

[ADVISORY CIRCULAR (AC) 102-1]

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 102] regarding unmanned aircraft systems (UAS) operations in the Specific 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 Open category of UAS operations covered by ICAO Model UAS Regulations [Part 101], Member States are encouraged to refer to [AC 101-1]. 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) 102-1]

Unmanned Aircraft System Operations – Certification

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 guidance for meeting the requirements for an unmanned aircraft system (UAS) authorization or an unmanned aircraft system (UAS) operator certificate (UOC) under [Part 102] *Unmanned Aircraft System Operations – Certification*.

This AC is not intended to cover every provision of [Part 102]. Rather, this AC is intended to provide guidance on those provisions where additional information may be helpful. Persons subject to [Part 102] are responsible for complying with every applicable provision of [Part 102], 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 102] but also refers to requirements in operating rule [Part 101].

Change Notice

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

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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 system operator's certificate
VLOS	visual line-of-sight
VMC	visual meteorological conditions

Background

The civilian use of unmanned aircraft systems (UAS) has markedly increased in recent years. Research and development into the civilian applications of UAS 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, cost prohibitive, or involved excessive personal risk. Consequently, UAS have an increasing presence in controlled and uncontrolled airspace.

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

This advisory circular (AC) provides guidance material to assist operators to understand what is required and when and how to obtain certification under [Part 102].

This AC should be viewed as a dynamic document and something that will be added to as more information and understanding is obtained about the range and scope of activities being certificated under [Part 102]. Amendments will also be made in light of safety and technology advances in the UAS sector. This AC does not provide exhaustive detail on what is required in respect to a particular type of UAS application. Rather, it is intended to guide operators preparing to make an application to the Civil Aviation Authority [CAA] for [Part 102] certification. This AC will be updated periodically in response to demands for further guidance material. The [CAA] will monitor trends and recurring inquiries to ensure that meaningful information is provided proactively through the AC.

[Part 101] and [Part 102] should be viewed in parallel. It is important to emphasize, however, that [Part 102] has been designed so the applicant will be required to comply with the relevant sections of [Part 101], unless the [Part 102] authorization or certificate provides otherwise. [Part 102] provides a framework for UA that is flexible providing the [CAA] with the discretion to tailor operational requirements to each proposed operation. Given the rapid advancements underway with UA technology, this approach ensures the regulatory regime can accommodate these aircraft while addressing the risks related to their activity.

Unmanned aircraft that weigh [25 kg] or less, and operate entirely in accordance with [Part 101] rules, are not the focus of this A C. Please refer to [Part 101] and [AC 101-1] for requirements relating to these aircraft.

What types of aircraft does this AC apply to?

For [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 rules also refer 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]; any UA over [25 kg] requires a UAS authorization or a UAS operator certificate (UOC).

What about model aircraft?

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

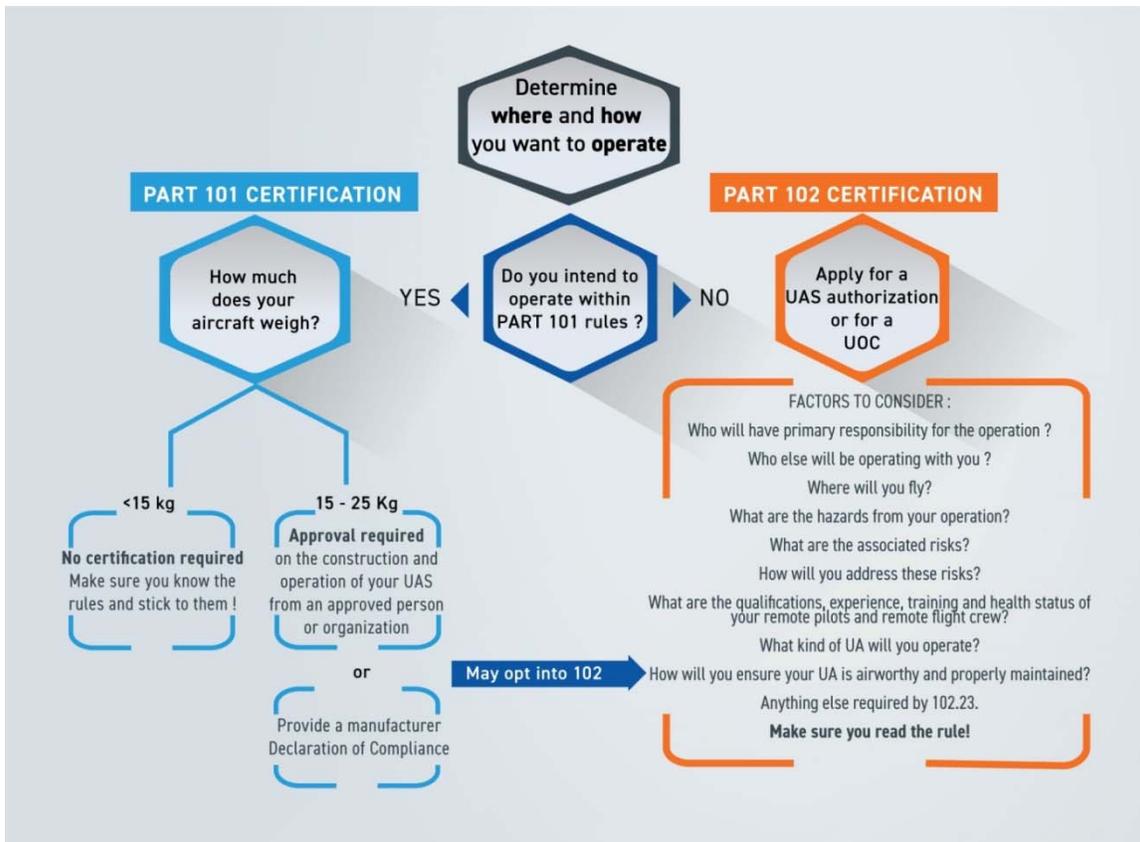
Therefore, “model aircraft” meet the definition of UA and are subject to regulation under [Part 101] or [Part 102], if operating outside the bounds of [Part 101].

Rules 102.13 Applicability, 102.21 Authorization & 102.23 Application

Do I need a certificate?

You require a UAS authorization or a UOC issued under [Part 102], if you intend to operate an UA that cannot operate strictly within the bounds of [Part 101]. Figure [1] outlines the decision pathway for operators to consider.

Figure [1]



How do I know if I should operate under [Part 101] or [Part 102]?

There are 12 key operating requirements under [Part 101]. You must:

- (1) operate an aircraft that is [25 kg or less] and always ensure that it is safe to operate; and
- (2) at all times, take all practicable steps to minimize hazards to persons, property and other aircraft (i.e. don't do anything hazardous); and
- (3) fly only in daylight; and
- (4) give way to all manned aircraft; and
- (5) be able to see the aircraft with your own eyes (e.g. not through binoculars, a monitor, or smartphone), to ensure separation from other aircraft (or use a UA observer to do this in certain cases); and
- (6) not fly your aircraft higher than [120 m [400 feet]] above ground level (AGL)(unless certain conditions are met); and
- (7) have knowledge of airspace restrictions that apply in the area you want to operate; and
- (8) not fly closer than [4 km] from any aerodrome (unless certain conditions are met); and
- (9) when flying in controlled airspace obtain an air traffic control (ATC) clearance issued by the ATC unit in the area; and
- (10) not fly in special-use airspace without the permission of the controlling authority of the area (e.g. military operating areas or restricted areas); and
- (11) have consent from anyone you want to fly above; and
- (12) have the consent of the property owner or person in charge of the area you are wanting to fly above.

This list should not substitute for a full reading of [Part 101]. You should conduct a thorough assessment of your operation and ensure you understand the [CAA] Rules that apply to your operation, before deciding whether to operate under [Part 101] and [Part 102].

Some exceptions may apply, but generally if you cannot operate within the bounds of [Part 101], your operation will need to be authorized or certificated under [Part 102].

General

Thinking about your proposed operation

Before you make an application to the [CAA] for a UAS authorization or UOC under [Part 102], you will need to give some thought to the scope of your proposed operation.

Below are some useful prompting questions that will help define the level of risk posed by your operation, and thus the appropriate regulatory response. The questions are *some* of the considerations for prospective applicants for a UAS authorization or a UOC and provide guidance based on the CAA's current understanding of UAS capabilities. This AC does not detail requirements for every circumstance, as each application will be considered individually.

The following questions will help you decide if there are any [Part 101] requirements with which you cannot comply. You will need to address those areas specifically, when preparing your application.

Do you want to operate an aircraft that is larger than [25 kg]?

If you want to operate an aircraft with a gross mass of [25 kg] or more, your operation falls within [Part 102] (The gross mass of [25 kg] includes any payload carried by the aircraft). You will only be permitted to operate an aircraft over this weight under the authority of a UAS authorization or UOC.

Do you want to operate an aircraft that is larger than [15 kg]?

If you want to operate an aircraft that weighs more than [15 kg], but not more than [25 kg], your operation may be a [Part 102] operation.

UA weighing between [15 kg] and [25 kg] may only be operated under [Part 101], if the UA is constructed and operated under the authority of the CAA, an approved aviation organization (AAO, see Part 149) or if the manufacturer has made a declaration acceptable to the [CAA] in accordance with 102.307.

This means that if the gross mass (including the payload) is over [15 kg] and you are not operating with specific authority by the CAA, as a member or under the authority of an AAO and you do not have a manufacturer's declaration of compliance, you will have to operate under [Part 102].

Please contact the [CAA] for further information about becoming an AAO.

Do you intend to operate at night?

If you wish to fly at night you will need to explain in your application how you will address:

- the availability of aircraft lighting/aids to ensure your aircraft is visible to other UA operations or manned aircraft;
- how visual contact with the aircraft will be maintained;
- the areas of proposed operations;
- the risks to persons or property on the ground; and
- how notification of UA flights will be made to emergency services in the area.

The term "day" is as listed in the Aeronautical Information Publication. Daylight Tables can be viewed for free on [http://www.\(input web address\)](http://www.(input web address)). Tables exist for different locations around (specify country) and the time at which day officially begins or ends.

Do you want to operate over crowds or in congested areas?

Operating above gatherings of people or congested areas where people may be present is inherently hazardous. Flight above or in proximity to large or dense crowds of people at events, whether held indoors or outdoors, have additional risks.

Applicants will be expected to address the following in their application:

- identification of the hazards and risks, including those that might be exacerbated by a crowd or people being present;
- the configuration of the aircraft (fixed wing vs multi rotor, etc.);
- reliability of the UA (to include manufacturer's declaration);
- reliability of the control system;
- mitigations in place in the event of any system failure;
- system redundancy (such as an acceptable automatic recovery parachute); and
- if practicable, the steps the operator proposes to obtain the consent of or to give notice to person(s) affected by the operation.

Operating close to buildings or structures where people are present or in close proximity may also be hazardous. If you are proposing to use a UA close to buildings, you will need to address additional concerns such as:

- procedures for dealing with the impact into a structure or object; and
- crowd/access control to ensure a safety perimeter in the event the aircraft falls to the ground.

Do you want to operate beyond visual-line-of-sight (BVLOS)?

We expect that for the foreseeable future the standard operating environment will be to operate within unaided visual line-of-sight (VLOS). "Unaided" VLOS indicates the aircraft is able to be seen by the remote pilot without the use of equipment, such as binoculars or a telescope.

While [Part 102] does not prohibit BVLOS operations, this type of operation presents a number of challenges for operators. The risks associated with BVLOS will require a strong safety case in your application. Some of the features of a safety case would include:

- identification of the airspace class to be used, any associated requirements and how the requirements will be met;
- ability to provide separation from other traffic such as operating in segregated airspace or a technological solution (e.g. detect and avoid system (DAA)); and
- mitigating risks to persons, property and terrain.

Applicants for BVLOS operations relying on segregated airspace will have to obtain approval for the designation of the airspace from the local air traffic control (ATC) unit before a UAS authorization or UOC for the BVLOS operation can be issued by the [CAA].

Applicants should be aware that the establishment of special use airspace in accordance with [Part 73 (specify CAA regulations for special use airspace)] (i.e. military operating areas, restricted areas or danger areas) on a frequent basis and/or in numerous locations, can disrupt the conventional aviation system. In some cases, the use of special use airspace is not likely to be a workable solution except infrequently and for certain purposes such as research and testing in areas of low density aviation activity.

UA that are being flown using first person view (FPV) or from a remote device that requires the attention of the remote pilot will require a UA observer to be present to maintain the unaided visual line of sight at all times with the UA. The UA observer is to advise the pilot of any traffic that enters the operational area. It is important to include in the application by what means the UA observer(s) will remain in constant communication with the remote pilot.

An FPV operation without a UA observer is considered to be a BVLOS operation and will require applicants to address the safety considerations above.

Can I use observers to extend my Visual Line of Sight (VLOS)?

VLOS operations can extend the operational area by using a sufficient number of UA observers who are in direct contact with the remote pilot. The UA observer notifies the remote pilot of traffic entering the operational area and, if necessary, halts the operation until traffic is clear.

A good example of extending the operational area with additional UA Observers has been during powerline surveying. This could apply to other operations that may use UA including precision agriculture tasks.

VLOS operations with an extended operational area can be approved if conducted with an appropriate number of remote flight crew members for the operation and the UA continuously gives way to manned aircraft. If you wish to conduct VLOS operations over an extended area, you will need to establish a procedure for contacting other aviation operations in the area to identify scheduled operations and to advise them of the intended UA operation (e.g. for agricultural or local helicopter operations).

Do you want to fly above [400 feet] above ground level?

Under [Part 101], a [120 m (400 ft)] ceiling applies to UA (with some exceptions). The purpose of this ceiling is to create a buffer between conventional aircraft and those that are operating under [Part 101].

The overarching obligation is on UA to give way to all manned aircraft. Conventional aircraft are generally not permitted to fly below 500 ft unless they have a reason to do so; some conventional aircraft operate below 500 ft such as agricultural operations; helicopters may operate below 500 ft.; aircraft operate below 500 ft when landing and taking off. The give way rule applies to both [Part 101] and [Part 102] operations, unless a [Part 102] authorization or certificate provides otherwise.

If you want to operate above [120 m (400 feet)] you will need to first identify the class of airspace in which you intend to operate. Different rules apply depending on the airspace in which you intend to fly. You will need to consult ATC as to whether a clearance or special equipment is required, such as a transponder, or whether other conditions might be applied to the operation.

Do you want to fly within [4 km] of an aerodrome?

You may fly your UA within [4 km] of an aerodrome if it is 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.

If you wish to fly a non-shielded operation within [4 km] of an uncontrolled aerodrome, it is important that you demonstrate an understanding of the risks of doing so and can demonstrate ways of managing those risks. If you are unable to reach an agreement with the aerodrome owner under [Part 101] rules, then you may be able to get a [Part 102] authorization.

For this to happen, it will be important for you to demonstrate that you have thought through the following:

- how the airfield operator will be informed as to your operation; and
- how the appropriate frequencies will be monitored; and
- anything else relevant to ensure the safety of the manned aerodrome in question.

It will also be important to demonstrate that you have the requisite knowledge and skills to operate near an aerodrome using the necessary technical equipment to communicate with air traffic control. This could include:

- a pilot licence issued under [Part 61]; or
- a remote pilot licence issued by the CAA or under an AAO [Part 149].

Do you want to carry out agricultural operations?

Unmanned aircraft operations for agricultural purposes are potentially hazardous as they can involve flying very low to the ground, the use of hazardous materials, and potentially involve operations near other low-flying aircraft.

[Part 137] *Agricultural Aircraft Operations* is the current Part governing agricultural operations by manned aircraft. It provides a useful basis for considering the safety requirements of proposed agricultural operation. Conditions may be imposed on a UOC that reflect those of [Part 137].

For example, personnel associated with your operation may be required, as a condition of their certificate, to hold agriculture and chemical ratings. The application of chemicals require that operators be fully aware of the potential for overspray and accidental damage to other crops or property.

What should be included in your submission?

Safety management is the cornerstone of any aviation operation. A UA operation will introduce hazards and risks that will need to be managed. It is the responsibility of the operator to demonstrate how the UA operation will be conducted safely by completing an operational risk assessment.

UA operations may involve carriage of goods that have one or more inherent hazards and are therefore classified as dangerous goods. See Advisory Circular 102-37, Carriage of Dangerous Goods by UA:

Understanding the Risks and the Responsibilities [here](#).

When applying for a UAS authorization or a UOC, you must be able to demonstrate that the operation will be safe by preparing an operational risk assessment. The [CAA] will look at the people involved in the operation, the aircraft, and the scope of the operation. The [CAA] must be satisfied that the operation is safe and that the operator is able to mitigate and control the safety risks before issuing the authorization or UOC.

To demonstrate the safety of the proposed operation, the applicant may include **standard operating procedures (SOP)** or an operations manual. The SOP should include a process for conducting a risk assessment on the type of operation the organization intends to undertake. Refer also to rule 102.23(b)(10) later in this advisory circular.

It is highly recommended that the operator establish a basic **Safety Management System (SMS)** for their organization. Information on creating a SMS for Small Organizations developed by the Safety Management International Collaboration Group (SM ICG) is available at the following link:

[https://www.skybrary.aero/index.php/Safety_Management_International_Collaboration_Group_\(SM_ICG\)](https://www.skybrary.aero/index.php/Safety_Management_International_Collaboration_Group_(SM_ICG))

Another option for creating a SMS for small organizations is available from New Zealand at:

<https://www.aviation.govt.nz/safety/sms-safety-management-systems>

In preparing your documentation, the applicant may wish to incorporate requirements from other parts of the Civil Aviation Rules (e.g., some requirements from [Part 91 *General Operating Flight Rules*], or from an agricultural operation, [Part 137 *Agricultural Aircraft Operations*]). This would help to provide assurance to the [CAA] that the operation is going to be conducted according to the highest level of safety.

102.21 Authorization to Operate an Unmanned Aircraft

Operators who either require or prefer to be certified under [Part 102] will need to make an application to the [CAA] on form [specify form number]. The application form can be found on the [CAA] website under [Forms].

The application form is comprehensive. This is due to the need to cover a wide range of different operations that may be undertaken. You may find that you do not need to complete all sections if your operation is relatively simple. This can be determined in consultation with [CAA] personnel. The more information you provide, the more expeditious the [CAA's] assessment of the application will be and consequently the time taken for review.

We recommend that if you are planning to make a [Part 102] application, you contact the [CAA] to determine whether a pre-certification meeting is recommended to discuss the scope of the proposed operation and any application requirements. There is normally no cost associated with this meeting.

What will be assessed?

The [CAA] will review your entire proposed operation, using your application as the guiding document for this assessment. This is the same application to be used for those seeking authorization for short-term or one-time operations.

For planning purposes, documentation to be organized prior to submitting a formal application include approvals required for operation in segregated airspace or a manufacturer's declaration of compliance, if

applicable.

102.23 UAS Authorization or UAS Operator Certificate

If you want to apply for an unmanned aircraft operator certificate, you are required to submit documentation addressing a number of important matters relating to the proposed operation.

The documentation may include a concept of operations (CONOPS) or a brief that describes how an operator will conduct its operation to maintain the required level of safety and remain in compliance with the rules.

To assist the CAA in reviewing your submission, it is helpful to compile a matrix that lists the required rules with an adjacent column listing which section/paragraph in their documentation compliance is demonstrated. The matrix supports the application process and assists the [CAA's] in their assessment process.

102.23(a)

This rule lists the required items for a UAS authorization or UOC. A well written and comprehensive explanation of your operation will help the [CAA] to assess your application, especially if it provides a clear description of the operational procedures in your own words.

The [CAA] has the discretion to require only some of the items in the application, as appropriate, to the particular circumstances, context and characteristics of the proposed operation. This emphasizes the benefit of a pre-certification meeting to discuss what might be expected in the submission.

102.23(b)(1) Person with primary responsibility for the operation

This rule requires you to identify all primary person(s). As the title implies, these are the person(s) who have primary control over any part of the UA operation and may not be the same person making the initial application. Those responsible for funding the operation and/or providing the resources including the aircraft should be included. It is usual to provide an organization chart showing lines of responsibility between persons identified as having accountability for any part of the operation. For owner/operator operations this will be relatively straightforward, but for large organizations it is expected that roles and lines of responsibility are clearly represented.

The selection process for primary person(s) including the level of scrutiny applied to make the selection may be reviewed by the CAA. In addition to knowledge of the aviation regulatory environment and experience in the transport industry, it is anticipated that the primary person(s) may undergo evaluations such as a criminal background check, driving records review, compliance with transport safety regulatory requirements, conviction record for transport safety offences, pilot records history or other pertinent aviation records reports.

The [CAA] review of an organization's hiring process and the selection of the primary person(s) is not confined to considering particular criteria and may take into account any relevant matters and consider information obtained from relevant sources.

102.23(b)(2) Person having control over privileges of the certificate

This rule requires the identification of any person(s) who has control over any of the part(s) of the UAS authorization or UOC issued to the organization. This may include the person(s) with control over the

flights, training, or maintenance.

The use of an organization chart shows lines of responsibility and how information is reported.

102.23(b)(3) Location of operation

This rule requires the identification of the actual areas UAS operations will occur. In some cases, areas can be delineated by street or highway names. In other cases, an aviation sectional chart or geographic map marking the area may be the best option. Coordinates of latitude and longitude can also be used.

While it is possible to seek approval for operations “within [specify country]” or other large non-specific geographic areas, the applicant will need to explain how current airspace restrictions and/or other temporary operating conditions in effect for the operational area will be obtained.

102.23(b)(4) Operational Risk Assessment

The rule requires an Operational Risk Assessment (ORA) which is part of a safety management system. While there are many ORA methods that can be used, the ORA should be tailored to the risk of the operation, with appropriate mitigations stated. The inclusion of a documented method for identifying hazards and controlling the associated risks will provide confidence that the intending operator understands the context of their operation and applies the standards that are likely to produce the best safety results. Consideration should be given to how this information is collected and disseminated to personnel, including the personnel’s role in any mitigations.

ICAO Doc 9859, Chapter 2, Section 2.5 Safety Risk Management, explains the hazard assessment process. All phases of an operation should be considered.

102.23(b)(5) Reporting procedures

The rule requires procedures be implemented to report accidents and incidents.

The [CAA] is able to tailor a particular reporting framework on a case-by-case basis.

[CAA] form [specify form number] should be used as the reporting mechanism. Some sections of the form may not be applicable (in which case they should be left blank), but using the form will ensure consistency in the [CAA] reporting system.

You will generally be required to report the following types of events:

- injury to persons;
- loss of control;
- fly-away;
- engine or structural failure;
- incidents involving manned aircraft;
- incidents involving dangerous goods carriage;
- incursion into airspace not authorized; and

- damage to third party property.

If you are unsure whether to report, it is encouraged a report be made.

You may also be required to undertake regular statistical reporting. When linked with incident reporting, data is provided to the [CAA] to determine the reliability of a UA operation or a particular model of UA. The more data gathered, the sooner reliability of an operation can be established which could inform policy work or revise limitations applied to a particular UA.

102.23(b)(6) Licensing and qualifications

This rule relates to operating requirements for personnel licensing, qualifications, training and competency.

The rule contemplates the [CAA] being satisfied around two key areas of knowledge and competence:

- (1) general aviation knowledge (incorporating such things as airspace and air law); and
- (2) detailed knowledge of the UA (including aircraft handling).

In assessing what qualification and/or knowledge may be required for personnel involved in a particular operation, the [CAA] will need to be satisfied as to the person's knowledge and competence. Generally, a qualification or pilot licence will be evidence of this.

All assessments will occur in the context of the role the person will be performing and the nature and scope of the operation in which they are involved. This includes people performing the following types of roles:

- UA remote pilot-in-command;
- control station attendants;
- personnel handling dangerous goods;
- UA observers.

Persons having control and remote pilot

To be approved as a person having control and/or the remote pilot of a UA under a [Part 102] certificate, it is expected that the relevant person will possess both general aviation knowledge and the UAS competence for the model(s) of UA.

Unless the nature and scope of the operation requires otherwise, the following are likely to be acceptable to demonstrate general aviation knowledge:

- a pilot licence issued under [Part 61, pilot certification], or a pilot certificate issued by a [Part 149] organization;
- a UA licence (or equivalent) issued by a competent foreign aviation authority acceptable to the [CAA];
- a certificate of achievement issued by a [Part 141] training organization, which indicates:

- passing grade for the aviation law theory course; and
- competency in operating UA; and
- competency in the use of aviation radios (if applicable).

Unless the nature and scope of the operation require otherwise, the following are likely to be acceptable to demonstrate UAS competence:

- an Approved Aviation Organization [certificate] relevant to the type of UA (e.g. fixed-wing, helicopter, multi-rotor, etc.):
- a certificate of training (or equivalent) from the manufacturer of the UA to be operated, or its [specify CAA country] agent:
- a certificate of training from a [Part 141] training organization authorized to conduct unmanned aircraft training.

Growth is expected in the number of organizations delivering UAS training courses. For these to be considered for acceptance, an operator will need to obtain and supply a copy of the course syllabus, provide the copy to the CAA which will then be assessed by the [CAA].

UA Observers/remote flight crew

Observers should not be impaired either visually or aurally other than by an impairment that can be corrected (e.g. with prescription glasses or hearing aids).

Unless the nature and scope of the operation require otherwise, observers will generally be expected to demonstrate competence in at least the following areas:

- methods of communicating with the pilot directly; and
- action and backup action to take if communications fail;
- familiarity with the method of dividing the sky into sectors so reports to the remote pilot of an intruder's position can be located; and
- emergency procedures should any unanticipated event take place.

Support crew tasked with providing crowd control will be expected to demonstrate that they are trained and authorized by the operator. Support crew should wear appropriate, high visibility apparel.

Once certificated, observers and support crew should be trained and authorized in writing by the operator. A record of any ongoing training and site authorizations should be held by the operator and the concerned crew member.

Flight time recording and operational experience

The following practice is recommended:

Pilots and other related personnel should maintain a logbook recording their flight time and operational experience. The logbook should record at least:

- the remote pilot's/crew member's name;
- UA type and serial number, if applicable;
- flight time;
- purpose of the flight;
- outcome of the flight; and
- operational flight or training flight details.

The logbook can be in paper or electronic form but should be able to be produced when requested by the [CAA].

Maintaining these records will be useful when seeking to renew a [Part 102] certificate and/or, when applying to change or increase the scope of an operation under an existing certificate.

102.23(b)(7) Details of aircraft to be used

The [CAA] would expect to see the following information provided with an application:

- type of the UA (rotorcraft, fixed-wing, multi-rotor, etc.);
- dimensions and weight;
- identification of the manufacturer of the aircraft, or if it is a homebuilt UAS, the name of the person who constructed it and the date it was constructed;
- any associated attachments or equipment; and
- any unique markings or identification, including the primary and any secondary color of the UA.

If the [CAA] requires marking in accordance with [Part 47, cite registration and markings regulation], guidance will be found in advisory circular [AC 47-1, if applicable].

If compliance with registration and markings regulations is not required, the expectation is that the UA will be marked using a fire-proof, permanent label that clearly identifies the operator with their contact information. The marking should be affixed in a location that can be read without removal of any cover. The label size can be scaled for the size of the UA.

102.23(b)(8) Control systems

The rule requires the control system to be identified and approved. The C2 Link (command and control link) refers to the data link between the UA and its remote pilot station for the purposes of managing the flight. Currently, there are no design standards or configuration requirements that apply to unmanned aircraft control systems. Work is progressing internationally by RTCA, to develop standards in this area, but this is yet to be completed.

In the interim, caution is necessary in regard to reliability of C2 Link, including the potential for jamming or other interference. Due to potential errors, UA that utilize this technology are unlikely to be acceptable, unless an operator can demonstrate that these issues have been resolved.

For UA that are likely to operate in [specify country], the evaluation of the C2 Link will be carried out on the basis of an operating history. The availability of a sound operational history should be considered when determining the use of a particular UAS model/type.

102.23(b)(9) Aircraft maintenance

This rule requires you to establish a maintenance program that is acceptable to the [CAA] for all UA operated. The maintenance program should reflect the nature of the operation and the size and complexity of the UA. This program should be based on the manufacturer's maintenance instructions and should cover at least:

- a pre-flight inspection instructions or checklist;
- a post-flight inspection instructions or checklist;
- a periodic (i.e. regular) scheduled inspection timetable;
- details of any component finite or retirement lives;
- actions in regard to manufacturer's service information or airworthiness directives;
- person(s) responsible for maintenance on the aircraft; and
- damage tolerance criteria (i.e. when components such as a propeller must be changed).

Details of all maintenance actions will generally be expected to be recorded in an aircraft logbook.

The following describes levels of maintenance performance that are likely to be acceptable under a [Part 102] certificate:

Small to Medium UA

Maintenance on small to medium size unmanned aircraft is generally considered to be the responsibility of the operator. The manufacturer's recommendations should be followed.

Small and medium UA manufacturers may only supply basic maintenance instructions in the form of a handbook or instructional manual. Operators will be expected to reflect any operating manual instructions and limitations in their maintenance program.

Battery Maintenance

Battery maintenance is important with both electric-powered and conventionally powered UA utilizing on-board electronics. Operators should develop good maintenance practices in regard to battery packs, including monitoring their performance and removing from service packs that indicate a loss of performance before they fail. Battery maintenance on lithium polymer ('LiPo') batteries is important as these can be very dangerous if not monitored carefully and treated with respect.

When transporting LiPo batteries to an operational site, best practice for handling and transporting dangerous goods should be followed and all recommended precautions carried out, including the use of safe bags, etc.

102.23(b)(10) Operational procedures

The rule requires you to ensure that all operational procedures related to proposed operations need to be documented in an operations manual. This could include, but is not limited to:

- mission planning (operational risk assessment, dangerous goods risk assessment, consent from persons who are over flown, property owner permissions if required, NOTAM filing procedures);
- operating area assessment;
- meteorological limits and how they are determined;
- remote pilot and personnel duties during normal and contingency operations;
- checklists for the UAS;
- procedures for transporting dangerous goods or dropping of items;
- communication procedures between personnel during a UA operation;
- minimum distance from persons or property and the UA and how to discern the distance;
- camera operator operations and the communication links between observers;
- safety procedures at the base facility.

The manufacturers operating guide and any limitations specified provide a useful starting point for establishing an operations manual.

102.23(b)(11) Cargo-handling and dropping of items

This rule is intended to capture additional operating configurations in respect to the carriage of cargo or the dropping of items. Where an operator intends to move cargo, including the transport of dangerous goods, drop items or conduct agricultural operations, procedures should be developed to ensure the operation can be conducted without harming persons or property. The potential consequences of identified hazards with these type operations will be considered in the operator's ORA process. A safety management system, appropriate to the size of the organization, is especially useful for these types of operations.

ICAO guidance on UA operations carrying dangerous goods (AC 102-37) that provides information about the safety risk assessment process and addresses key considerations is available at: <https://www.icao.int/safety/ua>.

102.23(b)(12) Construction and design of unmanned aircraft

Currently, there are no recognized design standards, configuration requirements or airworthiness certificates that apply to UA. Work has been undertaken by ASTM and other standards bodies, on design

standards for small UA. Some initial standards have been developed and can be found at: <https://www.astm.org/>. These standards provide guidance material for intending operators.

The [CAA] will undertake initial airworthiness assessments on a case-by-case basis. The [CAA's] assessment will consider whether the UA has been designed and constructed to an appropriate standard or safety assurance level, and whether it is suitable for the proposed operation to be conducted, equipment to be used, or payload that will be carried. This can be evidenced by submitting a Declaration of Compliance (DOC) from the manufacturer or the person who constructed the UA. At the discretion of the [CAA], they may subsequently require the means of compliance data on which the DOC is based, in order to review the method of testing and the derived data.

The [CAA] will also consider an approval issued by an Approved Aviation Organization (AAO), in accordance with 149.9(a)(4). In order to be issued approval to inspect and approve the construction of a UA, the organization's assessment procedures will have been scrutinized and found acceptable to the [CAA]. The organization will be required to make available their requirements for submitting documentation for the inspection and approval process to the public.

Other factors relevant to the [CAA's] assessment will be:

- the proposed use of the UA;
- the type, complexity, size and nature of operation of the UA;
- whether the [CAA] is familiar with the manufacturer and/or model of aircraft;
- whether the aircraft is the first of its kind in [specify CAA country];
- any operating history of the particular UA or UA model/type;
- any overseas certification or approval for the UA model/type; and
- accident or incident statistics in [specify CAA country] or overseas.

Until the development of comprehensive and widely-accepted standards are recognized, testing and/or proving flights may be required.

For fixed-wing UA, the use of a wing and tail-plane static load test is simple to carry out and would aid in satisfying structural assessments.

Any UA that holds type certification and is modified for use is expected to be maintained, as appropriate, in accordance with its type-certified status and meet ongoing regulatory maintenance requirements.

Operators of larger aircraft should look to standards that may exist within the U.S. Federal Aviation Administration (FAA) and/or the European Union Aviation Safety Agency (EASA) regarding design requirements. The [CAA] recommends that any person intending to operate very large unmanned aircraft contact the [CAA] for guidance, prior to applying any such standard.

Availability of safety redundancies

The carriage of a flight termination parachute is considered a highly effective safety redundancy, and is a means by which an operator may demonstrate mitigation of key hazards associated with the operation of a

UA, particularly in respect to managing the risks of flight over property and people. A flight termination parachute not only allows for a number of recovery efficiencies, but provides an emergency backup that can give confidence to the [CAA] in mitigating risk. Industry standards exist for parachute systems and are available to the multi-rotor market as well.

Test/proving flights

Until design standards become available, the [CAA] may require operators to conduct flight testing or proving flights and include the data in the means of compliance that supports the DOC. If the UAS is approved by a [Part 149] organization, an applicant may be required to present the UA operating history that demonstrates reliability, controllability and safe flight characteristics, as part of the application process. In either case, to meet this requirement, and for potential future statistical reporting requirements, an operator should ensure that accurate aircraft logbooks are maintained for each UA that is flown, including during testing or proving flights.

Logbooks should record at least the following information:

- UA identification by model and serial number;
- engine identification by type, model, and serial number;
- propeller(s) fitted by size and type;
- ground control station in use by manufacturer, model and serial number;
- defects and rectification details including component change details;
- time in service of aircraft and components;
- times for finite or overhaul required items;
- airworthiness directive or other manufacturer's service information tracking details;
- purpose of flight and area flown;
- identification of remote pilot;
- control system for any out-of-phase maintenance if appropriate (e.g. servo replacement);
- legible records of all maintenance inspections carried out, the date and the name of the inspector;
- legible records of any modification made to the design, structure, systems or controls of the UA;
and
- any other data required by the [CAA].

102.23(b)(13) Amendment and distribution of the application and documentation

For this requirement, the applicant needs to have a process for amending the application submission. Controlling the documentation can be done using a list of effective pages (LEP) and a page allowing a chronological record of amendments. The amendment process should have a control sheet that tracks the amendment process. This may include:

- need for amendment;
- whether prior approval for the amendment is required by the [CAA] (see rule 102.35(b));
- acceptance of the amendment (by primary person);
- update of LEP and amendment page; and
- distribution to manual holders (including the [CAA]).

102.23(b)(14) Approvals

This requires the operator to identify any approvals issued that are associated with the operation. For example, you should provide evidence of any approvals on which your operation may rely, such as a request for segregated airspace, manufacturer's DOC, UAS approval from a [Part 149] organization, or evidence of approval from person(s) to be overflown.

102.23(c) Reduced application requirements

This rule allows the [CAA] to vary the submission content required proportionate to the kind of operation the applicant has requested. This would allow the [CAA] to tailor the initial application requirements of an operator to reflect the risk and complexity of their operation.

For example, an operator may intend to operate entirely within [Part 101], but is seeking a UOC as a requirement for obtaining insurance for their operation. The [CAA] may decide that, given the operation is within [Part 101], the operator's application need not be comprehensive on all matters covered under rule 102.23(b). Essentially, the [CAA] can scale the applicant's submission requirements commensurate with the risk posed by the operation.

Another example when the [CAA] may scale the applicant's submission requirements is during an urgent response following a disastrous event. For these operations, the [CAA] may consider an expedited review for known UA operators that the CAA has had an oversight experience with previously or a UA operator who is pre-approved. The CAA will still require an operational request which will be evaluated by the air navigation service provider (ANSP) unit. The CAA will give operational input, if necessary. The application for a known UA operator applying for U-AID in urgent circumstances is available [here](#).

102.23(d) Application acceptability

The application and associated documentation are the basis for a UAS authorization or UOC issued by the [CAA]. Consequently, any changes to the information entered on the application or on the associated documents require an amendment.

102.25 Issuance of a UAS Authorization or UOC

This rule enables the [CAA] to issue a UAS authorization or UOC in accordance with the Civil Aviation Act [specify CAA year enacted, if appropriate], provided the [CAA] is satisfied that all criteria have been met. The [CAA] may require additional procedures be added to the UAS authorization or UOC holder's submission or impose conditions or limitations by attachment to the certificate.

As part of an application for a [Part 102] certificate, the primary person(s) required by rule 102.23(b)(1) may be required to undergo a background check. This may also be required for the remote pilot and other personnel with designated responsibility for any part of the operation.

Aviation safety

This rule prohibits the [CAA] from issuing a UAS authorization or UOC if by authorizing an operation it would be contrary to aviation safety. In other words, the authorization must not have an adverse impact on aviation safety. The impact of the proposed UA operation on manned aviation will be considered by the [CAA].

Considerations include:

- injury to people in the air or on the ground;
- damage to property including other aircraft in the air or on the ground;
- disruption to the [specify CAA country] civil aviation system;
- creating a situation where other airspace users are subjected to taking action that could endanger their flight operations; and
- flight over sensitive areas such as power substations, government facilities, military installations, prisons, etc.

102.25(b)(1) Requirements

This rule provides for the [CAA] to apply any requirements considered necessary having regard to the complexity of the operation, when issuing a UAS authorization or UOC.

As a general rule, it can be assumed that additional requirements will be proportionate to the size and complexity of the UA operation and any similarity with manned aircraft operations. For example, the [CAA] may require an approved maintenance program for any large complex UAS proposed in the operation.

102.25(b)(2) Conditions

This rule provides for the [CAA] to apply any condition considered necessary having regard to the complexity of the operation. The range and scope of UA operations is so vast that the decision on which conditions would apply to a particular operation can only be made once an application is received.

Agricultural operations are an exception due to the hazardous nature of chemicals carried as well as humanitarian deliveries that carry dangerous goods. It would be expected that the UOC would include conditions and limitations related to these operations.

102.25(b)(3) Markings

This requirement for the [CAA] to determine if marking under [Part 47, Registration and Markings] is required has been covered in rule 102.23(b)(7). While there is no simple delineation criteria the majority of the current UA have structures that do not provide area for compliance with [Part 47, Registration and Markings]. In these cases, the operator will need to apply somewhere on the UA a fireproof, permanent label clearly identifying the registration number and the operator contact information.

102.29(a) Operations specification

Upon completion of the assessment, the [CAA] may issue a UA authorization or UOC. In either case, the [CAA] may issue conditions and limitations that clearly stipulate the privileges and type of operations that are authorized and any conditions imposed, in the interest of aviation safety.

The conditions and limitations are produced by the [CAA]. They are likely to vary depending on the kind of operation and the aircraft used, although some conditions and limitations may be common across all certificates.

102.29(b) Privileges of certificate holder

The rules indicate that if the [CAA] has specified in the UAS authorization or UOC that an operator must comply with any additional rules, the operator must comply.

102.31 Duration of certificate

The rule provides that a certificate may be issued for a period of up to [three] years.

For first time applicants, the [CAA] may issue a certificate for a period of less than [three] years. This is to allow the [CAA] the time necessary to observe the operator's operational practices and allow for technology changes in the operating environment. During this period, the [CAA] may conduct inspections of the operator's facilities/locations and monitor the conduct of operations.

If the operator currently holds a [CAA] certificate, then the [CAA] may issue a new certificate with a [five] year validity period. This policy reflects the operator's safety practices in its performance of civil aviation activities to the CAA and that the [CAA] has the confidence that the operator will continue to exercise similarly under the new authorization.

102.33 Conditions for operation for a UAS authorization or UOC

This rule makes it clear that the certificate holder must comply with all rules under [Part 101], except where the operation specifications provides relief from or varies certain [Part 101] rules.

It further requires the certificate holder to comply with their application submission and any conditions imposed by the [CAA] under conditions and limitations on the Certificate or on the operation specifications attached to the certificate.

Rule 102.23(b) makes it clear that the certificate holder is responsible for any other operator or personnel conducting operations under the authority of that certificate. He/she must ensure that all personnel are fully aware of the procedures in the application and understands the content, conditions and limitations specified on the certificate, and the operation specifications attached to the certificate.

102.35 Changes to application

Procedures for the amendment of the application are required to be documented in the application submission (refer to rule 102.23(b)(13)). There are two types of amendment, those that require prior acceptance of the [CAA] and those that do not. A procedure for each should be described in the application submission.

The application form for amendment [specify form number] is the same as the initial application form and can be found on the [CAA web site under Forms].

102.37 Renewal of certificate

This rule is self-explanatory; however, to provide ample time to process a renewal application, you should submit the application at least 60 days prior to the certificate expiration date.

102.49 Safety Management System

The operator's system for safety management should be commensurate with the size of the organization. For non-complex organizations, operators may want to review the [SMS for Small Organizations](https://www.skybrary.aero/index.php/SMS_for_Small_Organizations) developed by the Safety Management International Collaboration Group (SM ICG) at https://www.skybrary.aero/index.php/SMS_for_Small_Organizations.

Another option from New Zealand that may be helpful in creating an SMS for small organizations can be reviewed at: <https://www.aviation.govt.nz/safety/sms-safety-management-systems>.

Subpart E – Requirements for Manufacturer

102.301 Applicability

This rule applies to any person or entity that designs, produces, or modifies a UAS.

102.305 Means of Compliance

In reviewing a manufacturer's means of compliance the [CAA] expects performance-based requirements and industry consensus standards to accommodate varying means of compliance. This allows the regulatory process to progress alongside UAS innovation and development.

102.307 Manufacturer Declaration

The manufacturer declaration is self-certification to the [CAA] that the UAS complies with a performance standard and ensures the UAS meets the appropriate safety level for a category of operation. The CAA will establish minimum safety levels (design or technical) to which manufacturers must demonstrate compliance. The minimum safety levels will be provided in an AC or other guidance document for ease of amendment.

102.309 Notice to the [CAA]

The manufacturer shall notify the [CAA] of any unsafe condition that renders the UAS non-compliant with the means of compliance upon which the declaration was made. The manufacturer should also devise a way to notify the public regarding the status of any UAS product found non-compliant.

102.311 Documentation

This rule requires the manufacturer to retain the substantiating data used for the means of compliance upon which the DOC was found acceptable. This data should be kept as long as the means of compliance remains valid. In the event of a safety defect, the data could help to determine the cause, scope and severity of a defect.

— END —