

AERONAUTICAL CIRCULAR CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT:

Operator Permit for Unmanned Aircraft Operations in Macao

EFFECTIVE DATE:

12 October 2021

CANCELLATION:

NIL

GENERAL:

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this Aeronautical Circular (AC).

1. Introduction

- 1.1. According to the Paragraph 185 (a) of the ANRM, a person shall not operate an unmanned aircraft having a total mass exceeding 7 kg but not exceeding 25 kg, except under the authority of and in accordance with a UA operator permit and a UA activity permit.
- 1.2. Paragraph 188 of the ANRM states that the Civil Aviation Authority (AACM) may grant, vary or renew a UA operator permit to any person if it is satisfied that the person is competent to secure the safe operation of unmanned aircraft having regard, in particular to its equipment, organisation, staffing, method of control and supervision, training programme, maintenance arrangements and any other arrangements. The UA operator permit may be granted subject to such conditions and limitations as the AACM thinks fit and is valid for the period specified in the permit.
- 1.3. In addition, paragraph 189 of the ANRM specifies the responsibilities of a UA operator permit holder which requires the UA operator permit holder to ensure every pilot engaged or employed, or to be engaged or employed, is a fit and qualified person to operate the unmanned aircraft type and model corresponding to that unmanned aircraft and for the purpose specified in the UA operator permit and provide training to maintain the competency of its pilot(s) to operate the unmanned aircraft.

- 1.4. The purpose of this AC is to promulgate the detailed requirements with regard to the grant, variation and renewal of a UA operator permit and the qualification requirements of UA pilots.

2. Applicability

This AC is applicable to a person or organisation who wishes to obtain the UA operator permit for operating an unmanned aircraft having a total mass exceeding 7 kg but not exceeding 25 kg in Macao.

Noted: The UA operator permit holder shall be an operator which refers a person or an organisation to conduct the unmanned aircraft operations or offering to engage in unmanned aircraft operations as service provider, but should not be the client who engages the services.

3. Definition

Geofencing means an automatic function to limit the access of the unmanned aircraft to airspace areas or volumes provided as geographical limitations based on the unmanned aircraft position and navigation data.

Privately built UA means an unmanned aircraft assembled or manufactured for the builder's own use, not including UA assembled from a set of parts placed on the market by the manufacturer as a single ready-to-assemble kit.

Total mass, in relation to an unmanned aircraft, means the mass of the aircraft including the mass of any other object that may be attached to the unmanned aircraft during its operation, such as any payload, battery or fuel.

Unmanned aircraft (UA) means an aircraft which is intended to operate with no pilot on board.

UA Activity permit means a permit issued by the Civil Aviation Authority to an applicant for a single activity or a block of repeated activities involving the operation of an unmanned aircraft taking into account the location(s) of operation, type(s) of operation to be conducted, date(s)/time(s) during which the operation(s) is to be conducted, operating altitude and mitigation measures to address location-specific circumstances.

UA manufacturer means a person who manufactures a UA or has a UA designed or manufactured, and markets that product under their name or trademark.

UA operator permit means a permit issued by the Civil Aviation Authority, which authorises the holder of the permit to operate an unmanned aircraft of the type and model and for the purpose stated in the permit.

UA pilot, in relation to an unmanned aircraft, means the person who has operational control of that unmanned aircraft.

4. Operations Manual

- 4.1. A UA operator permit holder shall nominate an accountable person to ensure that all operations and maintenance activities can be carried out to the standard required by the AACM. The contact details of the accountable person shall be clearly identified and documented in the operations manual.
- 4.2. A UA operator permit holder shall establish system, policies and procedures in its operations manual.
- 4.3. A UA operator permit holder shall submit the AACM with a copy of the whole of the operations manual for the time being in effect together with all amendments and/or revisions for review and acceptance.
- 4.4. A UA operator permit holder shall ensure the operations manual is regularly reviewed and changes are incorporated at the earliest opportunity to ensure it remains current. Any proposed changes to the operations manual shall be submitted to the AACM for acceptance before implementation. The UA operator permit holder shall maintain proper revision control of the operations manual and identify clearly to the AACM the amendments made in the operations manual that is to be submitted to the AACM.
- 4.5. The operations manual shall include the following information:
 - (a) operator's responsibilities and contact details of accountable person for the unmanned aircraft operations;
 - (b) description of qualification, training and currency requirements to ensure competency and currency for UA pilot(s);
 - (c) details of the unmanned aircraft and its associated elements such as the ground control station:
 - (i) picture(s) clearly showing the unmanned aircraft and its associated elements;
 - (ii) specifications of the unmanned aircraft and its associated elements;
 - (iii) maintenance regime of the unmanned aircraft and its associated elements.
 - (d) description of how the flight activities records, maintenance records and training records are managed;
 - (e) description of the type(s) of operation to be conducted and general procedures to conduct the operation safely;
 - (f) emergency procedures for all envisaged unmanned aircraft operations;

- (g) procedures for safety occurrences reporting, and management of casualties arising from any accident;

Note: A detailed explanation to assist in developing their operations manual are contained in Appendix 1 to this AC.

5. UA equipment

- 5.1. UA having a total mass exceeding 7 kg but not exceeding 25 kg operated in Macao shall not be:

- (a) privately built UA; or
- (b) customised or modified UA unless certified by the UA manufacturer.

- 5.2. UA eligible for application of UA operator permit shall possess the following features:

- (a) Geofencing function;
- (b) Warning about low power and/or weak control link signal; and
- (c) Automatically bring the UA to a predetermined location for safe landing when power is low and/or control link signal is weak.

- 5.3. All components, parts, accessories and payload shall be installed in accordance with the UA user manual published by the UA manufacturer.

- 5.4. The ground control station and control system shall meet the specification specified by the UA manufacturer.

- 5.5. A UA operator permit holder shall develop a maintenance regime of the UA and its associated elements based on the instructions published by the UA manufacturer as much as possible.

6. Eligible applicant

- 6.1. Only the accountable person as required by the paragraph 4.1 of this AC is eligible to make application of initial grant, variation or renewal of UA Operator Permit.

7. Initial Grant of UA Operator Permit

- 7.1. Applicant shall submit their application well in advance of the proposed commencement date of the intended operations and factor permit processing time into their planning. In principle, the more complex unmanned aircraft operations, such as night-time operations, will take longer processing time for the grant of UA operator permit. Processing time depends on the completeness and quality of document submitted.

Note: Operators are encouraged to communicate with the AACM to factor the required processing time for their intended operations before submitting the application.

7.2. An application for a UA operator permit shall be made at least 2 months in advance of the proposed commencement date to the AACM with the following supporting documents of the intended operations:

- (a) operations manual with required information as detailed in Paragraph 4 of this AC;
- (b) supporting evidence of competency of UA pilot(s):
 - (i) copy of valid UA pilot licence or certificate issued/recognised by the competent civil aviation authority for the unmanned aircraft, in respect of unmanned aircraft type and weight, to be operated and specified in the UA operator permit;
 - (ii) details of training or course attended for acquiring the licence or certificate as mentioned in subparagraph (i) above, this shall include associated syllabus and/or assessment covering knowledge and skill outlined in Appendix 2 to this AC; and
 - (iii) records of training attended by UA pilot(s) as specified in the operator's operation manuals;
- (c) user manual and specification of the unmanned aircraft published by the UA manufacturer;
- (d) if the UA used is customised or modified, supporting evidence that it has been re-certified by the UA manufacturer;
- (e) if the UA used is not customised or modified, a declaration by the accountable person stating that there is no uncertified modification to the UA;
- (f) any other documents or information that AACM may require to decide on the application.

7.3. A UA operator permit may be granted by the AACM for the period specified in the permit, being a period not exceeding one year.

8. Variation of UA Operator Permit

8.1. A UA operator permit holder shall apply to the AACM to vary a UA operator permit because of:

- (a) addition and/or removal of UA specified in the UA operator permit;
- (b) a change in the type(s) of operation specified in the UA operator permit.

In principle, the more complex variation, such as change in the type(s) of operations specified in the UA operator permit, will take longer processing time for the variation of UA operator permit. Processing time depends on the completeness and quality of document submitted.

Note: Operators are encouraged to communicate with the AACM to factor the required processing time for their intended variations before submitting the application.

8.2. An application to vary a UA operator permit shall be made at least 2 weeks to the AACM with the following supporting documents in advance of the proposed effective date for the intended variation:

- (a) revised operations manual;
- (b) if the UA used has been modified, supporting evidence that it has been re-certified by the UA manufacturer;
- (c) supporting documents for the intended variation to the UA operator permit;
- (d) any other documents or information that the AACM may require to decide on the application.

9. Renewal of UA Operator Permit

9.1. An application to renew a UA operator permit shall be made at least 1 month to the AACM with the following supporting documents in advance of the date of expiry of the existing UA operator permit:

- (a) copy of valid UA pilot licence or certificate as required in Paragraph 7.2(b)(i) of this AC;
- (b) records of flight activities carried out by the UA pilot(s) for the unmanned aircraft specified in the UA operator permit conducted during the validity period of the existing UA operator permit;
- (c) records of maintenance conducted on the unmanned aircraft during the validity period of the existing UA operator permit;
- (d) if the UA used is customised or modified, supporting evidence that it has been re-certified by the UA manufacturer;
- (e) if the UA used is not customised or modified, a declaration by the accountable person stating that there is no uncertified modification to the UA;
- (f) records of training attended by UA pilot(s) as specified in the operator's operation manuals during the validity period of the existing UA operator permit;

(g) summary of any unmanned aircraft safety occurrences recorded during the validity period of the existing UA operator permit. If no safety occurrences occurred, a declaration signed by the accountable person for the organisation's unmanned aircraft operations has to be provided;

9.2. A UA operator permit may be renewed by the AACM for the period specified in the permit, being a period not exceeding one year.

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Appendix 1 Guidance for developing an operations manual

This appendix provides guidance on the structure of a typical operations manual. The guidance is generic and could be applied to the various types of organisations or an individual.

Operations Manual Format

The operations manual should be accompanied by a cover page, indicating the following:

- Operator name (e.g. XYZ Ltd)
- Title of the document and revision number (e.g. UAS Operations Manual Revision 1)

A suggested content structure is as listed in the following. Detailed explanations to each section are also provided in the following paragraph.

Section 1 – Organisation

Section 2 – Qualification and Training

Section 3 – Unmanned Aircraft

Section 4 – Management of Records

Section 5 – Unmanned Aircraft Operations

Section 6 – Safety Occurrence Reporting

Section 1 – Organisation

Responsibilities of the Operator

This section contains the responsibilities of the operator, which includes being responsible for providing and allocating the necessary resources for effective safety compliance for all unmanned aircraft operational matters and supervision of all personnel involve in unmanned aircraft operations. In addition, the contact details of an accountable person who is responsible for the unmanned aircraft operations shall be clearly identified and documented.

An example is as follows:

The operator is accountable for the overall compliance of safety requirements and ensuring that adequate resources are available to conduct the operations in accordance to the operations manual, the type(s) of operation and conditions specified in the UA operator permit.

The operator's responsibilities include:

- Providing and allocating manpower, technical, financial or other resources necessary for effective safety compliance;
- Establishing and monitoring of safety performance, and resolution of any safety issues;
- Ensuring all unmanned aircraft activities are conducted with the necessary permits granted by the relevant authorities, and in compliance with the conditions listed in the permits;
- Maintaining all records, such as flight logs, maintenance logs, unmanned aircraft configuration management and UA pilot's training records;
- Ensuring all UA pilots are proficient, qualified, familiar with and implement the procedures set out in the operations manual;
- Ensuring that the operations manual and any included supporting documents is complete, relevant and up-to-date, and will be complied with at all times.

Mr. / Mrs. Xxx xxx xxx is the accountable person from [Operator name] responsible for ensuring that all operations and maintenance activities can be carried out to the standard required by the AACM.

Mr. / Mrs. Xxx xxx xxx
[Title]
[Operator name]
[Operator Address]
[Telephone Contact]
[E-mail Contact]

Please also note that the operator refers to a person or an organisation engaged in or offering to engage in unmanned aircraft operations, and does not refer to just the UA pilot in control of the unmanned aircraft.

Section 2 – Qualification and Training

This section describes the qualification, training and currency requirements to ensure all UA pilots are fit and qualified to operate the specific unmanned aircraft for the types of operations.

Each UA pilots shall hold valid UA pilot licence or certificate issued/recognised by the competent civil aviation authority.

Additionally, the UA Pilot shall undergo the training provided by the operator to maintain its competency to operate the specific unmanned aircraft for the types of operations to be specified or specified in the permit. The UA Pilot training should cover the following areas:

- Familiarisation with operator's procedures and processes
- Operational limitations of the unmanned aircraft
- Capabilities of the unmanned aircraft such as modes of control and failsafe behaviours
- Specifications of the unmanned aircraft
- Emergency handling procedures
- Scenario-based procedures and contingencies (e.g. building inspection involving observers)

Furthermore, this section should indicate the currency requirements based on their operational needs. The minimum number of sorties required for currency is recommended to be at least 1 every 6 months.

Section 3 – Unmanned Aircraft

This section describes the unmanned aircraft configurations, unmanned aircraft system specifications, and maintenance procedures for specific unmanned aircraft.

A separate sub-section should be created for each unmanned aircraft for better organisation, and each sub-section should contain the information as described in the following paragraphs.

Unmanned Aircraft Configuration List

This section briefly describes all the configurations of a specific unmanned aircraft the operator is using. Configurations listed in this section should correspond to the respective configuration management of the maintenance logbook.

Each variant of the unmanned aircraft type should have its own table of configuration, and examples are as follows:

Picture(s) of unmanned aircraft configuration,
showing clearly the unmanned aircraft and payload(s) installed

Configuration Name	DJI Phantom X Adv	Configuration Weight	2.0 kg
Payload 1 Brand / Model	Zenmuse 3-axis Gimbal	Payload Weight	0.3 kg
Payload 2 Brand / Model	Zenmuse Z5 Camera	Payload Weight	0.2 kg

Picture(s) of unmanned aircraft configuration,
showing clearly the unmanned aircraft and payload(s) installed

Configuration Name	DJI Phantom X Pro	Configuration Weight	1.9 kg
Payload 1 Brand / Model	Fixed FLIR Camera	Payload Weight	0.2 kg
Power Source	Original on-board battery removed and replaced with a dummy weight. Unmanned aircraft powered by ground power via tether system.		

Unmanned Aircraft System Specifications

This section lists the specifications of the unmanned aircraft, payload(s) installed, ground control station and any other critical systems required for the operation of unmanned aircraft (e.g. tether system, parachutes, airbag, launcher etc.).

For unmanned aircraft specifications, the following should minimally be included:

- Unmanned aircraft brand / model / name

- Unmanned aircraft empty mass (without any payload installed)
- Unmanned aircraft maximum take-off mass
- Unmanned aircraft dimensions (e.g. length and wingspan)
- Unmanned aircraft flight duration capable
- Unmanned aircraft maximum speed capable
- Unmanned aircraft maximum height capable
- Unmanned aircraft power source (e.g. on-board battery / power via tether, type of power source, number of cells / voltage, total capacity etc.)
- Radio frequency band & field strength / power

For payload specifications (if applicable), the following should minimally be included:

- Payload brand / model / name
- Payload type / description
- Payload mass
- Any other additional specifications

For ground control station specifications (if applicable), the following should minimally be included:

- Ground control station brand / model / name
- Description of functions (e.g. list of all possible flight modes including failsafe modes)
- Any other additional specifications

Maintenance Regime

This section describes the maintenance plan of the unmanned aircraft, which includes the maintenance criteria, maintenance procedures and maintenance schedule.

The operator shall follow the maintenance schedule and procedures as stated in the UA manufacturer's maintenance manual as much as possible. The maintenance manual's title and revision, and references to the relevant sections to the maintenance manual are to be indicated. The maintenance manual shall also be submitted to the AACM for reference.

An example as follows:

Maintenance for the above listed unmanned aircraft configurations will be conducted in accordance with the manufacturer's instructions, as stated in the following table.

Document Title	Revision No. / Date	Referenced Section / Page
DJI Phantom X Maintenance Manual	Revision 3.0 2017.5	All

If there are no manuals or instructions from the manufacturers, the operator has to develop their own maintenance plan and describe it in this section. Maintenance plan should minimally cover the maintenance criteria, maintenance procedures and maintenance schedule for the critical unmanned aircraft sub-systems.

If a third party maintenance vendor is contracted, operator may include details on the maintenance covered and the frequency in which maintenance will be performed.

Section 4 – Management of Records

This section describes what types of records are kept, information collected for each type or records, and how long the records are kept for.

Management of Flight Activity Records

Flight activity records shall reflect all flight activities carried out by the UA pilot(s) for the unmanned aircraft specified in the UA operator permit. It is also used to record UA pilots' flying hours for the purpose of tracking UA pilot currency and the running hours of the unmanned aircraft flown for the purpose of tracking time to maintenance.

This section should include the minimum information that are as described in the following. However, additional information may also be included as required by the operator.

All flights conducted shall be recorded for the purpose of tracking UA pilots' flying hours and equipment running hours.

All flight activity records should be kept minimally for a period of 1 year.

Flight activity records should include:

- Date, time and/or duration of flight
- Location of flight

- Unmanned aircraft of the flight
- UA pilot of the flight

It is recommended that all flight activity records are maintained by a log in an electronic form so that the required information may be sorted as necessary (e.g. sort by UA pilot, unmanned aircraft).

Management of Maintenance Logs

A maintenance logbook is used to record all maintenance conducted on the unmanned aircraft. As the maintenance log is also used to keep track the configuration of the unmanned aircraft, each unmanned aircraft should have its dedicated maintenance logbook with a unique identifier assigned to it.

For operators who delegate maintenance to another organisation (e.g. DJI Care), a maintenance log should still be maintained, minimally recording when the unmanned aircraft was sent for maintenance and what was maintained or replaced as advised by the maintenance organisation.

This section should include the minimum information that are as described in the following. However, additional items may also be included in required by the operator.

All maintenance conducted on the unmanned aircraft, either scheduled or unscheduled, shall be recorded in a maintenance logbook. Each unmanned aircraft shall have its dedicated maintenance logbook to track its configuration.

All maintenance logs shall be kept minimally for a period of 1 year upon decommissioning of the respective unmanned aircraft.

The maintenance logbook shall be divided into following sections:

- Configuration Management – The part number and serial number of all installed components on the unmanned aircraft, which the operator can readily replace during maintenance, shall be tracked in this section.
- Maintenance / Defects Log – The purpose and date of maintenance, name of personnel conducting the maintenance, description of defects found and description of rectifications and repairs conducted shall be recorded in this section. All critical defects shall be rectified before the unmanned aircraft is allowed to be released for operations.

Management of Training Records

Training records shall record any trainings a UA pilot has underwent.

All training records shall be kept for a period of 1 year.

This section should include the minimum information that are as described in the following. However, additional information may also be included in required by the operator.

All trainings related to the safe operations or maintenance of the unmanned aircraft attended by a UA pilot shall be recorded. Training details to be recorded shall include:

Name of training

Date of training completed

Attendees of training

It is recommended that all training records are maintained by a log in an electronic form so that the required information may be sorted as necessary (e.g. sort by UA pilot).

Section 5 – Unmanned Aircraft Operations

This section describes the unmanned aircraft operations undertaken by the operator, minimally including the description of the type of operations, unmanned aircraft and UA pilot(s) for the type of operations, and unmanned aircraft operating procedures.

Types of Operations

This section describes the types of operations (e.g. aerial photography / videography) the operator plans to undertake, which minimally includes:

1. Types of operations
2. Unmanned aircraft to be used
3. UA pilot(s)

An example as follows:

Type of Operation	Specific Unmanned Aircraft for the Type of Operation	Designated UA pilot(s) to Operate the Specific Unmanned Aircraft for the Type of Operation
Aerial Photography / Videography	Unmanned Aircraft A Type: Brand: Model: Serial Number:	Mr. XX Mr. YY

	Unmanned Aircraft B Type: Brand: Model: Serial Number:	Mr. XX Mr. ZZ
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General Unmanned Aircraft Operating Procedures

This section describes the general operating procedures for the type of operations as described above, which minimally includes:

- Flight planning, crew communication procedures and/or coordinating instructions, etc.
- Roles and responsibilities of key personnel involved in the operations
- Any additional operating procedures that may be required for operating concepts that are specialized in nature (e.g. night time operations, autonomous operations, flight trials and experimentation etc.)

Flight Procedures – Flight Checks

This section describes the flight procedures to be followed for all envisaged operations of the unmanned aircraft.

If operator is following flight check procedures as stated in the manufacturer's user manual, the user manual's title and revision, and references to the relevant sections of the user manual are to be indicated. The user manual should also be submitted to the AACM for reference.

An example as follows:

Pre-flight checks for the above listed unmanned aircraft configurations shall be conducted in accordance with the manufacturer's instructions, as stated in the following table.

Document Title	Revision No. / Date	Referenced Section / Page
DJI Phantom X Advanced User Manual	V2.0 2016.3	Section – Flight, pg 53-54
DJI Phantom X Pro User Manual	V1.0 2017.5	Section 5, pg 61-70

If there are no manuals or instructions from the manufacturers, the operator is to develop their own flight check procedures and describe them in this section. Flight check procedures should minimally cover all the critical unmanned aircraft sub-systems such as propulsion system, power system,

command and control system, navigation and flight control system, as well as the over structure integrity.

Flight Procedures – Emergency Procedures

The procedures for emergencies may include pilot intervention or automatic failsafe behaviour of the unmanned aircraft. This section describes procedures that minimally address the following emergencies at all phases of flights:

- Loss of unmanned aircraft control / unmanned aircraft flyaway
- Loss of control link with unmanned aircraft
- Loss of unmanned aircraft power / low unmanned aircraft battery
- Loss of positioning capabilities (e.g. GPS signal loss)
- Any other scenario unique to the unmanned aircraft

The operator should also consider prioritization when compounded emergencies occur.

An example as follows:

Emergency	Procedures
Loss of unmanned aircraft control / unmanned aircraft flyaway	<ol style="list-style-type: none"> 1) Upon loss of control with unmanned aircraft, the UA pilot shall continuously attempt to regain control by either adjusting the transmitter antenna or removing closer to the unmanned aircraft. 2) If control is not regained after 8 seconds, and the UA does not automatically return to its take-off point or land on the spot, it means that this is not the case of a control link loss. 3) The UA pilot shall continue all means to regain control or take down the unmanned aircraft, and alert the AACM of the incident.
Loss of unmanned aircraft power / unmanned aircraft low battery	<ol style="list-style-type: none"> 1) Upon reaching 30% of battery health, the UA pilot will be alerted via the ground control station, he/she shall then land the unmanned aircraft at the designated landing area. 2) Upon reaching 10% of battery health, the unmanned aircraft will override the unmanned aircraft pilot control and automatically return to take-off point. 3) If there is a loss of GPS signal during this flight phase, unmanned aircraft will automatically land on the spot. 4) For this scenario, the unmanned aircraft pilot shall ensure that there is nobody within the vicinity of the landing area.

Loss of control link with unmanned aircraft	<ol style="list-style-type: none"> 1) Upon loss of control link with unmanned aircraft, UA pilot shall attempt to regain control by either adjusting the transmitter antenna or moving closer to the unmanned aircraft. 2) If link is not regained after 8 seconds, the unmanned aircraft will automatically return to take-off point. 3) If there is also a loss of GPS signal, the unmanned aircraft will automatically land on the spot, instead of returning to take-off point. 4) The unmanned aircraft pilot shall ensure that there is nobody within the vicinity of the landing area.
Loss of positioning capabilities	<ol style="list-style-type: none"> 1) Upon loss of GPS signal, unmanned aircraft will automatically switch to its Vision Positioning System to maintain its position. 2) UA pilot shall, as soon as practicable, attempt to land the unmanned aircraft in a safe location. 3) If both the GPS signal is loss and the Vision Positioning System is faulty, UA pilot shall switch to “manual” mode and attempt to land the unmanned aircraft in a safe location.

Section 6 – Safety Occurrence Reporting

This section describes the procedures to reporting of any safety matters relating to the unmanned aircraft, as well as management of casualties as a result of an unmanned aircraft accident.

An example of general procedures for reporting of safety matters is as follows:

The operator shall notify the AACM by the quickest available means upon becoming aware of the following reportable safety occurrences:

- Any malfunctions of, or damage to, the unmanned aircraft structure, components, or subsystems, while in operation, which affect its airworthiness or led to difficulty in control of the unmanned aircraft
- Any damage to unmanned aircraft, due to foreign objects or environment, while in operation, which affects its airworthiness or led to difficulty in control of the unmanned aircraft
- Near collision of the unmanned aircraft with other aircraft or objects, near misses, or occurrence that has a potential of causing an accident
- Any airspace infringement event
- Any other significant safety incidents that may endanger the operations of the unmanned aircraft and/or cause danger to persons and property

- Any occurrence during the operation of the unmanned aircraft leading to:
 - (a) Missing or total loss of the UA;
 - (b) Requiring major repairs of the unmanned aircraft;
 - (c) Serious injury or fatality to people.

The initial notification to the AACM shall include, but not limited to the following:

- Permit details (such as operator permit number, activity permit number etc.)
- Date, time and location of the occurrence
- Casualty and damaged property involved
- Details on unmanned aircraft used and state of the unmanned aircraft
- Details of UA pilot involved
- Initial analysis to the cause of occurrence
- Immediate action taken after the occurrence

Following the initial notification, a written report including the following information shall be submitted to the AACM:

- Information provided in the initial notification to the AACM
- Investigation outcome
- Root cause analysis / causal factors analysis
- Corrective / preventive actions taken to prevent a recurrence

An example of general procedures for management of casualties is as follows:

In the event of an unmanned aircraft incident or accident resulting in casualties, all personnel involved in the unmanned aircraft operations shall follow the casualty management plan as set out in the following:

- The UA pilot shall stop the unmanned aircraft operation as soon as practicable, and attend to the casualty immediately.

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- For minor injuries, first aid shall be administered to the casualty and ...
- For serious injuries, the casualty shall be transported to the nearest hospital and ...

Appendix 2 Basic Knowledge and Skill for UA Pilot

A. Aeronautical Knowledge:

- a. Air Law and/or Operational Rules;
- b. Meteorology;
- c. General Aviation Knowledge and Principles of Flight;
- d. Knowledge of UA systems;
- e. Operations Procedures;
- f. Knowledge of Specific UA Type.

B. Practical Competency:

I. Pre-flight actions and procedures

- a. Obtain, interpret and apply information for the preparation of operations, such as:
 - (i) weather forecasts;
 - (ii) operation area conditions and/or limitations;
 - (iii) aircraft performance limitations.
- b. Perform a pre-operation inspection to decide whether the unmanned aircraft and associate system are serviceable.

II. In-flight actions and procedures (Type Specific):

Aeroplane:

- a. Launch the aircraft or take-off;
- b. Perform turns in different directions;
- c. Fly with controlled climb and descent rates;
- d. Perform landings to demonstrate normal and cross-wind landing technique;
- e. Use of different flight modes;
- f. Collect information to ensure the continued safe operation of the unmanned aircraft;

Multi-rotor:

- a. Lift-off and establish stable hover;
- b. Perform turns in different directions;
- c. Fly with controlled ascent and descent rates;
- d. Perform a 360-degree level turn;
- e. Perform a Figure of 8;
- f. Land at lift-off spot;
- g. Perform landings to demonstrate normal and cross-wind landing technique;
- h. Use of different flight modes;
- i. Collect information to ensure the continued safe operation of the unmanned aircraft;

Helicopter:

- a. Lift-off and establish stable hover;
- b. Perform turns in different directions;
- c. Fly with controlled ascent and descent rates;
- d. Perform a 360-degree level turn;
- e. Perform a Figure of 8;
- f. Land at lift-off spot;
- g. Perform landings to demonstrate normal and cross-wind landing technique;
- h. Use of different flight modes;
- i. Collect information to ensure the continued safe operation of the unmanned aircraft;

Power-lift:

- a. Lift-off and establish stable hover;
- b. Perform turns in different directions;
- c. Fly with controlled ascent and descent rates;
- d. Perform a Figure of 8;
- e. Land on lift-off spot;
- f. Perform landings to demonstrate normal and cross-wind landing technique;

- g. Use of different flight modes;
- h. Collect information to ensure the continued safe operation of the unmanned aircraft;

III. Abnormal situations and emergencies

- a. Use of fail-safe equipment and modes;
- b. Manage the unmanned aircraft to a suitable position to land/recover in the landing/recovery area.

IV. Post-flight actions and procedure

- a. Inspection of the unmanned aircraft after flight.