Advisory Circular
AC102-1

Unmanned Aircraft – Operator Certification

Initial
01 February 2018

General

Civil Aviation Safety Authority of PNG (CASA PNG) advisory circulars (ACs) contain information about standards, practices, and procedures that the Director of Civil Aviation ('the Director') has found to be an **acceptable means of compliance** with the associated rule.

An acceptable means of compliance is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular.

An advisory circular may also include **guidance material** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

Purpose

This advisory circular provides guidance and compliance advice for meeting the requirements for certification of unmanned aircraft operators under Part 102 *Unmanned Aircraft Operator – Certification*.

Related Rules

This advisory circular relates specifically 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.

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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
CAR	Civil Aviation Rules
CASA PNG	Civil Aviation Safety Authority of PNG
EVLOS	extended visual line of sight
FPV	first person view
ICAO	International Civil Aviation Organisation
IAW	in accordance with
LAME	licensed aircraft maintenance engineer
LEP	list of effective pages
NM	nautical miles
RP	remote pilot
RPA	remotely piloted aircraft
RPAS	remotely piloted aircraft system
SMS	safety management system
SOP	standard operating procedures
SC	support crew
UA	unmanned aircraft
UAS	unmanned aircraft system(s)
UAV	unmanned aerial vehicle
UAOC	unmanned aircraft operator certificate
VLOS	visual line of sight
VMC	visual meteorological conditions

Background

This advisory circular provides compliance guidance and explanatory material to assist operators to understand what is required and when and how to obtain certification under Part 102.

The advisory circular should be viewed as a living 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 RPAS sector.

The advisory circular does not provide prescriptive or exhaustive detail on what an operator must and must not do in respect of a particular type of RPAS application; rather, it is intended to guide operators preparing to make an application to CASA PNG for Part 102 certification.

Part 101 and Part 102 operate alongside one another. It is important to note that Part 102 has been designed, for now, as a 'stand-alone' rule for unmanned aircraft, however the applicant will be required to comply with the relevant requirements of Part 101, unless the Part 102 certificate provides otherwise.

Part 102 provides a framework for unmanned aircraft that is flexible, providing the Director with the discretion to tailor fit-for-purpose safety and operational requirements to each proposed operation. Given the rapid advancements underway with unmanned aircraft technology, this approach ensures the regulatory regime can accommodate these aircraft, while addressing the risks relating to their activity.

Note: Unmanned aircraft that weigh less than 25 kg, and operate entirely in accordance with Part 101 rules, are not the focus of this advisory circular. Please refer to Part 101 and AC101-1 for requirements relating to these aircraft.

Types of unmanned aircraft this AC applies to

There are a wide range of terms used to describe these aircraft, including unmanned aerial vehicle (UAV), unmanned aerial system (UAS), 'drone' or model aircraft.

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 the purposes of providing relevant compliance advice in this advisory circular, CASA PNG use the following descriptions:

- ***Small unmanned aircraft*** *means under 25 kg; and*
- ***Medium unmanned aircraft*** *means 25 to 150 kg; and*
- ***Large unmanned aircraft*** *means over 150 kg.*

Remotely piloted aircraft (RPA) – Part 101

Under Part 101, the term used is 'remotely piloted aircraft' (RPA), defined as a subclass of unmanned aircraft.

A 'remotely piloted aircraft' is—

'an unmanned aircraft that is piloted from a remote station and—

(1) includes a radio controlled model aircraft, but

(2) does not include a control line model aircraft or a free flight model aircraft.

A remotely piloted aircraft includes its associated remote pilot station or stations, the required command and control links, and any other components required to operate the system.

Unmanned aircraft (UA) – Part 102

For Part 102 operations, the key term is 'unmanned aircraft'.

An unmanned aircraft (UA) is:

'an aircraft designed to operate with no pilot on board and includes unmanned balloons, kites, control-line model aircraft, free flight model aircraft and remotely piloted aircraft'.

The rules also refer to an unmanned aircraft *system* (UAS) which is—

'an aircraft and its associated elements which are operated with no pilot on board'.

Part 102 applies to *all* unmanned aircraft that do not operate under Part 101, including any fully autonomous aircraft (not to be confused with RPAS that can be programmed to operate automatically or on an automatic basis, where the operator may still intervene).

Model aircraft

Model aircraft are traditionally regarded as small unmanned aircraft flown by hobbyists for purely recreational reasons. 'Model aircraft' meet the definition of remotely piloted aircraft, and are therefore subject to regulation under Part 101, or Part 102 if operating beyond the limits prescribed in Part 101.

While Part 101 still refers to subcategories of 'model aircraft', such as free flight model aircraft and control line model aircraft, the more general term 'model aircraft' no longer exists. Model aircraft are now referred to as 'remotely piloted aircraft' under Part 101, and are considered unmanned aircraft for the purposes of Part 102.

The classification of model aircraft as remotely piloted aircraft, does not prohibit private operators or organisations from referring to these aircraft as model aircraft. They are defined as remotely piloted aircraft in the Rules primarily for functionality and for risk management purposes.

Recreational versus commercial considerations

The rules do not make a distinction between remotely piloted aircraft that are operated for commercial or recreational purposes. This position reflects the CASA's view that the aviation-related risk posed by remotely piloted aircraft differs very little between aircraft used for recreational versus commercial purposes.

For example, the risk to persons or property from a small unmanned aircraft taking an aerial photograph or video is the same, whether the photograph or video is sold or retained for private use. The important aspect in both cases, is that the risks to persons and property are properly managed.

For further information, refer to AC101-1.

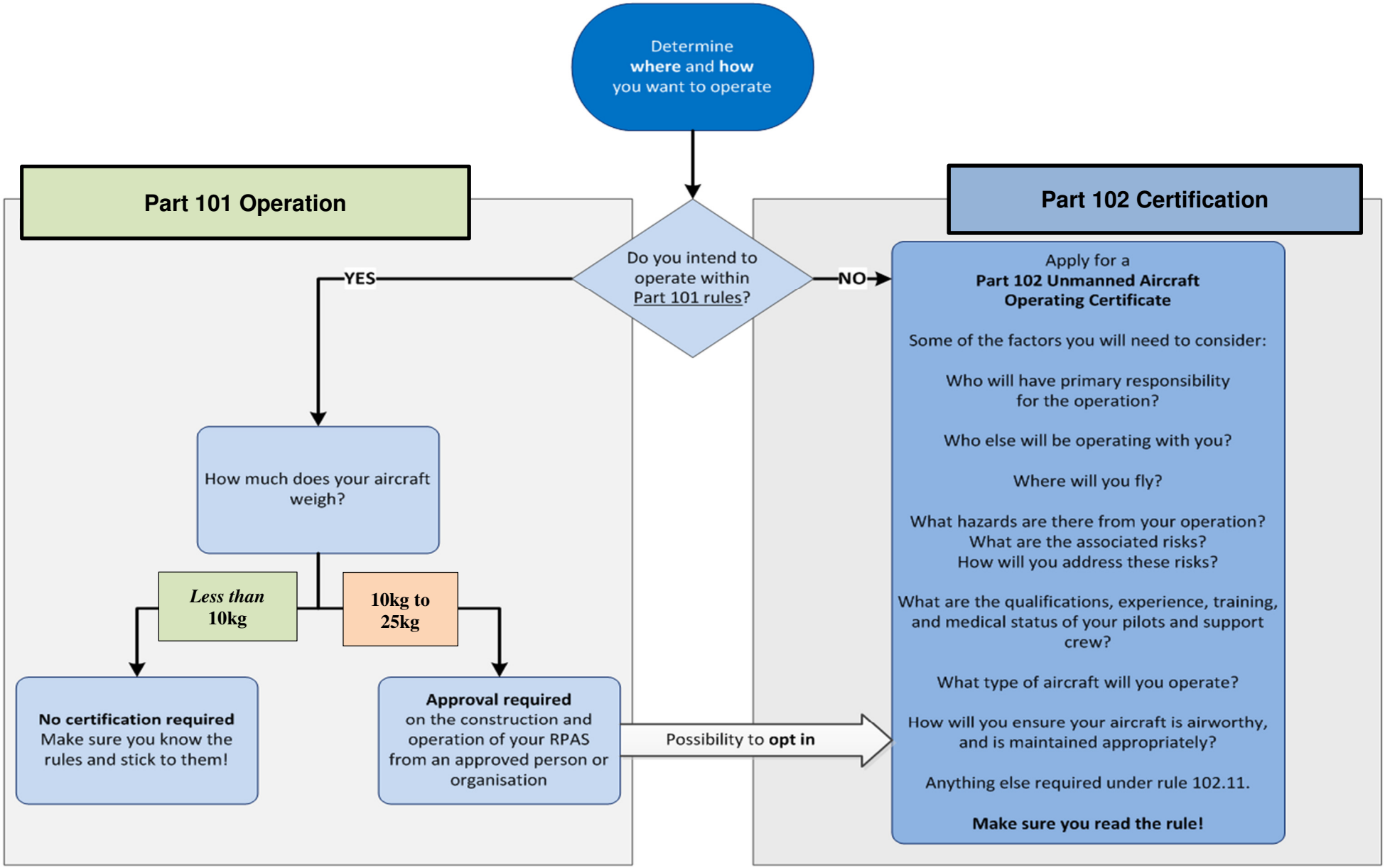
Rules 102.1 Purpose, 102.3 Application & 102.7 Requirements

Unmanned aircraft certificate requirements

You require an unmanned aircraft operator certificate (UAOC) issued under Part 102, if you intend to operate an unmanned aircraft that cannot operate strictly within the limitations of Part 101.

Figure [1] following outlines the decision pathway for operators to consider.

Figure [1]


Determine
where and how
you want to operate
Part 101 Operation
Part 102 Certification
Do you intend to operate within Part 101 rules?
YES
NO
How much does your aircraft weigh?
Less than 10kg
10kg to 25kg
No certification required
Make sure you know the rules and stick to them!
Approval required
on the construction and operation of your RPAS from an approved person or organisation
Possibility to opt in
Apply for a
Part 102 Unmanned Aircraft Operating Certificate
Some of the factors you will need to consider:
Who will have primary responsibility for the operation?
Who else will be operating with you?
Where will you fly?
What hazards are there from your operation?
What are the associated risks?
How will you address these risks?
What are the qualifications, experience, training, and medical status of your pilots and support crew?
What type of aircraft will you operate?
How will you ensure your aircraft is airworthy, and is maintained appropriately?
Anything else required under rule 102.11.
Make sure you read the rule!

Part 101 or Part 102 operations

There are 12 key operating requirements under Part 101. You must—

(1) not operate an aircraft that is more than 10 kg without the Director's approval and always ensure that it is safe to operate; and

(2) at all times, take all practicable steps to minimise 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 in certain cases, use an observer to do this); and

(6) not fly your aircraft higher than 120 metres (400 feet) above ground level (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 kilometres of any aerodrome (unless certain conditions are met); and

(9) obtain an Air Traffic Control clearance issued by PNG Air Services Ltd prior to flying in controlled airspace; and

(10) not fly in special-use airspace (e.g. restricted, military operating areas or low flying zones) without the permission of the administering authority of the area; 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 want 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 Civil Aviation Rules that apply to your operation, before deciding whether to operate under Part 101 and 102.

Some exceptions may apply, but generally if you cannot meet any of these requirements; this is a good indication that your operation will need to be certificated under Part 102.

General guidance material

Considerations for your proposed operation

Before you make an application to CASA PNG for an unmanned aircraft operator certificate under Part 102, you will need to give some thought to the scope of your proposed operations.

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 list of questions below are only *some* of the considerations for prospective unmanned aircraft operators, and provides guidance based on CASA PNG's current understanding of RPAS capabilities, and the current Papua New Guinea RPAS environment.

The advisory circular does not detail specific requirements for different applications or uses but CASA PNG considers each application on its own merits. You will be expected to demonstrate how you intend to address the hazards identified, and the associated risks presented by your operation.

The series of questions below will help you decide what aspects of Part 101 you may not be able to comply with, and therefore the areas where you will need to pay particular focus on in preparing your application.

Unmanned aircraft larger than 10 kg

If you want to operate an aircraft with a gross mass of more than 10 kg, but not more than 25 kg you may be covered by Part 102. Aircraft weighing between 10 kg and 25 kg may not be operated under Part 101. This means that if the gross mass (including the payload) is over 10 kg you can only be covered by Part 102 certification.

Unmanned aircraft larger than 25 kg

If you want to operate an aircraft with a gross mass of more than 25 kg, you are automatically covered by Part 102. Authorisation to operate an aircraft over the 25kg gross mass may only be granted under the authority of a Part 102 certificate. The gross mass of 25 kg includes any payload carried by the aircraft.

Approved person or organisation

Please contact the CASA PNG for further information about becoming an approved person or organisation under Part 101.202

Night operations

If you wish to fly your unmanned aircraft at night you will need to explain in your application how you propose to address—

- the availability of aircraft lighting/aids to ensure your aircraft is visible to other remotely piloted aircraft operators or manned aircraft; and
- how you will maintain visual contact with the aircraft; and
- area of proposed operations; and
- risks to persons or property on the ground; and
- notification of flights to emergency services.

The term ‘day’ is as defined in the Civil Aviation Rules Part 1.

Operating over crowds, in congested areas and close to buildings

Operating above gatherings of people or congested areas where people may be present is inherently hazardous. Flights above or in proximity to people at sporting events or other events (whether held indoors or outdoors) involving large or dense crowds of people have additional risks.

Applicants for an UAOC are expected to address the following in their applications—

- identification of the hazards and risks, including those that might be exacerbated by a crowd or people being present; and
- the configuration of the aircraft (fixed wing vs multi rotor or airship); and
- reliability of the machine; and
- reliability of the control system; and
- mitigations in place in the event of any system failure; and
- system redundancy (such as an acceptable automatic recovery parachute); and
- if practicable, the steps the operator proposes to take to obtain the consent or give notice to person 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 an aircraft close to buildings, you will need to address additional things such as—

- procedures for dealing with impact with structures or objects; and
- crowd/access control to ensure a safety perimeter in the event of the aircraft falling to the ground.

Beyond visual-line-of-sight (BVLOS) operations

We expect that for the foreseeable future the standard operating environment will be to operate within '*unaided*' visual line of sight (VLOS). '*Unaided*' means that the aircraft is able to be seen by the operator without the use of an instrument, such as binoculars or a telescope.

While Part 102 does not prohibit BVLOS operations, these types of operation present a number of challenges for operators. The risks associated with such operations mean that if you are intending to undertake BVLOS operations, you will need to present a strong and convincing safety case in your application. Some of the features of a safety case would include—

- identification of the airspace class to be used and associated requirements and how they will be met; and
- ability to provide separation from other traffic, such as segregated airspace or a technological solution (e.g. seek, detect and avoid systems); and
- mitigate risk to persons, property and terrain.

BVLOS airspace requirements

BVLOS operations relying on segregated airspace will need to have successfully obtained approval, for the designation of such airspace before operations would be approved.

UAOC applicants should be aware that the establishment of special-use airspace in accordance with a Part 71 authorisation (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 in limited numbers and for specific purposes, such as research and testing in areas of low traffic intensity aviation activity.

BVLOS and First Person View (FPV)

Unmanned aircraft that are flown using First Person View (FPV), or from a remote device that requires the attention of the pilot, will still need an observer to be present to maintain the unaided visual line of sight contact at all times with the aircraft. This observer is needed, among other things, to advise the pilot of any other traffic that enters the UA's operational area.

An FPV operation without an observer is considered a BVLOS operation and will require operators to address the safety case considerations above.

Extended Visual Line of Sight (EVLOS) operations

Extended visual line-of-sight (EVLOS) means observing an extended area of airspace by utilising observers at the boundary of the area, who are in direct contact with the pilot/operator. These observers provide the separation by ensuring no other traffic enters the operational area. UA operations where this process has been utilised is in the surveying of power-lines. This may also be considered a possible solution for precision agriculture tasks that utilise UAs.

EVLOS may be approved if conducted with a number of appropriate support crew for the operation, and you can ensure the separation of unmanned aircraft from other aircraft.

If you wish to conduct EVLOS operations you are required to establish procedures for contacting other aviation operations in the area (e.g. for agricultural operations, other manned agricultural aviation operators, or local helicopter operators), to ascertain when and where they intend to operate in a specific area and to advise them of the intended UA operation.

Flying above 400 feet AGL

Under Part 101, a 400 ft AGL ceiling applies to remotely piloted aircraft operations (with some exceptions). The purpose of this ceiling is to create a buffer zone between conventional aircraft and those that are operated under Part 101.

Conventional aircraft are generally not permitted to fly below 500 ft AGL, unless they have a bona fide reason to do so. Conventional aircraft such as agricultural operations however, do operate below 500 ft. Aircraft also operate below 500 ft when landing and taking off.

This is why there is an overarching obligation on remotely pilot aircraft operators, to give way to all manned aircraft. The 'give-way' rule applies to both Part 101 and Part 102 operations, unless a Part 102 certificate provides otherwise.

If you want to operate above 400 ft AGL you will need to first identify the class of airspace that you intend to operate in. Different rules apply depending on the airspace you intend to fly in.

You may also need to consult PNG Air Services Ltd (PNGASL) to ascertain if you will require an air traffic control clearance and/or special aircraft equipment, such as a transponder, or any other conditions that they might set for the operation that you have to abide by.

Flying UAs within 4 km of an aerodrome

You may not use your aircraft within 4km of an aerodrome *unless* 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 certificate that does not include this requirement. However, for this to happen, it will be important for you to demonstrate that you have thought through the following—

- how you can and will inform the airfield operator about what you are doing; and
- how you will monitor the appropriate air traffic frequencies; and
- anything else that will be 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, and use the necessary technical equipment to communicate with air traffic control. This may include—

- a pilot licence issued under Part 61; or
- other appropriate documents acceptable to the Director.

Flying above people without obtaining their consent

Under Part 101, operators are required to avoid using airspace above people unless they have the consent of people below the flight. This requirement applies to operations over private property as well as public land, and public spaces.

For more information about the consent rule (rule 101.207(a)(1)), refer to AC 101-1.

Generally, operating above people without their consent is likely to be a hazardous activity. You will need to explain in your application why it is not possible or practicable to obtain consent from the people you intend to fly above.

In deciding whether to relax or remove the requirement to obtain consent, relevant considerations would include—

- the weight and size of the aircraft involved; and
- the configuration of the aircraft, whether fixed-wing or multi-rotor or airship (and things such as the aircraft's glide capability and whether rotor blades are closed/covered will be particularly relevant); and
- reliability of the aircraft; and
- reliability of the control system (and any related system); and
- mitigations in place in the event of any system failure, including "return home" functionality; and
- system redundancy (such as an acceptable automatic recovery parachute); and
- the geographical area that the unmanned aircraft is intended to be used in; and
- the height(s) at which the aircraft will be operated; and
- consideration of the hazard register to establish the operator's understanding of their operation and safety management system.

If an operation is approved to be conducted without obtaining consent, you may still be required (as a condition included in the certificate), to take reasonable steps to notify people who may be affected by an operation. This may include use of such mediums as newspaper advertising, letterbox drops, or signs affixed in a particular area or at the entry to an area of intended operation.

In other cases, for example a sports event, it may be possible to have notice included as part of a ticket to give attendees prior warning of an operation occurring (and establish acceptance of those operations as a condition of entry).

Flying above property without getting owner's consent

Under Part 101, operators are required to avoid flying piloted unmanned aircraft in airspace above an area of property, unless prior consent has been obtained from any persons occupying that property or the property owner. This requirement applies to both private property as well as public land, and public spaces.

Consent may be obtained from the property owner or occupier. In practice this will mean, for private property, the owner, a tenant, or a representative at the property. For public spaces, consent is needed from the agency or organisation owning or controlling that space (e.g. a local council or the appropriate Government Department).

Consent may be implied or explicit depending on the situation involved and therefore may not have to be sought from the same people repeatedly, if standing arrangements or understandings are entered into. The consent itself could take multiple forms, such as informally verbal, written, or more formally contractual. This will depend on the situation and the requirements of the landowner, the people involved and, potentially, the commercial imperatives of the operator.

Existing agreements and arrangements may be sufficient in certain cases. For example, commercial contracts that already guarantee access or through the implied consent of operations that have already taken place.

For more information about the consent rule (rule 101.207(a)(1)) refer to AC-101-1.

Issues with obtaining owner consent

Seeking consent is a two-step process—

(1) locate the landowner or person occupying that property (or their representative); and

(2) seek the consent of those on the property or around your operation.

If it is not practicable or possible to obtain consent from property owners or property you intend to fly above, you will need a Part 102 certificate. The reason you may not be able to obtain consent could include—

- that obtaining consent would be onerous namely due to—
    - the number of properties to be overflown; and
    - the location of the operation; and
    - of the nature of the operation (e.g. emergency services use); and
- an inability to locate a property owner or representative; and
- attempts to contact a property owner have failed; and
- unwillingness of a property owner to give consent; and
- it is unclear who is appropriate or authorised to give consent.

You will need to explain in your application, why it is not possible or practicable to obtain consent from the property owners/occupiers you intend to fly above. In deciding whether to relax or remove the requirement to obtain consent, relevant considerations would include—

- the weight and size of the aircraft involved; and
- the configuration of the aircraft, whether fixed-wing or multi-rotor or airship (and things such as the aircraft's glide capability and whether rotor blades are closed/covered will be particularly relevant); and
- reliability of the aircraft; and
- reliability of the control system (and any related system); and
- mitigations in place in the event of any system failure, including "return home" functionality; and
- system redundancy (such as an acceptable automatic recovery parachute); and
- the geographical area in which the aircraft is intended to be used; and
- the height(s) at which that the aircraft will be operated; and
- consideration of the hazard register to establish the operator's understanding of their operation and safety management system.

If an operation is approved to be conducted without obtaining consent, you may still be required (as a condition included in the certificate), to take reasonable steps to give notice to people who may be affected by an operation. This may include use of such mediums as newspaper advertising, letterbox drops, or signs affixed in a particular area or at the entry to an area of intended operation.

Legislation and Privacy provisions

It is important to note that even if you obtain consent, you remain subject to all other relevant legislation, including local body bylaws and requirements.

If you are using a camera or other similar technology you will likely be subject to Section 49 of the 'Right to Privacy' provisions of the PNG Constitution.

UA 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 your proposed operation.

Conditions that reflect those of Part 137 may be imposed on a Part 102 certificate. 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 requires that operators be fully aware of the potential for overspray and accidental damage to other crops or property.

UAOC application and exposition

Any unmanned aircraft operation will introduce hazards and risks that will need to be managed. This is the responsibility of the operator, so it is essential that you give this thorough consideration.

Establishing a **hazard register** is a crucial demonstration that you are aware of all the potential hazards, the level of risk each hazard poses, and the measures that will be taken to mitigate these risks.

When applying for an unmanned aircraft operating certificate, you must be able to demonstrate that the operation will be safe. The Director will look at the people involved in the operation, the aircraft, and the scope of the operation. The Director must be satisfied that the operation is safe, and that the operator is able to mitigate and control the risks before issuing the UAOC.

Standard operating procedures (SOPs)

To demonstrate the safety of the proposed operation, the operator also requires an exposition that should establish and document a set of **standard operating procedures (SOP)**. The SOP should include a process for conducting a risk assessment on the type of operation, and the organisation intends to undertake. The SOP should take the form of a simple organisation manual that is controlled by the operator. Refer also to rule 102.11(b)(10) later in this advisory circular.

It is highly recommended that the operator establish a basic **Safety Management System (SMS)** for their organisation. Information for developing a small non-complex organisation SMS should be obtained by the applicant.

In preparing your exposition, you may wish to incorporate requirements from other parts of the Civil Aviation Rules s (for example, some requirements from Part 91 *General Operating Flight Rules*, or for an agricultural operation, Part 137 *Agricultural Aircraft Operations*). This would help to provide assurance to the Director that the operation is going to be conducted according to the highest possible safety standard.

102.9 Application for an Unmanned Aircraft Operator Certificate

Operators who require, or would prefer, to be certified under Part 102, will need to make an application to CASA PNG on Form CA 102 which may be obtained by email request to CASA PNG (see also website www.casapng.gov.pg).

The CA 102 application form is quite comprehensive due to the need to cover a wide range of very different operations that may be undertaken. You may find that you do not need to complete all sections of the Form if your operation is relatively simple, and these can be determined in consultation with CASA PNG staff. The time taken for assessment of the application will depend on the provision of information appropriate to and required for the proposed operation.

It is recommended if you are planning to make a Part 102 application, that you contact CASA PNG for an initial meeting to discuss the scope of the proposed operations, application and certification requirements.

What CASA PNG will assess

CASA PNG will review your entire proposed operation, using your *exposition* as the guiding document for the assessment.

Your *hazard register* will also be key to demonstrating that you understand all of the hazards related to your operation, and have mitigations in place to manage any associated risk.

102.11 Unmanned Aircraft Operator Exposition

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

An exposition is a description of how an operator (no matter how big or small) will conduct its operations to maintain the required level of safety and remain in compliance with the rules.

To assist you, the CASA PNG has compiled a Part 102 compliance matrix (Form CA 102/03). This document identifies each rule requirement and has space for the applicant to identify the specific section/paragraph in their exposition that shows compliance with that specific rule. The matrix supports the application and is vital to the CASA PNG assessment process, enabling considerable time and cost saving.

The preferred approach is for you to identify a section and/or paragraph reference against each rule. It follows that the exposition needs a section/paragraph numbering system. Further, for exposition control, page numbering, issue date, list of effective pages (LEP) and contents page are also needed. The introduction page of the compliance matrix has further guidance on this subject.

102.11(b) Exposition matters:

This rule lists the items that are required to form an exposition. A well-written and comprehensive exposition will help CASA PNG assess your application, especially if it provides a clear description of the operational procedures in your own words.

The Director has the discretion to require only some of these items, as appropriate to the particular circumstances, context and characteristics of the proposed operation and emphasizes the importance of an initial meeting to discuss what might be expected from you.

102.11(b)(1) Person with primary responsibility:

This rule requires you to identify a "Primary/(Prime) Person". As the title implies, this is the person who has primary control of the operation and is usually the person making the initial application. Usually this is the person responsible for funding the operation and/or providing the resources (including the aircraft). It is usual to provide a small organisational structure diagram (similar to a family tree), showing lines of responsibility between persons identified as having a responsibility for any part of the operation. For owner/operator operations this will be relatively straightforward, but for large organisations, it is expected that there are clear roles and lines of responsibility.

The prime person is also the person that will be subject of a fit and proper person assessment. Further information on fit and proper person assessment is detailed later in this advisory circular.

102.11(b)(2) Person having control:

This rule requires the identification of any person who has control over any part of the operation. It may be the person with control over the flights or training, or the person responsible for maintenance control. The use of the family tree would show the lines of responsibility and reporting back to the prime person.

102.11(b)(3) Areas of operation:

This rule requires the identification of the actual geographic areas in which you will operate your RPAS. In some cases you will be able to delineate the area by street or locality names. In other cases, a map marking out the area may be the best solution.

Seeking general approvals for operations "within Papua New Guinea" or other large non-specific geographical areas is not encouraged, and the operator will need to outline how it will go about ensuring it is aware of any local airspace restrictions and/or other localised operating conditions.

102.11(b)(4) Hazard register:

This rule requires you to complete and provide a hazard register. This register should be tailored to the risk of the operation, with appropriate mitigations identified.

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 operations, and applies the standards that are likely to produce the best safety results. Consideration should be given to how you collect the information. and how you disseminate the plan to manage, and minimise hazards to your personnel, including their role in any hazard mitigation.

The hazard assessment process should consider all phases of operation, including hazards associated with the launch and landing of the aircraft.

102.11(b)(5) Reporting information:

The rule requires that you have procedures to report accidents and incidents. Currently Part 12, which details reporting requirements for manned aircraft, also applies to Part 102 unmanned aircraft operations. It does not apply to remotely piloted aircraft operated under Part 101 but the Director is instead able to tailor a specific reporting framework on a case-by- case basis.

Intending operators are required to report certain accidents and serious incidents in accordance with Part 12. CASA PNG CA005 Occurrence Report should be used as the reporting mechanism. Many sections of the form are unlikely to be applicable (in which case they should be left blank), but use of the form will ensure consistency in the CASA PNG reporting system.

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

- injury to persons; and
- loss of control; and
- fly-away; and
- motor or structural failure; and
- incidents involving manned aircraft; and
- incursion into airspace where not authorised; and
- damage to third party property.

If you are unsure whether to report or not we encourage you to err on the side of reporting.

You may also be required to undertake regular statistical reporting which, when linked with incident reporting, provides data for CASA PNG to determine the reliability of unmanned aircraft. The more data gathered, the sooner reliability can be established which could inform policy work to revise limitations applied to unmanned aircraft operations.

102.11(b)(6) Licensing and qualifications:

This rule relates to operating requirements for personnel licensing, qualifications, training and competency. There are currently no internationally recognised standards for unmanned aircraft competency and qualification requirements. The PNG Civil Aviation Rules also do not prescribe any particular pre-requisite for the operation of an RPAS.

The rule contemplates the Director being satisfied around two key areas of knowledge and competence—

(1) general aviation knowledge (incorporating such things as airspace and air law); and

(2) specific knowledge related to remotely pilot aircraft/unmanned aircraft (including aircraft handling).

In assessing what qualification and/or knowledge may be required for personnel involved in a particular operation, CASA PNG 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—

- pilot-in-command; and
- control station attendants; and
- observers.

Pilot in command and persons having control

To be approved as a person having control and/or the pilot-in-command of an RPAS under a Part 102 certificate, it is expected that the relevant person possess both general aviation knowledge and RPAS-specific competence.

Unless the nature and scope of the operation require otherwise, the following are likely to be acceptable to demonstrate *general aviation knowledge*—

- a pilot licence issued under Part 61, (or foreign recreational micro-light or glider pilot certificate):
- a remotely piloted aircraft licence (or equivalent) issued by a competent foreign aviation authority acceptable to the Director:

- a pass in the private pilot licence (PPL) air law exam; radio telephony test; radio telephony rating; five hours of air instruction and experience focused on airspace and flight radiotelephony use:

  Note: Radio telephony requirements apply only if an aviation radio is to be used as part of the operation.

- a certificate of achievement issued by a Part 141 training organisation, which indicates—
  - a pass in aviation law theory; and
  - competency in operating unmanned aircraft; 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 *RPAS-specific competence—*

- a certificate of training (or equivalent) from the manufacturer of the unmanned aircraft to be operated, or its Papua New Guinea agent:
- a certificate of training from a Part 141 training organisation authorised to conduct unmanned aircraft training.

We expect a growth in the number of organisations delivering RPAS training courses. For these to be considered for acceptance, an operator will need to obtain and supply a copy of the course syllabus, which will then be considered by CASA PNG.

For other personnel involved in an operation, CASA PNG will consider each application on its merits. General guidance is provided below.

Observers/support crew

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

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

- methods of communicating with the pilot both directly; and
- action and backup action to take if communications fail; and
- methods of division of the sky into sectors so any intruder's position is instantly known once reported to the pilot; and
- emergency procedures should any event take place.

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

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

Flight time recording and operational experience

The following is recommended guidance only and is not a condition of a Part 102 certificate:

Pilots and other related personnel should maintain a logbook recording their flight time and operational experience.

The logbook should record at least—

- the pilot's/crew member's name; and
- aircraft type and serial number (if it has one); and
- flight time; and
- purpose of the flight; and
- 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 CASA PNG.

Maintaining these records is not mandatory but highly recommended and 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 UA certificate.

102.11(b)(7) Details of aircraft to be used:

CASA PNG expects to see the following information provided with an application—

- format of the aircraft (rotorcraft/fixed-wing); and
- the dimensions and weight (ready to fly); and
- identification of the manufacturer of the aircraft, or if it is a homebuilt RPAS, the identity of the person who constructed it, where and when; and
- any attachments or role equipment fitted; and
- any unique markings or identifications, including the primary and any secondary colour of the aircraft.

If the Director, having given due consideration to rule 102.13(b)(3), requires marking in accordance with Part 47, the CASA Airworthiness Branch should be consulted for further guidance on aircraft marking requirements.

If Part 47 compliance is not required, then the expectation is that the aircraft will be marked using a permanent label that clearly identifies the operator.

Unless the size or nature of the aircraft necessitates otherwise, CASA PNG expects that the aircraft is marked in a way that identifies the operator. The marking should be affixed in a location that can be read without removal of any cover and label sizes scaled to suit the size of the aircraft.

102.11(b)(8) Control systems:

The rule requires the control system to be identified and approved. Currently, there are no internationally recognised design standards or configuration requirements that apply to unmanned aircraft control systems.

The command and control (C2) link refers to the data link between the RPA and its remote pilot station for the purposes of managing the flight. Work is progressing internationally by the Radio Technical Commission for Aeronautics (RTCA), to develop standards in this area, but this is a work-in-progress matter.

In the interim, caution is necessary in regard to reliability of C2 links, including the potential for signal jamming or other interference. Because of this, large unmanned aircraft utilising this technology are unlikely to be acceptable, unless an operator can demonstrate that these issues have been resolved.

For unmanned aircraft that are likely to operate in Papua New Guinea, the evaluation of the C2 link will be carried out on the basis of an operating history. The availability of good operational history should be considered when determining the use of a particular RPAS model/type.

102.11(b)(9) Aircraft maintenance:

The rule requires you to establish a maintenance programme that is acceptable to the Director for all aircraft you operate.

The maintenance programme should reflect the nature of the operations the aircraft is applied to, and the size and complexity of the aircraft itself. This programme should be based on the manufacturer's maintenance instructions and should cover at least—

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

Large unmanned aircraft

For large unmanned aircraft, maintenance conducted by a Part 66 qualified, rated, licensed aircraft maintenance engineer (LAME), will generally be acceptable. Maintenance performed by a Part 145 maintenance organisation is also likely to be acceptable. The CASA Airworthiness Branch should be consulted for further guidance.

Maintenance performed by manufacturers of large unmanned aircraft is likely to be acceptable, but evidence of any maintenance programme applied by the manufacturer would need to be supplied for approval. Manufacturers of large unmanned aircraft may provide maintenance support and training to operators; you may wish to provide evidence of any such training to be approved to perform certain maintenance on an aircraft.

Those aircraft that, but for the absence of a pilot, would generally be issued with an airworthiness certificate would likely be required to undergo the standard certification process provided under Part 21.

Medium and small unmanned aircraft

Maintenance on small and medium size unmanned aircraft is generally considered to be the responsibility of the operator.

Small and medium unmanned aircraft 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 guidance, and limitations in their maintenance programme and exposition.

Battery maintenance

Battery maintenance is important with both electric-powered and conventionally powered unmanned aircraft utilising 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.

102.11(b)(10) Operational procedures:

The rule requires you to ensure that all operational procedures related to proposed flights need to be documented. This could include but is not limited to—

- how you determine meteorological limits; and
- how you operate the aircraft regarding pilots; and
- camera operator and the links between observers; and
- preflighting aircraft; and
- communications between personnel; and
- how you ensure minimum distances between persons and/or property.

In manned aircraft operation, these are called "*standard operating procedures*" (SOPs), and this is a good term to use. Refer to the general guidance material found in the front section of this advisory circular for additional advice. The manufacturers operating guidelines and any limitations specified, provide a useful starting point for the establishment of operating procedures.

102.11(b)(11) Cargo-handling and dropping of items:

This rule is intended to capture additional operating configurations in respect of the carriage of cargo or the dropping of items. Where an operator intends to move cargo or drop items or conduct agricultural operations or any similar operation, procedures should be developed to ensure the operation can be conducted without harming persons or property. These procedures should also be tested against your risk assessment processes. The established procedures should be added to the SOPs.

102.11(b)(12) Construction and design of unmanned aircraft:

Currently, there are no internationally recognised design standards, configuration requirements or airworthiness certificates that apply to unmanned aircraft. Work has been undertaken by ASTM in the United States, on design standards for small unmanned aircraft. Some initial standards have been developed and can be found at the ASTM website here. These standards provide good guidance material for intending operators, and may assist with aircraft selection.

CASA PNG will undertake initial airworthiness assessments on a case-by-case assessment. The assessment will consider whether the aircraft has been designed and constructed to an appropriate standard or level, and whether it is suitable for the proposed operations to be conducted, equipment used, or payload carried.

An assessment for the UAOC will consider the design standard that is most appropriate for the size and weight of intended aircraft.

CASA PNG will consider any manufacturer documentation, including any operations manual and limitations and/or any information about the standards, to which the aircraft has been designed and constructed.

Other factors relevant to CASA PNG's assessment will be—

- the proposed use of the aircraft; and
- the type, complexity, size and nature of the aircraft; and
- whether CASA PNG is familiar with the manufacturer and/or model of aircraft; and
- whether the aircraft is the first of its kind in Papua New Guinea; and
- any operating history of the specific aircraft, or aircraft model/type; and
- any overseas certification or approval for the aircraft model/type; and
- accident or incident statistics in Papua New Guinea or overseas.

Until the development of more comprehensive and widely-accepted standards, fit-for-purpose testing and/or proving may be required and assessed on a case-by-case basis. For fixed-wing aircraft, the use of a wing and tail-plane static load test is simple to carry out and would aid and substantially satisfy structural assessment.

Any aircraft that holds type certification that is to be modified for RPAS use would be expected to maintain (as appropriate) its type-certified status, and continue to meet ongoing regulatory maintenance requirements.

Unmanned aircraft similar in size to microlight aircraft would be treated in a similar manner to manned microlight aircraft. CASA PNG may use international standards to guide its assessments; operators may wish to use the very light aircraft (VLA), light sport aircraft (LSA) or the United Kingdom BCAR Section S standards, as a base design standard.

Operators of larger aircraft should look to the standard FAA and /or European EASA design requirements as appropriate. CASA PNG recommends that any person intending to operate very large unmanned aircraft, contact CASA PNG prior to applying any such standards for guidance.

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 unmanned aircraft, particularly in respect of 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 Director in risk mitigation. These parachute systems are now becoming available to the multi-rotor market as well, and should have a high priority for installation.

Test/proving flights

CASA PNG may, until design standards become available, require operators to conduct flight testing or proving flights to demonstrate safety of flight, controllability, and reliability.

As part of the application process, an applicant may be required to demonstrate an operating history in a test area that demonstrates reliability, controllability and safe flight characteristics. To meet this requirement, and future statistical reporting requirements, an operator should ensure that accurate aircraft logbooks are maintained for each unmanned aircraft that is flown, including any testing or proving flights.

Logbooks should record at least the following information—

- aircraft identification by model and serial number; and
- engine identification by type, model, and serial number; and
- propeller/s fitted by size and type; and
- ground control station in use by manufacturer, model and serial number; and
- defects and rectification details including component change details; and
- time in service of aircraft and components; and
- retirement lives of any finite or overhaul required items; and
- any relevant airworthiness directive or other manufacturer's service information tracking details; and
- purpose of flight and area flown; and
- identification of pilot in command; and
- control system for any out of phase maintenance if appropriate e.g. servo replacement; and
- records of all maintenance inspections carried out and by whom; and
- records of any modification made to the design, structure, systems or controls of the aircraft; and
- any other data required on a case-by-case basis.

102.11(b)(13) Amendment and distribution of exposition

For this requirement, the applicant needs to have a process for amending the exposition. Controlling the exposition is done by the use of a list of effective pages (LEP), and a page allowing a chronological record of amendments incorporated into the exposition. The amendment process should have a control sheet that tracks the amendment process. This may, for example, include—

- need for amendment; and
- whether the amendment needs prior approval by the Director (see rule 102.23); and
- acceptance of the amendment (by prime person); and
- update of LEP and amendment page; and
- distribution to manual holders (including CASA PNG).

102.11(c) Adopt by reference

The applicant may propose that certain parts of the operation would be conducted in accordance with the requirements of any Civil Aviation rule as a means of managing the risks. For example, the applicant may use a rule number and any appropriate clause as a reference to a means of compliance, avoiding the requirement to describe in detail the full rule requirement.

102.11(d) Director's discretion

This rule allows the Director to vary the exposition content required, proportionate to the kind of operation the applicant has requested. This would allow the Director to tailor the initial application requirements of an applicant to reflect the risk and complexity of their operation.

For example, an operator may intend to operate entirely within Part 101, but is seeking an UAOC as a requirement for obtaining insurance for their operation. The Director may decide that, given the operation is within Part 101, the applicant's exposition need not be as comprehensive as all the matters covered under rule 102.11(a). Essentially, the Director can scale the applicant's exposition requirements in line with the risk posed by the operation.

102.13 Grant of a certificate

This rule enables the Director to issue an operating certificate in accordance with the Civil Aviation Act 2000 (as amended) ('the Act'), providing he is satisfied all criteria have been met. The Director may require additional procedures added to the certificate holder's exposition, or impose requirements or conditions on the certificate holder's Operation Specifications attached to the certificate.

Additionally, anyone holding or applying for an aviation document must satisfy the Director they are a fit and proper person (FPP). This is a requirement of the Act. An aviation document includes, for example, a licence, rating, or air operator certificate. An UAOC is an aviation document. The FPP process is explained below.

As part of an application for a Part 102 certificate, the primary person required by rule 102.11(b)(i) will be required to undergo an FPP assessment. The Director may also require the pilot-in-command, and other personnel involved in an operation to undergo FPP assessments.

Fit and proper person

Fit and proper person assessments are made on a case-by-case basis. The Act sets out the criteria to be considered by the Director, when determining whether or not a person is fit and proper. The relevance and weight given to any particular matter (or information), however, may vary depending on the document that has been applied for (i.e. the level of involvement in the aviation system). It is entirely possible that a person may be fit and proper for one level of involvement in the civil aviation system, for example, to hold a private pilot licence, but not fit and proper for a higher level of involvement in the system, such as holding a commercial pilot licence or a senior person position.

The criteria for the fit and proper person test are set out in the Act, and include—

- the applicant's conviction record for transport safety offences; and
- the applicant's experience in the transport industry; and
- the applicant's knowledge of aviation regulatory requirements; and
- the applicant's history of compliance with transport safety regulatory requirements; and
- the applicant's history of physical or mental health or behavioural problems.

The Director is not confined to considering the criteria specifically listed in the Act, and may take into account any other relevant matters, and consider information obtained from any source. This means the Director may ask for a full criminal conviction history if this is deemed necessary and appropriate.

The fit and proper person application form may be obtained by email request form CASA PNG, and may require the applicant to provide official criminal offence history records from official Government sources. These records can take some time to obtain and should be requested as early as possible in the application process.

Aviation safety

This rule also prohibits the Director from issuing a certificate if its issue would be contrary to aviation safety. In other words, the issue must not have an adverse impact on aviation safety. This is in regard to all aviation safety so the impact on the manned aviation system from the proposed unmanned aircraft operation must be assessed.

Hazards are circumstances that could lead to—

- injury to people in the air or on the ground; and
- damage to property including other aircraft in the air or on the ground; and
- disruption to the Papua New Guinea civil aviation system; and
- creating a situation where other airspace users are subjected to taking action that could endanger their flight operations; and
- flights over sensitive areas such as power substations, dangerous storage areas, prisons, etc.

102.13(b)(1) Requirements

This rule provides for the Director, when issuing a certificate, to apply any requirements he considers are necessary having regard to the complexity of the operation.

As a general rule, it can be assumed that additional requirements will be proportionate to the size and complexity of the unmanned aircraft operation, and any similarity with manned aircraft operations. This, for example, could be the requirement to have the operator provide a maintenance programme approved under rule 91.609 for any large complex RPAS they may operate.

102.13(b)(2) Conditions

This rule provides for the Director, when issuing a certificate, to apply any conditions he or she considers are necessary having regard to the complexity of the operation. The range and scope of unmanned aircraft operations is so vast, that the decision on which conditions would apply to a specific operation can only be made once an application is received.

As noted above, in rule 102.11(c) the applicant may propose that the operation would be conducted in accordance with the requirements of any Civil Aviation Rules, as a means of managing the risks. On this basis it can be assumed that for small and medium unmanned aircraft, the rules will generally not apply and the guidance material published earlier in this advisory circular will fill that role.

Agricultural operations are one exception due to the hazardous nature of chemicals carried, and it would be expected the relevant aspects of Part 137 would be reflected as conditions on the UAOC.

102.13(b)(3) Markings

This requirement for the Director to determine if marking under Part 47 is required has been covered in rule 102.11(b)(7). While there is no simple delineation criteria, larger aircraft that have surface areas that will allow compliance with Part 47 may be subject to this requirement. The majority of the current RPAS have structures that simply do not provide area for compliance with Part 47. In these cases the operator will need to apply, somewhere on an external surface, a permanent label clearly identifying who the operator is.

102.15 Operations specification

Upon completion of the assessment, CASA PNG may decide to issue an unmanned aircraft operator certificate. This will include the issue of an operations specification that clearly stipulates the privileges and type of operations, that are authorised and any conditions imposed in the interest of aviation safety.

You do not need to prepare the operations specifications. This is a document that is produced by CASA PNG. Your role is simply to ensure that your application includes all of the information that is needed to be included in an operations specifications.

The conditions contained on each operators' operations specifications are likely to vary depending on the kind of operation and the aircraft used, although some conditions may be common across all certificates.

102.17 Privileges of certificate holder

Both rules 102.17(a) and (b) relate directly to the operations specification issued with the operator certificate, and simply point the reader to the operations specification to see the details of what is permitted.

The rules further indicate that if the Director has specified on the operations specifications that an operator must comply with any additional rules, then they must do so even if the rule does not apply to remotely pilot aircraft as a matter of course.

102.19 Duration of certificate

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

For first time applicants, the Director is likely to grant a certificate for any period up to two years. This is to allow the Director/CASA PNG to develop a relationship with the operator, and to cater for possible technology changes in the operating environment during the two-year period. During the two-year period CASA PNG may conduct inspections and monitoring to assess your performance.

If you currently hold a CASA PNG (organisational) certificate, then CASA PNG may issue a certificate with a longer validity period. This policy reflects the fact that the organisation has had an opportunity to demonstrate its capabilities in other areas of civil aviation, and that the Director can have confidence that the operator will behave similarly in exercising its privileges under the new certificate.

102.21 Conditions of operation of unmanned aircraft

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

It further requires the certificate holder to comply with their exposition, and any conditions imposed by the Director on the operations specification attached to the certificate.

Rule 102.21(b) makes it clear that the certificate holder is responsible for any other operator, or personnel conducting operations under authority of that certificate. He/she must ensure that these personnel are fully aware of the procedures in the exposition and understand the content, conditions, and limitations specified on the operations specification.

102.23 Changes to exposition

Procedures for the amendment of the exposition are required to be documented in the exposition (refer to rule 102.11(b)(13).

There are two types of amendment, those that require prior acceptance of the Director and those that do not. The procedure for each should be described in the exposition.

102.25 Renewal of certificate

The rule is self-explanatory, however, to provide ample time for processing of the renewal application, you should make the application at least 60 days prior to the certificate expiry date.