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CHINA CLASSIFICATION SOCIETY

GUIDELINES FOR USE OF UNMANNED AERIAL VEHICLES FOR SURVEYS

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1 General

1.1 Objectives and application

The Guidelines, based on the relevant requirements of IACS REC42 Guidelines for Use of Remote Inspection Techniques for Surveys and its amendments, specify technical standards for Unmanned Aerial Vehicles (UAVs) and qualification requirements for organizations performing UAV inspection by studying application of UAV technology in ship/offshore installation surveys, elaborate on the technology requirements and operational methods for application of UAV technology in site survey based on the analysis of data and information collected by UAVs, and are intended to provide guiding principles for development and application of prototype UAVs serving ship/offshore installation surveys.

1.2 Scope of application

Inspection by way of UAVs is to be considered as an alternative technique in performing an examination of hard to reach structures in a safe, effective and efficient manner. Inspection by way of UAVs is generally applicable to ship/offshore installations of all types when the safety of the surveyed installations/locations is not compromised and local laws and regulations are met.

1.3 Definitions

1.3.1 Unmanned Aerial Vehicle (UAV) means an aircraft with no pilot on board that is operated by wireless remote control device and self-programmed remote control device.

1.3.2 Pilot is short for UAV flight controller or drone pilot.

1.3.3 CCS means China Classification Society.

1.3.4 Organization performing UAV inspection means the supplier providing UAV inspection services for site survey.

1.3.5 Applicant means a unit, organization or personnel submitting survey application to CCS, e.g. shipyard, ship company, offshore installation owner, etc.

1.4 Application and responsibilities

1.4.1 Application

For inspection by way of UAVs, the applicant generally submits application to CCS and states that the applicant agrees with all requirements of CCS for inspection by way of UAVs and abides by relevant laws and regulations in the place where the survey is carried out, and can provide facilitating conditions to the party performing surveys.

1.4.2 Responsibilities

1.4.2.1 Responsibilities of the applicant

- (1) The applicant is to entrust a qualified organization performing UAV inspection to carry out survey.
- (2) The applicant is to provide facilitating conditions and safety measures for inspection by way of UAVs.
- (3) The applicant is to carry out on-site supervision for inspection by way of UAVs and give safe reminders in a timely manner.
- (4) The applicant is to coordinate the shipyard/ repair yard/ port, if any, to provide necessary facilitating conditions for inspection by way of UAVs.

1.4.2.2 Responsibilities of the organization performing UAV inspection

The requirements as well as safety and management provisions of CCS do not exempt the organization performing UAV inspection from the obligation to conform to relevant international and domestic regulations on safety and environmental protection. Moreover, the organization performing UAV inspection is to:

- (1) ensure inspection by way of UAVs is carried out as per requirements and undertake main responsibility for safety during the survey process;
- (2) designate qualified personnel to operate UAVs;
- (3) provide UAVs satisfying the survey requirements to ensure the effectiveness and efficiency of the survey;
- (4) know about laws and regulations in the place where the survey is carried out to ensure the legality of use of UAVs;
- (5) know about and implement the management requirements of the manufacturer/repair yard/dock/ship owner;
- (6) accept on-site supervision of the Surveyor, and carry out inspection by way of UAVs according to the survey plan confirmed by the Surveyor as well as requests given by the Surveyor based on the on-site survey situation.

1.4.2.3 Responsibilities of CCS

- (1) CCS is to verify qualification compliance of the organization performing UAV inspection.
- (2) CCS is to supervise the organization performing UAV inspection at site to abide by relevant provisions of the interested parties.
- (3) CCS is to instruct the pilot to carry out inspection and collect information and effectively implement the survey plan.

2 Technical standards for UAVs and qualification of the organization performing UAV inspection

2.1 General requirements

This Section mainly specifies technical standards for UAVs and qualification requirements for the organization performing UAV inspection.

2.2 Flight control

When UAVs are used for on-site survey, the relevant operations are to comply with local laws and regulations on UAVs operation where the survey is carried out.

2.3 Technical standards for UAVs

2.3.1 Safety performance

UAVs are to have the following safety performance during the collection of survey data:

- (1) UAVs are to be capable of flying stably without visible light or GPS.
- (2) UAVs are to be capable of automatic collision prevention when flying without visible light or GPS.
- (3) UAVs are to be capable of forced landing when the battery is running low.
- (4) UAVs are to be capable of automatic hovering, forced landing or returning in case of loss of communication.
- (5) UAVs are to be equipped with warning lights.
- (6) UAVs and their flight control systems are not to affect normal operation of electrical and electronic equipment onboard ships.

2.3.2 Operation performance

- (1) UAVs are to have intelligent stability augmentation function when flying without visible light or GPS;
- (2) UAVs are to have stable hovering function when flying without visible light or GPS.

2.3.3 Endurance capacity

The endurance capacity of a UAV is normally to be not less than 30 minutes (fully-loaded), and it is to have enough spare batteries to complete the scheduled inspection.

2.3.4 Data transmission and communication

- (1) Data transmission and communication is under open wireless band
- (2) UAVs are to have strong anti-interference capability, capable of stable communication when inside metal cabins, and real-time image transmission capability.

2.3.5 Data storage

- (1) Data type: video, photo;
- (2) Video resolution: no less than 1920×1080 pixels;
- (3) Image resolution: no less than 3840×2160 pixels;
- (4) Video format: MP4 or other mainstream formats;
- (5) Photo format: JPG or other mainstream formats;
- (6) Storage mode and capacity: the storage capacity of the airborne storage card is to be not less than the data volume for continuous collection during the maximum endurance time of the UAV, and there are to be enough spare memory cards to complete the scheduled inspection.

2.3.6 Requirements for airborne lighting

The UAV is to be equipped with light to provide satisfactory photographing condition in the dark environment.

2.3.7 Requirements for airborne cameras

- (1) adapting to low light environment;
- (2) having good anti - shake performance;
- (3) having optical zoom function;
- (4) having continuous snapshot function.

2.4 Qualification requirements for the organization performing UAV inspection

2.4.1 Organizations performing inspection

Inspection by way of UAVs are to be carried out by professional organizations performing inspection, which have been verified by CCS to have the capacity of performing inspection by way of UAVs and certified by CCS according to the requirements of UR Z-17 and Chapter 5, PART ONE of CCS Rules for Classification of Sea-going Steel Ships.

Organizations providing UAV inspection service for CCS-classed ships or offshore installations are to comply with the following requirements:

- (1) satisfying the requirements on UAV operation given by the local competent authorities where the survey is conducted, such as the Regulations on the Operation of Light and Small Unmanned Aerial Vehicles (for trial implementation) issued by Civil Aviation Administration of China (CAAC);
- (2) employing at least two pilots complying with the requirements of 2.4.2 of the Guidelines;
- (3) possessing at least two UAVs complying with the requirements of 2.3 of the Guidelines and the UAVs are properly maintained as per the requirements of the manufacturers;
- (4) procedures and guidelines: the organization performing inspection is to provide documented procedures and guidelines on how to provide UAV inspection service, including but not limited to:
 - a) safety instructions;
 - b) flight route planning;
 - c) UAV operation and maintenance;
 - d) data processing and storage.

2.4.2 Requirements for pilots

Pilots are to be employed by an organization performing UAV inspection certified by CCS and are to comply with the following requirements as a minimum:

- (1) Pilots are to obtain corresponding certificate for UAV operation according to requirements given by local competent authorities where the survey is conducted.
- (2) Pilots are to be capable of skillfully controlling UAVs manually and are to obtain operation certificates issued by trade association or equipment manufacturer that are consistent with the type of UAVs to be maneuvered.
- (3) Pilots are to be trained by training organizations approved or accepted by CCS, have sufficient knowledge on ship structure of the relevant ship types, pass the test of CCS and obtain the certificate for UAV operators issued by CCS.

3 Data and information

3.1 General requirements

Based on the current situation of UAV technology, data collected by UAVs are mostly visual information. This Section briefly describes relevant provisions on the collection, processing of visual data and data security.

3.2 Data collection

Visual data (e.g. still image, live video and recorded video) collected during flight by UAVs is to be evaluated based on the following standards:

- (1) The collected image and video are clear enough to identify the details of the hull structure and possible anomalies. The resolution of the image taken is to be not less than 3840×2160 pixels, the resolution of video not less than 1920×1080 pixels, and the quality of the photo or video is to be sufficient to make a meaningful assessment of the hull structure.
- (2) If any anomaly is suspected or identified during the inspection, the image quality is to enable the Surveyor to further ascertain the nature, severity level and approximate dimensions of the abnormality.
- (3) Data identified as a result of hull structural component anomalies is to be effectively collected independently for subsequent tracking.
- (4) Visual data, including both live video and recorded video, is to be continuous and uninterrupted, with stable quality to ensure that the inspected items are not overlooked by the Surveyor.
- (5) The UAV system is to be equipped with wired or wireless communication, and the data transmission interval is to be such that in case of network interruption, data is temporarily stored and data transmission is to be carried out immediately after network recovery.
- (6) As to data format, the collected data is to include the registration information of the UAV, data collection location and collection time.

3.3 Data processing

While most of the data evaluation will be performed in real time during flight operations or within a short period of time, the UAV system of the organization performing UAV inspection is to include an appropriate platform to display and playback visual data, including still images, live video, and recorded video. The large amount of visual data collected by the UAV can be processed and optimized, and any processing and optimization of the original data is not to affect further detailed inspection and evaluation. Upon completion of the inspection, the organization performing UAV inspection is to issue the survey report and provide relevant visual data to the attending Surveyor and the applicant.

Enhanced data processing technologies may include:

- (1) The measured abnormal data can be effectively imaged (for example, crack dimension measurement, corrosion area measurement, etc.).
- (2) Artificial intelligence is used for pattern recognition of cracks, fractures, corrosion, etc.
- (3) Data analysis of abnormal trends and predictions.
- (4) 3D model generation for data integration and reporting.

These enhanced data processing technologies may be used to assess the life expectancy of ships or offshore installations, and the use of enhanced data processing technologies is at the discretion of the applicant.

3.4 Data security

The organization performing UAV inspection ensures that the data collected during operation and any subsequent analysis are captured, transmitted, and stored in a secure way.

The organization performing UAV inspection is to comply with any statutory or regulatory requirements, company regulations and contractual agreements requirements.

If the organization performing UAV inspection provides the UAV data management system to the applicant and the classification society for remote access to the data, the validity and security of the remotely accessed data are to be ensured. To ensure the security of data transmission, encryption may be applied for data transmission if necessary.

4 Application in site survey of ships

4.1 General requirements

This Section provides guidance and points for attention on the application of UAVs in site survey of ships.

4.2 Survey conditions

4.2.1 To ensure the effective implementation of the survey, the applicant is to provide the Surveyor entering the relevant facilities as well as the organization performing UAV inspection with the safe survey conditions in compliance with the relevant provisions, including necessary passages and means of access, compartment environment and safety protection, etc.

4.2.2 The UAV is to be considered as an effective method of detecting defects and reflecting the condition of structural coating. However, other effective inspection techniques are to be adopted for a proper assessment of structural defects and the determination of repair specifications.

4.2.3 Inspection by way of UAVs is to be conducted in the presence of the attending Surveyor, who is to confirm the survey results at the site. The Surveyor can confirm the UAV inspection results by selecting part of the structural components for close-up inspection when necessary. Suspected areas detected during inspection by way of UAVs are to be confirmed by the Surveyor using other effective survey techniques.

4.2.4 The space where UAV inspection is carried out is to have sufficient visibility and is to be kept clean so that site personnel can safely conduct inspection by way of UAVs.

4.2.5 If the following conditions exist, the inspection is not to be carried out by UAVs, but by effective conventional inspection techniques:

- (1) Where there are records or indications of obvious structural defects or damages to the inspected facilities and the UAV is unable to further verify the defect condition or damage scope.
- (2) When the results provided by UAV inspection cannot clearly reflect the actual condition, such as blurred and unclear image or data loss, etc.

4.3 Survey plan

To ensure a safe, effective, and efficient conduct of survey, prior to the commencement of the survey, a survey planning meeting is to be held between the applicant's representative, the organization performing UAV inspection and the shipyard's representative (if applicable) which is organized by the attending Surveyor. The relevant survey requirements and extent are to be addressed in the meeting. The organization performing UAV inspection is to prepare a UAV Survey Planning Document, which is to be confirmed by the attending Surveyor, the applicant's representative and the shipyard's representative (if applicable), and establish effective means of contact with the attending Surveyor, the applicant's representative and the shipyard's representative (if applicable). The UAV Survey Planning Document is to include at least the following:

- (1) Survey type (i.e., annual survey, intermediate survey, special survey, CAP survey, damage survey etc.);
- (2) Particulars of the ship;
- (3) Qualification of the organization performing UAV inspection and information of the survey equipment;
- (4) Location and anticipated time frame for the survey;
- (5) Flight permit for UAV inspection, where necessary, e.g. flight permit of the local government, flight permit of the shipyard;
- (6) Extent of the survey (including overall survey and close-up survey of compartments);
- (7) Specific flight route planning of the UAV;
- (8) Risk Assessment Report of UAV flight;
- (9) Safety precautions.

4.4 Risk assessment

Necessary risk assessment is to be carried out prior to the commencement of the UAV inspection to identify potential safety hazards and flight risks. The Risk Assessment Report is to be prepared by the organization performing UAV inspection, and unanimously confirmed and agreed by the applicant's representative, the attending Surveyor and the shipyard's representative, if applicable, in the survey planning meeting.

The organization performing UAV inspection is to prepare the Risk Assessment Report according to the ship's Hazardous Area Plan and the actual conditions of the surveyed areas, which is to include at least the following:

- (1) Explosion risks in hazardous areas: If the UAV operation is proposed within spaces with potential explosion risks, typical factors to be considered include, but are not limited to the following categories:
 - a) the UAV (e.g. the motor, power supply system, battery) and its onboard equipment (e.g. the camera, lighting) are to be rated for intended classification level; or
 - b) necessary means are carried out for the intended survey spaces, such as purging, inerting, so that the spaces comply with the safe survey conditions for UAV inspection; or
 - c) potential explosion risks during operation, e.g. spark generated by collision and falling.
- (2) Dropped object risks: In case of UAV operation failure or malfunction, it can pose risks as a dropped object. Typical factors to be considered include, but are not limited to:
 - a) safety protective measures in the take-off/landing zones;

- b) the UAV is to avoid fly over areas where operations are carried out by people. When such avoidance is impossible, the corresponding safety protective measures are to be developed beforehand.

(3) Collision Risks: Collision may occur due to the external environment, human errors, and malfunctions. Typical factors to be considered include, but are not limited to:

- a) Collision with other operating machinery, e.g. cherry picker, crane, etc.;
- b) Influences of the external environment, e.g. gales, birds, etc.; for situations where UAVs are required to fly close to the sea, such as for damage survey, the maximum wave height is also to be considered;
- c) signal interference of remotely controlled devices or unexpected malfunction of the equipment;
- d) visual line of sight (VLOS) or unexpected interruption of the pilot operation and blind area of flight.

(4) Other risks: in addition to the safety risks caused by the flight of the UAV, the potential safety risks of the personnel involved in the UAV inspection, such as electric shock, slipping, personnel falling, etc., are also to be taken into account, and the corresponding requirements of CCS Guidelines for Clients on Safety of Survey are to be satisfied.

4.5 Survey operations

4.5.1 Pilot

Each survey is to be carried out by at least 2 pilots; one of them maneuvers the UAV according to the predetermined flight routes, while the other person controls the onboard camera for data collection, determines the flight routes and looks out for any hazards, communicates with the applicant's representative and the attending Surveyor, and takes charge of the UAV maneuvering in emergency.

The pilot is to hold the UAV operation license and relevant qualification documents, have the ability to operate the UAV skillfully, be familiar with the flight routes and flight environment of this UAV inspection, and record the survey results.

4.5.2 Pre-flight preparation

Prior to each UAV field inspection, the pilot is to make full preparations before taking off, which include at least the following:

- (1) confirmation that the surrounding environment meets the minimum requirements for UAV inspection;
- (2) confirmation that the survey items in the UAV Survey Planning Document are same as those on site;
- (3) confirmation that the flight routes in the UAV Survey Planning Document are operable on site;
- (4) confirmation that all safety measures in the Risk Assessment Report have been implemented;

(5) confirmation with CCS attending Surveyor, the applicant's representative and the shipyard's representative (if applicable), and obtaining the permission to start the survey.

Any party should have the responsibility and obligation to immediately abort the operation at any time if any inconsistency with the UAV Survey Planning Document is found and/or factors that may affect survey safety and effects exist.

4.5.3 Control of the survey process

The UAV inspection is to be conducted under the supervision of CCS attending Surveyor. The organization performing UAV inspection is to provide a real-time image transmission system at site so that the attending Surveyor can conduct on-site monitoring of the data collected by the UAV and the survey content.

When defects other than those specified in the UAV Survey Planning Document are found during the UAV inspection, the scope of the survey is to be expanded upon the approval of CCS attending Surveyor and recorded in the final survey report.

4.6 Survey data

Upon completion of the inspection, the organization performing UAV inspection is to provide complete inspection images and video data in the format specified in the Guidelines, accompanied by a written description specifying the survey scope and shooting time.

The image is to be clear, and the picture complete, without modified clipping, post-processing and proportional adjustment, consistent with the actual condition of the surveyed facility.

Video data is to be completely recorded by HD recording equipment, without post-processing and editing, consistent with the actual condition of the surveyed facility.

4.7 Survey report

Upon completion of the inspection, the organization performing UAV inspection is to issue the survey report and provide complete video data and photo information. The report is to truly reflect the content and survey situation of the UAV inspection, and is to be signed and confirmed by the attending Surveyor as the basis and/or supplement for the issuance of the classification and statutory survey reports. The survey report is to include at least the following:

- (1) Survey type (i.e., construction survey, annual survey, intermediate survey, special survey, CAP survey, damage survey etc.);
- (2) Particulars of the ship, qualification of the organization performing UAV inspection/personnel and information of the survey equipment;
- (3) Location and time for the survey, environmental conditions, ship condition;
- (4) Extent and results of the UAV inspection;
- (5) Extent and results of the extended survey, if any.

5 Application in the survey to offshore engineering on site

5.1 General requirements

This Section provides guidance and points for attention on the application of UAVs in the survey to mobile and fixed offshore units, offshore floating units and other offshore installations on site.

5.2 Survey conditions

To satisfy the safety requirements and ensure the effective implementation of the survey, survey conditions for UAVs are to comply with the requirements of 4.2 of the Guidelines.

5.3 Survey plan

Prior to the commencement of the survey, a survey planning meeting is to be held between the Surveyor, the applicant's representative, the organization performing UAV inspection and the shipyard's representative, if applicable, to confirm that appropriate plans are available for any circumstances that may occur during the survey. The organization performing UAV inspection is to prepare a UAV Survey Planning Document, which is to be approved and agreed by the Surveyor, the applicant's representative and the shipyard's representative, if applicable. The organization performing UAV inspection is also to submit the UAV Survey Planning Document in accordance with laws and regulations on flight control in the area where the survey is carried out, where applicable. The UAV Survey Planning Document is to be developed in accordance with the requirements of 4.3 of the Guidelines, and specify the operation condition of the offshore installation at the expected time of survey, such as in dock, in port, floating or lifting condition. When UAV is used in conjunction with the conventional inspection technique, the Surveyor is to pay attention to check that the area inspected by the two inspection techniques covers all the areas that should be inspected.

The organization performing UAV inspection is to plan the specific flight routes based on the survey work scope and requirements and the installation's Hazardous Area Plan. Emergency flight plans are to be made in case of environment change, system malfunction or total loss of the UAV. Planned altitudes and distances from the structure are to be determined based on local regulatory requirements and safety consideration.

Risk assessment is to be carried out prior to the commencement of the UAV inspection. Risk assessment and the development of the Risk Assessment Report is to be comply with 4.4 of the Guidelines, and attention is to be paid to:

1. condition of the offshore installation (moored, dynamic positioning, mooring positioning or lifting condition), risks due to weather and sea conditions of the surveyed area, if applicable;
2. the effects of height of the surveyed area, complexity and compactness of structure and small space on UAV operation and image acquisition and their risks to the safety of the UAV, offshore installation and personnel;
3. The following factors bring risks to flight stability and accuracy:
 - (1) working environment where appropriate working temperature range is exceeded;

- (2) air flow caused by inlet and outlet fans, if applicable;
- (3) areas where GPS or other positioning systems are not working, if applicable.

5.4 Survey operations

5.4.1 Pre-flight preparation

Pre-flight preparation is to comply with the requirements of 4.5.2 of the Guidelines. For flight operations outdoors (outside the compartment), the organization performing UAV inspection is to listen to weather and hydrological forecasts of the area 24 hours before the start of flight operations. When the UAV is used in the marine environment, attention is to be paid to the impact of meteorological and hydrological conditions such as wind, waves and currents on the inspection quality and safety during the survey.

5.4.2 Flight condition

Survey operations are to comply with the requirements of 4.5 of the Guidelines. A designated personnel as safety watch is strongly recommended, who is to watch out for any safety hazards on the worksite while other people are performing the job and empowered to abort the operation in the event of a perceived or actual safety hazards.

Any personnel related or adjacent to the flight team are not to cause unnecessary interference to the pilot. Any changes to the flight method are to be agreed upon by all parties. Recommendation to changes in flight method may be proposed to the designated intermediary in the UAV flight team.

For flight operations outdoors (outside the compartment), the weather and sea conditions suitable for flight operations are to be clearly specified according to the instructions of the UAV. In case of adverse weather or sea conditions, such as rain and heavy sea, the operation is to be immediately aborted.

Means for reliable and constant communication is to be provided and maintained between all the UAV team members who are not in the same place throughout the operation. If the communication signal between the team members is lost or significantly interfered with, the operation is to be aborted immediately. Communication protocol and unified nomenclatures between the attending Surveyor and UAV operation team are to be determined. Each team member can directly communicate with the applicant's representative.

Whenever an anomaly is found during the operation, reference data (i.e., still image capture, location, etc.) is to be properly documented for the final reporting. The attending Surveyor is to be present or in the vicinity of the space that is subject to the survey and direct the UAV operation team, as needed, with regard to the survey requirements and executions.

5.4.3 Post-flight

When the flight is over, the operator is to make logging, carry out maintenance of the UAV and handle battery according to the procedures of the organization performing UAV inspection.

5.5 Data collection and review

The organization performing UAV inspection is to provide survey image, video data and corresponding textual specifications complying with Section 3 and 4.6 of the Guidelines to the attending Surveyor for review. As agreed upon by all parties during the planning stage, the attending Surveyor is to either:

- (1) review all the visual data on-site after the flight so that additional flights can be made if considered necessary;
- (2) review all forms of visual data off-site within a specified period of time so that additional flight requests or other alternative inspection methods can be arranged.

Proper equipment setup is to be arranged by the applicant and the organization performing UAV inspection for the attending Surveyor to review the data. If the Surveyor is not satisfied with the result, an additional flight request may be made by the Surveyor or additional alternative survey techniques may be required.

5.6 Survey report

The organization performing UAV inspection is to prepare and provide the relevant survey report which objectively reflects the UAV inspection content and condition. If the applicant is contracting with the organization performing UAV inspection to provide additional data, technical support or recommendations outside the scope of the survey items of CCS, such information is to be provided in a separate report. Reports submitted to CCS and their review are to comply with the requirements of 4.7 of the Guidelines.

Appendix 1 Relevant regulations of the People's Republic of China on UAV Flight Control

1. Overview of the national standard system development

At present, the formulation of laws and regulations on UAVs in the non-military field is still in its infancy. According to the Notice on the Issuance of Guidelines for the Development of Standard System for Unmanned Aircraft Systems (2017-2018 edition) issued by the Standardization Administration of PRC on May 22, 2017, the relevant standard systems will be completed in two stages:

Stage 1 (2017~2018): initially establish relevant standard systems;

Stage 2 (2019~2020): gradually push forward the designation of relevant standard systems, and basically establish and improve relevant standard systems by 2020.

By that time, relevant standard systems will be developed by aircraft type, use, industry, etc.

2. Regulations on real-name registration

According to the Regulations on the Real-name Registration of Civil Unmanned Aerial Vehicles issued by the Airworthiness Certification Department of Civil Aviation Administration of China (CAAC) on May 16, 2017, all UAVs with a takeoff weight of 250 grams or more shall be registered with real name since June 1, 2017.

3. Regulations on airspace restrictions

According to the Regulations on Air Traffic Management of Unmanned Aerial Vehicles issued by CAAC Aviation Industry Management Office on September 21, 2016, civil unmanned aircraft system activities within the scope of civil airspace such as the flight routes, approaches (terminals) and the airport control areas, or civil unmanned aircraft system activities affecting operation in such areas above shall apply to the local administration for review. However, if all of the following conditions can be met simultaneously, there is no need to apply for review:

- (1) outside the airport clearance area;
- (2) the maximum takeoff weight of a civil UAV is less than or equal to 7 kg;
- (3) flying within the visual range, and weather conditions do not affect the continuous visibility of the UAV;
- (4) flying in the daytime;
- (5) the flight speed is not greater than 120 km/h;
- (6) the civil UAV meets relevant requirements on airworthiness management;
- (7) the pilot meets the relevant qualification requirements;

- (8) the pilot completes the inspection of the civil UAV system before the flight;
- (9) the flight shall not affect any aspect other than flight activities, including ground personnel, facilities, environmental safety and social security, etc.
- (10) operators shall ensure that their flight activities continue to meet the above conditions.

4. Regulations on pilot license

CAAC Flight Standard Department issued the regulations on the management of civil UAV pilot on July 11, 2016. The regulations classify UAVs into nine categories, with different requirements for pilots. The details are as follows:

Category	Empty weight(kg)	Takeoff gross weight(kg)
I	$0 < W \leq 1.5$	
II	$1.5 < W \leq 4$	$1.5 < W \leq 7$
III	$4 < W \leq 15$	$7 < W \leq 25$
IV	$15 < W \leq 116$	$25 < W \leq 150$
V	UAVs for vegetation protection	
VI	Unmanned airship	
VII	UAVs of categories I and II operating beyond line-of-sight	
XI	$116 < W \leq 5700$	$150 < W \leq 5700$
XII	$W > 5700$	

(1) The UAV system pilot shall be responsible for the following situations, and is not required to be licensed:

- a) UAVs operating indoors;
- b) UAVs of categories I and II (the pilot can make records in the UAV cloud system for information if necessary. The records shall include the pilot's real identity information, the type of the UAV used, and the pilot shall pass the online regulation test);
- c) UAVs tested in unpopulated, sparsely populated areas.

(2) Under the following circumstances, the UAV pilots shall be managed by the trade association which shall examine pilots and issue qualification certificates, and supervised by the Flight Standard Department of CAAC:

- a) UAVs operating in the isolated airspace except UAVs of categories I and II;
- b) UAVs of categories III, IV, V, VI, VII operating in the mixed airspace.

For UAVs of categories XI, XII operating in the mixed airspace, the pilots are managed by CAAC (from which the pilots shall obtain their license).