

ADVISORY CIRCULAR (AC) 101-1

DESCRIPTION

This Advisory Circular (AC) was developed for ICAO Member States and interested stakeholders and provides guidance associated with the ICAO Model UAS Regulations [Part 101] regarding unmanned aircraft system (UAS) operations in the Open category. It may assist CAA personnel in the implementation and oversight of UAS operations. Throughout this AC, information enclosed by brackets “[]” indicate items that CAAs may need to align with existing CAA regulatory references.

For the Specific category of UAS operations covered by ICAO Model UAS Regulations [Part 102], Member States are encouraged to refer to AC 102-1. A third category, the Certified category of UAS operations, is under development by ICAO. The Certified category covers international IFR operations.

An AC provides information and guidance by describing an acceptable means, but not the only means, of demonstrating compliance with the regulations and standards. An AC does not change, create, amend or permit deviations from regulatory requirements nor does it establish minimum standards. This AC serves as guidance for consideration by ICAO member States to create, add, or amend, future or existing guidance material developed by the CAA.

These model regulations and the accompanying guidance material are available for download on ICAO's public website: <https://www.icao.int/safety/UA/>. The documents on the website are intended to be living documents and are subject to change without notice.

[Advisory Circular (AC) 101-1]

Unmanned Aircraft Systems (UAS) [25 kilograms or less] Operating in compliance with [Part 101] Rules

General

Civil Aviation Authority (CAA) Advisory Circulars (AC) contains information advisory in nature to provide guidance about standards, practices, and procedures resulting from rules promulgated by the CAA. This AC is not mandatory and does not constitute a regulation. This AC does not change, add to, or delete regulatory requirements or authorize deviations from regulatory requirements.

Purpose

This advisory circular provides advice on best practices to be observed when operating small unmanned aircraft that weigh [25 kilograms or less] and operate in accordance with [Part 101] rules.

This AC is not intended to cover every provision of [Part 101]. Rather, this AC is intended to provide guidance on those provisions where additional information may be helpful. Persons subject to [Part 101] are responsible for complying with every applicable provision of [Part 101], regardless of whether the provision is discussed in this AC.

Rules not included in this AC are considered self-explanatory and no further advisory information is provided at this time.

Related Rules

This advisory circular relates to Civil Aviation Rule [Part 101].

Change Notice

This document is the initial issue of this advisory circular. June 23, 2020.

Table of Contents

[Advisory Circular (AC) 101-1]	2
Unmanned Aircraft Systems (UAS) [25 kilograms or less]	2
Operating in compliance with [Part 101] Rules	2
Glossary	4
Background	5
<i>What types of aircraft does this advisory circular apply to?</i>	5
<i>What about model aircraft?</i>	6
<i>The basic framework of [Part 101].</i>	6
<i>Pilot/operator qualifications</i>	7
<i>Airworthiness</i>	7
Subpart A – General Provisions	8
101.001 Applicability	8
101.009 Approval of Areas for Operation of Unmanned Aircraft.....	8
Subpart B – Operating Rules	8
101.5 Registration	8
101.13 Controlled airspace	9
101.15 Airspace knowledge	9
101.17 Hazard and risk minimization	9
101.19 Dropping of articles	10
Subpart C – Unmanned Aircraft	10
101.21 Approved person or organization.....	10
101.23 Aerodromes.....	10
101.23(a)(1)	10
<i>What constitutes a shielded operation?</i>	11
101.25 Airspace	11
101.25(a).....	11
101.25(a)(1)	11
<i>Requirement to obtain consent of people who you intend to fly over</i>	12
<i>Public land & spaces</i>	12

101.25(c)	12
101.27 Visual line-of-sight operation	12
101.37 Aircraft mass limits	13
<i>Additional Guidance for Operators</i>	13
Avoiding manned aircraft	13
What to do if a UA is lost or flies away?	13
What level of human control is required?	13
Can I operate my UAS under the influence of drugs or alcohol?	13
Where are there likely to be low flying aircraft and what can I do to operate safely in these areas?	13

Glossary

The following terms are used throughout this document.

AC	advisory circular
AGL	above ground level
AIP	Aeronautical Information Publication
ATC	air traffic control
ATM	air traffic management
BVLOS	beyond visual line-of-sight
CAA	Civil Aviation Authority
FPV	first person view
ICAO	International Civil Aviation Organization
IAW	in accordance with
LEP	list of effective pages
NM	nautical miles
RPAS	remotely piloted aircraft system
SMS	safety management system
SOP	standard operating procedures
UA	unmanned aircraft
UAS	unmanned aircraft system(s)
UOC	unmanned aircraft operator certificate
VLOS	visual line-of-sight
VMC	visual meteorological conditions

Background

The civilian use of unmanned aircraft system (UAS) has markedly increased in recent years. Research and development into the civilian applications of unmanned aircraft (UA) is a dynamic and rapidly evolving area. Control and guidance systems are now available that enable these aircraft to perform a variety of tasks that were previously unachievable, unreasonably expensive, or involved too much personal risk. As a result, UA have an increasing presence in controlled and uncontrolled airspace.

Growth of UAS use is currently concentrated in smaller UA, similar to model aircraft in size, although not necessarily in performance. However, the use of larger, conventional aircraft is also growing.

Within the ICAO Model UAS Regulations, UAS operations will be conducted under [Part 101] or [Part 102]. [Part 101] operators are not required to seek authorization from the Civil Aviation Authority (CAA). As a result, there are no direct requirements over the skills and qualifications of the remote pilot unless the UA is operated within [4 km] of an aerodrome. For UA operated within [4 km] of an aerodrome, the remote pilot must have knowledge of airspace.

There are no airworthiness requirements for the UA in [Part 101] unless the UA weighs more than [15 kg]. UA weighing more than [15 kg] but [25 kg or less] requires inspection and approval from an Approved Aviation Organization (AAO); or the manufacturer may file a Declaration of Compliance for a make/model of UA that specifies the demonstrated capabilities of the UA that the [CAA] accepts. By providing the additional division of [15 kg to 25 kg or less], the CAA has additional flexibility to delineate between UA that warrant additional scrutiny without requiring additional remote pilot qualifications.

[Part 101] applies to all UAS users. This approach allows lower-risk operations to take place without burdensome authorization requirements, as long as the operator remains compliant with the limitations set out in [Part 101] and the UA is registered.

[Part 102] is designed for higher-risk operations. It is flexible in that very few activities are prohibited. Instead, a UAS authorization or a UAS operator certificate (UOC) will be granted on a case-by-case basis once the [CAA] is satisfied that the operator has identified the hazards associated with the intended operation(s) and the associated consequences and has a plan in place to mitigate those risks.

The purpose of this advisory circular is to provide guidance to assist operators in understanding how to comply under [Part 101]. It may also assist operators to understand the difference between a UAS operation under [Part 101] and a UAS operation that requires a UAS authorization or a UOC under [Part 102].

UAS operators are welcome to contact the CAA at [specify CAA contact information] to discuss their proposed operation or type of UA to determine the rules that may apply to them.

What types of aircraft does this advisory circular apply to?

[Part 101] and [Part 102] use a number of different terms, which are defined in different parts of the rules. For ease of reference, these are outlined below.

For [Part 101] and [Part 102] operations, the key term is “unmanned aircraft (UA).” A UA is: “an aircraft which is intended to be operated with no pilot onboard.”

The rule also refers to a UA *system* (UAS) which is: “an aircraft and its associated elements which are operated with no pilot on board.” A UAS includes its associated remote pilot station or stations, the

required command and control links and any other components required to operate the system.

[Part 102] applies to *all* UA that do not operate under [Part 101]. This could include any UA, regardless of the level of onboard automation.

Relevant parameters referenced in this document are unmanned aircraft weighing [25 kg or less].

What about model aircraft?

Model aircraft are traditionally regarded as UA flown by hobbyists for purely recreational purposes. Model aircraft are also referred to as “unmanned aircraft” under [Part 101] and [Part 102]. The rules do not make a distinction between UA based on the purpose of the operation (e.g. commercial, professional, or recreational). This position reflects the [CAA’s] view that the aviation-related risk posed by UA differs very little between a UA that is used for recreational, commercial or professional purposes.

Therefore, ‘model aircraft’ meet the definition of UA and are subject to regulation under [Part 101] or [Part 102].

The basic framework of [Part 101]

[Part 101] only applies to UA weighing [25 kg or less] that can fully comply with [Part 101]. Any aircraft weighing more than [25 kg] and those that cannot comply with [Part 101] must apply for a UAS authorization or a UAS certificate (UOC) under [Part 102].

UA weighing more than [15 kg] and [25 kg or less] do not require authorization from the CAA to operate, but it is required that the UA be constructed or inspected and approved under the authority of an Approved Aviation Organization (AAO), see [Part 149] or the UAS manufacturer must have issued a Declaration of Compliance that has been accepted by the [CAA] in accordance with 102.307.

Under [Part 101], operation of a UA is subject to the following 12 key elements:

- (1) operate a UA that weighs [25 kg or less] and always ensure that it is safe to operate;
- (2) assure that UA weighing more than [15 kg] and [25 kg or less] has been approved under the authority of an AAO, or a Declaration of Compliance is on record with the CAA;
- (3) take all practicable steps to minimize hazards to persons, property and other aircraft (i.e. don’t do anything hazardous);
- (4) fly only in daylight;
- (5) give way to all manned aircraft;
- (6) be able to see the UA with your own eyes (e.g., not through binoculars, a monitor, or smartphone), which also applies to a UA observer;
- (7) maintain flight at or below [120 m (400 ft)] above ground level (AGL) (unless certain conditions are met);
- (8) have knowledge of airspace restrictions that apply in the area of operation;
- (9) fly no closer than [4 km] from any aerodrome (unless certain conditions are met);

- (10) obtain an air traffic control (ATC) clearance issued by the local ATC unit, if planning to fly in controlled airspace;
- (11) remain clear of special-use airspace unless permission is given by the administering authority of the area (e.g. restricted or military operating areas);
- (12) obtain consent from anyone you plan to fly above; and
- (13) obtain consent from the property owner or person in charge of the area you plan to fly above.

This list is not a substitute for a full reading of [Part 101]. A thorough assessment of the proposed operation and an understanding of the Civil Aviation Rules that apply to the proposed operation are required prior to initiating UA operations.

Pilot/operator qualifications

[Part 101] does not require a remote pilot qualification. However, to comply with [Part 101] fully, the operator needs to understand in what airspace he or she will be operating. Knowledge of aeronautical charts and how to read them is required. It can be gained from any aviation training school, Aero Club or from a qualified, licensed or certificated pilot who is willing to provide guidance and supervise the training. This is not an onerous requirement and is vital to the safety of the UAS operation and integration with other airspace users.

For [Part 101] operations on or within [4 km] of an aerodrome, other than a shielded operation conducted outside of the boundary of the aerodrome, it is expected the remote pilot or operator would, at a minimum, have knowledge of the use of aeronautical charts and airspace so that an assessment of the operation and full compliance with [Part 101] can be made.

Airworthiness

Currently, there are no recognized design standards, configuration requirements or airworthiness certificates that apply to UA that weigh less than [15 kg]. However, the construction, modification, inspection and operation of UA weighing more than [15 kg and 25 kg or less] under [Part 101], are subject to the requirements mentioned above in accordance with 101.21 or in accordance with 102.307.

If operating a UA weighing [15 kg or less], the operator will need to be satisfied that:

- the UA is appropriate for the intended use;
- is of a suitable manufacturing standard;
- is assembled, constructed and maintained in accordance with the manufacturer's instructions;
- can be operated in accordance within the manufacturer's limitations;
- is checked for faults and defects before each flight (preflight inspection); faults and defects could include cracking in the structure, breakdown or delamination of bonded surfaces, any leakage inside or outside of the aircraft; loose or missing hardware; electrical components (burning smell, visible signs of arcing); engine checks (consistent sound during operation or noticeable change or lack of synchronization from control inputs); sufficient battery capacity, service life

and without battery casing distortion; and

- has mitigated risks associated with possible loss of positive control ensuring that all control links between the control station and the UA are working properly.

It is a best practice to assess the need and extent of repairs that may be needed for continued safe flight operations and to operate a UA in compliance with the operating manual or instructions provided by the manufacturer. Otherwise, it may be considered hazardous (refer to rule 101.17).

The manufacturer's guidelines relating to maintenance, pre-flight inspections and post-flight inspections should always be followed.

Operators should also consider:

- implementing battery maintenance and testing programmes, especially for lithium polymer (LiPo) batteries (LiPo batteries are regarded as dangerous goods);
- for all UA, service retirement lives should be considered based on the manufacturer's recommendation or operating history;
- multi-rotor machines that are manufactured with optional rotor guards should be purchased with the guards and the guards should remain fitted at all times when the aircraft has any chance of approaching people, including during a loss of control occurrence.

Subpart A – General Provisions

101.001 Applicability

[Part 101] applies to UA weighing [25 kg or less] that can fully comply with [Part 101] when conducting flight operations.

It does *not* apply to UA that are being operated under a valid UAS authorization or UOC issued under [Part 102]. Please refer to [Part 102] or advisory circular AC102-1 for further information on applying for a UAS authorization or UOC.

101.009 Approval of Areas for Operation of Unmanned Aircraft

A person(s) or an organization may apply for the approval of a certain geographical area to be designated for specific operations such as a test sight, for the membership of an organization, for training, etc. This section described what is contained in such an approval.

Subpart B – Operating Rules

101.5 Registration

Registration is important under [Part 101]. It allows identification of the aircraft and owner and provides the [CAA] with data regarding the industry. Registration is also a way to record experience with a particular model of UA should the operator elect to expand operations into [Part 102].

101.13 Controlled airspace

This rule requires an authorization from the air traffic control (ATC) unit responsible for the airspace before operating in the airspace. To facilitate a clearance in a timely manner, it is recommended that operators contact the local ATC unit concerned and discuss the proposed operation. Depending on the complexity of the operation, an approval may be accommodated. In some cases, a Memorandum of Understanding (MOU) may be required.

101.15 Airspace knowledge

Before operating any UA under [Part 101], the operator, or supervisor of an operator, must be aware of the airspace restrictions, classifications and designations made under [Part 71, cite the airspace regulations]. Without this knowledge, an operator may put other airspace users or people on the ground at risk.

This knowledge can be obtained from an AAO, a flight training organization or a suitably qualified manned pilot or remote pilot who can inform the operator about airspace.

The ability to read and understand an aeronautical chart identifying restricted, military operating and danger areas, as well as controlled airspace would be an acceptable means of demonstrating an awareness of airspace designations and restrictions required by rules 101.11, 101.13 and 101.15.

101.17 Hazard and risk minimization

Operators have an overarching obligation to minimize hazards to persons, property and other aircraft. Even when complying with the rules, operators are obliged to make sure that they do not operate their aircraft in a hazardous manner. Operators need to plan their flights and ensure that they contemplate the consequences of all hazards that exist or could arise during their flight. Some of the hazards to consider may include:

- (a) flight over gatherings of people or in proximity to crowds irrespective of whether or not those people have given permission for the flight to be conducted over them;
- (b) flight over property with buildings, structures, installations and vehicles where people may be present and could be harmed in the case of a failure;
- (c) flight over roads or highways;
- (d) flight in weather or visibility conditions that could lead to a loss of control;
- (e) flight undertaken when the aircraft is not airworthy or correctly maintained (e.g. batteries not fully charged, range check not carried out or pre-flight check including “return home” not programmed);
- (f) remote flight crew operating when physically fatigued, due to an impairment, or fatigue as a result of a mental health condition;
- (g) flight undertaken in areas where the radio spectrum is known to be unreliable; and
- (h) flight undertaken without proper range testing prior to each operation.

In some cases it will not be possible to reduce the risks to a point where it is safe to fly. For example, operating over crowds or gatherings of people who have given consent to the operation could still be

hazardous, if there is limited ability to land the UA safely in the event of a system failure.

Flying other than in accordance with the rules is always considered hazardous. This includes:

- (a) flight in restricted or military operating areas without the administering authority's authorization;
- (b) flight undertaken when the operator is unaware of the particular airspace requirements for their area of operation; and
- (c) flight undertaken in controlled airspace without authorization from the air traffic control unit responsible for the airspace being used.

Operators should consider operational concerns to ensure they do not create a public nuisance or commit offences by operating carelessly or causing unnecessary endangerment.

101.19 Dropping of articles

This rule allows the dropping of articles as long as it does not create a hazard to persons or property on the ground. Operators are required to assure that the area where the load is to be dropped is clear of persons and property, including livestock and pets. The rule also allows that a payload can be carried.

This rule should be considered in conjunction with rule 101.17.

Subpart C – Unmanned Aircraft

101.21 Approved person or organization

This rule prescribes that the CAA can designate person(s) or organizations that are permitted to perform the functions of 101.21(1) through (6). These person(s) or organizations will be assessed on a case by case basis. The CAA will make the list of approved organizations available for the public at [specify website or other reference]. Without CAA designees, the CAA will administer all approvals.

Organizations that wish to be approved to provide aviation services shall submit an application. The application will be assessed on its merits by the [CAA]. Interested parties should contact the [CAA] at [specify contact information] to discuss the process or submit the application located [here](#).

101.23 Aerodromes

101.23(a)(1)

This rule outlines requirements relating to flying from an uncontrolled aerodrome, a controlled aerodrome, and within [4 km] of an aerodrome.

Information on published aerodromes can be found at this link: [provide appropriate link(s)]

Any UA flying activity within these areas requires the remote pilot or operator to either be:

- (a) the holder of, or to be supervised by the holder of:
 - (i) an AAO (Part 149) remote pilot qualification;

(ii) a pilot licence issued under [Part 61] (Certification of Pilots, Flight Instructors and Ground Instructors); or

(b) under the direct supervision of a person appointed by an AAO to give instruction in UA operations.

These requirements do not apply to a person flying within [4 km] of an aerodrome, if the activity is a shielded operation and is conducted outside the airfield boundary.

What constitutes a shielded operation?

Shielded operations are defined in [Part 101]. Examples could be a flight that takes place in a stadium below the height of the roof or a flight that takes place in a forested area below the height of the trees.

101.25 Airspace

101.25(a)

This rule covers general operations outside of a danger area, requires operators to avoid operating over persons who have not given consent, to observe the surrounding area for other aircraft and avoid operations above [400 ft] AGL.

101.25(a)(1)

This rule concerns the need to obtain the consent people that the operators are flying over. An operator must not use airspace above:

- (1) people unless they have the consent of people below the flight.

The rule is designed to account for the many different scenarios that are possible with a UA operation. It is important to note that this is only *one* aspect of the risk mitigation required as part of [Part 101]. There is still an overarching obligation to take practicable steps to avoid hazards.

If you cannot obtain consent or obtaining consent is impractical, it may be a signal that your operation is too hazardous to be conducted under [Part 101]. You can apply to the [CAA] to be certified under [Part 102]. [Part 102] allows the [CAA] to work through different options with an operator on issues of consent.

Consent rules are targeted at delivering the following:

- (1) Notice awareness – the person(s) affected are made aware of the operation and can respond to the notice.
- (2) Communication/knowledge – the rule encourages an exchange of information about the hazards related to the operation or present in the area of intended operation.
- (3) Control/manage – persons affected by the operation can remove themselves from the area or manage what they do in that space and agree to be exposed to some level of hazard.

Consent rules are not intended to address the potential privacy or ‘nuisance’ issues associated with UA operations, and operators should not assume that obtaining consent exempts them from other local government requirements on privacy or nuisance.

Requirement to obtain consent of people who you intend to fly over

This requirement may apply to public land and public spaces.

The rule is written to take into account dynamic situations, such as in a park. While you will be expected to plan and manage the possibility of people suddenly appearing under your aircraft, you need to have taken reasonable steps to *avoid* flying over people. Therefore, it is a good policy to choose operating in areas that do not have a risk of someone suddenly appearing under your aircraft who has not given his or her consent.

In practice, if a person on the ground unexpectedly moves below your UA and remains, you will need to take steps to move the aircraft away from the person or confirm that they consent to it being flown over them.

Public land & spaces

Civil aviation rules do not supersede local government policies or bylaws regarding the use of public land. The local authority will assess the issue of consent. Some ways in which consent may occur:

- blanket prohibition on UAS operations in certain public areas;
- allowances for certain public areas to be used for qualified UAS operations; or
- a policy for general parks or other public spaces.

Local authorities and [specify government offices] are in the best position to know the risks associated with UA operations in their region. Operations occurring over mixed or conflicting land use areas, for example, and the risk posed by UA operations can be best communicated to all users by the local authorities or [specify government offices].

Any operator planning to fly over public land is advised to contact their local government authority.

101.25(c)

The requirement to operate only in Class G airspace means that the operator needs to be aware of airspace classification. The same applies to other rules regarding restricted areas, military operating areas and danger areas. All of these types of areas are explained in [specify aviation publication or pertinent guidance].

An operator who intends to fly above [400 ft] and outside a danger area designated for UA activity is required to provide information on the operation to the [CAA] NOTAM Office at least [24 hours] before the intended operation.

101.27 Visual line-of-sight operation

This rule outlines requirements for an operator to ensure their operation remains within unaided visual sight (i.e. without the use of an instrument, such as binoculars or a telescope).

First-person view systems are permitted under this rule, but still require a separate UA observer who has suitable training and competency and can maintain unaided visual line-of-sight contact at all times with the aircraft and have direct communication with the remote pilot. This UA observer is to advise the remote pilot of any traffic that enters the operational area, the direction it is coming from, and advise the

appropriate action to maintain safe clearance.

101.37 Aircraft mass limits

This rule prohibits the operation of unmanned aircraft weighing more than [15 kg and 25 kg or less], under [Part 101], unless its construction and operation has been authorized, inspected and approved by the CAA, an AAO or the manufacturer has an accepted Declaration of Compliance on record with the CAA.

Any UA weighing more than [25 kg] must be operated under the authority of a UAS authorization or UOC under [Part 102], irrespective of whether they intend to operate within the operating limits in [Part 101].

The CAA must approve a person or organization to have responsibility for the tasks outlined above for UA weighing more than [15 kg] and [25 kg or less]. Applications will be assessed by the [CAA] based on the merits of the applicant's submission.

Additional Guidance for Operators

Avoiding manned aircraft

Unmanned aircraft are required to give way to all manned aircraft. It is the operator's responsibility to ensure that this rule is complied with at all times.

What to do if a UA is lost or flies away?

To prevent a UA fly-away, it is important to follow the manufacturers' pre-flight requirements. It is recommended that the operators' contact information be placed on the unmanned aircraft in a prominent position, so the aircraft can be returned in the case of a fly-away.

What level of human control is required?

The degree of control depends on the UA system and varies from hands-on during the entire flight to preprogramming elements of the flight. It is required that the remote pilot be familiar with all aspects of the UA and its systems. Flights viewed as autonomous are not defined nor included in this AC.

Can I operate my UAS under the influence of drugs or alcohol?

Operating a UA when impaired by drugs or alcohol is prohibited. No person is to operate a UA within [8] hours of consuming an alcoholic beverage.

Where are there likely to be low flying aircraft and what can I do to operate safely in these areas?

Low flying aircraft are generally located near airports, in airspace used for pilot training or when conducting an operation that requires flight below the minimum safe altitude published in [Part 91, General Operating and Flight Rules]. Generally, this is [1000 feet] above congested areas and [500 feet] above rural areas. Flight can include agricultural aviation and helicopter operations including medical evacuation, search and rescue, etc., in urban and remote areas. The remote pilot must be aware of other aircraft, persons, and property in the vicinity of the operating area and maneuver the UA to avoid any possibility of collision. The remote pilot must take action to ensure other aircraft will not need to maneuver to avoid colliding with the UA.

— END —