

Advisory Circular

UNMANNED AIRCRAFT PILOT LICENCE (UAPL)

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GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 3C of the Air Navigation Act (Cap. 6) (ANA), to show that compliance with a statutory requirement has been achieved. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

PURPOSE

This Advisory Circular provides guidance to obtain an Unmanned Aircraft Pilot Licence (UAPL) pursuant to the Air Navigation (101 – Unmanned Aircraft Operations) Regulations 2019 (“ANR-101”).

APPLICABILITY

This AC is applicable to persons interested in obtaining an Unmanned Aircraft Pilot Licence (UAPL).

RELATED REGULATIONS

This AC relates specifically to Part 4 of the ANR-101

RELATED ADVISORY CIRCULARS

AC 101-2-1(0) Permits for Unmanned Aircraft Operations
AC 101-3-1(0) Approvals for Training Organisations

CANCELLATION

This AC is the first on the subject.

EFFECTIVE DATE

This AC is effective from 22 July 2020

OTHER REFERENCES

Nil.

1 APPLICABILITY OF UAPL

1.1 Effective 1 February 2021, a person must not act as an unmanned aircraft (UA) pilot of:

- (a) a UA of any total mass in the course of business or for a purpose that is neither a recreation purpose nor an education purpose; or
- (b) a UA of a total mass exceeding 7 kg for any purpose.

unless the person holds a UAPL that is in force and authorises the person to fly a UA of the class and category corresponding to that UA.

Note: Existing UA pilots listed in UA Operator Permits (OP) that are in force can continue to operate the UA as per the UA OP conditions without the need to hold a UAPL until 1 February 2021. For more information on transition for existing UA pilots listed in valid UA OPs, refer to **Appendix 1**.

2 UAPL CLASSES, CATEGORIES AND RATINGS

2.1 A UAPL authorises a UA pilot to fly a UA of the class and category corresponding to that UA. There are two classes of UAPL and 4 categories of UA within each class.

2.2 A Class A UAPL allows a UA pilot to operate any UA in the corresponding category with total mass that does not exceed 25 kg.

2.3 A Class B UAPL allows a UA pilot to operate specific UA model(s), also referred to as rating, with total mass that exceeds 25 kg. An applicant applying for a Class B UAPL must hold a valid Class A UAPL in the corresponding category, as a prerequisite. For example, a person applying for a Class B UAPL to operate a 40kg rotorcraft must hold a valid Class A UAPL in the rotorcraft category first.

2.4 There are 4 categories of UA within each class of UAPL. The categories are as follows:

- (a) Aeroplane
- (b) Rotorcraft
- (c) Powered-lift
- (d) Airship

Note: Rotorcraft category includes helicopters and multi-copters (e.g. quadcopters, octocopters, etc.)

3 UAPL APPLICATION

3.1 A person who wishes to apply for a Class A UAPL must fulfil the following pre-requisites:

- (a) be at least 16 years old; and
- (b) successfully pass a theory test administered by CAAS; and

Note: An applicant needs to achieve a minimum of 75% test score to pass the theory test. An applicant is not allowed to attempt the theory test more than 2 times within a period of one month. Registration of theory test can be made through the website at <https://tasman-caas-candidate.aspeq.com>. Refer to **Appendix 2** for the theory test syllabus.

- (c) successfully pass a practical assessment relating to the class and category of the licence conducted by an Authorised Flight Examiner (AFE) engaged or employed by a CAAS-approved UA training and assessment organisation (UATO), or by the Authority.

Note: A pass in the theory test is required before attempting the practical assessment. A pass in the theory test shall be valid for 24 months from the date on which the theory test was attempted.

Note: Applicants are encouraged to attend a training course conducted by UATOs before attempting the theory test and practical assessment. The list of CAAS-approved UATOs can be found on the CAAS website at <https://www.caas.gov.sg/public-passengers/unmanned-aircraft/ua-regulatory-requirements/ua-pilot-licence>. Refer to **Appendix 3** for the scope of the practical assessment.

3.2 An application for a UA pilot licence must:

- (a) be submitted through the CAPELS website at <https://capels.caas.gov.sg> ; and
- (b) be accompanied by the following information;
 - (i) the identity and contact address of the applicant; and
 - (ii) theory test results.

3.3 Base on the result of the practical assessment, limitation(s) may be imposed on the licence holder. (e.g. restricted to Multi-rotor UA only, restricted to Multi-rotor UA less than 7kg only, etc.). Limitation(s) can be removed by undergoing a “removal of limitations” check with approved UATOs and the applicant does not need to submit any application through CAPELS. Upon successful completion of check, stated limitation(s) will be removed from the licence.

3.4 Results of the practical assessment will be uploaded by the Authorised Flight Examiner (AFE). No further upload is required from applicant.

4 UAPL VARIATION

4.1 A holder of a valid UAPL may at any time apply to the Authority to vary its licence to:

- (a) add or remove a category to the UAPL;
- (b) add or remove a rating to the UAPL; or
- (c) modify a condition of the UAPL.

4.2 An application to vary a UAPL must:

- (a) be submitted through the CAPELS website at <https://capels.caas.gov.sg>; and
- (b) be accompanied by the following information;
 - (i) practical assessment results of the applicant (uploaded to the CAPELS by the AFE and tagged to the applicant) if the application is to add a Class A category to the UAPL
 - (ii) documents evidencing that the applicant has satisfied all the requirements for the corresponding category in Class A if the application is to add a rating in Class B.

4.3 An applicant can apply to add a specific UA model(s) in Class B if he holds a valid Class A UAPL in the corresponding category(s). As an illustration, a holder of a Class A UAPL which qualifies the holder to operate only rotorcraft will not be allowed to vary his licence to add a rating in Class B to include –Aeroplanes, Powered-lift, or Airship categories as he has not satisfied the requirements for the corresponding category in Class A.

4.4 In addition, before applying for a Class B UAPL, the applicant should ensure that the specific UA model(s) should be already listed in a valid OP or in the process of assessment by the Authority under an ongoing OP application. Applicants have to also provide supporting evidence of competency in operating the specific UA model(s) through CAPELS. Evidence of pilot competency includes, but not limited to, relevant training from the original equipment manufacturer (OEM) or OP holder whom the applicant is being engaged or employed.

5 PROFICIENCY CHECK

5.1 All UAPL holders must pass a proficiency check conducted by an AFE from an approved UATO. The check has to be completed at least once every 4 years from the date on which the category was specified on the UAPL or from the date of expiry.

5.2 For Class A UAPL holders, a failure to complete a proficiency check will lead to the expiry of the UAPL in respect of each Class A category specified in the licence.

5.3 For Class B UAPL holders, in addition to the proficiency check stated in paragraph 5.1, a refresher training, in respect of each rating stated in Class B, is required to be completed at least once a year. The refresher training can be conducted by a UATO

or a UA Operator Permit holder by whom the holder of the UAPL is employed or engaged. Failure to complete the proficiency check or refresher training will lead to the expiry of the UAPL in respect of the rating specified in the licence.

- 5.4 Documents evidencing the completion of Class B refresher training must be provided to the AFE UA when the licence holder undergoes the proficiency check.

6 ADMINISTRATIVE INFORMATION

- 6.1 Applications for the UAPL are to be submitted through the CAPELS website at <https://capels.caas.gov.sg>. The website also includes user instructions.

- 6.2 Two categories of account holders are available in CAPELS:

- (a) SingPass account holders will need to register for an account by logging in using their SingPass via the CAPELS website.
- (b) Non-SingPass account holders will need to register for an account using their email address via the CAPELS website. Upon registration, users will receive an email that contains a link for an e-mail verification to complete their account set-up.

- 6.3 Upon successful submission of the application, CAAS will review the submitted information and documents, and may contact the applicant for further clarifications. Regardless of the outcome of the application, fees paid are not refundable or transferrable. A list of applicable licence fees is listed in **Appendix 4**.

- 6.4 The typical processing time for a UAPL application is 10 working days, depending on the completeness of the submission of supporting documents and complexity of the UAPL application. Applicants are encouraged to submit their applications well in advance of their intended operations.

- 6.5 Upon grant, applicants will receive an e-mail that contains instructions to view their digital licence via a mobile application.

APPENDIX 1 TRANSITION FOR UA PILOTS IN VALID OPERATOR PERMIT (OP)

1 UA PILOTS IN VALID OPERATOR PERMITS (OP) WITH NO LIMITATION

1.1 Existing UA pilots who have no limitation stated in a valid UA OP, will only be required to successfully pass the theory test. They may be granted a UAPL with limitation(s) depending on the UA model previously assessed. A “removal of limitations” check will be required to remove the limitations stated in the UAPL.

1.2 Some examples include:

(a) A UA pilot listed in a valid UA OP who was previously assessed on DJI Phantom 4 Pro that weighs less than 7kg, will minimally be required to pass the theory test to apply for UAPL. The applicant will only be granted a licence with the following limitation:

- UAPL Class A - Rotorcraft (restricted to operate Multi-rotor UA less than 7kg only)

(b) A UA pilot listed in a valid UA OP who was previously assessed on DJI M600 that weighs more than 7kg, will minimally be required to pass the theory test to apply for UAPL. The applicant will only be granted a licence with the following limitation:

- UAPL Class A - Rotorcraft (restricted to operate Multi-rotor only)

2 UA PILOTS IN VALID OPERATOR PERMITS (OP) WITH LIMITATION(S)

2.1 Existing UA pilots who have limitation(s) (i.e. ‘limited to GPS-assisted flights only’, ‘limited to flights within enclosed area only’, ‘limited to event only’, ‘limited to indoor flights only’) stated in a valid UA OP, are required to successfully pass both theory test and practical assessment.

2.2 An example includes:

(a) A UA pilot listed in a valid UA OP who was previously assessed on a DJI Mavic will have to successfully pass a theory test and complete a practical assessment conducted by a CAAS-approved UATO or by the Authority. A practical assessment is compulsory in this scenario as the DJI Mavic is limited to GPS-assisted flights only.

APPENDIX 2 UAPL THEORY TEST LEARNING OUTCOMES

The following table shows the subjects, number of questions and duration of the theory test.

Subject Name	Duration	Number of Questions	Passing Mark
General Unmanned Aircraft System (UAS) Knowledge	1.5 hrs	50	75%
Principles of Flight			
Air Law			
Navigation and Meteorology			
Human Factors			
Safety and Operations			

The following table shows the recommended study guides to prepare for the theory test.

Recommended Study Guides	
1.	Air Navigation Act (ANA)
2.	Air Navigation (101 – Unmanned Aircraft Operations) Regulations
3.	The Complete Remote Pilot – Aviation Supplies & Academy (ASA) <i>By: Bob Gardner and David Ison</i>
4.	Remote Pilot Test Prep 2019 – Aviation Supplies & Academy (ASA)
5.	The Droner’s Manual – Aviation Supplies & Academy (ASA) <i>By: Kevin Jenkins</i>

Syllabus Reference	Learning Outcome
010 00 00	General UAS Knowledge
010 01 00	Introduction to UAS
010 01 01	Define what is an Unmanned Aircraft System (UAS) and Unmanned Aircraft (UA)
010 01 02	Describe the different categories of UA and its operating principles <ul style="list-style-type: none"> - Aeroplane - Rotorcraft <ul style="list-style-type: none"> o Multi-rotor o Helicopter - Powered-Lift - Airship
010 01 03	Explain the various applications of UAS (e.g. aerial photography/videography, surveillance, etc.)
010 02 00	UAS Components and Systems
010 02 01	Identify UAS components of different categories and describe its functions
010 02 02	Describe major systems of UAS and how the systems are integrated with each other <ul style="list-style-type: none"> - Power and Electrical System - Propulsion System - Flight Control and Navigation System - Command and Control (C2) System - Ground Control System
010 02 03	Describe how to recognize and/or identify failed/damaged components (e.g. failed servo, propeller damage, etc.)
010 02 04	Understand the importance of following original equipment manufacturer (OEM) guidelines when repairing UAS
010 03 00	UAS C2
010 03 01	Describe the operation of the UAS C2 link <ul style="list-style-type: none"> - The transmitter module - The receiver module
010 03 02	Understand the importance of radio-line-of-sight
010 03 03	Identify the causes of radio interference and loss link

Syllabus Reference	Learning Objectives
020 00 00	Principles of Flight
020 01 00	Aerodynamics
020 01 01	Identify the four forces of flight <ul style="list-style-type: none"> - Lift - Weight - Thrust - Drag
020 01 02	Describe the aerofoil interaction with airflow <ul style="list-style-type: none"> - Lift generation / aerodynamic force - Angle of attack (AOA) - Ground effect
020 01 03	Describe aerodynamic stall and spin <ul style="list-style-type: none"> - Causes of stalls - Symptoms of stalls - Stages of spins - Basic stall/spin recovery
020 01 04	Describe aerodynamic stability <ul style="list-style-type: none"> - Static stability - Dynamic stability
020 02 00	Control of Motion (Aeroplane / Rotorcraft / Powered-lift / Airship)
020 02 01	List the axes of motion <ul style="list-style-type: none"> - Lateral axis (pitch) - Longitudinal axis (roll) - Vertical axis (yaw)
020 02 02	Describe the function of the main control surfaces <ul style="list-style-type: none"> - Ailerons - Elevator - Rudder
020 02 03	Understand the function of trim

Syllabus Reference	Learning Objectives
030 00 00	Air Law
030 01 00	Air Navigation Act (ANA)
030 01 01	Know the provisions stated in the ANA. Included but not limited to; <ul style="list-style-type: none"> - Dangerous activity involving aircraft - Flying without satisfying safety requirements - Trespassing at aerodromes - Penalty for dangerous flying
030 02 00	Air Navigation (101 – Unmanned Aircraft Operations) Regulations
030 02 01	Know the provisions stated in the ANR101
030 02 02	Explain the regulations applicable to different UAS operations (recreation, education and non-recreation / non-education purposes)
030 03 00	Airspace
030 03 01	List “no-fly” zones using onemap.sg
030 03 02	List locations that require permits to fly (onemap.sg)
030 03 03	State altitude restrictions for UAS operations
030 04 00	UA Registration
030 04 01	State who requires UA Registration
030 04 02	Understand the UA Registration process
030 05 00	Permits
030 05 01	State who requires an Operator Permit, Class 1 Activity Permit, Class 2 Activity Permit and other permits.
030 05 01	Know the UA Operator Permit conditions
030 05 02	Understand the permit application process
030 06 00	Unmanned Aircraft Pilot Licence (UAPL)
030 06 01	State the associated UAPL classes, categories and ratings
030 06 02	State the requirements for the issuance and maintenance of an UAPL
030 06 03	State the privileges of an UAPL
030 07 00	UA Basic Training
030 07 01	State who requires UA Basic Training
030 08 00	Penalties
030 08 01	State the penalties upon contravening provisions relating to UA operations of the ANA and ANR-101

Syllabus Reference	Learning Objectives
040 00 00	Navigation & Meteorology
040 01 00	Navigation
040 01 01	Describe the geographic coordinate system used in basic navigation <ul style="list-style-type: none"> - UTM map projection - Latitude and longitude
040 01 02	State and explain the means of navigation for UA <ul style="list-style-type: none"> - Global Positioning System (GPS) - Global Orbiting Navigation Satellite System (GLONASS) - Ground based navigation systems - Local area differential GNSS (WADGNSS) <ul style="list-style-type: none"> • Classical DGNSS • Real Time Kinematics (RTK) • Wide Area Kinematics (WARTK) - Factors affecting accuracy of satellite navigation systems - Basic principles of operation and common errors
040 01 03	Describe other forms of guidance systems, their operating principles and pros/cons <ul style="list-style-type: none"> - Infra-red (IR) system - Vision-based system - Ultrasound system - Light Detection and Ranging (LIDAR) system
040 02 00	Meteorology
040 02 01	State atmospheric properties and their effects on UA performance <ul style="list-style-type: none"> - Pressure - Temperature - Density - Humidity
040 02 02	Define basic altimetry terms <ul style="list-style-type: none"> - Height - Elevation - Altitude - Mean Sea Level (MSL) - Above Mean Sea Level (AMSL) - Above Ground Level (AGL)
040 02 03	Identify cloud types and their impact on UAS operations <ul style="list-style-type: none"> - Cumulus (CU) - Cumulonimbus (CB)
040 02 04	Identify different types of winds and their impact on UA during operations <ul style="list-style-type: none"> - Headwind - Tailwind - Crosswind
040 02 05	Describe how to obtain and interpret reliable weather information <ul style="list-style-type: none"> - Meteorological Services Singapore (non-aviation) - METAR (aviation) - Aeronautical weather charts/reports

Syllabus Reference	Learning Objectives
050 00 00	Human Factors
050 01 00	Physiology – Vision
050 01 01	Describe correct visual scanning techniques
050 01 02	Identify visual illusions during UAS operations and how to overcome them <ul style="list-style-type: none"> - Disorientation - Spatial Disorientation
050 02 00	Physiology – Medications
050 02 01	Describe the effects of medications during UAS operations
050 03 00	Physiology – Psychoactive Substances
050 03 01	Know the prohibition of use of psychoactive substances during UAS operations
050 03 02	Describe the effects of intoxication during UAS operations
050 03 03	State the penalty on operating an UA under the influence of any psychoactive substances
050 04 00	Psychology – Fatigue
050 04 01	Identify the causes of fatigue
050 04 02	Describe the effects of fatigue on UAS operations
050 04 03	Describe fatigue management techniques
050 05 00	Psychology – Stress
050 05 01	Identify the causes of stress
050 05 02	Describe the effects of stress on UAS operations
050 05 03	Describe stress management techniques

Syllabus Reference	Learning Objectives
060 00 00	Safety & Operations
060 01 00	Situational Awareness
060 01 01	Describe the importance of situational awareness <ul style="list-style-type: none"> - Maintaining situational awareness - Assessing situations and making decisions - Task prioritization and management
060 02 00	Operational Risks and Hazards
060 02 01	Define risk and hazard
060 02 02	Identify common UAS operational risks and hazards
060 02 03	Apply the general steps to perform risk assessment
060 03 00	Documentation
060 03 01	List and explain the content required in Operations Manual for UA operations
060 04 00	UAS Operations
060 04 01	List the common phases and describe the checks conducted and/or considerations for each phase <ul style="list-style-type: none"> - Flight planning and management considerations - Contingency/Emergency planning considerations - Pre-flight phase - In-flight phase - Post-flight phase
060 04 02	Describe crew resource management (CRM) and how it can contribute to safety of UAS operations
060 05 00	UAS Maintenance
060 05 01	Know the difference between maintenance and flight checks
060 05 02	Explain the importance of maintenance
060 05 03	Know the importance of keeping a maintenance log
060 06 00	UAS Emergency Procedures
060 06 01	List the common emergencies and how these emergencies are identified <ul style="list-style-type: none"> - Loss of GPS - Low power - Loss of C2 link - Loss of orientation/control - Stall (aeroplane) - Fly-away
060 06 02	Explain the importance of emergency procedures
060 06 03	Development appropriate and adequate emergencies handling procedures

APPENDIX 3 UAPL PRACTICAL ASSESSMENT REQUIREMENTS

The practical assessment should include but not limited to the following:

1. General Knowledge of UAS Functions

The candidate should have adequate knowledge of the operating UAS as a whole which includes:

- Being able to provide an overview of the UAS in general;
- Being able to identify major components and explain its functions; and
- Being able to identify and explain different indication lights / sounds and flight modes / abnormal conditions

2. UAS Checks

The candidate should be proficient with the pre-flight and post-flight checks of the UA, making reference to the Original Equipment Manufacturer (OEM) documents and UATO's training manual (if required).

3. Flight Manoeuvres with Manual Controls

The candidate should be able to demonstrate smooth and controlled flying while performing a series of manoeuvres **without GNSS assistance** which includes:

- Precision hovering (tolerance of +/- 1 metre);
- Straight and Level Circuits;
- Climbing and descending Circuits;
- Figure of 8; and
- Precision landing

4. Mission Planning and Execution

The candidate should be proficient with mission planning procedures via ground control system and able execute / modify the mission during flight.

5. Emergency Procedures

The candidate should be able to demonstrate procedures in the event of emergencies which includes:

- Immediate landing;
- Abort landing;
- Emergency stop; and
- Return to Home (RTH)

APPENDIX 4 UAPL FEES

As reproduced from the Second Schedule of ANR-101:

Unmanned Aircraft Pilot Licence	Fee
UAPL Initial: for the first category	\$500
UAPL Variation: for each additional category / rating in Class B	\$200
CAAS theory test / re-test	\$125