CIVIL AVIATION AUTHORITY OF MALAYSIA
CIVIL AVIATION CIRCULAR (CAC) 01/2025

1st November 2025

CAC REFERENCE NUMBER:	CAC 01/2025
APPLICABILITY:	FLIGHT OPERATIONS
EFFECTIVE DATE:	01/11/2025
DOCUMENT(S) EFFECTED:	CAD 6011 Part (I) – UNMANNED AIRCRAFT SYSTEM REMOTE PILOT TRAINING ORGANISATION
	CAD 6011 Part (II) – UNMANNED AIRCRAFT SYSTEM AGRICULTURAL UAS OPERATIONS

REVISED CADs REQUIREMENTS AND GUIDANCE

1 Introduction

1.1 This Civil Aviation Circular (CAC) is issued by the Chief Executive Officer (CEO) of the Civil Aviation Authority of Malaysia, as CAC 01/2025, in exercise of the powers conferred by section 24O of the Civil Aviation Act 1969 [*Act 3*].

1.2 This CAC, including the attachments is a legally binding document that supersedes the relevant paragraph(s) of the current published standards, requirements, procedures, or guidelines in the CADs.

1.3 The standards, requirements, procedures, or guidelines stated in this CAC will be incorporated into the relevant CADs in the next planned revision cycle.

1.4 Without prejudice, any revision(s) in this CAC is only applicable to the aforementioned chapter or paragraph of the CADs herewith thereto.

2 Revision(s)

2.1 The revision(s) of the CADs affected can be found in attachments as below.

No.	Attachment	CAD
1	Attachment 1	CAD 6011 Part (I) – Unmanned Aircraft System Remote Pilot Training Organisation
2	Attachment 2	CAD 6011 Part (II) – Unmanned Aircraft System Agricultural UAS Operations

3 Incorporating changes into CADs and CAGMs

3.1 The changes stated in this CAC will be incorporated into the next revision of the applicable CADs.

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Chief Executive Officer
for Civil Aviation Authority of Malaysia
1 November 2025

ATTACHMENT 1 TO CAC 01/2025: CAD 6011 PART I – UNMANNED AIRCRAFT SYSTEM REMOTE PILOT TRAINING ORGANISATION

1 Revision(s)

1.1 **Chapter 2.2 Abbreviation**

1.1.1 To add as follows:

RCoC-AL	Remote Pilot Certificate of Competency - Agriculture Light

1.1.1.1 **Reason for change**: A new abbreviation is added to introduce the new certificate, RCoC-AL.

1.2 **Paragraph 3.12**

1.2.1 Paragraph **3.12.8.1** has been amended as follows:

Additional requirements on RFI/RGI teaching Agricultural Module and RCoC-AL.

1.2.1.1 **Reason for change**: For the inclusion of instructor requirement for RCoC-AL.

1.2.2 Paragraph **3.12.9.4** has been amended as follows:

An AE/FIE assessing for Module 2 (Agricultural Operations) and RCoC-AL shall hold a valid Pest Control Operator (PCO) certificate issued by LRMP.

1.2.2.1 **Reason for change**: For the inclusion of AE/FIE requirement for RCoC-AL.

1.3 **Paragraph 4.1.1**

1.3.1 Paragraph **4.1.1** has been amended as follows:

Minimum age requirement for the issuance of RCoC-B, its additional modules and RCoC-AL by the CAAM is 18 years old. Minimum age requirement for the issuance of A2 RCoC by the CAAM is 16 years old.

1.3.1.1 **Reason for change**: To provide requirement for the issuance of RCoC-AL.

1.4 **Paragraph 4.5**

1.4.1 Paragraph **4.5.5** has been amended by inserting additional sub-paragraph after a) as follows:

b) All teaching materials for RCoC-AL shall be developed in dual language – both English and Bahasa Malaysia.

1.4.1.1 **Reason for change**: To fulfil requirement of RCoC-AL syllabus being taught in dual language.

1.4.2 Paragraph **4.5.6** has been amended by inserting additional sub-paragraph after b) as follows:

c) All student handout for RCoC-AL shall be developed in dual language – both English and Bahasa Malaysia.

1.4.2.1 **Reason for change:** To fulfil requirement of RCoC-AL syllabus being taught in dual language.

1.5 **Paragraph 6.1.1**

1.5.1 Paragraph **6.1.1.a) 2) ii)** has been amended as follows:

ii) If the RCoC-B is paired with Module 2 (AGR), the Certificate holder may conduct operations for commercial agricultural UAS works which include dispensation operations and fulfils requirements of CAD 6011 (II).

1.5.1.1 **Reason for change:** To provide distinction between training/competency requirements for remote pilot operating under commercial agricultural UAS works approval and private agricultural UAS works approval.

1.5.2 Paragraph **6.1.1.a) 2)** has been amended by inserting the additional requirement after iii) as follows:

iv) With RCoC-AL, the certificate holder may conduct operations for private agricultural UAS works which include dispensation operations and fulfils requirements of CAD 6011 (II).

a.2.iv.1 The syllabus requirements are detailed at Appendix 5 (A)(i) – Theoretical Knowledge Syllabus for RCoC-AL (English), Appendix 5 (A)(ii) – Theoretical Knowledge Syllabus for RCoC-AL (Bahasa Malaysia), and Appendix 5 (B)(i) – Practical Flying Syllabus/Assessment Criteria for RCoC-AL (English) and Appendix 5 (B)(ii) – Practical Flying Syllabus/Assessment Criteria for RCoC-AL (Bahasa Malaysia).

1.5.2.1 **Reason for change**: To introduce a new competency requirement for private agricultural UAS works approval and to provide guideline on the theoretical and practical flying syllabus.

1.6 **Paragraph 6.1.1.1**

1.6.1 Paragraph **6.1.1.1** has been amended as follows:

For better understanding of the RCoC-B, its additional modules and RCoC-AL, refer below:

a) Basic Module

1) **RCoC-B (RCoC-Basic) module**: This module is suitable for VLOS operations. However, this module is not suitable for operations close to uninvolved persons.

b) Additional Modules.

1) **RCoC (EVLOS) module 1**: This module covers operations that involve and unmanned aircraft being flown beyond VLOS of the remote pilot but make use of visual observers for the purpose of avoiding collisions (i.e. operations that are frequently referred to as Extended VLOS [EVLOS]).
2) **RCoC (AGR) module 2**: This module covers operations for agricultural UAS works which include dispensation operations.

c) Special Module

1) **RCoC-AL module**: This module covers requirements for private agricultural UAS works. It covers the content of both RCoC-B and Module 2 (AGR) syllabus which has been tailored to better suite the operational needs of private agriculture operations.

Note. – CAAM will come up with additional module(s) at a later stage.

d) Each competency certificate (the RCoC-B, its additional modules and RCoC-AL) is valid until the expiry date which will be at the end of the month of which the assessment of competence is done, 5 years later.

e) The RCoC comprises of both a theoretical knowledge examination and a practical flight test, conducted at an RPTO facility.

1.6.1.1 **Reason for change**: To provide further explanation on the introduction of the RCoC-AL syllabus as well as validity period of the competency certificate.

1.7 **Paragraph 7.1**

1.7.1 Paragraph **7.1.1** has been amended as follows:

The RCoC-B and/or its additional module(s) and RCoC-AL theoretical examination must be conducted under formal online examination provided by the CAAM at the RPTO test centres.

1.7.1.1 **Reason for change:** To include the new syllabus under the theoretical examination and practical flying test process.

1.7.2 Paragraph **7.1.2** has been amended by inserting sub-paragraph d) as follows:

The examination shall comprise depending on the course taken, as following:

a) a minimum of 60 questions for RCoC-B

b) 30 questions for module 2

c) 30 questions for A2 RCoC.

d) 60 questions for RCoC-AL.

1.7.2.1 **Reason for change:** To include the requirement for number of theoretical examination questions for the new syllabus.

1.7.3 Paragraph **7.1.4** has been amended by inserting sub-paragraph d) as follows:

The duration of the examination shall be, depending on the course taken, as following:

a) RCoC-B: 90 minutes

b) Module 2: 45 minutes

c) A2 RCoC: 45 minutes.

d) RCoC – AL: 90 minutes.

1.7.3.1 **Reason for change:** To provide requirement for the duration of the theoretical examination for the new syllabus.

1.7.4 Paragraph **7.1.7.2** has been amended as follows:

The RCoC-B and/or its additional module(s) and the RCoC-AL theoretical knowledge examination provided by the CAAM, as well as any associated theoretical knowledge training courses that are provided by the RPTO, shall cover at minimum all subject areas as listed as following:

	Item	Subjects
a)	RCoC-B	Theoretical Knowledge Syllabus for RCoC-B
b)	Module 1	Does not require an additional theoretical knowledge syllabus. Only require practical flight test training and assessment.
c)	Module 2	Theoretical Knowledge Syllabus for Module 2
d)	RCoC-AL	Theoretical Knowledge Syllabus for RCoC-AL (English) Theoretical Knowledge Syllabus for RCoC-AL (Bahasa Malaysia)

1.7.4.1 **Reason for change:** For the inclusion of the new syllabus.

1.8 **Appendices**

1.8.1 **Appendix 5(A)(i) – Theoretical Knowledge Syllabus for RCoC-AL (English)** has been inserted after Appendix 4(B), as follows:

Subjects	**Areas to be covered**
Chapter 1: UAS General Knowledge	
1.1 **Introduction to UA**	*1.1.1* Definition of UAS *1.1.2* Provide basic introduction on different types of UAS (ie. Multi Rotor, Fixed Wing, VTOL)
1.2 **Common terminology**	*1.2.1* VLOS *1.2.2* EVLOS *1.2.3* BVLOS *1.2.4* Assemblies of People *1.2.5* Uninvolved Persons *1.2.6* Unmanned Aircraft System *1.2.7* Aerial work *1.2.8* Designated Area *1.2.9* Autonomous Operations *1.2.10* 1:1 Rule *1.2.11* AGL *1.2.12* AMSL
1.3 **UA Components and Functions**	*1.3.1* Power and Propulsion system *1.3.2* Flight Battery *1.3.2.1* Battery calculation *1.3.2.2* Good practices of UA Battery *1.3.2.2.1* Connectors *1.3.2.2.2* Charging *1.3.2.2.3* Balancing *1.3.2.2.4* Discharging

	1.3.2.2.5 Storage *1.3.2.2.6* Disposal *1.3.3* Motor *1.3.3.1* What is Brushless Motor *1.3.4* Electronics Speed Controller *1.3.4.1* Functions of ESC *1.3.5* Telemetry System *1.3.6* Remote Controller *1.3.7* Telemetry Modules (Transmitter and Receiver) *1.3.8* Payload and Sensors *1.3.8.1* Payload (i.e. Camera) *1.3.8.2* Inertial Measurement Unit (IMU) – Accelerometer and Gyroscope *1.3.8.3* Global Positioning System (GPS) Module *1.3.8.4* Barometer *1.3.8.5* Additional components for Agriculture UAS *1.3.8.5.1* Overview of spraying systems *1.3.8.5.2* Tanks (Tank Level Sensors) *1.3.8.5.3* Nozzles *1.3.8.5.4* Pumps *1.3.8.5.5* Flow regulators (Flow Sensors) *1.3.8.5.6* Spray System Controller
***1.4* Principles of Flight**	*1.4.1* The Four Forces of Flight *1.4.1.1* Thrust *1.4.1.2* Lift *1.4.1.3* Weight *1.4.1.4* Drag *1.4.2* Three Axes of Flight *1.4.2.1* Lateral Axis (Pitch) *1.4.2.2* Vertical Axis (Yaw) *1.4.2.3* Longitudinal Axis (Roll) *1.4.3* Radio Control Movements

	1.4.3.1 Mode 1 *1.4.3.2* Mode 2 *1.4.3.3* Mode 3 *1.4.4* Mode 4
1.5 **UAS Limitations**	*1.5.1* Datalink Frequencies/ Spectrum *1.5.2* Maximum Take-off Mass *1.5.2.1* What is Maximum Take-off mass *1.5.3* Battery Duration and Endurance *1.5.4* Structural Limitations *1.5.5* Centre of Gravity *1.5.6* Payload and its effects during flight
1.6 **Maintenance of System**	*1.6.1* Scheduled and Unscheduled Maintenance *1.6.2* Security of UA/ Attached items *1.6.3* Manufacturer's recommendations
1.7 **Technical Mitigations**	*1.7.1* Ground Risk *1.7.2* Air Risk
Chapter 2: Air Law and UAS Regulatory Requirement	
2.1 **ICAO**	*2.1.1* History of ICAO *2.1.2* Brief introduction of ICAO Annexes (Annex 1 – 19)
2.2 **Regulators**	*2.2.1* Civil Aviation Authority Malaysia (CAAM) *2.2.1.1* Civil Aviation Act 1969 [*Act 3*] *2.2.1.1.1* Section 24O of Act 3 *2.2.1.2* Civil Aviation Regulations 2016 [*P.U.(A) 97/2016*] *2.2.1.3* Civil Aviation Directives *2.2.1.3.1* Civil Aviation Directives Part (II) - Agricultural UAS Operations *2.2.1.3.1.1* UAWC Requirements *2.2.1.3.1.2* Private UAWC Requirements *2.2.1.3.1.3* Commercial UAWC Requirements *2.2.1.4* Civil Aviation Circulars *2.2.1.5* Civil Aviation Notices

	2.2.1.6 Civil Aviation Guidance Materials *2.2.1.7* Safety Directives. *2.2.1.8* Safety Information *2.2.2* Department of Survey and Mapping Malaysia (JUPEM) *2.2.2.1* Official Secrets Act 1972 [*Act 88*], Section 4 and Section 7 *2.2.2.1.1* Application procedure for *Permit Penggambaran/Pemetaan Udara* *2.2.3* Standard and Industrial Research of Malaysia (SIRIM) *2.2.3.1* Responsibility of SIRIM *2.2.3.2* SIRIM Requirement on UAS *2.2.3.3* Type of Approval/Certification issued by SIRIM *2.2.3.3.1* Type Approval (Certificate of Conformity) *2.2.3.3.2* Special Approval *2.2.4* Malaysian Communications and Multimedia Commission (MCMC) *2.2.4.1* Responsibility of MCMC *2.2.4.2* MCMC Requirement on UAS *2.2.4.3* MCMC Approved Frequency *2.2.4.4* Type of Approval/Certification issued by SIRIM *2.2.4.4.1* Class Assignment (CA) *2.2.4.4.2* Apparatus Assignment (AA) *2.2.5* Malaysia Office of the Chief Government and Security Office (CGSO) *2.2.5.1* Responsibility of CGSO *2.2.5.1.1* Governs all *Kawasan Larangan dan Tempat Larangan* and *Sasaran Penting* (KLTL and SP) *2.2.6* Additional authorisation required for UA operations in Sabah *2.2.6.1* Sabah Lands and Survey Department (JTU) *2.2.6.1.1* Application procedure for approval/authorisation from JTU *2.2.6.2* Sabah State Home Affairs and Research Office (PHEDNP)

	2.2.6.2.1 Application procedure for approval/authorisation from PHEDNP *2.2.7* Additional authorisation required for UA operations in Sarawak. *2.2.7.1* Office of Premier of Sarawak *2.2.7.1.1* Application procedure to obtain approval/authorisation from Sarawak State Security and Enforcement Unit (UKPS) *2.2.7.2* Land and Survey Department Sarawak (JTSS) *2.2.7.2.1* Application procedure to obtain approval/authorisation from JTSS
2.3 **Additional Regulatory Requirements In Regards To Agricultural UAS Operations in Malaysia.**	*2.3.1* Ministry of Agriculture and Food Security *2.3.1.1* Pesticides Act 1974 [*Act 149*] *2.3.1.2* Pesticides (Licencing for Sale and Storage for Sale) Rules 2007 [*P.U.(A) 399/2007*]
2.4 Occurrence Reporting	*2.4.1* Purpose of Occurrence Reporting *2.4.1.1* Occurrence Reporting Regulations - Regulation 165 of CAR 2016 *2.4.2* Definitions *2.4.2.1* Reportable Occurrence *2.4.2.2* Accident *2.4.2.3* Serious incident *2.4.2.4* Fatal Injury *2.4.3* Occurrence Reporting Flowchart *2.4.3.1* Reportable Items *2.4.4* Organisations involved *2.4.4.1* Reporting Requirement – AAIB *2.4.4.2* Reporting Requirement – CAAM
Chapter 3: Airspace Operating Principles	
3.1 Flight Information Region (FIR)	*3.1.1* Basic Introduction to Aerodrome *3.1.2* Basic Introduction to airways system *3.1.3* Introduction to class A, B, C and G airspace

3.2 Aeronautical Information Services	*3.2.1* Introduction to Aeronautical Information Services (AIS) - Aeronautical Information Publication (AIP), Aeronautical Information Circular (AIC), NOTAM, Aeronautical Charts *3.2.1.1* Notice to Airmen (NOTAM) *3.2.1.1.1* NOTAM for UAS *3.2.1.1.2* How to Read NOTAM
3.3 **Navigation Warning**	*3.3.1* Prohibited Area *3.3.2* Restricted Area *3.3.3* Danger Area
Chapter 4: Human Performance Limitation	
4.1 **Introduction to Human Performance Limitation (HPL)**	*4.1.1* Introduction to HPL *4.1.2* Relations of accidents and incidents to human error *4.1.3* Relations of human error to Human Performance and Limitation
4.2 Common performance limitation	*4.2.1* Fatigue *4.2.1.1* Definition of Fatigue *4.2.1.2* Type of Fatigue *4.2.1.3* Physical Fatigue *4.2.1.3.1* Example of Physical Fatigue *4.2.1.4* Mental Fatigue *4.2.1.4.1* Example of Mental Fatigue (Commercial pressure/ work stress)

4.3 Receptors Limitation during UA Operations	*4.3.1* Vision Limitation *4.3.1.1* Sunlight Radiation *4.3.1.1.1* Effects and Ways to Overcome *4.3.1.2* Dust and Debris *4.3.1.2.1* Effects and Ways to Overcome *4.3.1.3* Lighting transition from surrounding to screen *4.3.1.3.1* Effects and Ways to Overcome *4.3.2* Auditory Limitation *4.3.2.1* Noise from UA (Turbine and Propeller) *4.3.2.1.1* Effects and ways to overcome *4.3.2.2* Hearing Loss *4.3.2.2.1* Avoid long exposure to the sound *4.3.2.2.2* Use earmuffs for high-intensity noise operations
Chapter 5: UAS Navigation Systems	
5.1 Fundamentals of UAS Navigation	*5.1.1* Overview of GPS *5.1.2* Signal accuracy and limitations in rural/agricultural terrain *5.1.3* Sources of GNSS error: multipath, atmospheric interference, shading
5.2 Real Time Kinematics (RTK)	*5.2.1* What is RTK and how it enhances positioning *5.2.2* Components: base station, rover (UAS), telemetry link *5.2.3* Use cases: precision spraying.
Chapter 6: Airmanship and Aviation Safety	
***6.1* Airmanship**	*6.1.1* Definition and importance of airmanship *6.1.2* Good flying etiquette and responsibility *6.1.2.1* Respecting UAS limitations (payload, battery, weather) *6.1.2.2* Maintaining situational awareness over complex terrain *6.1.2.3* Discipline in following procedures and regulations *6.1.2.4* Strict adherence to pre-flight checklists and SOPs *6.1.2.5* Ethical conduct in handling payloads (e.g., pesticides/fertilizers)

6.2 Crew Resource Management	*6.2.1* Role of CRM in two-person agricultural UAS teams *6.2.2* Visual Observer (VO) *6.2.2.1* Situational reporting *6.2.2.2* Hazard identification *6.2.2.3* Airspace awareness *6.2.2.4* Communication with PIC (Pilot-in-Command) *6.2.3* Effective crew coordination: *6.2.4* Shared mental models *6.2.5* Radio/hand signal communications *6.2.6* Task separation (remote pilot, visual observer, payload handler)
Chapter 7: Operational Procedures	

7.1 **Pre-Flight**	*7.1.1* Mission Planning *7.1.1.1* Type of spraying method (spot spraying or blanket spraying) *7.1.1.2* Flight paths (AB flight paths or grid pattern) *7.1.2* Risk Assessment *7.1.2.1* Hazard Identification *7.1.2.2* Risk Analysis *7.1.2.3* Risk Assessment and Tolerability *7.1.2.4* Risk Mitigation *7.1.3* Defining operational area *7.1.3.1* Boundary Zones *7.1.3.1.1* Green Area (Activity Area) *7.1.3.1.2* Yellow Line (Cautious Area) *7.1.3.1.3* Red Line (Emergency Zone) *7.1.3.1.4* Blue Line (Boundary Line) *7.1.4* Ensure relevant submission of declaration before operations *7.1.5* Informing nearby ATC/FIS before operation starts *7.1.6* Weather Consideration *7.1.7* Pre-flight Setup *7.1.7.1* Loading of chemicals *7.1.7.2* Proper usage of PPE *7.1.8* Operational Briefing
7.2 **Take-off**	*7.2.1* Take-off procedures *7.2.2* Safe take off in farm environments
7.3 **In-flight**	*7.3.1* Active monitoring of UA status. *7.3.2* Situational awareness of the operational volume *7.3.3* Crewmember always on-looking for potential threats such as birds, low-level aircraft, weather and other UA users. *7.3.4* Monitoring of spray system.

7.4 **Landing**	*7.4.1* Ensure the landing area is cleared *7.4.2* Identify another emergency landing spot *7.4.3* Implement shut down sequence of the UA *7.4.4* Safe landing in farm environments
7.5 **Post-flight**	*7.5.1* Conduct UA post-flight inspections *7.5.2* Debriefing *7.5.3* Documentation of post-flight operations (Flight-log, battery log, etc) *7.5.3.1* Storage of flight log – Physical or software.
7.6 Emergency and Abnormal Situation	*7.6.1* Definition of Emergency situation *7.6.2* Definition of an abnormal situation *7.6.3* Example of Emergency and Abnormal Situation *7.6.4* Handling UA Emergency situation *7.6.5* Handling UA abnormal situation
7.7 Emergency Response Plan (ERP)	*7.7.1* What is ERP *7.7.2* Objective of ERP *7.7.3* Example of ERP situations and Supplementary Documents
7.8 Payload and Dispensation Systems	*7.8.1* Types of agricultural payloads *7.8.1.1* Pesticides *7.8.1.2* Herbicides *7.8.1.3* Fertilizer *7.8.2* Chemical compatibility and Mixing Procedures *7.8.3* Storage and transportation of chemicals *7.8.4* Personal Protective Equipment (PPE) requirements
7.9 **Insurance**	*7.9.1* Insurance requirement *7.9.1.1* Insurance shall cover liability towards the third party *7.9.1.2* Insurance shall be valid for the operations of RPTO, UAWC, and SUP

1.8.1.1 **Reason for change:** To provide guideline for the development on teaching materials for RCoC-AL in English.

1.8.2 **Appendix 5(A)(ii) – Theoretical Knowledge Syllabus for RCoC-AL (Bahasa Malaysia)** has been inserted after Appendix 5(A)(i) – Theoretical Knowledge Syllabus for RCoC-AL (English), as follows:

Subjek	***Skop Pembelajaran***
***Bab 1*: *Pengetahuan Am* UAS**	
1.1 Pengenalan kepada UA	*1.1.1* *Definisi* UAS *1.1.2* *Pengenalan asas kepada pelbagai jenis* UAS (i.e. Multi Rotor, Fixed Wing, VTOL)
1.2 Istilah umum	*1.2.1* VLOS *1.2.2* EVLOS *1.2.3* BVLOS *1.2.4* Assemblies of People *1.2.5* Uninvolved Persons *1.2.6* Unmanned Aircraft System *1.2.7* Aerial work *1.2.8* Designated Area *1.2.9* Autonomous Operations *1.2.10* 1:1 Rule *1.2.11* AGL *1.2.12* AMSL
1.3 Komponen* UA *dan Fungsinya	*1.3.1* *Sistem kuasa dan pendorongan* *1.3.2* *Bateri penerbangan* *1.3.2.1 Pengiraan bateri* *1.3.2.2 Amalan baik bagi pengunaan dan penyelenggaran bateri* UA. *1.3.2.2.1* *Penyambung* (Connectors) *1.3.2.2.2* *Pengecasan* *1.3.2.2.3* *Pengimbangan* (Balancing) *1.3.2.2.4* *Nyahcas* (Discharging) *1.3.2.2.5* *Penyimpanan* *1.3.2.2.6* *Pelupusan*

	1.3.3 Motor *1.3.3.1 Motor* Brushless *1.3.4* Electronic Speed Controller (ESC) *1.3.4.1 Fungsi* ESC *1.3.5 Sistem telemetri* *1.3.6 Alat kawalan jauh* *1.3.7 Modul Telemetri (Pemancar dan Penerima)* *1.3.8 Muatan* (payload) *dan pengesan* (sensor) *1.3.8.1 Muatan* (payload) (i.e. *Kamera*) *1.3.8.2* Inertial Measurement Unit (IMU) – Accelerometer *dan* Gyroscope *1.3.8.3 Modul* Global Positioning System (GPS) 1.3.8.4 Barometer *1.3.8.5 Komponen tambahan untuk* Agriculture UAS *1.3.8.5.1 Gambaran sistem penyemburan* *1.3.8.5.2 Tangki* (Tank Level Sensors) *1.3.8.5.3 Nozel* *1.3.8.5.4 Pam* *1.3.8.5.5 Pengawal aliran* (Flow Sensors) *1.3.8.5.6 Pengawal sistem semburan*
1.4 Prinisip Penerbangan	*1.4.1 Empat daya penerbangan* 1.4.1.1 Thrust 1.4.1.2 Lift 1.4.1.3 Weight 1.4.1.4 Drag *1.4.2 Tiga paksi penerbangan* *1.4.2.1 Paksi lateral* (Pitch) *1.4.2.2 Paksi menegak* (Yaw) *1.4.2.3 Paksi membujur* (Roll) *1.4.3 Pergerakan kawalan radio* *1.4.3.1 Mod 1* *1.4.3.2 Mod 2*

	1.4.3.3 Mod 3 *1.4.3.4 Mod 4*
***1.5 Had* UAS**	*1.5.1 Frekuensi* datalink *atau spektrum* *1.5.2* Maximum Take-Off Mass (MTOM) *1.5.2.1 Pengenalan kepada* Maximum Take-Off Mass (MTOM) *1.5.3 Tempoh dan ketahanan bateri* *1.5.4 Batas struktur* *1.5.5* Centre of Gravity *1.5.6 Kesan muatan* (payload) *terhadap penerbangan*
***1.6 Penyelenggaraan Sistem* UAS**	*1.6.1 Penyelenggaraan berjadual dan tidak berjadual* *1.6.2 Keselamatan* UA *dan peralatan yang dipasang* *1.6.3 Cadangan pengeluar*
1.7 Mitigasi Teknikal	*1.7.1 Risiko darat* *1.7.2 Risiko udara*
***Bab 2: Undang-undang Udara dan Keperluan Kawal Selia* UAS**	
***2.1* ICAO**	*2.1.1 Sejarah* ICAO *2.1.2 Pengenalan ringkas* ICAO Annexes (Annex 1 – 19)
2.2 Pengawal Selia	*2.2.1 Pihak Berkuasa Penerbangan Awam* (CAAM) *2.2.1.1 Akta Penerbangan Awam 1969 [Akta 3]* *2.2.1.1.1 Seksyen 24O Akta 3* *2.2.1.2 Peraturan-Peraturan Penerbangan Awam 2016 [P.U.(A) 97/2016]* 2.2.1.3 Civil Aviation Directives 2.2.1.3.1 Civil Aviation Directives Part (II) – Agricultural UAS Operations *2.2.1.3.1.1 Keperluan* UAWC *2.2.1.3.1.2 Keperluan* Private UAWC *2.2.1.3.1.3 Keperluan* Commercial UAWC 2.2.1.4 Civil Aviation Circulars 2.2.1.5 Civil Aviation Notices 2.2.1.6 Civil Aviation Guidance Materials

	2.2.1.7 Safety Directives 2.2.1.8 Safety Information *2.2.2 Jabatan Ukur dan Pemetaan Malaysia* (JUPEM) *2.2.2.1 Akta Rahsia Rasmi 1972 [Akta 88], Seksyen 4 dan Seksyen 7* *2.2.2.1.1 Prosedur permohonan untuk Permit Penggambaran/Pemetaan Udara* *2.2.3 Institut Piawaian dan Penyelidikan Perindustrian Malaysia* (SIRIM) *2.2.3.1 Tanggungjawab* SIRIM *2.2.3.2 Keperluan* SIRIM *untuk* UAS *2.2.3.3 Jenis kelulusan atau pensijilan yang dikeluarkan oleh* SIRIM 2.2.3.3.1 Type Approval (Certificate of Conformity) 2.2.3.3.2 Special Approval *2.2.4 Suruhanjaya Komunikasi dan Multimedia Malaysia* (MCMC) *2.2.4.1 Tanggungjawab* MCMC *2.2.4.2 Keperluan* MCMC *untuk* UAS *2.2.4.3 Frekuensi yang diluluskan oleh* MCMC *2.2.4.4 Jenis kelulusan atau pensijilan yang dikeluarkan oleh* MCMC *2.2.4.4.1* Class Assignment (CA) *2.2.4.4.2* Apparatus Assignment (AA) *2.2.5 Pejabat Ketua Pegawai Keselamatan Kerajaan Malaysia* (CGSO) *2.2.5.1 Tanggungjawab* CGSO *2.2.5.1.1 Mengawal semua Kawasan Larangan dan Tempat Larangan dan Sasaran Penting (KLTL dan SP)* *2.2.6 Keperluan kebenaran atau kelulusan tambahan untuk operasi* UAS *di Sabah* *2.2.6.1 Jabatan Tanah dan Ukur Sabah* (JTU) *2.2.6.1.1 Prosedur permohonan kelulusan daripada* JTU *2.2.6.2 Pejabat Hal Ehwal Dalam Negeri dan Penyelidikan Sabah* (PHEDNP) *2.2.6.2.1 Prosedur permohonan kelulusan daripada* PHEDNP

	2.2.7 Keperluan kebenaran dan kelulusan tambahan untuk operasi UAS *di Sarawak* *2.2.7.1 Jabatan Premier Sarawak* *2.2.7.1.1 Cara permohonan kelulusan daripada Unit Keselamatan dan Penguatkuasaan Sarawak* (UKPS) *2.2.7.2 Jabatan Tanah dan Survei Sarawak* (JTSS) *2.2.7.2.1 Cara permohonan kelulusan daripada* JTSS
2.3 Keperluan kawal selia tambahan berkaitan operasi pertanian* UAS *di Malaysia.	*2.3.1 Kementerian Pertanian dan Keterjaminan Makanan* *2.3.1.1 Akta Racun Perosak 1974 [Akta 149]* *2.3.1.2 Peraturan-Peraturan Racun Perosak (Perlesenan bagi Jualan dan Penyimpanan) 2007 [P.U.(A) 300/2007]*
2.4 *Pelaporan Kejadian*	*2.4.1 Tujuan untuk pelaporan kejadian* (Occurrence Reporting) *2.4.1.1 Peraturan pelaporan kejadian - Peraturan* 165 CAR 2016 *2.4.2 Definisi* 2.4.2.1 Reportable Occurrence 2.4.2.2 *Kemalangan* (Accident) 2.4.2.3 *Insiden serius* (Serious incident) 2.4.2.4 *Kecederaan Maut* (Fatal injury) *2.4.3 Carta alir pelaporan kejadian* *2.4.3.1 Item yang perlu dilaporkan* *2.4.4 Organisasi yang terlibat* *2.4.4.1 Keperluan laporan* – AAIB *2.4.4.2 Keperluan laporan* – CAAM
Bab 3: Prinsip Operasi Ruang Udara	
3.1 Flight Information Region (FIR)	*3.1.1 Pengenalan asas kepada* Aerodrome *3.1.2 Pengenalan asas kepada sisten laluan udara* *3.1.3 Pengenalan kepada kelas ruang udara* A, B, C *dan* G.
3.2 Aeronautical Information Services	*3.2.1 Pengenalan kepada* Aeronautical Information Services (AIS) - Aeronautical Information Publication (AIP), Aeronautical Information Circular (AIC), NOTAM, Aeronautical Charts *3.2.1.1* Notice to Airmen (NOTAM) *3.2.1.1.1* NOTAM *untuk* UAS

	3.2.1.1.2 Cara membaca NOTAM
3.3 *Amaran Navigasi*	*3.3.1 Kawasan Larangan* *3.3.2 Kawasan Terhad* 3.3.3 *Kawasan Bahaya*
Bab 4: **Human Performance Limitation (HPL)**	
4.1 Pengenalan kepada **Human Performance Limitation (HPL)**	*4.1.1 Pengenalan kepada HPL* *4.1.2 Hubungan antara kemalangan dan insiden dengan kesilapan manusia* *4.1.3 Hubungkait antara kesilapan manusia dan kemampuan manusia*
4.2 *Had prestasi yang lazim*	*4.2.1 Keletihan* (Fatigue) *4.2.1.1 Definisi keletihan* *4.2.1.2 Jenis keletihan* *4.2.1.3 Keletihan fizikal* *4.2.1.3.1 Contoh keletihan fizikal* *4.2.1.4 Keletihan mental* *4.2.1.4.1 Contoh keletihan mental (tekanan kerja atau tekanan komersial)*

4.3 *Had deria semasa operasi* UAS.	*4.3.1 Had penglihatan* *4.3.1.1 Radiasi cahaya matahari* *4.3.1.1.1 Kesan dan cara mengatasi* *4.3.1.2 Habuk dan serpihan* *4.3.1.2.1 Kesan dan cara mengatasi* *4.3.1.3 Peralihan cahaya dari persekitaran ke skrin* *4.3.1.3.1 Kesan dan cara mengatasi* *4.3.2 Had pendengaran* *4.3.2.1 Bunyi dari* UA (turbine *dan* propeller) *4.3.2.1.1 Kesan dan cara mengatasi* *4.3.2.2 Kehilangan pendengaran* *4.3.2.2.1 Pengelakkan pendedahan lama kepada bunyi* *4.3.2.2.2 Penggunaan pelindung telinga semasa operasi dengan tahap bunyi tinggi*
***Bab 5: Sistem Navigasi* UAS**	
5.1 *Asas Navigasi* UAS	*5.1.1 Pengenalan kepada* GPS *5.1.2 Ketepatan isyarat dan had di kawasan luar bandar* *5.1.3 Punca ralat* GNSS: multipath, *gangguan atmosfera*, shading
5.2 Real Time Kinematics (RTK)	*5.2.1 Definisi* RTK *dan cara ia meningkatkan ketetapan kedudukan* *5.2.2 Komponen: stesen pangkalan*, rover (UAS), *pautan telemetri* *5.2.3* Use cases: *Penyemburan tepat* (Precision Spraying)
Bab 6: Airmanship dan Keselamatan Penerbangan	

6.1 Airmanship	*6.1.1 Definisi dan kepentingan* airmanship *6.1.2 Etika penerbangan yang baik dan bertanggungjawab* *6.1.2.1 Menghormati had* UAS *(muatan* (payload), *bateri, cuaca)* *6.1.2.2 Mengekalkan kesedaran terhadap keadaan sekeliling* (situational awareness) *di kawasan muka bumi yang kompleks* *6.1.2.3 Disiplin dalam mengikuti prosedur dan peraturan* *6.1.2.4 Pematuhan terhadap senarai semak pra-penerbangan* (pre-flight) *dan SOP* *6.1.2.5 Tingkah laku beretika dalam mengendalikan muatan (contoh: racun perosak atau baja)*
6.2 Crew Resource Management (CRM)	*6.2.1 Peranan* CRM *dalam pasukan* UAS *pertanian dua orang* *6.2.2 Pemerhati visual* (Visual Observer (VO)) *6.2.2.1 Laporan situasi* 6.2.2.2 *Kenalpasti bahaya* (Hazard identification) *6.2.2.3 Kesedaran ruang udara* *6.2.2.4 Komunikasi dengan* PIC (Pilot-in-Command) *6.2.3 Koordinasi kru berkesan:* *6.2.3.1* Shared mental models *6.2.3.2 Komunikasi radio atau isyarat tangan* *6.2.3.3 Pemisahan tugas* (remote pilot, visual observer, *pengendali muatan* (payload))
Bab 7: Prosedur Operasi	

***7.1 Pra-Penerbangan* (Pre-flight)**	*7.1.1 Perancangan misi* *7.1.1.1 Kaedah penyemburan* (*semburan setempat* (spot spraying) *atau semburan menyeluruh* (blanket spraying)) *7.1.1.2 Corak laluan penerbangan (laluan penerbangan AB atau corak grid)* 7.1.2 *Penilaian risiko* (risk assessment) 7.1.2.1 *Pengenalpastian bahaya* (hazard identification) 7.1.2.2 *Analisis risiko* (risk analysis) *7.1.2.3 Penilaian risiko* (risk assessment) *dan kebolehterimaan* (tolerability) 7.1.2.4 *Pengurangan risiko* (risk mitigation) *7.1.3 Penentuan kawasan zon sempadan* *7.1.3.1 Zon sempadan* *7.1.3.1.1 Garisan Hijau (kawasan aktiviti)* *7.1.3.1.2 Garisan Kuning (kawasan berhati-hati)* *7.1.3.1.3 Garisan Merah (zon kecemasan)* *7.1.3.1.4 Garisan Biru (garisan sempadan)* *7.1.4 Pemakluman kepada* ATC/FIS *berdekataan sebelum operasi bermula* *7.1.5 Pertimbangan cuaca* *7.1.6 Persediaan pra-penerbangan* (pre-flight) *7.1.6.1 Cara pengisian bahan kimia* *7.1.6.2 Pengunaan* PPE *yang betul* *7.1.7 Taklimat operasi*
***7.2 Berlepas* (Take-off)**	*7.2.1 Prosedur untuk berlepas* (take-off) *7.2.2 Pelepasan* (take-off) *yang selamat dalam persekitaran pertanian*
***7.3 Semasa Penerbangan* (In-flight)**	*7.3.1 Pemantauan aktif status* UA. *7.3.2 Kesedaran situasi* (situational awareness) *terhadap ruang atau kawasan operasi.* *7.3.3 Pemantauan krew terhadap ancaman yang bakal berlaku seperti burung, pesawat pada tahap rendah, cuaca dan pengguna* UA *yang lain.* *7.3.4 Pemantauan sistem penyemburan*.

7.4 Pendaratan **(Landing)**	*7.4.1 Memastikan kawasan pendaratan adalah selamat.* *7.4.2 Pengenalpastian lokasi pendaratan kecemasan.* *7.4.3 Pelaksanaan prosedur penutupan* (shut down) UA *7.4.4 Pendaratan selamat di kawasan pertanian*
7.5 Pasca Penerbangan **(Post-flight)**	*7.5.1 Pemeriksaan UA selepas penerbangan.* *7.5.2 Taklimat susulan* (debriefing) *7.5.3 Dokumentasi operasi pasca-penerbangan* (post-flight) (*log penerbangan, log bateri, dsb*) *7.5.3.1 Penyimpanan log penerbangan – fizikal atau perisian*
7.6 Situasi Kecemasan **(Emergency)** ***dan Luar Biasa*** **(Abnormal)**	*7.6.1 Definisi situasi kecemasan* (emergency) *7.6.2 Definisi situasi luar biasa* (abnormal) *7.6.3 Contoh situasi kecemasan dan luar biasa* *7.6.4 Pengendalian* UA *dalam situasi kecemasan* *7.6.5 Pengendalian* UA *dalam situasi luar biasa*
7.7 **Emergency Response Plan (ERP)**	*7.7.1 Pengenalan kepada* ERP *7.7.2 Objektif* ERP *7.7.3 Contoh situasi* ERP *dan dokumen sokongan*
7.8 ***Muatan*** **(Payload)** ***dan Sistem Penyemburan***	*7.8.1 Jenis muatan* (payload) *pertanian:* *7.8.1.1 Racun perosak* (Pesticides) *7.8.1.2 Racun rumpai* (Herbicides) *7.8.1.3 Baja* (Fertilizer) *7.8.2 Keserasian bahan kimia dan prosedur campuran* *7.8.3 Penyimpanan dan pengangkutan bahan kimia* *7.8.4 Keperluan* Personal Protective Equipment (PPE).
7.9 Insuran	*7.9.1 Keperluan insuran* *7.9.1.1 Insuran meliputi liabiliti kepada pihak ketiga* *7.9.1.2 Insuran sah untuk operasi* RPTO, UAWC dan SUP

1.8.2.1 **Reason for change:** To provide guideline for the development on teaching materials for RCoC-AL in Bahasa Malaysia.

1.8.3 **Appendix 5(B)(i) – Practical Flying Test Syllabus/Assessment Criteria for RCoC-AL (English)** has been inserted after Appendix 5(A)(ii) – Theoretical Knowledge Syllabus for RCoC-AL (Bahasa Malaysia), as follows:

Subject	Areas to be covered
UA Practical Activity	Basic Familiarisation (Orientation Familiarisation) • Heading Lock (Clock code: 12, 3, 6, 9) • Course Lock (Pitch Forward, Pitch Backward, Roll Left, Roll Right) • Different altitudes (Climbing up and down) • Clockwise / Anti-clockwise Basic Flying Pattern • Square (Level 1) • Circle (Level 2) • Figure of 8 (Level 3) Pre-Operation Setup & Site Preparation • Conduct site survey and hazard identification • Determine buffer zones and environmental constraints • Assess weather (wind speed, humidity, etc.) • Perform crew briefing and task delegation • Plan mission using Ground Control Software (waypoints, altitude, spray area) • Conduct equipment check (airframe, battery, controller, payload) Ground Handling & Safety Procedures • Demonstrate correct use of PPE (gloves, goggles, respirator) • Follow pre-flight checklist • Set return-to-home (RTH) and failsafe functions • Coordinate roles between pilot, visual observer, and ground crew

	Take-off, Flight & Spraying Operations • Perform manual take-off and controlled hovering • Fly low-altitude straight-line paths for spraying • Execute automated spray missions via uploaded waypoints • Monitor tank level and spray performance in-flight • Maintain safe altitude using terrain-following sensors (ultrasonic/LiDAR) Emergency & Abnormal Scenario Handling • Simulate chemical leak or payload failure • Perform emergency landing or abort spraying mission • Respond to low battery, GPS loss, or communication failure • Navigate around unexpected field obstacles Post-Operation Procedures • Perform safe landing and disarm UAS • Conduct post-flight equipment inspection • Simulate safe disposal and cleaning of chemical tank (no actual chemicals) • Upload and back up mission data • Complete flight logbook and mission report

1.8.3.1 **Reason for change:** To provide guideline for the development on teaching materials for practical flying training and assessment for RCoc-AL in English.

1.8.4 **Appendix 5(B)(ii) – Practical Flying Test Syllabus/Assessment Criteria for RCoC-AL (Bahasa Malaysia)** has been inserted after Appendix 5(B)(i) – Practical Flying Test Syllabus/Assessment Criteria for RCoC-AL (English), as follows:

Subjek	***Skop Pembelajaran***
***Aktiviti Amali* UA**	*Pengenalan asas (Pengenalan orientasi)* • Heading Lock (Clock code: 12, 3, 6, 9) • Course Lock (Pitch *ke hadapan*, Pitch *ke belakang*, Roll *ke kiri*, Roll *ke kanan*) • *Ketinggian berbeza* (Climbing up and down) • *Mengikut arah jam / Berlawan arah jam* *Corak penerbangan asas* • *Segi empat (Tahap 1)* • *Bulatan (Tahap 2)* • *Angka 8 (Tahap 3)* *Persediaan pra-operasi dan persediaan tapak* • *Melakukan peninjauan terhadap tapak dan pengenalpastian bahaya* (hazard identification) • *Penentuan zon penampan* (buffer zone) *dan kekangan persekitaraan* • *Penilaian cuaca (kelajuaan angina, kelembapan, dll.)* • *Pelaksanaan taklimat kru dan pengagihan tugas* • *Perancangan misi mengunakan perisian* ground control (waypoints, altitude, spray area) • *Pemeriksaan peralatan (rangka* UA, *bateri, alat kawalan, muatan* (payload)) *Pengendalian darat dan prosedur keselamatan* • *Demonstrasi cara penggunaan* PPE *yang betul (sarung tangan, cermin mata pelindung, respirator)* • *Senarai semak pra-penerbangan* (pre-flight) • *Penetapan fungsi* return-to-home (RTH) *dan fungsi* failsafe • *Kordinasi antara juruterbang jarak jauh* (remote pilot), *pemerhati visual* (visual observer) *dan krew darat*

	Pelepasan (take-off), *penerbangan dan operasi semburan* • *Pelaksanaan pelepasan* (take-off) *secara manual dan berhenti di udara* (hovering) *terkawal* • *Penerbang pada altitud rendah dalam laluan lurus untuk penyemburan* • *Pelaksanaan misi semburan automatik melalui* waypoints • *Pantau paras tangki dan prestasi semburan semasa penerbangan* • *Kekalkan altitud selamat menggunakan pengesan* terrain-following *Pengendalian situasi kecemasan dan situasi luar biasa* • *Simulasi kebocoran bahan kimia atau kegagalan muatan* (payload) • *Pelaksanaan pendaratan kecemasan atau pembatalan misi semburan* • *Tindak balas terhadap bateri lemah, kehilangan* GPS, *atau kegagalan komunikasi* • *Mengemudi di sekeliling halangan ladang yang tidak dijangka* *Prosedur pasca-operasi* • *Pelaksanaan pendaratan selamat dan menyahaktif* (disarm) UAS • *Pemeriksaan terhadap peralatan pasca-penerbangan* (post-flight) • *Simulasi pelupusan dan pembersihan tangki bahan kimia dengan selamat (tanpa menggunakan bahan kimia sebenar)* • *Muat naik dan penyimpanan data misi* • *Pelengkapan log penerbangan dan laporan misi*

1.8.4.1 **Reason for change:** To provide guideline for the development on teaching materials for practical flying training and assessment for RCoC-AL in Bahasa Malaysia.

1.8.5 Appendix 5 – Training and Procedure Manual has moved to Appendix 6.

1.8.6 Appendix 6 – Occurrence Reporting has moved to Appendix 7.

1.8.7 Appendix 7 – Safety Management System has moved to Appendix 8.

ATTACHMENT 2 TO CAC 01/2025: CAD 6011 PART II – UNMANNED AIRCRAFT SYSTEM AGRICULTURAL UAS OPERATIONS

1 Revision(s)

1.1 **Chapter 2.2 – Abbreviation**

1.1.1 To add as follows:

RCoC-AL Remote Pilot Certificate of Competency - Agriculture Light

1.1.1.1 **Reason for addition**: New certificate added for remote pilot of private agricultural UAS operation.

1.2 **Paragraph 4.10.5**

1.2.1 Paragraph **4.10.5 a)** has been amended as follows:

e) The RP shall hold a valid RCoC issued by the CAAM as below:

	Type of Operations	RCoC
1	Commercial	RCoC-B + Module 2 (AGR)
2	Private	RCoC-B + Module 2 (AGR) or RCoC-AL

1.2.1.1 **Reason for change**: Updated type of operations and requirement for Remote Pilots to hold an RCoC-AL for private operations.