centred in front of the pilot, returning to standard height and line when the manoeuvre is complete.

The $\frac{1}{4}$ rolls should be approximately half way along the up and down lines. The model must be rolled so that the bottom of the model is towards the pilot. The stall turn must then be completed in the same direction as the initial run-in.

For instance, run-in from the left, pull up, $\frac{1}{4}$ roll to the left (shows the bottom of the model) then stall turn to the model's left (to it's right as you are looking at it). On the downline $\frac{1}{4}$ roll to the right, pulling out to standard height and on the same line as the entry.

The stall turn must be an accurate stall turn, not a wing over (i.e. the model must transition from vertically up to vertically down within it's own wingspan).

Although you should not expect a perfect manoeuvre, it should be an accurate stall turn. The vertical climb and dive should be near vertical and the throttle should be used in the appropriate manner.

(h) The candidate will then perform seven manoeuvres, selected from the list below. The manoeuvres and the order in which they are flown must be agreed with the examiners prior to the test.

(h.1) Knife-edge flight in either direction, below 30 feet (10m), for at least 4 seconds or longer at the discretion of the examiner.

Run-in line should be standard, descending to just below 30 feet before quarter rolling to knife edge. The manoeuvre should be performed so that the centre of the knife edge run is positioned in front of the pilot.

After the manoeuvre, the model should quarter roll to upright before climbing away to standard height.

Throughout the duration of the manoeuvre, the heading and height of the model should not deviate substantially. This is particularly important in the knife edge manoeuvre as deviations are very easy to introduce during the pass and, although minor deviations are acceptable, you should judge this manoeuvre quite 'hard'.

(h.2) Cuban 16 with half and full rolls

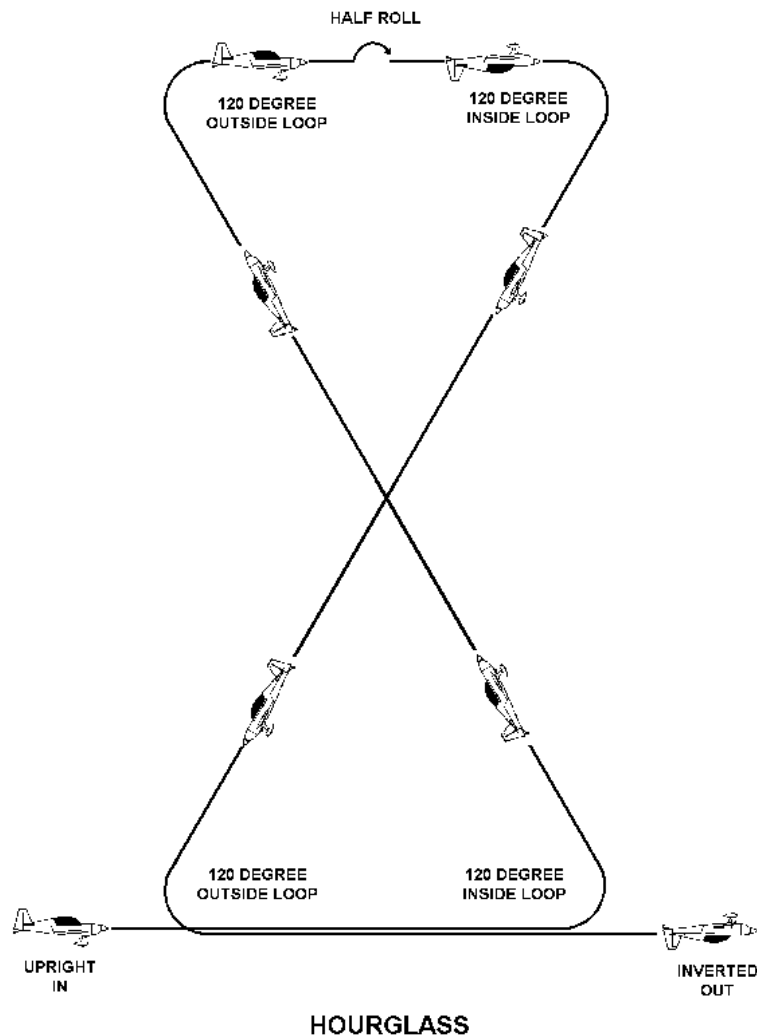
From level flight perform an inside $\frac{5}{8}$ loop to inverted 45 degrees down, full roll to inverted, perform a $\frac{3}{4}$ outside loop to upright 45 degrees down, half roll to inverted, $\frac{3}{4}$ outside loop to upright 45 degrees down, full roll to upright, $\frac{3}{4}$ inside loop to inverted 45 degrees down, half roll to upright and recover in level flight at the point where the first loop was started.

This should be performed from standard height and line. Each loop should be of approximately equal radius and the two down lines should be at 45 degrees. Each rolling manoeuvre should be centred approximately on the crossover point of the downlines.

Throughout the duration of the manoeuvre, the heading of the model should not deviate substantially, although minor deviations are acceptable. Significant differences in loop radius, downline angles and roll positions are not allowable and the model must exit the manoeuvre within a few degrees of initial heading and a few feet of initial height.

The manoeuvre should be positioned so that the crossover point of the eights is approximately in front of the pilot. This is controlled initially by starting the first looping manoeuvre after the model has flown past the pilot for an appropriate distance.

(h.3) Hourglass with half roll in top line



From level flight perform a 1/3 inside loop through approximately 120 degrees to inverted 60 degree climb. At the top of the climb perform a 1/3 outside loop to level flight. Half roll to inverted. Perform a 1/3 inside loop through approximately 120 degrees to upright 60 degree dive. Perform a 1/3 outside loop through approximately 120 degrees to level flight, exit inverted.

The looping parts of the manoeuvre should be performed reasonably tightly, significantly tighter than a 'normal' loop and each should be of a consistent size.

The top leg should be level and the vertical plane of the manoeuvre should be maintained, with little wandering off line. Exit height should be consistent with the entry height.

An exact 60 degrees for the climb and dive elements is not required but the angle should be near that and be consistent.

(h.4) Complete two consecutive outside square loops, from the bottom.

That is, from level flight, half roll to inverted and then push to vertical. Push at each corner, half rolling from inverted level flight to upright at the completion of the manoeuvre.

This should be flown from standard height and line and centred in front of the pilot, returning to standard height and line when the manoeuvre is complete.

The square loops should be superimposed on each other with each leg of approximately the same length and each corner of approximately the same radius. Throughout the duration of the manoeuvre, the heading of the model through the horizontal legs and the line through the vertical legs should not deviate substantially although minor deviations are acceptable.

(h.5) Double stall turn, entry and exit inverted.

That is, entry inverted, push to vertical, stall turn away from the flightline to vertical down, pull half inside loop to vertical up, stall turn away from the flightline to vertical down, push to recover from vertical, exit inverted.

This should be flown from standard height and line with the bottom of the half loop between the stall turns in front of the pilot and at the same height as the run-in. The exit should also be at standard height and line. The model should half roll and run in inverted, pushing to vertical before reaching the pilot. The direction of the stall turn must always be away from the flight line behind the pilot.

Although you should not expect a perfect manoeuvre, the stall turns should be at approximately the same height and accurate, not a chandelle or a wing over. The vertical climbs and dives should be near vertical, the throttle should be used in the appropriate manner and the model should not fly over the top the stall turns in a semi-circle.

Substantial deviations from lines and heights are not acceptable but minor allowances can be made.

(h.6) Inverted rectangular figure of eight at a constant height of no more than 50 feet (15m).

The descent to below 50 feet (just over one house high) should take place before the model is half rolled to inverted and the manoeuvre commenced. The start and finish of the manoeuvre should be on standard line. The first turn should be in front of and away from the pilot.

Watch out for the turns being flown either too tight or too wide (most will try to fly them too tight and almost try to put a ninety degree 'snap' turn in, which is not a requirement). The size of the two squares should be reasonably equal.

Wandering in height should be minimal and you should see a good square manoeuvre with the pilot paying attention to the correct direction of flight throughout. At the end of the manoeuvre, the model should be half rolled to upright before it begins its climb away.

(h.7) Pull to vertical, one vertical roll up, push to vertical down, one vertical roll down, pull to upright.

This should be flown from standard height and line and centred in front of the pilot, returning to standard height and line when the manoeuvre is complete.

The rolls should be approximately half way along the up and down lines and the model may be rolled either way. Whatever the pilot decides, the push over must be on the original line of the initial run-in and it must be reasonably tight although a stalled manoeuvre may be performed, it is not required.

Although you should not expect a perfect manoeuvre, it should be reasonably accurate. The vertical climb and dive should be near vertical and the throttle should be used in the appropriate manner.

(h.8) Double avalanche. Two consecutive inside loops, each with positive snap roll at the top.

This should be flown from standard height and line and centred in front of the pilot, returning to standard height and line when the manoeuvre is complete.

The loops should be superimposed on each other with each being approximately the same size. The snap rolls should be of the 'fully stalled and all controls at maximum deflection' type. Very fast 'twinkle' rolls (which may look like snaps on first viewing) are not acceptable.

Throughout the duration of the manoeuvre, the heading of the model in the looping plane should not deviate substantially although minor deviations are acceptable. The snap rolls should be positioned at or near the top of the loop. The loops should generally be round although it is accepted that the snap roll may tend to stretch the manoeuvre slightly oval.

(h.9) Knife edge 45 degree climb with one positive snap roll from knife edge to knife edge in either direction.

This should be flown from standard height and line and the initial pull up from level flight to 45 degrees should be performed approximately 80 metres before the model crosses in front of the pilot and the quarter roll to knife edge (either way) should be performed immediately after the pull up.

The positive snap roll should be performed as the model crosses in front of the pilot and the 45 degree knife edge climb should then continue and be approximately the same length as the climb before the snap. The model then quarter rolls to upright and then pushes back to level flight on the standard line but obviously at a higher level than the start..

Throughout the climbing manoeuvre, the heading of the model should not deviate substantially although minor deviations are acceptable. The snap roll may affect the line of the upper climb but this should be immediately corrected by the pilot.

(h.10) Rolling Circle.

The manoeuvre should be started and finished on standard line and height, should be started and finished in front of the pilot and with the circle going away from the flightline. The circle should be clearly round and of reasonable diameter. The number of rolls in the circle is not specified and the candidate can perform as many as he wishes. However, as the circle finishes, the model should be upright and just finishing a roll.

Good height control, however, is essential, and no significant deviations should be noticed during the circle. Small deviations from circular are allowed but you should see a recognisably round manoeuvre. It is also important that the finish of the manoeuvre should be on the same line as the start. This manoeuvre can be difficult to control in this respect and you can allow a little leeway but a significant difference between run-in line and run-out line is not acceptable.

(h.11) Knife Edge Spin (Hanno Screw) 6 turn minimum.

That is, the Model from height in either direction enters a knife edge spin of at least 6 turns in the vertical down line. The fuselage not to be more than 30 degrees from horizontal, or wing not to be more than 30 degrees off vertical. The model recovers to a vertical down line and exits to upright in the same direction as entry.

(h.12) Blender (Somenzini Spin) in a vertical down line.

The Model from height in either direction, pushes to a vertical down line and completes a minimum of 3 x full aileron rolls before snapping through inverted in the same direction to a flat inverted spin of at least 3 turns. The model either recovers to the vertical down line briefly and exits in the same direction as entry, or exits to a Rolling Harrier in the same direction as entry.

(h.13) Rolling Harrier below 20 feet (6m).

The model at low level in either direction is flown through the stall to the Harrier position and completes a straight and level Rolling Harrier pass for a distance of 50m or longer at the examiners discretion.

(h.14) Inverted Harrier figure eight below 20 feet (6m).

With the model held in the inverted high alpha Harrier position, the pilot fly's a reduced size figure 8 circuit (25m) at a constant height not exceeding 6m, with the central crossover away from the pilot.

(h.15) 20 second Prop Hang below 20 feet (6m) with 3 torque rolls.

The model transitions to the steady vertical prop hang at low level in front of the pilot and over the take-off area. It is held at a height not to exceed 6m for a period of 20 seconds (or longer if required). During this period the model should complete 3 torque rolls. Aileron inducement may be used if required. The rolls need not be paused or continuous.

(h.16) Parachute/Elevator on a 45 degree down line.

From height and in either direction, the model transitions to the stall and is held in a controlled Parachute/Elevator descent (nose to be level or high) on the 45 degree down line to the established base line.

(h.17) Double Rudder Grind. Upright to Inverted to Upright on 45 degree lines.

At low level (below 10m) the model enters upright to the 45 degree up line. It quarter rolls to knife edge at the mid-point and Rudder Grinds to the 45 degree down line, quarter rolling to inverted at the mid-point and pushing to the 45 degree up- line before quarter rolling at the mid-point to Rudder Grind back to the 45 degree down line. It quarter rolls at the mid-point again before exiting upright on the established base line. The transition through inverted at the centre should be in front of the pilot.

(h.18) Double Stall turn with Wall entry and Wall to Harrier exit. (Flown in both directions).

The model flies at speed to a Wall followed by a short vertical climb to a stall turn left or right to the vertical down line. It transitions via a Wall at entry height exiting to an upright Harrier for a minimum of 3 seconds.. The manoeuvre is repeated at the opposite end in the opposing direction. Stall turns should be performed away from the pilot.

(h.19) Small Square Rudder Circuit with level wings Below 30 feet (10m).

The model completes a reduced size (25m) square circuit at constant height and medium speed. The wings to remain roughly level throughout. The model should not transition to the stall and should not Harrier the circuit.

(h.20) High Alpha Knife Edge with Half Roll at Centre Below 30 feet (10m).

The model enters a low level, high alpha, knife edge pass of constant height with a half roll to opposite knife edge at its mid-point and in front of the pilot. The knife edge pass to traverse a minimum distance of 50m or further at the examiners discretion.

(i) Perform a landing circuit appropriate to the site and conditions.

This may be a square circuit with four turns or 'racetrack' with two. Watch out for the downwind leg not being flown parallel to the upwind leg and the turns being flown either too tight or too wide. If a square circuit is flown, the throttle should be reduced either just before or just after the last crosswind turn with the crosswind leg descending into the turn on to final approach. If a racetrack circuit is flown, the throttle should be closed before the final 180 degree turn and the turn itself should be flown descending.

Once established on final approach, on line and descending, the throttle may be used in an appropriate manner. You should take note that he has visually checked the active area before and during the manoeuvre (watch for head movements).

(j) Perform a landing, wheels to touch within 5 metres of a pre-designated point.

The pilot should call **LANDING** when on finals. Visual checks of the active area are still very important and must be seen to be done even at this stage of the landing; again you should watch for head movement.

If the candidate opens the throttle and climbs away then they should have a very good reason, such as people on the runway. Any reasons offered by the candidate for an unscheduled overshoot cannot include not being lined up correctly or anything similar. However, a forced overshoot for good reasons should not be penalised and a new approach and landing should be allowed.

Touchdown should be smooth and within the designated landing zone and the model should decelerate and turn off the runway in a controlled manner. Ground loops and nose over landings are not acceptable at this level.

The model should taxi in from the landing area, stopping a safe distance from the pits and other pilots, ready for recovery. **Any attempt to taxi close to other pilots or close to or into the pits is an instant fail.**

The candidate should agree with the examiner beforehand whether they intend to take the transmitter with them when retrieving their model or choose to leave it with a competent person. The candidate must explain the safety considerations behind their decision, which must be agreed with the examiner. If the candidates elects not to take the transmitter and no one else is available to hold it then you should offer. When the model has been retrieved and returned to the pits area the transmitter should be returned to the pilot. Whatever process is

agreed, it must also be in accordance with any relevant club rules, as appropriate. Generally, for 2.4GHz operations and with suitable consideration, candidates should be able to give a robust safety based argument for taking their Tx with them to recover the model, if it has landed on the normal landing/take-off area. Conversely, it is difficult to see how any such argument could be made for candidates using 35MHz or 27MHz equipment.

If the model does not taxi in then the Examiners should take this into account when assessing the candidates flight as a pilot at this level should be capable of controlling his aircraft in all active phases of the flight. If the candidate has performed an excellent flight then not taxiing in might not weigh too heavily but it might well affect the decision if the candidates flight was average but passable. In borderline cases, it might be appropriate to ask the candidate to repeat the take-off/landing manoeuvres so that safe taxiing out and in may be demonstrated.

(k) Complete post flight checks as required by the BMFA Safety Codes.

The post flight checks are set out clearly in the handbook but you should watch particularly that the 'Rx off, Tx off, frequency system cleared' sequence is followed correctly.

(l) Exceptionally, at a pre-determined point in the flight an intermediate landing may be permitted for the sole purpose of either re-fuelling or the fitting of a freshly charged flight battery. This landing may only be made with the prior consent of the Examiners. The pre-determined point may be either after a specific manoeuvre or at a specific time of flight, whichever is requested by the candidate and agreed by the Examiners.

Full pre and post flight checks are not normally required during an intermediate landing and take off unless the model suffered a hard landing. However, the candidate should give the model at least a quick visual examination whilst on the ground.

(m) Two attempts per examination will be allowed in any one day.

(n) All manoeuvres must be carried out in front of the pilot.

This accepts, of course, that the pilot will remain facing away from an imaginary flightline which will be behind him.

The Interview

'The applicant will be interviewed by the Examiners and must display a satisfactory depth of knowledge of model flying in general and, in particular, of safety matters based on the BMFA Safety Codes for General Flying and Model Flying Displays.'

If you are a Chief Examiner, you should already be familiar with the interview procedure that is expected when you test Examiner candidates (if you are a Club Examiner, you will have endured the procedure yourself at some time).

The questioning for the 'C' certificate should be approached in exactly the same manner and the depth of questioning and the level of the candidates responses should be about the same. However, you obviously won't be asking the 'C' certificate candidate questions about them testing Examiner candidates.

The whole point here is that a short list of questions such as you might have in mind for a 'B' certificate test is not sufficient. You can ask questions if you wish but the emphasis should be on a longer, more informal and deeper interview so that you can satisfy yourself that the candidate does have the required 'satisfactory depth of knowledge'.

Remember that on **no account** can a good performance in this section of the test make up for a flying test that you considered a failure. If you have failed the candidate's flying you should tell them at the end of the flying test. However, this does not mean that you shouldn't take them through at least part of the required interview and questioning. Your advice might help them prepare better for the flying test next time and the experience of being interviewed will probably make them less nervous about this aspect of the test in future.

On the other hand, it doesn't matter how well the candidate can fly, if they cannot satisfy you that they have the depth of knowledge of model flying and the BMFA Member's Handbook required, they should not pass. The achievement scheme is a test of both flying ability and at 'C' certificate level, depth of knowledge.

How long you talk to the candidate and how many questions you actually ask will depend on the circumstances at the time. For instance, if the candidate has done a good flying test, gives you confident answers to your queries and obviously knows what they are talking about, the questioning need not be prolonged. An acceptable test but with some rough edges can be offset to an extent by the candidate performing well during your talk with him.

A candidate who has done a test which you found just acceptable and who is not confident in their knowledge of model flying and hesitates on any questions you may ask should be interviewed for a significantly longer time and, if you are not satisfied you should not hesitate to fail them.

There is no list of approved questions and this part of the test is strictly the business of the two Examiners involved.

As a Examiner you should prepare yourself thoroughly for any testing that you do to this standard and, if you wish, you may sort out a list of sensible questions and, particularly, points of view to put to the candidate. Beware of being too rigid on this, however, as it's very easy to ask the same questions each time and word will pass from candidate to candidate

Remember that if you ask questions based on the BMFA Safety Codes; the candidate is not expected to reply to them 'parrot fashion'. You are looking for a 'thinking' pilot and common sense points of view with regards to safety and flying in general are what you should be looking for. It's more important that the candidate knows and understands the reasoning behind BMFA safety recommendations rather than being able to repeat them word perfect.

C' CERTIFICATE (AEROBATICS) Check List

(a)	Carry out pre-flight checks as required by the BMFA Safety Codes, including fail-safe	
(b)	Take off and join the circuit in appropriate direction for the conditions.	
(c)	Perform a slow roll in either direction.	
(d)	Fly Inverted straight flight for a minimum of 5 seconds at approximately 30 feet with one roll from inverted to inverted.	
(e)	Perform an inverted 2 ½ turn spin, exit to inverted.	
(f)	Perform a square loop with ½ roll on both vertical legs.	
(g)	Stall turn with ¼ rolls on the ascent and decent, exit upright. Stall turn to be done with underside of model towards the pilot.	
(h)	Select and perform seven manoeuvres from the list below.	
(h1)	Knife-edge flight in either direction, below 30 feet, for at least 4 seconds or longer at the discretion of the examiner.	
(h2)	Cuban 16 with half and full rolls.	
(h3)	Hourglass with half roll in top line.	
(h4)	Two consecutive outside square loops, from the bottom.	
(h5)	Double stall turn, entry and exit inverted.	
(h6)	Inverted rectangular figure of eight at a constant height, no more than 50 ft	
(h7)	Pull to vertical, one vertical roll up, push to vertical down, one vertical roll down, pull to upright level flight.	
(h8)	Double avalanche. Two consecutive inside loops, each with positive snap roll at the top.	
(h9)	Knife edge 45 degree climb with one positive snap roll from knife edge to knife edge in either direction.	
(h10)	Rolling Circle.	
(h11)	Knife edge spin (Hanno Screw) 6 turn minimum	
(h12)	Blender (Somenzini Spin) in a vertical down line	
(h13)	Rolling Harrier below 20 feet	
(h14)	Inverted Harrier figure eight below 20 feet	
(h15)	20 second prop hang below 20 feet with 3 torque rolls	
(h16)	Parachute /Elevator on a 45 degree down line	
(h17)	Double rudder grind. Upright to inverted to upright on 45 degree lines	

(h18)	Double stall turn with Wall entry and Wall to Harrier exit (flown in both directions)	
(h19)	Small square rudder circuit with level wings below 30 feet	
(h20)	High alpha knife edge with half roll at centre below 30 feet	
(i)	Perform a landing circuit appropriate to the site and conditions.	
(j)	Perform a landing, wheels to touch within 5 metres of a pre-set point.	
(k)	Complete post-flight checks as required by the BMFA Safety Codes.	
(l)	Answer satisfactorily during the interview, showing depth of knowledge about model flying and safety matters.	

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