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**Safety Standards for Commercial-Use, Unmanned,  
Rotary-Wing Aircraft in Uninhabited Areas**

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Japan UAV Association

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## CHAPTER 1. OVERVIEW

### 1.1. Purpose

These Standards define items necessary for the safe operation of unmanned helicopters. Here, “safe operation” refers to operating the unmanned helicopter with minimized threat to the life or property of any third party.

These Standards are formulated for the purpose of defining design requirements relating to safety which must be met by unmanned helicopters based on current (March 2004) engineering standards, and the requirements that must be strictly observed by the operators operating the unmanned helicopter, the mechanics and the owners, in view of their capabilities, with respect to the handling of the helicopter, as well as customer control aimed at preventing the use of unmanned helicopters for purposes that are contrary to the best interests of society.

These Standards are being formulated and put into practice by the Japan UAV Association. Rules pertaining to the handling of these Standards are set forth in Section 5 of this chapter.

Unmanned helicopters used for pesticide spraying in Japan are governed by the “Guidelines for the Operation of Industrial-use Unmanned Helicopters” and other documents provided by the Japan Agricultural Aviation Association (JAAA).

### 1.2. Scope

These Standards are applicable to unmanned helicopters, as well as to their navigation devices, operated in uninhabited areas, including out of visual range,. In principle, these Standards apply to aircraft manufactured and operated in Japan.

Table 1 outlines the scope of application of these Standards.

**Table 1. Range covered by the standards**

Class.		Unmanned aircraft (UAVs)		
		Rotary-wing craft (unmanned helicopters)	Fixed-wing craft, airships, etc.	Hobby-level radio control transmitters
Operation conditions				
Airspace shared with manned craft		Separate standards to be formulated	Separate standards to be formulated	
Manned craft areas		Separate standards to be formulated	Separate standards to be formulated	
Uninhabited areas	Out of visual range	Applicable range of these Standards	Separate standards to be formulated	
	Within visual range	Applicable range of these Standards (Note) These Standards do not apply to unmanned helicopters for pesticide spraying.	Separate standards to be formulated	

Note: Unmanned helicopters for pesticide spraying also fall within the classes of unmanned craft areas and visible-range aircraft, but because they fly at relatively low altitudes (less than 10 meters AGL), and because they have to satisfy standards such as the spraying specifications necessary for spraying pesticides, they are regulated by the “Guidelines for the Operation of Industrial-use Unmanned Helicopters” provided by the JAAA.

Unmanned helicopters that are manufactured in Japan but operated in other countries must conform to these Standards and to the laws of the country in which they are operated.

Moreover, persons intending to export unmanned helicopters overseas must carry out various procedures

required in order to register with the Japan UAV Association, based on the Customer Control Standards noted in Chapter 6, and to be in compliance with export and trade directives (Ministry of Economy, Trade and Industry). Exporters are responsible for all obligations pertaining to overseas exports and to export commodities.

If unmanned helicopters that have been manufactured overseas are being operated in Japan, operation must conform to related domestic regulations in Japan (the Radio Law, etc.) as well as to these Standards. Also, persons exporting unmanned helicopters to Japan and those importing them into Japan must notify and consult with the Japan UAV Association. This does not necessarily apply, however, to temporary operation such as demonstration flights.

### 1.3. Definitions

- “Unmanned helicopter” refers to a rotary-wing aircraft operated by means of radio communication, that is used for industrial purposes and can be used for aviation purposes, with no person or persons onboard.
- “Navigation device” refers to a control device that makes it possible for the unmanned helicopter to fly itself autonomously, without depending on visual guidance from a person or persons. Operation outside of visual range requires a navigation device or devices onboard.
- “Uninhabited area” refers to an area where no people are present on the ground. As a rule, the flight altitude is limited to less than 150 meters. If the operator intends to fly the craft at an altitude of 150 meters or higher, however, the requisite procedures must be followed with respect to navigation in conformance with Article 99-2 of the Civil Aeronautics Law, those procedures include coordination with the various related ministries and government agencies, and issuance of a Notice to Airman (NOTAM), as well as verifying various technical items relating to flight safety with the manufacturer.
- “Within visual range” refers to the range within which the operator is able to exercise visual guidance control.
- “Beyond visual range” refers to a range exceeding that defined by “within visual range”.

### 1.4. Safety Assurance Plan

Chapter 2 and subsequent chapters of these Standards explain items necessary in order to operate unmanned helicopters safely, in specific terms. This section describes an overview of a plan for assuring safety.

Table 2 shows items necessary in order to operate unmanned helicopters safely when operating them in uninhabited areas.

**Table 2. Safety assurance plan**

No.	Item	Necessary conditions for assuring safety
1	Design	If a breakdown or malfunction occurs, flight may not be continued under conditions where control is not possible. As a last resort if a breakdown or malfunction occurs, the helicopter is forcibly crashed.
2	Maintenance inspection	The operator carries out a mandatory start-up inspection, as a daily maintenance inspection. A mandatory annual inspection will be carried out once a year by an authorized aircraft mechanic.
3	Operator	Operators must undergo navigation training, and must obtain navigation skills certification. The skills certification provided to operators must certify that the operator has attained the standard level or higher in navigation skills and in knowledge necessary for safe operation.
4	Operation	A safe distance from the unmanned helicopter must be assured. There must be no people nearby in areas where there is a possibility of the unmanned helicopter crashing. As a rule, the ground clearance will be less than 150 meters, and the flight area will not overlap that in which manned aircraft are flying.
5	Customer control	Unmanned helicopters will not be sold to persons regarding whom there is a fear that they will be used for purposes contrary to the best interests of society, such as terrorism. During the use of unmanned helicopters, registration control of customers will be carried out at all times through maintenance inspections. After an unmanned helicopter has been taken out of service, it will be confirmed that it has been completely destroyed.

## **1.5. Revisions to and Application of the Standards**

Rules for making revisions to and application of these Standards are as noted below.

### (1) Revisions

The Association chairperson shall investigate any items deemed necessary based on questions raised by Association members, and revisions shall be carried out after obtaining the approval of the Association chairperson at a general assembly of the Japan UAV Association.

As a rule, revisions shall be made once a year, but under emergency circumstances, revisions may be made as necessary.

### (2) Application

Based on the Standards, the Japan UAV Association shall accept and process various types of applications, and shall issue various types of endorsements and certifications.

## **CHAPTER 2. DESIGN STANDARDS**

### **2.1. Purpose**

These design standards define technical requirements necessary in order to assure safety with respect to unmanned helicopters and their navigation devices when operated in uninhabited areas (both within and beyond visual range), as well as defining handling procedures ranging from operation applications to observation inspections, certification, and performance endorsements.

### **2.2. Scope**

These design standards apply to unmanned helicopters and their navigation devices. The Japan UAV Association shall verify and approve the conformance of the unmanned helicopter to these design standards.

The definitions of unmanned helicopters and their navigation devices are as noted in Chapter 1, Section 3.

These design standards stipulate the minimum design requirements in order to assure safety.

With respect to items pertaining to performance and quality, it is presumed that each manufacturer will be responsible for observing voluntary standards, and thus this area is not noted in these design standards.

Moreover, with respect to craft that have already received performance approval from the Japan Agricultural Aviation Association, if the craft is being used for agricultural applications, there is no need for new approval to be obtained.

If the helicopter is being used for applications other than agricultural applications, however, approval must be obtained once again from the Japan Agricultural Aviation Association.

With respect to the manufacturing of unmanned helicopters (including navigation devices) that have a total takeoff weight of 100 kg or more, the Aircraft Manufacturing Industry Law will apply.

### **2.3. Design Safety Standards 1 (Unmanned Helicopters)**

#### (1) Functions and performance

Functions and performance will depend on the voluntary standards of the manufacturer, but manufacturers shall submit performance data tables and application documents pertaining to construction. (The items will depend on whether Form 1 or 2 is used.)

Among those documents, manufacturers must clearly indicate flight operation requirements (weather, takeoff weight, altitude, temperature, etc.).

The actual helicopter will be used for observation inspections, and flight will be carried out based on the equipment weight noted in the application documents. The operator must demonstrate the ability to maintain a hovering state for 30 seconds within a sphere having a diameter twice the rotor diameter, using visual navigation.

## (2) Strength

The craft must be strong enough to withstand ordinary operation. Details shall depend on the voluntary standards of the manufacturer.

## (3) Endurance

The durability of the helicopter must be proven by implementing a flight test of at least 100 hours. A flight log must be submitted together with the application.

## (4) Safety requirement standards

Failsafe mechanisms to prevent runaways must be devised for use in any failure mode that governs operation in the event of hypothetical breakdowns or malfunctions.

Specifically, "preventing runaways" refers to a forced landing or crashing the helicopter within the same radius as the flight altitude.

## (5) Failure mode governing accidents, malfunctions, etc. that must be taken into consideration

### Radio waves

- Deformation of instruction signals
- Communication interruptions because of degraded radio wave conditions, etc.

### Sensors

- Erroneous output, etc.

### Navigation devices

- Inability to operate because of electrical or mechanical problems

### Engine

- Engine stoppage or an unexpected increase in speed because of an electrical or mechanical problem

### Power supply

- An unexpected loss of the main power supply

## (6) Other items that must be taken into consideration

### Rotating objects flying off of the aircraft

- Measures must be taken to prevent objects such as the main rotor, tail rotor, or the linkages of these from flying off of the aircraft.

### Assuring safety at startup

- Measures must be taken to prevent injuries to the operator because of an unexpected increase in engine speed when starting up.

### Flight data records

- It must be possible to record flight data so that the cause can be investigated if an accident occurs.

### Transmitters

- Transmitters must conform to radio laws set forth by the Ministry of Internal Affairs and Communications.

## 2.4. Design Safety Standards 2 (Navigation Devices)

Because observation inspections cannot be carried out using navigation devices alone, when the actual application is submitted, it must be submitted together with the application for the unmanned helicopter.

### (1) Functions and performance

Functions and performance will depend on the voluntary standards of the manufacturer, but manufacturers shall submit performance data tables and application documents pertaining to construction. (The items will depend on whether Form 1 or 2 is used.)

Among those documents, manufacturers must clearly indicate flight operation restrictions (weather, takeoff weight, altitude, temperature, etc.).

In the flight observation inspections, flight will be carried out based on the equipment weight noted in the application documents. It must be demonstrated that the helicopter can fly along a designated path or can maintain a hovering state for 3 minutes at a designated spot within a sphere having a diameter twice the rotor diameter using the navigation device, without navigation being done by an operator.

### (2) Strength

The device must be strong enough to withstand ordinary operation. Details shall depend on the voluntary standards of the manufacturer.

### (3) Endurance

The durability of the device must be proven by implementing a flight test of at least 100 hours. A flight log must be submitted together with the application.

### (4) Safety requirement standards

Failsafe mechanisms to prevent runaways must be devised for use in any failure mode that governs operation, in the event of hypothetical breakdowns or malfunctions,. Specifically, "preventing runaways" refers to landing or bringing down the helicopter within the same radius as the flight altitude.

Additionally, these procedures must be documented in a manual, and the operator must be thoroughly familiar with them.

It does not necessarily need to be assumed that two independent failure modes will occur at the same time, but two subordinate failure modes must be taken into consideration.

### (5) Failure mode governing accidents, malfunctions, etc. that must be taken into consideration

#### Ground station

- Sending of erroneous instructions because of a breakdown or malfunction of the ground station, etc.

#### Radio waves

- Deformation of instruction signals
- Communication interruptions because of degraded radio wave conditions, etc.

#### Sensors

- Erroneous output, etc.

#### Control software

- Errors in program input, etc.

#### Power supply

- Unexpected loss of the main power supply for the system on the aircraft side
- Unexpected loss of the main power supplies for the system on the ground side

### (6) Other items that must be taken into consideration

#### Flight monitor

- It must be possible to monitor the state of the aircraft at all times during flight out of visible range.
- Also, it must be possible to bring the aircraft home or to forcibly crash land it in the event that monitoring is interrupted.

Flight data recording

- It must be possible to record flight data so that the cause can be investigated if an accident occurs.

Transmitters

- Transmitters must conform to radio laws set forth by the Ministry of Internal Affairs and Communications.

## **2.5. Application for Performance Endorsement**

Persons or companies planning to manufacture or market unmanned helicopters or navigation devices must submit an application to the Japan Agricultural Aviation Association, using either Form 1 or Form 2.

There are two different situations in which applications are submitted.

(1) Cases involving new development or new importation

(2) Cases involving an important change in the functions of an aircraft or a navigation device for which the performance has already been endorsed

Important changes in functions include the following:

Significant changes to safety systems

Changes that will significantly affect the way that the user handles the aircraft

If a model has been changed without significantly changing the functions, the contents of the change are noted on the form and the application is submitted.

## **2.6. Observation Inspections in Order to Endorse Performance**

When an application for performance endorsement has been submitted, the chairperson of the Association reviews the documents to make sure that the performance conforms to the design safety standards, and then carries out an observation inspection together with the applicant, based on the observation inspection standards formulated separately.

The chairperson of the Association decides whether or not the application is approved, based on the results of the observation inspection, and notifies the applicant of the results.

If the application has not been granted, a performance improvement opinion form is issued that states the reason for the rejection along with suggestions for improvement.

If the application is granted, a performance endorsement is issued using Form 1.

If an application using Form 2 was received, the contents of the change will be confirmed, and a model additional endorsement form will be issued using Form 2.

## **CHAPTER 3. MAINTENANCE AND INSPECTION STANDARDS**

### **3.1. Purpose**

Regular maintenance and inspections conducted by a skilled mechanic are crucial to flying the unmanned helicopter safely on an ongoing basis. As a rule, unmanned helicopters are to be inspected once a year.

These Maintenance and Inspection Standards determine the qualifications of the mechanic(s) carrying out the maintenance and inspection, the standards of the servicing plant carrying out the maintenance and inspection, and the Regular Inspection Sheets that prove that the inspection was carried out.

### **3.2. Obligations of the Unmanned Helicopter Owner**

In order to assure safety, the owner of the unmanned helicopter must have the helicopter inspected and serviced at least once a year by an aircraft mechanic or mechanics at a servicing plant approved by the Japan UAV Association.

### **3.3. Contents of Inspections, Maintenance and Other Items**

Because the contents of inspections and maintenance vary depending on the manufacturer and the pertinent model, the manufacturer shall establish the inspection contents, the required level of skill of the aircraft mechanic, the equipment and facilities at the servicing plant and other information, and shall submit the information to the Japan UAV Association.

### **3.4. Aircraft Mechanic Standards**

Persons carrying out maintenance of unmanned helicopters (regular inspections, repairs, alterations, etc.) must have obtained Form 3 aircraft mechanic skills certification issued by the Japan UAV Association.

There are two types of aircraft mechanic certification, depending on the competence of the mechanic.

#### Aircraft mechanic skills certification

This certification is awarded to persons who have sufficient skills and the knowledge to be engaged in the maintenance business.

#### Authorized aircraft mechanic skills certification

This certification is awarded to persons who may issue Regular Inspection Sheets as a representative of the Japan UAV Association when the servicing of unmanned helicopters is carried out.

The manufacturer defines the knowledge and skills necessary for each of these competency levels with respect to servicing of the relevant model, and trains mechanics.

When an employee has reached the designated level, the manufacturer may submit an application for Form 3 aircraft mechanic skills certification to the Japan UAV Association, and the skills certificate is issued. Skills certificates are valid for a period of three years.

The aircraft and navigational devices that the mechanic is qualified to handle are noted on the skills certificate. Even though applicant has received skill certificate by having certain skills and knowledge and passed examination, they must then continue their training until certificate expires.

### **3.5. Servicing Plant Standards**

Plants carrying out maintenance of unmanned helicopters (regular inspections, repairs, alterations, etc.) must obtain Form 4 servicing plant certification issued by the Japan UAV Association.

(However, plants that have received certification as organizations designated by the chairperson of the Japan Agricultural Aviation Association are exempted from this requirement.)

Required conditions that must be met by the servicing plant

- (1) The register of regular employees must include persons who have obtained aircraft mechanic skills certification. (These persons may not be hired on a part-time basis.)
- (2) Authorized aircraft mechanics must be registered as regular employees. (These persons may be hired on a part-time basis.)
- (3) The plant must possess the equipment and facilities necessary in order to service the pertinent model.
- (4) The plant must be capable of carrying out servicing of the pertinent model.

(However, in cases in which the manufacturer himself owns the servicing plant, conditions (1) and (2) are omitted from the required conditions.)

Plants desiring to receive certification as servicing plants must submit a Form 4 application to the chairperson accompanied by a letter of recommendation from the manufacturer of the pertinent model verifying that the plant meets the standards of the manufacturer.

When an application is received, the chairperson issues a Form 4 servicing plant certificate for the plant if it has been demonstrated that it meets the required conditions for servicing plants.

The pertinent models and navigation devices on which the plant may perform servicing are noted on the servicing plant certificate.

### **3.6. Regular Inspection Sheets**

When regular inspections are being carried out by servicing plants that have been issued servicing plant certification, the regular inspection will be completed using the procedure described below.

- (1) The inspection and servicing will be carried out by an aircraft mechanic who has received aircraft mechanic skills certification.
- (2) An authorized aircraft mechanic will carry out the inspection on the pertinent model, based on the inspection and maintenance record.
- (3) The authorized aircraft mechanic who carried out the servicing of the aircraft will submit a Form 8 Servicing Completed Notification to the Japan UAV Association, and will receive a Form 8 Regular Inspection Sheet.
- (4) The Regular Inspection Sheet will be affixed to a part of the aircraft where it can be easily seen.

## **CHAPTER 4. OPERATOR QUALIFICATION STANDARDS**

### **4.1. Purpose**

Persons navigating unmanned helicopters must receive skills certification issued by the Japan UAV Association. These Operator Qualification Standards clarify requirements pertaining to the training of operators of unmanned helicopters.

### **4.2. Types of Operator Qualifications**

There are two types of unmanned helicopter operator qualifications, as described below.

#### **(1) Remote operator**

These operators have specialized knowledge pertaining to unmanned helicopters, and have the skills to navigate unmanned helicopters using visual operation.

#### **(2) Autonomous navigation operator**

These operators have specialized knowledge pertaining to autonomous navigation devices, and are capable of operating autonomous navigation-type unmanned helicopters.

In order to fly the helicopter within visual range, the operator must have the qualifications described in (1) above, and in order to fly the helicopter beyond visual range, the operator must have the qualifications described in both (1) and (2) above.

### **4.3. Training System**

“Training system” refers to a training curriculum and an instructor or instructors who will provide instruction for unmanned helicopter operators.

Because the contents of the training system vary depending on the manufacturer and the pertinent model, the unmanned helicopter manufacturer must put together a training system relating to operator training, and must submit a notification to the Japan UAV Association.

Training curricula are divided into operation skills practice and classroom lectures.

The required contents of the training curriculum vary depending on the type of operator, so each operator must fulfill the contents noted below.

### (1) Remote operators

Operation skills practice 1: Unmanned helicopter operation skills training must conform to the “Unmanned Helicopter Navigation Skills Endorsement Standards” stated in Appendix 3.

Operation skills practice 2: The operator must be able to actually operate the pertinent model.

Specifically, the operator must be able to do the following appropriately: prepare for flight, carry out the startup inspection, operate the helicopter, perform post-flight checks and stow all equipment.

Classroom lectures: Mastery of the knowledge required in order to operate the unmanned helicopter safely must include the following items.

- A. Items pertaining to laws and regulations (the Civil Aeronautics Law and the Radio Law)
- B. Standards relating to the safety of unmanned helicopters (the contents of these Standards)
- C. Provisions and rules pertaining to safety that must be observed particularly closely by the operator
- D. Knowledge of safety measures (failsafe mechanisms) of the pertinent model, and ways of working with those measures
- E. The construction of the unmanned helicopter and daily inspection items

### (2) Autonomous navigation operators

Operation skills practice 1: The operator must be able to deal accurately with various kinds of problems that are likely to occur during the operation of the pertinent autonomous systems.

Operation skills practice 2: The operator must be able to actually operate the pertinent model.

Specifically, the operator must be able to do the following appropriately: prepare for flight, carry out the startup inspection, operate the helicopter, perform post flight checks and stow all equipment.

Classroom lectures: Mastery of the knowledge required in order to operate the unmanned helicopter safely must include the following items.

- A. Items pertaining to laws and regulations
- B. Standards relating to the safety of unmanned helicopters (the contents of these Standards)
- C. Provisions and rules pertaining to safety that must be observed particularly closely by the operator
- D. Knowledge of safety measures (failsafe mechanisms) of the pertinent model, and ways of working with those measures
- E. The construction of autonomous systems and daily inspection items

An instructor is a person who has outstanding skills as an operator, and is able to act in the role of a lecturer in the classroom curriculum.

The manufacturer must take responsibility for training the instructor.

When the manufacturer submits notification of the training system, a roster of instructors must be appended. (The roster must indicate whether the instructor is a remote operator of unmanned helicopters, or an autonomous system operator; however, instructors may be both.)

The classroom facilities and teaching materials change significantly depending on the performance requirements for the pertinent model and other factors, so these are left to the discretion of the manufacturer, and no particular standards are provided. However, training must be carried out in a location and using materials that make it possible to sufficiently elicit the performance of the pertinent model.

If changes have been made in the training curriculum or instructors, the Japan UAV Association must be notified promptly.

#### **4.4. Skills Certification**

For persons who have completed the training sponsored by the manufacturer and have satisfied the “Unmanned Helicopter Navigation Endorsement Standards”, the instructor hired by the manufacturer may submit a Form 5 application for operator skills certification, and a Certificate 5 “Operator Skills Certificate” may be issued by the Japan UAV Association.

There are two types of operator skills certificate: a “Remote Operator Skills Certificate” and an “Autonomous Navigation Operator Skills Certificate”.

The model name(s) of the aircraft that can be operated shall be noted on the skills certificate.

If an operator is to operate a different model after obtaining a skills certificate, he or she must carry out procedures for adding the applicable models. This is done based on a letter of recommendation from the instructor hired by the manufacturer.

Skills certificates are to be valid for a period of three years from the time that they are issued (three years for each model for which a skills certificate was first obtained).

Even though applicant has received skills certificate by having certain skills and knowledge and passed examination, they must then continue their training until certificate expires.

If a skills certificate is lost or damaged, the holder of the certificate must promptly notify the Japan UAV Association and must have the certificate re-issued.

The operator must have the skills certificate with him or her when operating an unmanned helicopter, and must present it to related persons if so requested.

### **CHAPTER 5. AIRCRAFT HANDLING STANDARDS**

#### **5.1. Purpose**

This chapter summarizes items that, with regard to safety, must be observed by personnel working with or on the unmanned helicopters. .

#### **5.2. Obligations of Persons Working With the Unmanned Helicopters**

Persons working with unmanned helicopters must operate them in uninhabited areas, regardless of the type of unmanned helicopter, and must make every effort to stay within the boundaries of the uninhabited area.

Moreover, when flying unmanned helicopters, the navigator must do his or her best to avoid flying over the property of third parties. If flying over the property of a third party is unavoidable, permission must be received from the owner.

All of the items to be observed that are noted in these Standards prescribe only contents that are common to all unmanned helicopters, and in addition to these, personnel working with the helicopters have an obligation to similarly observe handling provisions for safety purposes that are set forth by the manufacturer separately from these Standards (different provisions for each model).

Items that must be observed are summarized here divided according to the following three flying conditions:

- (1) Low-altitude flight within visual range
- (2) Flight outside of visual range
- (3) Items requiring particular consideration with regard to handling

##### (1) Low-altitude flight within visual range

This item prescribes items that must be observed when flying within visual range and at a ground clearance of 10 meters or less.

No one may approach the unmanned helicopter within a radius of 15 meters of the helicopter.

The unmanned helicopter must always be flown at a distance of at least 15 meters from people. Additionally, there must be no people present in the direction of advance of the unmanned helicopter.

As a rule, the helicopter must be flown at a speed of 10 meters per second or less. If this speed is to be exceeded, a clearance must be maintained that is proportional to the speed.

Flight must not exceed the capabilities of the aircraft system or flight restrictions. The capabilities of the aircraft system and the flight restrictions shall be based on technical materials such as instruction manuals issued by the manufacturer.

In order to make sure that the unmanned helicopter is flown in uninhabited areas, an appropriate number of personnel shall be in position to monitor safety.

### (2) Flight outside of visual range

This section prescribes items that must be observed when flying outside of visual range.

When taking off and landing, no one may approach the unmanned helicopter within a radius of 15 meters of the helicopter.

In response to the flight speed, the unmanned helicopter must be flown at a distance from people that is equivalent to or exceeding the flight altitude.

The unmanned helicopter must be flown at less than 150 meters AGL .

As a rule, at a ground clearance of 10 meters or less (AGL), the unmanned helicopter must be flown at a speed of 10 meters per second or less. At a ground clearance of 10 meters or more, the helicopter must be flown at a speed of 30 meters per second or less.

Flight must not exceed the capabilities of the aircraft system or flight restrictions. The capabilities of the aircraft system and the flight restrictions shall be based on technical materials such as instruction manuals issued by the manufacturer.

In order to make sure that the unmanned helicopter is flown in uninhabited areas, an appropriate number of personnel shall be in position to monitor safety.

### (3) Items requiring particular consideration with regard to handling the unmanned helicopter

When flying at an altitude of 150 meters or more, in the vicinity of air routes, or in the vicinity of airports

In accordance with Article 99, Section 2 of the Civil Aeronautics Law, procedures such as coordination with various ministries and the issuance of a NOTAM must be carried out, and in addition, technical items pertaining to flight safety must be confirmed with the manufacturer before operating the unmanned helicopter.

Flying in the vicinity of other transportation systems

The unmanned helicopter must not be flown over expressways or over railroads.

## **CHAPTER 6. CUSTOMER CONTROL STANDARDS**

### **6.1. Purpose**

The purpose of these Standards is to make it possible to understand at all times who is using unmanned helicopters, the nationality of the user, where the helicopter is being used and for what purpose, in order to make sure that these helicopters are not used for acts that are contrary to the best interests of society.

### **6.2. Obligations of the Seller**

If a seller is selling an unmanned helicopter (including resale), or is operating or destroying a helicopter, the owner of the unmanned helicopter must be ascertained.

With respect to unmanned helicopters for which model approval has been granted by the Japan UAV Association, a customer control log is established in order to ascertain the owners of the unmanned helicopters.

Unmanned helicopters registered in the customer control log include those that were manufactured domestically (including those that were exported) and those that have been imported into Japan. (However, this does not include unmanned helicopters used for agricultural spraying, which are controlled by the Japan Agricultural Aviation Association.)

Laws and regulations relating to this chapter are those listed below. These must be strictly observed.

Laws and regulations of the Ministry of Economy, Trade and Industry relating to trade management

Laws and regulations relating to environment related waste management

Laws and regulations of police (firefighting) agencies relating to the prevention of terrorism

### **6.3. Customer Control at the Time of Sale**

When an unmanned helicopter marketing company is going to be selling an unmanned helicopter to a customer, a customer investigation must be carried out ahead of time, and the company must avoid selling unmanned helicopters to any national government, group, individual, etc. that has a motive contrary to the best interests of society.

When an unmanned helicopter is sold, the following items must be included in the contract concluded between the buyer and the seller, and the contract must be signed and stamped with the seal of the buyer.

The unmanned helicopter may not be used for any applications other than those decided at the time of sale, without the permission of the seller.

The unmanned helicopter may not be sold or transferred to a third party without the permission of the original seller/manufacturer.

As a rule, if the unmanned helicopter is no longer being used, it should be completely destroyed and disposed of through the seller.

When an unmanned helicopter is sold, the seller must submit a Form 7 Notification of Registration of an Industrial-use Unmanned Aircraft to the Japan UAV Association. The model of the aircraft that was sold, the name, the manufacturing number, the purpose of use, the company selling the aircraft, the owner, and the location where the unmanned helicopter will be stored must be noted on the form.

When the Japan UAV Association receives the above notification, the Association issues a Certificate 6 (Registration Completed Certificate) and a Certificate 7 (Performance Certificate). At the same time, the sale is registered in the unmanned helicopter customer control log.

The seller to whom the certificates have been issued shall affix the Performance Certificate on the relevant aircraft in a place that will be easy to see. Additionally, the registration number shall be painted or affixed to the surface of the aircraft using a text size that is large enough to be easily confirmed.

As a rule, the customer is prohibited from reselling or transferring the unmanned helicopter to a third party. If this is to be done, the seller must be notified in advance.

The seller shall conduct a customer investigation of the third party, and shall verify that the unmanned helicopter will not be used for any purpose that is contrary to the best interests of society.

If a resale or transfer contract is formed, the procedures shall be exactly the same as those used for a new sale.

The Japan UAV Association shall act in concert with related ministries and agencies and shall make every effort to assure that unmanned helicopters will not be used by antisocial organizations.

#### **6.4. Aircraft Control at the Time of Operation**

The customer shall exert every possible form of control to make sure that the unmanned helicopter is not stolen.

In the event of a theft, the customer shall promptly contact the police and the company that sold the unmanned helicopter.

The seller shall visually confirm once a year that the aircraft is under the control of the owner, and shall carry out the procedures to renew the registration. Moreover, the seller shall confirm whether or not the address or other information pertaining to the owner has changed, and shall submit a Form 9 Registration Renewal Notification and apply for the unmanned helicopter customer control log to be updated.

If there has been a change in the address of the owner, the purpose of use, or the location where the unmanned helicopter is kept, the Japan UAV Association shall change the entry in the unmanned helicopter customer control log.

If any antisocial act is perceived in the practical operation method, the seller shall consult with the Japan UAV Association, and shall take legal action such as notifying the police.

This is a requirement in Japan and recommendation for other countries for security and safety reasons.

#### **6.5. Guidelines for the Destruction of Unmanned Helicopters**

If the owner of an unmanned helicopter will no longer be operating the aircraft, the owner must bring the unmanned helicopter to the seller, and must carry out the procedures for canceling the registration.

The seller must destroy the unmanned helicopter that will no longer be operated in such a way that it cannot be flown, and must also dispose of it in a way that conforms to regulations designed to encourage recycling.

The seller must obtain a copy of the proof of disposal (for example, photographs showing the destruction of principal parts with the manufacturing number on them, or manifests relating to recycling) to the Japan UAV Association. The seller must also submit a Form 10 Notification of Registration Deletion to the Japan UAV Association.

If the owner wishes to continue storing the unmanned helicopter without having it destroyed, the seller must destroy multiple principal parts of the unmanned helicopter so that it cannot be flown, must receive a written oath indicating that the unmanned helicopter will not be used, and must submit a Form 10 Notification of Registration Deletion to the Japan UAV Association.

If the Japan UAV Association has received an application for deletion of a registration, the Association deletes the registration from the unmanned helicopter customer control log.

This is a requirement in Japan and recommendation for other countries for security and safety reasons.

	Design standards	Maintenance and inspection standards	Operator qualification standards	Customer control standards	Flight operation standards	Radio wave standards
Primary target of standards	Unmanned helicopters, navigation devices	Aircraft mechanic, servicing plant	Operator	Registration, changes, destruction	Conditions enabling operation	73 MHz, 2.4GHz, others
Application to the Association	Industrial-use Unmanned Aircraft Performance Endorsement Application (Form 1) Industrial-use Unmanned Aircraft Model Addition Application (Form 2)	Industrial-use Unmanned Aircraft Mechanic Skills Approval Application (Form 3) Industrial-use Unmanned Aircraft Servicing Plant Application (Form 4)	Industrial-use Unmanned Aircraft Operator Skills Approval Application (Form 5) Industrial-use Unmanned Aircraft Mechanic Model Expansion Application (Form 6)	Registration Notification for Industrial-use Unmanned Aircraft (Form 7) Servicing Completed Notification for Industrial-use Unmanned Aircraft (Form 8) Registration Renewal Notification for Industrial-use Unmanned Aircraft (Form 9) Registration Deletion Notification for Industrial-use Unmanned Aircraft (Form 10)		
Certificate, etc. issued by the Association	Industrial-use Unmanned Aircraft Performance Endorsement Certificate (Certificate 1) Industrial-use Unmanned Aircraft Model Addition Certification (Certificate 2)	Industrial-use Unmanned Aircraft Mechanic Skills Certification (Certificate 3) Industrial-use Unmanned Aircraft Servicing Plant Certification (Certificate 4)	Industrial-use Unmanned Aircraft Operator Skills Certificate (Certificate 5)	Registration Completed Certificate for Industrial-use Unmanned Aircraft (Certificate 6) Performance Certificate for Industrial-use Unmanned Aircraft (Certificate 7) Regular Servicing Form for Industrial-use Unmanned Aircraft (Certificate 8)		
Management tools	Registered models control log	Servicing plant and aircraft mechanic control log	Operator control log	Customer control log		
Standards formulated by the Association	Unmanned Helicopter Design Safety Standards (these Standards) Navigation Device Design Safety Standards (these Standards) Observation Inspection Standards (Appendix 2)		Unmanned Helicopter Technical Navigation Skills Endorsement Standards (Appendix 3)		Operation standards (low-altitude within visual range, out of visual range - these Standards)	
Criteria that must be formulated by the manufacturer	Design standards, evaluation standards, durability standards, reliability standards	Aircraft mechanic skills approval standards, authorized aircraft mechanic skills approval standards and, servicing plant approval	Training curriculum (remote, autonomous), instructor qualifications standards, operation skills approval standards categorized by	Customer selection standards	Operation standards by model	

		standards	model			
Related bills	Aircraft Manufacturing Industry Law			Export trade directives	Civil Aeronautics Law	Radio Law
Related organizations	Ministry of Economy, Trade and Industry			Ministry of Economy, Trade and Industry, National Police Agency, Japan Agricultural Aviation Association	Ministry of Land, Infrastructure and Transport, Civil Aviation Bureau	Ministry of Internal Affairs and Communication, Bureau of Telecommunications; Japan Radio Control Safety Association
Operation procedures	<p>1. The manufacturer develops an industrial-use unmanned aircraft based on the manufacturer's own voluntary standards.</p> <p>2. The manufacturer submits an application to the Association.</p> <p>3. The Association reviews the documents with respect to safety standards, and conducts an observation inspection on those that pass the review.</p> <p>4. The Association issues a performance endorsement certificate for those that passed the observation inspection. This enables domestic registration of the aircraft.</p>	<p>1. The manufacturer autonomously sets up a mechanic system, and trains the mechanics and establishes a servicing plant.</p> <p>2. The manufacturer submits an application to the Association for mechanics or servicing plants that have met its voluntary standards.</p> <p>3. Based on the documents, the Association confirms that the standards have been met, and issues an endorsement certificate.</p> <p>4. This endorsement certificate is renewed every three years.</p>	<p>1. The manufacturer establishes a training curriculum based on the guidelines set forth by the Association, and carries out operation training.</p> <p>2. Persons who have met the manufacturer's standards submit an application to the Association together with a document indicating that the manufacturer's training program has been satisfactorily completed.</p> <p>3. Based on the documents, the Association confirms that the standards have been met, and issues a skills endorsement certificate.</p> <p>4. This endorsement certificate is renewed every three years.</p>	<p>1. Based on its autonomous customer selection standards, the manufacturer confirms the customer and submits a Notification of Registration to the Association.</p> <p>2. The Association registers the customer in the customer control log and issues notice of confirmation.</p> <p>3. As long as the unmanned helicopter is being operated, the contents of the registration are confirmed every year by means out of a Servicing Completed Notification. At that point, a Regular Inspection Sheet is issued.</p> <p>4. When an unmanned helicopter is destroyed, a document indicating proof of the destruction/Registration Deletion Notification is submitted, and the registration is deleted from the customer control log.</p>	<p>1. When an actual sale is made, the manufacturer explains the operation standards issued by the Association and the standards for operating each of the different models to the user, and encourages the user to make sure that these will be observed. (The manufacturer explains that the user will be liable for any injury or damage to a third-party because of an accident that occurred as a result of a failure to observe the standards.)</p>	

Note) If a request is made to have a form re-issued because the original was lost or damaged, the application will be submitted again using the pertinent form.

## Performance Confirmation Observation Inspection Standards

### **1. Table of contents**

- (1) Confirmation of specifications and data (explanation using the actual aircraft, drawings, etc.)
- (2) Confirmation of conformance to safety requirement standards
- (3) Measurements (data dimensions, weight)
- (4) Flight test
- (5) Other factors (durability, maintenance and servicing, etc.)

### **2. Confirmation of specifications and data**

#### (1) Motor

The engine main unit, fuel system, ignition system, cooling system, dyna-starter system, and other systems will be examined based on the actual items and drawings provided by the applicant, to make sure they are the same as those described in the application.

#### (2) Power transmission drive

The clutch, main rotor drive, tail rotor drive, and other items will be examined based on the actual items and drawings provided by the applicant, to make sure they are the same as those described in the application.

#### (3) Airframe construction

The frame, landing unit, main rotor, tail rotor, and other items will be examined based on the actual items and drawings provided by the applicant, to make sure they are the same as those described in the application.

#### (4) Wireless transmitters and receivers for operation

Transmitters, receivers, antennas, and other items will be examined based on the actual items and drawings provided by the applicant, to make sure they are the same as those described in the application.

Also, it should be indicated that the "Proof of Conformance to Recommended Standards" label issued by the Japan Radio Control Safety Association has been affixed to the transmitter.

#### (5) Control unit

Sensors, control systems, control software, and other items will be examined based on the actual items and drawings provided by the applicant, to make sure they are the same as those described in the application.

#### (6) Control actuators

Servo motors and other items will be examined based on the actual items and drawings provided by the applicant, to make sure they are the same as those described in the application.

### **3. Confirmation of conformance to safety requirement standards**

Based on the safety requirements standards conformance inspection sheet of the applicant, it will be proven, using the actual aircraft whenever possible, that failsafe mechanisms are operating.

With respect to records of flight data, data will be sampled after the test flight has been completed, and it will be proven, using electronic data, that records are being taken correctly.

### **4. Measurements**

#### (1) Dimensional data

Actual measurements will be taken of the principal dimensions noted in the application (overall length, overall height, overall width, rotor diameter, airframe length, etc.). (The basic tolerance will be  $\pm 10$  mm,

and application will be made in advance for those that have particularly large unevenness.)

(2) Measurement of empty weight, and maximum takeoff weight

First, the empty weight of the equipment (full fuel tank + full equipment) will be measured.

Next, the computed added weight calculated from the values measured for the atmospheric pressure and the air temperature (following equation) will be measured to make sure that it is the maximum takeoff weight.

$$\text{Computed added weight} = (\text{maximum takeoff weight} \times 293 / (273 + T_a) \times (P_a - P_w) / 999) - \text{equipment empty weight}$$

$T_a$  = Air temperature (°)

$P_a$  = Atmospheric pressure (hpa)

$P_w$  = Water vapor partial pressure (hpa)

Approach: Converted to JIS standards conditions (air temperature 20°, atmospheric pressure 1,013 hpa, humidity 65%)

## 5. Flight test

The following tests are carried out under the maximum takeoff weight described above.

The flight is carried out under the normal takeoff configuration.

The test is carried out if the wind velocity is within the operation boundary when the test is conducted.

If it looks likely that the wind velocity will exceed the operation limit, the test is delayed until the wind dies down.

The same applies for natural conditions such as rain, frost, and snow.

(1) Takeoff

The unmanned helicopter takes off from within a circle with the same dimensions as the main rotor diameter, and it is confirmed that the center of gravity position of the airframe (may be the same as main rotor mast position) does not move outside of the circle, and that an altitude equivalent to or higher than the main rotor diameter is reached within 10 seconds.

(2) Hovering

At an altitude that is equivalent to or higher than the main rotor diameter, the operator demonstrates that he or she is able to keep the unmanned helicopter hovering using visual operation, and is able to keep the helicopter within a sphere twice that of the main rotor diameter for 30 seconds.

(3) Landing

The operator demonstrates that he or she can land the unmanned helicopter from an altitude equivalent to or higher than the main rotor diameter, with the helicopter landing within 15 seconds in such a way that the center of gravity position is within a circle having the same dimensions as the main rotor diameter.

(4) Operability on the horizontal plane

When the unmanned helicopter is advanced 50 meters at the cruising speed ( $\pm 20\%$ ) specified by the applicant, the offset in the direction of advance must be within 2 meters. It must be proved that this requirement can be satisfied regardless of the wind direction.

(Specifically, two direct flight lines must be provided at 90-degree angles, and the test is carried out four times by going back and forth on these lines.)

(5) Operability in the vertical direction

The helicopter ascends to the limit altitude determined by the applicant, and the flight determined by the applicant is carried out in midair and then the helicopter is landed. There are no particular numeric tolerance values, but it will be confirmed that the helicopter can be operated safely.

(6) Failsafe demonstration flight

If there is a demonstration flight of the failsafe mode that can be carried out safely, it is demonstrated at this point. The way in which this flight is conducted is left to the applicant, but should be reasonable.

(The Association shall be held harmless in the event of any damage from performing this demonstration.)

(7) Pattern flight in order to take records of the flight data

A pattern flight that consists of the following sequence is carried out, and the data is retrieved from the airframe: takeoff – hovering – ascent – descent – right pirouette – advance – backward direction – to the right – to the left – to the right – proportional turn – hovering – landing.

Following the pattern flight, , based on the data downloaded to a computer, that the airframe is operating in accordance with instructions from a human source.

**6. Other factors (relating to durability, maintenance and servicing, etc.)**

(1) It must be proven that the unmanned helicopter has 100 or more hours of flight time.

The flight log must be submitted.

(2) Procedural manuals relating to maintenance, servicing and operation must have been created.

(3) The applicant must respond to questions from the technical committee (responses are not required concerning confidential items).

# Unmanned Helicopter Navigation Skills Endorsement Standards

## (1) Navigation skills endorsement standards

At a speed between 5 and 20 km/h, the operator must be able to make the unmanned helicopter ascend stably to an altitude of 50 m, at a distance of 80 m.

At a given position of an altitude of 50 m and a distance of 80 m, the operator must be able to keep the unmanned helicopter hovering stably for at least 10 seconds, both facing into the wind and with a side wind.

At a given position of an altitude of 50 m and a distance of 80 m, the operator must be able to fly the unmanned helicopter at a speed of between 5 and 20 km/h, make it turn or perform a figure 8, and then make it descend stably.

The operator must be able to make the unmanned helicopter ascend stably to an altitude of 100 m, and a distance of 160 m, at a speed of between 5 and 20 km/h.

At a given position of an altitude of 100 m and a distance of 160 m, the operator must be able to keep the unmanned helicopter hovering stably for at least 10 seconds, both facing into the wind and with a side wind.

At a given position of an altitude of 100 m and a distance of 160 m, the operator must be able to fly the unmanned helicopter at a speed of between 5 and 20 km/h, make it turn or perform a figure 8, and then make it descend stably.

The descent time is 10 second or longer to descend 50 m.

## (2) Criteria for judging flight navigation skills

The degree of navigation skill is judged by a qualifications tester designated by the Japan UAV Association, and the judgment is based on the Skills Approval Score Sheet.

Navigation skills are judged in four ranks, using the "Excellent", "Good", "Fair" and "Fail" stages noted on the Skills Approval Score Sheet.

## (3) Flight navigation skills judgment criteria

Of the four items ("Excellent", "Good", "Fair" and "Fail"), "Fail" is not permitted.

## (4) Notification of navigation skills judgment

The person undergoing training must be notified of the judgment of the four items, and a reason for the judgment must be given.

### Assumed conditions

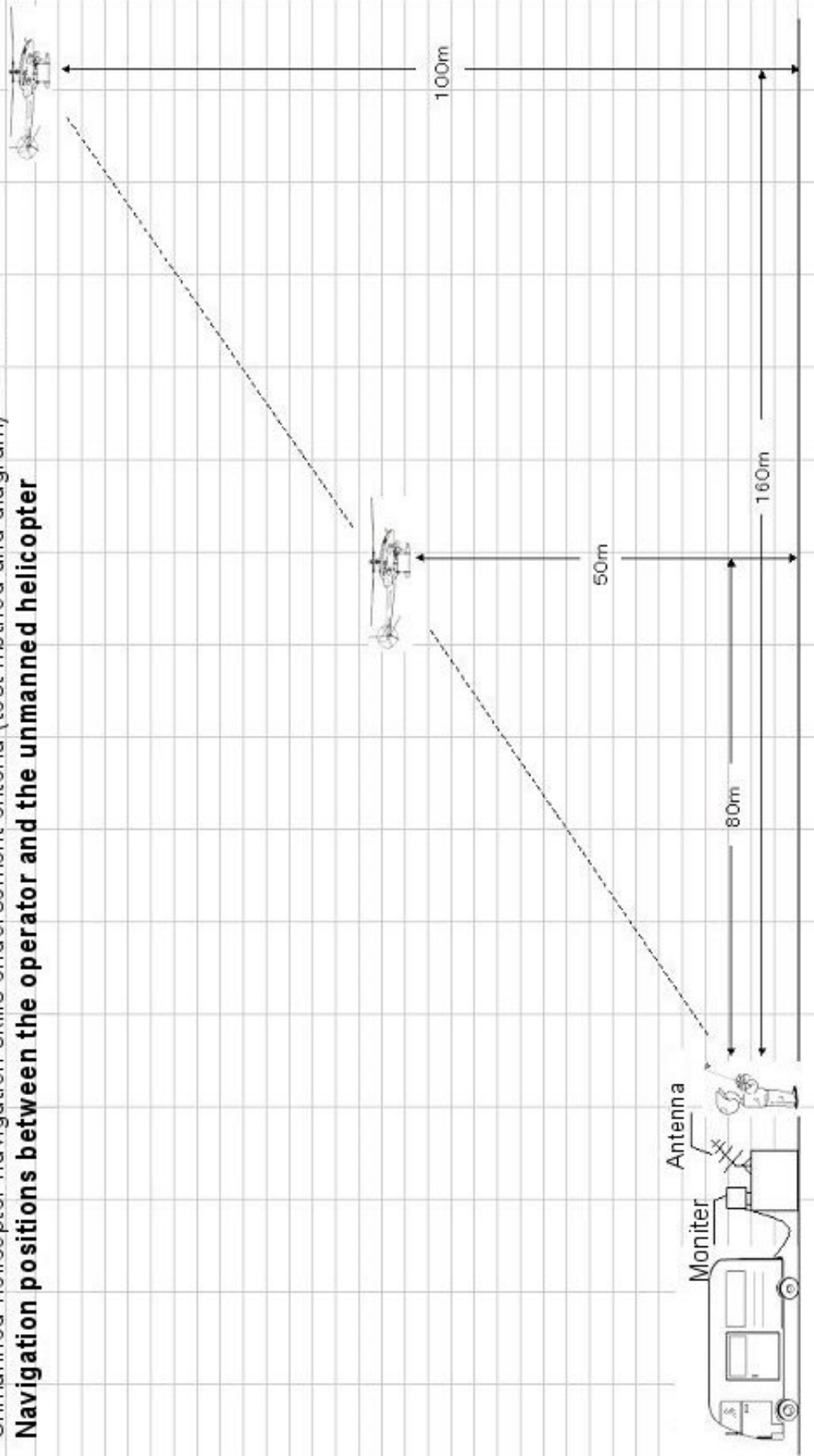
The aircraft used for the flight test must have control functions up to the attitude control level, and must not rely on speed control and position control.

The operator obtains information in order to know the position and speed based on images from camera devices, and from information pertaining to the position and speed provided vocally by the navigator, and uses manual helicopter control to operate the helicopter in conformance with the standards noted above.

When carrying out the test, the qualifications tester obtains objective position information from linear distance data based on movements of the camera images, position information from GPS information, and the laser range finder.

Unmanned helicopter navigation skills endorsement criteria (test method and diagram)

**Navigation positions between the operator and the unmanned helicopter**



Crass. No		Examinee		Inspector	
Overall judgment			Excellent · Good · Fair · Failure		
Test discontinued		Crash, violation against instruction, help from instructor, unsafe flight			

(Pre-flight check)

\* Check off pertinent items.

Confirmation of peripheral safety	People (observer , etc)	
Radio wave check	Whether or not frequency can be used	
Wind velocity confirmation	Wind velocity of 5 m/s or less	
Wind direction confirmation	Wind direction (wind sock)	
Fuel replenishment	Filled until tank is full	
Control system operation check	Control switch, stop switch, failsafe	
Confirmation airframe check	Area around main and tail head, cooling water	
Operation check of devices, etc	Servo, cameras, monitor, etc	

(Skill confirmation)

	Bad mark items	Failed (test discontinued)	Faire	Good	Excellent
The position of height 50m and a distance 80m	Take off	± 5m or more	± 3m or more	± 2m or more	± 1m or more
	Speed when ascending	Dangerous speed	20Km	10Km	5Km
	Path when ascending	Above people or house		Safety considered	Safety sufficient considered
	Tail in hovering (position)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Tail in hovering (altitude)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Nose in hovering (position)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Nose in hovering (altitude)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Speed when descending	Dangerous speed	20Km	10Km	5km
	Path when descending	Above people or house		Safety considered	Safety sufficient considered
Landing	± 5m or more	Within ± 3m	Within ± 2m	Within ± 1m	
	Bad mark items	Failed (test discontinued)	Faire	Good	Excellent
The position of height 100m and a distance 160m	Take off	± 5m or more	± 3m or more	± 2m or more	± 1m or more
	Speed when ascending	Dangerous speed	20Km	10Km	5Km
	Path when ascending	Above people or house		Safety considered	Safety sufficient considered
	Tail in hovering (position)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Tail in hovering (altitude)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Nose in hovering (position)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Nose in hovering (altitude)	± 20 m or more	10m ~ 20m	5m ~ 10m	0m ~ 5m
	Speed when descending	Dangerous speed	20Km	10Km	5km
	Path when descending	Above people or house		Safety considered	Safety sufficient considered
Landing	± 5m or more	Within ± 3m	Within ± 2m	Within ± 1m	

