



GUIDANCE MATERIAL TO JARUS-FCL RECOMENDATION

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<p>The JARUS Working Group “Flight Crew Licensing”, WG-1, published, on 5th October 2015 the first edition of the JARUS-FCL Recommendation. This JARUS FCL Recommendation aims at providing recommendations for the States to use for their own national legislation, concerning uniform personnel licensing and competencies for personnel involved in the operation of remotely piloted aircraft systems (RPAS).</p> <p>This document is guidance material (GM) to the JARUS-FCL Recommendation.</p> <p>Like with the JARUS-FCL Recommendation, this GM provides a harmonised basis to regulate organisations involved in the life cycle of civil RPAS. The JARUS-FCL Recommendation and its GM may be used by the competent authorities to develop provisions regarding licensing and competencies in RPAS activities in relation to the concept of operations in their respective States or Regions.</p> <p>Due to the rapid evolution of RPAS technology, the JARUS-FCL Recommendation and this GM will be subject to continuous review and may be updated when appropriate.</p>		
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JARUS

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RECOMENDATION**

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EXPLANATORY NOTE

Introduction

JARUS is a group of experts coming from National Aviation Authorities (NAAs) from the five continents and the European Aviation Safety Agency (EASA).

The Working group Remote Flight Crew Licensing, WG1 of JARUS, published, on October 5, 2015 the first edition of the JARUS-FCL Recommendation. This JARUS FCL Recommendation aims at providing recommendations for States to use for their own national legislation, concerning uniform personnel licensing and competencies for personnel involved in the operation of remotely piloted aircraft systems (RPAS).

This document is guidance material (GM) to the JARUS-FCL Recommendation.

Like with the JARUS-FCL Recommendation this GM provides a harmonised basis to regulate organisations involved in the life cycle of civil RPAS. The JARUS-FCL Recommendation and its GM may be used by the competent authorities to develop provisions regarding licensing and competencies in RPAS activities in relation to the concept of operations in their respective States or Regions.

Due to the rapid evolution of RPAS technology, the JARUS-FCL Recommendation and this GM will be subject to continuous review and may be updated when appropriate.

REMOTE PILOT LICENSING OF REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)

The competent authorities for civil aviation of certain ICAO Contracting States (referred to as the Joint Authorities for Rulemaking on Unmanned Systems (JARUS)),

Having regard to the ICAO Manual on Remotely Piloted Aircraft Systems (RPAS) (Doc 10019 AN/507),

Having regard to the ICAO Circular 328,

Having regard the FAA model civil aviation regulation (MCARS),

Having regard EASA Part-FCL (Commission Regulation (EU) No 1178/2011, Annex 1),

Having regard the Communication from the Commission to the European Parliament and the council, "A new era for aviation. Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner" (Brussels, 8.4.2014, COM(2014) 207 final,

Having regard the Riga Declaration on Remotely Piloted Aircraft "Framing the Future of Aviation" (Riga 6.3.2015)

Having regard the EASA paper 'Concept of Operations for Drones, A risk based approach to regulation of unmanned aircraft', thereof

Whereas:

- (1) JARUS agreed this GM to JARUS-FCL RECOMMENDATION with a view to provide a harmonised basis to regulate organisations involved in the life cycle of civil RPAS.
- (2) The JARUS-FCL GM may be used by the competent authorities to develop provisions regarding licensing and competencies in RPAS activities in relation to the concept of operations in their respective States or Regions.
- (3) Due to the rapid evolution of RPAS technology, the JARUS-FCL guidance material will be subject to continuous review and may be updated when appropriate.

SUBPART A

GENERAL PROVISIONS

GM1 JARUS-FCL.001 Competent authority

JOINT AUTHORITIES FOR RULEMAKING ON UNMANNED SYSTEMS (JARUS)

The purpose of JARUS is to recommend a single set of technical, safety and operational requirements for all aspects linked to the safe operation of the Remotely Piloted Aircraft Systems (RPAS). This requires review and consideration of existing regulations and other material applicable to manned aircraft, the analysis of the specific risks linked to RPAS and the drafting of material to cover the unique features of RPAS

The material will be made available to interested parties for consideration and use.

COMPETENT AUTHORITY

Aviation Authorities worldwide, are involved in the rulemaking, certification and operational approval of RPAS and related crews; it is of interest and benefit to these authorities to coordinate the effort of establishing the technical, safety and operational requirements for related projects.

The objective of JARUS is to provide guidance material aiming to facilitate each authority to write their own requirements and to avoid duplicate efforts. If endorsed by the authorities, this harmonised guidance, both technical and operational, would facilitate the validation process of foreign certificates.

It is not the scope of JARUS to develop law or mandatory standards. The law in fact does not only include technical, safety and operational provisions, but also procedures, legal privileges and responsibilities. Each State or Regional Organisation will need to decide how to dispose the harmonised provisions developed by JARUS.

In order to provide a sound and widely supported recommendation to the interested parties, JARUS will publicly consult interested stakeholders from the RPAS market, including Industry, on their draft deliverables. Since JARUS is not developing legally binding or mandatory regulatory material, this consultation is not in replacement of the usual consultation that a country uses in its rulemaking processes. The JARUS consultation is aimed at delivering a better quality, harmonised proposal for regulation. JARUS does not develop draft ICAO SARPS nor industry standards.

GM1 JARUS-FCL.005 Scope

INTERPRETATIVE MATERIAL

Whenever remote pilot licences and associated ratings, endorsements and certificates are mentioned in the JARUS-FCL Recommendations, these are meant to be valid remote pilot licences and associated ratings, endorsements and certificates issued in accordance with the national legislations of the State who issued these remote pilot licences and associated ratings, endorsements and certificates.

Whenever 'or' is used as an inclusive 'or', it should be understood in the sense of 'and/or'.

GM1 JARUS-FCL.010 Definitions

ABBREVIATIONS

- (a) The following abbreviations apply to the Guidance Material to the JARUS-FCL Recommendation :

A	Aeroplane
AC	Alternating Current
ADF	Automatic Direction Finding
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information regulation and control
AIS	Aeronautical Information Services
APU	Auxiliary Power Unit
As	Airship
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATO	Approved Training Organisation
ATS	Air Traffic Service
AUM	All Up Mass

B	Balloon
BEM	Basic Empty Mass

BITD Basic Instrument Training Device

CAS Calibrated Air Speed

CDI Course Deviation Indicator

CG Centre of Gravity

DC Direct Current

DF Direction Finding

DME Distance Measuring Equipment

DPATO Defined Point After Take-off

DPBL Defined Point Before Landing

DR Dead Reckoning navigation

DVE Degraded Visual Environment

EFIS Electronic Flight Instrument System

EOL Engine Off Landings

ERPM Engine Revolution Per Minute

ETA Estimated Time of Arrival

FCL Flight Crew Licensing

FFS Full Flight Simulator

FIS Flight Information Service

FSTD Flight Simulation Training Device

ft feet

G Gravity forces

GLONASS Global Orbiting Navigation Satellite System

GM Guidance Material

GNSS Global Navigation Satellite Systems

GPS Global Positioning System

H Helicopter

HF High Frequency

HUMS Health and Usage Monitoring System

IAS Indicated Air Speed

ICAO International Civil Aviation Organisation

IGE In Ground Effect

IFR Instrument Flight Rules

ILS Instrument Landing System

IMC Instrument Meteorological Conditions

ISA International Standard Atmosphere

JARUS Joint Authorities for Rulemaking on Unmanned Systems

kg Kilogram

LDP Landing Decision Point

LMT Local Mean Time

m Meter

MCAR Model Civil Aviation Regulation

ME Multi-engine

MEP Multi-engine Piston

MP Multi-pilot

NAA National Aviation Authority

NDB Non-directional Beacon

NOTAM Notice To Airmen

NOTAR No Tail Rotor

OAT Outside Air Temperature

OBS Omni Bearing Selector

OGE Out of Ground Effect

PIC Pilot-In-Command

PICUS Pilot-In-Command Under Supervision

QDM Magnetic heading

QFE Atmospheric pressure at aerodrome elevation

QNH Altimeter sub-scale setting to obtain elevation when on the ground

RPA Remotely Piloted Aircraft

RPAS Remotely Piloted Aircraft System

RPIC Remote Pilot-In-Command

RPL Remote Pilot Licence

RPM Revolution Per Minute

RPS Remote Pilot Station

RRPM Rotor Revolution Per Minute

R/T Radiotelephony

RTF Radiotelephony Failure

SATCOM Satellite communication

SE Single-engine

SEP Single-engine Piston
SLPC Single Lever Power Control
SP Single-pilot

TAS True Air Speed
TAWS Terrain Awareness Warning System
TDP Take-off Decision Point
TORA Take-off Run Available
TODA Take-off Distance Available

UTC Coordinated Universal Time

V Velocity
VFR Visual Flight Rules
VHF Very High Frequency
VLOS Visual Line of Sight
VMC Visual Meteorological Conditions
VOR VHF Omni-directional Radio Range

ZFM Zero Fuel Mass

Definitions

The State may provide guidance in those cases where the definition of flight time does not describe or permit normal practices. Examples are: crew change without stopping the rotors and rotors running engine wash procedure following a flight. In any case, the time when rotors are running between sectors of a flight is included within the calculation of flight time.

It is intended only for the purpose of flight and duty time regulations.

GM1 JARUS-FCL.020 Student remote pilots

MANOEUVRES AND PROCEDURES FOR PRE-SOLO FLIGHT TRAINING

A student remote pilot who is receiving training for solo flight on the category of RPA to be flown, should at least receive and log flight training for the following manoeuvres and procedures:

- (a) Proper flight preparation procedures, including pre-flight planning and preparation, determination of airworthiness, powerplant operation and RPS operation;
- (b) Taxiing, or surface operations, including run-ups, if applicable;
- (c) Take-offs and landings, including normal and crosswind;
- (d) Straight and level flight and turns in both directions;
- (e) Climbs and climbing turns;
- (f) Aerodrome traffic patterns including entry and departure procedures;
- (g) Collision avoidance, windshear avoidance and wake turbulence avoidance;
- (h) Descents, with and without turns, using high and low drag configurations;
- (i) Control of the RPA in different speeds;
- (j) Stall identification and avoidance from various flight attitudes and power combinations with recovery techniques;
- (k) System operation, including command control and communication systems and any other system suitable for the RPAS used for training;
- (l) Handover of RPA control between RPS, if applicable;
- (m) Emergency procedures and equipment malfunctions;
- (n) RPA flying using backup modes applicable for the type of RPA used for training;
- (o) Approaches to a landing area with simulated engine malfunctions;
- (p) Go-arounds;
- (q) In the case of an RPA, category helicopter: Hovering and ground work, flight conveyance, transition between flight and hovering.
- (r) In the case of Airships: mastering and unmastering

GM1 JARUS-FCL.025 Theoretical knowledge examinations for the issue of remote pilot licences and associated ratings

TERMINOLOGY

- (a) The meaning of the following terms used in JARUS-FCL.025 should be as follows:

- (1) 'Entire set of examinations': an examination in all subjects required by the licence level.
- (2) 'Examination': the demonstration of knowledge in one or more examination papers.
- (3) 'Examination paper': a set of questions to be answered by a candidate for examination.
- (4) 'Attempt': a try to pass a specific paper.
- (5) 'Sitting': a period of time established by the competent authority within which a candidate can take an examination. This period should not exceed 10 consecutive days. Only one attempt at each examination paper is allowed in one sitting.

PASS STANDARDS

- (a) A pass in a theoretical knowledge examination paper should be awarded to an applicant achieving at least 75 % of the marks allocated to that paper. There is no penalty marking.
- (b) Unless otherwise determined by the competent authority, an applicant has successfully completed the required theoretical knowledge examination for the appropriate remote pilot licence or associated rating when the applicant has passed all the required theoretical knowledge examination papers within a period of 18 months counted from the end of the calendar month when the applicant first attempted an examination.
- (c) If an applicant has failed to pass one of the theoretical knowledge examination papers within 4 attempts, or has failed to pass all papers within either 6 sittings or the period mentioned in paragraph (b), the applicant shall re-take the complete set of theoretical knowledge examination papers. Before re-taking the theoretical knowledge examinations, the applicant shall undertake further training at an ATO. The extent and scope of the training needed shall be determined by the ATO, based on the needs of the applicant.

VALIDITY PERIOD

The successful completion of the theoretical knowledge examinations should be valid for the issue of an VLOS RPL or RPL, for a period of 2 years.

GM1 JARUS-FCL.050 Recording of flight time

GENERAL

- (a) The record of the flights flown should contain at least the following information:
 - (1) personal details: name(s) and address of the remote pilot;
 - (2) for each flight:
 - (i) name(s) of RPIC;
 - (ii) date of flight;
 - (iii) place and time of departure and arrival;

- (iv) type, including make, model and variant, and registration of the RPA and RPS;
 - (v) indication if the RPA is SE or ME, if applicable;
 - (vi) total time of flight;
 - (vii) accumulated total time of flight;
 - (viii) type of operation, e.g. VLOS, BVLOS, night etc
- (3) for each RPA FSTD session, if applicable:
- (i) type and qualification number of the training device;
 - (ii) FSTD instruction;
 - (iii) date;
 - (iv) total time of session;
 - (v) accumulated total time
- (4) details on remote pilot function, namely RPIC, including solo, student RPIC and RPICUS time, remote co-pilot, dual, RPAS instructor or RPAS examiner;
- (5) Operational conditions, namely if the operation takes place at night, or is conducted under instrument flight rules.
- (b) Logging of flight time:
- (1) RPIC flight time:
- (i) the holder of a remote pilot license may log as RPIC time all of the flight time during which he or she is the RPIC, including all time in which he or she is the sole manipulator of the flight controls.;
 - (ii) the applicant for or the holder of a remote pilot licence may log as RPIC time all solo flight time, flight time as student RPIC and flight time under supervision provided that such student RPIC time and flight time under supervision are countersigned by the RPAS instructor;
 - (iii) the RPAS instructor may log as RPIC time all flight time while acting as an RPAS instructor;
 - (iv) the RPAS examiner may log as RPIC time all flight time while acting as an RPAS examiner;
 - (v) a remote co-pilot acting as RPIC under supervision on an RPA on which more than one remote pilot is required under the type certification of the RPA or as required by operational requirements provided that such RPIC under supervision time is countersigned by the RPIC;

- (vi) if the holder of a remote pilot licence carries out a number of flights upon the same day returning on each occasion to the same place of departure and the interval between successive flights does not exceed 30 minutes, such series of flights may be recorded as a single entry.
 - (2) remote co-pilot flight time: the holder of a remote pilot licence acting as co-pilot may log all flight time as remote co-pilot flight time on an RPA on which more than one remote pilot is required under the type certification of the RPA , or the regulations under which the flight is conducted;
 - (3) instruction time: a summary of all time logged by an applicant for a remote licence or associated rating as RPAS flight instruction, may be logged if certified by the RPAS instructor from whom it was received;
 - (4) RPIC under supervision flight time: provided that the method of supervision is acceptable to the competent authority, a remote co-pilot may log as RPIC flight time flown as RPIC under supervision when all the duties and functions of RPIC on that flight were carried out in such a way that the intervention of the RPIC in the interest of safety was not required.
- (c) Format of the record:
- (1) Details of flights flown under RPAS operation may be recorded in a computerised format maintained by the operator. In this case an operator should make the records of all flights operated by the remote pilot, including differences and familiarisation training, available upon request to the flight crew member concerned;
 - (2) For other types of flight, the remote pilot should record the details of the flights flown in the following logbook format.

GM1 JARUS-FCL.055 Language proficiency

GENERAL

- (a) The language proficiency assessment should be designed to reflect a range of tasks undertaken by remote pilots but with specific focus on language rather than operational procedures.
- (b) The assessment should determine the applicant's ability to:
 - (1) communicate effectively using standard R/T phraseology;
 - (2) deliver and understand messages in plain language in both usual and unusual situations that necessitate departure from standard R/T phraseology.

NOTE: refer to the 'Manual on the Implementation of ICAO Language Proficiency Requirements' (ICAO Doc 9835), Appendix A Part III and Appendix B for further guidance.

ASSESSMENT

- (c) The assessment may be subdivided into three elements, as follows:
 - (1) listening: assessment of comprehension;
 - (2) speaking: assessment of pronunciation, fluency, structure and vocabulary;
 - (3) interaction.
- (d) The three elements mentioned above may be combined and they can be covered by using a wide variety of means or technologies.
- (e) Where appropriate, some or all of these elements may be achieved through the use of the R/T testing arrangements.
- (f) When the elements of the testing are assessed separately, the final assessment should be consolidated in the language proficiency endorsement issued by the competent authority.
- (g) The assessment may be conducted during one of the several existing checking or training activities, such as licence issue or rating issue and revalidation, line training, operator line checks or proficiency checks.
- (h) The competent authority may use its own resources in developing or conducting the language proficiency assessment, or may delegate this task to language assessment bodies.
- (i) The competent authority should establish an appeal procedure for applicants.
- (j) The holder of a licence should receive a statement containing the level and validity of the language endorsements.

- (k) Where the assessment method for the English language established by the competent authority is equivalent to that established for the assessment of use of the English language in accordance with GM2 JARUS-FCL.055, the same assessment may be used for both purposes.

BASIC ASSESSMENT REQUIREMENTS

- (l) The aim of the assessment is to determine the ability of an applicant for a pilot licence or a licence holder to speak and understand the language used for R/T communications.

(1) The assessment should determine the ability of the applicant to use both:

- (i) standard R/T phraseology;
- (ii) plain language, in situations when standardised phraseology cannot serve an intended transmission.

(2) The assessment should include:

- (i) voice-only or face-to-face situations;
- (ii) common, concrete and work-related topics for remote pilots.

(3) The applicants should demonstrate their linguistic ability in dealing with an unexpected turn of events, and in solving apparent misunderstandings.

(4) The assessment should determine the applicant's speaking and listening abilities. Indirect assessments, of grammatical knowledge, reading and writing, are not appropriate.

(5) The assessment should determine the language skills of the applicant in the following areas:

- (i) pronunciation:
 - (A) the extent to which the pronunciation, stress, rhythm and intonation are influenced by the applicant's first language or national variations;
 - (B) how much they interfere with ease of understanding.
- (ii) structure:
 - (A) the ability of the applicant to use both basic and complex grammatical structures;
 - (B) the extent to which the applicant's errors interfere with the meaning.
- (iii) vocabulary:
 - (A) the range and accuracy of the vocabulary used;
 - (B) the ability of the applicant to paraphrase successfully when lacking vocabulary.

(iv) fluency:

- (A) tempo;
 - (B) hesitancy;
 - (C) rehearsed versus spontaneous speech;
 - (D) use of discourse markers and connectors.
- (v) comprehension:
- (A) on common, concrete and work-related topics;
 - (B) when confronted with a linguistic or situational complication or an unexpected turn of events.

NOTE: the accent or variety of accents used in the test material should be sufficiently intelligible for an international community of users.

- (vi) interactions:
- (A) quality of response (immediate, appropriate, and informative);
 - (B) the ability to initiate and maintain exchanges:
 - (a) on common, concrete and work-related topics;
 - (b) when dealing with an unexpected turn of events.
 - (C) the ability to deal with apparent misunderstandings by checking, confirming or clarifying.

NOTE: the assessment of the language skills in the areas mentioned above is conducted using the rating scale in this GM JARUS-FCL.055.

- (6) When the assessment is not conducted in a face-to-face situation, it should use appropriate technologies for the assessment of the applicant's abilities in listening and speaking, and for enabling interactions (for example: simulated pilot or controller communication).

ASSESSORS

- (m) It is essential that the persons responsible for language proficiency assessment ('assessors') are suitably trained and qualified. They should be either aviation specialists (for example current or former flight crew members or air traffic controllers), or language specialists with additional aviation-related training. An alternative approach would be to form an assessment team consisting of an operational expert and a language expert.
 - (1) The assessors should be trained on the specific requirements of the assessment.
 - (2) The assessors should not test applicants to whom they have given language training.

CRITERIA FOR THE ACCEPTABILITY OF LANGUAGE ASSESSMENT BODIES

(n) To ensure an impartial assessment process, the language assessment should be independent of the language training.

(1) To be accepted, the language assessment bodies should demonstrate:

- (i) appropriate management and staffing;
- (ii) quality system established and maintained to ensure compliance with, and adequacy of, assessment requirements, standards and procedures.

(2) The quality system established by a language assessment body should address the following:

- (i) management;
- (ii) policy and strategy;
- (iii) processes;
- (iv) the relevant provisions of ICAO, Part-FCL, MCAR, or JARUS-FCL or, standards and assessment procedures;
- (v) organisational structure;
- (vi) responsibility for the development, establishment and management of the quality system;
- (vii) documentation;
- (viii) quality assurance programme;
- (ix) human resources and training (initial and recurrent);
- (x) assessment requirements;
- (xi) customer satisfaction.

(3) The assessment documentation and records should be kept for a period of time determined by the competent authority and made available to this competent authority, on request.

(4) The assessment documentation should include at least the following:

- (i) assessment objectives;
- (ii) assessment layout, time scale, technologies used, assessment samples, voice samples;
- (iii) assessment criteria and standards (at least for the levels 4, 5 and 6 of the rating scale mentioned in this GM JARUS-FCL.055);
- (iv) documentation demonstrating the assessment validity, relevance and reliability;
- (v) assessment procedures and responsibilities:

- (A) preparation of individual assessment;
- (B) administration: location(s), identity check and invigilation, assessment discipline, confidentiality or security;
- (C) reporting and documentation provided to the competent authority or to the applicant, including sample certificate;
- (D) retention of documents and records.

NOTE: refer to the 'Manual on the Implementation of ICAO Language Proficiency Requirements' (ICAO Doc 9835) for further guidance.

GM2 JARUS-FCL.055 Language proficiency

RATING SCALE

THE FOLLOWING TABLE DESCRIBES THE DIFFERENT LEVELS OF LANGUAGE PROFICIENCY:

LEVEL	PRONUNCIATION ASSUMES A DIALECT OR ACCENT INTELLIGIBLE TO THE AERONAUTICAL COMMUNITY	STRUCTURE RELEVANT GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE DETERMINED BY LANGUAGE FUNCTIONS APPROPRIATE TO THE TASK	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
EXPERT (LEVEL 6)	PRONUNCIATION, STRESS, RHYTHM, AND INTONATION, THOUGH POSSIBLY INFLUENCED BY THE FIRST LANGUAGE OR REGIONAL VARIATION, ALMOST NEVER INTERFERE WITH EASE OF UNDERSTANDING.	BOTH BASIC AND COMPLEX GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE CONSISTENTLY WELL CONTROLLED.	VOCABULARY RANGE AND ACCURACY ARE SUFFICIENT TO COMMUNICATE EFFECTIVELY ON A WIDE VARIETY OF FAMILIAR AND UNFAMILIAR TOPICS. VOCABULARY IS IDIOMATIC, NUANCED AND SENSITIVE TO REGISTER.	ABLE TO SPEAK AT LENGTH WITH A NATURAL, EFFORTLESS FLOW. VARIES SPEECH FLOW FOR STYLISTIC EFFECT, FOR EXAMPLE TO EMPHASISE A POINT. USES APPROPRIATE DISCOURSE MARKERS AND CONNECTORS SPONTANEOUSLY.	COMPREHENSION IS CONSISTENTLY ACCURATE IN NEARLY ALL CONTEXTS AND INCLUDES COMPREHENSION OF LINGUISTIC AND CULTURAL SUBTLETIES.	INTERACTS WITH EASE IN NEARLY ALL SITUATIONS. IS SENSITIVE TO VERBAL AND NON- VERBAL CUES, AND RESPONDS TO THEM APPROPRIATELY.
EXTENDED (LEVEL 5)	PRONUNCIATION, STRESS, RHYTHM, AND INTONATION, THOUGH INFLUENCED BY THE FIRST LANGUAGE OR	BASIC GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE CONSISTENTLY WELL CONTROLLED. COMPLEX	VOCABULARY RANGE AND ACCURACY ARE SUFFICIENT TO COMMUNICATE EFFECTIVELY ON COMMON, CONCRETE,	ABLE TO SPEAK AT LENGTH WITH RELATIVE EASE ON FAMILIAR TOPICS, BUT MAY NOT VARY SPEECH FLOW AS A	COMPREHENSION IS ACCURATE ON COMMON, CONCRETE, AND WORK-RELATED TOPICS AND MOSTLY ACCURATE WHEN THE	RESPONSES ARE IMMEDIATE, APPROPRIATE, AND INFORMATIVE. MANAGES THE SPEAKER OR

LEVEL	PRONUNCIATION ASSUMES A DIALECT OR ACCENT INTELLIGIBLE TO THE AERONAUTICAL COMMUNITY	STRUCTURE RELEVANT GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE DETERMINED BY LANGUAGE FUNCTIONS APPROPRIATE TO THE TASK	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
	REGIONAL VARIATION, RARELY INTERFERE WITH EASE OF UNDERSTANDING.	STRUCTURES ARE ATTEMPTED BUT WITH ERRORS WHICH SOMETIMES INTERFERE WITH MEANING.	AND WORK-RELATED TOPICS. PARAPHRASES CONSISTENTLY AND SUCCESSFULLY. VOCABULARY IS SOMETIMES IDIOMATIC.	STYLISTIC DEVICE. CAN MAKE USE OF APPROPRIATE DISCOURSE MARKERS OR CONNECTORS.	SPEAKER IS CONFRONTED WITH A LINGUISTIC OR SITUATIONAL COMPLICATION OR AN UNEXPECTED TURN OF EVENTS. IS ABLE TO COMPREHEND A RANGE OF SPEECH VARIETIES (DIALECT OR ACCENT) OR REGISTERS.	LISTENER RELATIONSHIP EFFECTIVELY.
OPERATIONAL (LEVEL 4)	PRONUNCIATION, STRESS, RHYTHM, AND INTONATION ARE INFLUENCED BY THE FIRST LANGUAGE OR REGIONAL VARIATION BUT ONLY SOMETIMES INTERFERE WITH EASE OF UNDERSTANDING.	BASIC GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE USED CREATIVELY AND ARE USUALLY WELL CONTROLLED. ERRORS MAY OCCUR, PARTICULARLY IN UNUSUAL OR UNEXPECTED CIRCUMSTANCES, BUT RARELY INTERFERE WITH MEANING.	VOCABULARY RANGE AND ACCURACY ARE USUALLY SUFFICIENT TO COMMUNICATE EFFECTIVELY ON COMMON, CONCRETE, AND WORK-RELATED TOPICS. CAN OFTEN PARAPHRASE SUCCESSFULLY WHEN LACKING VOCABULARY PARTICULARLY IN UNUSUAL OR UNEXPECTED CIRCUMSTANCES.	PRODUCES STRETCHES OF LANGUAGE AT AN APPROPRIATE TEMPO. THERE MAY BE OCCASIONAL LOSS OF FLUENCY ON TRANSITION FROM REHEARSED OR FORMULAIC SPEECH TO SPONTANEOUS INTERACTION, BUT THIS DOES NOT PREVENT EFFECTIVE COMMUNICATION. CAN MAKE LIMITED USE OF DISCOURSE MARKERS AND CONNECTORS. FILLERS ARE NOT	COMPREHENSION IS MOSTLY ACCURATE ON COMMON, CONCRETE, AND WORK-RELATED TOPICS WHEN THE ACCENT OR VARIETY USED IS SUFFICIENTLY INTELLIGIBLE FOR AN INTERNATIONAL COMMUNITY OF USERS. WHEN THE SPEAKER IS CONFRONTED WITH A LINGUISTIC OR SITUATIONAL COMPLICATION OR AN UNEXPECTED TURN OF EVENTS,	RESPONSES ARE USUALLY IMMEDIATE, APPROPRIATE, AND INFORMATIVE. INITIATES AND MAINTAINS EXCHANGES EVEN WHEN DEALING WITH AN UNEXPECTED TURN OF EVENTS. DEALS ADEQUATELY WITH APPARENT MISUNDERSTANDINGS BY CHECKING, CONFIRMING, OR CLARIFYING.

LEVEL	PRONUNCIATION ASSUMES A DIALECT OR ACCENT INTELLIGIBLE TO THE AERONAUTICAL COMMUNITY	STRUCTURE RELEVANT GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE DETERMINED BY LANGUAGE FUNCTIONS APPROPRIATE TO THE TASK	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
				DISTRACTING.	COMPREHENSION MAY BE SLOWER OR REQUIRE CLARIFICATION STRATEGIES.	
PRE-OPERATIONAL (LEVEL 3)	PRONUNCIATION, STRESS, RHYTHM, AND INTONATION ARE INFLUENCED BY THE FIRST LANGUAGE OR REGIONAL VARIATION AND FREQUENTLY INTERFERE WITH EASE OF UNDERSTANDING.	BASIC GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ASSOCIATED WITH PREDICTABLE SITUATIONS ARE NOT ALWAYS WELL CONTROLLED. ERRORS FREQUENTLY INTERFERE WITH MEANING.	VOCABULARY RANGE AND ACCURACY ARE OFTEN SUFFICIENT TO COMMUNICATE EFFECTIVELY ON COMMON, CONCRETE, AND WORK-RELATED TOPICS BUT RANGE IS LIMITED AND THE WORD CHOICE OFTEN INAPPROPRIATE. IS OFTEN UNABLE TO PARAPHRASE SUCCESSFULLY WHEN LACKING VOCABULARY.	PRODUCES STRETCHES OF LANGUAGE, BUT PHRASING AND PAUSING ARE OFTEN INAPPROPRIATE. HESITATIONS OR SLOWNESS IN LANGUAGE PROCESSING MAY PREVENT EFFECTIVE COMMUNICATION. FILLERS ARE SOMETIMES DISTRACTING.	COMPREHENSION IS OFTEN ACCURATE ON COMMON, CONCRETE, AND WORK-RELATED TOPICS WHEN THE ACCENT OR VARIETY USED IS SUFFICIENTLY INTELLIGIBLE FOR AN INTERNATIONAL COMMUNITY OF USERS. MAY FALL TO UNDERSTAND A LINGUISTIC OR SITUATIONAL COMPLICATION OR AN UNEXPECTED TURN OF EVENTS.	RESPONSES ARE SOMETIMES IMMEDIATE, APPROPRIATE, AND INFORMATIVE. CAN INITIATE AND MAINTAIN EXCHANGES WITH REASONABLE EASE ON FAMILIAR TOPICS AND IN PREDICTABLE SITUATIONS. GENERALLY INADEQUATE WHEN DEALING WITH AN UNEXPECTED TURN OF EVENTS.
ELEMENTARY (LEVEL 2)	PRONUNCIATION, STRESS, RHYTHM, AND INTONATION ARE HEAVILY INFLUENCED BY THE FIRST LANGUAGE OR REGIONAL VARIATION AND	SHOWS ONLY LIMITED CONTROL OF FEW SIMPLE MEMORISED GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS.	LIMITED VOCABULARY RANGE CONSISTING ONLY OF ISOLATED WORDS AND MEMORISED PHRASES.	CAN PRODUCE VERY SHORT, ISOLATED, MEMORISED UTTERANCES WITH FREQUENT PAUSING AND A DISTRACTING USE OF FILLERS TO SEARCH FOR	COMPREHENSION IS LIMITED TO ISOLATED, MEMORISED PHRASES WHEN THEY ARE CAREFULLY AND SLOWLY ARTICULATED.	RESPONSE TIME IS SLOW, AND OFTEN INAPPROPRIATE. INTERACTION IS LIMITED TO SIMPLE ROUTINE EXCHANGES.

LEVEL	PRONUNCIATION ASSUMES A DIALECT OR ACCENT INTELLIGIBLE TO THE AERONAUTICAL COMMUNITY	STRUCTURE RELEVANT GRAMMATICAL STRUCTURES AND SENTENCE PATTERNS ARE DETERMINED BY LANGUAGE FUNCTIONS APPROPRIATE TO THE TASK	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
	USUALLY INTERFERE WITH EASE OF UNDERSTANDING.			EXPRESSIONS AND ARTICULATE LESS FAMILIAR WORDS.		
PRE- ELEMEN- TARY (LEVEL 1)	PERFORMS AT A LEVEL BELOW THE ELEMENTARY LEVEL.	PERFORMS AT A LEVEL BELOW THE ELEMENTARY LEVEL.	PERFORMS AT A LEVEL BELOW THE ELEMENTARY LEVEL.	PERFORMS AT A LEVEL BELOW THE ELEMENTARY LEVEL.	PERFORMS AT A LEVEL BELOW THE ELEMENTARY LEVEL.	PERFORMS AT A LEVEL BELOW THE ELEMENTARY LEVEL.

NOTE: OPERATIONAL LEVEL (LEVEL 4) IS THE MINIMUM REQUIRED PROFICIENCY LEVEL FOR R/T COMMUNICATION.

LEVELS 1 THROUGH 3 DESCRIBE PRE-ELEMENTARY, ELEMENTARY AND PRE-OPERATIONAL LEVELS OF LANGUAGE PROFICIENCY RESPECTIVELY, ALL OF WHICH DESCRIBE A LEVEL BELOW THE LANGUAGE PROFICIENCY REQUIREMENT.

LEVELS 5 AND 6 DESCRIBE EXTENDED AND EXPERT LEVELS AT LEVELS OF PROFICIENCY MORE ADVANCED THAN THE MINIMUM REQUIRED STANDARD.

GM1 JARUS-FCL.110 Theoretical knowledge examination

SYLLABUS OF THEORETICAL KNOWLEDGE FOR RPL AND VLOS RPL – ALL CATEGORIES

The following tables contain the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the RPL and VLOS RPL. The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated to the remote pilot licence and the activity. An approved course shall comprise at least the amount of theoretical knowledge instruction as indicated in the specific RPAS instruction provisions for each category. This RPAS instruction provided by the ATO should include a certain element of formal classroom work but may include also such facilities as interactive video, slide or tape presentation, computer-based training and other media distance learning courses. The training organisation responsible for the training has to check if all the appropriate elements of the training course of theoretical knowledge instruction have been completed to a satisfactory standard before recommending the applicant for the examination.

The applicable items for each remote pilot licence are marked with 'x'. An 'x' on the main title of a subject means that all the sub-divisions are applicable.

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
010 00 00 00	AIR LAW AND ATC PROCEDURES INCLUDING RPAS SPECIFIC REGULATIONS	x	x	x	x	x	x	x	x	
010 01 00 00	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		X		X		X		X	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
010 02 00 00	AIRWORTHINESS OF RPAS	X	X	X	X	X	X	X	X	
010 03 00 00	RPAS NATIONALITY AND REGISTRATION MARKS	X	X	X	X	X	X	X	X	
010 04 00 00	PERSONNEL LICENSING	X	X	X	X	X	X	X	X	
010 05 00 00	RULES OF THE AIR	X	X	X	X	X	X	X	X	
010 06 00 00	AIR NAVIGATION SERVICES: RPAS OPERATIONS	X	X	X	X	X	X	X	X	
010 07 00 00	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT	X	X	X	X	X	X	X	X	
010 08 00 00	AERONAUTICAL INFORMATION SERVICE	X	X	X	X	X	X	X	X	
010 09 00 00	AERODROMES OR HELIPORTS, (ICAO Annex 14, Volume I, Aerodrome Design and Operations)	X	X	X	X	X	X	X	X	
010 10 00 00	FACILITATION		X		X		X		X	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
010 11 00 00	SEARCH AND RESCUE		X		X		X		X	
010 12 00 00	SECURITY	X	X	X	X	X	X	X	X	
010 13 00 00	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION	X	X	X	X	X	X	X	X	
021 00 00 00	AIRCRAFT GENERAL KNOWLEDGE: AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT	x	x	x	x	X	X	X	X	
021 01 00 00	SYSTEM DESIGN, LOADS, STRESSES AND MAINTENANCE	x	x	x	x	X	X	X	X	
021 02 00 00	AIRFRAME	x	x	x	x	X	X	X	X	
021 03 00 00	HYDRAULICS	x	x	x	x					
021 04 00 00	LANDING GEAR, WHEELS, TYRES AND BRAKES	x	x	x	x	X	X			
021 05 00 00	FLIGHT CONTROLS	x	x	x	x	X	X	X	X	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
021 06 00 00	PNEUMATICS:	x	x	x	x	X	X			
021 07 00 00	ANTI AND DE-ICING SYSTEMS		x		x					
021 08 00 00	FUEL SYSTEM (including batteries and fuel cells)	x	x	x	x	x	X	X	X	
021 09 00 00	ELECTRICS	x	x	x	x	X	X	X	X	
021 10 00 00	PISTON ENGINES	x	x	x	x	X	X	X	X	
021 11 00 00	TURBINE ENGINES		x		x					
021 12 00 00	PROTECTION AND DETECTION SYSTEMS	x	x	x	x	X	X	X	X	
021 14 00 00	HELICOPTER: MISCELLANEOUS SYSTEMS			x	x					
021 15 00 00	HELICOPTER: ROTOR HEADS			x	x					
021 16 00 00	HELICOPTER: TRANSMISSION			x	x					

		Aeroplane		Helicopter		Multicopter		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
021 17 00 00	HELICOPTER: BLADES			x	x	X	X			
021 18 00 00	AIRSHIP: SYSTEM DESIGN, LOADS, STRESSES AND MAINTENANCE							X	X	
021 19 00 00	AIRSHIP : ENVELOPE							X	X	
021 20 00 00	AIRSHIP: BURNER (HOT AIR As)							X	X	
021 21 00 00	AIRSHIP: FUEL CYLINDERS (HOR AIR As)							X	X	
021 22 00 00	AIRSHIP: GONDOLA							X	X	
021 23 00 00	AIRSHIP: LIFTING GAS (GAS As)							X	X	
021 24 00 00	AIRSHIP: BURNING GAS (HOR AIR As)							X	X	
021 25 00 00	AIRSHIP: BALLAST (GAS As)							X	X	
022 00 00 00	AIRCRAFT GENERAL KNOWLEDGE: INSTRUMENTATION	x	x	x	x	X	X	X	X	
022 01 00 00	SENSORS AND INSTRUMENTS	x	x	x	x	X	X	X	X	

		Aeroplane		Helicopter		Multicopter		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
022 02 00 00	MEASUREMENT OF AIR DATA PARAMETERS	x	x	x	x	X	X	X	X	
022 03 00 00	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE	x	x	x	x	X	X	X	X	
022 04 00 00	GYROSCOPIC INSTRUMENTS	x	x	x	x	X	X	X	X	
022 05 00 00	INERTIAL NAVIGATION AND REFERENCE SYSTEMS		x		x		X			
022 06 00 00	AEROPLANE: AUTOMATIC FLIGHT CONTROL SYSTEMS	x	x							
022 07 00 00	HELICOPTER: AUTOMATIC FLIGHT CONTROL SYSTEMS			X	x					
022 08 00 00	MULTICOPTER: AUTOMATIC FLIGHT CONTROL SYSTEMS					X	X			
022 09 00 00	AIRSHIP: AUTOMATIC FLIGHT CONTROL SYSTEMS							X	X	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
022 10 00 00	TRIMS AND FLIGHT ENVELOPE PROTECTION	x	x	x	x	X	X	X	X	
022 10 00 00	COMMUNICATION SYSTEMS	x	x	x	x	x	x	x	x	
022 11 00 00	FMS		x		x		X		X	
022 12 00 00	ALERTING SYSTEMS AND PROXIMITY SYSTEMS		x		x		X		X	
022 13 00 00	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		x		x		X		X	
022 14 00 00	MAINTENANCE, MONITORING AND RECORDING SYSTEMS	x	x	x	x	x	x	x	x	
022 15 00 00	DIGITAL CIRCUITS AND COMPUTERS	x	x	x	x	x	x	x	x	
030 00 00 00	FLIGHT PERFORMANCE AND PLANNING	x	x	x	x	x	x	x	x	
031 00 00 00	MASS AND BALANCE:	X	x	x	x	x	x	x	x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
031 01 00 00	PURPOSE OF MASS AND BALANCE CONSIDERATIONS	x	x	x	x	x	x	x	x	
031 02 00 00	LOADING	x	x	x	x	x	x	x	x	
031 03 00 00	FUNDAMENTALS OF CG CALCULATIONS	x	x	x	x	x	x	x	x	
031 04 00 00	MASS AND BALANCE DETAILS OF AIRCRAFT	x	x	x	x	x	x	X	X	
031 05 00 00	DETERMINATION OF CG POSITION	x	x	x	x	x	x	x	X	
032 00 00 00	PERFORMANCE: AEROPLANES	x	x							
032 01 00 00	GENERAL	x	x							
032 02 00 00	PERFORMANCE SE AEROPLANES	X	x							
032 03 00 00	PERFORMANCE ME AEROPLANES	X	x							

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
033 00 00 00	FLIGHT PLANNING AND FLIGHT MONITORING	x	x	x	x	x	x	x	x	
033 01 00 00	FLIGHT PLANNING FOR VFR FLIGHTS		x		x		X	X	X	
033 02 00 00	FLIGHT PLANNING FOR IFR FLIGHTS		x		x					
033 03 00 00	FUEL AND ENERGY PLANNING	x	x	x	x	x	x	x	x	
033 04 00 00	PRE-FLIGHT PREPARATION	x	x	x	x	x	x	x	x	
033 05 00 00	ICAO FLIGHT PLAN (ATS FLIGHT PLAN)		x		x				X	
033 06 00 00	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x	x	x					
034 00 00 00	PERFORMANCE: HELICOPTERS			x	x					
034 01 00 00	GENERAL			X	X					
034 02 00 00	PERFORMANCE SE HELICOPTERS				X					
035 00 00 00	PERFORMANCE SE AIRSHIP							X	X	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
035 01 00 00	GENERAL							X	X	
040 00 00 00	HUMAN PERFORMANCE	x	x	x	x	x	x	x	x	
040 01 00 00	HUMAN FACTORS: BASIC CONCEPTS	x	x	x	x	x	x	x	x	
040 02 00 00	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE FOR RPAS PILOTS	x	x	x	x	x	x	x	x	
040 03 00 00	BASIC AVIATION PSYCHOLOGY	x	x	x	x	x	x	x	x	
050 00 00 00	METEOROLOGY	x	x	x	x	x	x	x	x	
050 01 00 00	THE ATMOSPHERE	x	x	x	x	x	x	x	x	
050 02 00 00	WIND	x	x	x	x	x	x	x	x	
050 03 00 00	THERMODYNAMICS		x		x		X		X	
050 04 00 00	CLOUDS AND FOG	x	x	x	x	x	x	x	x	
050 05 00 00	PRECIPITATION	x	x	x	x	x	x	x	x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
050 06 00 00	AIR MASSES AND FRONTS	x	x	x	x	x	x	x	x	
050 07 00 00	PRESSURE SYSTEMS	x	x	x	x	x	x	x	x	
050 08 00 00	CLIMATOLOGY	x	x	x	x	x	x	x	x	
050 09 00 00	FLIGHT HAZARDS	x	x	x	x	x	x	x	x	
050 10 00 00	METEOROLOGICAL INFORMATION	x	x	x	x	x	x	x	x	
060 00 00 00	NAVIGATION		x		x		x		x	
061 00 00 00	GENERAL NAVIGATION		x		x		x		x	
061 01 00 00	BASICS OF NAVIGATION		x		x		X		X	
061 02 00 00	MAGNETISM AND COMPASSES		x		x		X		X	
061 03 00 00	CHARTS	x	x	x	x	x	x	x	x	
061 04 00 00	DEAD RECKONING NAVIGATION		x		x		X		X	
061 05 00 00	IN-FLIGHT NAVIGATION		x		x		x		x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
062 00 00 00	RADIO NAVIGATION		x		x		x		x	
062 01 00 00	BASIC RADIO PROPAGATION THEORY		x		x		x		x	
062 02 00 00	RADIO AIDS		x		x		x		x	
062 03 00 00	RADAR		x		x		x		x	
062 04 00 00	INTENTIONALLY LEFT BLANK									
062 05 00 00	AREA NAVIGATION SYSTEMS AND RNAV OR FMS		x		x		x		x	
062 06 00 00	GNSS, AREA NAVIGATION SYSTEMS, RNAV/FMS		x		x		x		x	
070 00 00 00	OPERATIONAL PROCEDURES	x	x	x	x	x	x	x	x	
071 01 00 00	GENERAL REQUIREMENTS	x	x	x	x	x	x	x	x	
071 02 00 00	RPA CATEGORIZATION OF OPERATIONS	x	x	x	x	x	x	x	x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
071 02 00 00	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)	x	x	x	x	x	x	x	x	
071 03 00 00	AIRCRAFT EMERGENCY PROCEDURES	x	x	x	x	x	x	x	x	
080 00 00 00	PRINCIPLES OF FLIGHT	x	x	x	x	x	x	x	x	
081 00 00 00	PRINCIPLES OF FLIGHT: AEROPLANE	x	x							
081 01 00 00	SUBSONIC AERODYNAMICS	x	x							
081 02 00 00	HIGH SPEED AERODYNAMICS		x							
081 03 00 00	INTENTIONALLY LEFT BLANK									
081 04 00 00	STABILITY	x	x							
081 05 00 00	CONTROL	x	x							
081 06 00 00	LIMITATIONS	x	x							
081 07 00 00	PROPELLERS	x	x							

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
081 08 00 00	FLIGHT MECHANICS	x	x							
082 00 00 00	PRINCIPLES OF FLIGHT: HELICOPTER			x	x					
082 01 00 00	SUBSONIC AERODYNAMICS			x	x					
082 02 00 00	TRANSONIC AERODYNAMICS AND COMPRESSIBILITY EFFECTS			x	x					
082 03 00 00	ROTORCRAFT TYPES			x	x					
082 04 00 00	MAIN ROTOR AERODYNAMICS			x	x					
082 05 00 00	MAIN ROTOR MECHANICS			x	x					
082 06 00 00	TAIL ROTORS			x	x					
082 07 00 00	EQUILIBRIUM, STABILITY AND CONTROL			x	x					
082 08 00 00	HELICOPTER FLIGHT MECHANICS			x	x					
083 00 00 00	PRINCIPLES OF FLIGHT: AIRSHIP							x	x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
083 10 00 00	AEROSTATIC							X	x	
083 20 00 00	LOADING LIMITATIONS							x	x	
083 30 00 00	OPERATIONAL LIMITATIONS							x	x	
084 00 00 00	PRINCIPLES OF FLIGHT: MULTIROTOR					x	x			
084 10 00 00	ROTOR AERODYNAMICS					x	x			
084 20 00 00	ROTOR MECHANICS					x	x			
084 30 00 00	MULTIROTOR FLIGHT MECHANICS					x	x			
090 00 00 00	COMMUNICATIONS	x	x	x	x	x	x	x	x	
091 00 00 00	VFR COMMUNICATIONS	x	x	x	x	x	x	x	x	
091 01 00 00	DEFINITIONS	x	x	x	x	x	x	x	x	
091 02 00 00	GENERAL OPERATING PROCEDURES		x		x		x		x	
091 03 00 00	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	x	x	x	x	x	x	x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
091 04 00 00	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x		x		x		x	
091 05 00 00	DISTRESS AND URGENCY PROCEDURES	x	x	x	x	x	x	x	x	
091 06 00 00	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	x	x	x	x	x	x	x	
	IFR COMMUNICATIONS									
092 01 00 00	DEFINITIONS		x		x		x		x	
092 02 00 00	GENERAL OPERATING PROCEDURES		x		x		x		x	
092 03 00 00	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x		x		x		x	
092 04 00 00	DISTRESS AND URGENCY PROCEDURES		x		x		x		x	
092 05 00 00	RELEVANT WEATHER INFORMATION TERMS (IFR)		x		x		x		x	

		Aeroplane		Helicopter		Multirotor		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
092 06 00 00	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x		x		x		x	
093 00 00 00	COMMAND AND CONTROL	x	x	x	x	x	x	x	x	
093 01 00 00	DEFINITIONS	x	x	x	x	x	x	x	x	
093 02 00 00	GENERAL OPERATING PROCEDURES	x	x	x	x	x	x	x	x	
093 03 00 00	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	x	x	x	x	x	x	x	x	
093 04 00 00	DISTRESS AND URGENCY PROCEDURES	x	x	x	x	x	x	x	x	
093 05 00 00	HANDOVER PROCEDURES	x	x	x	x	x	x	x	x	
100 00 00 00	REMOTE PILOT STATIONS	x	x	x	x	x	x	x	x	
100 01 00 00	DEFINITIONS	x	x	x	x	x	x	x	x	
100 02 00 00	GENERAL OPERATING PROCEDURES	x	x	x	x	x	x	x	x	

		Aeroplane		Helicopter		Multicopter		Airship		Balloon - reserved
		VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	VLOS RPL	RPL	
100 03 00 00	ACTION REQUIRED TO BE TAKEN IN CASE OF RPS FAILURE	x	x	x	x	x	x	x	x	
110 00 00 00	LAUNCH AND RECOVERY EQUIPMENT	x	x	x	x	x	x	x	x	
110 01 00 00	DEFINITIONS	x	x	x	x	x	x	x	x	
110 02 00 00	GENERAL OPERATING PROCEDURES	x	x	x	x	x	x	x	x	
110 03 00 00	ACTION REQUIRED TO BE TAKEN IN CASE OF LAUNCH AND RECOVERY EQUIPMENT FAILURE	x	x	x	x	x	x	x	x	
120 00 00 00	DATA LINK SYSTEMS	x	x	x	x	x	x	x	x	
120 01 00 00	DEFINITIONS	x	x	x	x	x	x	x	x	
120 02 00 00	RADIO LINE OF SITE SYSTEMS	x	x	x	x	x	x	x	x	
120 03 00 00	BEYOND LINE OF SITE SYSTEMS		x		x		x		x	

GM2 JARUS-FCL.110 Theoretical knowledge examination

- (a) The examinations should covering all the subjects listed:
 - (1) Air law;
 - (2) RPAS general knowledge;
 - (3) RPAS flight performance, planning and loading;
 - (4) Human performance;
 - (5) Navigation (for RPL only);
 - (6) Meteorology;
 - (7) Operation procedures;
 - (8) Principles of flight;
 - (9) Radiotelephony.
- (b) Communication practical classroom testing may be conducted.
- (c) The period of the validity period determined by the competent authority, mentioned in JARUS-FCL.025(b) should be counted from the end of the calendar month when the applicant first attempted an examination.

GM1 JARUS-FCL.120 Skill test

SKILL TEST

Further training may be required following any failed skill test or part thereof. There should be no limit to the number of skill tests that may be attempted.

CONDUCT OF THE TEST

- (a) If the applicant chooses to terminate a skill test for reasons considered inadequate by the RPAS examiner, the applicant should retake the entire skill test. If the test is terminated for reasons considered adequate by the RPAS examiner, only those sections not completed should be tested in a further flight.
- (b) Any manoeuvre or procedure of the test may be repeated once by the applicant. The RPAS examiner may stop the test at any stage if it is considered that the applicant's demonstration of flying skill requires a complete retest.
- (c) **An applicant should be required to fly the RPA from a position where the RPIC functions can be performed and to carry out the test as if there is no other crew member unless another crewmember is normally required. Responsibility for the flight should be allocated in accordance with national regulations.**

CONTENTS OF THE SKILL TEST

- (d) The area and route to be flown for the navigation test should be chosen by the RPAS examiner. The route may end at the aerodrome or site of departure or at another aerodrome or site. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are in order. The navigation section of the test should have a duration that allows the applicant to demonstrate the applicant's ability to complete a route.
- (e) An applicant should indicate to the RPAS examiner the checks and duties carried out, including the identification of radio facilities, when applicable. Checks should be completed in accordance with the authorised checklist for the RPA on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the RPA used.

FLIGHT TEST TOLERANCE

- (f) The applicant should demonstrate the ability to:
- (1) operate the RPA within its limitations;
 - (2) complete all manoeuvres with smoothness and accuracy;
 - (3) exercise good judgment and airmanship;
 - (4) apply aeronautical knowledge;
 - (5) maintain control of the RPA at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.
- (g) The limits should be established by the authority according to the system type. The RPAS examiner should make allowance for turbulent conditions and the handling qualities and performance of the RPA used:

NOTE: The limits can differentiate a little depending which category of RPA is used for the skill test. The RPAS examiner will notify the applicant the limits according to the category of RPA. The following tolerances are **examples**:

- (1) If applicable height in manual modes:
 - (i) normal flight ± 150 ft
 - (ii) with simulated engine failure ± 200 ft
- (2) If applicable heading or tracking:
 - (i) normal flight $\pm 10^\circ$
 - (ii) with simulated engine failure $\pm 15^\circ$
- (3) If applicable speed:
 - (i) take-off and approach $+15/-5$ knots
 - (ii) all other flight regimes ± 15 knots

CONTENT OF THE SKILL TEST

- (h) The skill test contents and sections set out in this GM can be used for the skill test for the issue of an RPL or VLOS RPL.

USE OF RPAS CHECKLISTS, AIRMANSHIP, CONTROL OF RPA BY EXTERNAL VISUAL REFERENCE, ANTI-ICING PROCEDURES, AND PRINCIPLES OF THREAT AND ERROR MANAGEMENT, ETC. APPLY IN ALL SECTIONS	
A	GROUND EVALUATION
B	PRE-FLIGHT, INCLUDING: FLIGHT PLANNING, DOCUMENTATION, MASS AND BALANCE, NOTAM AND WEATHER BRIEFING, DETERMINATION OF AIRWORTHINESS
C	RPAS INSPECTION AND SERVICING (INCLUDING RPS AND C ²)
D	GROUND MANOEUVRING AND TAKE-OFF
E	PERFORMANCE CONSIDERATIONS
F	AERODROME/SITE AND TRAFFIC PATTERN OPERATIONS
G	DEPARTURE PROCEDURE, ALTIMETER SETTING, COLLISION AVOIDANCE (LOOK-OUT)
H	ATC COMPLIANCE AND R/T PROCEDURES
SECTION 2 GENERAL AIRWORK	
A	VLOS CONTROL OF THE RPA BY EXTERNAL VISUAL REFERENCE, INCLUDING STRAIGHT AND LEVEL, CLIMB, DESCENT AND LOOK-OUT
B	TURNES
C	STEEP DESCENTS AND CLIMBS(IF APPLICABLE)
D	TRANSFER FROM VLOS TO BVLOS
E	BVLOS FLIGHT BY REFERENCE SOLELY TO INSTRUMENTS, INCLUDING: I. LEVEL FLIGHT, CONTROL OF HEADING, ALTITUDE AND AIR SPEED; II. CLIMBING AND DESCENDING TURNS; III. RECOVERIES FROM UNUSUAL ATTITUDES
F	ATC COMPLIANCE AND R/T PROCEDURES
SECTION 3 EN-ROUTE PROCEDURES	
A	FLIGHT PLAN, DEAD RECKONING, NAVIGATION USING VISUAL REFERENCE FROM PAYLOAD AND MAP READING

B	MAINTENANCE OF ALTITUDE, HEADING AND SPEED AND COLLISION AVOIDANCE
C	ORIENTATION, TIMING AND REVISION OF ETAS AND LOG KEEPING
D	OBSERVATION OF WEATHER CONDITIONS AND DIVERSION TO ALTERNATE AERODROME/SITE(PLANNING AND IMPLEMENTATION)
E	USE OF RADIO NAVIGATION AIDS
F	FLIGHT MANAGEMENT (CHECKS, ENERGY SYSTEMS, ETC.)
G	ATC COMPLIANCE AND R/T PROCEDURES
H	TRANSFER OF CONTROL BETWEEN RPIC OR RPS IF APPLICABLE
SECTION 4 APPROACH AND LANDING PROCEDURES	
A	APPROACHPROCEDURES
B	CIRCUIT
C	TRANSFER OF CONTROL BETWEEN RPIC TO VLOS RP
D	AUTOMATIC LANDING PROCEDURES
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
A	USE OF CHECKLISTS
B	ENGINE FAILURE
C	COMMAND AND CONTROL LINK LOSS FAILURE
D	APPROPRIATE ABNORMAL AND EMERGENCY PROCEDURES THAT ARE APPLICABLE TO THE TYPE OF UAS BEING OPERATED

REMOTE PILOT LICENCE

SECTION 2 - ADDITIONAL PROVISIONS FOR RPL

Specific provisions for the RPA category aeroplanes - RPL(A)

GM1 JARUS-FCL.125 RPL(A) Experience and JARUS-FCL.130 RPL(A) RPAS instruction

RPAS FLIGHT INSTRUCTION FOR THE RPL(A)

(i) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(j) Syllabus of RPAS flight instruction for RPA category aeroplane – RPA(A)

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (i)** the applicant's progress and ability;
- (ii)** the weather conditions affecting the flight;
- (iii)** the flight time available;
- (iv)** instructional technique considerations;
- (v)** the local operating environment;
- (vi)** applicability of the exercises to the specific RPA(A).

(2) Each of the exercises involves that the applicant to be aware of the needs of good airmanship and situational awareness and look-out if applicable, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the RPA(A):

- (A)** (A) characteristics of the RPA(A);
- (B)** RPS layout;
- (C)** RPAS systems;
- (D)** checklists, procedures and controls.

(ii) Exercise 1b: Emergency procedures:

- (A)** action if fire on the ground and in the air;
- (B)** powerplant, RPS and electrical system fire;
- (C)** systems failure;
- (D)** RPS escape drills, location and use of emergency equipment and exits.

- (iii) Exercise 2: Preparation for and action after flight:
 - (A) flight authorisation and RPA(A) acceptance;
 - (B) serviceability documents;
 - (C) equipment required, maps, etc.;
 - (D) external checks;
 - (E) internal checks;
 - (F) Command and control checks;
 - (G) seat or rudder panel adjustments if applicable;
 - (H) starting and warm-up checks;
 - (I) power checks;
 - (J) running down system checks and switching off the powerplant;
 - (K) parking, security and picketing (for example tie down);
 - (L) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience: flight exercise.
- (v) Exercise 4: Effects of controls:
 - (A) primary effects when laterally level and when banked;
 - (B) further effects of aileron and rudder;
 - (C) effects of:
 - (a) air speed;
 - (b) slipstream as applicable;
 - (c) power;
 - (d) trimming controls as applicable;
 - (e) flaps as applicable;
 - (f) other controls, as applicable;
 - (g) Envelope protection characteristics;
 - (D) operation of powerplant controls.
- (vi) Exercise 5a: Taxiing:
 - (A) pre-taxi checks;

- (B) starting, control of speed and stopping;
 - (C) powerplant handling;
 - (D) control of direction and turning;
 - (E) turning in confined spaces;
 - (F) parking area procedure and precautions;
 - (G) effects of wind and use of flying controls;
 - (H) effects of ground surface;
 - (I) freedom of rudder movement;
 - (J) marshalling signals;
 - (K) instrument checks;
 - (L) air traffic control procedures;
 - (M) communication and procedures with ground crew.
- (vii) Exercise 5b: Emergencies: brake and steering failure.
- (viii) Exercise 6: Straight and level:
- (A) at normal cruising power, attaining and maintaining straight and level flight;
 - (B) flight at critically high air speeds;
 - (C) demonstration of inherent stability, if applicable;
 - (D) control in pitch, including use of trim , if applicable;
 - (E) lateral level, direction and balance and trim, if applicable;
 - (F) at selected air speeds. use of power and configuration changes, if applicable;
- (ix) Exercise 7: Climbing:
- (A) entry, maintaining the normal and max rate climb and levelling off;
 - (B) levelling off at selected altitudes;
 - (C) en-route climb (cruise climb);
 - (D) climbing with flap down, if applicable;
 - (E) recovery to normal climb;

- (F) maximum angle of climb.
- (x) Exercise 8: Descending:
 - (A) entry, maintaining and levelling off;
 - (B) levelling off at selected altitudes;
 - (C) glide, powered and cruise descent (including effect of power and air speed);
 - (D) side slipping (on suitable types).
- (xi) Exercise 9: Turning:
 - (A) entry and maintaining level turns;
 - (B) resuming straight flight;
 - (C) faults in the turn (for example in correct pitch, bank and balance) , if applicable;
 - (D) climbing turns;
 - (E) descending turns;
 - (G) turns onto selected headings, use of heading indicator.
- (xii) Exercise 10a: Slow flight if applicable:

NOTE: the objective is to improve the student remote pilot's ability to recognise inadvertent flight at critically low speeds and provide practice in maintaining the aeroplane in balance while returning to normal air speed.

- (A) safety checks;
 - (B) introduction to slow flight;
 - (C) controlled flight down to critically slow air speed;
 - (D) application of full power with correct attitude and balance to achieve normal climb speed.
- (xiii) Exercise 10b: Stalling if applicable:
 - (A) safety checks;
 - (B) symptoms;
 - (C) recognition;
 - (D) clean stall and recovery without power and with power;
 - (E) recovery when a wing drops;

(F) approach to stall in the approach and in the landing configurations, with and without power and recovery at the incipient stage.

(xiv) Exercise 11: Spin avoidance if applicable:

(A) safety checks;

(B) stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45 °);

(C) RPAS instructor induced distractions during the stall.

NOTE : consideration of manoeuvre limitations and the need to refer to the RPA(A) manual and mass and balance calculations.

(xv) Exercise 12: Take-off and climb to downwind position:

(A) pre-take-off checks;

(B) into wind take-off;

(C) safeguarding the nose wheel;

(D) crosswind take-off;

(E) drills during and after take-off;

(F) short take-off and soft field procedure/techniques including performance calculations;

(G) noise abatement procedures.

(xvi) Exercise 13: Circuit, approach and landing:

(A) circuit procedures, downwind and base leg;

(B) powered approach and landing;

(C) safeguarding the nose wheel;

(D) effect of wind on approach and touchdown speeds and use of flaps;

(E) crosswind approach and landing;

(F) glide approach and landing;

(G) short landing and soft field procedures or techniques;

(H) flapless approach and landing if applicable;

(I) wheel landing (tail wheel RPA(A));

(J) missed approach and go-around;

- (K) noise abatement procedures.
- (xvii) Exercise 12/13: Emergencies:
 - (A) abandoned take-off;
 - (B) engine failure after take-off;
 - (C) mislanding and go-around;
 - (D) missed approach;
 - (E) Command and control link loss procedure;
 - (F) navigation system failure procedures, if applicable

NOTE: in the interests of safety it will be necessary for remote pilots trained on nose wheel RPA(A) to undergo dual conversion training before flying tail wheel RPA(A), and vice-versa.

- (xviii) Exercise 14: First solo:
 - (A) RPAS instructor's briefing, observation of flight and de-briefing;
 - (B) procedures for leaving and rejoining the circuit;
 - (C) the local area, restrictions, map reading;
 - (D) use RPAS navigation aids for homing;
- (xix) Exercise 15: Forced landing without power:
 - (A) forced landing procedure;
 - (B) choice of emergency landing site, provision for change of plan;
 - (C) gliding distance;
 - (D) descent plan;
 - (F) powerplant cooling;
 - (G) powerplant failure checks;
 - (H) use of radio;
 - (I) base leg;
 - (J) final approach;
 - (K) landing;
 - (L) actions after landing.
- (xx) Exercise 18a: Navigation:

- (A) flight planning:
 - (a) weather forecast and actuals;
 - (b) map selection and preparation:
 - (1) choice of route;
 - (2) controlled airspace;
 - (3) danger, prohibited and restricted areas;
 - (4) safety altitudes.
 - (c) calculations:
 - (1) magnetic heading(s) and time(s) en-route;
 - (2) energy consumption;
 - (3) mass and balance;
 - (4) mass and performance.
 - (d) flight information:
 - (1) NOTAMs etc.;
 - (2) radio frequencies and other means of communication required by the subjective situation;
 - (3) selection of alternate aerodromes and emergency landing sites.
 - (e) RPA(A) documentation;
 - (f) notification of the flight:
 - (1) pre-flight administrative procedures;
 - (2) flight plan form.
 - (g) Command and control communication;
 - (H) lost link route;
 - (I) Required navigation capabilities;
- (B) departure:
 - (a) organisation of RPS workload;
 - (b) departure procedures:
 - (1) altimeter settings;

- (2) ATC liaison in controlled or regulated airspace;
 - (3) setting heading procedure;
 - (4) noting of ETAs.
 - (c) maintenance of altitude and heading;
 - (d) revisions of ETA and heading;
 - (e) log keeping;
 - (f) use of radio;
 - (g) use of nav aids;
 - (h) minimum weather conditions for continuation of flight;
 - (i) in-flight decisions;
 - (j) transiting controlled or regulated airspace;
 - (k) diversion procedures;
 - (l) uncertainty of position procedure;
 - (m) lost procedure;
 - (n) lost link procedures;
 - (o) RPIC handover procedures;
 - (p) RPS handover procedures.
- (C) arrival and aerodrome joining procedure:
- (a) ATC liaison in controlled or regulated airspace;
 - (b) altimeter setting;
 - (c) entering the traffic pattern;
 - (d) circuit procedures;
 - (e) parking;
 - (f) security of aeroplane;
 - (g) refuelling;
 - (h) closing of flight plan, if appropriate;
 - (i) post-flight administrative procedures.

(xxi) Exercise 18b: Flight at lower levels and in reduced visibility for VLOS only:

- (A) actions before descending;
 - (B) hazards (for example obstacles and terrain);
 - (C) effects of wind and turbulence;
 - (D) vertical situational awareness (avoidance of controlled flight into terrain);
 - (E) avoidance of noise sensitive areas;
 - (F) joining the circuit;
 - (G) bad weather circuit and landing.
- (xxii) Exercise 18c: Radio navigation:
- (A) use of GNSS:
 - (a) selection of waypoints;
 - (b) to or from indications and orientation;
 - (c) error messages.
 - (B) use of en-route or terminal radar:
 - (a) availability and AIP;
 - (b) procedures and ATC liaison;
 - (c) remote pilot's responsibilities;
 - (d) secondary surveillance radar:
 - (1) transponders;
 - (2) code selection;
 - (3) interrogation and reply.
- (xxiii) Exercise 19: instrument flight:
- (A) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;
 - (B) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
 - (C) transition from VLOS to instrument flight on take-off;
 - (D) SIDs and arrivals;
 - (E) en-route IFR procedures;

(F) holding procedures;

(H) instrument approaches to specified minima;

(I) missed approach procedures;

(J) automated landings.

(3) In the following table it is indicated which exercise should apply for the RPL(A) or VLOS RPL(A):

Exercise	1a	2	3	4	5b	6	7	8	9	10a
RPL(A)	v	v	v	v	v	v	v	v	v	v
VLOS RPL(A)	v	v	v	v	v	v	v	v	v	v
Exercise	11	12	13	14	18b	18c	19			
RPL(A)	v	v	v	v		v	v			
VLOS RPL(A)	v	v	v	v	v	v				

A. Specific provisions for the RPA category helicopter - RPL(H)

GM1 JARUS-FCL.125 RPL(H) Experience and JARUS-FCL.130 RPL(H) RPAS instruction

FLIGHT INSTRUCTION FOR THE RPL(H)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Ground instruction

Enhanced ground instruction in weather interpretation, planning and route assessment, decision making on encountering DVE including reversing course or conducting a precautionary landing.

(c) Syllabus of RPAS instruction for RPA category helicopter – RPA(H)

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (i) the applicant's progress and ability;
- (ii) the weather conditions affecting the flight;
- (iii) the flight time available;
- (iv) instructional technique considerations;
- (v) the local operating environment;
- (vi) applicability of the exercises to the RPA(H).

(2) Each of the exercises involves that the applicant to be aware of the needs of good airmanship and situational awareness and look-out if applicable, which should be emphasised at all times.

- (i) Exercise 1a: Familiarisation with the RPA(H):
 - (A) characteristics of the RPA(H), external features;
 - (B) RPS layout;
 - (C) RPAS systems;
 - (D) checklists, procedures and controls.
- (ii) Exercise 1b: Emergency procedures:

- (A) action if fire on the ground and in the air;
 - (B) powerplant, RPS electrical system fire;
 - (C) systems failures;
 - (D) RPS escape drills, location and use of emergency equipment and exits.
- (iii) Exercise 2: Preparation for and action after flight:
- (A) flight authorisation and RPA(H) acceptance;
 - (B) serviceability documents;
 - (C) equipment required, maps, etc.;
 - (D) external checks;
 - (E) internal checks;
 - (F) Command and control checks;
 - (G) seat and flight controls adjustments;
 - (H) starting and warm-up checks clutch engagement and starting rotors;
 - (I) power checks;
 - (J) running down system checks and switching off the powerplant;
 - (K) parking, security and picketing;
 - (L) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience: flight exercise.
- (v) Exercise 4: Effects of controls:
- (A) function of flight controls, primary and secondary effect;
 - (B) effects of:
 - (a) air speed;
 - (b) power changes (torque);
 - (c) yaw (sideslip);
 - (d) disc loading (bank and flare);
 - (e) controls of through backup modes.

- (C) instruments;
 - (D) use of powerplant controls or anti-icing control.
- (vi) Exercise 5: Power and attitude changes:
- (A) relationship between cyclic control position, disc attitude, fuselage attitude and air speed;
 - (B) flapback;
 - (C) power required diagram in relation to air speed;
 - (D) power and air speed changes in level flight;
 - (E) use of instruments for precision;
 - (F) engine and air speed limitations.
- (vii) Exercise 6: Straight and level:
- (A) at normal cruising power, attaining and maintaining straight and level flight;
 - (B) control in pitch, including use of trim;
 - (C) maintaining direction and balance, (ball or yawstring use);
 - (D) setting power for selected air speeds and speed changes;
 - (E) use of instruments for precision.
- (viii) Exercise 7: Climbing:
- (A) optimum climb speed, best angle or rate of climb from power required diagram;
 - (B) initiation, maintaining the normal and maximum rate of climb, levelling off;
 - (C) levelling off at selected altitudes or heights;
 - (D) use of instruments for precision.
- (ix) Exercise 8: Descending:
- (A) optimum descent speed, best angle or rate of descent from power required diagram;
 - (B) initiation, maintaining and levelling off;
 - (C) levelling off at selected altitudes or heights;
 - (D) descent (including effect of power and air speed);

- (E) use of instruments for precision.
- (x) Exercise 9: Turning:
 - (A) initiation and maintaining level turns;
 - (B) resuming straight flight;
 - (C) altitude, bank and co-ordination;
 - (D) climbing and descending turns and effect on rate of climb or descent;
 - (E) turns onto selected headings, use of heading indicator;
 - (F) use of instruments for precision.
- (xi) Exercise 10: Basic autorotation:
 - (A) safety checks, verbal warning and look-out;
 - (B) entry, development and characteristics;
 - (C) control of air speed and RRPM, rotor and engine limitations;
 - (D) effect of AUM, IAS, disc loading, G forces and density altitude;
 - (E) re-engagement and go-around procedures (throttle over-ride or ERPM control);
 - (F) vortex condition during recovery;
 - (G) turns in autorotation;
 - (H) demonstration of variable flare simulated engine off landing if applicable.
- (xii) Exercise 11a: Hovering:
 - (A) demonstrate hover IGE, importance of wind effect and attitude, ground cushion, stability in the hover and effects of over controlling;
 - (B) student holding cyclic stick only;
 - (C) student handling collective lever (and throttle) only;
 - (D) student handling collective lever, (throttle) and pedals;
 - (E) student handling all controls;
 - (F) demonstration of ground effect;
 - (G) demonstration of wind effect;
 - (H) demonstrate gentle forward running touchdown;

- (I) specific hazards for example snow, dust and litter.
- (xiii) Exercise 11b: Hover taxiing and spot turns:
 - (A) revise hovering;
 - (B) precise ground speed and height control;
 - (C) effect of wind direction on RPA(H) attitude and control margin;
 - (D) control and co-ordination during spot turns;
 - (E) carefully introduce gentle forward running touchdown.
- (xiv) Exercise 11c: Hovering and taxiing emergencies:
 - (A) revise hovering and gentle forward running touchdown, explain (demonstrate where applicable) effect of flight control failure in the hover;
 - (B) demonstrate simulated engine failure in the hover and hover taxi;
 - (C) demonstrate dangers of mishandling and over-pitching.
- (xv) Exercise 12: Take-off and landing:
 - (A) pre-take-off checks or drills;
 - (B) look-out;
 - (C) lifting to hover;
 - (D) after take-off checks;
 - (E) danger of horizontal movement near ground;
 - (F) danger of mishandling and overpitching;
 - (G) landing (without sideways or backwards movement);
 - (H) after landing checks or drills;
 - (I) take-off and landing crosswind and downwind.
- (xvi) Exercise 13: Transitions from hover to climb and approach to hover:
 - (A) look-out;
 - (B) revise take-off and landing;
 - (C) ground effect, translational lift and its effects;
 - (D) flapback and its effects;

- (E) effect of wind speed and direction during transitions from or to the hover;
 - (F) the constant angle approach;
 - (G) demonstration of variable flare simulated engine off landing.
- (xvii) Exercise 14a: Circuit, approach and landing:
- (A) revise transitions from hover to climb and approach to hover;
 - (B) circuit procedures, downwind and base leg;
 - (C) approach and landing with power;
 - (D) pre-landing checks;
 - (E) effect of wind on approach and IGE hover;
 - (F) crosswind approach and landing;
 - (G) go-around;
 - (H) noise abatement procedures.
- (xviii) Exercise 14b: Steep and limited power approaches and landings:
- (A) revise the constant angle approach;
 - (B) the steep approach (explain danger of high sink rate and low air speed);
 - (C) limited power approach (explain danger of high speed at touch down);
 - (D) use of the ground effect;
 - (E) variable flare simulated engine off landing.
- (xix) Exercise 14c: Emergency procedures:
- (A) abandoned take-off;
 - (B) missed approach and go-around;
 - (C) flight control failure (if applicable);
 - (D) tail rotor control or tail rotor drive failure (briefing only);
 - (E) simulated emergencies in the circuit to include:
 - (a) flight control failure;

- (b) simulated powerplant failure on take-off, crosswind, downwind and base leg;
 - (c) governor failure if applicable.
- (xx) Exercise 15: First solo:
 - (A) RPAS instructor's briefing, observation of flight and debriefing;
 - (B) warn of low tail, low skid or wheel during hover, landing;
 - (C) warn of dangers of loss of RRPM and overpitching;
 - (D) pre-take-off checks;
 - (E) into wind take-off;
 - (F) procedures during and after take-off;
 - (G) normal circuit, approaches and landings;
 - (H) action if an emergency.
- (xxi) Exercise 16: Sideways and backwards hover manoeuvring in all nose positions:

NOTE: Nose position means nose in, nose out, nose left and nose right.

- (A) manoeuvring sideways flight heading into wind;
 - (B) manoeuvring backwards flight heading into wind;
 - (C) combination of sideways and backwards manoeuvring;
 - (D) manoeuvring sideways and backwards and heading out of wind;
 - (E) stability and weather cocking;
 - (F) recovery from backwards manoeuvring (pitch nose down);
 - (G) limitations for sideways and backwards manoeuvring.
- (xxii) Exercise 17: Spot turns:
 - (A) revise hovering into wind and downwind;
 - (B) turn on spot through 360°:
 - (a) around remote nose position;
 - (b) around tail rotor;
 - (c) around RPA(H) geometric centre;

- (d) square and safe visibility clearing turn.
- (C) rotor RPM control, torque effect, cyclic limiting stops due to CG position and wind speed and direction.
- (xxiii) Exercise 18: Hover OGE and vortex ring:
 - (A) establishing hover OGE;
 - (B) drift, height or power control;
 - (C) demonstration of incipient stage of vortex ring, recognition and recovery (from a safe altitude);
 - (D) loss of tail rotor effectiveness.
- (xxiv) Exercise 19: Simulated EOL:
 - (A) the effect of weight, disc loading, density altitude and RRPM decay;
 - (B) revise basic autorotation entry;
 - (C) optimum use of cyclic and collective to control speed or RRPM;
 - (D) variable flare simulated EOL;
 - (E) demonstrate constant attitude simulated EOL;
 - (F) demonstrate simulated EOL from hover or hover taxi;
 - (G) demonstrate simulated EOL from transition and low level.
- (xxv) Exercise 20: Advanced autorotation:
 - (A) over a selected point at various height and speed;
 - (B) revise basic autorotation: note ground distance covered;
 - (C) range autorotation;
 - (D) low speed autorotation;
 - (E) constant attitude autorotation (terminate at safe altitude);
 - (F) 'S' turns;
 - (G) turns through 180 ° and 360 °;
 - (H) effects on angles of descent, IAS, RRPM and effect of AUM.
- (xxvi) Exercise 21: Practice forced landings:
 - (A) procedure and choice of the forced landing area;

- (B) forced landing checks and crash action;
 - (C) re-engagement and go-around procedures.
- (xxvii) Exercise 22: Steep turns:
- (A) steep (level) turns (30 ° bank);
 - (B) maximum rate turns (45 ° bank if possible);
 - (C) steep autorotative turns;
 - (D) faults in the turn: balance, attitude, bank and co-ordination;
 - (E) RRPM control and disc loading;
 - (F) vibration and control feedback;
 - (G) effect of wind at low level.
- (xxviii) Exercise 23: Transitions:
- (A) revise ground effect, translational lift and flapback;
 - (B) maintaining constant height, (20-30 ft AGL);
 - (C) transition from hover to steady forward flight and back to hover;
 - (D) demonstrate effect of wind.
- (xxix) Exercise 24: Quick stops:
- (A) use of power and controls;
 - (B) effect of wind;
 - (C) quick stops into wind;
 - (D) quick stops from crosswind and downwind terminating into wind;
 - (E) danger of vortex ring;
 - (F) danger of high disc loading.
- (xxx) Exercise 25a: Navigation:
- (A) flight planning:
 - (a) weather forecast and actuals;
 - (b) map selection and preparation and use;
 - (1) choice of route:

- (2) controlled airspace, danger and prohibited areas;
 - (3) safety altitudes and noise abatement considerations.
- (c) calculations:
 - (1) magnetic heading(s) and time(s) en-route;
 - (2) energy consumption;
 - (3) mass and balance.
- (d) flight information:
 - (1) NOTAMs, etc.;
 - (2) radio frequencies;
 - (3) selection of alternate landing sites and emergency landing sites.
- (e) RPA(H) documentation;
- (f) notification of the flight:
 - (1) pre-flight administrative procedures;
 - (2) flight plan form (where appropriate).
- (g) Command and control communication;
- (H) lost link route;
- (I) Required navigation capabilities;
- (B) departure:
 - (a) organisation of RPS workload;
 - (b) departure procedures:
 - (1) altimeter settings;
 - (2) ATC liaison in controlled or regulated airspace;
 - (3) setting heading procedure;
 - (4) noting of ETAs.
 - (c) maintenance of height or altitude and heading;
 - (d) revisions of ETA and heading;

- (e) log keeping;
- (f) use of radio;
- (g) use of nav aids (if fitted);
- (h) minimum weather conditions for continuation of flight;
- (i) in-flight decisions;
- (j) transiting controlled or regulated airspace;
- (k) uncertainty of position procedure;
- (l) lost procedure;
- (n) lost link procedures;
- (o) RPIC handover procedures;
- (p) RPS handover procedures.

(C) arrival and aerodrome joining procedure:

- (a) ATC liaison in controlled or regulated airspace;
- (b) altimeter setting;
- (c) entering the traffic pattern;
- (d) circuit procedures;
- (e) parking;
- (f) security of RPA(H);
- (g) refuelling;
- (h) closing of flight plan (if appropriate);
- (i) post-flight administrative procedures.

(xxxi) Exercise 25b: Problems at low heights and in reduced visibility for VLOS only:

- (A) actions before descending;
- (B) hazards (for example obstacles and other aircraft or RPA);
- (C) effects of wind and turbulence;
- (D) avoidance of noise sensitive areas;
- (E) actions in the event of encountering DVE;
- (F) decision to divert or conduct precautionary landing;

- (G) bad weather circuit and landing;
 - (H) appropriate procedures and choice of landing area;
 - (I) precautionary landing.
- (xxxii) Exercise 25c: Radio navigation:
- (A) use of GNSS:
 - (a) selection of waypoints;
 - (b) to or from indications and orientation;
 - (c) error messages.
 - (B) use of en-route or terminal radar:
 - (a) availability and AIP;
 - (b) procedures and ATC liaison;
 - (c) pilots responsibilities;
 - (d) secondary surveillance radar (if transponder fitted):
 - (1) transponders;
 - (2) code selection;
 - (3) interrogation and reply.
- (xxxiii) Exercise 26: Advanced take-off, landings and transitions:
- (A) landing and take-off out of wind (performance reduction);
 - (B) ground effect, translational lift and directional stability variation when out of wind;
 - (C) downwind transitions;
 - (D) vertical take-off over obstacles;
 - (E) running take-off;
 - (F) cushion creep take-off;
 - (G) reconnaissance of landing site;
 - (H) running landing;
 - (I) zero speed landing;
 - (J) crosswind and downwind landings;
 - (K) steep approach;

(L) go-around.

(xxxiv) Exercise 27: Sloping ground:

- (A) limitations and assessing slope angle;
- (B) wind and slope relationship: blade and control stops;
- (C) effect of CG when on slope;
- (D) ground effect on slope and power required;
- (E) right skid up slope;
- (F) left skid up slope;
- (G) nose up slope;
- (H) avoidance of dynamic roll over, dangers of soft ground and sideways movement on touchdown;
- (I) danger of striking main or tail rotor by harsh control movement near ground.

(xxxv) Exercise 28: Limited power:

- (A) take-off power check;
- (B) vertical take-off over obstacles;
- (C) in-flight power check;
- (D) running landing;
- (E) zero speed landing;
- (F) approach to low hover;
- (G) approach to hover;
- (H) approach to hover OGE;
- (I) steep approach;
- (J) go-around.

(xxxvi) Exercise 29: Confined areas:

- (A) landing capability and performance assessment;
- (B) locating landing site and assessing wind speed and direction;
- (C) reconnaissance of landing site;
- (D) select markers;

- (E) select direction and type of approach;
 - (F) circuit;
 - (G) approach to committed point and go-around;
 - (H) approach;
 - (I) clearing turn;
 - (J) landing;
 - (K) power check and performance assessment in and out of ground effect;
 - (L) normal take-off to best angle of climb speed;
 - (M) vertical take-off from hover.
 - (N) Command and control communication considerations.
- (xxxvii) Exercise 30: instrument flight:
- (A) instrument appreciation:
 - (a) attitude instrument flight;
 - (b) instrument scan.
 - (B) instrument limitations;
 - (C) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;
 - (D) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions;
 - (E) transition from VLOS to instrument flight on take-off;
 - (F) SIDs and arrivals;
 - (G) en-route IFR procedures;
 - (H) holding procedures;
 - (I) instrument approaches to specified minima;
 - (J) missed approach procedures;
 - (K) automated landings.
- (xxxviii) Exercise 31a: Night flying (if night endorsement required):

- (A) pre-flight inspection (navigation and orientation lights) using torch, pan lights, etc.;
 - (B) RPS night configuration;
 - (C) take-off (no sideways or backwards manoeuvring);
 - (D) hover taxi (higher and slower than by day);
 - (E) transition to climb;
 - (F) level flight;
 - (G) approach and transition to hover;
 - (H) landing;
 - (I) autorotation;
 - (J) practice forced landing (with flares if appropriate: simulated);
 - (K) night emergencies (for example failure of lights, etc.).
- (xxxix) Exercise 31b: Night cross-country (if night endorsement required):
- (A) navigation principles as for day cross-country.

(3) In the following table it is indicated which exercise should apply for the RPL(H) or VLOS RPL(H):

Exercise	1a	2	3	4	5	6	7	8	9	10
RPL(H)	v	v	v	v	v	v	v	v	v	v
VLOS RPL(H)	v	v	v	v	v	v	v	v	v	v
Exercise	11a	11b	11c	12	13	14a	14b	14c	15	16
RPL(H)	v	v	v	v	v	v	v	v	v	v
VLOS RPL(H)	v	v	v	v	v	v	v	v	v	v
Exercise	17	18	19	20	21	22	23	24	25a	25b
RPL(H)	v	v	v	v	v	v	v	v	v	
VLOS RPL(H)	v	v	v	v	v	v	v	v		v
Exercise	25c	26	27	28	28	31a	31b			
RPL(H)	v	v	v	v	v	v	v			
VLOS RPL(H)	v	v	v	v	v	v	v			

SECTION 4

Specific provisions for the RPA category Multirotor - RPL(MR)

GM1 JARUS-FCL.125 RPL(MR) Experience and JARUS-FCL.130 RPL(MR) RPAS instruction

RPAS INSTRUCTION FOR THE RPL(MR)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Syllabus of RPAS instruction for RPA category multirotor– RPA(MR)

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (i) the applicant's progress and ability;
- (ii) the weather conditions affecting the flight;
- (iii) the flight time available;
- (iv) instructional technique considerations;
- (v) the local operating environment;

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and situational awareness and look-out if applicable, which should be emphasised at all times.

(i) exercise 1: Familiarisation with the RPAS (MR)

(B) Briefing objectives:

- (a) Introduction to the RPA (MR);
- (b) RPS (MR) and Remote controller and use of app (if applicable);
- (c) Power Plants RPAS (MR);
- (d) Function of the Flight controller;
- (e) Electronic speed Controller
- (f) Familiarisation with the RPS (MR) Control Stick Position and Functionality
- (g) Emergency drills:

- (1) Action in the event of fire in the air and on the ground: RPA (MR), power plant, RPS/Remote Controller (as applicable)
 - (2) System failure drills as applicable to type
 - (3) Use of emergency equipment (fire extinguishers, first aid kits and emergency response plan)
- (h) RPA (MR) and RPS/Remote Controller association:
 - (1) Antenna direction
 - (2) Battery indications
 - (3) Remote controller safety
 - (4) Command control link
 - (5) Frequency pairing RPA to RPS/Remote Controller
- (i) Return to home:
 - (1) Programme home position and set altitude (QNH as applicable)
 - (2) Activate return to home
 - (3) Regaining control
- (j) Description and function of flight Modes:
 - (1) GNSS Modes
 - (2) Attitude/Stability hold Mode
- (k) Buddy Box
- (l) Handing over of controls;
 - (1) Events requiring handing over control
 - (2) Procedure for handing over controls
- (m) Need for constant look out
- (n) Clock method of reporting traffic
- (o) Right of Way

(C) B. Air exercise:

- (p) All Briefing objectives mentioned above should also be trained on site during the air exercise.

(D) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(ii) EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(A) Briefing objectives:

- (a) Flight authorisation and RPA (MR) and RPS acceptance, including technical log (if applicable) and all required RPAS (MR) documentation
- (b) Equipment required for flight
- (c) Flight plan (as required)
- (d) ATC Clearance (as required)
- (e) Check lists
- (f) Student comfort and human factors (suitable clothing, eye and sun protection. IMSAFE)
- (g) RPS Setup
- (h) Starting and after starting checks
- (i) Communication checks
- (j) Control function verification
- (k) Shutting down the RPA (MR) and RPS/Remote controller (including system checks as applicable)
- (l) Packing and storage of RPA (MR). Leaving RPS/packing and storage of Remote controller (including safety or security as applicable)

(m) Completion of authorisation sheet, battery logs and RPAS (MR) serviceability documents

(n) Energy managing (batteries).

(B) Air exercise:

(a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(b) Applicable procedures and Check Lists:

- (1) a. RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (2) b. Consideration of Airmanship and power plant handling;
- (3) c. Specific hazard identification, risk mitigation and situational awareness;
- (4) d. Similarity to previous exercises (as applicable);
- (5) e. De-briefing after flight.

(iii) EXERCISE 3: AIR EXPERIENCE (Intro Flight)

(A) Briefing objectives:

(a) Brief Exercise 1 and 2 as above.

(B) Air exercise:

(a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(iv) EXERCISE 4: BASIC AERODYNAMICS & EFFECTS OF CONTROLS

(A) Briefing objectives:

- (a) Lift Formula
- (b) Newton's Laws of Motion
- (c) Torque
- (d) Torque and Angular Velocity
- (e) Momentum
- (f) Planes of movement around each axis
- (g) Skidding and Slipping
- (h) Gyroscopic Forces
 - (1) i. Precession
 - (2) xii. Rigidity
- (i) Function of the flight controller
 - (1) Ascending and Descending
 - (2) Yaw
 - (3) Pitch
 - (4) Roll
- (j) Function of the flight controls/control sticks (primary and secondary, as applicable)
- (k) Effect on controls when in different modes;
- (l) Lift, weight, thrust and drag
- (m) Force couple
- (n) Explanation of the basic aerofoil including definitions
- (o) Propeller theory
 - (1) Chord
 - (2) Angle of Incidence
 - (3) Helix angle
 - (4) Propeller types: fixed and variable pitch

(5) Propeller efficiency

(p) RPAS Specific Theory

(B) Air exercise:

(a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

(a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);

(b) Consideration of Airmanship and power plant handling;

(c) Specific hazard identification, risk mitigation and situational awareness;

(d) Similarity to previous exercises (as applicable);

(e) De-briefing after flight.

(v) EXERCISE 5: TAIL IN HOVER

(A) Briefing objectives:

(a) Hovering

(b) Recap of newton's laws

(c) Ground effect and power required

(1) Wind

(2) Altitude

(3) Surface of ground effect

(d) Stability in hover

(e) Introduction of Weight and Balance

(f) Effect and movement of C of G

(g) Effect of control failure (i.e. loss of link, power plant failure) in hover.

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(vi) EXERCISE 6: TAIL-IN HOVER YAWING SLOWLY TO RIGHT AND LEFT

(A) Briefing objectives:

- (a) Recap of Newton's laws
- (b) Newton's Laws Applicable to Yaw
- (c) Recap the planes of movement around each axis
- (d) Torque and Angular Velocity
- (e) Differential power (flight controller) resulting in the yaw
- (f) Effects of yawing on maintaining altitude (as a result flight controller adjustments);
- (g) Effect of wind and altitude applicable to flight modes and control inputs.

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;

(d) Similarity to previous exercises (as applicable);

(e) De-briefing after flight.

(vii) EXERCISE 7: TAIL-IN HOVER, MOVE TO RIGHT THEN TO THE LEFT

Briefing objectives:

(a) Recap of Newton Laws

(b) Newton's Laws Applicable to Roll

(c) Differential power (flight controller) resulting in the roll

(d) Recap the planes of movement around each axis

(e) Effects of rolling maintaining altitude (as a result flight controller adjustments)

(f) Effect of wind and altitude

(D) Air exercise:

(a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(E) Applicable procedures and Check Lists:

(a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);

(b) Consideration of Airmanship and power plant handling;

(c) Specific hazard identification, risk mitigation and situational awareness;

(d) Similarity to previous exercises (as applicable);

(e) De-briefing after flight.

(viii) EXERCISE 8: TAIL-IN HOVER, MOVE FORWARDS THEN BACKWARDS

(A) Briefing objectives:

(a) Recap newton laws

(b) Newton's Laws Applicable to Pitch

(c) Transitional Lift

(d) Differential power (flight controller) resulting in the pitch

(e) Straight and level flight and forces acting on the RPA (MR)

- (f) Importance of maintaining direction and balance
- (g) Recap the planes of movement around each axis
- (h) Effects of pitch on maintaining altitude (as a result flight controller adjustments);

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(ix) EXERCISE 9: TAIL-IN HOVER, ASCEND AND DESCEND

(A) Briefing objectives:

- (a) Recap Newton Laws
- (b) Newton's Laws Applicable to Climbing and Descending
- (c) Vortex Ring State
- (d) Adjusting power resulting in climbing or descending
- (e) Maintaining a constant Rate of Climb or Descend
- (f) Recap the planes of movement around each axis
- (g) Recap lift, weight, thrust and drag
- (h) Effect of wind and altitude.

(B) R. Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);

- (b) Consideration of Airmanship and power plant handling;
 - (c) Specific hazard identification, risk mitigation and situational awareness;
 - (d) Similarity to previous exercises (as applicable);
 - (e) De-briefing after flight.
- (x) EXERCISE 10: TAKE-OFFS

(A) Briefing objectives:

- (a) Pre take-off checks or drills including command and control checks and radio links
- (b) Co-ordination between RPAS ground crew
- (c) Technique for lifting to hover
- (d) Normal Take-off
- (e) Cross wind take off and taking off into wind
- (f) After take-off checks
- (g) Danger of rapid control inputs and movement near the ground
- (h) Take-off crosswind and downwind
- (i) cb. Rejected take-off technique
- (j) First person view (FPV) flying
- (k) Effect of wind, altitude and surface
- (l) Circuit patterns
- (m) Ground operations and taxiing
- (n) Ground effect and power required
 - (1) Wind
 - (2) Altitude
 - (3) Surface of ground effect

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xi) **EXERCISE 11: TAIL-IN HOVER PERFORMING A HORIZONTAL RECTANGLE**

Briefing objectives:

- (a) Recap of Newton law
- (b) Newton's Laws Applicable to Roll and Pitch
- (c) Recap differential power (flight controller) resulting in the roll and pitch
- (d) Recap the planes of movement around each axis
- (e) Recap the effects of maintaining altitude (as a result flight controller adjustments)
- (f) Effect of wind and altitude.

(D) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(E) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xii) **EXERCISE 12: TAIL-IN HOVER PERFORMING A VERTICAL RECTANGLE**

(A) Briefing objectives:

- (a) Recap of Newton Laws
- (b) Newton's Laws Applicable to Roll, Ascending and Descending
- (c) Recap differential power (flight controller) resulting in the roll
- (d) Recap Adjusting power resulting in the climbing or descending
- (e) Recap the planes of movement around each axis
- (f) Recap the effects of roll maintaining altitude (as a result flight controller adjustments)
- (g) Effect of wind and altitude.

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xiii) EXERCISE 13: NOSE-IN HOVER

(A) Briefing objectives:

- (a) Recap on ground effect and power required
- (b) Recap on effect of wind, altitude and surface
- (c) Recap on stability in hover
- (d) Recap on effect of controls (i.e. loss of link, power plant failure) failure in hover
- (e) Recap the planes of movement around each axis relative to tail-in hover

- (f) Planes of movement around each axis nose-in hover
- (g) Effect of wind and altitude

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) AA. Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xiv) EXERCISE 14: FROM HOVER FLY A SQUARE BOX ROTATING (YAWING) THE MULTI-ROTOR IN THE DIRECTION OF FLIGHT

(A) Briefing objectives:

- (a) Recap differential power (flight controller) resulting in the yaw and pitch
- (b) Recap the planes of movement around each axis relative to tail-in and nose in
- (c) Recap the effects of yaw maintaining altitude (as a result flight controller adjustments)
- (d) Effect of wind and altitude

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;

- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xv) EXERCISE 15: FROM HOVER FLY A CIRCLE ROTATING (YAWING) THE MULTI-ROTOR NOSE-IN TO THE CENTRE OF THE CIRCLE

(A) Briefing objectives:

- (a) Recap differential power (flight controller) resulting in roll, yaw and pitch
- (b) Recap the planes of movement around each axis relative to tail-in and nose in
- (c) Recap the effects of roll, yaw and pitch maintaining altitude (as a result flight controller adjustments)
- (d) Effect of wind and altitude

(B) Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xvi) EXERCISE 16: TRANSITION FROM HOVER TO FORWARD FLIGHT

(D) Briefing objectives:

- (a) Recap on straight and level flight
- (b) Recap the planes of movement around each axis relative to tail-in and nose in
- (c) Recap stability in hover
- (d) Effect of control in hover in Attitude, GPS and Full manual mode

- (e) Effect of control (i.e. loss of link, power plant failure) failure in hover
- (f) Maintaining directional control

(A) Air exercise:

All briefing objectives mentioned above should also be trained on site during the air exercise.

(B) Applicable procedures and Check Lists:

- (g) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (h) Consideration of Airmanship and power plant handling;
- (i) Specific hazard identification, risk mitigation and situational awareness;
- (j) Similarity to previous exercises (as applicable);
- (k) De-briefing after flight.

(xvii) EXERCISE 17: CLIMBING AND DESCENDING FROM LEVEL FLIGHT

(A) Briefing objectives:

- (a) Adjusting power resulting in climbing or descending
- (b) Recap the planes of movement around each axis relative to tail-in and nose in
- (c) Recap lift, weight, thrust and drag
- (d) Recap on straight and level
- (e) Entry to climb
- (f) Levelling off from climb at selected altitudes or heights
- (g) Entry to descent
- (h) Danger of rapid descent
- (i) Levelling off from descent at selected altitudes or heights
- (j) Effect of wind and altitude

(B) AH. Air exercise:

- (a) All briefing objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xviii) EXERCISE 18: TURNS FROM LEVEL FLIGHT

(A) Briefing objectives:

- (a) Recap differential power (flight controller) resulting in yaw and roll
- (b) Recap the planes of movement around each axis relative to tail-in and nose in
- (c) Recap lift, weight, thrust and drag
- (d) Recap on straight and level
- (e) Entry to turn
- (f) Maintaining bank angle, exiting and resuming straight and level flight
- (g) Turns onto selected headings
- (h) Effect of wind and altitude

(B) Air exercise:

- (a) All **briefing** objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xix) EXERCISE 19: SPEED CONTROL IN LEVEL FLIGHT

(A) Briefing objectives:

- (a) Recap on straight and level (maintaining altitude)
- (b) Control stick inputs
- (c) Effect of wind and altitude

(B) Air exercise:

- (a) All **briefing** objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xx) EXERCISE 20: APPROACH AND LANDINGS

(A) Briefing objectives:

- (a) Circuit pattern and associated procedures
- (b) Take-off and climb (including checks)
- (c) Maintaining situational awareness.
- (d) Final approach speeds
- (e) Landing technique
- (f) Cross wind landing, and landing into wind
- (g) Effect of wind on the approach
- (h) Ground Effect
- (i) Wind
- (j) Altitude
- (k) Surface of ground effect

- (l) Crosswind approach and landing technique
- (m) Missed approach and go-around technique
- (n) Confined landings
- (o) Emergency failure drills in the circuit
- (p) Line of site limitations
- (q) Parachute-assisted landings

(B) Air exercise:

- (a) All **briefing** objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xxi) EXERCISE 21: ACTIONS AFTER FAILURE OF A POWER PLANT

(A) Briefing objectives:

- (a) Action after failure of a power plant :
 - (1) Power plant failure
- (b) Command link failure
- (c) Selection of ditching area during pre-flight survey
- (d) Shut down procedure
- (e) Rules or height for recovery and go-around
- (f) Emergency drill (fire extinguisher, first aid kit and emergency response plan).
- (g) Avoiding Flyaways
- (h) Importance of decision making

(B) Air exercise:

- (a) All **briefing** objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xxii) Exercise 22: RPAS Emergency Procedures

(A) Briefing objectives:

- (a) Avoiding Flyaways
- (b) Importance of decision making
- (c) Low battery procedure
- (d) Loss of GPS
- (e) Failure of data link
- (f) Compass failure
- (g) FVP flying
- (h) Airborne Collision avoidance procedures
- (i) Ground observers and communication
- (j) Recovery from unusual attitudes (as applicable)
- (k) Loss of orientation when flying in VLOS procedure
- (l) Change of destination
- (m) In-flight lost C2 link flight plan programming
- (n) Software failure
- (o) RPS Failure

(p) Communication failure

(B) Air exercise:

(a) All **briefing** objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xxiii) EXERCISE 23: Practical Operational Flight

(A) Briefing objectives:

(a) Legal considerations

(b) Flight planning:

- (1) Weather forecast and actuals
- (2) Identification and avoidance of hazardous weather
- (3) Map analysis
- (4) Mission planning and system programming
- (5) Choice of route
- (6) Safe altitude considerations
- (7) Selection of radio frequencies
- (8) Selection of ditching area

(c) Airspace:

- (1) Controlled
- (2) Danger, prohibited and restricted areas

(d) Calculations:

- (1) Magnetic heading(s) and time(s) en-route
 - (2) Wind considerations
 - (3) Energy consumption
 - (4) Reserves
 - (5) Mass and balance
- (e) RPAS (MR) documentation
- (f) Notification of the flight:
 - (1) pre-flight administrative procedures
 - (2) flight plan form
 - (3) closing of a flight plan
- (g) Departure
 - (1) altimeter settings:
 - (2) setting of home position
 - (3) ATC liaison in controlled or regulated airspace
- (h) use of radio
- (i) minimum weather conditions for continuation of flight
- (j) decision making
- (k) transiting controlled or regulated airspace
- (l) diversion procedures
- (m) uncertainty of position procedure
- (n) RTH procedure
- (o) RPIC handover procedures
- (p) RPS handover procedures
- (q) Traffic pattern and circuit procedures
- (r) Safe handling of batteries/refuelling
- (s) post-flight administrative procedures.
- (t) hazards identification
- (u) effects of wind and turbulence

- (v) situational awareness
- (w) avoidance of noise sensitive areas
- (x) remote pilot's responsibilities
- (y) transponders

(B) Air exercise:

- (a) All **briefing** objectives mentioned above should also be trained on site during the air exercise.

(C) Applicable procedures and Check Lists:

- (a) RPAS (MR) handling techniques: Demonstration and Observation (as applicable);
- (b) Consideration of Airmanship and power plant handling;
- (c) Specific hazard identification, risk mitigation and situational awareness;
- (d) Similarity to previous exercises (as applicable);
- (e) De-briefing after flight.

(xxiv) Exercise 23: Risk and Hazard Assessment

(A) Definitions

- (a) Hazards
- (b) Risk
- (c) Serious Incident
- (d) Serious Injury
- (e) Accident
- (f) Risk assessment
- (g) Importance of risk assessment
- (h) Objective a risk assessment
- (i) Completing a risk assessment
- (j) Identification of hazardss
- (k) Risk Severity Matrix

- (l) Analysis of Risk
- (m) Prioritising risk
- (n) Risk Probability Matrix
- (o) Risk Categorisation
- (p) Risk and hazard mitigation
- (q) Review and monitor risk assessment
- (r) Required documentation
- (s) Accident and incident reporting

(xxv) Exercise 24a: Navigation

(A) flight planning:

- (a) weather forecast and actuals;
- (b) map selection and preparation and use;
 - (1) choice of route:
 - (2) controlled airspace, danger and prohibited areas;
 - (3) safety altitudes and noise abatement considerations.
- (c) calculations:
 - (1) magnetic heading(s) and time(s) en-route;
 - (2) energy consumption.
- (d) flight information:
 - (1) NOTAMs, etc.;
 - (2) radio frequencies;
 - (3) selection of alternate landing sites and emergency landing sites.
- (e) RPA(MR) documentation;
- (f) notification of the flight:
 - (1) pre-flight administrative procedures;
 - (2) flight plan form (where appropriate).
- (g) command and control communication;
- (H) lost link route;
- (I) required navigation capabilities;

(B) departure:

- (a) organisation of RPS workload;
- (b) departure procedures:

- (1) altimeter settings if applicable;
- (2) ATC liaison in controlled or regulated airspace;
- (3) setting heading procedure;
- (4) noting of ETAs.
- (c) maintenance of height or altitude and heading;
- (d) revisions of ETA and heading;
- (e) log keeping;
- (f) use of radio;
- (g) use of nav aids (if applicable);
- (h) minimum weather conditions for continuation of flight;
- (i) in-flight decisions;
- (j) transiting controlled or regulated airspace;
- (k) uncertainty of position procedure;
- (l) lost procedure;
- (n) lost link procedures
- (o) RPIC handover procedures;
- (p) RPS handover procedures.
- (C) arrival and aerodrome or landing site joining procedure:
 - (a) ATC liaison in controlled or regulated airspace;
 - (b) altimeter setting;
 - (c) entering the traffic pattern;
 - (d) circuit procedures;
 - (f) security of RPA(MR);
 - (g) energy replenishment;
 - (h) closing of flight plan (if appropriate);
 - (i) post-flight administrative procedures.

(xxvi) Exercise 24b Problems at low heights and in reduced visibility
for VLOS only:

- (A) actions before descending;
 - (B) hazards (for example obstacles and other aircraft or RPA);
 - (C) effects of wind and turbulence;
 - (D) avoidance of noise sensitive areas;
 - (E) actions in the event of encountering DVE;
 - (F) decision to divert or conduct precautionary landing;
 - (G) bad weather circuit and landing;
 - (H) appropriate procedures and choice of landing area;
 - (I) precautionary landing.
- (xxvii) Exercise 24c: Radio navigation:
- (A) use of GNSS:
 - (a) selection of waypoints;
 - (b) to or from indications and orientation;
 - (c) error messages;
 - (d) secondary surveillance radar (if transponder fitted):
 - (1) transponders;
 - (2) code selection;
 - (3) interrogation and reply.
- (xxviii) Exercise 25: instrument flight:
- TBD

- (xxix) Exercise 26a: Night flying (if night endorsement required):
- (A) pre-flight inspection (navigation and orientation lights) using torch, pan lights, etc.;
 - (B) RPS night configuration;
 - (C) take-off (no sideways or backwards manoeuvring);
 - (D) hover taxi (higher and slower than by day);
 - (E) transition to climb;
 - (F) level flight;

- (G) approach and transition to hover;
 - (H) landing;
 - (I) practice forced landing;
 - (J) night emergencies (for example failure of lights, etc.).
- (xxx) Exercise 25b: Night cross-country (if night endorsement required):
- (A) navigation principles as for day cross-country.

(3) In the following table it is indicated which exercise should apply for the RPL(MR) or VLOS RPL(MR):

Exercise	1a	2	3	4	5	6	7	8	9	10
RPL(MR)	v	v	v	v	v	v	v	v	v	v
VLOS RPL(MR)	v	v	v	v	v	v	v	v	v	v
Exercise	11a	11b	11c	12	13	14a	14b	14c	15	16
RPL(MR)	v	v	v	v	v	v	v	v	v	v
VLOS RPL (MR)	v	v	v	v	v	v	v	v	v	v
Exercise	17	18	19	20	21	22	23	24	25a	25b
RPL(MR)	v	v	v	v	v	v	v	v	v	
VLOS RPL (MR)	v	v	v	v	v	v	v	v		v
Exercise	25c	26	27	28	28	31a	31b			
RPL(MR)	v	v	v	v	v	v	v			
VLOS RPL(MR)	v	v	v	v	v	v	v			

SECTION 5

Specific provisions for the RPA category Airship - RPL(As)

GM1 JARUS-FCL.125 RPL(As) Experience and JARUS-FCL.130 RPL(As) RPAS instruction

FLIGHT INSTRUCTION FOR THE RPL(AS)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Syllabus of flight instruction for RPA category airship– RPA(As)

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (i) the applicant's progress and ability;
- (ii) the weather conditions affecting the flight;
- (iii) the flight time available;
- (iv) instructional technique considerations;
- (v) the local operating environment;

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the RPA(As):

- (A) characteristics of the RPA(As);
 - (B) RPS layout;
 - (C) RPAS systems;
 - (D) checklists, procedures and controls.
- (ii) Exercise 1b: Emergency drills:
- (A) action if fire on the ground and in the air;
 - (B) powerplant and electrical system fire;
 - (C) systems failure;
 - (D) RPS escape drills, location and use of emergency equipment and RPS exits.
- (iii) Exercise 2: Preparation for and action after flight:
- (A) flight authorisation and RPA(As) acceptance;
 - (B) serviceability documents;
 - (C) equipment required, maps, etc.;
 - (D) mass and balance;
 - (E) external checks;
 - (F) ground crew briefing;
 - (G) internal checks;
 - (H) seat or rudder panel adjustments;
 - (I) starting and warm-up checks;
 - (J) power checks;
 - (K) running down system checks and switching off the powerplant;
 - (L) parking, security and masting;
 - (M) completion of authorisation sheet and serviceability documents;
 - (N) command and control link procedures
- (iv) Exercise 3: Air experience: flight exercise.
- (v) Exercise 4: Effects of controls:
- (A) primary effects;
 - (B) further effects;

- (C) effects of:
 - (i) air speed;
 - (ii) power;
 - (iii) trimming controls;
 - (iv) other controls, as applicable.
- (vi) Exercise 5: Ground manoeuvring:
 - (A) pre-Unmastering checks;
 - (B) verification of As internal pressure
 - (C) starting, control of speed and stopping;
 - (D) powerplant handling;
 - (E) unmastering procedures;
 - (F) control of direction and turning;
 - (G) effects of wind;
 - (H) effects of ground surface;
 - (I) marshalling signals;
 - (J) instrument checks;
 - (K) air traffic control procedures;
 - (L) emergencies.
- (vii) Exercise 6a: Take-off procedures:
 - (A) pre-take-off checks;
 - (B) take-off with different static heaviness;
 - (C) drills during and after take-off;
- (viii) Exercise 6b: Emergencies:
 - (A) abandoned take-off;
 - (B) powerplant failure after take-off;
 - (C) malfunctions of thrust vector control;
 - (D) aerodynamic control failures;
 - (E) electrical and system failures;

- (F) lost link procedures;
 - (G) RPIC handover procedures;
 - (H) RPS handover procedures.
- (ix) Exercise 7: Climbing:
- (A) entry, maintaining the normal and max rate climb and levelling off;
 - (B) levelling off at selected altitudes;
 - (C) maximum angle of climb;
 - (D) maximum rate of climb.
- (x) Exercise 8: Straight and level:
- (A) attaining and maintaining straight and level flight;
 - (B) flight at or close to pressure height;
 - (C) control in pitch, including use of trim;
 - (D) at selected air speeds (use of power);
 - (E) during speed changes;
 - (F) use of instruments for precision.
- (xi) Exercise 9: Descending:
- (A) entry, maintaining and levelling off;
 - (B) levelling off at selected altitudes;
 - (C) maximum rate of descent;
 - (D) maximum angle of descent;
 - (E) use of instruments for precision flight.
- (xii) Exercise 10: Turning:
- (A) entry and maintaining level turns;
 - (B) resuming straight flight;
 - (C) faults in the turn;
 - (D) climbing turns;
 - (E) descending turns;
 - (F) turns onto selected headings, use of heading indicator and compass;

- (G) use of instruments for precision.
- (xiii) Exercise 11: Hovering: hovering manoeuvres (as applicable).
- (xiv) Exercise 12a: Approach and landing:
 - (A) effect of wind on approach and touchdown speeds;
 - (B) landing with different static heaviness;
 - (C) missed approach and go-around procedures;
- (xv) Exercise 12b: Emergencies:
 - (A) aborted approach or go-around;
 - (B) malfunction of thrust vector control;
 - (C) envelope emergencies;
 - (D) fire emergencies;
 - (E) aerodynamic control failures;
 - (F) electrical and system failures;
 - (G) command and control link failure.
 - (H) Internal pressure emergencies
- (xvi) Exercise 13: Precautionary landing:
 - (A) occasions necessitating;
 - (B) in-flight conditions;
 - (C) landing area selection;
 - (D) circuit and approach;
 - (E) actions after landing;
- (xvii) Exercise 14a: Navigation:
 - (A) flight planning:
 - (a) weather forecast and actuals;
 - (b) map selection and preparation:
 - (1) choice of route;
 - (2) airspace structure;
 - (3) sensitive areas;

- (4) safety altitudes.
- (c) calculations:
 - (1) heading(s) and time(s) en-route;
 - (2) energy consumption;
 - (3) mass and balance;
 - (4) performance.
- (d) flight information:
 - (1) NOTAMs etc.;
 - (2) radio frequencies;
 - (3) selection of alternate landing sites.
- (e) RPA(As) documentation;
- (f) notification of the flight:
 - (1) pre-flight administrative procedures;
 - (2) flight plan form.
- (B) departure:
 - (a) organisation of RPS workload;
 - (b) departure procedures:
 - (1) altimeter settings;
 - (2) ATC liaison in controlled or regulated airspace;
 - (3) setting heading procedure;
 - (4) noting of ETAs.
 - (c) maintenance of altitude and heading;
 - (d) revisions of ETA and heading;
 - (e) log keeping;
 - (f) use of radio;
 - (h) minimum weather conditions for continuation of flight;
 - (i) in-flight decisions;
 - (j) transiting controlled or regulated airspace;

- (k) diversion procedures;
 - (l) uncertainty of position procedure;
 - (m) lost procedure;
 - (n) lost link procedures;
 - (o) RPIC handover procedures;
 - (p) RPS handover procedures.
- (C) arrival, landing site joining procedure:
- (a) ATC liaison in controlled or regulated airspace;
 - (b) altimeter setting;
 - (c) entering the traffic pattern;
 - (d) circuit procedures;
 - (e) parking or on masting;
 - (f) security of RPA(As);
 - (g) energy and gas replenishment;
 - (h) closing of flight plan, if appropriate;
 - (i) post-flight administrative procedures.

(xviii) Exercise 14b: Navigation at lower levels and in reduced visibility for VLOS operation:

- (A) actions before descending;
- (B) hazards (for example obstacles, and terrain);
- (D) effects of winds, turbulence and precipitation;
- (E) vertical situational awareness;
- (F) avoidance of noise sensitive areas;
- (G) joining the circuit;
- (H) bad weather circuit and landing.

SECTION 6

Specific provisions for the RPA category Balloon - RPL(B)

**GM1 JARUS-FCL.125 RPL(B) Experience and JARUS-FCL.130 RPL(B)
RPAS instruction**

reserved

Subpart C

CLASS AND TYPE RATINGS

Common provisions

reserved

GM1 JARUS-FCL.200 Circumstances in which type ratings are required

LIST OF TYPE RATINGS

reserved

GM1 JARUS-FCL.210 type ratings – variant

- (a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the RPA or RPS.

21 GM1 JARUS-FCL.215 Provisions for the issue of class and type ratings

SYLLABUS OF THEORETICAL KNOWLEDGE FOR TYPE RATINGS

I. SE AND ME RPA(A)

- (a) Detailed listing for RPA(A) structure and equipment, normal operation of systems and malfunctions:

- (1) dimensions: minimum required runway width for 180 ° turn.

- (2) powerplant including auxiliary power unit:

- (i) type of powerplant or powerplants;

- (ii) in general, function of the following systems or components:

- (A) powerplant;

- (B) auxiliary power;

- (C) oil system;

- (D) fuel system or energy storing system;

- (E) ignition system;

- (F) starting system;

- (G) fire warning and extinguishing system;

- (H) generators and generator drives;

- (I) power indication;

- (J) reverse thrust;

- (iii) on piston or turbine-propeller powerplants additionally:

- (A) propeller system;

- (B) feathering system.

- (iv) powerplant controls (including starter), powerplant instruments, their function, interrelation and interpretation;
 - (v) powerplant operation, including APU, during powerplant start, start and powerplant malfunctions, procedures for normal operation in the correct sequence.
- (3) fuel system:
 - (i) location of the fuel tanks, fuel pumps, fuel lines to the powerplants, tank capacities, valves, energy storage and measuring;
 - (ii) location of the following systems:
 - (A) filtering;
 - (B) heating;
 - (C) fuelling and defueling;
 - (D) dumping;
 - (E) venting.
 - (F) power distribution unit
 - (iii) on the RPS:
 - (A) the monitors and indicators of the energy system;
 - (B) quantity and flow indication, interpretation.
 - (iv) procedures:
 - (A) fuel or energy procedures distribution into the various tanks or energy storage;
 - (B) fuel or energy supply, temperature control and fuel dumping.
- (4) Pressurisation:
 - (i) components of the system and protection devices;
 - (ii) RPS monitors and indicators;
 - (iii) interpretation about the operational condition;
 - (iv) normal operation of the system during start, cruise, approach and landing, payload air conditioning airflow and temperature control.
- (5) ice and rain protection:

- (i) ice protected components of the aeroplane including powerplants, heat sources, controls and indications;
 - (ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems.
- (6) hydraulic system:
 - (i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;
 - (ii) controls, monitors and indicators on the RPS, function and interrelation and interpretation of indications.
- (7) landing gear:
 - (i) main components of the:
 - (A) main landing gear;
 - (B) nose gear;
 - (C) gear steering;
 - (D) wheel brake system, including anti-skid.
 - (ii) gear retraction and extension (including changes in trim and drag caused by gear operation);
 - (iii) required tyre pressure, or location of the relevant placard;
 - (iv) controls and indicators including warning indicators in the RPS in relation to the retraction or extension condition of the landing gear and brakes;
 - (v) components of the emergency extension system.
- (8) flight controls and high lift devices:
 - (i) main components of RPA flight controls:
 - (A) aileron system;
 - (B) elevator system;
 - (C) rudder system;
 - (D) trim system;
 - (E) spoiler system;
 - (F) lift devices;

- (G) stall warning system;
 - (H) take-off configuration warning system.
- (ii) flight control system from the RPS controls to the flight control or surfaces;
- (iii) controls, monitors and indicators including warning indicators of the systems mentioned under (8) (i), interrelation and dependencies.
- (9) electrical power supply:
 - (i) number, power, voltage, frequency and location of the main power system (AC or DC), auxiliary power system location and external power system;
 - (ii) location of the controls, monitors and indicators on the RPS;
 - (iii) flight instruments, communication and navigation systems, main and back-up power sources;
 - (iv) location of vital circuit breakers;
 - (v) generator operation and monitoring procedures of the electrical power supply.
- (10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:
 - (i) visible antennae;
 - (ii) controls and instruments of the following equipment on the RPS during normal operation:
 - (A) flight instruments;
 - (B) flight management systems;
 - (C) radar equipment, including radio altimeter;
 - (D) communication and navigation systems;
 - (E) autopilot controls;
 - (F) flight data recorder, RPS voice recorder and data-link communication recording function;
 - (G) TAWS;
 - (H) collision avoidance system;
 - (I) warning systems;

(J) command and control communication system;

(K) Launch and recovery system controls;

(L) autoland systems controls.

(11) payload compartment:

(i) operation of the exterior of the RPA, and payload compartment;

(12) pneumatic system:

(i) components of the pneumatic system, pressure source and actuated components;

(ii) controls, monitors and indicators in the RPS and function of the system;

(b) Limitations:

(1) general limitations:

(i) certification of the RPA(A), category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and RPA(A) systems:

(A) maximum tail and crosswind-components at take-off and landing;

(B) maximum speeds for flap extension v_{fo} ;

(C) at various flap settings v_{fe} ;

(D) for landing gear operation v_{lo} , M_{lo} ;

(E) for extended landing gear v_{le} , M_{le} ;

(F) for maximum rudder deflection v_a , M_a ;

(G) for tyres;

(H) one propeller feathered.

(ii) Maximum and minimum performance data:

(A) minimum control speed air $vmca$;

(B) minimum control speed ground $vmcg$;

(C) stall speed under various conditions v_{so} , vs_1 ;

(D) maximum speed v_{ne} , M_{ne} ;

- (E) maximum speed for normal operation v_{mo} , M_{mo} ;
- (F) altitude and temperature limitations;
- (G) stall warning system.
- (H) maximum airport pressure altitude, runway slope;
- (I) maximum taxi mass;
- (J) maximum take-off mass;
- (K) maximum lift off mass;
- (L) maximum landing mass;
- (M) zero fuel mass;
- (N) maximum dumping speed $vdco$, $Mdco$, $vdce$, $Mdce$;
- (O) maximum load factor during operation;
- (P) certificated range of centre of gravity.

(2) powerplant limitations:

- (i) operating data of the powerplant:
 - (A) time limits and maximum temperatures;
 - (B) minimum RPMs and temperatures;
 - (C) torque;
 - (D) maximum power for take-off and go-around on pressure altitude or flight altitude and temperature;
 - (E) piston powerplants: certified range of mixture;
 - (F) minimum and maximum oil temperature and pressure;
 - (G) maximum starter time and required cooling;
 - (H) time between two start attempts for powerplants and auxiliary power unit;
 - (I) for propeller: maximum RPM of propeller triggering of automatic feathering device;
 - (J) for electrical powerplant applications, a minimum voltage and current required;

- (K) Threshold and maximum electrical componanats temperatures.
 - (ii) certified oil grades.
- (3) systems limitations:
 - (i) operating data of the following systems:
 - (A) pressurisationmaximum pressures;
 - (B) electrical power supply, maximum load of main power system (AC or DC);
 - (C) maximum time of power supply by battery in case of emergency;
 - (E) autopilot limitations of various modes;
 - (F) ice protection;
 - (H) temperature limits of powerplant and wing anti-ice.
 - (ii) fuel system: certified fuel specifications, minimum and maximum pressures and temperature of the fuel.
- (4) minimum equipment list.
- (c) Performance, flight planning and monitoring:
 - (1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing according to the documentation available (for example for take-off v_1 , v_{mbe} , v_r , v_{lof} , v_2 , take-off distance, maximum take-off mass and the required stop distance) on the following factors:
 - (i) accelerate or stop distance;
 - (ii) take-off run and distance available (TORA, TODA);
 - (iii) ground temperature, pressure altitude, slope, wind;
 - (iv) maximum load and maximum mass (for example ZFM);
 - (v) minimum climb gradient after powerplant failure;
 - (vi) influence of snow, slush, moisture and standing water on the runway;
 - (vii) possible single or dual powerplant failure during cruise flight;
 - (viii) use of anti-icing systems;

- (ix) failure of antiskid system;
- (x) speeds at reduced thrust, v_1 , v_{1red} , v_{mbe} , v_{mu} , v_r , v_{lof} , v_2 ;
- (xi) safe approach speed v_{ref} , on v_{mca} and turbulent conditions;
- (xii) effects of excessive approach speed and abnormal glideslope on the landing distance;
- (xiii) minimum climb gradient during approach and landing;
- (xiv) limiting values for a go-around with minimum energy;
- (xv) maximum allowable landing mass and the landing distance for the destination and alternate aerodrome on the following factors:
 - (A) available landing distance;
 - (B) ground temperature, pressure altitude, runway slope and wind;
 - (C) energy consumption to destination or alternate aerodrome;
 - (D) influence of moisture on the runway, snow, slush and standing water;
 - (E) failure of the anti skid system;
 - (F) influence of thrust reverser and spoilers.
- (2) flight planning for normal and abnormal conditions:
 - (i) optimum or maximum flight level;
 - (ii) minimum required flight altitude;
 - (iii) drift down procedure after an powerplant failure during cruise flight;
 - (iv) power setting of the powerplants during climb, cruise and holding under various circumstances, as well as the most economic cruising flight level;
 - (v) calculation of a short range or long range flight plan;
 - (vi) optimum and maximum flight level and power setting of the powerplants after powerplant failure.
- (3) flight monitoring.
- (d) Load and balance and servicing:

- (1) load and balance:
 - (i) load and trim sheet on the maximum masses for take-off and landing;
 - (ii) centre of gravity limits;
 - (iii) influence of fuel consumption on the centre of gravity;
 - (iv) lashing points, load clamping, maximum ground load.
- (2) servicing on ground, servicing connections for:
 - (i) fuel;
 - (ii) oil;
 - (iii) water;
 - (iv) hydraulic;
 - (v) oxygen;
 - (vi) nitrogen;
 - (vii) conditioned air;
 - (viii) electric power;
 - (ix) start air;
- (e) Emergency procedures:
 - (1) recognition of the situation as well as immediate memory actions in correct sequence and for those conditions recognised as emergencies by the manufacturer and competent authority for certification:
 - (i) powerplant failure during take-off before and after v1, as well as in-flight;
 - (ii) malfunctions of the propeller system;
 - (iii) powerplant overheat, powerplant fire on ground and in-flight;
 - (iv) wheel well fire;
 - (v) electrical smoke in the RPS or fire;
 - (vi) emergency descent;
 - (vii) anti-ice system overheat;
 - (viii) fuel pump failure;

- (ix) fuel freezing overheat;
 - (x) electric power failure;
 - (xi) equipment cooling failure;
 - (xii) flight instrument failure;
 - (xiii) partial or total hydraulic failure;
 - (xiv) failures at the lift devices and flight controls including boosters;
 - (xv) command and control communication failure;
 - (xvi) autoland system failure;
 - (xvii) lunch and recovery system failure;
- (2) actions according to the approved abnormal and emergency checklist:
 - (i) powerplant restart in-flight;
 - (ii) landing gear emergency extension;
 - (iii) application of the emergency brake system;
 - (iv) emergency extension of lift devices;
 - (v) fuel dumping;
 - (vi) emergency descent.
- (f) Special requirements for autoland systems
- (h) Flight management systems.

II. SE AND ME RPA(H)

- (a) Detailed listing for RPA(H) structure, transmissions, rotors and equipment, normal and abnormal operation of systems:
 - (1) dimensions.
 - (2) powerplant including aux. power unit, rotor and transmissions; if an initial type rating for a turbine powerplant helicopter is applied for, the applicant should have received turbine powerplant instruction:
 - (i) type of powerplant;

(ii) in general, the function of the following systems or components:

- (A) powerplant;
- (B) auxiliary power unit;
- (C) oil system;
- (D) fuel system;
- (E) ignition system;
- (F) starting system;
- (G) fire warning and extinguishing system;
- (H) generators and generator drive;
- (I) power indication;
- (J) water or methanol injection.

(iii) powerplant controls (including starter), powerplant instruments and indications on the RPS, their function and interrelation and interpretation;

(iv) powerplant operation, including APU, during powerplant start and powerplant malfunctions, procedures for normal operation in the correct sequence;

(v) transmission system:

- (A) lubrication;
- (B) generators and generator drives;
- (C) freewheeling units;
- (D) hydraulic drives;
- (E) indication and warning systems.

(vi) type of rotor systems: indication and warning systems.

(3) fuel system:

(i) location of the fuel tanks, fuel pumps, fuel lines to the powerplants tank capacities, valves and measuring;

(ii) the following systems:

- (A) filtering;
- (B) fuelling and defuelling heatings;

- (C) dumping;
- (D) transferring;
- (E) venting.

(iii) On the RPS: the monitors and indicators of the fuel system, quantity and flow indication, interpretation;

(iv) fuel procedures distribution into the various tanks
fuel supply and fuel dumping.

(4) Payload air conditioning:

- (i) components of the system and protection devices;
- (ii) RPS monitors and indicators.

NOTE: interpretation about the operational condition: normal operation of the system during start, cruise approach and landing, payload air conditioning airflow and temperature control.

(5) ice and rain protection, windshield wipers and rain repellent:

- (i) ice protected components of the helicopter, including powerplants and rotor systems, heat sources, controls and indications;
- (ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems;
- (iii) controls and indications of the windshield wipers and rain repellent system operation.

(6) hydraulic system:

- (i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;
- (ii) controls, monitors and indicators in the RPS, function and interrelation and interpretation of indications.

(7) landing gear, skids fixed and floats:

- (i) main components of the:
 - (A) main landing gear;
 - (B) nose gear;
 - (C) tail gear;

- (D) gear steering;
 - (E) wheel brake system.
- (ii) gear retraction and extension;
- (iii) required tyre pressure, or location of the relevant placard;
- (iv) controls and indicators including warning indicators in the RPS in relation to the retraction or extension condition of the landing gear;
- (v) components of the emergency extension system.
- (8) flight controls, stab- and autopilot systems: controls, monitors and indicators including warning indicators of the systems, interrelation and dependencies.
- (9) electrical power supply:
 - (i) number, power, voltage, frequency and if applicable phase and location of the main power system (AC or DC) auxiliary power system location and external power system;
 - (ii) location of the controls, monitors and indicators in the RPS;
 - (iii) main and back-up power sources flight instruments, communication and navigation systems, main and back-up power sources;
 - (iv) location of vital circuit breakers;
 - (v) generator operation and monitoring procedures of the electrical power supply.
- (10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:
 - (i) antennas;
 - (ii) controls and instruments of the following equipment in the RPS:
 - (A) flight instruments (for example air speed indicator, pitot static system, compass system, flight director);
 - (B) flight management systems;
 - (C) radar equipment (for example weather radar, transponder);

- (D) communication and navigation system (for example HF, VHF, ADF, VOR/DME, ILS, marker beacon) and area navigation systems;
 - (E) stabilisation and autopilot system;
 - (F) flight data recorder, RPS voice recorder, data-link communication recording function and radio altimeter;
 - (G) collision avoidance system;
 - (H) TAWS;
 - (I) HUMS.
- (11) RPS, cabin and cargo compartment:
 - (i) operation of the exterior, RPS, cabin and cargo compartment lighting and the emergency lighting;
 - (ii) operation of the cabin doors and emergency exits.
- (12) emergency equipment:
 - (i) operation and correct application of the following mobile emergency equipment in the helicopter:
 - (A) portable fire extinguisher;
 - (B) first-aid kits;
 - (C) portable oxygen equipment;
 - (D) emergency ropes;
 - (E) life-jacket;
 - (F) life rafts;
 - (G) emergency transmitters;
 - (H) crash axes;
 - (I) megaphones;
 - (J) emergency signals;
 - (K) torches.
 - (ii) operation and correct application of the fixed emergency equipment in the helicopter: emergency floats.
- (b) Limitations:

- (1) general limitations, according to the RPA(H) flight manual;
 - (2) minimum equipment list.
- (c) Performance, flight planning and monitoring:
- (1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing:
 - (i) take-off:
 - (A) hover performance in and out of ground effect;
 - (B) all approved profiles, cat A and B;
 - (C) HV diagram;
 - (D) take-off and rejected take-off distance;
 - (E) take-off decision point (TDP) or (DPATO);
 - (F) calculation of first and second segment distances;
 - (G) climb performance.
 - (ii) en-route:
 - (A) air speed indicator correction;
 - (B) service ceiling;
 - (C) optimum or economic cruising altitude;
 - (D) max endurance;
 - (E) max range;
 - (F) cruise climb performance.
 - (iii) landing:
 - (A) hovering in and out of ground effect;
 - (B) landing distance;
 - (C) landing decision point (LDP) or (DPBL).
 - (iv) knowledge or calculation of: v_{lo} , v_{le} , v_{mo} , v_x , v_y , v_{toss} , v_{ne} , $v_{max\ range}$, v_{mini} .
 - (2) flight planning for normal and abnormal conditions:
 - (i) optimum or maximum flight level;

- (ii) minimum required flight altitude;
 - (iii) drift down procedure after an powerplant failure during cruise flight;
 - (iv) power setting of the powerplants during climb, cruise and holding under various circumstances as well as at the most economic cruising flight level;
 - (v) optimum and maximum flight level and power setting after an powerplant failure.
- (3) effect of optional equipment on performance.
- (d) Load, balance and servicing:
 - (1) load and balance:
 - (i) load and trim sheet on the maximum masses for take-off and landing;
 - (ii) centre of gravity limits;
 - (iii) influence of the fuel consumption on the centre of gravity;
 - (iv) lashing points, load clamping, max ground load.
 - (2) servicing on the ground, servicing connections for:
 - (i) fuel;
 - (ii) oil, etc.;
 - (iii) and safety regulations for servicing.
- (e) Emergency procedures.
- (f) Special requirements for extension of a type rating for instrument approaches down to a decision height of less than 200 ft (60 m):
 - (1) airborne and ground equipment:
 - (i) technical requirements;
 - (ii) operational requirements;
 - (iii) operational reliability;
 - (iv) fail operational;
 - (v) fail passive;
 - (vi) equipment reliability;

- (vii) operating procedures;
 - (viii) preparatory measures;
 - (ix) operational downgrading;
 - (x) communication.
- (2) procedures and limitations:
 - (i) operational procedures;
 - (ii) crew co-ordination.
- (g) Special requirements for helicopters with EFIS.
- (h) Optional equipment.

III. RPA(As)

(a) Detailed listing for RPA(As) structure and equipment, normal operation of systems and malfunctions:

- (1) dimensions;
- (2) structure and envelope:
 - (i) internal structure;
 - (ii) envelope;
 - (iii) pressure system;
 - (iv) gondola;
 - (v) empennage.
 - (vi) Gas or hot air system
- (3) flight controls;
- (4) systems:
 - (i) hydraulic;
 - (ii) pneumatic.
- (6) energy system;
- (7) fire warning and extinguishing system;
- (8) emergency equipment;

- (9) electrical systems;
- (10) avionics, radio navigation and communication equipment;
- (11) instrumentation;
- (12) powerplants and propellers;
- (13) operational procedures during start, cruise, approach and landing:
 - (i) normal operations;
 - (ii) abnormal operations.
- (b) Limitations:
 - (1) general limitations:
 - (i) certification of the RPA(As), category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems;
 - (ii) speeds;
 - (iii) altitudes.
 - (2) powerplant limitations;
 - (3) systems limitations;

22 GM1 JARUS-FCL.220 Validity revalidation and renewal of type ratings

RENEWAL TYPE RATINGS: REFRESHER TRAINING

(a) Paragraph (c)(1) of JARUS-FCL.220 determines that if type rating has lapsed, the applicant shall take refresher training at a State-approved training provider. The objective of the training is to reach the level of proficiency necessary to safely operate the relevant type of RPA. The amount of refresher training needed should be determined on a case-by-case basis by the State-approved training provider, taking into account the following factors:

(1) the experience of the applicant. To determine this, the State-approved training provider should evaluate the remote pilot's log book, and, if necessary, conduct a test in an FSTD;

(2) the complexity of the RPA;

(3) the amount of time elapsed since the expiry of the validity period of the rating. The amount of training needed to reach the desired level of proficiency should increase with the time lapsed. In some cases, after evaluating the remote pilot, and when the time lapsed is very limited (less than 3 months), the State-approved training provider may even determine that no further refresher training is necessary. When determining the needs of the remote pilot, the following items can be taken into consideration:

(i) expiry shorter than 3 months: no supplementary requirements;

(ii) expiry longer than 3 months but shorter than 1 year: a minimum of two training sessions;

(iii) expiry longer than 1 year but shorter than 3 years: a minimum of three training sessions in which the most important malfunctions in the available systems are covered;

(iv) expiry longer than 3 years: the applicant should again undergo the training required for the initial issue of the rating or, in case of RPA(H), the training required for the 'additional type issue', according to other valid ratings held.

(b) Once the State-approved training provider has determined the needs of the applicant, it should develop an individual training programme that should be based on the initial training for the issue of the rating and focus on the aspects where the applicant has shown the greatest needs.

(c) After successful completion of the training, the State-approved training provider should give a certificate, or other documental evidence that the training has been successfully achieved to the applicant, to be submitted to the competent authority when applying for the renewal. The certificate or documental evidence needs to contain a description of the training programme.

Subpart D

ADDITIONAL ENDORSEMENTS

22 GM1 FCL.300 Night endorsement for RPA

If the privileges of a remote pilot licence are to be exercised in VFR conditions at night, applicants shall have completed an approved training course. The course shall comprise:

- (a) Theoretical knowledge instruction:
 - (1) Specific aspects of human factors related to night operations;
 - (2) Relevant lighting systems for night operations; Specific RPAS instrumentation needed for night operations, eg: infrared etc.
 - (3) Airlaw; and
 - (4) Meteorology.

(b) at least 5 hours of RPAS flight time in the appropriate RPA category at night, including at least:

- (1) 3 hours of dual RPAS instruction, including at least 1 hour of cross-country navigation;
- (2) 5 take-offs and 5 landings.

23 GM JARUS-FCL.305 High altitude RPA endorsement

HIGH ALTITUDE RPA ENDORSEMENT COURSE

(a) The aim of the course is to qualify remote pilot license holders to exercise the privileges of the remote pilot licence at high altitude.

(b) The ATO should issue a certificate of satisfactory completion of the instruction that can be used for endorsement on the remote pilot licence.

(c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

- (1) High-altitude aerodynamics and meteorology;
- (2) Airspace flight rules related to high altitude operations;

(d) Flying training

The exercises of the high altitude flight syllabus should be repeated as necessary until the student remote pilot achieves a safe and competent standard:

- (1) In all cases, exercises 1 to 2 of the high altitude flight syllabus should be completed;
- (2) For exercises 1 to 2, up to 50 % of the required flight training may be completed in an FSTD;
- (3) The flying exercises should comprise:
 - (i) Exercise 1:
Air experience: flight exercise at high altitude.
 - (ii) Exercise 2:
 - (A) Emergency descent procedures;
 - (B) High altitude loss link procedures.

SUBPART E

RPAS INSTRUCTORS

Common provisions

GM JARUS-FCL.400 RPAS instructor certificates

GENERAL

- (a) Additionally to the existing national instructor categories, the RPAS instructor should be recognised
- (b) A person may hold more than one instructor certificate.

SPECIAL CONDITIONS

- (a) When new RPA or RPS types are introduced in a State or in an operator's fleet, requirements such as to hold a remote pilot licence and rating equivalent to the one for which RPAS instruction is being given, or to have adequate flight experience, may not be possible to comply with. In this case, to allow for the first RPAS instruction courses to be given to applicants for remote pilot licences or ratings for these RPA or RPS types, competent authorities they have the possibility to issue a specific certificate that does not have to comply with the provisions established in this Subpart.
- (b) When the new RPA or RPS type introduced in an operator's fleet already existed, the competent authority should only give the specific certificate to an applicant that is qualified as RPIC on that RPA or RPS.
- (d) The RPAS instructor certificate should ideally be limited in validity to the time needed to qualify the first RPAS instructors for the new RPA or RPS in accordance with this Subpart, but in any case it should not exceed the 1 year established in the JARUS-FCL Recommendation.

GM JARUS-FCL.410 RPAS instructor competencies and assessment

- (a) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching and assessing threat and error management and CRM.
- (b) The training and assessment of RPAS instructors should be made against the following performance standards:

Competence	Performance	Knowledge
Prepare resources	(a) ensures adequate facilities; (b) prepares briefing material; (c) manages available tools.	(a) understand objectives; (b) available tools; training methods.
Create a conducive learning environment	(a) establishes credentials, role models appropriate behaviour; (b) clarifies roles; (c) states objectives; (d) ascertains and supports trainees needs.	(a) barriers to learning; (b) learning styles.
Present knowledge	(a) communicates clearly; (b) creates and sustains realism; (c) looks for training opportunities.	teaching methods.
Integrate TEM and CRM	makes TEM and CRM links with technical training.	HF, TEM or CRM.
Manage time to achieve training objectives	allocates time appropriate to achieving competency objective.	syllabus time allocation.
Facilitate learning	(a) encourages trainee participation; (b) shows motivating, patient, confident and assertive manner; (c) conducts one-to-one coaching; (d) encourages mutual support.	(a) facilitation; (b) how to give constructive feedback; (c) how to encourage trainees to ask questions and seek advice;
Assesses trainee performance	(a) assesses and encourages trainee self-assessment of performance against	(a) observation techniques; (b) methods for recording

	competency standards; (b) makes assessment decision and provide clear feedback; (c) observes CRM behaviour.	observations.
Monitor and review progress	(a) compares individual outcomes to defined objectives; (b) identifies individual differences in learning rates; (c) applies appropriate corrective action.	(a) learning styles; (b) strategies for training adaptation to meet individual needs.
Evaluate training sessions	(a) elicits feedback from trainees; (b) tracks training session processes against competence criteria; (c) keeps appropriate records.	(a) performance and evaluation criteria.
Report outcome	reports accurately using only observed actions and events.	(a) phase training objectives; (b) individual versus systemic weaknesses.

GM1 JARUS-FCL.415 RPAS instructor training course

RPAS INSTRUCTOR TRAINING COURSE

RPA(A), RPA(H) , RPA(MR) and RPA(As)

GENERAL

- (a) The aim of the RPAS instructor training course for RPA(A), RPA(H), RPA(MR) and RPA(As) is to train remote pilot licence holders of this category RPA(A), RPA(H) , RPA(MR) and RPA(As) to the level of competence defined in JARUS-FCL.410.
- (b) The RPAS instructor training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the RPAS instructor task including at least the following:
 - (1) refresh the technical knowledge of the student RPAS instructor;

- (2) train the student RPAS instructor to teach the ground subjects and air exercises;
- (3) ensure that the student RPAS instructor's flying is of a sufficiently high standard;
- (4) teach the student RPAS instructor the principles of basic instruction.

CONTENT

- (c) The RPAS instructor training course consists of two parts:
 - (1) Part 1, theoretical knowledge, including the teaching and learning instruction that should comply with JARUS-FCL.410;
 - (2) Part 2, RPAS instruction.

Part 1

TEACHING AND LEARNING

- (a) The RPAS instructor training course should include at least 125 hours of theoretical knowledge instruction, including at least 25 hours teaching and learning RPAS instruction.
- (b) The applicant for RPAS instructor certificate holding an instructor certificate for manned aircraft may be exempt of this part according to article 6 of JARUS-FCL Recommendation.

CONTENT OF THE TEACHING AND LEARNING RPAS INSTRUCTIONS (INSTRUCTIONAL TECHNIQUES):

- (a) The learning process:
 - (1) motivation;
 - (2) perception and understanding;
 - (3) memory and its application;
 - (4) habits and transfer;
 - (5) obstacles to learning;
 - (6) incentives to learning;
 - (7) learning methods;
 - (8) rates of learning.
- (b) The teaching process:
 - (1) elements of effective teaching;
 - (2) planning of instructional activity;
 - (3) teaching methods;
 - (4) teaching from the 'known' to the 'unknown';
 - (5) use of 'lesson plans'.
- (c) Training philosophies:
 - (1) value of a structured (approved) course of training;
 - (2) importance of a planned syllabus;
 - (3) integration of theoretical knowledge and flight instruction;
- (d) Techniques of applied instruction:
 - (1) theoretical knowledge: classroom instruction techniques:
 - (i) use of training aids;
 - (ii) group lectures;
 - (iii) individual briefings;
 - (iv) student participation or discussion.
 - (2) flight: instruction techniques:
 - (i) the flight or RPA and RPS environment;
 - (ii) techniques of applied instruction;

- (iii) post-flight and during-flight judgement and decision making.
- (e) Student evaluation and testing:
 - (1) assessment of student performance:
 - (i) the function of progress tests;
 - (ii) recall of knowledge;
 - (iii) translation of knowledge into understanding;
 - (iv) development of understanding into actions;
 - (v) the need to evaluate rate of progress.
 - (2) analysis of student errors:
 - (i) establish the reason for errors;
 - (ii) tackle major faults first, minor faults second;
 - (iii) avoidance of over criticism;
 - (iv) the need for clear concise communication.
- (f) Training programme development:
 - (1) lesson planning;
 - (2) preparation;
 - (3) explanation and demonstration;
 - (4) student participation and practice;
 - (5) evaluation.
- (g) Human performance and limitations relevant to flight instruction:
 - (1) physiological factors;
 - (2) psychological factors:
 - (i) human information processing;
 - (ii) behavioural attitudes;
 - (iii) development of judgement and decision making.
 - (3) threat and error management.
- (h) Specific hazards involved in simulating systems failures and malfunctions in the RPA during flight:
 - (i) importance of 'touch drills';
 - (ii) situational awareness;
 - (iii) adherence to correct procedures.
- (i) Training administration:
 - (1) flight or theoretical knowledge instruction records;
 - (2) remote pilot's personal flying logbook;
 - (3) the flight or ground curriculum;
 - (4) study material;
 - (5) official forms;

- (6) flight manual or equivalent document;
- (7) flight authorisation papers;
- (8) RPA and RPS documents;
- (9) the remote pilot's licence regulations.

Part 2

A. RPA category aeroplanes – RPA(A)

AIR EXERCISES

(a) The air exercises are similar to those used for the training of the remote pilot licence, category RPA(A), but with additional items designed to cover the needs of an RPAS instructor.

(b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (1) the applicant's progress and ability;
- (2) the weather conditions affecting the flight;
- (3) the flight time available;
- (4) instructional technique considerations;
- (5) the local operating environment.

(c) It follows that student RPAS instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

(d) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the RPAS instructor and practised by the student during the flight. It should include information on how the flight will be conducted, who is to fly the RPA(A) and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.

(e) The four basic components of the briefing will be:

- (1) the aim;
- (2) principles of flight (briefest reference only);
- (3) the air exercise(s) (what, and how and by whom);
- (4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

(f) The preparation of lesson plans is an essential prerequisite of good RPAS instruction and the student RPAS instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

(g) The student RPAS instructor should complete flight training to practise the principles of basic instruction.

(h) During this training, except when acting as a student remote pilot for mutual flights, the student RPAS instructor occupies the seat normally occupied by the RPAS instructor.

(i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.

(j) If the privileges of the RPAS instructor certificate are to include RPAS instruction for night flying, exercises 19 and 20 of the RPAS instruction syllabus should be undertaken at night in addition to by day either as part of the course or subsequent to certification issue.

(k) The student RPAS instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

SYLLABUS OF RPAS INSTRUCTION CONTENTS

BRIEFINGS AND AIR EXERCISES

NOTE: though exercise 11b is not required for the remote pilot licence category RPA(A) course, it is a requirement for the RPAS instructor course.

EXERCISE 1: FAMILIARISATION WITH THE RPA(A)

(a) Briefing objectives:

- (1) introduction to the RPA(A);
- (2) explanation of the RPS layout;
- (3) RPAS powerplant;
- (4) checklists, drills and controls;
- (5) propeller safety;
 - (i) precautions general;
 - (ii) technique for starting (if applicable to type).
- (6) differences when occupying the RPAS instructor's seat;
- (7) emergency drills:
 - (i) action if fire in the air and on the ground: engine, RPAS and electrical fire;
 - (ii) system failure as applicable to type;
 - (iii) escape drills from the RPS: location and use of emergency equipment and exits.

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Briefing objectives:

- (1) flight authorisation and RPA(A) and RPS acceptance, including technical log (if applicable) and certificate of maintenance;
- (2) equipment required for flight (maps, etc.);
- (3) external checks;
- (4) internal checks;
- (5) student comfort, seat or rudder pedal adjustment if applicable;
- (6) starting and warming up checks;
- (7) power checks;
- (8) running down, system checks and switching off the engine;
- (9) leaving the RPS, parking, security and picketing the RPA(A);

- (10) completion of authorisation sheet and RPA(A) and RPS serviceability documents.
- (b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

- (a) Briefing objectives:

NOTE: there is no requirement for a briefing for this exercise.

- (b) Air exercise:

- (1) air experience;
- (2) RPS layout, ergonomics and controls;
- (3) RPAS procedures: flight exercise

EXERCISE 4: EFFECTS OF CONTROLS

- (a) Briefing objectives:

- (1) function of primary flying controls: when laterally level and banked;
- (2) further effect of ailerons and rudder;
- (3) effect of inertia;
- (4) effect of air speed;
- (5) effect of slipstream;
- (6) effect of power;
- (7) effect of trimming controls;
- (8) effect of flaps;
- (9) Envelope protection characteristics;
- (10) operation of RPS climate systems.

- (b) Air exercise:

- (1) primary effects of flying controls: when laterally level and banked;
- (2) further effects of ailerons and rudder;
- (3) effect of air speed;
- (4) effect of slipstream;
- (5) effect of power;
- (6) effect of trimming controls;
- (7) effect of flaps;
- (8) operation of RPS climate systems;
- (9) Envelope protection characteristics.

EXERCISE 5: TAXIING

- (a) Briefing objectives:
 - (1) pre-taxiing checks;
 - (2) starting, control of speed and stopping;
 - (3) engine handling;
 - (4) control of direction and turning (including manoeuvring in confined spaces);
 - (5) parking area procedures and precautions;
 - (6) effect of wind and use of flying controls;
 - (7) effect of ground surface;
 - (8) freedom of rudder movement;
 - (9) marshalling signals;
 - (10) instrument checks;
 - (11) ATC procedures;
 - (12) emergencies: steering failure and brake failure.
- (b) Air exercise:
 - (1) pre-taxiing checks;
 - (2) starting, control of speed and stopping;
 - (3) engine handling;
 - (4) control of direction and turning;
 - (5) turning in confined spaces;
 - (6) parking area procedures and precautions;
 - (7) effect of wind and use of flying control;
 - (8) effect of ground surface;
 - (9) freedom of rudder movement;
 - (10) marshalling signals;
 - (11) instrument checks;
 - (12) ATC procedures;
 - (13) emergencies: steering failure and brake failure.

EXERCISE 6: STRAIGHT AND LEVEL FLIGHT

- (a) Briefing objectives:
 - (1) the forces;
 - (2) longitudinal stability and control in pitch;
 - (3) relationship of CG to control in pitch;
 - (4) lateral and directional stability (control of lateral level and balance);
 - (5) attitude and balance control;
 - (6) trimming;

- (7) power settings and air speeds;
- (8) drag and power curves;
- (9) range and endurance.
- (b) Air exercise:
 - (1) at normal cruising power;
 - (2) attaining and maintaining straight and level flight;
 - (3) demonstration of inherent stability;
 - (4) control in pitch, including use of elevator trim control;
 - (5) lateral level, direction and balance, use of rudder trim controls as applicable at selected air speeds (use of power):
 - (i) effect of drag and use of power (two air speeds for one power setting);
 - (ii) straight and level in different RPA(A) configurations (flaps and landing gear);

EXERCISE 7: CLIMBING

- (a) Briefing objectives:
 - (1) the forces;
 - (2) relationship between power or air speed and rate of climb (power curves maximum rate of climb (v_y));
 - (3) effect of mass;
 - (4) effect of flaps;
 - (5) engine considerations;
 - (6) effect of density altitude;
 - (7) en-route climb (cruise climb);
 - (8) maximum angle of climb (v_x).
- (b) Air exercise:
 - (1) entry and maintaining the normal maximum rate climb;
 - (2) levelling off;
 - (3) levelling off at selected altitudes;
 - (4) climbing with flaps down;
 - (5) recovery to normal climb;
 - (6) en-route climb (cruise climb);
 - (7) maximum angle of climb;
 - (8) use of instruments to achieve precision flight.

EXERCISE 8: DESCENDING

- (a) Briefing objectives:

- (1) the forces;
 - (2) glide descent: angle, air speed and rate of descent;
 - (3) effect of flaps;
 - (4) effect of wind;
 - (5) effect of mass;
 - (6) engine considerations;
 - (7) power assisted descent: power or air speed and rate of descent;
 - (8) cruise descent;
 - (9) sideslip.
- (b) Air exercise:
- (1) entry and maintaining the glide;
 - (2) levelling off;
 - (3) levelling off at selected altitudes;
 - (4) descending with flaps down;
 - (5) powered descent: cruise descent (including effect of power and air speed);
 - (6) side-slipping (if applicable);
 - (7) use of instrument to achieve precision flight.

EXERCISE 9: TURNING

- (a) Briefing objectives:
- (1) the forces;
 - (2) use of controls;
 - (3) use of power;
 - (4) maintenance of attitude and balance;
 - (5) medium level turns;
 - (6) climbing and descending turns;
 - (7) slipping turns;
 - (8) turning onto selected headings: use of heading indicator and compass .
- (b) Air exercise:
- (1) entry and maintaining medium level turns;
 - (2) resuming straight flight;
 - (3) faults in the turn (incorrect pitch, bank and balance);
 - (4) climbing turns;
 - (5) descending turns;
 - (6) slipping turns (on suitable types);

- (7) turns to selected headings: use of heading indicator and compass

NOTE: stall or spin awareness and avoidance training consists of exercises 10a, 10b and 11a.

EXERCISE 10a: SLOW FLIGHT

(a) Briefing objectives:

- (1) RPA handling characteristics during slow flight at minimum speed.
- (2) slow flight during instructor induced distractions;
- (2) configurations where application of engine power causes a strong 'nose-up' trim change.

(b) Air exercise:

- (1) safety checks;
- (2) introduction to slow flight;
- (3) controlled slow flight in the clean configuration:
 - (iii) straight and level flight;
 - (iv) level turns;
 - (v) climbing and descending;
 - (vi) climbing and descending turns.
- (5) 'instructor induced distractions' during flight at low air speed: the need to maintain balanced flight and a safe air speed;
- (6) effect of going around in configurations where application of engine power causes a strong 'nose up' trim change.

EXERCISE 10b: STALLING

(a) Briefing objectives:

- (1) characteristics of the stall;
- (2) angle of attack;
- (3) effectiveness of the controls at the stall;
- (4) factors affecting the stalling speed:
 - (i) effect of flaps, slats and slots;
 - (ii) effect of power, mass, CG and load factor.
- (5) effects of unbalance at the stall;
- (6) symptoms of the stall;
- (7) stall recognition and recovery;
- (8) stalling and recovery:
 - (i) without power;
 - (ii) with power on;

- (iii) with flaps down;
- (iv) maximum power climb (straight and turning flight to the point of stall with uncompensated yaw);
- (v) stalling and recovery during manoeuvres involving more than 1 G (accelerated stalls, including secondary stalls and recoveries);
- (vi) recovering from incipient stalls in the landing and other configurations and conditions;
- (vii) recovering at the incipient stage during change of configuration;
- (viii) stalling and recovery at the incipient stage with 'instructor induced' distractions.

NOTE: consideration is to be given to manoeuvre limitations and references to the flight manual or equivalent document (for example owner's manual or remote pilot's operating handbook) in relation to mass and balance limitations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are also covered in the next exercise spinning.

(b) Air exercise:

- (1) safety checks;
- (2) symptoms of the stall;
- (3) stall recognition and recovery:
 - (i) without power;
 - (ii) with power on;
 - (iii) recovery when a wing drops at the stall;
 - (iv) stalling with power 'on' and recovery;
 - (v) stalling with flap 'down' and recovery;
 - (vi) maximum power climb (straight and turning flight) to the point of stall with uncompensated yaw: effect of unbalance at the stall when climbing power is being used;
 - (vii) stalling and recovery during manoeuvres involving more than 1 G (accelerated stalls, including secondary stalls and recoveries);
 - (viii) recoveries from incipient stalls in the landing and other configurations and conditions;
 - (ix) recoveries at the incipient stage during change of configuration;
 - (x) instructor induced distractions during stalling.

NOTE: consideration of manoeuvre limitations and the need to refer to the RPA(A) manual and weight (mass) and balance calculations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If

specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are to be covered in the next exercise: spinning.

NOTE: if not safe to exercise stall the exercise should be performed in a FSTD

EXERCISE 11: SPIN AVOIDANCE

(a) Briefing objectives:

- (1) causes, stages, autorotation and characteristics of the spin;
- (2) recognition and recovery at the incipient stage: entered from various flight attitudes;
- (3) RPA limitations.
spin entry;
- (4) recognition and identification of spin direction;
- (5) spin recovery;
- (6) use of controls and automation;
- (7) effects of power or flaps (flap restriction applicable to type);
- (8) effect of the CG upon spinning characteristics;
- (9) spinning from various flight attitudes;
- (10) safety checks.

(b) Air exercise (FSTD, if suitable):

- (1) RPA limitations;
- (2) safety checks;
- (3) recognition at the incipient stage of a spin;
- (4) recoveries from incipient spins entered from various attitudes with the RPA(A) in the clean configuration, including RPAS instructor induced distractions.
- (5) spin entry;
- (6) recognition and identification of the spin direction;
- (7) spin recovery (reference to flight manual);
- (8) use of controls;
- (9) effects of power or flaps (restrictions applicable to RPA(A) type);
- (10) spinning and recovery from various flight attitudes.

NOTE: The above exercise should be carried out in an RPA or suitable FSTD to avoid negative training. Should the FSTD data not be valid for spins or not available, the instructor should inform the student accordingly.

EXERCISE 12: TAKE-OFF AND CLIMB TO DOWNWIND POSITION

(a) Briefing objectives:

- (1) handling: factors affecting the length of take-off run and initial climb;
- (2) correct lift off speed, use of elevators (safeguarding the nose wheel), rudder and power;
- (3) effect of wind (including crosswind component);
- (4) effect of flaps (including the decision to use and the amount permitted);
- (5) effect of ground surface and gradient upon the take-off run (if applicable);
- (6) effect of mass, altitude and temperature on take-off and climb performance;
- (7) pre take-off checks (including C2 checks and coordination with RPAS ground crew, if any);
- (8) ATC procedure before take-off;
- (9) drills, during and after take-off;
- (10) noise abatement procedures;
- (11) tail wheel considerations (as applicable);
- (12) short or soft field take-off considerations or procedures;
- (13) emergencies:
 - (i) aborted take-off;
 - (ii) engine failure after take-off.
 - (iii) loss of C2 link during or after take-off
- (14) ATC procedures.

(b) Air exercise:

- (1) take-off and climb to downwind position;
- (2) pre take-off checks (including C2 checks and coordination with RPAS ground crew, if any);
- (3) into wind take-off;
- (4) safeguarding the nose wheel (if applicable);
- (5) crosswind take-off;
- (6) drills during and after take-off;
- (7) short take-off and soft field procedure or techniques (including performance calculations);
- (8) noise abatement procedures.

EXERCISE 13: CIRCUIT, APPROACH AND LANDING

(a) Briefing objectives:

- (1) downwind leg, base leg and approach: position and drills;
- (2) factors affecting the final approach and the landing run;
- (3) effect of mass;
- (4) effects of altitude and temperature;
- (5) effect of wind;
- (6) effect of flap;
- (7) landing;
- (8) effect of ground surface and gradient upon the landing run;
- (9) types of approach and landing:
 - (i) powered;
 - (ii) crosswind;
 - (iii) flapless (at an appropriate stage of the course);
 - (iv) glide;
 - (v) short field;
 - (vi) soft field.
- (10) tail wheel RPA(A) considerations (as applicable);
- (11) missed approach;
- (12) engine handling;
- (13) wake turbulence awareness;
- (14) windshear awareness;
- (15) ATC procedures;
- (16) mislanding and go-around;
- (17) special emphasis on situational awareness.
- (18) handover between remote pilots or RPS if applicable
- (19) LOS limitations

(b) Air exercise:

- (1) circuit approach and landing;
- (2) circuit procedures: downwind and base leg;
- (3) powered approach and landing;
- (4) safeguarding the nose wheel;
- (5) effect of wind on approach and touchdown speeds and use of flaps;
- (6) crosswind approach and landing;
- (7) glide approach and landing;
- (8) flapless approach and landing (short and soft field);

- (9) short field and soft field procedures;
- (10) wheel landing (tail wheel aircraft);
- (11) missed approach and go-around;
- (12) mislanding and go-around;
- (13) noise abatement procedures.
- (14) handover between remote pilots or RPS if applicable

EXERCISE 14: FIRST SOLO AND CONSOLIDATION

NOTE: a summary of points to be covered before sending the student on first solo.

(a) Briefing objectives:

During the flights immediately following the solo circuit consolidation period the following should be covered:

- (1) procedures for leaving and rejoining the circuit;
- (2) local area (restrictions, controlled airspace, etc.);
- (3) briefing of the solo flight exercises
- (4) Use of navigational aids

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 16: FORCED LANDING WITHOUT POWER

(a) Briefing objectives:

- (1) selection of forced landing areas;
- (2) provision for change of plan;
- (3) gliding distance: consideration;
- (4) planning the descent;
- (5) key positions;
- (6) engine failure checks;
- (7) use of radio: R/T 'distress' procedure;
- (8) base leg;
- (9) final approach;
- (10) go-around from an exercise;
- (11) landing considerations;
- (12) actions after landing: RPA security;
- (13) causes of engine failure.

(b) Air exercise:

- (1) forced landing procedures;
- (2) selection of landing area:
 - (i) provision for change of plan;
 - (ii) gliding distance considerations.
- (3) planning the descent;
- (4) key positions;
- (5) engine failure checks;
- (6) engine cooling precautions;
- (7) use of radio;
- (8) base leg;
- (9) final approach;
- (10) landing;
- (11) actions after landing
- (12) RPA security.

EXERCISE 18a: NAVIGATION

(a) Briefing objectives:

- (1) flight planning;
 - (i) weather forecast and actual(s);
 - (ii) map selection, orientation, preparation and use:
 - (A) choice of route;
 - (B) regulated or controlled and segregated airspace;
 - (C) danger, prohibited and restricted areas;
 - (D) safety altitude.
 - (E) C² link planning.
 - (iii) calculations:
 - (A) magnetic heading(s) and time(s) en-route;
 - (B) energy requirements;
 - (C) mass and balance;
 - (D) mass and performance.
 - (iv) flight information:
 - (A) NOTAMs etc.;
 - (B) noting of required radio frequencies;
 - (C) selection of alternate aerodrome(s) and emergency landing sites

- (v) RPAS documentation.
 - (vi) notification of the flight:
 - (A) pre-flight administration procedures;
 - (B) flight plan form (where appropriate).
 - (2) departure;
 - (i) organisation of RPS workload;
 - (ii) departure procedures:
 - (A) altimeter settings;
 - (B) setting heading procedures;
 - (C) noting of ETA(s).
 - (iii) en-route map reading: identification of ground features;
 - (iv) maintenance of altitudes and headings;
 - (v) revisions to ETA and heading, wind effect, drift angle and groundspeed checks;
 - (vi) log keeping;
 - (vii) use of radio;
 - (viii) minimum weather conditions for continuance of flight;
 - (ix) 'in-flight' decisions;
 - (x) diversion procedures;
 - (xi) operations in regulated, controlled or segregated airspace;
 - (xii) procedures for entry, transit and departure;
 - (xiii) navigation at minimum level;
 - (xiv) uncertainty of position procedure, including R/T procedure;
 - (xv) lost procedure;
 - (xvi) use of nav aids.
 - (3) arrival procedures and aerodrome circuit joining procedures:
 - (i) ATC liaison, R/T procedure, etc.;
 - (ii) altimeter setting,
 - (iii) entering the traffic pattern (controlled or uncontrolled aerodromes);
 - (iv) circuit procedures;
 - (v) parking procedures;
 - (vi) security of aircraft;
 - (vii) refuelling;
 - (viii) booking in.
- (b) Air exercise:
- (1) flight planning:
 - (i) weather forecast and actual(s);

- (ii) map selection and preparation:
 - (A) choice of route;
 - (B) regulated, controlled or segregated airspace;
 - (C) danger, prohibited and restricted areas;
 - (D) safety altitude.
 - (E) C² link planning.
- (iii) calculations:
 - (A) magnetic heading(s) and time(s) en-route;
 - (B) energy requirements;
 - (C) mass and balance;
 - (D) mass and performance.
- (iv) flight information:
 - (A) NOTAMs etc.;
 - (B) noting of required radio frequencies;
 - (C) selection of alternate aerodromes and emergency landing sites
- (v) RPA documentation;
- (vi) notification of the flight:
 - (A) flight clearance procedures (as applicable);
 - (B) flight plans.
- (2) aerodrome departure;
 - (i) organisation of RPS;
 - (ii) departure procedures:
 - (A) altimeter settings;
 - (B) en-route:
 - (C) noting of ETA(s).
 - (iii) wind effect, drift angle and ground speed checks;
 - (iv) maintenance of altitudes and headings;
 - (v) revisions to ETA and heading;
 - (vi) log keeping;
 - (vii) use of radio;
 - (viii) minimum weather conditions for continuance of flight;
 - (ix) 'in-flight' decisions;
 - (x) diversion procedure;
 - (xi) operations in regulated controlled or segregated airspace;
 - (xii) procedures for entry, transit and departure;

- (xiii) uncertainty of position procedure;
- (xiv) lost procedure;
- (xv) use of nav aids.
- (3) arrival procedures and aerodrome joining procedures:
 - (i) ATC liaison, R/T procedure etc.;
 - (ii) altimeter setting,
 - (iii) entering the traffic pattern;
 - (iv) circuit procedures;
 - (v) parking procedures
 - (vi) security of RPA(A);
 - (vii) refuelling;

EXERCISE 18b: FLIGHT AT LOWER LEVELS AND IN REDUCED VISIBILITY FOR VLOS

(a) Briefing objectives:

- (2) low level familiarisation:
 - (i) actions before descending;
 - (ii) visual impressions and height keeping at low altitude;
 - (iii) effects of speed and inertia during turns;
 - (iv) effects of wind and turbulence;
- (3) low level operation:
 - (i) weather considerations;
 - (ii) low cloud and good visibility;
 - (iii) low cloud and poor visibility;
 - (iv) avoidance of moderate to heavy rain showers;
 - (v) effects of precipitation;
 - (vi) joining a circuit;
 - (vii) bad weather circuit, approach and landing.

(b) Air exercise:

- (2) low level familiarisation:
 - (i) actions before descending;
 - (ii) visual impressions and height keeping at low altitude;
 - (iii) effects of speed and inertia during turns;
 - (iv) effects of wind and turbulence;
 - (v) hazards of operating at low levels;
- (3) low level operation:
 - (i) weather considerations;

- (ii) low cloud and good visibility;
- (iii) low cloud and poor visibility;
- (iv) avoidance of moderate to heavy rain showers;
- (v) effects of precipitation (forward visibility);
- (vi) joining a circuit;
- (vii) bad weather circuit, approach and landing.

EXERCISE 18c: RADIO NAVIGATION

(a) Briefing objectives:

- (1) use of radar facilities:
 - (i) availability and provision of service and AIS;
 - (ii) types of service;
 - (iii) R/T procedures and use of transponder:
 - mode selection;
 - emergency codes.
- (2) use of GNSS (RNAV – SATNAV):
 - (i) availability;
 - (ii) operating modes;
 - (iii) limitations.

(b) Air exercise:

- (1) use of en-route or terminal radar:
 - (i) availability and AIP;
 - (ii) procedures and ATC liaison;
 - (iii) remote pilot responsibilities;
 - (iv) secondary surveillance radar;
 - (v) transponders;
 - (vi) code selection;
 - (vii) interrogation and reply.
- (2) use of GNSS (RNAV – SATNAV):
 - (i) setting up;
 - (ii) operation;
 - (iii) interpretation.

EXERCISE 19: INSTRUMENT FLIGHT

(a) Briefing objectives:

- (1) flight instruments;

- (i) instrument knowledge;
 - (ii) attitude instrument flight;
 - (iii) pitch indications;
 - (iv) bank indications;
 - (v) different dial presentations;
 - (vi) introduction to the use of the attitude indicator;
 - (vii) pitch attitude;
 - (viii) bank attitude;
 - (ix) maintenance of heading and balanced flight;
 - (x) instrument limitations (inclusive system failures).
- (2) attitude, power and performance:
- (i) attitude instrument flight;
 - (ii) control instruments;
 - (iii) performance instruments;
 - (iv) effect of changing power and configuration;
 - (v) cross-checking the instrument indications;
 - (vi) instrument interpretation;
 - (vii) direct and indirect indications (performance instruments);
 - (viii) instrument lag;
 - (ix) selective radial scan;
- (3) basic flight manoeuvres (full panel):
- (i) straight and level flight at various air speeds and RPA(A) configurations;
 - (ii) climbing;
 - (iii) descending;
 - (iv) standard rate turns onto pre-selected headings:
 - (A) level;
 - (B) climbing;
 - (C) descending.
- (b) Air exercise:
- (1) Introduction to instrument flying
- (i) flight instruments;
 - (ii) instrument use;
 - (iii) attitude instrument flight;
 - (iv) pitch attitude;
 - (v) bank attitude;
 - (vi) maintenance of heading and balanced flight.

- (2) attitude, power and performance;
 - (i) attitude instrument flight;
 - (ii) effect of changing power and configuration;
 - (iii) cross-checking the instruments;
 - (iv) selective radial scan;
- (3) basic flight manoeuvres (full panel);
 - (i) straight and level flight at various air speeds and RPA(A) configurations;
 - (ii) climbing;
 - (iii) descending;
 - (iv) standard rate turns onto pre-selected headings:
 - (A) level;
 - (B) climbing;
 - (C) descending.

EXERCISE 20: NIGHT FLYING (if night instructional qualification required for night endorsement)

(a) Briefing objectives:

- (1) start up procedures;
- (2) local procedures: including ATC liaison;
- (3) taxiing:
 - (i) parking area and taxiway lighting;
 - (ii) judgement of speed and distances;
 - (iii) use of taxiway lights;
 - (iv) avoidance of hazards: obstruction lighting;
 - (v) instrument checks;
 - (vi) holding point: lighting procedure;
 - (vii) initial familiarisation at night;
 - (viii) local area orientation;
 - (ix) significance of lights on other aircraft;
 - (x) ground obstruction lights;
 - (xi) division of remote piloting effort: external or instrument reference;
 - (xii) re-joining procedure;
 - (xiii) aerodrome lighting: approach and runway lighting (including VASI and PAPI):
 - (A) threshold lights;
 - (B) approach lighting;

- (C) visual approach slope indicator systems.
- (4) night circuits;
 - (i) take-off and climb:
 - (A) line up;
 - (B) visual references during the take-off run;
 - (C) handover between VLOS remote pilot to remote pilot
 - (ii) circuit:
 - (A) RPA positioning: reference to runway lighting;
 - (B) the traffic pattern and look-out;
 - (C) initial approach and runway lighting demonstration;
 - (D) RPA positioning and orientation;
 - (F) intercepting the correct approach path;
 - (G) going around.
 - (iii) approach and landing:
 - (A) positioning, base leg and final approach;
 - (B) diurnal wind effect;
 - (C) use of landing lights;
 - (D) the flare and touchdown;
 - (E) the roll out;
 - (F) turning off the runway: control of speed.
 - (iv) missed approach:
 - (B) re-positioning in the circuit pattern;
- (6) night emergencies;
 - (i) radio failure;
 - (ii) failure of runway lighting;
 - (iii) failure of RPA(A) landing lights;
 - (iv) failure of RPS internal lighting;
 - (v) failure of RPA(A) navigation lights;
 - (vi) total electrical failure in RPAS;
 - (vii) rejected take-off;
 - (viii) engine failure;
 - (ix) obstructed runway or landing site procedures.

(b) Air exercise: during the air exercise all briefing objectives mentioned above should also be trained on site and the student RPAS instructor should demonstrate the following items:

- (1) how to plan and to perform a flight at night;
- (2) how to analyse and correct errors as necessary.

B. RPA CATEGORY HELICOPTERS – RPA(H)

GROUND INSTRUCTION

NOTE: During ground instruction the student RPAS instructor should pay specific attention to the teaching of enhanced ground RPAS instruction in weather interpretation, planning and route assessment, decision making on encountering DVE including reversing course or conducting a precautionary landing.

Part 2

AIR EXERCISES

- (a) The air exercises are similar to those used for the training of the remote pilot licence, category RPA(H), but with additional items designed to cover the needs of an RPAS instructor.
- (b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
 - (1) the applicant's progress and ability;
 - (2) the weather conditions affecting the flight;
 - (3) the flight time available;
 - (4) instructional technique considerations;
 - (5) the local operating environment;
 - (6) applicability of the exercises to the helicopter type.
- (c) It follows that student RPAS instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

- (d) The briefing normally includes a statement of the objectives and a brief reference to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the RPAS instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the RPA(H) and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.
- (e) The four basic components of the briefing will be:
 - (1) the aim;
 - (2) principles of flight (briefest reference only);
 - (3) the air exercise(s) (what, and how and by whom);

(4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

- (f) The preparation of lesson plans is an essential prerequisite of good instruction and the student RPAS instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

- (g) The student RPAS instructor should complete flight training to practise the principles of basic instruction.
- (h) During this training, except when acting as a student remote pilot for mutual flights, the student instructor occupies the seat normally occupied by the RPAS instructor
- (i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.
- (j) If the privileges of the RPAS instructor certificate are to include instruction for night flying, exercise 28 should be undertaken either as part of the course or subsequent to certificate issue.
- (k) The student RPAS instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.
- (l) The student RPAS instructor should be trained to keep in mind that wherever possible, flight simulation should be used to demonstrate to student remote pilots the effects of flight into DVE and to enhance their understanding and need for avoidance of this potentially fatal flight regime.

SYLLABUS OF RPAS INSTRUCTION CONTENTS

BRIEFINGS AND AIR EXERCISES

EXERCISE 1: FAMILIARISATION WITH THE RPA(H)

(a) Briefing objectives:

- (1) introduction to the RPA(H);
- (2) explanation of the RPS layout;
- (3) RPA(H) and power plant systems;
- (4) checklist(s) and procedures;
- (5) familiarisation with the RPA(H) controls;
- (6) differences when occupying the RPAS instructor's seat;
- (7) emergency drills:
 - (i) action if fire in the air and on the ground: engine, RPS or and electrical fire;
 - (ii) system failure drills as applicable to type;
 - (iii) escape drills from the RPS: location and use of emergency equipment and exits.

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Briefing objectives:

- (1) flight authorisation and RPA(H) and RPS acceptance, including technical log (if applicable) and certificate of maintenance;
- (2) equipment required for flight (maps, etc.);
- (3) external checks;
- (4) internal checks;
- (5) student comfort, seat and rudder pedal adjustment if applicable;
- (6) starting and after starting checks;
- (7) system, power or serviceability checks (as applicable);
- (8) closing down or shutting down the RPA(H) (including system checks).
- (9) parking RPA(H) and leaving the RPS (including safety or security as applicable);
- (10) completion of authorisation sheet and RPA(H) and RPS serviceability documents.

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

(a) Briefing objectives:

NOTE : there is no requirement for a briefing for this exercise.

(b) Air exercise:

- (1) air experience;
- (2) RPS layout, ergonomics and controls;
- (3) TPS procedures: stability and control.

EXERCISE 4: EFFECTS OF CONTROLS

(a) Briefing objectives:

- (1) function of the flying controls (primary and secondary effect);
- (2) effect of air speed;
- (3) effect of power changes (torque);
- (4) effect of yaw (sideslip);
- (5) effect of disc loading (bank and flare);
- (6) effect on controls when in different modes;

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 5: POWER AND ATTITUDE CHANGES

(a) Briefing objectives:

- (1) relationship between cyclic control position, disc attitude, fuselage attitude and air speed flap back;
- (2) power required diagram in relation to air speed;
- (3) power and air speed changes in level flight;
- (4) powerplant and air speed limitations;

(b) Air exercise:

- (1) relationship between cyclic control position, disc attitude, fuselage attitude and air speed flap back;
- (2) power and air speed changes in level flight;

EXERCISE 6: LEVEL FLIGHT, CLIMBING, DESCENDING AND TURNING

NOTE: for ease of training this exercise is divided into four separate parts in the RPA(H) syllabus but may be taught complete or in convenient parts.

(a) Briefing objectives:

- (1) basic factors involved in level flight;

- (2) normal power settings;
 - (3) use of trim;
 - (4) importance of maintaining direction and balance;
 - (5) power required or power available diagram;
 - (6) optimum climb and descent speeds, angles or rates;
 - (7) importance of balance, attitude and co-ordination in the turn;
 - (8) effects of turning on rate of climb or descent;
 - (9) use of the direction or heading indicator and compass;
- (b) Air exercises:
- (1) maintaining straight and level flight at normal cruise power;
 - (2) control in pitch, including use trim;
 - (3) use of the ball to maintain direction and balance;
 - (4) setting and use of power for selected air speeds and speed changes;
 - (5) entry to climb;
 - (6) normal and maximum rate of climb;
 - (7) levelling off from climb at selected altitudes or heights;
 - (8) entry to descent;
 - (9) effect of power and air speed on rate of descent;
 - (10) levelling off from descent at selected altitudes or heights;
 - (11) entry to medium rate turns;
 - (12) importance of balance, attitude and co-ordination to maintain level turn;
 - (13) resuming straight and level flight;
 - (14) turns onto selected headings, use of direction indicator and compass;
 - (15) turns whilst climbing and descending;
 - (16) effect of turn on rate of climb or descent;

EXERCISE 7: AUTOROTATION

- (a) Briefing objectives:
- (1) characteristics of autorotation;
 - (2) safety checks (including situational awareness and verbal warning if applicable);
 - (3) entry and development of autorotation;
 - (4) effect of AUM, IAS, disc loading, G forces and density altitude on RRPM and rate of descent;
 - (5) rotor and engine limitations;

- (6) control of air speed and RRPM;
 - (7) recovery to powered flight;
 - (8) throttle override and control of ERPM or RRPM during re-engagement (as applicable);
 - (9) danger of vortex condition during recovery.
- (b) Air exercise:
- (1) safety checks (situational awareness and verbal warning if applicable);
 - (2) entry to and establishing in autorotation;
 - (3) effect of IAS and disc loading on RRPM and rate of descent;
 - (4) control of air speed and RRPM;
 - (5) recovery to powered flight;
 - (6) medium turns in autorotation;
 - (7) simulated engine off landing (as appropriate).

EXERCISE 8: HOVERING AND HOVER TAXIING

- (a) Briefing objectives:
- (1) ground effect and power required;
 - (2) effect of wind, attitude and surface;
 - (3) stability in hover and effects of over controlling;
 - (4) effect of control in hover;
 - (5) control and co-ordination during spot turns;
 - (6) requirement for slow hover speed to maintain ground effect;
 - (7) effect of controls failure in hover;
 - (8) specific hazards, for example snow, dust, etc.
- (b) Air exercise:
- (1) ground effect and power or height relationship;
 - (2) effect of wind, attitude and surface;
 - (3) stability in hover and effects of over controlling;
 - (4) effect of control and hover technique;
 - (5) gentle forward running touchdown;
 - (6) control and co-ordination during spot (90 ° clearing) turns;
 - (7) control and co-ordination during hover taxi;
 - (8) dangers of mishandling and over pitching;
 - (9) (where applicable) effect of controls failure in hover;
 - (10) simulated engine failure in the hover and hover taxi.

EXERCISE 9: TAKE-OFF AND LANDING

(a) Briefing objectives:

- (1) pre take-off checks or drills including C² checks and coordination between RPAS ground crew;
- (2) importance of situational awareness;
- (3) technique for lifting to hover;
- (4) after take-off checks;
- (5) danger of horizontal movement near ground;
- (6) dangers of mishandling and over pitching;
- (7) technique for landing;
- (8) after landing checks;
- (9) take-off and landing crosswind and downwind.

(b) Air exercise:

- (1) pre take-off checks or drills including C² checks and coordination between RPAS ground crew;
- (2) pre take-off situational awareness;
- (3) lifting to hover;
- (4) after take-off checks;
- (5) landing;
- (6) after landing checks or drills;
- (7) take-off and landing crosswind and downwind.

EXERCISE 10: TRANSITIONS FROM HOVER TO CLIMB AND APPROACH TO HOVER

(a) Briefing objectives:

- (1) revision of ground effect;
- (2) translational lift and its effects;
- (3) inflow roll and its effects;
- (4) revision of flap back and its effects;
- (5) avoidance of curve diagram and associated dangers;
- (6) effect or dangers of wind speed and direction during transitions;
- (7) transition to climb technique;
- (8) constant angle approach;
- (9) transition to hover technique.

(b) Air exercise:

- (1) revision of take-off and landing;
- (2) transition from hover to climb;
- (3) effect of translational lift, inflow roll and flap back;
- (4) constant angle approach;
- (5) technique for transition from descent to hover;
- (6) a variable flare simulated engine off landing.

EXERCISE 11: CIRCUIT, APPROACH AND LANDING

(a) Briefing objectives:

- (1) circuit and associated procedures;
- (2) take-off and climb (including checks or speeds);
- (3) crosswind leg (including checks, speeds or angles of bank in turns);
- (4) downwind leg (including pre-landing checks);
- (5) base leg (including checks, speeds or angles of bank in turns);
- (6) final approach (including checks or speeds);
- (7) effect of wind on approach and hover IGE;
- (8) crosswind approach and landing technique;
- (9) missed approach and go-around technique (as applicable);
- (10) steep approach technique (including danger of high sink rate);
- (11) limited power approach technique (including danger of high speed at touchdown);
- (12) use of the ground effect;
- (13) rejected take-off technique;
- (14) controls failure drills and landing technique (where applicable);
- (15) drills or technique for tail rotor control or tail rotor drive failure;
- (16) emergency failure drills in the circuit to include:
 - (i) powerplant failure
 - (ii) C² link failure
- (18) on take-off:
 - (i) crosswind;
 - (ii) downwind;
 - (iii) base leg;
 - (iv) on final approach.
- (19) noise abatement procedures (as applicable).
- (20) line of sight limitations

(b) Air exercise:

- (1) revision of transitions and constant angle approach;
- (2) basic training circuit, including checks;
- (3) crosswind approach and landing technique;
- (4) missed approach and go-around technique (as applicable);
- (5) steep approach technique;
- (6) basic limited power approach or run on technique;
- (7) use of ground effect;
- (8) Controls failures and approach to touchdown with controls failures and to recover at safe height (as applicable);
- (9) simulated powerplant failure on take-off, crosswind, downwind, base leg and finals;
- (10) variable flare simulated engine off landing.
- (11) handover between remote pilots.

EXERCISE 12: FIRST SOLO

(a) Briefing objectives:

- (1) warning of change of attitude due to reduced and laterally displaced weight;
- (2) low tail, low skid or wheel during hover or landing;
- (3) dangers of loss of RRPM and over pitching;
- (4) pre take-off checks;
- (5) into wind take-off;
- (6) drills during and after take-off;
- (7) normal circuit, approach and landing;
- (8) action if an emergency.
- (9) use of navigational aids

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 13: SIDEWAYS AND BACKWARDS HOVER MANOEUVRING in all nose positions:

Nose position means nose in, nose out, nose left and nose right.

(a) Briefing objectives:

- (1) revision of hovering;
- (2) directional stability and weather cocking effect;
- (3) danger of pitching nose down on recovery from backwards manoeuvring;

- (4) RPA(H) limitations for sideways and backwards manoeuvring;
 - (5) effect of CG position.
- (b) Air exercise:
 - (1) revision of hovering and 90 ° clearing turns;
 - (2) manoeuvring sideways heading into wind;
 - (3) manoeuvring backwards heading into wind;
 - (4) manoeuvring sideways and backwards heading out of wind;
 - (5) manoeuvring backwards too fast and recovery action.

EXERCISE 14: SPOT TURNS

- (a) Briefing objectives:
 - (1) revision of ground effect and effect of wind;
 - (2) weather cocking and control actions;
 - (3) control of RRPM;
 - (4) torque effect;
 - (5) cyclic limiting stops due to CG position (where applicable);
 - (6) rate of turn limitations;
 - (7) spot turn about nose position;
 - (8) spot turn about tail rotor position;
 - (9) spot turn about RPA(H) geometric centre;
 - (10) square (safe visibility) and clearing turn.
- (b) Air exercise:
 - (1) weather cocking, torque effect and control actions;
 - (2) rate of turn;
 - (3) spot turn about nose position;
 - (4) spot turn about tail rotor position;
 - (5) spot turn about RPA(H) geometric centre;
 - (6) square and clearing turn.

EXERCISE 15: HOVER OUT OF GROUND EFFECT AND VORTEX RING

- (a) Briefing objectives:
 - (1) revision of ground effect and power required diagram;
 - (2) drift, height and power control, look-out or scan;
 - (3) vortex ring, (including dangers, recognition and recovery actions);
 - (4) loss of tail rotor effectiveness.
- (b) Air exercise:

- (1) to demonstrate hover OGE;
- (2) drift, height, power control and look-out, and instrument scan technique;
- (3) recognition of incipient stage of vortex ring and settling with power;
- (4) recovery action from incipient stage of vortex ring;
- (5) recognition of loss of tail rotor effectiveness and recovery actions.

EXERCISE 16: SIMULATED ENGINE OFF LANDINGS

(a) Briefing objectives:

- (1) revision of basic autorotation;
- (2) effect of AUM, disc loading, density altitude and RRPM decay;
- (3) use of controls to control speed or RRPM;
- (4) torque effect;
- (5) use of flare or turn to restore RRPM;
- (6) technique for variable flare simulated EOL;
- (7) technique for constant attitude simulated EOL;
- (8) revision of technique for hover or hover taxi simulated EOL;
- (9) emergency technique for engine failure during transition;
- (10) technique for low level simulated EOL.

(b) Air exercise

- (1) revision of entry to and control in autorotation;
- (2) variable flare simulated EOL
- (3) constant attitude simulated EOL;
- (4) hover simulated EOL;
- (5) hover taxi simulated EOL;
- (6) low level simulated EOL.

EXERCISE 17: ADVANCED AUTOROTATIONS

(a) Briefing objectives:

- (1) effect of air speed or AUM on angles or rates of descent;
- (2) effect of RRPM setting on angle or rate of descent;
- (3) reason and technique for range autorotation;
- (4) reason and technique for constant attitude autorotation;
- (5) reason and technique for low speed and 'S' turns in autorotation;
- (6) speed or bank limitations in turns in autorotation;
- (7) revision of re-engagement or go-around procedures.

(b) Air exercise:

- (1) selection of ground marker and standard datum height to determine distance covered during various autorotation techniques;
- (2) revision of basic autorotation;
- (3) technique for range autorotation;
- (4) technique for constant attitude autorotation;
- (5) technique for low speed autorotation, including need for timely speed recovery;
- (6) technique for 'S' turn in autorotation;
- (7) 180 and 360 ° turns in autorotation;
- (8) revision of re-engagement and go-around technique.

EXERCISE 18: PRACTICE FORCED LANDINGS

- (a) Briefing objectives:
 - (1) types of terrain or surface options for choice of best landing area with the use of the payload;
 - (2) practice forced landing procedure;
 - (3) forced landing checks and crash actions;
 - (4) rules or height for recovery and go-around.
- (b) Air exercise:
 - (1) recognition of types of terrain from normal cruise height or altitude with the use of the payload;
 - (2) practice forced landing technique;
 - (3) revision of recovery or go-around technique.

EXERCISE 19: STEEP TURNS

- (a) Briefing objectives:
 - (1) air speed or angle of bank limitations;
 - (2) technique for co-ordination to hold bank or attitude;
 - (3) revision of speed or bank limitations in autorotation including RRPM control;
 - (4) significance of disc loading, vibration and control feedback;
 - (5) effect of wind in turns at low level.
- (b) Air exercise:
 - (1) technique for turning at 30 ° of bank;
 - (2) technique for turning at 45 ° of bank (where possible);
 - (3) steep autorotative turns;

- (4) explanation of faults in the turn: balance, attitude, bank and co-ordination;
- (5) effect of wind at low level.

EXERCISE 20: TRANSITIONS

(a) Briefing objectives:

- (1) revision of effect of ground cushion, translational lift and flap back;
- (2) training requirement for precision exercise;
- (3) technique for transition to forward flight and back to hover as precision exercise;
- (4) effect of wind.

(b) Air exercise:

- (1) transition from hover to cruising speed and back to hover;
NOTE: select constant height (20 - 30 ft) and maintain.
- (2) effect of wind.

EXERCISE 21: QUICK STOPS

(a) Briefing objectives:

- (1) revision of effect of wind;
- (2) technique for quick stop into wind;
- (3) technique for quick stop from crosswind;
- (4) revision of air speed and angles of bank limitations;
- (5) technique for emergency turn from downwind;
- (6) technique for quick stop from downwind from high speed: flare and turn;
- (7) technique for quick stop from downwind from low speed: turn and flare;
- NOTE: use reasonable datum speed for example high speed, low speed.
- (8) danger of holding flare when downwind, (vortex ring)
- (9) to revise danger of high disc loading.

(b) Air exercise:

- (1) technique for quick stop into wind;
- (2) technique for quick stop from crosswind;
- (3) danger of vortex ring and disc loading;
- (4) technique for quick stop from downwind with low speed;
- (5) technique for quick stop from downwind with high speed;
- (6) emergency turns from downwind.

EXERCISE 22: NAVIGATION

(a) Briefing objectives:

NOTE: to be broken down into manageable parts at discretion of instructor.

(1) flight planning:

- (i) weather forecasts and actuals;
- (ii) map selection, orientation, preparation and use:
 - (A) choice of route;
 - (B) regulated, controlled or segregated airspace;
 - (C) danger, prohibited and restricted areas;
 - (D) safety altitude.
 - (E) C² link planning
- (iii) calculations:
 - (A) magnetic heading(s), time(s) en route;
 - (B) energy requirements;
 - (C) mass and balance.
- (iv) flight information:
 - (A) NOTAMs etc;
 - (B) noting of required radio frequencies;
 - (C) selection of alternate landing sites.
- (v) RPAS documentation;
- (vi) notification of the flight:
 - (A) pre-flight administration procedures;
 - (B) flight plan form (where appropriate).

(2) departure:

- (i) organisation of RPS workload;
- (ii) departure procedures:
 - (A) altimeter settings;
 - (B) ATC liaison in controlled or regulated airspace;
 - (C) setting heading procedure;
 - (D) noting of ETA(s);
 - (E) maintenance of height or altitude and heading.
- (iii) procedure for revisions of ETA and headings, drift angle and ground speed checks.
- (iv) amending an ETA;
- (v) log keeping;
- (vi) use of radio;

- (vii) use of nav aids;
 - (viii) weather monitoring and minimum weather conditions for continuation of flight;
 - (ix) significance of in-flight decision making;
 - (x) technique for transiting controlled, regulated or segregated airspace;
 - (xi) uncertainty of position procedure;
 - (xii) lost procedure.
- (3) arrival:
- (i) aerodrome joining procedure, in particular ATC liaison in controlled, regulated or segregated airspace:
 - (A) altimeter setting;
 - (B) entering traffic pattern;
 - (C) circuit procedures.
 - (ii) parking procedures, in particular:
 - (A) security of RPAS;
 - (B) refuelling or recharging;
 - (C) closing of flight plan, (if appropriate);
 - (D) post flight administrative procedures.
- (4) navigation and C² link problems at low heights:
- (i) actions before descending;
 - (ii) significance of hazards, (for example obstacles and C² link loss);
 - (iv) effects of wind and turbulence;
 - (v) significance of avoiding noise sensitive areas;
 - (vi) procedures for joining a circuit from low level;
 - (vii) procedures for a bad weather circuit and landing;
 - (viii) actions in the event of encountering DVE;
 - (ix) appropriate procedures and choice of landing area for precautionary landings;
 - (x) decision to divert or conduct precautionary landing;
 - (xi) precautionary landing.
- (5) radio navigation:
- (i) use of en-route or terminal radar:
 - (A) availability and AIP;
 - (B) procedures and ATC liaison;
 - (C) pilots responsibilities;
 - (D) secondary surveillance radar:

- (a) transponders;
 - (b) code selection;
 - (E) interrogation and reply.
- (ii) use of GNSS:
 - (A) selection of waypoints;
 - (B) to or from indications and orientation;
 - (C) error messages;
 - (D) hazards of over-reliance in the continuation of flight in DVE.
- (b) Air exercise:
 - (1) navigation procedures as necessary;
 - (2) to advise student and correct errors as necessary;
 - (4) the significance of calculations;
 - (5) revision of headings and ETA's;
 - (6) use of radio;
 - (7) use of nav aids:
 - (8) cross-country flying by using visual reference, DR, GNSS; simulation of deteriorating weather conditions and actions to divert or conduct precautionary landing;
 - (8) log keeping;
 - (9) importance of decision making;
 - (10) procedure to deal with uncertainty of position;
 - (11) lost procedure;
 - (12) appropriate procedures and choice of landing area for precautionary landings;
 - (13) aerodrome joining procedure;
 - (14) parking and shut-down procedures;
 - (15) post-flight administration procedures.

EXERCISE 23: ADVANCED TAKE-OFF, LANDINGS AND TRANSITIONS

- (a) Briefing objectives:
 - (1) revision of landing and take-off out of wind (performance reduction);
 - (2) revision of wind limitations;
 - (3) revision of directional stability variation when out of wind;
 - (4) revision of power required diagram;
 - (5) technique for downwind transitions;
 - (6) technique for vertical take-off over obstacles;
 - (7) reconnaissance technique for landing site;
 - (8) power checks;

- (9) technique for running landing;
 - (10) technique for zero speed landing;
 - (11) technique for crosswind and downwind landings;
 - (12) steep approach, including dangers;
 - (13) revision of go-around procedures.
- (b) Air exercise
- (1) technique for downwind transition;
 - (2) technique for vertical take-off over obstacles;
 - (3) reconnaissance technique for landing site;
 - (4) power check and assessment;
 - (5) technique for running landing;
 - (6) technique for zero speed landing;
 - (7) technique for crosswind and downwind landings;
 - (8) technique for steep approach;
 - (9) go-around procedures.

EXERCISE 24: SLOPING GROUND

- (a) Briefing objectives:
- (1) limitations;
 - (2) wind and slope relationship, including blade and control stops;
 - (3) effect of CG when on slope;
 - (4) ground effect and power required when on slope;
 - (5) landing technique when on slope, left, right and nose-up;
 - (6) avoidance of dynamic rollover, dangers of soft ground and sideways movement;
 - (7) dangers of over controlling near ground on slope;
 - (8) danger of striking main or tail rotor on up slope.
- (b) Air exercise
- (1) technique for assessing slope angle;
 - (2) technique for landing and take-off left skid up slope;
 - (3) technique for landing and take-off right skid up slope;
 - (4) technique for landing nose up slope;
 - (5) dangers of over controlling near ground.

EXERCISE 25: LIMITED POWER

- (a) Briefing objectives:
- (1) use of appropriate RPA(H) performance graphs;

- (2) selection of technique according to available power;
- (3) effect of wind on available power.
- (b) Air exercise: to revise and refine techniques demonstrated in exercise 23.

EXERCISE 26: CONFINED AREAS

- (a) Briefing objectives:
 - (1) revision of use of RPA(H) performance graphs;
 - (2) procedure for locating landing site and selecting site marker;
 - (3) procedures for assessing wind speed and direction;
 - (4) landing site reconnaissance techniques;
 - (5) reason for selecting landing markers;
 - (6) procedure for selecting direction and type of approach;
 - (7) dangers of out of wind approach;
 - (8) circuit procedures;
 - (9) reason for approach to committal point and go-around, (practice approach);
 - (10) approach technique;
 - (11) revision of clearing turn and landing (sloping ground technique);
 - (12) hover power check or performance assessment IGE and OGE (if necessary);
 - (13) take-off procedures.
- (b) Air exercise
 - (1) procedures for locating landing site and selecting site marker;
 - (2) procedures for assessing wind speed and direction;
 - (3) landing site reconnaissance techniques;
 - (4) selecting landing markers, direction and type of approach;
 - (5) circuit procedure;
 - (6) practice approach, go-around and approach technique;
 - (7) revision of clearing turn and landing (sloping ground technique);
 - (8) hover power check or performance assessment IGE and OGE (if necessary);
 - (9) take-off procedures.

EXERCISE 27: BASIC INSTRUMENT FLIGHT

- (a) Briefing objectives:
 - (1) instrument knowledge;
 - (2) attitude instrument flight;

- (3) instrument scan;
- (4) instrument limitations;
- (5) basic manoeuvres by sole reference to instruments:
 - (i) straight and level flight at various air speeds and configurations;
 - (ii) climbing and descending;
 - (iii) standard rate turns, climbing and descending, onto selected headings;
 - (iv) recoveries from climbing and descending turns (unusual attitudes).
- (b) Air exercise:
 - (1) attitude instrument flight and instrument scan;
 - (2) basic manoeuvres by sole reference to instruments:
 - (i) straight and level flight at various air speeds and configurations;
 - (ii) climbing and descending;
 - (iii) standard rate turns, climbing and descending, onto selected headings;
 - (iv) recoveries from climbing and descending turns (unusual attitudes).

EXERCISE 28: NIGHT FLYING (if night instructional qualification required for a night endorsement)

- (a) Briefing objectives:
 - (1) medical or physiological aspects of night vision;
 - (2) requirement for torch to be carried (pre-flight inspection, etc.);
 - (3) use of the landing light;
 - (4) take-off and hover taxi procedures at night;
 - (5) night take-off procedure;
 - (6) RPS procedures at night;
 - (7) approach techniques;
 - (8) night landing techniques;
 - (9) night autorotation techniques (power recovery at safe height);
 - (10) technique for practice forced landing at night (using appropriate illumination);
 - (11) emergency procedures at night;
 - (12) navigation principles at night;
- (b) Air exercise:
 - (1) use of torch for pre-flight inspection;
 - (2) use of landing light;
 - (3) night take-off to hover (no sideways or backwards movement);

- (4) night hover taxi (higher and slower than by day);
- (5) night transition procedure;
- (6) night handover between VLOS remote pilot to remote pilot
- (7) night circuit;
- (8) night approach and landing (including use of landing light);
- (9) night autorotation (power recovery at safe height);
- (10) practice forced landing at night (using appropriate illumination);
- (11) night emergency procedures;
- (12) night cross country techniques, as appropriate.

B. RPA CATEGORY HELICOPTERS – RPA(MR)

GROUND INSTRUCTION

NOTE: During ground instruction the student RPAS instructor should pay specific attention to the teaching of enhanced ground RPAS instruction in weather interpretation, planning and route assessment, decision making on encountering DVE including reversing course or conducting a precautionary landing.

Part 2

AIR EXERCISES

- (a) The air exercises are similar to those used for the training of the remote pilot licence, category RPA(MR), but with additional items designed to cover the needs of an RPAS instructor.

- (b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
 - (1) the applicant's progress and ability;
 - (2) the weather conditions affecting the flight;
 - (3) the flight time available;
 - (4) instructional technique considerations;
 - (5) the local operating environment;
 - (6) applicability of the exercises to the helicopter type.
- (c) It follows that student RPAS instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

- (d) The briefing normally includes a statement of the objectives and a brief reference to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the RPAS instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the RPA(MR) and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.
- (e) The four basic components of the briefing will be:
 - (1) the aim;
 - (2) principles of flight (briefest reference only);
 - (3) the air exercise(s) (what, and how and by whom);

(4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

- (f) The preparation of lesson plans is an essential prerequisite of good instruction and the student RPAS instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

- (g) The student RPAS instructor should complete flight training to practise the principles of basic instruction.
- (h) During this training, except when acting as a student remote pilot for mutual flights, the student instructor occupies the seat normally occupied by the RPAS instructor
- (i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.
- (j) If the privileges of the RPAS instructor certificate are to include instruction for night flying, exercise 17 should be undertaken either as part of the course or subsequent to certificate issue.
- (k) The student RPAS instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.
- (l) The student RPAS instructor should be trained to keep in mind that wherever possible, flight simulation should be used to demonstrate to student remote pilots the effects of flight into DVE and to enhance their understanding and need for avoidance of this potentially fatal flight regime.

SYLLABUS OF RPAS INSTRUCTION CONTENTS

BRIEFINGS AND AIR EXERCISES

EXERCISE 1: FAMILIARISATION WITH THE RPA(MR)

(a) Briefing objectives:

- (1) introduction to the RPA(MR);
 - (2) explanation of the RPS layout;
 - (3) RPA(MR) and power plant systems;
 - (4) checklist(s) and procedures;
 - (5) familiarisation with the RPA(MR) controls;
 - (6) differences when occupying the RPAS instructor's controls;
 - (7) emergency drills:
 - (i) action if fire in the air and on the ground: engine, RPS or and electrical fire;
 - (ii) system failure drills as applicable to type;
 - (iii) escape drills from the RPS(if applicable), location and use of emergency equipment and exits.
- (b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Briefing objectives:

- (1) flight authorisation and RPA(MR) and RPS acceptance, including technical log (if applicable) and certificate of maintenance;
 - (2) equipment required for flight (maps, etc.);
 - (3) external checks;
 - (4) internal checks;
 - (5) student comfort, (6) starting and after starting checks;
 - (6) system, power or serviceability checks (as applicable);
 - (7) closing down or shutting down the RPA(MR) (including system checks).
 - (8) packing RPA(MR) and leaving the RPS (including safety or security as applicable);
 - (9) completion of authorisation sheet and RPA(MR) and RPS serviceability documents.
- (b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

(a) Briefing objectives:

NOTE : there is no requirement for a briefing for this exercise.

- (b) Air exercise:
 - (1) air experience;
 - (2) RPS layout, ergonomics and controls;

EXERCISE 4: EFFECTS OF CONTROLS

- (a) Briefing objectives:
 - (1) function of the flying controls (primary and secondary effect);
 - (2) effect of air speed;
 - (3) effect of power changes ;
 - (4) effect of yaw ;
 - (5) effect on controls when in different modes;
- (b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 5: POWER AND ATTITUDE CHANGES

- (a) Briefing objectives:
 - (1) relationship between control position, airframe attitude;
 - (2) power and air speed changes in level flight;
 - (3) powerplant and air speed limitations;
- (b) Air exercise:
 - (1) relationship between control position, airframe attitude;
 - (2) power and air speed changes in level flight;

EXERCISE 6: LEVEL FLIGHT, CLIMBING, DESCENDING AND TURNING

NOTE: for ease of training this exercise is divided into four separate parts in the RPA(MR) syllabus but may be taught complete or in convenient parts.

- (a) Briefing objectives:
 - (1) basic factors involved in level flight;
 - (2) normal power settings;
 - (3) importance of maintaining direction and balance;
 - (4) climb and descent technics, angles or rates;
 - (5) effects of turning on rate of climb or descent;
 - (6) use of the direction or heading indicator and compass;
- (b) Air exercises:
 - (1) maintaining straight and level flight at normal cruise power;
 - (2) setting and use of power for selected air speeds and speed changes;
 - (3) entry to climb;
 - (4) normal and maximum rate of climb;

- (5) levelling off from climb at selected altitudes or heights;
- (6) entry to descent;
- (7) effect of power and air speed on rate of descent;
- (8) levelling off from descent at selected altitudes or heights;
- (9) resuming straight and level flight;
- (10) turns onto selected headings, use of direction indicator and compass;
- (11) turns whilst climbing and descending;
- (12) effect of turn on rate of climb or descent;

EXERCISE 7: HOVERING AND HOVER TAXIING

(a) Briefing objectives:

- (1) ground effect and power required;
- (2) effect of wind, attitude and surface;
- (3) stability in hover;
- (4) effect of control in hover;
- (5) effect of controls failure in hover;
- (6) specific hazards, for example snow, dust, etc.

(b) Air exercise:

- (1) ground effect and power or height relationship;
- (2) effect of wind, attitude and surface;
- (3) stability in hover;
- (4) effect of control and hover technique;
- (5) (where applicable) effect of controls failure in hover;
- (6) simulated engine failure in the hover.

EXERCISE 8: TAKE-OFF AND LANDING

(a) Briefing objectives:

- (1) pre take-off checks or drills including C² checks and coordination between RPAS ground crew;
- (2) importance of situational awareness;
- (3) technique for lifting to hover;
- (4) after take-off checks;
- (5) danger of horizontal movement near ground;
- (6) technique for landing;
- (7) after landing checks;
- (8) take-off and landing crosswind and downwind.

(b) Air exercise:

- (1) pre take-off checks or drills including C² checks and coordination between RPAS ground crew:

- (2) pre take-off situational awareness;
- (3) lifting to hover;
- (4) after take-off checks;
- (5) landing;
- (6) after landing checks or drills;
- (7) take-off and landing crosswind and downwind.

EXERCISE 9: TRANSITIONS FROM HOVER TO CLIMB AND APPROACH TO HOVER

- (a) Briefing objectives:
 - (1) revision of ground effect;
 - (2) translational lift and its effects;
 - (3) effect or dangers of wind speed and direction during transitions;
 - (4) transition to climb technique;
 - (5) transition to hover technique.
- (b) Air exercise:
 - (1) revision of take-off and landing;
 - (2) transition from hover to climb;
 - (3) technique for transition from descent to hover;

EXERCISE 11: CIRCUIT, APPROACH AND LANDING

- (a) Briefing objectives:
 - (1) circuit and associated procedures;
 - (2) take-off and climb (including checks);
 - (3) crosswind leg (including checks);
 - (4) downwind leg (including pre-landing checks);
 - (5) base leg (including checks);
 - (6) final approach (including checks or speeds);
 - (7) effect of wind on approach and hover IGE;
 - (8) crosswind approach and landing technique;
 - (9) missed approach and go-around technique (as applicable);
 - (10) steep approach technique (including danger of high sink rate);
 - (11) use of the ground effect;
 - (12) rejected take-off technique;
 - (13) controls failure drills and landing technique (where applicable);
 - (14) emergency failure drills in the circuit to include:
 - (i) powerplant failure
 - (ii) C2 link failure
 - (15) on take-off:
 - (j) crosswind;

- (ii) downwind;
 - (iii) base leg;
 - (iv) on final approach.
- (16) line of site limitations
- (b) Air exercise:
 - (1) revision of transitions and constant angle approach;
 - (2) basic training circuit, including checks;
 - (3) crosswind approach and landing technique;
 - (4) missed approach and go-around technique (as applicable);
 - (5) steep approach technique;
 - (6) use of ground effect;
 - (7) simulated powerplant failure on take-off, crosswind, downwind, base leg and finals;
 - (8) handover between remote pilots.
 - (9) C2 link failure during circuit.

EXERCISE 10: FIRST SOLO

- (a) Briefing objectives:
 - (1) pre take-off checks;
 - (2) into wind take-off;
 - (3) drills during and after take-off;
 - (4) normal circuit, approach and landing;
 - (5) action if an emergency.
 - (6) use of navigational aids.
- (b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 11: SIDEWAYS AND BACKWARDS HOVER MANOEUVRING in all nose positions:

Nose position means nose in, nose out, nose left and nose right.

- (a) Briefing objectives:
 - (1) revision of hovering;
 - (2) directional stability and weather cocking effect;
 - (3) RPA(MR) limitations for sideways and backwards manoeuvring;
 - (4) effect of CG position.
- (b) Air exercise:
 - (1) revision of hovering;
 - (2) manoeuvring sideways heading into wind;
 - (3) manoeuvring backwards heading into wind;
 - (4) manoeuvring sideways and backwards heading out of wind;

EXERCISE 12: HOVER OUT OF GROUND EFFECT AND VORTEX RING

- (a) Briefing objectives:
 - (1) revision of ground effect;
 - (2) vortex ring, (including dangers, recognition and recovery actions);
- (b) Air exercise:
 - (1) to demonstrate hover OGE;
 - (2) recognition of incipient stage of vortex ring and settling with power;
 - (3) recovery action from incipient stage of vortex ring;

EXERCISE 13: PRACTICE FORCED LANDINGS

- (a) Briefing objectives:
 - (1) types of terrain or surface options for choice of best landing area with the use of the payload;
 - (2) practice forced landing procedure;
 - (3) forced landing checks and crash actions;
 - (4) rules or height for recovery and go-around.
- (b) Air exercise:
 - (1) recognition of types of terrain from normal cruise height or altitude with the use of the payload;
 - (2) practice forced landing technique;
 - (3) revision of recovery or go-around technique.

EXERCISE 14: NAVIGATION

- (a) Briefing objectives:

NOTE: to be broken down into manageable parts at discretion of instructor.

 - (1) flight planning:
 - (i) weather forecasts and actuals;
 - (ii) map selection, orientation, preparation and use:
 - (A) choice of route;
 - (B) regulated, controlled or segregated airspace;
 - (C) danger, prohibited and restricted areas;
 - (D) safety altitude.
 - (E) C2 link planning
 - (iii) calculations:
 - (A) magnetic heading(s), time(s) en route;

- (B) energy requirements;
 - (C) mass and balance.
- (iv) flight information:
 - (A) NOTAMs etc;
 - (B) noting of required radio frequencies;
 - (C) selection of alternate landing sites.
- (v) RPAS documentation;
- (vi) notification of the flight:
 - (A) pre-flight administration procedures;
 - (B) flight plan form (where appropriate).
- (2) departure:
 - (i) organisation of RPS workload;
 - (ii) departure procedures:
 - (A) altimeter settings;
 - (B) ATC liaison in controlled or regulated airspace;
 - (C) setting heading procedure;
 - (D) noting of ETA(s);
 - (E) maintenance of height or altitude and heading.
 - (iii) procedure for revisions of ETA and headings, drift angle and ground speed checks.
 - (iv) amending an ETA;
 - (v) log keeping;
 - (vi) use of radio;
 - (vii) use of nav aids;
 - (viii) weather monitoring and minimum weather conditions for continuation of flight;
 - (ix) significance of in-flight decision making;
 - (x) technique for transiting controlled, regulated or segregated airspace;
 - (xi) uncertainty of position procedure;
 - (xii) lost procedure.
- (3) arrival:
 - (i) aerodrome joining procedure, in particular ATC liaison in controlled, regulated or segregated airspace:
 - (A) altimeter setting;
 - (ii) landing procedures, in particular:
 - (A) security of RPAS;
 - (B) refuelling or recharging;

- (C) closing of flight plan, (if appropriate);
 - (D) post flight administrative procedures.
- (4) navigation and C2 link problems at low heights:
 - (i) actions before descending;
 - (ii) significance of hazards, (for example obstacles and c² link loss);
 - (iv) effects of wind and turbulence;
 - (v) significance of avoiding noise sensitive areas;
 - (vi) procedures for joining a circuit from low level;
 - (vii) procedures for a bad weather circuit and landing;
 - (viii) actions in the event of encountering DVE;
- (5) radio navigation:
 - (i) use of en-route or terminal radar:
 - (A) availability and AIP;
 - (B) procedures and ATC liaison;
 - (C) pilots responsibilities;
 - (D) secondary surveillance radar:
 - (a) transponders;
 - (b) code selection;
 - (E) interrogation and reply.
 - (ii) use of GNSS:
 - (A) selection of waypoints;
 - (B) to or from indications and orientation;
 - (C) error messages;
 - (D) hazards of over-reliance in the continuation of flight in DVE.
- (b) Air exercise:
 - (1) navigation procedures as necessary;
 - (2) to advise student and correct errors as necessary;
 - (3) the significance of calculations;
 - (4) revision of headings and ETA's;
 - (5) use of radio;
 - (6) use of nav aids;
 - (7) cross-country flying by using visual reference, DR, GNSS; simulation of deteriorating weather conditions and actions to divert or conduct precautionary landing;
 - (8) log keeping;
 - (9) importance of decision making;
 - (10) procedure to deal with uncertainty of position;
 - (11) lost procedure;

- (12) appropriate procedures and choice of landing area for precautionary landings;
- (13) aerodrome joining procedure;
- (14) landing and shut-down procedures;
- (15) post-flight administration procedures.

EXERCISE 15: CONFINED AREAS

(a) Briefing objectives:

- (1) revision of use of RPA(MR) performance graphs;
- (2) procedure for locating landing site;
- (3) procedures for assessing wind speed and direction;
- (4) landing site risk assessment techniques;
- (5) procedure for selecting direction and type of approach;
- (6) dangers of out of wind approach;
- (7) circuit procedures;
- (8) approach technique;
- (9) take-off procedures.

(b) Air exercise

- (1) procedures for assessing wind speed and direction;
- (2) landing site risk assessment techniques;
- (3) direction and type of approach;
- (4) circuit procedure;
- (5) practice approach, go-around and approach technique;
- (6) take-off procedures.

EXERCISE 16: BASIC INSTRUMENT FLIGHT

(a) Briefing objectives:

- (1) instrument knowledge;
- (2) attitude instrument flight;
- (3) instrument scan;
- (4) instrument limitations;
- (5) basic manoeuvres by sole reference to instruments:
 - (i) straight and level flight at various air speeds and configurations;
 - (ii) climbing and descending;
 - (iii) standard rate turns, climbing and descending, onto selected headings;

- (iv) recoveries from climbing and descending turns (unusual attitudes).
- (b) Air exercise:
 - (1) attitude instrument flight and instrument scan;
 - (2) basic manoeuvres by sole reference to instruments:
 - (i) straight and level flight at various air speeds and configurations;
 - (ii) climbing and descending;
 - (iii) standard rate turns, climbing and descending, onto selected headings;
 - (iv) recoveries from climbing and descending turns (unusual attitudes).

EXERCISE 17: NIGHT FLYING (if night instructional qualification required for a night endorsement)

- (a) Briefing objectives:
 - (1) medical or physiological aspects of night vision;
 - (2) requirement for torch to be carried (pre-flight inspection, etc.);
 - (3) use of the lights for RPA orientation;
 - (4) take-off and hover taxi procedures at night;
 - (5) night take-off procedure;
 - (6) RPS procedures at night;
 - (7) approach techniques;
 - (8) night landing techniques;
 - (9) technique for practice forced landing at night (using appropriate illumination);
 - (10) emergency procedures at night;
 - (11) navigation principles at night;
- (b) Air exercise:
 - (1) use of torch for pre-flight inspection;
 - (2) use of RPA light;
 - (3) night take-off to hover (no sideways or backwards movement);
 - (4) night hover taxi (higher and slower than by day);
 - (5) night transition procedure;
 - (6) night handover between VLOS remote pilot to remote pilot
 - (7) night circuit;
 - (8) night approach and landing (including use of landing light);
 - (9) practice forced landing at night (using appropriate illumination);
 - (10) night emergency procedures;
 - (11) night cross country techniques, as appropriate.

C. RPA CATEGORY AIRSHIPS – RPA(As)

Part 2

AIR EXERCISES

(a) The air exercises are similar to those used for the training of the remote pilot licence, category RPA(As), but with additional items designed to cover the needs of an RPAS instructor.

(b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (1) the applicant's progress and ability;
- (2) the weather conditions affecting the flight;
- (3) the flight time available;
- (4) instructional technique considerations;
- (5) the local operating environment.

(c) It follows that student RPAS instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

(d) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the RPAS instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the RPA(As) and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.

(e) The four basic components of the briefing will be:

- (1) the aim;
- (2) principles of flight (briefest reference only);
- (3) the air exercise(s) (what, and how and by whom);
- (4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

(f) The preparation of lesson plans is an essential prerequisite of good instruction and the student RPAS instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

- (g) The student RPAS instructor should complete flight training to practise the principles of basic instruction.
- (h) During this training, except when acting as a student remote pilot for mutual flights, the student RPAS instructor occupies the seat normally occupied by the RPAS instructor.
- (i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.
- (j) The exercises 15 and 16 of the RPAS instruction syllabus should be undertaken at night in addition to by day as part of the course.
- (k) The student RPAS instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

SYLLABUS OF RPAS INSTRUCTION CONTENTS

BRIEFINGS AND AIR EXERCISES

NOTE: Although exercise 16 is not required for the remote pilot licence, categorie RPA(As) course it is a requirement for the RPAS instructor course.

EXERCISE 1: FAMILIARISATION WITH THE RPAS(As)

(a) Briefing objectives:

- (1) introduction to the RPA(As);
- (2) characteristics of the RPA(As);
- (3) RPS layout;
- (4) RPA(As) and powerplant systems;
- (5) use of the checklist(s) and procedures;
- (6) to familiarise the student with the RPA(As) controls;
- (7) differences when occupying the RPAS instructor's seat;
- (8) emergency drills:
 - (i) action if fire in the air or on the ground: powerplant, RPAS and electrical fire;
 - (ii) system failure drills as applicable to type;
 - (iii) escape drills from RPS: location and use of emergency equipment and exits.

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Briefing objectives:

- (1) flight authorisation and RPA(As) and RPS acceptance including tech log (if applicable) and certificate of maintenance;
- (2) equipment required for flight (maps, etc.);
- (3) external checks;
- (4) internal checks;
- (5) student comfort, seat and rudder pedal adjustment if applicable;
- (6) starting and after starting checks;
- (7) system, power or serviceability checks (as applicable);
- (8) closing down or shutting down the RPAS(As) (including system checks);
- (9) parking, masting and unmasting the RPA(As) (including safety or security as applicable);

(10) completion of the authorisation sheet and RPA(As) serviceability documents;

(b) Air exercise: all briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

(a) Briefing objectives:

NOTE: there is no requirement for a briefing for this exercise.

(b) Air exercise:

- (1) air experience;
- (2) RPS layout, ergonomics and controls;
- (3) RPAS procedures: stability and control.

EXERCISE 4: EFFECTS OF CONTROLS

(a) Briefing objectives:

- (1) function of the flying controls (primary and secondary effect);
- (2) effect of air speed;
- (3) effect of power changes;
- (4) effect of trimming and other controls;
- (5) use of instruments;

(b) Air exercise:

- (1) function of the flying controls;
- (2) effect of air speed;
- (3) effect of power changes;
- (4) effect of trimming and other controls;
- (5) use of instruments (including instrument scan);

EXERCISE 5: GROUND MANOEUVERING

(a) Briefing objectives:

- (1) pre-flight checks;
- (2) starting, control of speed and stopping;
- (3) powerplant handling;
- (4) unmasting and masting procedures;
- (5) control of direction and turning;
- (6) effects of wind;
- (7) effects of ground surface;
- (8) marshalling signals;
- (9) instrument checks;
- (10) ATC procedures;

(11) emergencies.

(b) Air exercise:

- (1) starting, control of speed and stopping;
- (2) powerplant handling;
- (3) unmasting and masting procedures;
- (4) control of direction and turning;
- (5) effect of wind.

EXERCISE 6: TAKE-OFF PROCEDURES

(a) Briefing objectives:

- (1) pre take-off checks;
- (2) take-off with different static heaviness;
- (3) drills during and after take-off;
- (4) noise abatement procedures.

(b) Air exercise:

- (1) take-off with different static heaviness;
- (2) drills during and after take-off.

EXERCISE 6e: EMERGENCIES

(a) Briefing objectives:

- (1) rejected take-off;
- (2) engine failures and actions after take-off;
- (3) malfunctions of thrust vector control;
- (4) aerodynamic control failures;
- (5) electrical and system failures.
- (6) C² link failures.

(b) Air exercise:

- (1) how to reject a take-off;
- (2) engine failure and suitable action;
- (3) malfunctions of thrust vector control;
- (4) aerodynamic control failures.
- (5) C² link failures

EXERCISE 7: CLIMBING

(a) Briefing objectives:

- (1) entry and how to maintain the normal and max rate of climb;
- (2) levelling off procedure;
- (3) how to level off at selected altitudes;
- (4) maximum angle of climb;

- (5) maximum rate of climb.
- (b) Air exercise:
 - (1) how to level off at selected altitudes;
 - (2) maximum angle of climb.

EXERCISE 8: STRAIGHT AND LEVEL FLIGHT

- (a) Briefing objectives:
 - (1) how to attain and maintain straight and level flight;
 - (2) flight at or close to pressure height;
 - (3) control in pitch, including use of trim;
 - (4) at selected air speeds (use of power);
 - (5) during speed changes;
- (b) Air exercise:
 - (1) how to attain and maintain straight and level flight;
 - (2) flight at or close to pressure height;
 - (3) control in pitch, including use of trim;
 - (4) at selected air speeds (use of power);
 - (5) during speed changes.

EXERCISE 9: DESCENDING

- (a) Briefing objectives:
 - (1) entry, maintaining and levelling off techniques;
 - (2) levelling off at selected altitudes;
 - (3) maximum rate of descent;
 - (4) maximum angle of descent;
- (b) Air exercise:
 - (1) levelling off at selected altitudes;
 - (2) maximum rate of descent;
 - (3) maximum angle of descent.

EXERCISE 10: TURNING

- (a) Briefing objectives:
 - (1) entry and maintaining level turns;
 - (2) resuming straight flight;
 - (3) faults in the turn;
 - (4) climbing turns;
 - (5) descending turns;
 - (6) turns to selected headings: use of heading indicator and compass;
- (b) Air exercise

- (1) faults in the turn and correction techniques;
- (2) climbing turns;
- (3) descending turns.

EXERCISE 11: HOVERING

- (a) Briefing objectives: hovering manoeuvres (as applicable).
- (b) Air exercise: hovering manoeuvres (as applicable).

EXERCISE 12: APPROACH AND LANDING

- (a) Briefing objectives:
 - (1) effect of wind on approach and touchdown speeds;
 - (2) landing with different static heaviness;
 - (3) missed approach and go-around procedures;
 - (4) noise abatement procedures.
- (b) Air exercise
 - (1) a landing with different static heaviness;
 - (2) missed approach and go-around procedures.

EXERCISE 12e: EMERGENCIES

- (a) Briefing objectives:
 - (1) aborted approach or go-around;
 - (2) malfunction of thrust vector control;
 - (3) envelope emergencies;
 - (4) fire emergencies;
 - (5) aerodynamic control failures;
 - (6) electrical and system failures.
 - (7) C² link failures.
- (b) Air exercise: emergency drills and actions.

EXERCISE 13: PRECAUTIONARY LANDING

- (a) Briefing objectives:
 - (1) occasions necessitating a precautionary landing;
 - (2) in-flight conditions;
 - (3) landing area selection;
 - (4) circuit and approach.
- (b) Air exercise:
 - (1) how to perform the landing area selection;
 - (2) circuit and approach.

EXERCISE 14a: NAVIGATION

- (a) Briefing objectives:
 - (1) how to do the flight planning;
 - (2) departure for a navigation flight;
 - (3) in-flight navigational techniques;
 - (4) arrival and aerodrome joining procedures;
- (b) Air exercise:
 - (1) complete flight planning of a navigation flight;
 - (2) departure for a navigation flight;
 - (3) in-flight navigational techniques;
 - (4) arrival and aerodrome joining procedures.

EXERCISE 14b: NAVIGATION AT LOWER LEVELS AND IN REDUCED VISIBILITY

- (a) Briefing objectives:
 - (1) actions before descending;
 - (2) possible hazards (for example obstacles and C² link loss) and actions;
 - (3) effects of winds, turbulence and precipitation;
 - (4) vertical situational awareness;
 - (5) avoidance of noise sensitive areas;
 - (6) joining the circuit;
 - (7) bad weather circuit and landing.
- (b) Air exercise:
 - (1) actions before descending;
 - (2) vertical situational awareness;
 - (3) avoidance of noise sensitive areas;
 - (4) joining the circuit;
 - (5) bad weather circuit and landing.

EXERCISE 14c: RADIO NAVIGATION

- (a) Briefing objectives:
 - (1) use of en-route or terminal radar;
 - (2) Use of GNSS
- (b) Air exercise
 - (1) use of nav aids;
 - (2) procedure to deal with uncertainty of position.

EXERCISE 15: BASIC INSTRUMENT FLIGHT

(a) Briefing objectives:

- (1) instrument knowledge;
- (2) attitude instrument flight;
- (3) instrument scan;
- (4) instrument limitations;
- (5) basic manoeuvres by sole reference to the instruments:
 - (i) straight and level;
 - (ii) climbing and descending;
 - (iii) turns, climbing and descending, onto selected headings;
 - (iv) recoveries from climbing and descending turns.

(b) Air exercise:

- (1) attitude instrument flight and instrument scan;
- (2) the basic manoeuvres:
 - (i) straight and level;
 - (ii) climbing and descending;
 - (iii) turns, climbing and descending, onto selected headings;
 - (iv) recoveries from climbing and descending turns.

EXERCISE 16: NIGHT FLYING (if night instructional qualification required for night endorsement)

(a) Briefing objectives:

- (1) requirement for torch (pre-flight inspection, etc.);
- (2) use of the landing light;
- (3) ground manoeuvring procedures at night;
- (4) night take-off procedure;
- (5) RPS procedures at night;
- (6) approach techniques;
- (7) night landing techniques
- (8) emergency procedures at night;
- (9) navigation principles at night.

(b) Air exercise:

- (1) use of landing light;
- (2) night ground manoeuvring;
- (3) night take-off, circuit or approach and landing (including use of landing light).

SUBPART F

RPAS EXAMINERS

Common provisions

GM1 JARUS-FCL.500 RPAS examiner certificates

SPECIAL CONDITIONS

When new RPA or RPS are introduced and compliance with the requirements is not possible, the competent authority may issue a specific RPAS examiner certificate giving privileges for the conduct of skill test necessary for the introduction of the new RPA or RPS.

The competent authority should only give this specific RPAS examiner certificates to holders of other RPAS examiner certificates. As far as possible, preference should be given to persons with experience in similar types of RPA or RPS, for example, in RPA having the same kind and number of engines or rotors and of the same order of mass or technology.

This RPAS examiner certificate should ideally be limited in validity to the time needed to qualify the first RPAS examiners for the new RPA or RPS in accordance with this Subpart, but in any case it should not exceed the 3 years established in the rule.

GM1 JARUS-FCL.505 Limitation of privileges in case of vested interests

Examples of a situation where the RPAS examiner should consider if his/her objectivity is affected are when the applicant is a relative or a friend of the RPAS examiner, or when they are linked by economic interests or political affiliations, etc.

GM1 JARUS-FCL.510 Prerequisites for RPAS examiners

When evaluating the applicant's background, the competent authority should evaluate the personality and character of the applicant, and his/her cooperation with the competent authority.

The competent authority may also take into account whether the applicant has been convicted of any relevant criminal or other offenses, taking into account national law and principles of non-discrimination.

GM1 JARUS-FCL.515 RPAS examiner standardisation

GENERAL

(a) The competent authority may provide the RPAS examiner standardisation course itself or through an arrangement with an ATO. This arrangement should clearly state that the ATO is acting under the management system of the competent authority.

(b) States will establish an RPAS examiner standardisation course. States will determine the length and content of these courses based on individual needs. JARUS recommends States consider a 3-day course, divided into theoretical and practical training in an FSTD or RPAS conducting role played proficiency checks and skill tests.

(c) The competent authority or the ATO should determine any further training required before presenting the candidate for the RPAS examiner assessment of competence.

CONTENT

(d) The training may comprise:

(1) Theoretical training covering at least:

- (i) JARUS-FCL Recommendation and GM relevant to their duties;
- (ii) operational JARUS provisions and related GM relevant to their duties;
- (iii) national requirements relevant to their RPAS examination duties;
- (iv) fundamentals of human performance and limitations relevant to RPAS examination;
- (v) fundamentals of evaluation relevant to applicant's performance;
- (vii) MCC, if applicable.

(2) RPAS examiners should also be briefed on the protection requirements for personal data, liability, accident insurance and fees, as applicable in the state concerned.

(4) Practical training consisting of at least:

- (i) knowledge and management of the test for which the certificate is to be sought.
- (ii) knowledge of the administrative procedures pertaining to that test or proficiency check.

(5) For an initial RPAS examiner certificate, practical training should include the RPAS examination of the test profile sought, consisting of the conduct of at least two test or proficiency check profiles in the role of RPAS examiner (these two tests or proficiency checks profiles can be performed in the same simulator session), including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an RPAS examiner of the appropriate category on the applicable type. This training is conducted on the RPA or RPS if approval for testing or checking on the RPA or RPS is required. If RPAS examiner privileges in FSTD's are required, practical instruction in the use of FSTD(s) for testing or checking should also be completed.

(7) For extension of an RPAS examiner certificate to further RPA or RPS type, further practical training on the new type may be required, consisting of the conduct of at least one test or proficiency check profile in the role of RPAS examiner on the new type, including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an RPAS examiner of the appropriate category on the applicable type. A further RPAS examiner check on the new type may be required, which may be supervised by an RPAS inspector of the competent authority or a suitably authorised senior RPAS examiner.

GM2 JARUS-FCL.515 RPAS examiner standardisation

STANDARDISATION ARRANGEMENTS FOR RPAS EXAMINERS

(a) An RPAS examiner should allow an applicant adequate time to prepare for a test or check, normally not more than 1 hour.

(b) An RPAS examiner should plan a test or check flight so that all required exercises can be performed while allowing sufficient time for each of the exercises and with due regard to the weather conditions, traffic situation, ATC requirements and local procedures.

PURPOSE OF A TEST OR CHECK

(c) Determine through practical demonstration during a test or check that an applicant has acquired or maintained the required level of knowledge and skill or proficiency.

(d) Improve RPAS training and RPAS instruction in ATOs by feedback of information from RPAS examiners about items or sections of tests or checks that are most frequently failed.

(e) Assist in maintaining and, where possible, improving air safety standards by having examiners display good airmanship and flight discipline during tests or checks.

CONDUCT OF TEST OR CHECK

(f) An RPAS examiner will ensure that an applicant completes a test or check in accordance with the JARUS-FCL Recommendation and national RPAS requirements and is assessed against the required test or check standards.

(g) Each item within a test or check section should be completed and assessed separately. The test or check schedule, as briefed, should not normally be altered by an RPAS examiner. A failed item is not always a failed section, for example type rating skill test where a failure of an item in a section does not fail the entire section, only the failed item is taken again.

(h) Marginal or questionable performance of a test or check item should not influence an RPAS examiner's assessment of any subsequent items.

(i) An RPAS examiner should verify the requirements and limitations of a test or check with an applicant during the pre-flight briefing.

(j) When a test or check is completed or discontinued, an RPAS examiner should debrief the applicant and give reasons for items or sections failed. In case of a failed or discontinued skill test and proficiency check, the RPAS examiner should provide appropriate advice to assist the applicant in re-tests or re-checks.

(k) Any comment on, or disagreement with, an RPAS examiner's test or check evaluation or assessment made during a debriefing will be recorded by the RPAS examiner on the test or check report, and will be signed by the RPAS examiner and countersigned by the applicant.

RPAS EXAMINER PREPARATION

(l) An RPAS examiner should supervise all aspects of the test or check flight preparation, including, where necessary, obtaining or assuring an ATC 'slot' time.

(m) An RPAS examiner will plan a test or check in accordance with the JARUS-FCL Recommendation and national RPAS requirements. Only the manoeuvres and procedures set out in the appropriate test or check form will be undertaken. The same RPAS examiner should not re-examine a failed applicant without the agreement of the applicant.

RPAS EXAMINER APPROACH

(n) An RPAS examiner should encourage a friendly and relaxed atmosphere to develop both before and during a test or check flight. A negative or hostile approach should not be used. During the test or check flight, the RPAS examiner should avoid negative comments

or criticisms and all comments should be reserved for the debriefing.

ASSESSMENT SYSTEM

(o) Although test or checks may specify flight test tolerances, an applicant should not be expected to achieve these at the expense of smoothness or stable flight. An RPAS examiner should make due allowance for unavoidable deviations due to turbulence, ATC instructions, etc. An RPAS examiner should terminate a test or check only when it is clear that the applicant has not been able to demonstrate the required level of knowledge, skill or proficiency and that a full re-test will be necessary or for safety reasons. An RPAS examiner will use one of the following terms for assessment:

(1) a 'pass', provided that the applicant demonstrates the required level of knowledge, skill or proficiency and, where applicable, remains within the flight test tolerances for the remote pilot licence or associated rating;

(2) a 'fail' provided that any of the following apply:

- (i) the flight test tolerances have been exceeded after the RPAS examiner has made due allowance for turbulence or ATC instructions;
- (ii) the aim of the test or check is not completed;
- (iii) the aim of exercise is completed but at the expense of safe flight, violation of a rule or regulation, poor airmanship or rough handling;
- (iv) an acceptable level of knowledge is not demonstrated;
- (v) an acceptable level of flight management is not demonstrated;
- (vi) the intervention of the examiner or safety pilot is required in the interest of safety.

METHOD AND CONTENTS OF THE TEST OR CHECK

(p) Before undertaking a test or check an RPAS examiner will verify that the RPA or FSTD intended to be used is suitable and appropriately equipped for the test or check.

(q) A test or check flight will be conducted in accordance with the RPAS flight manual and, if applicable, the RPAS operating manual.

(r) A test or check flight will be conducted within the limitations contained in the RPAS operations manual of an ATO.

(s) Contents:

(1) a test or check is comprised of:

- (i) oral RPAS examination on the ground (where applicable);
- (ii) pre-flight briefing;
- (iii) in-flight exercises;
- (iv) post-flight debriefing.

(2) oral RPAS examination on the ground should include:

- (i) RPAS general knowledge and performance;
- (ii) planning and operational procedures;
- (iii) other relevant items or sections of the test or check.

(3) pre-flight briefing should include:

- (i) test or check sequence;
- (ii) power setting, speeds and approach minima, if applicable;
- (iii) safety considerations.

(4) in-flight exercises will include each relevant item or section of the test or check;

(5) post-flight debriefing should include:

- (i) assessment or evaluation of the applicant;
- (ii) documentation of the test or check with the applicant's RPAS instructor present, if possible.

(t) A test or check is intended to simulate a practical flight. Thus, an RPAS examiner may set practical scenarios for an applicant while ensuring that the applicant is not confused and air safety is not compromised.

(v) An RPAS examiner should maintain a flight log and assessment record during the test or check for reference during the post or flight debriefing.

(w) An RPAS examiner should be flexible to the possibility of changes arising to pre-flight briefings due to ATC instructions, or other circumstances affecting the test or check.

(x) Where changes arise to a planned test or check an RPAS examiner should be satisfied that the applicant understands and accepts the changes. Otherwise, the test or check flight should be terminated.

(y) Should an applicant choose not to continue a test or check for reasons considered inadequate by an RPAS examiner, the applicant will be assessed as having failed those items or sections not attempted. If the test or check is terminated for reasons considered adequate by the RPAS examiner, only these items or sections not completed will be tested during a subsequent test or check.

(z) An RPAS examiner may terminate a test or check at any stage, if it is considered that the applicant's competency requires a complete re-test or re-check.

GM3 JARUS-FCL.515 RPAS examiner standardisation

(a) An RPAS examiner should plan per day not more than:

- (1) three tests or checks relating to remote pilot licence category RPA(A), RPA(H), RPA (MR), RPA (As);
- (2) four tests or checks relating to remote pilot licence category RPA(B),
- (3) two assessments of competence related to RPAS instructor certificates;

(b) An RPAS examiner should plan at least:

- (1) three hours for a remote pilot licence category RPA(A), RPA(H), RPA (MR), RPA (As),
- (2) two hours for a remote pilot licence category RPA(B),
- (3) four hours for RPAS instructor tests or checks, including pre-flight briefing and preparation, conduct of the test, check or assessment of competence, de-briefing, evaluation of the applicant and documentation.

GM1 JARUS-FCL.520 RPAS examiners assessment of competence

GENERAL

(a) The competent authority may nominate either one of its inspectors or a senior RPAS examiner to assess the competence of applicants for an RPAS examiner certificate.

DEFINITIONS

(b) Definitions:

(1) 'Inspector': the inspector of the competent authority conducting the RPAS examiner competence assessment;

(2) 'RPAS examiner applicant': the person seeking certification as an RPAS examiner;

(3) 'Candidate': the person being tested or checked by the RPAS examiner applicant. This person may be a remote pilot for whom the test or check would be required, or the inspector of the competent authority who is conducting the RPAS examiner certification assessment of competence.

CONDUCT OF THE ASSESSMENT

(c) An inspector of the competent authority or a senior RPAS examiner will observe all RPAS examiner applicants conducting a test on a 'candidate' on an RPAS for which RPAS examiner certificate is sought. Items from the related training course and test or check schedule will be selected by the inspector for examination of the 'candidate' by the RPAS examiner applicant. Having agreed with the inspector the content of the test, the RPAS examiner applicant will be expected to manage the entire test. This will include briefing, the conduct of the flight, assessment and debriefing of the 'candidate'. The inspector will discuss the assessment with the RPAS examiner applicant before the 'candidate' is debriefed and informed of the result.

BRIEFING THE 'CANDIDATE'

(d) The 'candidate' should be given time and facilities to prepare for the test flight. The briefing should cover the following:

- (1) the objective of the flight;
- (2) licensing checks, as necessary;
- (3) freedom for the 'candidate' to ask questions;
- (4) operating procedures to be followed (for example RPAS operators manual);
- (5) weather assessment;
- (6) operating capacity of 'candidate' and RPAS examiner;
- (7) simulated weather assumptions (for example icing and cloud base);
- (8) contents of exercise to be performed;

(9) agreed speed and handling parameters (for example V-speeds, bank angle, approach minima);

(10) use of R/T;

(11) respective roles of 'candidate' and RPAS examiner (for example during emergency);

(12) administrative procedures (for example submission of flight plan).

(c) The RPAS examiner applicant should maintain the necessary level of communication with the 'candidate'. The following check details should be followed by the RPAS examiner applicant:

(1) involvement of the RPAS examiner in a MP operating environment;

(2) the need to give the 'candidate' precise instructions;

(3) responsibility for safe conduct of the flight;

(4) intervention by the RPAS examiner, when necessary;

(6) liaison with ATC and the need for concise, easily understood intentions;

(6) prompting the 'candidate' about required sequence of events (for example following a go-around);

(7) keeping brief, factual and unobtrusive notes.

ASSESSMENT

(d) The RPAS examiner applicant should refer to the flight test tolerances given in the relevant skill test. Attention should be paid to the following points:

(1) questions from the 'candidate';

(2) give results of the test and any sections failed;

(3) give reasons for failure.

DEBRIEFING

(e) The RPAS examiner applicant should demonstrate to the inspector the ability to conduct a fair, unbiased debriefing of the 'candidate' based on identifiable factual items. A balance between friendliness and firmness should be evident. The following points should be discussed with the 'candidate', at the applicant's discretion:

(1) advise the candidate on how to avoid or correct mistakes;

(2) mention any other points of criticism noted;

(3) give any advice considered helpful.

RECORDING OR DOCUMENTATION

(f) The RPAS examiner applicant should demonstrate to the inspector the ability to complete the relevant records correctly. These records may be:

- (1) the relevant test or check form;
- (2) licence entry;
- (3) notification of failure form;
- (4) relevant company forms where the RPAS examiner has privileges of conducting operator proficiency checks.

DEMONSTRATION OF THEORETICAL KNOWLEDGE

(g) The RPAS examiner applicant should demonstrate to the inspector a satisfactory knowledge of the regulatory requirements associated with the function of an RPAS examiner.

GM1 JARUS-FCL.525 Validity, revalidation and renewal of RPAS examiner certificates

RPAS EXAMINER REFRESHER SEMINAR

The RPAS examiner refresher seminar should follow the content of the RPAS examiner standardisation course and take into account specific contents adequate to the category of RPAS examiner affected.