香港特別行政區政府
民航處
Civil Aviation Department
The Government of the Hong Kong Special Administrative Region

Small Unmanned Aircraft Advisory Circular No. AC-015

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Permission for Façade Cleaning Operations Using Small Unmanned Aircraft

1. Background

1.1 The Small Unmanned Aircraft Order ("SUA Order"), Chapter 448G of the Laws of Hong Kong, comes into operation on 1 June 2022. Under the SUA Order, small unmanned aircraft ("SUA") operations are regulated under a risk-based approach and be classified according to the weight of the SUA and the operational risk level.

1.2 Given SUA's aerial accessibility and flexibility, SUA has emerged as a more cost-effective and safer option to façade cleaning-related works, such as window/ external wall cleaning of multi-storey buildings which may minimise the risk associated with personnel working at heights.

1.3 Due to the dropping of substances (e.g. spraying of water or cleaning agents) and the potential use of a **Category B** and/or **Oversized** SUA, such operations are categorised as **"Advanced Operations"** for which a permission under section 37 of the SUA Order is required from the Civil Aviation Department ("CAD") prior to operations.

1.4 This Advisory Circular ("AC") sets out the requirements for permission to operate an SUA up to 25 kg for façade cleaning or similar operations.

2. Definition

2.1 **"Involved Person"** means a person who takes part in or is well aware of the SUA operation, understands the risk, and is aware of the instructions and safety precautions in regard to the SUA operation. In practical terms, this means that an involved person must:

- be clearly notified about and aware of the SUA operations;

- understand the risks involved;
- have reasonable safeguards introduced for them by the venue manager or the SUA operating crew during SUA operation; and
- be expected to follow the directions and safety precautions provided.

2.2 A **vehicle** or **vessel** is considered to be "**under the control of the remote pilot**" (known as "involved" hereafter) if:

- The remote pilot shall be satisfied that a permission has been granted by appropriate persons which have an interest in the vehicle or vessel (e.g. the management party of the vehicle or vessel) for an SUA to operate within a distance less than the required lateral separation;
- Persons on board can reasonably be expected to follow directions and safety precautions for the SUA operation to avoid unplanned interactions with the SUA; and
- Persons on board should be adequately briefed or informed about the SUA operations.

2.3 A **structure** is considered to be "**under the control of the remote pilot**" (known as "involved" hereafter) if:

- The remote pilot shall be satisfied that a permission has been granted by appropriate persons which have an interest in the structure (e.g. the management party of the structure) for an SUA to operate within a distance less than the required lateral separation;
- Occupants of the structure can reasonably be expected to follow directions and safety precautions for the SUA operation to avoid unplanned interactions with the SUA; and
- Occupants of the structure should be adequately briefed or informed about the SUA operations.

2.4 **"Uninvolved Person/ Vehicle/ Vessel/ Structure"** means any person/ vehicle/ vessel/ structure other than an "involved person/ vehicle/ vessel/ structure".

2.5 Pursuant to section 3(2)(c) of the SUA Order, an SUA is a Category B aircraft (**"Category B SUA"**) in respect of a flight if its weight exceeds 7 kg but not more than 25 kg at any time during the flight.

2.6 Pursuant to section 16(1)(2) of the SUA Order, **"drop"** includes project and lower.

2.7 Pursuant to the Gazette Notice issued under section 17(2) of the SUA Order, the specified dimension of SUA does not exceed 1 m at all times during the flight, except that the longest distance between any two rotor blade tips can be up to 1.2 m. Any SUA exceeding the specified dimension is regarded as "**Oversized**" SUA in this AC.

2.8 In determining the weight or dimension, everything installed in, carried by, or attached to the SUA is to be taken into account[1]. For example, the weight or dimension of any battery, fuel or payload carried by the SUA, such as **tether**, nozzles, couplers, valves, rotor guards, stickers, lights, etc. are considered as part of the weight or overall dimension of the SUA.

3. Applicability

3.1 This AC applies to applicants who wish to apply for a permission from the CAD to operate an SUA up to 25 kg for façade cleaning or similar operations within Hong Kong.

Note: For operations of Category C SUA, please also refer to AC-014.

4. Equipment Requirements

4.1 The SUA shall be equipped with the necessary safety system capable of performing the functions specified in section 13 of the SUA Order, i.e. flight log and geo-awareness functions. The information recorded by safety system shall be kept for six months and that information related to any advanced operations shall be accessible in Hong Kong.

4.2 The SUA to be used for façade cleaning shall also be equipped with **appropriate navigation lighting**[2] . The lighting must be **visible** to the remote pilot at all times during the flight and it must be **sufficient for the remote pilot to determine the orientation and direction of the SUA visually**.

4.3 **Strobe** or **anti-collision light system** is also recommended for use in façade cleaning.

4.4 Installation of **rotor blade guard** is required to avoid collision while manoeuvring the SUA in close proximity of the involved building or structure. **Obstacle avoidance** is also recommended to further mitigate the risk of collision.

4.5 Any additional components or accessories mounted on the SUA (e.g. spraying system, liquid tank, tether and nozzle) shall be securely installed to ensure the safety of operations. Where necessary, **additional fasteners** shall be used to prevent the unexpected separation of detachable components from the SUA during the flight.

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[1] In the case for SUA operated with tethered system, the weight of SUA includes all the non-detachable components between the break off point (e.g. a hose coupling connected to water pump) and the SUA. It is the responsibility of the SUA operator to demonstrate to the satisfaction of the CAD how the SUA and its non-detachable components can be disconnected at the break off point from all other components in a safe and timely manner, without posing additional risk to uninvolved aircraft, people, vehicles, vessels and structures.

[2] Usually red lights on forward rotor arms and green lights on rear rotor arms, or red lights on left wing and green lights on right wing

4.6 The SUA system shall be designed to **avoid any accidental release** of any substances and allow the remote pilot to immediately stop the spraying operations in case of emergency. Accidental separation of detachable components from the SUA shall also be prevented.

4.7 **Geo-fence** and **altitude limiting functions** shall be equipped and in use during operations to cage the SUA in manoeuvring within a pre-defined flight volume. **Real Time Kinematic ("RTK") positioning system** is recommended.

4.8 **Appropriate ground station** or **remote controller software** shall also be in place to assist the remote pilot in identifying the SUA's position in real time.

4.9 **Anemometer** to monitor wind gust at high altitude shall be equipped for monitoring the change in wind speed and direction as flying altitude elevates.

4.10 A **maintenance schedule** shall be devised to form the programme for maintaining and servicing the SUA. Maintenance records shall be properly kept and provided to the CAD upon request.

4.11 Before take-off and during the flight, the SUA must achieve a positive satellite lock. Where the manufacturer does not specify the number of satellites to gain lock, the SUA shall not fly with less than 7 satellites positively acquired.

4.12 All personnel and crew members including the remote pilot involved in the façade cleaning are recommended to be provided with appropriate personal protective equipment (e.g. reflective apparel, safety vests, etc.)

Tethered Operations

4.13 For SUA operated with **tethered system**, the tether (e.g. cable/ hose attached to the SUA) shall be securely connected and positioned in such a way to prevent it from being jammed and tangled in any circumstances.

4.14 The strength of the tether shall be adequate to prevent unintended **cut off** by the rotating propellers and compatible with the ultimate loads expected during the operations.

4.15 The tether and the ground station can be **easily disconnected** by the supporting crew in case of emergency where the continual attachment may pose hazards to aviation and public safety. For example, installing a quick detachable connector or a quick release hose.

5. Personnel Requirements

5.1 The remote pilot for the flight shall hold a valid remote pilot certificate and be assigned with a corresponding "Advanced Rating".

5.2 If a visual observer ("VO") is involved in the operations, the remote pilot shall choose a VO whom the remote pilot is satisfied that the VO is competent for the advanced operations to be conducted.

5.3 VO is responsible for assisting the remote pilot during visual line of sight ("VLOS") operations. VO shall be at the same location as the remote pilot, has good eyesight and is capable of communicating timely and effectively with the remote pilot to avoid collision.

5.4 A competent crew member shall be appointed to carry out checks of all additional components /systems (e.g. spraying system, liquid tank, tether and nozzle) for signs of wear or damage, and handle the tether manually when required. The crew member is also responsible for monitoring the additional components /systems during the flight and assisting the remote pilot in executing the relevant emergency procedures when needed.

5.5 In addition to the above and subject to the area of operations, sufficient supporting crew shall be positioned in the area of operations as additional safety and observation support to assess the SUA's position, maintain constant visual lookout for any uninvolved people/ vehicles/ vessels approaching the SUA, and take necessary actions concerning ground safety.

5.6 Prior to operations, the VO and/or supporting crew shall be adequately briefed on details of the flight plan, safety risks involved, risk mitigating measures, operating procedures and emergency procedures, etc. They shall also be made aware of the terms and conditions of the permission issued by the CAD under section 37 of the SUA Order, and take all necessary measures to comply with such terms and conditions specified therein.

5.7 Effective audio communication must be maintained between the remote pilot, VO and/or supporting crew at all times during the flight.

5.8 Communication protocols (e.g. standardised commands and callouts) shall be established between the remote pilot, VO and supporting crew to communicate collision avoidance information, tethered operations (if applicable), spraying operations and emergency procedures.

5.9 Subject to the risks and complexity of the proposed operations, the remote pilot, VO, supporting crew and all other relevant personnel shall also attend specialised training including tethered operations where applicable, if so required by the CAD and/or the manufacturer.

5.10 Training records shall be properly kept and provided to the CAD upon request.

6. Operating Requirements

6.1 The area of operations must be cordoned off with sufficient lateral separation from uninvolved people, vehicles, vessels or structures. Safety margin to prevent potential hazards arising from spraying, the tether (if applicable) or the SUA's movement shall also be taken into account. If the SUA is tethered, as a general rule, the cordoning area shall be the tether length plus 5 m from the point where the tether is fixed to the ground. Alternative condoning arrangement and safety measure shall be provided to the CAD for consideration and acceptance if implementation of the above rule on the area of operations is considered impracticable.

6.2 Notice to the public for notifying SUA operations shall be in place. Placement of safety cones and warning signage are recommended to signify that SUA façade cleaning operations in the vicinity are in progress. This will enhance the awareness of the SUA location.

6.3 The remote pilot shall avoid **overflying any person** by the SUA when conducting spraying operations.

6.4 The flying speed of the SUA shall **not exceed 20 km/hr**.

6.5 If a tethering system is used, the length of the tether shall not exceed 25 m unless sufficient safety system and measures can be demonstrated to the satisfaction of the CAD.

6.6 The SUA shall not be operated within a Restricted Flying Zone or carry any dangerous goods during flight, unless a relevant permission has been separately obtained.

6.7 The remote pilot shall comply with all other applicable operating requirements to the SUA, i.e. operating the SUA only in daylight hours, maintaining VLOS in a specified way, maintaining the flying altitude at 300 ft AGL or below, maintaining lateral separation with any uninvolved person, vehicle, vessel or structure, not carrying any person or animal during flight, the remote pilot operating no more than one SUA at the same time and that the flight is wholly within Hong Kong. More information about the requirements is available in the Safety Requirements Document ("SRD") published by the CAD.

6.8 Applications may be made for any one or more than one specific type of advanced operations; but in any one flight, only one type of advanced operations shall be involved, unless otherwise specified by the CAD in the permission concerned.

6.9 Unless otherwise specified in the permission, the operating requirements applicable to Façade Cleaning Operations are detailed in **Table 1**.

Table 1 – Table of Operating Requirements for Façade Cleaning Operations

Operating Requirements	Façade Cleaning Operations
Time of operations	Daylight hours only
Maintain visual line of sight (VLOS)	✓
Maximum flying altitude	300 ft Above Ground Level (AGL)
Minimum lateral separation from uninvolved people / structures / vehicles / vessels	30 m*
Maximum speed	20 km/hr
Maximum number of SUA to be operated by a remote pilot at the same time	1
Maximum characteristic dimensions of SUA (e.g. wingspan or longest distance between any two rotor blade tips)	1 m, except that the longest distance between any two rotor blade tips can be up to 1.2 m
Carriage of persons or animals	×

** Cordon line must be established. For tethered operations with the tether length not exceeding 25 m, the minimum lateral separation from uninvolved people/ structures/ vehicles/ vessels = tether length + 5m from the point where the tether is fixed to the ground.*

7. Others

7.1 SUA operators and remote pilots shall also observe all such other requirements governed by other legislation in Hong Kong, such as the Telecommunications Ordinance and Personal Data (Privacy) Ordinance, etc. and follow relevant requirements and/or guidelines such as telecommunication, privacy, cyber security, data security, etc. set out by any other Government bureaux / departments, regulatory authorities, land owners or other stakeholders where necessary to ensure the safe operations of the SUA at all times.

7.2 In particular, the operator shall take appropriate measures to address privacy and other relevant concerns (e.g. permission from land owners or other stakeholders (such as owners' corporation, building management companies, etc.) where necessary) before the operations. Relevant information is available on the Office of the Privacy Commissioner for Personal Data (PCPD)'s website with the following link:

https://www.pcpd.org.hk/english/resources_centre/publications/files/GN_CCTV_Drones_e.pdf

8. Emergency Procedures

8.1 The remote pilot shall determine suitable responses and fail-safe mechanism for emergency during the operations, e.g. SUA mechanical failure, loss of command and control link, a jammed or tangled tether (if applicable) and etc.

9. Insurance Requirements

9.1 Pursuant to the SUA Order, a policy of insurance shall be in force during advanced SUA operations for the third-party liability (for bodily injury and/or death) arising out of or caused by the SUA operations. The insurance policy for advanced operations involving Category A/B SUA shall have a minimum coverage of HKD $10 million.

10. Application Procedures

10.1 Applicants may apply to the CAD for permission to conduct façade cleaning operations following the requirements set out in AC-002.

10.2 Apart from the requirements prescribed in the AC No. AC-002, an applicant shall also include the following information/ document specific to façade cleaning operations as part of the application:

a) Technical specifications of the SUA including its maximum characteristic dimension and maximum take-off weight taking into account everything installed in, carried by, or attached to the SUA;

b) A description and specifications of the system and accessories used for façade cleaning, including the spraying system, tethering system (if applicable) and other associated components;

c) An Operations Manual including (See **Appendix A** for details):
   - Duties and responsibilities of all crew member(s) including remote pilot, VO and/or supporting crew;
   - Description of the spraying system, tethering system (if applicable) and associated connections to the SUA, and the procedures to ensure safe operations;
   - General and emergency procedures to conduct the façade cleaning operations safely, including flight checks to be carried out and communication protocols between the remote pilot, VO and/or supporting crew;
   - Description of how the weight and dimension of the SUA taking into account everything installed in, carried by or attached to the aircraft can be monitored

and/or recorded at any time during the flight;

- Description of qualifications requirements to ensure competency and currency for all personnel involved in the intended operations, including the supporting crew; and

d) A risk assessment identifying hazards specific to façade cleaning operations and the corresponding risk mitigating measures (See **Appendix B** for details)

10.3 Subject to the risks and complexity of the proposed operations, the CAD may require a flight demonstration to be performed to assess the applicant's capabilities and safety of the proposed operations of the SUA and the tethering system (if applicable).

11. Enquiries

11.1 This AC will be subject to review and update from time to time in the light of the advancement of technology and increasing popular use of SUA in different professional applications. It shall also be noted that the safety requirements provided above are not meant to be exhaustive. It shall be the responsibility of the SUA operators and remote pilots to comply with all applicable regulatory requirements, put in place appropriate safety precautions and risk mitigating measures for the subject SUA operations, as well as to follow the requirements and guidelines set out by any other Government bureaux / departments, regulatory authorities, land owners or other stakeholders where necessary to ensure the safe operations of SUA at all times.

11.2 This AC shall be read in conjunction with the SUA Order, SRD and other SUA related documents published by the CAD.

11.3 For enquiries, please contact the Unmanned Aircraft Office of the CAD at sua@cad.gov.hk.

Appendix A – Structure of Operations Manual for Façade Cleaning Operations Using Small Unmanned Aircraft

The following structure serves as a framework for applicants to develop a comprehensive document for specific procedures and details necessary for safe execution of the proposed façade cleaning operations. While the structure is not intended to be exhaustive or prescriptive, the aspects it contains shall be thoroughly considered and addressed in the manual as necessary. For parts of general policies and procedures, please refer to the sample Operations Manual published on CAD website.

A. Personnel

A1. Roles and responsibilities

Specify the roles and responsibilities of each key position, including remote pilot, supporting crew, visual observer, tether operator (if applicable), and etc.

A2. Competency of the personnel

Detail the qualification / experience / training requirements required for each position of personnel.

A3. Training programme

Detail the training programme (OEM and internal training, as well as initial and recurrent training) for facacde cleaning operations. If applicable, specific training on tethered SUA operations shall be devised.

B. Overview of the SUA System and Safety Equipment

B1. Brief technical description of the SUA

Provide information about the SUA such as:

(i) SUA registration number
(ii) Manufacturer name (as applicable)
(iii) Model name or model number (as applicable)
(iv) Weight and size of SUA
(v) Command and control (C2) Link
(vi) Navigation and positioning system and fall-back design
(vii) Sensing system and collision avoidance
(viii) Means to cage the SUA within intended area of operations
(ix) Fail-safe mechanism
(x) Other technical specifications including maximum take-off weight, maximum

flying altitude, maximum speed, maximum operating time, wind speed limitation, other weather limitation etc.

Full technical specifications can be supplemented in the Appendix or as a separate technical manual.

B2. Brief technical description of the fluid spraying system

(i) Operating pressure and flow rate (Ensure the operational manoeuvre will not be affected by the fluid spraying operations) against the pressure limit of the target structure (e.g. window/ external wall of a building)
(ii) Maintenance requirements specified by the manufacturer (if any)

B3. Brief technical description of the tethering system (if applicable)

(i) Tether length, material and tensile strength
(ii) Emergency tether retraction or detachment mechanism
(iii) Trigger of emergency retraction or detachment
(iv) Environmental resistance (e.g. wind/ rain etc.)
(v) Maintenance requirements specified by the manufacturer (if any)

B4. Maintenance

(i) Maintenance schedule
(ii) Maintenance personnel
(iii) Maintenance instruction/procedure
(iv) Record of defects and maintenance
(v) Test before returning to service

C. Operational Control

C1. Monitoring of SUA operations

(i) Describe how the various operating parameters will be monitored by the remote pilot / operating crew. This shall include (but not be limited to) flight altitude, position, GNSS / GPS / RTK equipage, battery level, geo-fencing, the spraying system and tethering system (if applicable).
(ii) Maintain a good lookout at all times and avoid collision with other aircraft (both manned and unmanned).

C2. Emergency abort criteria

(i) State the abort conditions which, if reached, would lead to an immediate and safe termination of the operations.
(ii) State who is responsible to make real-time decision to abort the operations.

D. Operating Procedures

D1. Pre-flight Check

Develop procedures, checklist and items for pre-flight check applicable to façade cleaning operations, such as serviceability of SUA and additional components (e.g. tether / hose / nozzle / couplers), assembly and loading of SUA, connection of the additional components to the SUA, and etc.

D2. Normal Operating Procedures

State the normal procedures covering all necessary matters including safety.

Devise the procedures of controlling liquid spraying from SUA at different pressures and/or flow rate (including stoppage).

D3. Emergency Procedures

Specify the emergency procedures in response to at least the following situations specific to façade cleaning operations:

(i) SUA mechanical failure
(ii) Loss of C2 link
(iii) Flyaway
(iv) Uncontrolled spraying/leakage
(v) Tether jammed or tangled (if applicable)
(vi) Tether broke (if applicable)

E. Forms and records

E1. Include templates of forms and records used for maintenance, pre-flight check, post-flight check and etc.

Appendix B – Safety Risk Assessment for Façade Cleaning Operations Using Small Unmanned Aircraft

The applicant shall identify risks specific to the proposed façade cleaning operations and propose effective risk mitigating measures so that the risks are mitigated to an acceptable level. A template of risk assessment is available in the sample of Operations Manual. The following is an example of safety risk assessment for façade cleaning and some anticipated risks to be addressed. Applicant shall note that the list is not exhaustive. Any other risks associated with the proposed operations shall be identified and addressed.

Risk No.	Identified Hazard	Associated Risk (What & How)	Existing Mitigation	Current Risk Rating	Further Mitigation	Revised Risk Rating
1.	*Unexpected obstacles protruding from the building which hinders VLOS*	*SUA may collide with the building/ obstacles*	*Supporting Crew is appropriately positioned to monitor the SUA and the surrounding environment from another angle, while communicating closely with the Remote Pilot*	*4C*	*Only SUA with functioning obstacle avoidance feature will be used for operation.*	*1C*
2.	*Remote pilot's vision might be impaired by the environment, e.g. glare, reflection*					
3.	*Difficult for the SUA to hold its position due to deteriorated GPS signal*					
4.	*Unforeseeable gust between buildings*					
5.	*Difficult to maintain the position of SUA due to spraying of liquid at high pressure*					

6.	*Unexpected leakage of liquid which affects the control of SUA*					
7.	*(any other potential hazards identified by the operator)*					

– END –