



Recommendations for UAV operator training and certification requirements





Introduction

Unmanned Aerial Vehicles (UAVs) are increasingly used by farmers for a large host of agricultural activities including pesticide application. Farmers indeed should be enabled to take advantage of new technologies that bring about labour-savings, better precision and reduced operator exposure to pesticide spray. However, it is important these innovations are also used correctly and responsibly to protect operators, bystanders and the environment.

This guidance document aims to provide recommendations on the knowledge and skills required of UAV or drone operators to be **licensed to operate pesticide application safely and effectively**.

Who are UAV operators?

As a relatively new technology, UAV spray operators are typically already engaged in multiple services apart from UAV operation for pesticides. For example, they have existing expertise in general UAV operation or are pesticides spray service providers and farmers and have recently incorporated drone application into their service offerings. In both cases, UAV spray operators will need to acquire and combine additional knowledge of either drones or pesticides on top of their existing area of expertise.

Why do UAV operators need to be certified?

The crop protection industry is a highly regulated industry and has always been held to a high standard to provide farmers with the right tools for crop productivity while minimizing the associated risks. It is also common practice for professional pest control operators (PCOs) to be licensed to conduct the safe spray of pesticides. CropLife Asia is committed to promoting effective stewardship to ensure crop protection products are used in a responsible manner and will continue to work to uphold these practices with new agricultural technologies.

How are other countries regulating UAV operators?

China and Japan are two examples of countries that have developed a framework for training and licensing UAV operators. Both countries employ different approaches and governments can similarly tailor its approach based on the landscape of agricultural drone use in their respective countries.



In **China**, training and licensing of UAV operators is largely privatized due to the influence of leading Chinese drone manufacturers such as DJI and XAG that are dominant players in the global drone market. DJI for example has set up training schools for drone operators and works with CropLife and the crop protection industry to tailor their training for pesticide application by drones.



Japan on the other hand, with a history of using Radio Controlled Helicopters (RCHs) had more centralized control of licensing operators through the Japan Association for Agricultural Aerial Control (Nosui-Kyo). In 2019, however, the government of Japan authorized privatized drone training and licensing. The training manual developed by the Association however continues to be used as a base reference with new editions released to reflect new drone-related regulations in 2019 and 2020.

Regardless of approach, there are some key features that a country should include in its regulatory framework for the training and licensing of UAV operators.

Overview of regulations for UAV operator certification around Asia Pacific

(as of November 2020)

	Does the drone operator need to be licensed?	Is training conducted by country authority or a private training body?	Are operator licenses issued by country authority or a private accredited body?	Is the license to operate UAV integrated with the Pest Control Operator (PCO) license?
China	Yes	<p>The Aircraft Owners and Pilots Association (AOPA) is the official training and certification body registered with the Civil Aviation of China. However, private training bodies (usually drone manufacturers) are the more popular choice among Chinese operators for training and obtaining licenses as its training is more targeted to pesticide application. These private bodies are strongly supported by the government.</p> <p>The industry expects that private drone manufacturers will eventually receive official recognition by the government as a training and certification body.</p>		No
Japan	Yes	Private training bodies are authorized since 2019 in addition to Japan Agricultural Aviation Association (JAAA)	JAAA used to be the dedicated entrusted body, but training has been privatised since the regulations were revised in 2019	No. Two separate licenses are required.
Korea	Yes	Private training bodies are authorized to conduct training	Private accredited bodies are authorized to issue licenses	No. Two separate licenses are required
Philippines	Yes	Private training bodies are authorized to conduct training	Private accredited bodies are authorized to issue licenses	No. Two separate licenses are required
Taiwan	Yes	Government-linked agriculture institute works with universities to train operators	Authorities issue the licenses	No. Two separate licenses are required

What should be included in a training regulatory framework?

1 Extension or integration of existing training and licenses. As mentioned, UAV operators often provide multiple services which will determine the level of training required to conduct pesticide spray service. There are two typical types of licensing in recognition of the multiple services UAV operators can provide:

Example A: A drone flight training by drone manufacturer + general PCO training

This is typically for operators who are currently existing pest control operators (PCOs) license holders. Drone operation skills is then incorporated into an existing pest control training and certification course, as an “top-up” option.

Example B: Drone-specific pesticide training (no PCO license required)

However, it is not always necessary for drone operators to have a full pest control license if pest control is not in his domain of service offering. In certain countries, UAV operators for pesticide spray require basic knowledge and training on pesticides but not a PCO license.

2 Proficiency-testing: Regulatory guidelines should specify minimum training hours and pass rates and limits for test-retakes to ensure competency is upheld for training participants. This should be decided in consultation with the third-party training bodies and subject experts.

3 Upgrading and retraining: Upgrading and retraining of operators is important as drone technology will continue to evolve. Regulatory guidance should specify upgrading and retraining intervals. Similarly, regular evaluation of the training syllabus should also be required.

4 Roles and responsibilities or third-party trainers or certifying bodies: Regulators and typically the civil aviation authorities, accredit and entrust the development of training material, the training and the certification of UAV operators to third party bodies. This is the approach used in China (through private drone academies) and in Japan through an association and more recently, privatized training bodies.

Country authorities, rather than conducting training on their own, can instead ensure that the training conducted by third-parties adequately enables UAV operators to apply pesticides safely and effectively. The next section outlines the key elements of the training syllabus that a UAV operator is recommended to undergo and may be used as a reference for developing or vetting third-party training materials.



Key training topics for UAV operators

The training outline below should not be regarded as a definitive training material but as an indication of the minimum training requirements. Training materials should be localized and developed in consultation with and in consideration of drone manufacturers, local agricultural conditions, and local civil aviation and pesticide regulations.

TOPIC 1: Course Introduction

Objective: This section provides an overview and sets expectations for the training course

Recommended sub-topics:

- What is an unmanned aerial vehicle under the local Aviation Law? (e.g. what are the locally permitted classes of UAV)
- Situation surrounding UAVs (e.g. off-target awareness)
- Local requirements for obtaining a license for UAV operation

Recommended training approach/ methods:

Classroom/ textbook/ e-learning module

Level of detail:

Low



TOPIC 2: Laws and Regulations

Objective: This section is to inform participants of the relevant laws and regulations that operators must operate within and the penalties for non-compliance

Recommended sub-topics:

- Civil aviation law including no fly-zones
- Stewardship or Safe Use Standard Operating Procedures (SOP) (see appendix for references)
- Pesticide application regulation
- Documentation requirements where applicable (flight records)

Recommended training approach/ methods:

As this information can be lengthy, handouts summarizing relevant compliance rules or making these references available online will be useful to accompany the actual training.

Level of detail:

Medium



TOPIC 3: Operational/Technical Knowledge of UAV

Objective: This section focuses on the technical aspects of drone operation from basic operation, flight manoeuvring skills, care and maintenance, and technical information related to pesticide application.

Recommended sub-topics:

Basic Characteristics of UAVs

- Flight control system
- Power system
- Control and link system
- Aircraft type, maintenance and troubleshooting

Flight manoeuvring skills

- Take-off and landing
- Movement and rotation of UAV
- Assessing a field situation (safety checks)
- Environmental parameters (weather limitations)
- Navigating through different topology and barriers

UAV operation for crop protection products

- On crop protection products (mixing/loading, nozzle calibration, UAV height/speed, droplet size, nozzle selection and configuration, etc.)
- On crop protection-related maintenance of UAV (rinsing, outside cleaning, container disposal etc.)

Emergency Procedures

Recommended training approach/ methods:

Field demonstrations in addition to theory lessons. This can be done in collaboration with drone manufacturers.

Practical training hours should be included for flight maneuvering skills.

Level of detail:

High



TOPIC 4: Standard Operation Procedures (SOP) for Safe Pesticide Application

Objective: This section is focused on the safety aspects of drone operations for pesticide spray.

Recommended sub-topics:

Risk-benefit analysis of UAVs for pesticide application

- Non-target exposure (nozzle calibration / selection, drift and environmental safety including recognition of nearby sensitive areas, operator safety including correct selection of PPE)
- Spray efficacy (wind disturbance, uneven coverage, tank mix compatibility, crop type and pest type, relevance of droplet size, recommended spray volume and application timing relative to pest or crop stage)
- Equipment/ UAV system productivity (payload, battery and nozzle orientation)

How to read and adhere to pesticide label instructions

SOP for pre-application, application and post-application (see appendix II)

Pesticides-specific guidance for Responsible Use both in general and specific to UAV application (see appendix II)

Recommended training approach/ methods:

Handouts that summarize the basic dos and don'ts will be useful for operators to have at hand. Some samples are provided in Appendix II.

Proper examination and passing criteria should be carefully considered to ensure operators comply to a high safety standard.

Level of detail:

High



TOPIC 5: Pesticides Knowledge

Objective: This section is focused on specific areas of pesticide knowledge that is necessary and relevant for a drone operator applying pesticides.

The level of detail this section should go into depends on the other services the UAV operator provides. The recommendation below is the minimum standards for one solely conducting pesticide spray for drones without engaging in other pesticide-related services. This training will be suitable for operators applying pesticides selected or purchased by a farmer or person that has the right expertise on pesticides and crop protection. This section of training is not equivalent to and should not be substituted for other pesticide training/ certification courses.

Recommended sub-topics:

Adherence to country regulation

(registered products, specific drone label where applicable)

Adherence to label (human and environmental safety precautions in mixing, loading, and application)

Crop protection product knowledge

(Section 1.2 of FAO 2001 Guidelines on Good Practice for Aerial Application of Pesticides – see Appendix 1a)

- Appropriateness of the pesticide and formulation (specifically those applicable for drone use)
- The correct dose rate, application technique and procedures
- Awareness of the hazards associated with the use of the product
- First-aid procedures in the event of an accident

Recommended training approach/ methods:

Sample labels should be showcased during the training.

CropLife already has existing training materials on this topic and is committed to work further with regulators as needed.

Level of detail:

Medium



APPENDIX I: References for regulatory guidance on training and certification of UAV operators

- A. Food and Agricultural Organization (FAO) of the United Nations:** [Guidelines on Good Practice for Aerial Application of Pesticides](#), 2001
- B. China:** Civil Aviation Administration of China: 中国民用航空局 <<民用无人机驾驶员管理规定>> (Regulation of Commercial UAV Operator Civil Aviation Administration of China), July 11, 2016
- C. Japan:** MoAFF Food Safety and Consumer Affairs Bureau: “[無人マルチローターによる農薬の空中散布に係る安全ガイドライン, 令和元年7月30日付け元消案第1388号農林水産省消費・安全局長通知](#)” (Notification No. 1388, Safety Guideline for Aerial application by Unmanned Multi-rotors), July 30, 2019
- D. Philippines:** Fertilizer and Pesticide Authority (FPA): “Pesticide Regulatory Policies and Implementing Guidelines” (“Green Book”), Third Edition, 2020
- E. South Korea:** Korea Transportation Safety Authority, Ministry of Land, Infrastructure and Transport: “시험정보 안내 – 경량및초경량”/ ([Test Information Guide – Lightweight and Ultralight Aircraft Pilots](#))

APPENDIX II: References for Standard Operating Procedures (SOP)/stewardship guidelines for safe pesticide application by drone

- A. CropLife International:** “[Drone Manual](#)”/ “[Drones Manual \(Summary\)](#)”, 2020
- B. CropLife Asia:** “Recommendations for building a Standard Operating Procedure (SOP) for pesticide application by drone”, 2019
- C. CropLife International:** “[Responsible Use Manual](#)”, 2017
- D. Food and Agricultural Organization (FAO) of the United Nations:** [Guidelines on Good Practice for Aerial Application of Pesticides](#), 2001
- E. China:** China Crop Protection Industry Association (CCPIA): TCCPIA 019-2019: “植保无人飞机安全施用农药作业规范” (Specification for Safe Application of Pesticide by Crop Protection UAS), February 25, 2019
- F. Japan:** Japan Agricultural Aviation Association: [産業用マルチローター 安全対策マニュアル \(オペレーター ナビゲーター\)](#) (Industrial use multi-rotor Safe use manual for operator and navigator): 2020 version
- G. Malaysia:** Pesticides Board: “Prosedur Operasi Standard – Semburan Racun Perosak Menggunakan Unmanned Aerial Vehicle/ Dron” (Standard Operation Procedure – For Pesticides Spraying Using Unmanned Aerial Vehicle/ Drone), Version 1.0, 2018



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