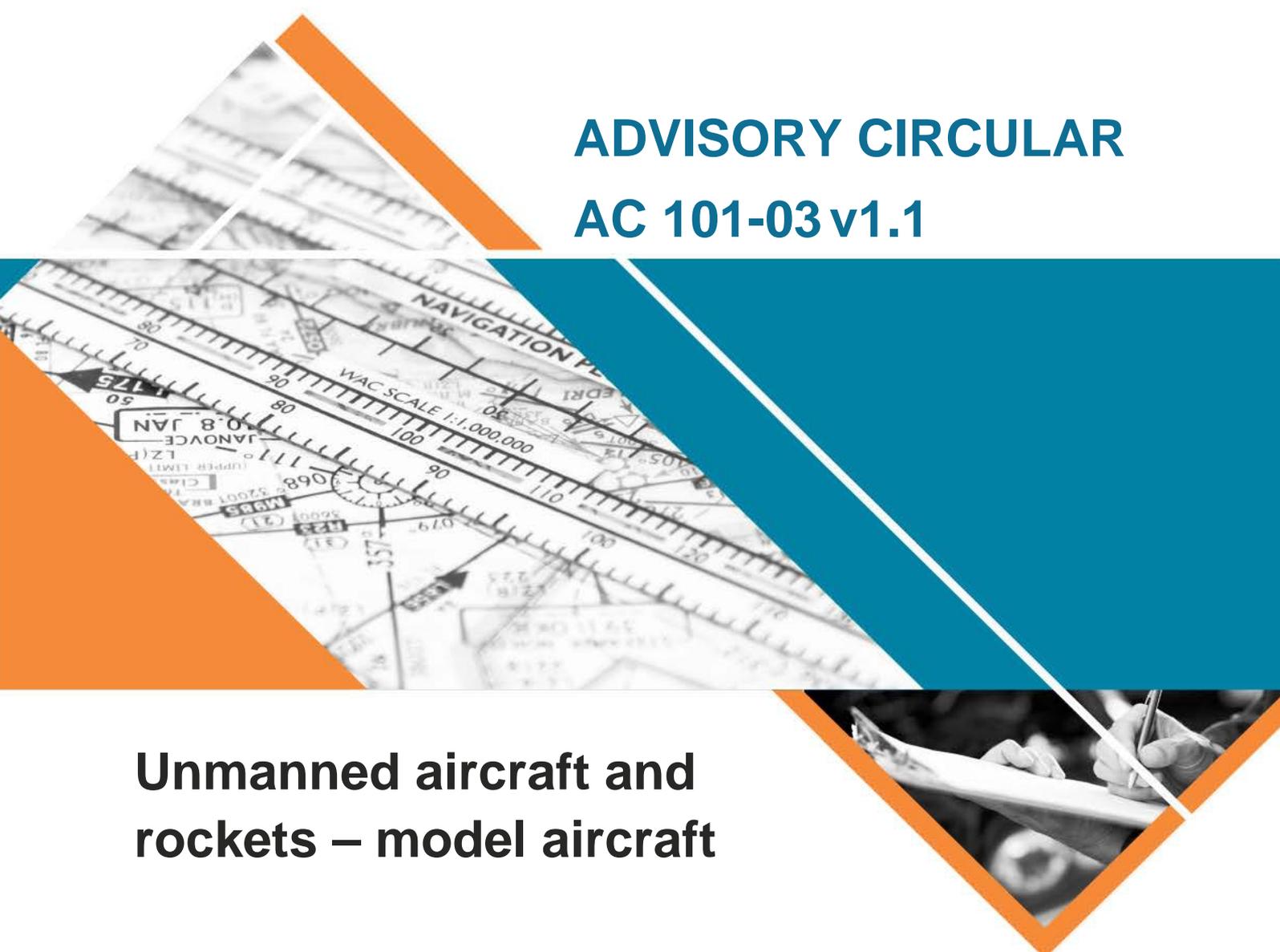




ADVISORY CIRCULAR AC 101-03 v1.1



Unmanned aircraft and rockets – model aircraft

Date	August 2018
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Advisory Circulars provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory Circulars should always be read in conjunction with the relevant regulations.

Audience

This advisory circular (AC) applies to:

- operators of model aircraft
- model aircraft clubs
- model aircraft associations.

Purpose

This AC provides guidance to builders and operators of model aircraft in the operation and construction of model aircraft and the means whereby they may safely and legally operate these aircraft. It also provides guidance to approved administration organisations and CASA staff on the regulation of model aircraft activities. While this AC prescribes a means of compliance with legislation, alternate procedures demonstrating an equivalent or greater level of safety will be considered on a case by case basis.

For further information

For further information, contact CASA's Remotely Piloted Aircraft Systems (RPAS) Branch (telephone 131 757).

Status

This version of the AC is approved by the Manager, RPAS Branch.

Note: Changes made in the current version are not annotated. The document should be read in full.

Version	Date	Details
v1.1	July 2018	Minor changes throughout to update and ensure that the advice remains consistent with the Part 101 regulations and other relevant legislation. AC placed into current style template.
(0)	July 2002	First AC published on this subject.

Unless specified otherwise, all subregulations, regulations, divisions, subparts and parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

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1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	advisory circular
CAR	<i>Civil Aviation Regulations 1988</i>
CASA	Civil Aviation Safety Authority
CASR	<i>Civil Aviation Safety Regulations 1998</i>
RPA	remotely piloted aircraft
VLOS	visual line of sight

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Controlled airspace	Airspace of defined dimensions within which an air traffic control service is provided to flights in accordance with the airspace classification.
Model aircraft	A remotely-piloted aircraft that is used for sport and recreation and cannot carry a passenger.
Giant model aircraft	An unmanned aircraft that has a take-off mass (excluding fuel) of more than 25 kilograms, but not more than 150 kilograms that is flown for sport and recreation.
Remote pilot	The person who manipulates the flight controls of a remotely piloted aircraft or who initiates and monitors the flight and is responsible for its safe conduct during flight time.
Remote pilot station	The station at which the remote pilot manages the flight of an unmanned aircraft.
Restricted area	An area declared under the <i>Airspace Regulations 2007</i> for which permission must be granted by the controlling authority before any operations in that area can occur while it is active.
Sport or recreation	In relation to the flight of an unmanned aircraft, a flight activity only for the pleasure, leisure or enjoyment of the remote pilot.
Populous area	An area [that] has a sufficient density of population for some aspect of the operation, or some event that might happen during the operation (in particular, a fault in, or failure of, the aircraft...) to pose an unreasonable risk to the life, safety or property of somebody who is in the area but is not connected with the operation.
Visual line of sight (VLOS)	Close enough to see, maintain orientation and achieve accurate flight and tracking

1.3 References

Regulations

Regulations are available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

Document	Title
Part 101 of CASR 1998	Unmanned aircraft and rockets
CASA Instrument 96/17	Operation of certain unmanned aircraft
CASA Instrument EX156/17	Exemption, approval and direction – operation of model aircraft – members of Model Aeronautical Association of Australia
CASA Instrument 96/17	Operation of certain unmanned aircraft
CASA Instrument EX156/17	Exemption, approval and direction – operation of model aircraft – members of Model Aeronautical Association of Australia

Advisory material

The following advisory circulars may be of interest to operators of model aircraft. CASA's advisory circulars are available at <http://www.casa.gov.au/AC>

Document	Title
AC 101-01	Remotely piloted aircraft systems – licensing and operations
AC 101-02	Unmanned aircraft and rockets – rockets
AC 101-10	Remotely piloted aircraft systems – operation of excluded RPA

1.4 Forms

CASA's forms are available at <http://www.casa.gov.au/forms>

Form number	Title
696	Application for Approval to Conduct an Air Display

2 Introduction

- 2.1.1 The Civil Aviation Act describes the conditions under which an aircraft may fly in Australia. The rules governing that flight are generally contained in the Civil Aviation Safety Regulations (CASR) and the rules and regulations for flying model aircraft are contained Part 101 of the CASR.
- 2.1.2 It is the responsibility of the operator of a model aircraft to ensure that the model is flown safely and in accordance with the regulations. The purpose of this publication, which was written in collaboration with the major aeromodelling association, is to provide guidance to anyone intending to fly a model aircraft so that they may achieve that aim.
- 2.1.3 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 sailplanes.
- 2.1.4 Nothing in this publication is intended to conflict with Part 101 or other legislation which, in case of doubt, is overriding.
- 2.1.5 A list of addresses of organisations referred to in this publication is given at Appendix J.

3 Definition of a model aircraft

- 3.1.1 A model aircraft is any unmanned aircraft, other than a balloon, rocket or kite, which is flown for sport or recreational purposes, weighing not more than 150 kg, excluding fuel but including equipment installed in or attached to the aircraft at the commencement of its flight.
- 3.1.2 A model aircraft flown for any other purpose is covered by the term 'remotely piloted aircraft' (RPA) and is subject to the rules applicable to RPA.
- 3.1.3 A model aircraft is excluded from the vast majority of the regulations applied to other aircraft. For example, there are no requirements for aircraft registration, pilot licensing or aircraft airworthiness certification; however the regulations which DO apply are contained in sub-parts A-C and G of Part 101.
- 3.1.4 CASA has classified model aircraft by take-off weight (excluding fuel) as follows:
- a. less than 100 grams – exempt, subject only to the general rules for unmanned aircraft
 - b. 100 grams to 25 kilograms – model aircraft
 - c. more than 25 kilograms but not more than 150 kilograms – giant model aircraft.
- 3.1.5 A giant model aircraft can only be operated under the rules and procedures of an approved aviation administration organisation such as the Model Aeronautical Association of Australia (MAAA).

4 Learning to fly

4.1 Local model flying clubs

- 4.1.1 If possible, contact and join a local model flying club – there is no doubt that this is the best way to learn to fly.
- 4.1.2 There are numerous model flying clubs throughout Australia and most of them offer training in radio-controlled flying to beginners in the sport.
- 4.1.3 Details of your local clubs can be obtained from the associations listed in Appendix K, or you could enquire at your local model shop, or search online.

4.2 Learning to fly without a model flying club

- 4.2.1 It is possible to learn to fly without being a member of a club, but it can be difficult.
- 4.2.2 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. Many models are available in computer simulator programs, but this is no substitute for face-to-face training.
- 4.2.3 Appendix A gives basic advice on radio-controlled model flying.

4.3 Professional model flying training

- 4.3.1 There are a number of organisations and individuals which offer commercial model flying training.
- 4.3.2 Details of these organisations are listed in specialist model flying magazines or can be obtained from local model aircraft supply shops and model flying associations.

5 Model Aircraft Safety Considerations

5.1 Model aircraft flying – all models

- 5.1.1 First, choose an unobstructed site and at all times keep a safe distance from:
- persons
 - vessels
 - vehicles
 - structures.
- 5.1.2 Then, only fly:
- in suitable weather
 - with regard to any other conditions such as local by-laws
 - with due consideration for other people and property.
- 5.1.3 Unless approval has been obtained beforehand, model aircraft must only be flown:
- so as not to create a hazard to people or property
 - in visual line of sight (VLOS)
 - clear of the movement areas, runways and the approach and departure paths of aerodromes
 - below 400 ft Above Ground Level (AGL)¹
 - clear of a populous area, as defined under the regulations
 - at least 30 m clear of people not directly associated with the flight of the aircraft.
- 5.1.4 The following factors should be considered also:
- Incorporation of an appropriate 'fail-safe' mechanism on the model (eg, 'return to home' function for when the control link is lost).
 - Ensuring that any load carried on the model is secure.
- 5.1.5 Model aircraft must not be operated within 3 Nm (5.5 km) of a controlled aerodrome.
- 5.1.6 Model aircraft must also not be operated within 3 Nm (5.5 km) of a non-controlled aerodrome, or helicopter landing site (HLS), *if there is a manned aircraft operating to or from the aerodrome*. This means that model flyers must not commence a flight and must land their aircraft when they become aware of a manned aircraft operating to or from the aerodrome/HLS. Once the manned aircraft has landed or departed, flying can commence or recommence as applicable.
- 5.1.7 Paragraph 5.1.5 above, does not apply to a model aircraft operated by a current member of the MAAA, provided the aircraft is operated in accordance with the MAAA Manual of Procedures.
- 5.1.8 When operating within 3 Nm (5.5 km) of an aerodrome/HLS, model operators must keep their aircraft outside the approach and departure areas and movement area of the

¹ Unless operating in accordance with CASA EX156/17 and the MAAA Manual of Procedures.

aerodrome/HLS unless operating under a specific authorisation from CASA (Regulation 101.075).

Model aircraft must not be flown over an area of an area where a fire, police or other public safety operation is being conducted. These areas are identified, dynamically, in the CASA '*Can I Fly There?*' app, available for Android and iOS devices, with a web-based HTML5 version also accessible. Go to the relevant app store to download a free copy.

6 Model aircraft operating areas

6.1 Finding model flying sites for model aircraft

- 6.1.1 Safe model aircraft flying below 400 ft AGL is possible in most areas of Australia provided that the model is kept away from areas where manned operations occur at low altitudes (eg, aerodromes, emergency operations) and populous areas.
- 6.1.2 Operators of all unmanned aircraft, including models, are required to obtain permission before flying a model above 400 ft AGL in controlled airspace unless operating under a specific CASA authorisation for this purpose.² Such flights should generally be conducted in an ongoing approved area (eg, model aircraft club grounds), but one-off permissions for specific events may be issued by CASA.
- 6.1.3 While this means that a model aircraft may be flown above 400 ft AGL in certain circumstances, there are advantages in seeking approval for a permanent model aircraft operating area. Publication of the details of a model aircraft operating area means that other users of airspace will be advised where there is potential for conflict with model aircraft. Try to fly at these sites rather than applying for individual permissions. The model associations listed in Appendix J should be able to advise you of local sites.
- 6.1.4 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 for this purpose.
- 6.1.5 Use the CASA mobile app 'Can I Fly There?' to identify the type of airspace where you intend to fly.³, or check with the relevant CASA Regional Office using CASA's toll free number, 131 757.

² The legislative instrument, CASA EX156/17, permits MAAA members flying in accordance with the MAAA Manual of Procedures to fly above 400 ft AGL, despite the prohibition in the legislative instrument CASA 96/17.

7 Commercial activities

7.1 Regulatory requirements

- 7.1.1 A model aircraft is, by definition, one flown for sport or recreation. To fly the same aircraft for other purposes requires authorisation from CASA. See AC 101-10 if you are considering flying unmanned aircraft for other purposes.
- 7.1.2 Learning to fly model aircraft and teaching the sport do not require a CASA authorisation where there is no financial reward, or the aircraft weighs less than 2 kg and is operated in standard operating conditions.⁴
- 7.1.3 A person conducting commercial activities must do so in accordance with the rules applicable to Remotely Piloted Aircraft and must either have a licence and an operating certificate issued by CASA or qualify to operate under the 'Excluded RPA' provisions. The requirements for obtaining an operating certificate and Remote Pilot Licence are contained in sub-part F of Part 101, with guidance published in AC 101-01.

⁴ See Regulation 101.238 for the meaning of standard operating conditions.

Appendix A

Radio-controlled models (general)

A.1 General

- **Always fly** with regard to the general regulations concerning radio-controlled flying covered in Sections 5, 6 and 7.
- Model aircraft should be thoroughly checked prior to each flying session and after any hard landing.
- Metal propellers must not be used on internal combustion engines or electric motors.
- All radio-controlled 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 soldered connections 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**.
- Familiarise yourself with your flying area, noting where the no-fly areas are. These can include overflights of the pits and spectator areas. Also, note any access driveways or footpaths in the area. These may be unrestricted public use facilities.
- 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.
- Always announce your intentions, especially when landing or taking off. Alert, other model aircraft pilots that you are either taking off or landing by verbal means. This will ensure that the landing area and take-off path can remain clear and safe to use.
- Avoid overflight of houses, domestic gardens, car parks, traffic or spectators. You have no control over people walking by at a reasonable distance from your takeoff/landing area, so you should take care not to overfly them at low level.

- At any sign of malfunction or an unexpected loss of the model's 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.

A.2 Pre-flying session checks

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

- the airframe for any transit damage.
- that servos, linkages and any hatches are secure.
- the undercarriage for secure fixing and correct alignment.
- the propeller for damage and secure fixing
- that control surfaces are secure and move freely.
- the engine is securely attached to the airframe.

A.2.1 Check before each flight (FM Transmitters)

- 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 a liquid-fuelled engine, allow 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 an engine falters or cuts it is usually set too 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 recheck 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'.

A.2.2 Before flying

- Be **S.M.A.R.T.** with your transmitter:
 - **S**witch on
 - **M**eter in the green (for FM transmitters)
 - **A**erial secure and extended
 - **R**ate switches in all correct positions
 - **T**rim all in correct position.

A.2.3 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.

Appendix B

Radio-controlled helicopters

B.1 General

- Only fly with regard to the general regulations concerning radio-controlled flying covered in chapters 5, 6 and 7.
- Take care to use sites which are of a 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 an engine-driven 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.

A model helicopter should not be flown or run up:

- In or near the 'pits' area or close to any spectators.
- Except as part of a manoeuvre well away from other people, they are not to be flown 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 resistant to shock and vibration.

B.1.1 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, if fitted, and all piping is secure.
- Check that the receiver aerial is secure and in good condition with no chafing or damage
- Check that batteries are properly charged and not damaged.

B.1.2 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.

Appendix C

Radio-controlled silent flight (gliders and electric-powered models)

C.1 General

- 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 will usually help to put you in contact with such a club. The MAAA and other specialist aeromodelling associations, such as the Australian Miniature Aerosports Society (AMAS), will also be happy to advise (see Appendix J 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 and, most importantly, they can 'trim' the model for you so that it will fly safely.

C.2 Flying the glider

C.2.1 Launching

- **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.

C.2.2 Flying

- **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.

C.2.3 Landing

- **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 when using FM frequencies.
- **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.

C.3 Electric-powered models

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

- When fast charging batteries, use a battery charger equipped with either a timer or a voltage or temperature-controlled cut-off. Overcharging batteries at high currents can be dangerous. Lithium batteries can be very dangerous if they are not treated with care. A hard-landing or crash may render a battery unsafe. Do not store damaged batteries in cars or homes.
- Ensure batteries are fully discharged before recycling them.
- Burial in sand is a good way to extinguish a Lithium-Polymer (LiPo) battery fire. Do NOT use water or salt water.
- Lithium batteries/cells require a special charger, or they may catch fire/explode. Do not fly with unsafe batteries. This includes puffed and damaged cells.
- It is recommended that LiPo batteries are kept balanced and not over-discharged.
- LiPo battery-powered model aircraft should not be flown during periods of total fire bans.
- Ensure that the 'bind' sequence has been completed and the model responds to all intended commands.
- If the receiver has a programmable 'fail-safe', ensure that the throttle is set to 'stop'.
- Check carefully that motor operation does not interfere with the radio control equipment in the model. A range check with the 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 electric-powered models can be extremely high. Make sure that all cables and connectors are in good order and are robust enough to perform without overheating.
- Take great care when handling any electric-powered 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.
- If possible use a speed controller that incorporates a "safety circuit" that will not allow the motor to start unless the throttle has been brought back to the "stop" position.

- Disconnect your power pack as soon as possible after you have finished flying.
- Do not leave you model "armed" if unattended.

Appendix D

Gas turbine-powered model aircraft

D.1 Introduction

Advances in ceramic bearing technology, microelectronics and some clever design work have enabled the development of the micro gas turbine engine for use in the propulsion of model aircraft. This development has opened up a new and very technical aspect of the model aviation.

Safety in the operation of any model aircraft is paramount, and even more so when using a turbine engine for propulsion. A turbine powered model aircraft is a very complicated and technical piece of equipment and is not recommended for a beginner to model aviation.

Aircraft powered by gas turbine engines can be very dangerous in the hands of inexperienced operators and without specific safety precautions being in place. The engines operate at very high speed, over 100,000 revolutions per minute, and at very high internal temperatures. It is imperative that the builder has a very good working knowledge of the operation the engine being used. The airframe has to be built to a very high standard and this requires the builder being conversant with the use of materials such as composites, epoxy and polyester resins.

In addition, the aircraft are generally capable of flying at speeds up to 400 km per hour and are extremely agile. The high speed and high kinetic energy of turbine powered model aircraft require corresponding anticipation and skill to prevent the model exceeding altitude limits or infringing safety zones. The level of competence required to enable a pilot to fly a turbine powered aircraft is very high.

The operation of gas turbine-powered aircraft can be dangerous for both the operators and the public.

It is strongly recommended that a model aviation organisation with comprehensive safety precautions be contacted in order for the operator to be trained in the requirements. The model and the operating and flying ability of the pilot will almost certainly be checked before being allowed to fly.

D.1.1 General

In addition to the provisions in Appendix A, the following safety provisions should be observed when operating gas turbine powered model aircraft:

- Engine(s) should be in standard production configuration with no modifications other than those tested, documented, and approved in writing by the manufacturer.
- Engines should be operated in accordance with the manufacturer's operating guidelines at all times.
- Only fuels such as kerosene, propane, dieseline and gasoline should be used.
- Propane powered engines should be isolated to prevent cross ignition in multi-engine installations.
- Tailpipes should be directed away from other personnel and public.
- A fire extinguisher should be present during all operations.
- Gas turbine-powered model aircraft should not be flown during periods of total fire bans.
- Refuelling areas should be established well clear of people and operating aircraft.
- Any engine involved in a crash should not be operated until inspected by the manufacturer or approved service centre, prior to operating and flying again.

D.1.2 Aircraft

- In addition to standard engine fuel control, a fail-safe FUEL SHUTOFF VALVE should be installed for remote operation by the pilot.
- The engine should have over-speed prevention.
- Wheel brakes should be fitted if the aircraft cannot remain at rest without external restraint when the engine is at idle speed.

D.1.3 Home built turbines

- All engines, including those built from recognised plans, should be inspected by an appropriately qualified person prior to installation in an airframe.
- Prior to flight test, an installation inspection should be performed which should include starting and ground running. The pilot should use this period to familiarize him- or herself with the handling characteristics of the engine and associated systems.
- Following a successful ground inspection, a flight test may be carried out well clear of all persons and populous areas.
- Engines installed in airframes not originally designed for turbine operations should also be inspected and test flown in a safe area.

Appendix E

Models over 25 kg – Permissions

E.1 The need for permission

- Model aircraft weighing more than 25 kg but less than 150kg are subject to all of the safety rules of CASR Part 101 as well as the rules and procedures of an approved model aircraft club or association.
- Any permission will only be issued once it has been determined that the model is designed and built to a satisfactory standard.
- Model aircraft that weight more than 150kg are large RPA and require the operator to hold a RePL and ReOC. See AC101.01 for more information on large RPA.
- **Any person or group contemplating building an aircraft that is likely to weigh more than 25 kg should apply at an early stage to one of the modelling associations for advice** (See Appendix J).

E.2 Design and build advice and inspection

- The modelling association contacted 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 confirm satisfactory design and build standards, it is particularly important to build to a schedule if the construction does not readily allow access to all parts of the model for a final inspection – such as box sections.
- Assistance and advice may be subject to membership of an appropriate association.

Any special operating conditions applicable to the model can also be recommended at this stage.

Appendix F

Free-flight models

F.1 General

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.**

Appendix G

Control-line models

G.1 General considerations

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.

Appendix H

Model displays

H.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 appropriate model aircraft club or association. Addresses of these organisations can be found in **Appendix J**.

A model flying display may be conducted if it is held in an approved area and in accordance with the relevant procedures of an approved aviation administration organisation.

Model displays that do not meet the conditions above must apply for CASA approval in accordance with subregulation 101.410(3). This includes giving CASA at least 21 days notice of the intended model display. Form 696, available on the CASA website, should be used to provide the relevant information. Send the form to rpas@casa.gov.au.

H.1.1 Display guidance

All organisers of model flying displays should consider the following guidance.

H.1.2 Organisation

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

- An **Events Director**, 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 pilots and who will take full control of all flying activities.

The organisers 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 CASA would allow an exception to be made in this instance.
- 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
 - 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 organisers
 - liaison with the police and local authorities if required or, in the case where model flying is part of a larger function, written notification to the function organisers of any special requirements.

H.1.3 Flight line Director

The Flight Line Director is responsible for the flight safety of the display and must exercise authority over all flying matters. He or she must not hesitate to discipline pilots if necessary and he or she has the final say on all matters on the flightline.

H.1.4 Radio control display sites

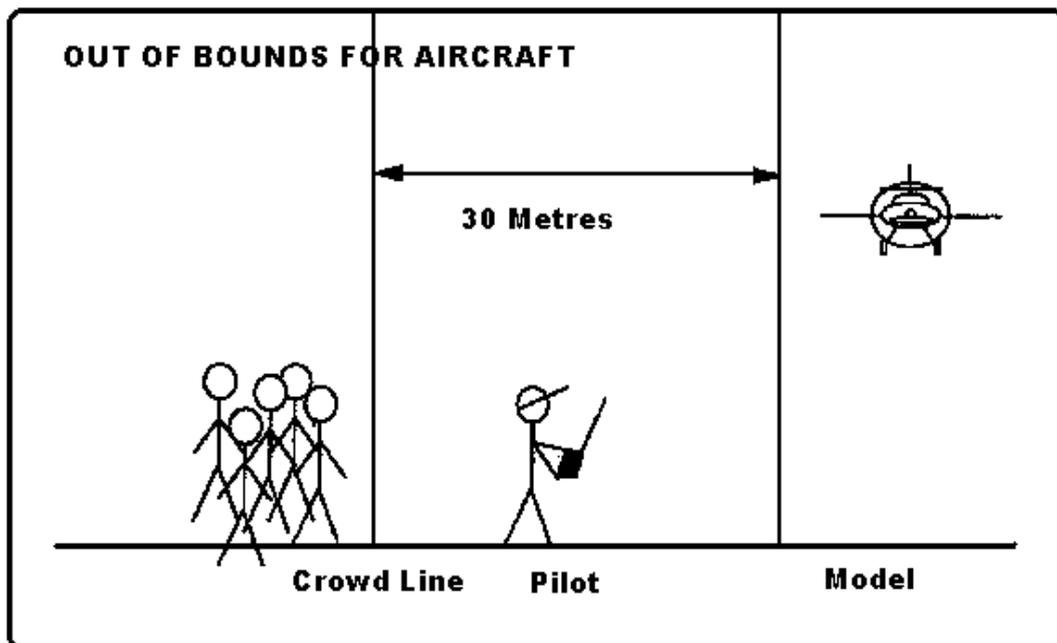
A firm surface or mown grass area for take-off and landing of recommended minimum size 100 x 40 metres should be available, with the 100 metres direction substantially into wind.

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 overflowed.

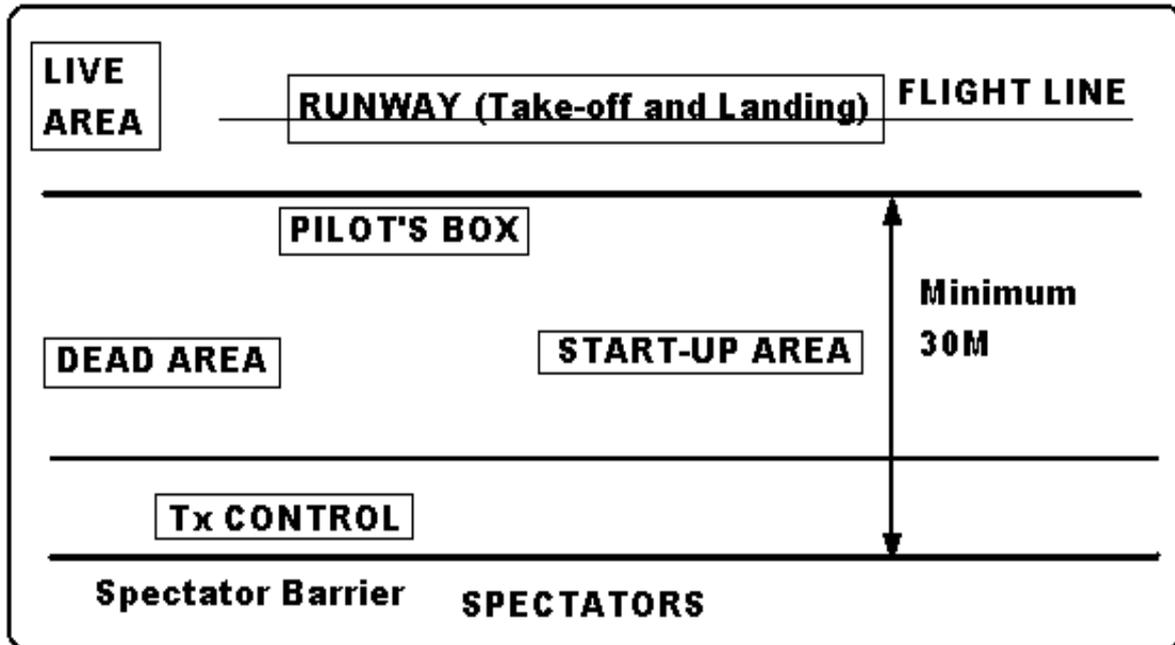
Spectators should be behind a barrier located parallel to the take-off and landing direction. They should be only on one side of the flying area for radio-controlled aircraft. In no circumstances should take-off and landing be performed towards spectator or nearby car park areas.

The distance of models from spectators should not be less than 30 metres for all operations including take-off or landing.



H.1.5 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.



Control Line Display Sites

The flying area should be substantially flat. 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.

THE BOUNDARY OF THE FLYING AREA SHOULD NOT BE LESS THAN 50 METRES FROM ANY OVERHEAD CABLES, OR MASTS SUPPORTING SUCH CABLES.

Spectators should be behind stout rope barriers or similar restraints surrounding the flying area and sufficient marshals should be appointed to ensure that the spectators are kept under control.

H.1.6 Model flying at manned aircraft displays

Any model flying at a manned air display is subject to the display organiser's directions.

Appendix I

Powerlines

I.1 General

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 voltage, 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.

Appendix J

Useful contacts

Association	Contact	Phone	Email	Website
Model Aeronautical Association of Australia (MAAA)	Kevin Dodd 16 Illidge Road, Victoria Point Qld 4165	07 3207 9067	secretary@maaa.asn.au	https://www.maaa.asn.au/
Australian Capital Territory Australian Capital Territory Aeromodeller Association	Dave Pinchbeck	0409 913 467	secretary@actaa.net.au	http://www.actaa.net.au/
Western Australia Aeromodeller of Western Australia	David Rose	0409 684 021	secretaryawa1@gmail.com	http://www.aeromodellers-wa.org.au/
New South Wales (Radio Control) Miniature Aero Sport of New South Wales	Tim Nolan 212 Silverwater Road, Sydney NSW 2128	0412 173 440	timnolan11@optusnet.com.au	http://nsw.aeromodellers.org.au/
Queensland Model Aeronautical Association of Queensland	Kathy Moody 16 Yalumba Cres, Toowoomba, Qld 4814	07 4634 4078	secretary@maaq.org	http://maaq.org/
South Australia Model Aerosports of South Australia	Paul Kumela	0490 371 869	secretary@masa.org.au	www.masa.org.au
Victoria Victorian Model Aeronautical Association	Norm Thompson PO Box 155 Doreen, VIC 3754	0431 786 573	secretary@vmaa.com.au	www.vmaa.com.au
Tasmania Tasmanian Model Aeronautical Association	Clive Butler		clivebutler@radial.net.au	http://www.tasmodelaero.com
Other associations				
Australian Miniature Aerosports	Mike Snabaitis	0417 879 416	secretary@amas.org.au	http://www.amas.org.au

Association	Contact	Phone	Email	Website
Association (AMAS)	(Secretary)			
Civil Aviation Safety Authority	RPAS Branch GPO Box 2005 Canberra ACT 2601	131 757	rpas@casa.gov.au	https://www.casa.gov.au/aircraft/landing-page/flying-drones-australia