

Safety Regulation Group



CAP 658

Model Aircraft: A Guide to Safe Flying

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30 April 2007

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Chapter 1 General Information

1 Introduction

The Civil Aviation Authority is empowered to regulate all civil flying activities over the United Kingdom, including model aircraft.

The rules and regulations for flying are contained in the **Air Navigation Order** as a series of **Articles**, established by parliamentary statute.

It is the legal responsibility of the operator of a model aircraft to ensure that the model is flown safely. This publication is intended to provide guidance to anyone intending to fly a model aircraft.

It is written in collaboration with the major UK aeromodelling associations who have provided much of the operational detail.

Guidance is also given beyond the statutory requirements, so that the experience of the aeromodelling associations can be of use to those new to flying model aircraft. The publication is laid out as a series of general chapters, applicable to the flying of any model, followed by more detailed information on flying particular types of aircraft, such as helicopters or seaplanes.

Nothing in this publication is intended to conflict with the Air Navigation Order or other legislation which, in case of doubt, must be considered as overriding.

A list of addresses of organisations referred to in this publication is given at **Annex A**.

This CAP, CAP 658 refers only to model aircraft used for sport and recreation. Guidance on the use of Unmanned Aerial Vehicles (UAVs) for aerial work is contained in CAP 722 - Unmanned Aerial Vehicle Operations in UK Airspace - Guidance.

Further advice on the operation of model aircraft and UAVs can be obtained from the CAA's Flight Operations Inspectorate (General Aviation) on 01293 573540.

Some of the text of this publication is presented in the third person singular. For conciseness, the pronoun 'he' is used throughout. 'She' should be substituted when appropriate.

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Chapter 2 Legal Requirements

1 Definition of a Small Aircraft

Any unmanned aircraft, other than a balloon or kite, weighing not more than 20 kg without its fuel but including any articles or equipment installed in or attached to the aircraft at the commencement of its flight.

The term 'small aircraft' is used in the ANO, rather than 'model aircraft' so that Unmanned Aerial Vehicles (UAVs) and other flying machines, are captured. This publication is specifically written to cover 'small' aircraft used for sporting and recreation purposes and therefore the term 'model' aircraft is used throughout.

A model aircraft is excluded from the vast majority of the regulations applied to other aircraft.

The regulations which **DO** apply are explained briefly in **Annex B**.

However, the most important – Articles 74 and 98 of the Air Navigation Order deserve fuller explanation.

1.1 Article 74

“A person shall not recklessly or negligently cause or permit an aircraft to endanger any person or property.”

All model flying activity is controlled by this article of the ANO and it is important that the operator of any model aircraft should bear this in mind at all times.

1.2 Article 98

Article 98 contains additional requirements to fly model aircraft safely.

Article 98 states:

- “(1) A person shall not cause or permit any article or animal (whether or not attached to a parachute) to be dropped from a small aircraft so as to endanger persons or property.**
- (2) The person in charge of a small aircraft which weighs more than 7 kg without its fuel but including any article or equipment installed in or attached to the aircraft at the commencement of its flight shall not fly such an aircraft:**
- (a) unless the person in charge of the aircraft has reasonably satisfied themselves that the flight can be safely made;**
 - (b) in Class A, C, D or E airspace unless the permission of the appropriate air traffic control unit has been obtained;**
 - (c) within an aerodrome traffic zone during notified hours of watch of the air traffic control unit (if any) at that aerodrome unless the permission of any such air traffic control unit has been obtained;**
 - (d) at a height exceeding 400ft above the surface unless it is flying in airspace described above and in accordance with the requirements thereof;**
 - (e) for aerial work purposes other than in accordance with a permission issued by the CAA which may be issued subject to such conditions as the CAA thinks fit.”**

- 1.3 This means that the legal requirement for safety is placed firmly on the operator of the model and the guidelines in Chapter 5 show what are considered reasonable conditions for the operation of models.

Models weighing up to 20 kg are therefore catered for by Article 74 and by the conditions of Article 98 used in conjunction with the advice of this publication.

A different treatment is needed for models weighing more than 20 kg.

2 Models Over 20 kg

NOTE: All model aircraft, except pure gliders, weighing more than 20 kg (weight of model and equipment, but excluding fuel) require an exemption to fly.

- 2.1 An **EXEMPTION** is used to allow an exception to the established law. Such an exception is usually only made subject to various additional conditions to ensure adequate safety.
- 2.2 **A model aircraft, except a pure glider weighing over 20 kg can only be operated under the terms of an Exemption issued by the CAA.** If you are planning to build a very large model, please first read **Chapter 3** and contact one of the modelling associations or the CAA to see if the proposed model is likely to be acceptable.
- 2.3 It is unlikely that an exemption will be issued without the condition that the model must be flown within the 'control' of a recognised model association and at a suitable site.
- 2.4 The maximum weight for a model aircraft to be treated under the guidelines of CAP 658 is 150kg. Above this weight full airworthiness regulations may apply. Builders contemplating the construction of a model weighing more than 150 kg should contact the CAA prior to commencing construction.

3 Article 73

“A person shall not recklessly or negligently act in a manner likely to endanger an aircraft, or any person therein.”

Article 73 refers to people in an aircraft endangering the aircraft or persons therein, whereas Article 74 refers to persons outside aircraft endangering aircraft. Obviously only Article 74 can apply to a model aircraft. However, technically Article 73 does apply to models over 20 kg.

Chapter 3 Models between 20 and 150 kg Exemptions and Permissions

1 The Need for Exemption

Model aircraft except pure gliders weighing between 20 and 150 kg are subject to all of the Rules or Articles of the Air Navigation Order.

As many of these Rules are practically impossible for the model operator to meet, the modeller must request a specific written Exemption to allow the model to be flown.

Any such Exemption will only be issued by the CAA subject to additional operating conditions and after it has been satisfied that the model is designed, built and test flown to a satisfactory standard.

Any person or group contemplating building an aircraft, except a pure glider, that is likely to weigh more than 20 but less than 150 kg should apply at an early stage to one of the modelling associations for advice. (See Annex A)

The Large Model Association (LMA) operates a model inspection scheme on behalf of all UK Aeromodelling Associations.

2 Design and Build Advice and Inspection

The LMA will advise on the availability of a member in the builder's area who will be able to supervise and assist with the project.

The assisting member will be authorised to confirm satisfactory design and build standards to the CAA.

The build inspection schedule will be as agreed between the CAA and the LMA. Details of the schedule will be sent on request by the association contacted.

It is particularly important to build to such a schedule if the construction does not readily allow access to all parts of the model for a final inspection – such as box sections.

In certain circumstances a charge may be made for elements of the above inspection process.

3 Exemptions

3.1 Flight Test Only

Once the inspection schedule has been satisfactorily completed, it will be forwarded to the LMA who will issue a Certificate of Design and Construction. This certificate should be forwarded to the CAA with a request for the issue of an Exemption – Test Only.

Any special operating conditions applicable to the model can also be advised by the LMA at this stage.

The Exemption – Test Only is valid for one year and will only permit flights in private (away from the public). During this time a Flight Test Log is to be completed. Details and guidance notes about the completion of the Flight Test Log are available from the LMA.

The Exemption – Test Only will not normally be renewed after its expiration.

On satisfactory completion, the Flight Test Log should be returned to the LMA who will then recommend the issue of an Exemption.

An Exemptions is specific to a model and named pilot. No other person can legally fly the model.

3.2 **Flight Exemption**

Once the Flight Test Schedule has been satisfactorily completed and a Flight Test Log submitted, the LMA will make a recommendation to the CAA for the issue of an Exemption. Any such Exemption issued will include any special operating conditions. The Exemption is valid for one year and can be renewed by application to the CAA with a statement that no changes have been made to the model.

If any changes have been made to the model it will have to be re-inspected and a new Exemption – Test Only issued.

The CAA does not charge for the issue of Exemptions.

3.3 **Gliders Between 20 kg and 150 kg in Weight**

Pure gliders with a weight of between 20 kg and 150 kg do not need an exemption from the CAA before they may be flown. However, before a model glider between these weights is built the advice of either the British Association of Radio Control Soarers (BARCS) or the Large Model Association (LMA) should be sought on construction, testing and operating techniques.

4 **Models Over 150 kg**

Before commencing construction contact the CAA to ascertain requirements. See Chapter 2, Paragraph 2.4 and Chapter 3, Paragraph 1.4 also.

Chapter 4 Learning to Fly

1 Local Model Flying Clubs

If it is at all possible, contact and join a local model flying club – there is no doubt that this is the best way to learn to fly.

There are many hundreds of model flying clubs in the UK and most of them offer training in radio control flying to beginners in the sport.

Details of your local clubs can be obtained from the Associations listed in **Annex A**, or you could enquire at your local model shop.

2 Learning to Fly Without a Model Flying Club

It is not impossible to learn to fly without being a member of a club, but it can be very difficult.

If you are unable to join a club to learn to fly, then try to get help from an experienced model flyer who will be able to guide you in your first efforts.

Chapter 6 gives basic advice on radio controlled model flying.

3 Commercial Model Flying Training

There are a number of organisations and individuals offering commercial model flying training.

Details of these operations are listed in specialist model flying magazines or may be obtained from local model shops.

FLYING WITHIN A CLUB IS THE BEST WAY TO BE SAFE.

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Chapter 5 Safety Considerations

1 Any Model Aircraft Flying

First

Choose an unobstructed site and at all times keep a safe distance from:

- PERSONS
- VESSELS
- VEHICLES
- STRUCTURES

Only Fly

- In suitable weather.
- With regard for any other conditions such as local byelaws.
- With due consideration for other people and property.

Failsafes

Any powered model aircraft fitted with a receiver capable of operating in failsafe mode (i.e. PCM receivers or Digital Signal Processing (DSP) receivers) should have the failsafe set, as a minimum, to reduce the engine(s) speed to idle on loss or corruption of signal.

2 Additional Requirements – Models Weighing 7 to 20 kg

Should only be flown

- When the weather is suitable.
- Clear of controlled airspace unless with ATC permission.
- Clear of any aerodrome traffic zone unless with ATC permission.
- At least 400 ft above the point of launch except with permission as above.
- Within sight of the operator at all times.
- Well clear of any congested area of a city, town or settlement.
- At least 50 m clear of persons, vessels, vehicles or structures. This can be reduced to 30 m for take-off or landing. Other model operators and any assistants or officials may be within this distance; as may vessels, vehicles or structures under their control.

and

- A serviceable 'fail-safe' mechanism should be incorporated to operate on loss of signal or detection of an interfering signal. For example on a power driven model this should operate, as a minimum, to reduce the engine(s) speed to idle.
- Ensure that any load carried on the model is secure.
- Flights must comply with any other conditions such as byelaws.
- Authority permission is required for any commercial flights.

3 Air Traffic Control and Controlled Airspace

Before flying within controlled airspace or an aerodrome traffic zone

- Obtain permission from the appropriate air traffic control unit.

Chapter 6 Flying Radio Controlled Models

1 General

Always fly with regard to the general regulations concerning radio control flying covered in Chapters 2 and 5.

Models should be checked thoroughly prior to each flying session and after any abnormally hard landing.

Metal propellers must not be used on internal combustion engines or electric motors.

All R/C models are subject to in-flight vibration, landing knocks, transport damage etc. Take care that receivers and batteries are well protected, servos are fixed securely, control linkages (pushrods, snakes, closed loop etc.) are robust enough for their purpose, are properly supported where necessary and are as slop free as possible and that all control surface hinges and horns are fitted correctly.

It is recommended that you use welded or soldered re-chargeable battery packs in your radio control equipment. Dry batteries may be adequate for use in transmitters but their use in airborne battery packs is not recommended.

With new or repaired radio control equipment, a ground range check should be performed, preferably with the equipment installed in a model. With the majority of radio equipment look for a minimum ground range of around 50 metres with the transmitter aerial down and the model's controls still functioning correctly with no 'jittering'.

It is also good practice to carry out a ground range check on your radio equipment at regular intervals, at least every few months, and a check is advisable if the equipment has not been used for a month or two.

When starting an engine, make sure that the model is restrained and cannot move forward.

When preparing for a flight, check that transmitter trims, rate switches etc. are in their correct positions and that each control surface on the model moves freely and in the correct sense.

Immediately before take-off, flight controls should be checked again for full, free and correct movement under full power if applicable. If there are any doubts as to their operation, do not fly.

Before take-off, check that both ground and sky are clear and never take off or land towards other pilots, spectators or the 'pits' area.

Maintain a clear view of the model and allow plenty of room between the flight path and spectators, other flyers or model 'pit' areas. Avoid flying between yourself and spectator or 'pit' areas, especially when landing.

Be aware of the sun's position in relation to you and the model. Flying "through the sun" can cause temporary blindness and the loss of control of the model. The use of sunglasses is recommended – remember never look directly at the sun.

Avoid low overflight of houses, domestic gardens, car parks, traffic or spectators. You have no control over people walking by at a reasonable distance from your take off/landing area but you should take care not to overfly them at low level.

At any sign of malfunction or an unexpected loss of models parts, land as soon as it is safe to do so.

When you decide to land, never assume that the landing area is clear. Always look and be prepared to land in a safe place away from your planned landing area if necessary. In all cases, the safety of people is paramount.

1.1 Pre Flying Session Checks

On arrival at the flying site, **CHECK**:

- the airframe for any transit damage,
- that servos and linkages are secure,
- the undercarriage for secure fixing and correct alignment,
- the propeller for damage and secure fixing.

1.2 Check before each Flight

- If frequency control is in operation, obtain clearance to transmit.
- Switch transmitter **ON** then receiver **ON**. Check that all controls operate freely and in the correct sense. Check that all control surfaces are in their correct positions with the transmitter trims at neutral.
- Look for any minor radio malfunctions such as slow or 'jittery' servos, glitches, etc. If in doubt, do not fly.
- After starting the engine and allowing it to warm up, check that the pick-up from idle to full power is satisfactory. Hold the model with its nose pointing upwards at a steep climbing angle for ten or fifteen seconds and check engine operation at full power. If the engine falters or cuts it is usually set to lean and must be re-tuned. Repeat the test until the engine runs correctly in the nose-up attitude.
- With the aircraft held securely on the ground, open up again to full power and re-check all flying controls again.
- Double Check that all transmitter trims, rate switches, mixers etc. are in their correct positions and that the transmitter meter is 'in the green'.

1.3 Before Flying

Be S.M.A.R.T. with your transmitter
S witch on
M eter in the green / M odel selection correct
A erial secure and extended
R ate switches in all correct positions
T rimms all in correct positions

1.4 Checks after each Flight

- Receiver **OFF** then transmitter **OFF**.
- Clear the frequency control system if it is in operation.
- Check propeller, airframe, undercarriage, wing fixing etc. for security of fastening and for possible flight or landing damage.
- Remember – Avoid flying with a damaged aircraft or propeller, or with any possible radio problem.

2 Radio Controlled Helicopters

Only fly with regard to the general regulations concerning radio control flying covered in Chapters 2 and 5.

Take care to use sites which are of suitable size in relation to the type of manoeuvres to be flown by the model.

Only fly after you have ensured that any spectators are well clear of the intended flight path of the model.

When starting the model in the pits, hold the rotor head firmly. When the engine is running carry the model a sensible distance from other people before running up or flying.

Do not release the rotor of the model until you are sure that it is safe to do so.

Never hold the model overhead to run up the engine or run the engine with no rotor blades fitted.

Rotor blades should be carefully balanced before use.

2.1 **A Model Helicopter Must Not be Flown or Run up:**

- In or near the 'pits' area or close to any spectators.
- Directly towards the pits area or any spectators.
- With metal rotor blades.
- With knife-sharp leading edges on main or tail rotors.
- With damaged or out of balance rotor blades. Note that blades, especially wooden ones, should be reinforced at the root with hardwood, glass-fibre or some other suitable material.
- With radio equipment unproofed against shock and vibration.

2.2 **Checks Before a Flying Session**

- Check all ball links for slop and change as necessary.
- Check that all rotor blades are in good condition with no damage apart from minor tip damage.
- Check for loose or missing nuts and bolts.
- Check that there is no backlash in the drive system apart from gear backlash which should not be excessive.
- Check that servos are secure and free from oil.
- Check that the fuel tank and all piping is secure.
- Check that the receiver aerial is secure and in good condition with no chafing or damage.

2.3 **Checks before each Flight**

- If a helicopter suffers damage or a heavy landing, re-do all the pre-flying session checks.

- Check all controls before starting especially for binding links or slowing of servos.
- Check that the receiver aerial cannot become entangled with any moving or rotating part.
- Re-check controls at high rotor rpm just before lift-off. At the same time check main rotor blades for true tracking (the rotor disk should be clear and steady). Any excessive vibration should be eliminated before flight.
- Double check that all switches on the transmitter are in their correct positions before **EVERY** flight.

3 Gas Turbine Powered Models

The operation of gas turbine engines require special care and the manufacturer's operating instructions must be understood and closely followed. All pilots and helpers must be fully briefed on the operation of the engine before any starts are attempted.

Never run an engine in excess of the manufacturers recommended power rating. Always follow the manufacturer's recommendations on pipe work and fittings, especially with regard to periodic renewal.

Take extra care during the engine's initial operating period. Until the unit is proven, do not operate it near people.

Pressurised gas fuels, such as Propane, require care in handling; spill dispersal rates can be slow and the gas can 'pool' in hollows or in void areas in fuselages. The liquid can also cause frostbite, if allowed to come into contact with skin.

Ensure that all fuel is stored in labelled containers fit for the purpose. These containers should be no larger than necessary.

All gas turbine models should be fitted with a failsafe. This must bring the engine to idle in the event of radio interference or failure. The fuel system must be capable of manual shut off via a fuel valve or fuel pump switch.

3.1 **Before Starting:**

Smoking or naked flames must not be allowed near the engine and the fuelling area

A suitable fire extinguisher (CO₂, dry powder but not water) should always be present at Start Up and for any period during which the engine is running.

The Start Up area should be kept clean and free from any loose items that may get sucked into the fan or turbine.

Ideally the Start Up area should be on a paved surface, but if this is not possible the grass should be short and clear of all loose material.

Check the integrity of any compressed air hoses, clips etc, prior to turning on the air. Manufacturers instructions should always be followed, particularly those relating to safety.

Gas fuelled models must never be left in the pits area fuelled up. Once fuelled up they should be moved directly to the designated start up area.

3.2 **Starting:**

Gas turbines should normally be started facing into wind; however, ensure that the jet tailpipe is never pointed at people or the pits area. The effect of the jet blast must always be kept to the absolute minimum.

Beware of the possibility of "wet" starts with liquid fuels.

Whenever possible a reliable helper should assist with the start. The helper should be close by and fully briefed on the operation of the engine. The helper should ensure that you are not distracted during the start sequence.

Models must be physically restrained during start up. The use of wheel brakes alone is not sufficient.

3.3 **Shutdown:**

After every flight ensure that the engine is fully shut down, the fuel shut-off has been operated and that any hatches are opened to assist with engine cooling.

3.4 **General Safety Information:**

Adverse runway conditions can have an adverse effect on the aircraft's performance on take-off. e.g. wet or long grass will significantly increase take-off distance.

The rate of climb at take-off weight may be significantly less than that of a propeller driven model aircraft. Care must be exercised to ensure safe clearance of any obstacles immediately after take-off.

The lack of "prop wash" over the control surfaces of a jet propelled model aircraft will result in less control surface effect particularly at low speed.

4 Radio Controlled Silent Flight (Gliders and Electric Powered Models)

Flying radio-controlled gliders and electrically powered models are essentially safe and environmentally acceptable pastimes provided a few basic safety precautions are taken.

Passers-by and others who may be watching the flying, particularly at slope soaring sites, tend to be unaware of the presence of gliders because gliders do not have engines or propellers and so do not make a noise. The pilot must therefore exercise even greater caution and awareness when flying on sites where the public are likely to be present.

If learning to fly, the best possible advice is to seek the help of members of your local club. The shop where you bought the model or radio will usually help to put you in contact with such a club. The BMFA and other specialist aeromodelling associations will also be happy to advise.

(See **Annex A** for addresses)

Before you even buy a model, local club members will be happy to advise on the best type of model to build and fly. They can advise on finishing the model, installing the radio and, most importantly, they can 'trim' the model for you so that it will fly safely. For gliders with a weight in excess of 20 kg, see **Chapter 3**.

4.1 Launching the Glider

- **When using a towline or bungee to fly from a flat field, always ensure that no other model is endangered** by checking above and behind before releasing the model. Models landing always have priority over models launching.
- **Ensure that any spectators are standing behind the launch point** so that if the model veers to either side, the spectators are not at risk.
- **When setting out the bungee or towline**, make sure that, when it disengages from the model, it will not fall across powerlines, or adjacent roads or pathways where passing vehicles or pedestrians could become entangled.
- **Check the proper operation of the radio and the movable surfaces of the model before any launch.** A previous hard landing may have caused some unseen damage. Such a check will safeguard your model and will also minimise the risk to bystanders, nearby property and vehicles.

IF IN DOUBT, DO NOT FLY.

4.2 Flying the Glider

- **When learning to fly, try to keep the model upwind** and leave yourself with plenty of altitude to make a proper landing approach.
- **Avoid flying the model directly into or across the sun;** the glare may cause you to lose sight of the model and effective control may be lost. Good sunglasses can minimise this problem and also protect your eyes.
- **Do not let the model fly too far downwind.** The smaller the model appears, the more difficult it is to fly and orientation becomes more of a problem. Know the limitations of your eyesight and always fly within 'easy' visual range.

4.3 Landing the Glider

- **Before launching, select your landing area.** This should be free of obstructions on the approach, which should always be into wind so as to reduce the speed of the model over the ground.
- **If possible, avoid overflying other pilots' transmitters** as this may cause radio interference.
- **Try to stay away from trees, buildings and other structures** which may cause turbulence, making the model difficult to control.
- **Be particularly vigilant for bystanders – especially children** – who may be unaware of the presence of the model as it lands.

4.4 Electroflight

For electrically powered models, all the safe operating conditions described in **Chapter 6** apply. In addition:

- When fast charging Ni-Cad or Ni-MH batteries, use a battery charger equipped with either a timer or a voltage or temperature controlled cut-off. Overcharging Ni-Cad or Ni-MH batteries at high currents can be dangerous.
- Lithium Polymer (Li-po) batteries are also extremely susceptible to both overcharging and over discharging. A charger designed specifically for charging Li-po batteries must be used. Care should be taken to ensure that the batteries are not discharged at current rates that are outside the manufacturers recommendations as to do so can be dangerous.
- Check carefully that motor operation does not interfere with the R/C equipment in the model. A range check with motor on and off should be carried out with all new installations. If in doubt, do not fly.
- Current flows in the battery-controller-motor setup of electroflight models can be extremely high. Make sure that all cables and connectors are in good order and are robust enough to perform without significant overheating.
- Take great care when handling any electroflight model that has its batteries fitted. The power and torque of electric motors can be very high and contact between a turning propeller and any obstruction will not stop the motor, but will just make it try to turn harder.

5 Seaplanes

5.1 General

The classification 'Aeroplane (Seaplane)' includes floatplanes and flying boats, both sometimes called waterplanes. The advice here also applies to amphibians when operating on water.

There are fewer suitable sites for seaplanes than landplanes in the UK and generally sites are also more restricted. The number of spectators is also much smaller. These factors are taken into account before suggesting the following modified safety considerations for seaplanes.

5.2 Seaplanes weighing up to 7 kg:

NO difference from landplanes of the same weight.

5.3 Seaplanes weighing over 7 kg and up to 20 kg:

Where conditions allow, and provided the model is flown along the line of the crowd or away from them;

- A minimum of 50 m separation should be maintained between the model in flight and the people who are not involved in the operation of the model.
- This distance may be reduced to 20 m for take off or landing.
- A distance of 10 m should be maintained while the model is taxiing. Taxiing towards the crowd should be minimised.
- All other requirements are the same as for landplanes.

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Chapter 7 Other Models

1 Free Flight Models

1.1 Only Fly:

- On sites that are clear and open with adequate open space downwind of the launch point. (With a strong wind this distance could be considerable).
- In good visibility.
- After you have ensured that any spectators are clear of the intended initial flight path of the model.
- With due consideration for other people and property.

2 Control Line Models

Only fly on sites that are **WELL CLEAR OF ANY OVERHEAD CABLES**. Even low level electrical cables on wooden poles carry **LETHAL** voltages. **KEEP CLEAR!**

Take care that the site you choose is clear and open and of a size suitable for the flying of control line models.

Do not fly until you have ensured that any spectators are well clear of the intended flight path of the model.

Before each flying session check that all controls, control lines, linkages etc. are in good condition and safe to use.

Before each flight, re-check control lines for damage.

If someone strays into the circle while you are flying, fly high to avoid them and stay high until the circle has been cleared.

3 Rockets

NOTE: Article 74 of the ANO "Endangering Safety of an Aircraft" applies to all rockets: the operator of a model rocket must ensure that it does not endanger a real aircraft.

3.1 General

Only fly on sites that are clear and open with adequate open space downwind of the launch point and in good visibility.

Models should be constructed of lightweight materials and should contain no metal structural parts.

Only commercially available factory produced motors should be used.

Models should be equipped with a suitable recovery system (parachute or streamer) or with aerodynamic surfaces sufficient to ensure a safe descent.

Motors should be ignited electrically in such a way that the operator is at least 5 metres from the launch point.

3.2 **Rockets between 160 Newton-seconds ('G' Rating) and 10,240 Newton-seconds ('M' Rating)**

In addition to the above, article 99 of the ANO "Regulation of Rockets" applies to all rockets with motive power exceeding 160 Newton-seconds ('G' Rating) and the requirements of the article are summarised below:

No person shall launch a rocket with a motive power that exceeds 160 Newton-seconds ('G' rating) unless he has reasonably satisfied himself that:

- the flight can be safely made; and
- the airspace within which the flight will take place is, and will throughout the flight, remain clear of any obstructions including any aircraft in flight;

and

- for a flight within controlled airspace, he has obtained the permission of the appropriate air traffic control unit for aircraft flying in that airspace;
- for a flight within an aerodrome traffic zone he has obtained the permission of the air traffic control unit, the aerodrome flight information service unit at the aerodrome or the air/ground communications service unit as appropriate;
- for a flight for aerial work purposes the flight is carried out under and in accordance with a permission granted by the CAA.

3.3 **Rockets over 10,240 Newton-seconds ('M' Rating)**

Large rockets exceeding 10,240 Newton-seconds must not be launched unless in accordance with a permission granted by the CAA.

Chapter 8 Control Frequencies

Radio usage for business, broadcasting and leisure activities continues to expand rapidly. The use of radio is carefully planned on an international basis to give as high a standard of service as possible. Unauthorised use of radio can cause harmful interference to legitimate users and/or put safety of life at risk.

It is therefore important that operators of model aircraft use the allocated frequencies and comply with the applicable technical restrictions.

OFCOM is the regulator for the UK communications industries, with responsibilities across television, radio, telecommunications and wireless communications services. Amongst its other responsibilities, OFCOM takes action to prevent interference and any risk to safety of life.

A summary of the frequencies allocated for model control are listed below. This information should be read in conjunction with OFCOM's document OfW 311 (available from www.ofcom.org.uk) on Radio Control Models which gives a comprehensive list of frequency allocations and technical restrictions that apply.

Frequency (MHz)	Use	Effective radiated power (milliwatts)	Comments
26.96 to 27.28	General	100	Also used for Citizen Band radio as well as low-power telemetry
34.945 to 35.305	Air	100	36 channels with a 10 kHz channel spacing
40.66 to 41.00	Surface	100	34 channels with a 10 kHz channel spacing
458.5 to 459.5	General	100	Telemetry & Telecommand

Additionally, the Wideband Data Transmission Applications (WBDTs) at 2400 to 2483.5 MHz may also be used for model control - OfW 311 contains full details.

Modellers should always think carefully about the possibility of interference and ensure the equipment they propose to use is suitable and operating in a frequency band appropriate for the intended use.

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Chapter 9 Model Flying Sites – Models Over 7 kg

Model Flying Sites for Models over 7 kg

The operator of a model weighing over 7 kg is required to obtain permission before flying his model within controlled airspace or within an active aerodrome traffic zone (ATZ).

Try to fly at a site which is already cleared for use by models rather than trying to obtain individual permission. The model associations are listed in **Annex A** and should be able to advise you of local sites.

For advice on whether there is controlled airspace in a particular part of the country, check with the appropriate airspace utilisation number given in **Annex A**.

Flight within an ATZ can be cleared by the relevant Air Traffic Control unit. Telephone numbers are in local telephone directories.

It is far better to establish a model flying site with long term permission, rather than seek one-off permission. A written permission for the use of a site may have conditions, such as a height limit and times of use. There may also be a requirement to notify air traffic control when the site is actually being used. There are many sites already established on this principle.

Direct liaison with the controlling authority or the aerodrome operator is needed to arrange this type of permission. However, if there are difficulties with the terms of such permission, or if permission is refused, arbitration by the CAA may be possible. The Flight Operations Inspectorate (General Aviation) or the Air Traffic Standards Department may be contacted for advice in the first instance.

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Chapter 10 Electricity Board Guidelines

There are over half a million kilometres of overhead electric power lines in the mainland of Britain. Most are uninsulated and carry up to 400,000 volts along conductors supported on wood and other poles, and on metal towers (pylons).

The safest way to avoid contact with overhead electric power lines is not to fly under or near them. Always observe the following precautions – your life may depend on it.

If a model is tangled in electricity wires, stay clear and call for expert help.

If wires are damaged by a model:

- **Stay clear and call the electricity supply authority.**
- Even small wires can carry lethal voltages and these can extend into the ground around the end of a broken line – sometimes up to several metres.
- Never try to 'rescue' a model with a wooden pole or other 'non conductor' – under some weather conditions, many materials will conduct high voltage electricity.

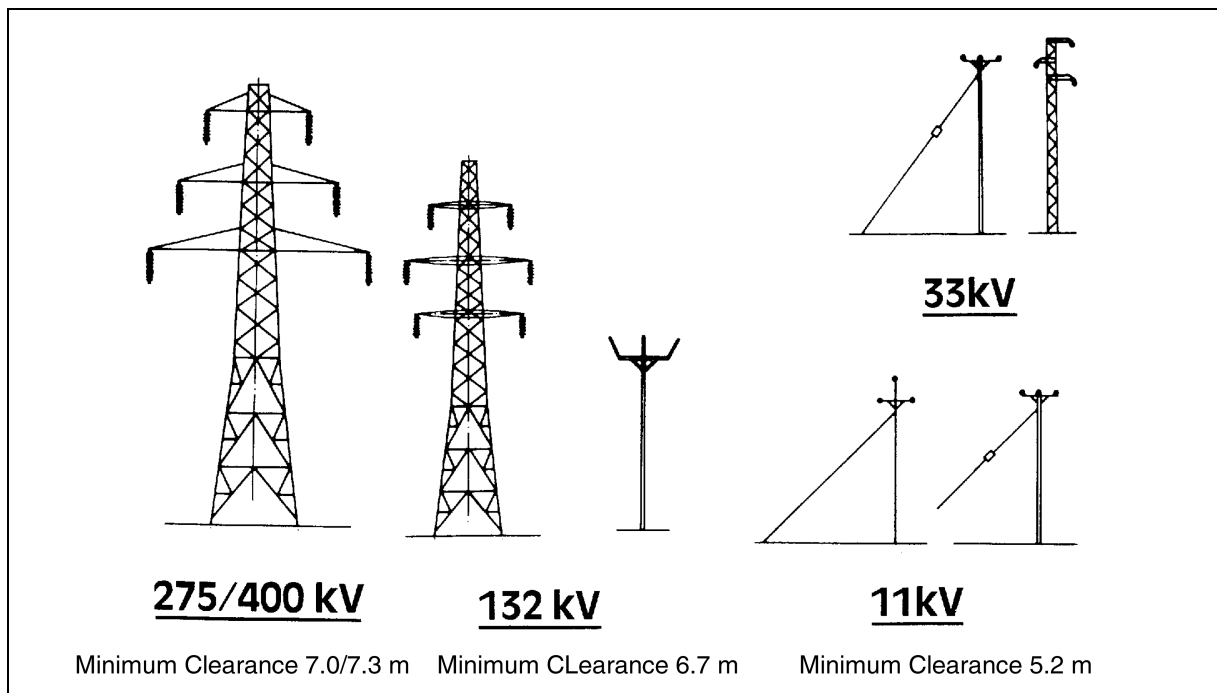


Figure 1 Typical Overhead Line Supports
With minimum clearances of lines from ground

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Chapter 11 Military Low Flying

Military low flying training takes place virtually anywhere in the UK outside of controlled airspace and away from major towns and cities.

Low Level Civil Aviation Notification Procedures – CANP – may be of help.

On a **WEEKDAY**, CANP lets you tell the military where and when you intend to fly.

CANP CAN BE USED IF A MODEL FLYING SITE IS PLANNED TO HAVE 5 OR MORE MODELS FLYING AT ONE TIME AND IF MILITARY LOW FLYING IS KNOWN TO TAKE PLACE IN THE AREA:

You can notify the Tactical Booking Cell of London Air Traffic Control Centre (Military) weekdays on:

Freephone 0800 515544 or Fax 0500 300 120 and give the following information:

	CIVIL LOW FLYING – RECREATIONAL ACTIVITY:
A	Model aircraft flying
B	Location – as Ordnance Survey grid reference + nearest village/town
C	Operating area e.g – 500 m radius
D	Date and start/finish in local time
E	Operating heights – lower/upper limits agl
F	Number (+ type) of models e.g – 3 gliders and 3 aeroplanes
G	Contact telephone number
H	Operator or Club name + phone if different to G

If possible, call the day before the planned activity. A minimum of 4 hours notice is required to allow the information to be circulated to military flying units.

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Chapter 12 Model Displays

1 General

This section provides general guidance for planning and organising a model flying display. As the size and nature of such events varies considerably it is only possible

to incorporate in this publication general pointers in terms of safety and control. It is recommended that groups contemplating holding a model flying display should also refer to the handbooks that are published by the British Model Flying Association, the Scottish Aeromodellers Association and, for events where models weighing over

20 kg are to be flown, the Large Model Association. Addresses of these organisations can be found in **Annex A**.

It is essential that any organiser contemplating holding a model flying display appoint the following:

A Flying Display Director, who is the person responsible for the safe conduct of the flying display and who will assume overall responsibility for the planning, organisation and subsequent running of the event.

A Flight Line Director who will assist in the planning of the flying, the briefing of the pilots and who will take full control of all flying activities.

A Flight Line Marshal who is responsible to the Flight Line Director, and will directly control the active model flying.

A Police and Emergency Services Liaison Officer who is responsible for all contact with police and emergency services both before and during the display.

2 Permissions

2.1 In Regulated Airspace

Flying displays involving models below 7 kg do not need permission but should not take place within regulated airspace without prior consultation with the relevant air traffic control unit. Consultation should be entered into as early as possible but not less than 28 days before the display.

Flying displays involving models above 7 kg need permission from the relevant air traffic control unit. Consultation should be entered into as early as possible but not less than 28 days before the display.

2.2 Outside Regulated Airspace

Flying displays involving models below 7 kg do not need permission.

Flying displays involving models over 7 kg whose maximum altitude is planned to exceed 400 feet above ground level need a permission from the Civil Aviation Authority, Flight Operations (General Aviation) Inspectorate.

3 Organisation

The organiser should:

- Determine whether the site permits the separation distances that will be required for the type(s) of model that are to be flown or, if not, whether the CAA will allow an exception to be made in this instance.
- Establish whether a CAA site exemption will be required for the display and if so apply for it at least 28 days in advance.
- If the event is to be on Ministry of Defence land, obtain permission from the Commanding Officer and apply for a licence from the appropriate Defence Land Agency office.
- Ensure that arrangements are made for:
 - spectator control or, in the case of an event at which model flying is part of a larger function, the siting of the model flying area in relation to spectator enclosures, car parks etc.
 - Verification of the competence of all pilots taking part in the display.
 - Effective transmitter control and frequency monitoring facilities in the case of radio control flying, including any out of hours flying at the display site.
 - Airworthiness and safety checking of all model aircraft and equipment to be used in the display.
 - Verification of third party public liability insurance covering individual flyers, any model flying clubs involved in the display and the display organiser.

NOTE: Radio Control flying displays should not take place within controlled airspace, including ATZs and MATZ, without prior consultation with the relevant air traffic control unit concerned. Such consultation should be sought as early as possible but not less than 28 days before the display.

4 Flight Line Marshal

The Flight Line Marshal is responsible for the flight safety of the display and must exercise authority over all flying matters. He must not hesitate to discipline pilots if necessary and he has the final say on all matters pertaining to the airside operation of the flight line.

5 Police and Emergency Services Liaison Officer

The Police and Emergency Services Liaison Officer is responsible for all contact with the police and emergency services both before and during the display. Before the display they will liaise with the police and local authorities if required or, in the case where model flying is part of a larger function, provide written notification to the function organisers of any special requirements. He will act as the point of contact with emergency services during the display.

6 Radio Control Display Sites

A tarmac or mown grass surface area for take-off and landing of recommended minimum size 100 x 40 metres should be available, with the 100 metres direction substantially into wind.

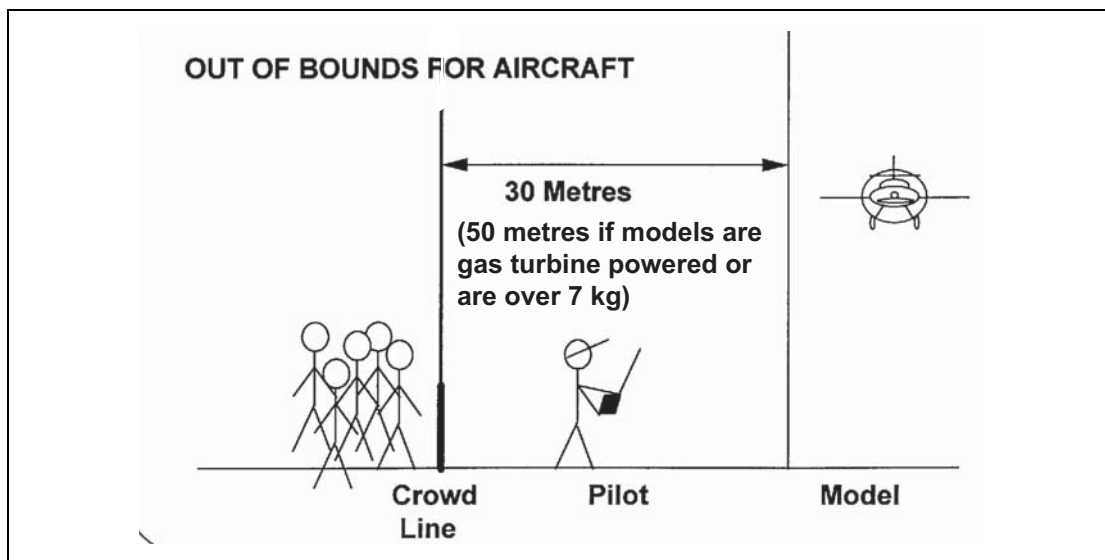
It is recommended that safety zones should be established for a minimum of 150 metres both upwind and downwind of the take-off and landing area and that there should be no spectators, moving vehicles or other obstructions within these safety zones.

The site should be positioned so that flying may generally take place without car parks or spectator areas being overflown.

Spectators should be behind a barrier located parallel to the take-off and landing direction. They should be only on one side of the flying area for radio controlled aircraft. In no circumstances should take-off or landing be performed towards spectator or car park areas.

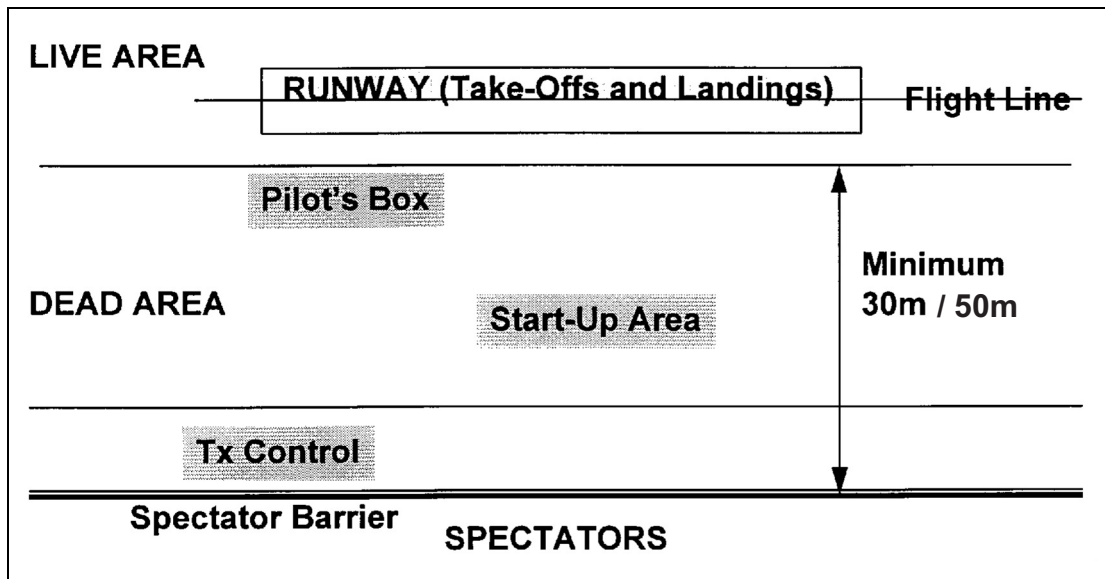
The distance of models in flight from spectators should not be less than 30 metres for models under 7 kg as shown in the diagram. For models over 7 kg and for all gas turbine powered models the distance should be 50 metres but this distance may be reduced to 30 metres for take-off or landing only. The organiser should also consider the need to add an additional separation distance for models of exceptional dimensions, weight or performance.

When planning for competitions or events where the display height exceeds 400ft, consideration should be given to increasing the separation distances from the crowd line.



7 Site Layout

The layout below is a standard type which may have to be modified slightly depending upon site conditions and the number of spectators expected. Areas should be allocated for the flight lines, pits, start up positions and pilots box. Safety should always be the prime consideration. Indeed, if the site requires significant deviation from this, great care should be exercised in the acceptance of the site as suitable for a display event



8 Weather

Careful consideration should be given to how weather conditions on the day may affect the planned display e.g. the effect of an on-crowd wind may be significant for larger models.

9 Control Line Display Sites

The flying area should be substantially flat. The aircraft are tethered and fly in a circular path; the minimum radius of the area required is the maximum control line length to be used in the display plus 15 metres.

A pilot's circle of approximately three metres diameter should be marked in the centre of the flying area (washable paint recommended) and pilots should ensure that they remain in this circle whilst flying.

UNDER NO CIRCUMSTANCES SHOULD THE BOUNDARY OF THE FLYING AREA BE LESS THAN 50 METRES FROM ANY OVERHEAD CABLES OR MASTS SUPPORTING SUCH CABLES.

Spectators should be behind stout rope barriers or similar restraints to isolate them from the flying area. Sufficient Marshals should be appointed to ensure that the spectators are appropriately controlled and supervised.

10 Ground Special Effects Safety

The use of explosives for simulated groundbursts, smoke and other special effects must be strictly controlled by a competent person appointed by the Event Organiser.

Debris from such effects must not impinge on aircraft, the spectators or the runway/taxiways and to this end the scale of any effects must be controlled and known before the event.

Briefings for ground officials and Display Pilots must draw attention to the hazardous nature of such devices and approval of all involved Display Pilots must be obtained before any demonstration goes ahead.

The location of the explosives and safety radii, if appropriate, are to be out of bounds to all staff except those directly involved with their operation.

Chapter 13 Occurrence Reporting

1 Definitions

An **ACCIDENT** is where a person suffers a fatal or serious injury as a result of contact with any part of any model including parts that have become detached from the model.

A **SERIOUS INCIDENT** means an incident involving circumstances indicating that an accident nearly occurred.

An **INCIDENT** is an occurrence that has the potential for an accident or serious incident to occur.

2 General Flying

In the event of an accident involving a model aircraft which causes injury to a third party, the pilot must inform their own National Association as soon as is reasonably practicable.

3 Public Events (Displays or Competitions)

The Organiser of a display is responsible for ensuring that any Accidents involving injuries to members of the public are reported to the CAA as soon as is reasonably practicable. Note this includes injuries caused by ground special effects.

The Organiser of a display or competition is also responsible for reporting any accidents or serious incidents to their respective Association with information to the BMFA.

Incidents occurring near or behind the crowd line or in any area to which the public has access must also be reported to the respective Association as soon as is reasonably practicable.

The Flying Display Director shall be responsible for the initial determination of the seriousness of any incident occurring at the display.

The Display Organiser shall be responsible for initiating the reporting procedure outlined above.

At a display or competition, the Display Organiser must appoint a Police and Emergency Services Liaison Officer to act as the point of contact for liaison with the police and emergency services in the event of an accident or serious incident.

4 Contact Details

The respective Associations are to maintain a list of contacts who are authorised to act on behalf of their Association on notification of an accident or serious incident occurring.

Contact details can be found in Annex A "Useful Addresses and Telephone Numbers".

Accident reporting (Out of Office Hours) CAA: 07808 900329

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Chapter 14 Aerial Work

All models over 7 kg and rockets over 160 Newton-seconds ('G' Rating) require an ANO Permission from the CAA to undertake Aerial Work. Aerial work with models over 20kg is not covered by this CAP, please refer to the "Light UAV Policy" and CAP 722 "Unmanned Aerial Vehicle Operations in UK Airspace – Guidance" available from the Flight Operations Inspectorate (General Aviation) or www.caa.co.uk.

1 Aerial Work Defined

A model aircraft flight is considered to be aerial work if it is undertaken for 'valuable consideration'.

2 Valuable Consideration Explained

Valuable consideration is defined as any gain you may make from the work undertaken.

In even simpler terms:

if, because of model flying, you are better off at the end of the day than when you started, you have probably been doing aerial work.

You may ignore any gain of nominal value – a pint of beer for instance, but a crate of the same is probably valuable consideration.

Models weighing not more than 7 kg, without fuel but including any attached article or equipment, can be used for aerial work purposes subject to the advice in the preceding chapters.

3 CAA Permissions

3.1 CAA permission must be obtained before undertaking any aerial work with a model weighing over 7 kg

Permission may be subject to operating conditions and will be for a specific period or event. It may be possible in the longer term to issue a Permission to an established company to allow, say, aerial photography within defined conditions (e.g. distances from people and buildings). Such permission will normally be reviewed annually.

3.2 Models weighing between 7 and 20 kg

Permission to undertake aerial work with models between 7 and 20 kg should be sought from the CAA, Flight Operations Inspectorate (General Aviation).

3.3 Models weighing over 20 kg

Permission to undertake aerial work with models over 20 kg should be sought from the Aircraft Certification Department, Airworthiness Division, CAA. Please refer to the "Light UAV Policy" and CAP 722 "Unmanned Aerial Vehicle Operations in UK Airspace – Guidance" available from www.caa.co.uk.

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Annex A Useful Addresses and Telephone Numbers

Civil Aviation Authority

Flight Operations Inspectorate (General Aviation)

Tel 01293 573524
Fax 01293 573973

Airworthiness Division

Tel 01293 573284
Fax 01293 573976

Air Traffic Standards Department

Tel 01293 573426
Fax 01293 573974

Safety Regulation Group
Aviation House
Gatwick Airport South
West Sussex RH6 0YR
www.caa.co.uk

Airspace Utilisation Section

Directorate of Airspace Policy
K102 CAA House
45-59 Kingsway
London WC2B 6TE

Tel 0207 453 6599

British Model Flying Association

Chacksfield House
31 St Andrews Road
Leicester LE2 8RE
www.bmfa.org
admin@bmfa.org

Tel 0116 2440028
Fax 0116 2440645
Out of office hours (answerphone)
0116 2440028

British Association of Radio Control Soarers

28 Moreland Drive
Gerrards Cross
Bucks SL9 8BD
home.clara.net/barcs/

Tel 01753 889825
Fax 01753 889825

Large Model Association

LMA Secretary
137 Beechwood Ave
Earldon
Coventry
CV5 6FR
E-mail: chris@LargeModelAssociation.com
www.largemodelassociation.com

Tel 02476 674639

Scottish Aeromodellers Association (SAA)

PO Box 1621
Johnstone
Renfrewshire
PA9 1YN
E-mail: Secretary@saaweb.org.uk
www.saaweb.org.uk

Tel: 01505 704111 (day)
01505 706300 (eve & weekends)
07704 981496 EMERGENCY USE
Fax: 01505 706500

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Annex B Relevant Legislation

Model aircraft are exempt from most of the rules, or Articles, of the Air Navigation Order which contains the statutory requirements for the operation of aircraft in United Kingdom airspace.

Article 164 specifies exemption from the Order, except for the following Articles:

- **Article 68** Aircraft must not be used for agricultural aerial application (crop spraying) unless the operator has an Aerial Application Certificate issued by the Authority.
- **Article 74** Endangering persons or property with an aircraft. See Chapter 2.
- **Article 96(1)** The Secretary of State has the right to prohibit, restrict or impose conditions on flight.
- **Article 97** Rules for flying balloons, kites, airships, gliders and parascending parachutes.
- **Article 98** Rules for flying Small Aircraft (including model aircraft); see Chapter 5.
- **Article 99** Rules for flying model rockets (see Chapter 7.3).
- **Article 144(1)(b) and (c)** Authority power to prevent aircraft flying.
- **Article 155(1) and (2)** Definitions.

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Annex C Forms

Model Aircraft Exemption – Application

Over 20kg

Model Aircraft Exemption – Application

Displays / Competitions

MODEL AIRCRAFT EXEMPTIONS – APPLICATION OVER 20KG



This form should be used to apply for an Exemption to fly a model aircraft that weighs more than 20kg.

Please return the completed form to: *Tony Hooper (LMA Chief Safety Officer)*
1 Little Pittern, Kineton, Warks. CV35 0LQ
Tel: (01926) 641490

TYPE OF APPLICATION: (Tick applicable box)

- Exemption to test fly a model over 20kg See Note 1
- Full Exemption to fly a model over 20kg See Note 2
- Renewal of Full Exemption to fly a model over 20kg See Declaration below
- Addition of Pilot(s) for model already holding a Full Exemption See Note 2

APPLICANT / MODEL:

Name(s) of Pilot(s) :

Name and Address of Applicant:

Tel Number:

Model Type: LMA Model Reg Number:

Model Weight (Kilograms): Wing/ Rotorspan (Metres):

Length (Metres): Engine Size (CC)/Type If Non Piston:

NOTE 1: Initial applications for models over 20kg must include an LMA Certificate of Design and Construction.

NOTE 2: A Full Exemption will only be issued if the test flights have been completed – these should be sent to the Chief Examiner and Safety Officer (CESO) of the Large Model Association for recording purposes. The application must also include an LMA Certificate of Design and Construction.

DECLARATION

I agree that the model will be operated in accordance with Article 98 of the Air Navigation Order 2005 and CAP 658 and with due regard for the guidelines laid down by the UK Model Associations.

Where applicable, I confirm that the model has NOT been modified, seriously damaged or rebuilt since the issue of the last exemption.

Signed: Date:

Name(Capitals)

LMA AUTHORSATION STAMP

**MODEL AIRCRAFT EXEMPTIONS – APPLICATION
DISPLAYS/COMPETITIONS**



This form should be used to apply for an Exemption under Article 98(d) of the ANO 2005 to allow a model to exceed 400 feet above the surface. If the flying is to take place within controlled airspace or ATZ, then an application should be made directly to the Air Traffic Control Unit for their permission.

Please return the completed form to: *Flight Operations Inspectorate (General Aviation),
Civil Aviation Authority, 1W Aviation House
Gatwick Airport South, West Sussex RH6 0YR
Tel: (01293) 573526 Fax: (01293) 573973*

TYPE OF APPLICATION: (Tick applicable box(es))

- Exemption to exceed 400 feet at a display or competition with models 7–20kg
- Exemption to exceed 400 feet at a display or competition with models over 20kg

APPLICANT:

Name(s) of Organiser:

Name(s) of Applicant (if different):

Address of Applicant:

.....

Telephone Number:

DISPLAY OR COMPETITION DETAILS:

Name of Event:

Date and Time of Event:

Location:

OS Map Number: OS Grid Reference:

Exemption Height Requested:

NOTE 1: Please include a map based on the 1:50,000 OS Map (Landranger Series) indicating the flying area and the position of the spectators (if applicable).

NOTE 2: This application will be forwarded to Airspace Utilisation Section (AUS) for appropriate NOTAM Action (Notice to Airmen) after the Exemption has been issued.

DECLARATION

I agree that the model will be operated in accordance with Article 98 of the Air Navigation Order 2005 and CAP 658 and with due regard for the guidelines laid down by the UK Model Associations.

Where applicable, I confirm that the model has NOT been modified, seriously damaged or rebuilt since the issue of the last exemption.

Signed: Date:

Name(Capitals)

Form SRG 1308 August 2006

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