

**Gas  
Turbine  
C**



*Est. 1922*

**BRITISH MODEL FLYING ASSOCIATION**

**THE R/C ACHIEVEMENT SCHEME**

**TEST STANDARDS for CHIEF and CLUB  
EXAMINERS**

**GUIDANCE for TEST CANDIDATES  
THE 'C' CERTIFICATE  
(GAS TURBINE)**

**2023 Issue  
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## **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](mailto: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 (Gas Turbine) 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'

Certificate (Gas Turbine) 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' (Gas Turbine) 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 (Gas Turbine), the candidate must already hold the 'B' Certificate (Fixed Wing). The manoeuvres required for the 'C (Gas Turbine)' Certificate are no more difficult than those of the 'B'.

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

Remember that addendum sheets to the Member's Handbook are published in BMFA News and on the BMFA website and that these may also be relevant as they contain up-to-date information.

Also be aware that you may ask questions on any local site rules that the candidate should be aware of and these may form an important part of the test questions you ask.

## 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' Certificate (GT) will need to fly a gas turbine powered model that is capable of flying the aerobatics manoeuvres required, but that does not necessarily mean either a scale or competition aerobatic model. In fact the test can be performed with many sports jet models. The options allowed in the test mean that, although a basic trainer may not be suitable, a strong and agile sports model would probably cope if, well trimmed and, above all, well flown.

The model should be of a minimum weight of 3kg.

Gas Turbine powered Turbo-prop aircraft are **not eligible** for the Gas Turbine 'C' test for a number of reasons; The GT 'C' test wasn't written with Turbo-props in mind, hence the manoeuvres aren't necessarily appropriate i.e demanding enough, for this type of aircraft. In addition, although most Turbo-prop aircraft have significant mass, the energy management isn't the same as a pure turbo jet powered aircraft, and finally the safety issues with Turbo-props are different from pure turbo jets.

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 complete the manoeuvres selected in the test is the responsibility of the pilot and it is the pilot you are testing, not the model.

Similarly, the type of model presented cannot be used as an excuse for not completing certain manoeuvres. Another important point to remember is that the candidate is not expected to build or necessarily 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 club mate.

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 & Speed**

The 'C' Certificate (GT) 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 for 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 can be flown as a continuous 'display' this is **ABSOLUTELY NOT** what is expected. The order in which all manoeuvres, including compulsory manoeuvres (d) to (i) are flown, must be proposed by the candidate and agreed with the examiners prior to the test. Positioning circuits are allowed between manoeuvres but the examiner 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' (GT) certificate allows an intermediate landing. The exact wording of the rule that appears in the Member's Handbook is - 'The schedule 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 re-fuelling'. This landing may only be made with the prior consent of the Examiners. This concession is in recognition of the number of manoeuvres to be flown and limited endurance of some gas turbine powered models. 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 but they should be able to trim the model out in the air very quickly if necessary. If you see obvious signs that the model is out of trim and the candidate makes no attempt to rectify the matter you should seriously question their basic competence.

Any re-trimming should be done on the first circuit and if the pilot cannot accomplish this then you should again seriously think about their basic ability, especially if they put the model in any danger or the model flies behind the pilot or in any other unsafe areas.

### **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/Spotter**

The candidate is allowed to have a caller/spotter standing with him during the flight. The caller's only duty is to remind the pilot of the manoeuvre to be flown next or to alert the pilot to any safety issues, for example an approaching full size aircraft. 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' certificate (GT) 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. However, if this situation does occur with the younger candidates, you should insist that they do all the pre-flight and preparation work themselves, up to starting the engine. If they cannot do this then they should not pass.

Many commercial gas turbine engines have an automatic start sequence that is initiated from the transmitter and requires no physical intervention close to the engine, if this is the case, the candidate would be expected to complete the start sequence themselves.

After engine start, the helper may carry or position 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 Gas Turbine '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

**The pilot must stand in the designated pilot area for the entirety of the flying part of 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 immediately prior to and during engine start-up. 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, uncluttered and safe 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 candidate's 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 of 'get the peg, Tx on, Rx on (**unless the equipment manufacturer specifies otherwise**). Also watch carefully and take note that the transmitter controls, trims and switches are checked by the pilot.

Any candidate who switches their radio on before checking the frequency control system should be failed on the spot.

**(b) Start-up and Taxi to the take-off position**

Prior to starting, the candidate and the examiner should agree the location of Pit and Start-Up areas, as well as the Taxi and Take-off points, which must be consistent with the site operations and safety requirements.

The engine should normally be started facing into wind, but the candidate should ensure that the exhaust is not pointed at people or the pit area. The start-up area should be in a safe position and should also be clean and free from any loose items that may get sucked into the turbine. The candidate should ensure there are no naked flames and that a suitable CO<sub>2</sub> or Foam extinguisher is on hand for the start, and while the engine is running.

The model must be physically restrained during start-up and until it reach the taxi point, the use of wheel brakes alone is not sufficient.

The model must taxi out from the taxi point to the take-off position. Taxying out of the pits is an instant fail. Prior to taxying out the pilot should inform other pilots flying that the model is going out onto the active area.

**(c) Take-Off and join the circuit in whichever direction is appropriate for the conditions.**

Take off must be performed 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 continue with a deteriorating situation. 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 throttle should be brought back to cruise power, the model levelled out and the first turn of the circuit started.

The type of circuit is not stated so either racetrack or rectangular 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.

**d) Procedure Turn**

The model approaches the manoeuvre at standard height and line and in straight and level flight on a line parallel with the Examiners. As the model draws level with the examiners it commences a 90° turn away from the examiners and pilot. The model maintains this track momentarily before commencing a 270° turn in the opposite direction, completing the manoeuvre on the reciprocal heading at the original height and on the original approach line.

The manoeuvre should be commenced so as to place the point where the model changes from the 90° turn to the 270° on a line which is at a right angle to the direction of entry and directly away from the examiners.

If the initial 90° turn is made too tight and or the 270° turn is initiated too soon, there is the danger that the model will complete the manoeuvre too close to the examiners, pilot and pits. This is a sign that they have not thought about the manoeuvre or practised it.

At no time during the second phase of the manoeuvre i.e. the 270 degree turn, should the aircraft be allowed to develop a nose down attitude, as this could result in a dive towards the examiners, pilot, pits etc. and you should fail the candidate if this is allowed to happen

**(e) Figure Eight**

**Fly a "figure of eight" course with the cross-over in front of the pilot, height to be constant. The examiners will expect this manoeuvre to be flown as accurately as in the 'B' Certificate test.**

The manoeuvre should be flown as shown in the 'B' Certificate diagrams in the handbook. The crossover point must always be in front of the pilot and, after a run in at standard height and line, the model **MUST** be turned through ninety degrees in the first turn so that it is flying exactly away from the pilot.

The first circle must also end with the model flying exactly away from the pilot, through the crossover point before it is turned into the second circle. Both circles should be of the same diameter as seen from the ground and this implies that they will be flown at varying bank angles.

The main problems with this manoeuvre nearly always happen on the first circle and if they do not get it right they will either finish up with the crossover way downwind, fly too near the pilots line or panic as the model accelerates towards them as it begins to come downwind and pull far too much bank (vertical!) to get the crossover point correct. This is not a sign that they have thought about the manoeuvre or practised it.

The second circle (3/4 circle actually) is rarely a problem. The manoeuvre finishes, as in the 'A' certificate diagrams, with the model flying at standard height and line across the front of the pilot, not with another turn away.

**(f) Fly a rectangular or race track circuit in the opposite direction to that in (i) at a constant height of not more than 100 feet.**

The comments below about parallel upwind and downwind legs and the type of turns required all apply. Height control should be good with no wavering and 100 feet is roughly three houses high.

**(g) Slow dirty pass**

Approximately 50m before the position of the examiners, the model should be established in straight and level slow flight, into wind, on the standard line, at a height not exceeding 50 feet with flaps and undercarriage extended, where appropriate. The model is then flown in this configuration until past the examiner's position after which, still in straight and level flight, it is accelerated to normal cruise speed by appropriate use of the throttle, with flaps and undercarriage retracted, as appropriate.

For models fitted with flaps and retracting undercarriage the use of these is mandatory for this manoeuvre.

You should watch that the candidate allows the model to accelerate before commencing any climb and that the appropriate actions to 'clean up' the aircraft are also taken, where appropriate,

Throughout the duration of the manoeuvre, the heading and height of the model should not deviate substantially although minor deviations are acceptable. Note that 50 feet is roughly the height of one and a half houses.

**(h) Fly into wind and complete one inside loop,**

Run in height and line should be standard and the manoeuvre should be performed exactly in front of the examiners. A perfect loop is not required, but the exit height and line should be very close to the original.

Skewing out is a sign that the model has not been trimmed correctly or that the wings were not level at the start of the manoeuvre. The pilot should not get into this situation to start with, but if they do then they must be able to compensate; if they cannot then you have to draw your own conclusions.

Watch for appropriate throttle management during the manoeuvre and penalise the pilot if they fly the manoeuvre at a constant high throttle setting.

**(i) Fly a landing circuit and approach and overshoot from below 10 feet Note that this manoeuvre is an aborted landing, not a low pass.**

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 (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 throttle should be reduced as appropriate for the approach and consideration should be given to the fact that many gas turbine powered models may require the throttle to be retarded significantly earlier in the landing pattern, when compared to other forms of propulsion.

Once established on final approach, on line and descending, the throttle may be adjusted to achieve the desired descent rate. The aim of all this is to have the model at a speed, position and rate of descent which will guarantee an accurate touchdown on the landing area. Only when this is **QUITE CLEAR** and the model is below 10 feet should the throttle be opened and the model climbed straight ahead back up to circuit height. Watch out for correct throttle control.

The pilot should call this manoeuvre out loudly as an **OVERSHOOT** and you should take note that the candidate has visually checked the active area before and during the manoeuvre (watch for head movements).

Anything less than this is not satisfactory. Discuss this with the candidate before the flight as, if the overshoot is simply flown as a low pass, the candidate should fail.

**(j) The candidate will then perform seven manoeuvres, selected from the list below. The manoeuvres and the order in which they are flown must be proposed by the candidate and agreed with the examiners prior to the test. The examiners may request an explanation of the reasoning behind the sequencing of these manoeuvres.**

**(1) Derry Turn, flown from either left or right**

The model should approach on the standard line in straight and level flight parallel with the examiner's line. As the model approaches the examiners position it commences a steep banked turn (approximately 45° angle of bank) so it is flying directly away from the examiners, i.e. 90° to the original direction.

When centred in front of the examiners the model then makes a 3/4 roll in the same direction as the entry to the turn, i.e. if the initial turn was to the right, then the roll should also be to the right. In other words the model effectively rolls from upright in a right hand bank through the inverted to upright in a left hand bank and completes the manoeuvre when it is flying in the opposite direction to that at the start.

The manoeuvre should be smooth and continuous with minimal or ideally no loss of height, and the exit track should be parallel to that at entry.

**(2) Split S (Reversal)**

The model should run in on the standard line in straight and level flight **at a height sufficient to ensure completion of the manoeuvre at a height of not less than 50 feet.**

As the model passes the position of the examiners the model performs a half roll and when inverted performs half of a circular inside loop and resumes straight and level flight on the standard height and line, in a direction opposite to that of the entry.

Skewing out of the loop is a sign that the model has not been trimmed correctly or that the wings were not level at the start of the half loop. The pilot should not get into this situation to start with but if they do then they must be able to compensate; if they cannot then you have to draw your own conclusions.

In order to avoid the potential for overstressing of the airframe, appropriate use of the throttle and energy management are important for this manoeuvre. The manoeuvre should be flown

smoothly, with the throttle retarded early and only opened as appropriate to resume normal flight.

You would not expect a candidate to elect to perform this manoeuvre shortly after any intermediate landing for the purpose of refuelling. If they do so, you should question the wisdom of this selection.

Note that an Immelmann turn might be a good choice to set the model up for the entry into this manoeuvre.

### **(3) Cuban Eight**

The model should run in on the standard line in straight and level flight at a height between approximately 50 and 100 feet. After passing the position of the examiners the model pulls up into a circular inside loop and completes approximately 2/3 of the loop until it is inverted 45° nose down. The model is then half roll to upright directly in front of the examiners position. The model then commences another inside loop until it is once again orientated 45° degree nose down inverted. The model is then half rolled to the upright and recovered to the original entry height and line.

Skewing out is a sign that the model has not been trimmed correctly or that the wings were not level at the start of the manoeuvre. The pilot should not get into this situation to start with but if they do then they must be able to compensate; if they cannot then you have to draw your own conclusions.

Appropriate use of the throttle should be made during the manoeuvre and the recovery to straight and level flight should be on the same height, line and direction as the original entry.

### **(4) Fly Inverted straight and level flight for a minimum of 3 seconds below 50 feet with a half roll to inverted and from inverted.**

Run-in line should be standard, descending to approximately 50 feet and the manoeuvre should be performed with the centre of the inverted portion positioned exactly in front of the examiners. If the initial run-in is upright the model must be half rolled to the inverted before the 3 second run commences.

After the 3 second run the model should be half rolled to upright before any climb-out. The entry and exit rolls may be in either direction.

Note that at typical gas turbine speeds, 3 seconds equates to the model being inverted for a distance of approximately 100m.

Throughout the duration of the manoeuvre, the heading and height of the model should not deviate substantially although minor deviations are acceptable. Note that 50 feet is roughly the height of one and a half houses.

Note that this manoeuvre is NOT a slow roll.

### **(5) Wingover**

The model should run in on the standard line in straight and level flight at a height of between approximately 50 and 100 feet. Immediately after passing the examiners' position a smooth climbing turn is commenced away from the examiners. At the apex of the turn the bank should be at least 60°. The nose of the model should then be lowered and the bank removed at the same rate as it was applied, and the turn continued through to 180° by which time the model should have recovered to straight and level flight at the same height as the entry, but on a reciprocal heading.

The manoeuvre should be smooth and continuous and the exit should be at the same height as the entry and on a parallel track.

### **(6) Knife edge pass**

### **Knife-edge flight in either direction, below 50 feet, for at least 3 seconds or longer**

The model should run in on the standard line in straight and level flight, descending to approximately 50 feet before quarter rolling to knife edge with the canopy towards the examiners. The manoeuvre should be performed so that the centre of the knife edge run is positioned in front of the examiners. The manoeuvre is completed by the model quarter rolling 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 could bring the model close to the examiner / pilot line.

Note that at typical gas turbine speeds, 3 seconds equates to the model being in knife edge flight for a distance of approximately 100m.

### **(7) Four point roll**

The manoeuvre should be flown at standard height and line. The model should be rolled  $90^{\circ}$  and should stop momentarily before rolling a further  $90^{\circ}$  in the same direction to the inverted. The inverted centre point of the roll should occur as the model passes in front of the examiners although you may allow a little leeway here.

The model is then rolled a further  $90^{\circ}$  in the same direction and the roll again stopped momentarily before rolling through a further  $90^{\circ}$  to the upright. The manoeuvre should be at least three seconds duration and the application of both elevator and rudder control at the appropriate times should be obvious to the examiners.

Note that at typical gas turbine speeds, 3 seconds equates to the model travelling a distance of approximately 100m during this manoeuvre.

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

### **(8) 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 three seconds duration and the application of both elevator and rudder control at the appropriate times should 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.

Note that at typical gas turbine speeds, 3 seconds equates to the model travelling a distance of approximately 100m during this manoeuvre.

### **(9) Complete two consecutive rolls.**

These should be performed from standard height and line and must be continuous rolls with no hesitation between them. The model should be half way through the two rolls when it passes in front of the pilot although you may allow a little leeway here.

There should be no serious loss of height or direction during the manoeuvre although slight barrelling of the rolls is permissible. The speed of the rolls should be such that the pilot has to make noticeable elevator inputs to maintain the model's height.

'Twinkle rolls' that are so fast that no visible elevator input is required are NOT acceptable, you have to be sure that the pilot is using the elevator. Slow rolls which require elevator and rudder input are acceptable if the pilot can perform them but are NOT a requirement



### **(10) Immelmann Turn**

The model should run in on the standard line in straight and level flight at a height between approximately 50 and 100 feet. The model then pulls up into the first half of a circular loop and when inverted, performs a half roll before resuming straight and level flight on the opposite track.

Skewing out in the half loop is a sign that the model has not been trimmed correctly or that the wings were not level at the start of the manoeuvre. The pilot should not get into this situation to start with, but if they do then they must be able to compensate; if they cannot then you have to draw your own conclusions.

The exit path should be the reciprocal of that at entry.

### **(k) Perform a landing circuit appropriate to the site and conditions.**

This may be a rectangular 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. Which ever circuit is flown, the throttle should be reduced at an appropriate point to achieve the desired decent rate and to establish the model on the desired path towards the landing area.

It should be appreciated that for many gas turbine powered aircraft the throttle may have to be reduced early in the landing pattern. Once established on final approach, on line and descending, the throttle may be adjusted to achieve the desired touch down point.

You should take note that the candidate has visually checked the active area before and during the manoeuvre (watch for head movements).

### **(l) Perform a landing, wheels to touch within 25 metres of a pre-designated point.**

The pilot should call **LANDING** when on final. 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 with minimal or no bounce and within the designated landing zone and the model should decelerate and turn off the runway in a controlled manner. Ground loops and heavy or nose over landings are not acceptable at this level.

**(m) Taxi back, stop and shutdown engine**

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

The candidate must NOT take their transmitter with them if the engine has stopped after the landing and model has to be retrieved. If 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.

If the model does not taxi in then the Examiners should take this into account when assessing the candidate's 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 Candidate's 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.

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

The post flight checks are set out clearly in the handbook but the Examiner should watch particularly **that the 'Rx off, Tx off (unless the equipment manufacturer specifies otherwise) , frequency system cleared' sequence is followed correctly.**

**(o) 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 re-fuelling. 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.

**(p) Two examination attempts will be allowed in any one day.**

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

## 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 Gas Turbines, 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 required depth of knowledge of model flying, safe turbine operation and the BMFA Member's Handbook, 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 performed 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 them.

A candidate who has performed 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 an 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.

The interview should include a 'what if' type of emergency scenario and the candidate will be expected to respond in a way appropriate to the circumstance. The candidate should be able to provide a clear and concise explanation of what actions they would take and why. Their response should indicate that they can think on their feet and safety should be a key element in their proposed actions.

The emergency situation can be anything from a flame out to failure of a system (retracts, flaps, speed brake etc.) or an individual servo failure, and the actions proposed by the pilot should be appropriate for the situation.

For the Gas Turbine 'C' it is essential to establish that the candidate has knowledge and understanding in a number of key areas related to turbine flying and operation, and you should ensure that you cover these during the interview. As a minimum these should include; an appreciation of airframe structural requirements, rigidity, control surfaces, hinges, linkages etc., an understanding of radio system requirements, including total power requirements and servo loads, positioning of sensitive components such as the Rx etc. and also the installation of the turbine and associated fuel and other systems.

This is especially important as there is the possibility that the candidate may not have built the model themselves. It is therefore essential to test their knowledge and understanding of these systems and the impact they have on the safe operation of a Gas Turbine powered model.

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.

## The BMFA RADIO CONTROL ACHIEVEMENT SCHEMES

### ‘C’ CERTIFICATE (GAS TURBINE) Check List

(a)	Carry out pre-flight checks as required by BMFA Safety Codes.	
(b)	Start up and Taxi out	
(c)	Take off and join the circuit in appropriate direction for conditions	
(d)	Perform a procedure turn to either left or right appropriate for conditions	
(e)	Fly a figure of eight	
(f)	Fly a rectangular or race track low level circuit - below 100 feet – in opposite direction to landing circuit	
(g)	Fly a slow dirty pass, flaps extended and undercarriage deployed where appropriate, height below 50 feet	
(h)	Fly one Inside loop into wind	
(i)	Fly a landing circuit appropriate to type, the site and prevailing conditions, and go-round from below 10 feet, this is an aborted landing, not a low pass	
(j)	Select and perform seven manoeuvres from the list below	
1	Derry turn, from either direction	
2	Reversal/Split S	
3	Cuban 8	
4	Inverted pass	
5	Wingover	
6	Knife edge pass, canopy towards pilot	
7	4 point roll	
8	Slow roll	
9	Two consecutive rolls	
10	Immelmann turn	
(k)	Perform a landing circuit appropriate to type, the site and prevailing conditions	
(l)	Perform a landing, wheels to touch within 25m of a pre-set point	
(m)	Taxi back, stop and shutdown engine	
(n)	Complete post flight checks as required by BMFA Safety Codes	
(o)	Answer satisfactorily during the Interview, showing a depth of knowledge about model gas turbine flying and safety matters	





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