Australian Government
Civil Aviation Safety Authority

OFFICIAL

Commercial pilot (balloon) syllabus of training

November 2024

Acknowledgement of Country

The Civil Aviation Safety Authority (CASA) respectfully acknowledges the Traditional Custodians of the lands on which our offices are located and their continuing connection to land, water and community, and pays respect to Elders past, present and emerging.

Inside front cover artwork: James Baban.

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This document contains guidance material intended to assist CASA officers, delegates and the aviation industry in understanding the operation of the aviation legislation. However, you should not rely on this document as a legal reference. Refer to the civil aviation legislation including the *Civil Aviation Act 1988* (Cth), its related regulations and any other legislative instruments—to ascertain the requirements of, and the obligations imposed by or under, the law.

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References

Acronyms

The acronyms and abbreviations used in this manual are listed in the table below.

Table 1. Acronyms

Acronym and abbreviation	Description
ABTO	Authorised Balloon Testing Officer
AC	Advisory Circular
AD	Airworthiness Directive
AIP	Aeronautical Information Publication
AOC	Air Operator's Certificate
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation (1988)
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation (1998)
COA	Certificate of Approval
CP(B)L	Commercial Pilot (Balloon) Licence
DAMP	Drug and Alcohol Management Plan
ERSA	En route supplement Australia
KDR	Knowledge Deficiency Report
MOS	Manual of standards
NOTAM	Notice to Airmen
PEXO	Pilot Examination Office
PP(B)P	Private Pilot (Balloon) Permit
SAR	Search and Rescue
VFR	Visual Flight Rules

Revision history

Revisions to this manual are recorded below in order of most recent first.

Table 2. Revision history

Version number	Date	Parts and sections	Details
4.0	November 2024	All	Completely revised and updated to include CASR Parts 91, 131 and MOS. References to old regulations and orders that are no longer applicable have been removed.
3.2	May 2017	1, 2 and 3	
3.1	June 2003		
3.0	1991	All	Initial issue

1 Overview

1.1 Introduction

This syllabus details the practical flying and theory knowledge requirements for the commercial pilot (balloon) licence (CP(B)L).

1.2 Commercial pilot (balloon) licence qualifications

An applicant for a CP(B)L must:

- hold a current class 1 or 2 medical certificate (regulation 5.04 of CAR, CASR Part 67)

In accordance with regulation 5.138 of CAR:

- be at least 18
- have held for at least one year a current private pilot (balloon) permit PP(B)P, or a recognised overseas private pilot authorisation
- meet the minimum hours of aeronautical experience listed in regulation 5.145 of CAR
- complete the flight training specified in regulation 5.146 of CAR
- successfully complete the flight test exercises specified in CASA form 192 Commercial Pilot (Balloon) Licence Application: Application for commercial pilot balloon licence
- Complete the aeronautical knowledge training specified in Syllabus Section 3 -*Aeronautical Knowledge* and pass the two-part written theory examination.

1.3 Practical flight training

CP(B)L training is normally conducted in a Class 1 balloon (< 260 000 cubic feet). Experienced candidates who hold an overseas licence with privileges equivalent to the CP(B)L are not required to undergo the full course of flying training but may be assessed for competency during a flight test.

In addition to the flying training syllabus, training will include topics which are not specifically related to the control manipulation tasks associated with flying, but which nonetheless may affect flying operations. This associated training addresses topics including airmanship, legislation, authorisations, and publications.

1.4 Aeronautical knowledge written theory examination

Written theory exams are conducted using the PEXO system How the exam system works | Civil Aviation Safety Authority (casa.gov.au)

The theory exam for the CP(B)L is divided into two separate papers:

- Flight rules and air law (CLWB)
- Operations – meteorology. navigation and human factors (COPB)

Under the PEXO system the supervising officer will provide the candidate with the pass or fail exam result and knowledge deficiency report (KDR) immediately on completing the exam. Your KDR report will be discussed with the testing officer during the flight test.

1.5 Balloon general knowledge – oral test

An oral test will be conducted by the flight testing officer before or after the CP(B)L flight test based on these knowledge areas:

- Restrictions relating to drugs/alcohol

- Understanding of Part 91 and 131 and MOS
- Understanding of fatigue rules in CAO 48.1 Appendix 4A
- VFR/VMC criteria
- equipment requirements in 131 MOS Ch 26
- CP(B)L privileges and limitations in CAO 40.7
- pilot maintenance in Schedule 8 Part 2 of CAR

Questions in the written exam may also be based on the topics in this section.

The flight testing officer will also conduct a review of the applicant's KDR from the written exam before or after the CP(B)L flight test

2 Flight training

2.1 Practical flight training and flight test

Regulation 5.146 of CAR requires that an applicant for a CP(B)L must undertake a course of balloon flying training that consists of 8 hours of balloon flying training that must include:

- at least 3 free flights
- 1 tethered flight
- at least 3 inflations and 3 deflations of a balloon

The balloon flying training must:

- be conducted by a balloon flight instructor who is employed, or otherwise engaged, by a balloon flying training school authorised by an Air Operator's Certificate.
- be undertaken in the year immediately before attempting the flight test

Before attempting a CP(B)L flight test a candidate should consistently demonstrate a high level of proficiency in conducting flight exercises including when under workload pressure.

Before attempting a CP(B)L flight test a candidate must be recommended for the test by the chief balloon flying instructor of the balloon flying school that conducts the training.

2.1.1 CP(B)L Flight test

The flight test will be conducted by an authorised balloon testing officer (ABTO) or an approved CASA officer in accordance with the flight test report CASA form 192.

Form 192 details the practical exercises to be completed and regulatory knowledge questions to be discussed.

During the flight test, the applicant for a CP(B)L must:

- Demonstrate competency to act as PIC in balloon transport operations and knowledge of procedures both in and outside controlled airspace. Flight in controlled airspace may be simulated if the test flight is conducted OCTA.
- Demonstrate knowledge and understanding of the subjects specified in section 1.5 – *Balloon General Knowledge*

Perfection of performance is not the essential requirement to achieve a pass in the flight test. The aim of the test is to demonstrate the candidate's ability to operate the balloon safely and to make all the operational decisions necessary for the safe conduct of the flight. To achieve a pass in the flight test a candidate should demonstrate that:

- correct techniques and procedures were used
- errors were not sustained
- the balloon was operated within AFM limitations
- all operations complied with regulatory and airspace requirements
- ground crew communications were managed
- passengers were managed effectively from boarding to disembarkation

Form 192 must be completed for every flight test regardless of whether the candidate fails or passes the test. A copy of the completed form will be filed on the student's flying training records.

2.1.2 Flight testing officer responsibilities

Before conducting a CP(B)L flight test, the testing officer must ensure that the candidate has satisfied all the prerequisites listed on form 192. The officer will check the candidate's pilot logbook to ensure they have

logged the required 75 hours as pilot in command that includes at least 60 hours of free flight time and at least 5 hours of tethered flight time. And that they have completed at least 8 hours of balloon flying training in the last year.

The testing officer will notify CASA of a planned CP(B)L flight test through the on-line Flight Test Management System. CASA may choose to conduct surveillance on a flight test.

2.2 Flying training syllabus

2.2.1 Pre-flight

2.2.1.1 Operational flight planning

Demonstrate how to plan the flight in accordance with CASR Parts 91, 131 and MOS:

- Obtain mandatory meteorological and operational information including NOTAMS applicable to the flight
- Identify possible take-off locations and tracks based on weather information
- Note possible suitable landing areas
- Know flight time endurance
- Note the designated airspace
- Prepare flight note and passenger list to be left with ground crew
- Know how to submit flight notification to the appropriate airways operations unit if required:
- Calculate balloon weight and loading using expected take-off temperature and planned altitude
- Ensure the balloon is airworthy by checking the aircraft logbook or technical log

2.2.1.2 Balloon and equipment check

Conduct pre-departure checks:

- inflator fan
- retrieve vehicle
- LPG fuel tanks
- VHF and UHF radios and phones
- Altimeter/variometer instrument Required maps and charts
- Compass or gps and/or moving map device
- Alternative ignition source
- Handling line
- First aid kit
- Fire extinguisher/s
- Launch rope and quick release
- Balloon gas and pibals.

2.2.1.3 Launch site check

State the factors to be considered in the selection of a launch site including:

- Vehicle access
- Surface condition and size of area

- Hazards to inflation
- Hazards to launch and climb out
- Airspace requirements

2.2.1.4 Inflation and pre-take-off

Demonstrate competence in:

- Pibal observations
- Balloon layout—consideration of wind direction and strength, hazards and risks
- Rigging the balloon
- Assigning ground crew duties, crew briefing and supervision
- passenger briefing pre-boarding
- Fan safety
- Attachment of launch rope restraint
- Inflation:
  - Cold - with the inflator fan
  - Hot - use of burner
- Conducting pre-flight inspections
  - during cold inflation
  - after hot inflation
- Boarding passengers
- Pre-flight passenger briefing – landing position
- Pre–take off checks

2.2.1.5 Flight Operations

Demonstrate competence in or discuss knowledge of topic:

- Use of quick release on launch restraint, lift off, climb out, establish level flight
- VHF radio communication with ATS (if required)
- Level flight and contour flying
- Controlled ascents and descents. Ascent and descent through windshear and inversions may be practiced or discussed
- observing weather developments, and determining appropriate action
- Flight in company with other balloons—considerations and communication. Situational awareness
- In-flight navigation
- Flight plan revision
- Communication with retrieve crew
- In-flight management of passengers
- Procedures for operating in Class C or D airspace
- Use of SSR transponder
- Fuel management
- Intermediate landings

- Aborted landing approach and overshoot, and assessment of options
- Approach and landing, including:
  - site selection—criteria, power line systems and other hazards
  - passenger briefing
  - pre-landing checks
  - extinguishing pilot lights before landing
  - appropriate use of deflation device fitted.
- In-flight emergencies (may be simulated or conducted on the ground) using the procedures specified in the flight manual

Note:

1 - At least one landing in a wind exceeding 8 kt is to be demonstrated during the training or test.

2.2.1.6 Post-Landing

Demonstrate competence in:

- Conducting post-landing actions, securing the balloon, deflation and pack-up
- Passenger management during disembarkation and on ground
- the pilot's responsibilities in relation to the use of land and property
- the correct refuelling procedures
- correct recording of flight details in the pilot and aircraft logbooks.

2.2.2 Associated training

These topics will be studied in training and may be discussed during the flight test.

- Situation awareness and maintaining lookout
- Threat and error management
- Decision making

2.2.3 Tethered Operations

If the five hours of tethered flight time required under regulation 5.145 of CAR have been logged in the pilot's logbook knowledge may be checked by discussion.

Demonstrate competence in conducting tethered balloon operations including:

- layout of tether ropes to tether points
- Tying of knots
- Correct attachment points on the balloon
- Ground crew duties
- Crowd control
- Fan safety
- Safe exchange of fuel tanks and passengers
- Recognition and understanding of potential hazards.

State the effect on a balloon and its tether system of:

- Wind gusts and turbulence
- Changes in ballast
- False lift.

3 Aeronautical knowledge

3.1 Examination requirements

This section describes the aeronautical knowledge subjects to be studied for the two-part written theory examination.

The pass standard for the written examination is 75%.

The examination comprises two two-hour papers: a flight rules and air law exam (CLWB) and an operations exam (COPB). The CLWB exam contains questions based on CASR Parts 91 and 131 and their MOS. The COPB exam includes questions on meteorology, navigation, balloon performance and human factors. However, there may be some overlap of topics between exams. Each exam contains approximately 40 questions.

A list of 'Permitted material' that may be taken into an exam is published on the CASA web site Commercial pilot licence (balloon) exams - CLWB and COPB | Civil Aviation Safety Authority (casa.gov.au).

It is the candidate's responsibility to have current versions of the documents mentioned. The exam supervisor will only be supplying the CPL(B) workbook, pen, pencil ruler, eraser and scribble paper.

The navigation section requires the use of supplied aeronautical charts.

Candidates should read the questions carefully to ensure that they correctly answer the question which has been posed.

In undertaking study for the exam an applicant may:

- Study independently
- Study at a balloon flying school which offers both flight and theory training

3.2 Flight rules and air law – CLWB

Questions in this exam may also include topics from the COPB syllabus.

3.2.1 Documents, regulations and publications

Subject area
Know the requirements for recording flight details in a pilot's personal logbook (CAR 5.51 to 5.53).
Know how to access publications online, what they are used for and know why it is important to ensure you are reading the latest version of these documents: • CASR (especially Parts 67, 91, 99 and 131) • 91 MOS (relevant sections) and 131 MOS • CAR (Part 4A and schedules 6, 7 and 8 (maintenance), Part 5 (balloon flight crew licensing) • CAOs 40.2.2, 40.7, 101.54 • AIP • ERSA • AC 131-01 and 131-02 • Guide for balloons and hot air airships
Know which flight related documents must be carried on a flight or left on the ground. (131.C.3, MOS Ch 5) Know that documents may be carried in electronic form (131.265)

3.2.2 Pilot licences and classification of operations

Subject area
Know the requirements to be eligible to hold: • A commercial pilot (balloon) licence (CAR 5.138) • A balloon class endorsement (CAO 40.7) • A balloon type authorisation CAR 5.141) • A balloon grade of night VFR rating (CAO 40.2.2)
Know the minimum medical certificate to be held by a CP(B)L holder and validity period (CAR 5.04 – 5.07) (CASR 67.205, 67.265)
Know the classification of Part 131 operations: • Balloon transport (was charter) (131.010) • Specialised balloon operations (was aerial work) may be commercial or non-commercial (131.020) • Commercial balloon flying training (CAR 206) • Part 131 recreational activity (131.025)
Know the CP(B)L flight review and recent experience requirements (CAR 5.143 and 5.144)
Know the rules relating to flight and duty time limitations for a CP(B)L holder (CAO 48.1 Appendix 4A)

3.2.3 Flight operations

Subject area
Know the following rules and/or requirements: • Not creating a hazard (91.055) • Visual flight rules and visual meteorological conditions for balloon operations (131.367, MOS Ch 2 and 19) • Special VFR (131 MOS Ch 2) • VFR flight at night (131 MOS Ch 19) • Flight preparation weather assessment (131.340,131.350, 131 MOS Chs 12,14) • Right of way -avoidance of collision in the air (91.D.4.4, 131.355, 131 MOS Ch 17) • Flights over water (131.365, MOS Ch 18) • Equipment to be carried on a balloon (131.460, 131 MOS Ch 26) • Pilot restraint harness • Fuel requirements (131.385, 131 MOS Ch 21) • Smoking in or around balloons (131.390, 131.395, 131 MOS Ch 23) • Flight in prohibited, danger and restricted areas (131.353, MOS Ch 15)
Know: • the rules relating to the use of drugs and alcohol (fit for duty) (91.520) • recall the minimum period between alcohol consumption and flight departure (91.520) • that a balloon transport operator will have a Drug and Alcohol Management Plan DAMP (Part 99)
Know the requirements relating to: • the minimum heights for balloon flights over populous areas, public gatherings and other areas (131.305, MOS Ch 8) • Dropping articles (131.310, MOS Ch 9) • for landing before the end of daylight (AIP ENR 1.2)

Subject area
• Carriage of animals (91.620) • Carriage of dangerous goods (AC 131-02)
Know the rules for the operation of a tethered hot air balloon **(131.375,** MOS Ch 20)

3.2.4 Balloon transport operations

Subject area
Know the rules relating to: • A pilot's authorities and responsibilities before and during flight (91.215,131.340, MOS Ch 12) • passenger lists (131.280, 131 MOS, Chs 5 and6) • Flight notification (131.345, 131 MOS Ch 13) • Carriage of passengers (131.455, MOS Ch 25) • Carriage of infants and children (131.400, 131.455, MOS Ch 25) • Passengers requiring assistance (131.405 MOS Ch 22) • Training flights (131.435) • Wearing a pilot restraint harness • Conditions of balloon transport AOC (131.090) • Balloon class endorsements (CAO 40.7)
Know the items of equipment (including communications and emergency equipment) required to be carried or fitted to a balloon (131.460, 131 MOS Ch 26) for a balloon transport flight
Know that an AOC holder must keep records and documents (131.B.7)

3.2.5 Aerodromes

Subject area
Know: • The aerodrome runway numbering system • The aerodrome traffic circuit system
Identify the following positions in the traffic circuit applicable to other aircraft: • Upwind leg • Crosswind leg • Downwind leg • Base leg • Final leg • Straight in approach • The dead side of the circuit.
Know the meaning of 'in the vicinity' of an aerodrome (91.360)
Know a balloon pilot's responsibilities regarding the use of aerodromes Traffic priorities and right of way (91.D.4.6) • Avoidance of traffic conflictions in the circuit area and on the manoeuvring area (91.D.4.6) • Overflight where landing not intended 131.360 131 MOS Ch 17) • Operations in the vicinity and at or within 3 NM of non-controlled aerodromes (91.360, 131.360, MOS Ch 17) • Position reporting procedures and requirements (131.354,131 MOS Ch16)

Subject area
Know: • Ground signals that may be displayed (91.670, 91 MOS Ch 2)

3.2.6 Airspace and air traffic services

Subject area
Know the classifications of airspace (A, C, D, E, G). (AIP ENR 1.4)
Identify on charts: • airspace boundaries • vertical limits of designated airspace from charts • division of airspace: FIR, FIA, CTA, CTR, CTAF, MBA • air traffic services: FIS, ATC • VFR routes, visual approach points, lanes of entry • Prohibited, restricted and danger areas PRD • CTAF areas • controlled aerodromes
Extract from ERSA PRD times of operation
Know the requirements and procedures relating to the use of radio communications and SSR transponders for: • VFR operations in controlled airspace class C and D • CTAF • MBA (131.353, 131.354, MOS Chs 15 and 16)

3.2.7 Emergencies, accidents, incidents, SAR

Subject area
Differentiate between an accident and an incident. IRM and RRM (AIP ENR 1.14)
Extract from the AIP the responsibility of a pilot regarding notification of IRM and RRM (AIP ENR 1.14)
Know how to contact the Australian Joint Rescue Coordination Centre (JRCC)
Flight notification (131.345, MOS Ch 13): • Flight note • SARTIME • Explain the responsibility of the ground support crew holding a flight note for a balloon conducting balloon transport operations for initiating SAR procedures • Differentiate between alert, uncertainty and distress, messages. ALERFA, INCERFA and DETRESFA (AIP GEN 2.2)
Know the emergency procedures relating to: • emergency landing or where the pilot is not in contact with their ground support crew • Radio failure in controlled airspace (131.353, MOS Ch 15)
Know how to recognise and avoid power line systems and the actions to be taken in the event of possible power line contact

Subject area
Know the aircraft flight manual emergency procedures: • Pilot light failure • Fire in the air • Fire on the ground • Gas leak in the air • Gas leak on the ground
Know the requirements for general emergency training, competency and proficiency checks for pilots and ground crew (131.565, 131.570, MOS Chs 27, 28)

3.2.8 Radiocommunication systems and procedures

Subject area
Know the basic principles of radio wave propagation and the appropriate frequency bands for UHF and VHF.
Know the limitations of UHF and VHF for quality of reception and range
Know when radiocommunications equipment must be fitted or carried (131.460 131 MOS Ch 26)
Know when radio broadcasts and reports must be made (131.354, 131 MOS Ch 16)
Use appropriate charts or ERSA to: • Extract VHF frequencies • Identify the service provider and services provided.
Know: • the phonetic alphabet and how to transmit numbers. (AIP GEN 3.4) • radio phraseology (AIP GEN 3.4) • Readability of radio transmission (AIP GEN 3.4) • how to find radio failure procedures (AIP and ERSA) • VHF distress frequency (AIP and ERSA)

3.2.9 Transponders

Subject area
Extract from AIP or ERSA transponder codes for: • Radio failure • Emergency • VFR flight in Class E or G airspace
Know when a transponder is required to be carried on a flight (131.460, 131 MOS Ch 26)
Know the meaning of the terms: • SQUAWK • CODE • IDENT
Describe the information that is transmitted (if any) when a transponder is selected to: • STBY • ON

Subject area
• ALT • IDENT • Mode C • Mode S
Know factors which may affect transponder reception.

3.3 Operations –COPB

Questions in this exam may also include topics from the CLWB syllabus.

3.3.1 Units of measurement and calculation

Subject area
Know: • Direction in degrees true (T) and magnetic (M) • Distance in nautical miles (NM) and kilometres (km) • Speed in knots (kt) and kilometres per hour (km/h) • Distance/speed/time formula T=D/S or D=S/T • Wind measurements – speed and direction • Time as a four, six and eight figure group • how to convert between UTC, and Australian Standard Times • Latitude and longitude in degrees and minutes • Map grid coordinates • Height and elevation in feet(ft) and metres(m).
Know how to use the AIP or on-line, information to find the beginning and end of daylight for a given location
Know how to convert between the following units: • Feet (ft) and metres (m) • Nautical miles (NM) and kilometres (km)

3.3.2 Use of maps and charts

Subject area
Interpret and decode the information contained in the following charts: • ERC • PCA • WAC • VNC • VTC • NATMAP 1:100,000 topographical map
Transfer the following information from ERC, VNC or VTC, or from grid references, to a topographical map: • CTR, CTA, and airspace classification boundaries • Prohibited, restricted and danger areas
Select the charts required to plan a VFR flight inside or outside controlled airspace.

3.3.3 Altimetry

Subject area
Know the meaning of: • QNH, local QNH and area QNH • QFE • Standard pressure setting • Altitude • Transition altitude • Transition level • Transition layer • Elevation • Height • Pressure height • Subscale setting

3.3.4 Pre-flight planning

Subject area
Know: • when and how to access the BOM and other weather services, and flight planning information (131.340, 131.345 131.350 131 MOS Chs 12, 13 and 14) • the weather forecast requirements • the weather information available • the flight notification requirements • the matters to be checked before take-off • the ATS unit responsible for a planned flight area • the requirements for flight over water (131.365, 131 MOS Ch 18)

3.3.5 Navigation

Subject area
Magnetic compass: • Know the difference between true and magnetic compass direction • Identify items which may induce errors in a simple magnetic compass
Know gps and navigation software options: • Hot Air • Oziexplorer • OzRunways • Google maps • Apple maps
Determine position and drift direction by use of: • Topographical features • Grid reference • Gps device or moving map software
Know how to access the tables of cruising levels under 10,000 ft in the AIP for flight under the visual flight rules (AIP ENR 1.7)

3.3.6 Airworthiness – documents and maintenance

Subject area
State the purpose of: • airworthiness certificates • certificate of registration • airworthiness directive (AD) • aircraft logbook statement
Know the aircraft logbook entry to determine whether a balloon is serviceable for a flight.
Know the responsibilities of a pilot-in-command regarding: • Pre- and post-assembly inspections • Recording/reporting balloon defects • Making aircraft logbook entries after a flight.
Know the maintenance functions which may be performed by a: • CAR 30 Certificate of Approval holder • the pilot-in-command of a balloon (CAR 42W, Schedule 7 Part 5 and Schedule 8 Part 2, AC 131-1).
Explain the terms: • major repair • aircraft component • time-in-service

3.3.7 Operating requirements

Subject area
Know: • The maximum number of passengers that may be carried (131.455, 131 MOS Ch 25) • the passenger restrictions for compartmented baskets (131 MOS Ch 25, AFM)
Know the fuel requirements for a balloon transport flight in accordance with the Part 131 MOS (131 MOS Ch 21).
Know: • LPG fuel tanks are filled to 80% • How to calculate fuel use based on fuel burn rate • The requirements for trip fuel and reserve fuel (131.385, 131 MOS Ch 21)
Know the ground crew complement required for a balloon transport operation (131.570, 131 MOS Ch 28)

3.3.8 Balloon performance

Subject area
Use manufacturers' charts to determine the lift capacity, and permissible loading, for a balloon under various conditions of ambient temperature and planned flight altitude
Explain the terms equilibrium, inertia, momentum, false lift, terminal descent rate
Relate burner power and effectiveness to load, fuel composition (propane/butane ratio), and ambient temperature.
State the effect on fuel consumption of, load, fuel pressure, ambient temperature, flight profile and rain
Calculate flight time endurance given fuel on board and fuel burn rate.
• Explain the factors to be considered in preparation for, and the execution of, a landing: – In light winds (a normal landing) – Using a handling line – In a wind exceeding 8 kt – With a high vertical speed – In thermic conditions – In conditions where descent must be made through a low-level windshear
Describe the causes for hard landings and the precautions to mitigate injury including passenger briefing.
Know the AFM performance limitations

3.3.9 LPG fuel

Subject area
Explain the properties of propane: • Specific gravity in liquid and gaseous form – lighter or heavier than air or water

Subject area
• Properties of Autogas mixtures • Difference from butane • Effect of temperature on fuel tank pressure and burner pressure
Describe fuel quantity measurement with reference to a percentage fuel gauge
State the reason for, and the correct method of, heating or pressurising fuel tanks
Know: • Hazards of overfilling a fuel tank • Causes of icing in fuel system
Explain what could cause and what to do in the event of a propane leak or fire
State the correct method for filling fuel tanks and the possible effects of overfilling

3.3.10 Burner and deflation systems

Subject area
Fuel systems and burners: • nominate main components, describing the purpose of each component • know the valves in a burner system • know how the system works • know a suitable burner pressure measured at the fuel pressure gauge • explain the possible faults and maintenance of the system • state the symptoms of fuel exhaustion • know the difference between vapour and liquid pilot lights
Know the common balloon deflation systems in common use and their characteristics
Know the requirements for a balloon type authorisation for a CP(B)L holder (CAR 5.141)

3.3.11 Aviation weather services

Subject area
Know the types of weather services available through: • BoM Knowledge Centre (bom.gov.au)NAIPS • Other online weather sources
Decode information contained in a: • TAF, • METAR • SPECI • GAF Know how to determine the validity period and when information is routinely updated
Analyse weather information applicable to a flight and: • Assess likely changes in weather during the flight • List any phenomena which may adversely affect the flight.

3.3.12 Aviation meteorology

Subject area
Describe the following terms: • Isobar, isotherm, pressure gradient • Temperature inversion, lapse rates • Atmospheric stability/instability • Relative humidity, dewpoint • Surface and gradient winds • Cold, warm and occluded fronts • Wind shear
On a mean sea level synoptic chart, as supplied by the Australian Bureau of Meteorology, identify: • High and low pressure systems • Warm and cold fronts • A trough, a ridge, a col • A tropical revolving storm • Wind speed and direction.
Clouds: • Identify and classify cloud types • State the standard abbreviation for each type • Describe the weather conditions associated with each type.
With respect to the phenomena list below: – thermals, turbulence and dust devils – wind gradient and wind shear – anabatic, katabatic, mountain and valley winds, drainage flow – orographic lift, curl over, mountain waves – land and sea breezes – inversion and fog – thunderstorms – downdrafts associated with terrain/cloud – diurnal variation of temperature and surface wind – atmospheric stability and instability • State the conditions favourable for their development • Recognise signs which may indicate their presence • Describe their effect on balloon flight characteristics • If applicable, state the action required to minimise their effect on a balloon.

3.4 Human performance and limitations

3.4.1 Health and Fitness

Subject area
Know the: • Reasons for, and the frequency of, physical examinations and that Designated Aviation Medical Examiners conduct medical examinations • Process of obtaining a medical examination including populating the online form • Role of CASA Avmed in determining medical fitness and that only those conditions which present a flight safety hazard are disqualifying.

Alcohol

Subject area
Know how alcohol is absorbed and excreted.
Know the factors that affect the elimination of alcohol from the body and describe the effects of illicit drugs and alcohol on proficiency, for example: • Judgement, comprehension, attention to detail • The senses, co-ordination and reaction times.

Drugs

Subject area
Identify the undesirable effects of over the counter and prescription drugs. The side effects of: • antihistamines • Amphetamines, tranquillisers, sedatives.

Blood donations

Subject area
Know the effects on flying after giving a blood donation.
Know the recommended period between giving blood and the next flight and know that this period can vary between individuals.

Hyperventilation

Subject area
Know what hyperventilation is and its causes.
Know how to identify and manage hyperventilation.

Atmospheric Pressure Change

Subject area
Know the effects on flying caused by a period of SCUBA diving and state the precautions to be taken if intending to fly after SCUBA diving.

Basic Knowledge of the Anatomy of the Ear

Subject area
Explain the ears' function in receiving sound transmissions.
Explain the purpose of the Eustachian tube and effects of atmospheric pressure changes.
Know the effect of noise exposure on: • Hearing loss—long and short term • Speech intelligibility

Subject area
• Fatigue.
Know the recommended methods of hearing protection.

Vision, Spatial Disorientation, Illusions

Subject area
Know the basic anatomy of the eye and its function during the day and at night.
Know the factors which affect night vision and identify methods of “dark adaptation”.
Know the limitations of the eye: • The ability to discern objects during flight, for example, other aircraft, electricity transmission lines • Glare • Colour vision in aviation

3.4.2 Basic health

Subject area
Know the effects and importance on pilot performance of the following factors: • Diet, exercise • Coronary risk factors—smoking, cholesterol, obesity, hereditary factors • Upper respiratory tract infection, for example, colds, hay fever, congestion of air passages and sinuses • Food poisoning and other digestive problems • Headaches and migraines • Pregnancy • when to stop flying • Injuries • Ageing • Alcohol and smoking • Dehydration • Emotional anxiety, depression and fear.
Recall that a pilot is not to fly when on any medication unless a medical clearance from a Designated Aviation Medical Examiner (DAME) has been obtained.
Explain the responsibilities of pilots with regard to being fit for duty.

3.4.3 Hypoxia

Subject area
List the causes of hypoxia and recognise the symptoms of hypoxia particularly: • Its effect on vision • The dangers of behavioural changes, for example, lack of self-criticism, over-confidence and a false sense of security.
State that the symptoms are difficult to detect in healthy individuals and can develop much faster at higher altitudes.

Subject area
List factors which may increase a person's susceptibility to hypoxia
List methods of combating various forms of hypoxia.

3.4.4 Human factors considerations

Subject area
Explain the basic concepts of information processing and decision making including: • How sensory information is used to form mental images
The influence of the following on the decision-making process: • personality traits, for example, introvert or extrovert • pride, peer pressure, employer pressure • the desire to get the task done • anxiety, over-confidence, boredom, complacency • types of memory—long and short term • memory limitations • checklists • workload/overload • skill experience, currency
Discuss the general concepts behind decision making and the methods of enhancing decision making skills.

Concepts of stress

Subject area
Know: • The interaction between stress and arousal and the effects of short- and long-term stress on pilot performance and health • The symptoms, causes and effects of environmental stress • working in an excessively hot, cold, vibrating or noisy environment • The symptoms and effects of domestic and work-related stress • The effects of stress on performance • The principles of stress management, for example: – cognitive/behavioural techniques – relaxation – time management.

Concepts of fatigue

Subject area
Identify causes of fatigue and describe its effect on pilot performance. Know fatigue mitigation strategies: • Sleep management • Relaxation • Fitness and diet.

Study guides

CASA publication Safety Behaviours: Human Factors for Pilots.

3.5 Recommended pre-study

3.5.1 Background

Knowledge of basic mathematics and physics is necessary to meet the aeronautical knowledge objectives in this syllabus.

Mathematics

The requirement is to solve problems using:

- basic arithmetic
- simple fractions
- percentages
- averages

Physics

The requirement is to:

- Solve problems relating to time, speed (velocity) and distance D=S x T
- Define velocity, acceleration, weight, mass, force, momentum, static equilibrium, density, specific gravity, and pressure.
- aerostatics

3.5.2 Study Material for CP(B)L

Civil Aviation Regulations

- CASRs:
  - CASRs Parts,31,39,91,131 and MOS
- CAR especially:
  - CAR 41, 42A, 42E, 42ZC, 43A & 43B (aircraft logbook), 50A
  - Part 5
  - Schedule 7 Part 5 and Schedule 8 Part 2

Civil Aviation Orders

CAOs:

- CAO 40.2.2
- CAO 40.7
- CAO 48.1 Appendix 4A
- CAO 95.54.
- CAO 101.45

Civil Aviation Advisory Circulars (AC)

- AC 131-1 Manned free balloons – continuing airworthiness
- AC 131-2 Manned free balloons - operations

Aeronautical Information Publication

AIPs especially sections GEN 1, 2 and 3 and ENR 1 and 5.

Navigation texts relating to mapping, scale, symbology, contours, magnetic and true direction, distance speed and time, use of UTC, and particularly the overprint of aeronautical features and airspace information.

Aviation meteorology

Manual of Aviation Meteorology

Meteorology – Aviation theory Centre

Human factors

Aircraft Human Performance and Limitations Tony Wilson