Australian Government
Civil Aviation Safety Authority

Commercial pilot (balloon) syllabus of training

Date	May 2017
Approver	Group Manager
Sponsor	Branch Manager, Flight Standards
Effective Date	May 2017
Review Date	April 2018

This document becomes an uncontrolled document when printed. Refer to https://www.casa.gov.au/files/cp-balloonpdf for current version.

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 (Act), its related regulations and any other legislative instruments—to ascertain the requirements of, and the obligations imposed by or under, the law.

Table of Contents

Glossary

Acronyms and abbreviations

Acronym / abbreviation	Description
ABF	Australian Balloon Federation
AC	Advisory Circular
AD	Airworthiness Directive
AIP	Aeronautical Information Publication
AOC	Air Operator's Certificate
ATO	Authorised Testing Officer
CAAP	Civil Aviation Advisory Publication
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation (1988)
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation (1998)
COA	Certificate of Approval
ERSA	En route supplement Australia
NOTAM	Notice to Airmen
PPC	Private Pilot Certificate
VFR	Visual Flight Rules

Revision History

Amendments/revisions of this syllabus are recorded below in order of most recent first.

Version No.	Date	Parts/Sections
3.2	May 2017	Part 1,2 and 3
3.1	June 2003	
3.0	1991	

Foreword

The Commercial pilot (balloon) syllabus of training was first published in 1991.

This version of the syllabus incorporates and amends the 2003 version of the syllabus only to the extent of updating references and links, adding some exam topics and making a minor reorganisation of the order of topics.

The main purpose of the syllabus is to provide information and guidance around the flying and ground training objectives and standards. Brief details about the administration of balloon licensing, the aeronautical experience and examination requirements are included.

The syllabus should be used in conjunction with the Civil Aviation Safety Regulations (1998), Civil Aviation Regulations (1988), Civil Aviation Orders, and relevant Civil Aviation Advisory Publications, Advisory Circulars and Airservices Australia publications.

Copies of the syllabus are available from the CASA website https://www.casa.gov.au/files/cp-balloonpdf

1. Overview

1.1 Introduction

This syllabus details the flying and ground training requirements for the commercial pilot (balloon) licence [CP(B)L].

While the syllabus is generally similar to the Australian Ballooning Federation Inc. (ABF) syllabus for the private pilot certificate (balloons) (PPC), a higher standard of both knowledge and skill is required. This will be assured by:

- Greater aeronautical experience requirements
- Broader knowledge requirements
- Higher skill standards
- Supervision and the structure of the training

1.1.1 Aeronautical experience requirements

Aeronautical experience requirements, as stipulated in Civil Aviation Regulations, should be viewed as the minimum requirements. Experience has shown that factors, such as ability and continuity of training, lead to marked differences in the flight time needed for individuals to reach the standard required. In particular the accumulation of only the minimum experience will not necessarily guarantee attainment of the required standard. In some cases candidates will require hours in excess of the stated minimum.

An applicant for a commercial pilot (balloon) licence shall:

- Meet the medical requirements specified in CAR 5.04, be aged 18 years or over, hold a current PPC issued by the Australian Ballooning Federation, and have held a PPC or a recognised overseas private licence for at least a year (CAR 5.138)

Note: A PPC (balloons) is only valid whilst the holder remains a member of the Australian Ballooning Federation Inc.

- Meet the aeronautical experience requirements specified in CAR 5.145
- Complete the aeronautical knowledge training specified in Chapter 3 Aeronautical Knowledge Training of this syllabus and pass the written examination
- Complete the flight training specified in CAR 5.146 and the syllabus in Chapter 2 Flying Training of this document and pass the flight test specified in the CASA form 192 Commercial Pilot (Balloon) Licence Application: https://www.casa.gov.au/files/form192pdf

Note: An applicant for a class endorsement must pass a flight test in a balloon of the applicable class prior to having that class endorsed on their licence. Only a class 1 or class 3 (gas balloon) endorsement may be issued to a pilot who does not have previous experience in charter operations.

Theory examination results

Under the PEXO system the supervising officer will provide the candidate with the pass or fail exam result and KDR immediately on completing the exam.

Flight test forms

A flight test form (Form 192) for the CP(B)L is to be found on CASA's website. A flight test form must be completed for every flight test regardless of whether the candidate fails or passes the test. All items to be tested in a given flight test are listed on the form so that both the candidate and the testing officer are aware of the sequences to be covered. A copy of the completed form is to be filed on the student's flying training records.

Assessment and recommendation for flight test

A training assessment should be carried out at the commencement of CP(B)L training. As a result, the instructor is to recommend, as appropriate, a tailored course of training designed to prepare the candidate for the flight test.

Prior to undertaking a CP(B)L flight test, a candidate must undertake an assessment flight with a flight instructor.

Flight test officer responsibilities

Prior to administering a pilot licence flight test, an authorised testing officer (ATO) must ensure that the candidate has satisfied all of the prerequisites as outlined in the CARs/CAOs. The flight test officer is to check the candidate's log book to ensure that the candidate has the required 75 hours in command and completed the required training.

1.2 Flying training

The flying training syllabus is in Chapter 2 - *Flying Training* of this document. It has been structured so as to:

- List mandatory flight sequences
- Provide guidance on the skill standard to be attained for each flight sequence

Flying training for a licence must be conducted by a flight instructor who is employed by, or working under the supervision of, a balloon flying training school authorised by an Air Operator's Certificate which includes balloon flying training.

The syllabus assumes that CP(B)L training will be conducted in class 1 balloons. 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 during an assessment flight(s) before seeking a flight test.

1.3 Aeronautical knowledge training

The aeronautical knowledge syllabus is in Chapter 3 – *Aeronautical Knowledge Training* of this document. It has been structured to:

- Integrate theoretical knowledge and flight training by identifying the knowledge areas appropriate to training
- Specify the knowledge standard required for each syllabus objective

In undertaking study in accordance with the aeronautical knowledge syllabus, a student may:

- Proceed independently using a self-study course
- Complete the training at a balloon flying training school which offers both flight and theory training to the level required

2. Flying training

2.1 Introduction

Flying training has been divided into the following:

- Performance standards and flight tests
- Flying training syllabus
- Associated training syllabus
- Flight test forms.

As an adjunct to the overall flying training syllabus, training will include areas which are not specifically related to the manipulative tasks associated with flying but which nonetheless impinge upon flying operations as a whole. This is known as associated training and addresses aspects such as airmanship, authorisations, and documents.

Performance standards have been defined to assist instructional staff to train and test students to standards appropriate to the CP(B)L. Each sequence in the syllabus has been assigned a performance standard as a guide to the skill and knowledge level that a student should achieve in a given sequence before being allowed to progress to the flight test.

2.2 Performance standards and flight tests

Note: For CP(B)L standard is 1 throughout the syllabus.

2.2.1 Practical flight training

For the practical flying phases the following standards apply:

Standard	Description
1	Has consistently demonstrated a high level of proficiency in conducting the exercise including when under work load pressure
2	Has consistently demonstrated proficiency in conducting the exercise. Is deemed fit to operate without supervision
3	Has been trained in the exercise and demonstrated the ability to safely perform the exercise under conditions specified by the flight instructor supervising the flight
4	Has had some training in the exercise but lacks sufficient skill or understanding of the techniques involved for solo operations

2.2.2 Associated training and aeronautical knowledge training

For non-flying training, that is associated training and aeronautical knowledge training, the following performance standards apply:

Standard	Level	Description
A	Essential	Must be known completely—relates directly to the safety of the balloon and occupants.
B	Important	Must be known in considerable depth—relates to the efficient and practical operation of a hot air balloon.
C	Additional	Should be known in considerable depth.

2.2.3 Flight tests

The flight test shall be conducted by a CASA examiner or by an approved test officer in accordance with the flight test report Form 192 Commercial Pilot (Balloon) Licence Application and will comprise:

- A balloon flight
- An oral examination of the objectives listed in Chapter 3 Section 3.2 - *Balloon General Knowledge*

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

- Demonstrate competency to act as a pilot-in-command of balloon in passenger charter operations both inside and outside controlled airspace. Flight in controlled airspace may be simulated
- Pass the oral examination on the subjects specified in Chapter 3 Section 3.2

2.3 Flying training syllabus

On the ground

Conduct a base pre-departure check covering the following:

- Fuel in the inflator fan
- Fuel in the retrieve vehicle
- Secure attachment of any trailer
- Required LPG cylinders are full
- All radios are charged
- Retrieve vehicle radio is checked
- Required maps and charts are available
- Compass, and gps (if used)
- Alternative ignition source is available and serviceable
- First aid kit is installed
- Fire extinguisher/s are available and serviceable
- Launch tie off and quick release are serviceable

- Load calculations using the load system as specified in the flight manual or operations manual are completed
- Loading and passenger documentation is prepared
- Altimeter/variometer instrument batteries are checked
- Ensure the balloon is airworthy by reference to the aircraft logbook
- Balloon gas and pibals are available

State the factors to be considered in the selection of a safe launch site. These shall include:

- Vehicular access
- Surface and size of area
- Shelter from wind (if available)
- Hazards to inflation, launch and climb out
- Proximity to designated airspace (for example, restricted or controlled areas)
- Compliance with the ABF landowner relations code of conduct

Demonstrate competence in:

- Unloading equipment from the vehicle and trailer
- Balloon layout—consideration of wind direction and strength, hazards and risks
- Rigging the balloon and burner testing
- Assigning crew duties, crew briefing and supervision
- Inflating:
  - cold air—with the inflator fan
  - hot air—use of burner
- Safety precautions for cold air and hot air inflating
- Conducting pre-flight inspections
- Passenger briefing
- Pre–take off checks

Tethered Operations

This activity may be demonstrated prior to the flight test.

Demonstrate competence in conducting tethered balloon operations including:

- Tying of knots, layout of tether ropes
- Correct attachment to the balloon
- Crowd control and safe exchange of passengers and fuel tanks
- 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

Free flight passenger flights and balloon promotions

Obtain mandatory meteorological and operational information applicable to the flight.

Plan the flight in accordance with the CAR 259 Permit and the Aeronautical Information Publication (AIP), and predict/identify:

- Average track, or choice of tracks, and overall intentions
- Possible landing areas and evaluate suitability of these areas
- Endurance
- Estimated time intervals at selected en-route points
- Potential hazards and designated airspace.
- NOTAMS
- Know how to submit flight notification to the appropriate airways operations unit if required:
  - Via pilot access to NAIPS (internet):
  - By telephone or radio
  - In writing (by fax)

Flight Operations

Demonstrate competence in:

- Launch, lift off, climb out (normal and fast), round off to level flight
- Level flight and contour flying
- Controlled ascents and descents. Ascent and descent through windshear and inversions may be practiced or discussed
- Assessing wind velocity and weather, observing weather developments, and determining appropriate action
- Flight in company with other balloons—considerations and communication. Scanning techniques
- In-flight navigation
- Map and gps reading
- Flight plan revision
- Communication with retrieve crew
- Routine safety checks
- In-flight management of passengers (may be simulated and discussed)
- Use of radio communication equipment
- Fuel management, determination of approximate fuel burn and endurance
- Intermediate landings including exchange of passengers and fuel tanks (may be discussed)
- Aborted landing and reassessment of options
- Handling of in-flight emergencies (may be simulated) using the procedures specified in the flight manual
- Approach and landing, including:

- site selection—criteria, power line systems and other hazards
- passenger briefing
- pre-landing checks
- extinguishing pilot lights
- appropriate use of deflation device(s) fitted.

Notes:

1. At least one “fast” landing in a wind exceeding 8 kt is to be demonstrated during the training or test.
2. Where a rapid (velcro rip panel, smart vent or similar) deflation device is fitted, this shall be used at least twice during training—at least one of these occasions shall be a “fast” landing.

The course of flying training specified in CAR 5.146 should be used to review the content of this syllabus with particular emphasis on emergency drills, flying techniques when carrying charter passengers, in-flight passenger management, fuel management, selection of appropriate landing sites and communication with air traffic services and with the retrieve crew.

Post Landing

- Conduct post-landing actions, deflation and pack up
- Know the pilot’s responsibilities in relation to the use of land and property
- Demonstrate the correct refuelling procedures and state the safety precautions to be observed during refuelling operations
- Demonstrate correct recording of flight details in the pilot and aircraft log books

2.3.1 Associated training syllabus

Discussion and application of:

- Situation awareness and maintaining lookout
- Threat and error management
- Decision making
- Fitness for duty including fatigue management
- Drug and alcohol use

2.3.2 Flight tests

There is one flight test relating to this syllabus, the CP(B)L flight test.

The CP(B)L application and flight test form is available on the CASA website at https://www.casa.gov.au/files/form192pdf. The test form must be completed for every test conducted whatever the result.

Form 192 Commercial Pilot (Balloon) Licence Application

The form is divided into sections:

- Section A: Mandatory requirements:
  - 1. Medical details
  - 2. Security check requirements (An applicant must hold an ASIC or AVID)
  - 3. Aeronautical experience

  - 4. Fit and Proper Person Requirements
- Section B: Applicant checklist
- Section C: Applicant declaration
- Section D: CFI Recommendation
- Section E: Declaration of the Testing Officer/CASA FOI
- Section F: Flight Test Report
  - Payment authorisation.

Candidates should understand that 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 conduct of the flight. To achieve a pass in the flight test a candidate should demonstrate the following standard:

- Correct techniques and procedures were used
- Errors in height were not sustained
- The balloon was operated within published limitations
- All operations complied with regulatory and airspace requirements
- Sound airmanship was displayed throughout the flight.

Sustained failure in any item listed on the flight test form will result in an overall fail assessment for the flight test, however at the discretion of the testing officer a candidate may be credited with passes in those items successfully completed and those items will not have to be repeated in a subsequent test.

3. Aeronautical knowledge training

3.1 Examination requirements

3.1.1 Introduction

This syllabus defines the aeronautical knowledge objectives which shall be met prior to attempting the written examination specified in CAR 5.138(1)(d) and the oral examination specified in this chapter.

The pass standard for the written examination is 75%.

The examination comprises two subject-parts, an Air Law exam (CLWB) and on operations exam (COPB). Both subject-parts must be passed within a two year period; each has a pass mark of 75% and contains approximately 40 questions. The COPB exam includes questions on meteorology, navigation, aerostatics and human factors.

Candidates need to be aware that for each exam, there is a list of 'Permitted material' published on the CASA web site https://www.casa.gov.au/standard-page/cplballoon-exams

It is the candidate's responsibility to have current versions of the documents and maps 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 1:100,000 topographical maps and various aeronautical charts. Candidates are advised to bring the necessary scale rulers with them to the examination.

Candidates should read the questions very carefully to ensure that they correctly answer the question which has been posed. Distractors (incorrect optional answers) are included and selected to correspond with known common faults in knowledge or technique.

3.2 Balloon general knowledge – oral exam

The oral examination will be based on the knowledge areas specified in this section. The testing officer may choose from the following topics. The pass standard is:

- 100% for items marked with an asterisk (*)
- 70% for all other items (on first response—to be corrected to 100% after discussion with the testing officer).

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

3.2.1 Propane

Explain the properties of propane:

- Specific gravity in liquid and gaseous form
- Effect of altitude on burner pressure
- Effect of temperature on 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 tanks
- * List the precautions to be observed for the prevention of fire
- * Recall the action required in the event of a propane leak or fire

3.2.2 Balloon performance and operations

- * Relate burner output to fuel pressure and ambient temperature
- List and explain the factors which may affect fuel consumption
- Explain the terms equilibrium, inertia, momentum, false lift, terminal descent rate
- List and 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
- * State considerations in the recognition and avoidance of power line systems and the actions to be taken in the event of probable power line contact
- * Be able to calculate the fuel and passenger loading of a hot air balloon

3.2.3 Parts of a hot air balloon

- * Name the parts and components of a hot air balloon and describe the function of each part
- * Demonstrate an ability to assemble, rig and disassemble a hot air balloon
- * Demonstrate a detailed knowledge of the possible problems or malfunctions that can occur with each hot air balloon component

3.2.4 Refuelling safety

- * List the procedures and safety precautions for refuelling a hot air balloon

Note: Candidates for a CP(B)L must know the information listed below for the particular balloon which they are to fly. The data for the actual balloon used for the flight test will be used as the basis of the oral part of the flight test.

3.2.5 Flight manual

- State emergency procedures
- List limitations
- Explain the reasons for imposing the flight manual limitations
- Demonstrate use of the load system specified in the flight manual and determine the maximum payload for a given pressure height and outside air temperature (OAT)

3.2.6 Burner and deflation systems

For the fuel systems and burners:

- nominate main components, describing the purpose of each component
- describe the safety features of the system

- state the principles of operating the system
- explain and demonstrate the operation of the fuel system in normal and emergency situations
- explain the care and maintenance of the system
- explain burner rating
- state the symptoms of fuel exhaustion and describe the use of an emergency (or back up) system, if fitted

Explain the deflation system and list the main advantages and disadvantages of that system compared with other common deflation systems in use in commercial balloons.

3.3 Flight rules and air law – written exam CLWB

The Flight Rules and Air Law exam must be passed before the CP(B)L flight test.

3.3.1 Documentation

Subject area	Standard
Recall the requirements for recording flight details in a pilot's personal log book (CAR 5.51 to 5.53)	A
Describe the method of obtaining publications and know why it is important to update these documents: • CASRs • CARs • CAR 259 permit • CAOs • AIP • CAAP • AC • NOTAM	A
Given an item of operational significance: • Select from the list in the previous subject area (the box above) the appropriate reference document • Extract and decode relevant and current information from these documents	B
Understand the terms and abbreviations in AIP GEN which are relevant to balloon flight in accordance with the visual flight rules.	A

3.3.2 Pilot licences and ratings, privileges and limitations

Subject area	Standard
State the requirements for a pilot to be eligible to hold: • A commercial pilot (balloon) licence • The balloon class endorsements • A balloon grade of night VFR. rating (CAO 40.2.2)	A
State the requirements for holding a medical certificate by a commercial (balloon) pilot (CAR 5.04 – 5.07).	B
As applicable to a commercial (balloon) pilot, decide whether a flight can be conducted in accordance with the rules relating to:	A

Subject area	Standard
• Privileges and limitations of the licence • Recent experience requirements • The classification of operations	
Extract and apply the rules relating to flight and duty time limitations for commercial balloon pilots (CAO 48.1 Appendix 4A or an approved alternative schedule)	B

3.3.3 Flight rules and conditions of flight

Subject area	Standard
Recall and apply the following rules and/or requirements:	
• Rules of the air (CAR 160–174D)	A
• Visual flight rules and visual meteorological conditions for balloon operations below 10 000 ft AMSL (AIP)	A
• Flight in prohibited, danger and restricted areas (AIP)	A
• Carriage and discharge of firearms (CAR 143 & 144)	A
• Fuel requirements (CAR 234)	A
• Smoking in balloons (CAR 259 Permit)	A
State the rules relating to the use of drugs and alcohol, and recall the minimum period between alcohol consumption and flight departure (CAR 256 (1) to (4))	A
Select the documents (including maps) which must be carried during flight by a balloon in Australian airspace (CAR 139, CAR 259 permit)	B
Recall the requirements relating to the minimum heights for balloon flights in commercial operations (CAR 157, CAR 259 Permit; CAAP 157-1(0)):	
• Over populated areas	A
• Over aerodromes (where landing is not intended)	A
• Over other areas, by day	A
• By night	B
State the limitations imposed on flights over public gatherings (CAR 156)	A
Time of landing: • Recall the requirement for landing before the end of daylight (AIP)	A

3.3.4 Air service operations

Subject area	Standard
In respect of the need to hold an AOC for commercial balloon operations and the responsibilities of the chief pilot, state and apply (CAO 82.7): • The requirements applicable to the holder • The responsibilities of the chief pilot	B
Extract and apply the rules relating to: • A pilot's responsibilities before and during flight (CAR, 225, 228, 233)	A

Subject area	Standard
• The duties and powers of a pilot-in-command (CAR 309) • Compilation of passenger lists (CAR 259 Permit)	
Extract and apply the rules relating to: Carriage of passengers (CAO 20.16.3 Appendix 6A , CAR 259 Permit) • infants and children • sick and handicapped persons – Training flights (CAR 249, 206) – Carriage of animals (CAR 256A) – Carriage of dangerous goods (CAR 259 Permit) – Dropping articles (CAR 150, CAO 29.5)	B
Recall the rules for the operation of tethered (fixed) balloons (CAR 259 Permit)	A
State the requirements for the carriage and use of radio in commercial balloon operations (AIP GEN 1.5 & ENR 1.1)	A

3.3.5 Aerodromes

Subject area	Standard
With reference to a diagram of an aerodrome, identify the areas and markings associated with: • Runways and runway strips including numbering system • Taxiways • Movement areas • Wind direction indicators • Signals area (including signals displayed) • Helipads	B
Identify the following positions in the traffic circuit applicable to other classes of aircraft: • Upwind leg • Crosswind leg • Downwind leg • Base leg • Final leg • The dead side of the circuit	A
State the meaning of the following light signals directed at an aircraft in flight, or on the ground, from the tower at a controlled aerodrome: • Steady red • Steady green • Flashing red • Flashing green • Flashing white	C
State a commercial (balloon) pilot's responsibilities with regard to the use of aerodromes (CAR 166, CAR 259 Permit) and: • Traffic priorities and right of way • Avoidance of traffic conflictions in the circuit area and on the manoeuvring area	A

Subject area	Standard
• Overflight where landing not intended • Operations in the vicinity of non-controlled aerodromes • Position reporting procedures and requirements	

3.3.6 Airspace and air traffic services

Subject area	Standard
Differentiate between the various classifications of airspace (A, C, D, E, G)	A
With respect to the terms listed in (a) to (g) explain each term and, if applicable: • Identify airspace boundaries on appropriate charts • Extract vertical limits of designated airspace from charts or ERSA – division of airspace: FIR, FIA, CTA, CTR, CTAF area – air traffic services: FIS, RAS, ATC, controlled airspace – VFR routes, visual approach points, lanes of entry – Prohibited, restricted and danger areas – CTAF procedures in areas where CTAF procedures apply – controlled aerodromes – ADIZ	A
Differentiate between radio reports and broadcasts	B
State the requirements and procedures relating to the use of radio communications and transponders for VFR operations: • In controlled airspace class C, D • Close to controlled airspace • At licensed aerodromes where CTAF procedures apply • At unlicensed aerodromes • In class G airspace • In ADIZ	A C

Altimetry

Subject area	Standard
• State the datum from which an altimeter indicates height when the following are set on the subscale: – Area QNH – Local QNH – QFE – Standard Pressure Setting • State and apply the altimetry procedures appropriate to flight below 10,000 ft AMSL	A

3.3.7 Emergencies, accidents, incidents

Subject area	Standard

Subject area	Standard
Differentiate between an accident and an incident. IRM and RRM	B
Extract from the AIP the responsibility of a pilot regarding notification of IRM and RRM	B
Explain the terms: • Flight note • Sartime • ALERFA, INCERFA and DETRESFA	C
Explain the responsibility of the retrieve crew holding a flight note for a balloon in commercial operations with respect to initiating SAR procedures.	B
Extract from ERSA emergency procedures relating to: • Action following emergency landing or where the pilot is not in contact with their retrieve crew • Radio failure in controlled airspace	A

3.3.8 Radio

Subject area	Standard
State the basic principles of radio wave propagation and recall the appropriate frequency bands for UHF, VHF, and HF	C
State the limitations of UHF/VHF and HF in terms of quality of reception and range (for both communication and navigation)	B
List factors which may affect VHF and HF reception	B
Use appropriate charts/documents to: • Extract VHF frequencies • Determine communication and navaid coverage • Identify the service provider and services provided	A

3.3.9 Voice technique

Subject area	Standard
State the phonetic alphabet and the method of transmitting numbers	A
State and apply pertinent procedures and phraseology applicable to balloon operations.	A
State the purpose and operation of radio set controls: • On/off switch • Frequency selection • Squelch and mute controls • Transmit button	A

Radio

Subject area	Standard
Describe and apply standard “trouble checks” in the event of communication difficulties.	A

Subject area	Standard
Extract radio failure procedures from ERSA	

Emergency radio procedures

Subject area	Standard
Differentiate between distress, urgency and safety messages Give examples of situations where each of the above should be used State each of the above message prefixes and extract the elements of each message from ERSA	A

3.3.10 Transponders

Subject area	Standard
State the precautions to be observed when selecting transponder codes and extract from ERSA codes for: • Radio failure • Emergency	A
Given an area of operations, decide whether it is necessary to use a transponder.	A
State the meaning of the terms: • SQUAWK • CODE • IDENT	B
Describe the information that is transmitted (if any) when a pilot selects: • STBY • ON • ALT • IDENT. • Mode C and mode S	B
Identify indications of normal and abnormal transponder operations and list factors which affect transponder reception	B

3.4 Reserved

3.5 Operations –written exam COPB

The knowledge in Operations must be met to the specified standard before the CP(B)L flight test.

3.5.1 Fundamentals

Subject area	Standard
Recall the method of expressing the following quantities and match them against	B

Subject area	Standard
appropriate definitions: • Direction in degrees true (T), magnetic (M) • Distance in nautical miles (NM), kilometres (km) • Speed in knots (kt), kilometres per hour (km/h) • Wind velocity • Time as a four, six and eight figure group • Latitude and longitude in degrees and minutes Height and elevation in feet(ft) and metres(m)	
Use the AIP, on-line, or satellite based information to: • find the beginning and end of daylight for a given location • Carry out conversions between UTC, and Australian Standard Times	A
Carry out conversions between the following units:	
• Feet (ft) and metres (m)	A
• Nautical miles (NM) and kilometres (km)	A
• Degrees Fahrenheit (°F) and degrees Celsius (°C)	C
• Pounds (lb) and kilograms (kg)	C
• Gallons (gal)—US or Imperial (IMP)—and litres (l)	C
• Volumetric units and lb or kg given specific gravity	B

3.5.2 Charts and publications

Subject area	Standard
From the list below, select the appropriate publication(s) which will provide information relating to a given item of navigational significance: • ERC • PCA • WAC • VNC • VTC • NATMAP 1:100,000 topographical map	A
Be able to explain and apply the relationship between latitude and distance in nautical miles	B

3.5.3 Use of maps and charts

Subject area	Standard
Interpret topographical detail and decode symbols displayed on ERC, WAC, VNC, VTC and 1:100,000 topographical map	A
Express position in latitude and longitude, as a bearing and distance from a given position, or as a six-figure grid reference	A

Subject area	Standard
Transfer the following information from ERC, VNC or VTC, or from grid references, to a 1:100,000 topographical map: • CTR, CTA, and airspace classification boundaries • Prohibited, restricted and danger areas • Sensitive areas (SZs)	A
Measure track (M) and distance (NM) from a VTC, and from a 1:100,000 topographical map	A
Extract and interpret data which is applicable to a balloon flight under VFR from: • The *AIP* book • The En Route Supplement Australia (ERSA)	A
Select the charts required to plan a VFR flight inside or outside controlled airspace	A

3.5.4 Altimetry

Subject area	Standard
Recall the values of mean sea level pressure and temperature, and the temperature and pressure lapse rate in the International Standard Atmosphere.	C
Match the following terms against appropriate definitions/ statements:	
• QNH	A
• QFE	C
• Standard pressure setting	B
• Altitude	A
• Transition altitude	B
• Transition level	C
• Transition layer	C
• Elevation	B
• Height	C
• Pressure height	B
• Density height	C
State the altimeter sub-scale settings to be used when operating below 10,000ft and when above the transition level	B
Recall the tables of cruising levels under 10,000 ft given in the AIP, for flight under the visual flight rules	C
With reference to a topographical map, determine: Altitude, given height AGL Height AGL, given altitude	A
Use an altimeter to determine elevation and pressure height	B
Given ambient temperature and QNH, convert elevation to pressure height, by the following methods:	B

Subject area	Standard
Using a computer Mathematically using 1 hPa deviation = 30 ft	

3.5.5 Navigation instruments

Subject area	Standard
Describe the effects of lag and barometric error on the reading of a sensitive altimeter	C
Identify items which may induce errors in a simple magnetic compass	C

3.5.6 Pre-flight planning

Subject area	Standard
Given an area of operation: • List the weather services and flight planning information available to a pilot • Nominate the sources and method of obtaining this information • Nominate the applicable area forecasts and TAFs • Explain the use of pibals before launch and during flight and the information that can be obtained	A
Given an area of operation, suitable charts, weather and operational information: • Plan a flight in accordance with the CAR 259 Permit and AIP and predict: – route (that is, track, intermediate landing points and destination) – approximate positions at specified time intervals along the route • Nominate: – cruising levels appropriate to other types of aircraft – the appropriate ATS unit(s) responsible for a given area • Evaluate whether a flight will, or is likely to: – enter controlled airspace or a CTAF – enter prohibited, restricted or danger areas – pass within a specified distance of an aerodrome, CTAF or controlled airspace	A A B A

3.5.7 In flight navigation

Subject area	Standard
Determine position by use of: • Position lines • Topographical pin-points	A
Determine the Track Made Good (TMG) between two given fixes	A
Estimate or calculate Ground Speed (GS) using time and distance flown between	B

Subject area	Standard
two fixes	
Use TMG and GS to predict the: • Time of arrival over a nominated position • Position of the balloon at a nominated time	B

3.5.8 Fundamentals

Subject area	Standard
State the purpose of airworthiness certificates and certificates of registration	B
With reference to the balloon log book, decide whether a balloon is serviceable for a flight	A
State the responsibilities of a pilot-in-command with regard to: • Daily and post-assembly inspections • Recording/reporting balloon defects • Making log-book entries after a flight	A
Determine the maintenance functions which may be performed by the pilot-in-command of a balloon and use of aircraft components (CAR 42W, Schedule 8, AC 131-1)	B
Explain the terms "major repair" and "time-in-service" with respect to a balloon. Know who can make repairs. (CAR schedule 7, AC131-1)	B
Given a commercial flight scenario, extract from CAOs, AIP and the Operator's CAR 259 Permit, the items of equipment (including communications and emergency equipment) required to be on board a balloon (CAO 20.11, 20.18 Appendix X, CAR 259 Permit; AIP)	A
State the rules with respect to the display of lights at night by a balloon in tethered and free-flight operations (CAO 40.2.2, ABF Ops manual)	B

3.5.9 Operating requirements

Subject area	Standard
Extract from AIP, ERSA and the Operator's CAR 259 Permit, all items of information relevant to commercial balloon operations. Know the passenger restrictions for compartmentalised baskets (CAO 20.16.3 section 6A)	A
Apply fuel requirements for a commercial balloon flight in accordance with a sample fuel policy which meets the requirements of CAR 234	A
Determine whether a particular area is suitable for the launching and landing of a balloon in accordance with the guidance to CAR 92 given in CAAP 92-3	B

3.5.10 Pressure height and density height

Subject area	Standard
Recall and apply the characteristics of the International Standard Atmosphere below 10,000 ft	B

Subject area	Standard
State the relationship between elevation, QNH, pressure height, temperature and density height, and recall the relationship of these to the lift capacity of a balloon	A
Describe how to use an altimeter to obtain: • Elevation of a location, given QNH • Local QNH at a site whose elevation is known • Pressure height of a location	B
Calculate: • The pressure height of a location, knowing the QNH and its elevation	B

3.5.11 Balloon performance

Subject area	Standard
Use manufacturers' charts to determine the lift capacity, and hence permissible loading, for a balloon under various conditions of temperature and height	A
State the likely results of exceeding a balloon's flight manual limits of load, climb and descent rates, and duration of valve operation	B
Relate burner power and effectiveness to load, fuel composition (propane/butane ratio), fuel temperature and envelope porosity	A
State the effect on balloon fuel consumption of windshear, surface wind, load, fuel pressure, flight profile and rain—in free and tethered operations	A
Calculate flight time endurance given fuel on board and fuel burn rate	A
Describe the cause and effects of false lift and procedures for counteracting	A
Describe the causes for hard landings and the precautions to mitigate injury	A

3.5.12 Properties of propane

Subject area	Standard
Explain the properties of propane: • Specific gravity in liquid and gaseous form • Effect of altitude on burner pressure • Effect of temperature on tank pressure and burner pressure	A
Describe fuel quantity measurement with reference to a percentage fuel gauge	A
State the reason for, and the correct method of, heating or pressurising tanks	A
Explain what could cause and what to do to do in the event of a propane leak	A
State the correct method for filling fuel tanks and the possible effects of overfilling	A

3.5.13 Burner and deflation systems

Subject area	Standard
For fuel systems and burners: • nominate main components, describing the purpose of each component • describe the safety features of the system	A

Subject area	Standard
• state the principles of operating the system • explain the care and maintenance of the system • explain burner rating • state the symptoms of fuel exhaustion and describe the use of an emergency (or back up) system, if fitted	
Explain balloon deflation systems and list the main advantages and disadvantages of each system	A
State the actions to be taken in the event of a potential or actual powerline strike State the methods for detection and avoidance of powerlines	A

3.5.14 Flight preparation and planning

Subject area	Standard
State the kinds of pre-flight information available to a pilot for flight planning, and describe how to obtain each type of information	A
State the operations for which it is necessary to obtain weather and pre-flight briefing (CAR 120, 239, AIP, CAR 259 Permit)	A
State the means for submitting flight details by: • A flight note held by the retrieve crew • NAIPS	A
State the important elements of a pre-flight and pre-landing passenger briefing	A

3.5.15 Aviation weather services

Subject area	Standard
List the types of weather services available to a pilot for flight below 10,000 ft and state the: • Purpose and ingredients of each service • Method by which it is provided to a pilot	B
State the operations for which it is necessary to obtain weather and pre-flight briefing (CAR 120, AIP, CAR 259 Permit)	A
Decode information contained in a TAF, METAR and SPECI and understand the contents of an ARFOR	A
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	A

3.5.16 Aviation meteorology

Subject area	Standard
Describe the following terms: • Isobar, isotherm, pressure gradient	A

Subject area	Standard
• Temperature inversion, lapse rates • Atmospheric stability/instability • Relative humidity, dewpoint • Surface and gradient winds • Cold, warm and occluded fronts • Wind shear • Microburst	
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. • Describe weather characteristics associated with items (a) to (d) above	A
For clouds: • Identify and classify cloud types • State the standard abbreviation for each type • Describe the weather conditions associated with each type	B
• With respect to the phenomena listed in (a) to (j) 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	A
Match the following wind speed descriptions with appropriate recognition signs: Calm 0 kt Light air 1-3 kt Light breeze 4-6 kt Gentle breeze 7-10 kt Moderate breeze 11-16 kt Fresh breeze 17-21 kt (Reference *Manual of Meteorology Part 1*)	B

3.6 Human performance and limitations

3.6.1 Health and Fitness

Subject area	Standard

Subject area	Standard
Explain the: • Reasons for, and the frequency of, physical examinations and state that a CASA network of Designated Aviation Medical Examiners exists • Process of obtaining a medical examination • Role of CASA with regard to medical fitness and that only those conditions which present a flight safety hazard are disqualifying	A

Alcohol

Subject area	Standard
Explain how alcohol is absorbed and excreted. State 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	A

Drugs

Subject area	Standard
Identify the undesirable effects of over the counter and prescription drugs. In particular the side effects of: • Aspirin, antihistamines, nasal decongestants • Amphetamines, tranquillisers, sedatives, antibiotics	A

Blood donations

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

Hyperventilation

Subject area	Standard
Identify and manage hyperventilation. State what hyperventilation is and its causes	B

Atmospheric Pressure Change

Subject area	Standard
Trapped gases: • Know the effect of changes in pressure on gases trapped in the body cavities • Describe the effect on normal bodily function • State the measures for prevention and treatment.	B

Subject area	Standard
Explain the effects of flying after a period of underwater diving and state the precautions to be taken if intending to fly after underwater diving	

Basic Knowledge of the Anatomy of the Ear

Subject area	Standard
Explain the ears' function in receiving sound transmissions	B
Explain the purpose of the Eustachian tube and effects of atmospheric pressure changes	B
State the effect of noise exposure on: • Hearing loss—long and short term • Speech intelligibility • Fatigue	B
State the recommended methods of hearing protection	B

Vision, Spatial Disorientation, Illusions

Subject area	Standard
Have a basic knowledge of the anatomy of the eye and its function during the day and at night	B
List the factors which affect night vision and identify methods of "dark adaptation"	C
Explain the limitations of the eye with respect to: • The ability to discern objects during flight, for example, other aircraft, transmission lines • Glare • Colour vision in aviation Common visual problems, such as, myopia, hyperopia, astigmatism, presbyopia	
Explain of the importance of: • Seeking experienced professional advice for spectacles prescription • Selecting suitable sunglasses	A
• Explain the factors which are conductive to mid-air collisions. Describe and practice techniques for visual "scanning"	C
Explain the term "disorientation"	A
Explain the sensory systems involved in maintaining body equilibrium, for example, that equilibrium is normally maintained by use of the eyes, inner ear and proprioceptive system ("seat of the pants")	B
Explain that these mechanisms were developed for use by land based mammals and do not provide reliable information under all conditions of flight	C
Explain: • When sensory illusions usually occur—external visual clues are poor or ambiguous and that they are predictable • The factors that may make a person susceptible to disorientation How to overcome sensory illusions	A

Subject area	Standard
List which illusions may result from the following flight factors: • Depth perception, for example – flying over water, snow, desert and other featureless terrain – effects of fog, haze, dust • Landing illusions – approach angles—steep, shallow – slope of terrain under approach path – when approaching over water • Relative motion between objects	 B A B B
•	A

3.6.2 Basic health

Subject area	Standard
Explain 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	A
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	A
Explain the responsibilities of pilots with regard to being medically fit for flight	A

3.6.3 Reserved

3.6.4 The atmosphere and associated problems

Subject area	Standard
Explain the variation of temperature and pressure with altitude.	A
Explain the basic concepts of the circulatory and respiratory systems in terms of the distribution of oxygen and the excretion of carbon dioxide.	C
Describe what is meant by the partial pressure of oxygen	C

3.6.5 Hypoxia

Subject area	Standard

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

3.6.6 Human factors considerations

Subject area	Standard
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 • aides memoire, rules of thumb • work load/overload • skill experience, currency	B
Discuss the general concepts behind decision making and the methods of enhancing decision making skills	B

Concepts of stress

Subject area	Standard
Explain: • 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	B

Concepts of fatigue

Subject area	Standard
Identify causes of fatigue and describe its effect on pilot performance.	A

Subject area	Standard
Differentiate between acute and chronic fatigue. Discuss coping strategies, for example: • Sleep management • Relaxation • Fitness and diet	

Basic principles of crew co-ordination

Subject area	Standard
Discuss factors which influence verbal and non-verbal communication between crew, such as: • Barriers to communication • Listening skills • Assertion skills. Discuss factors which affect the decision making process, such as: • Communication attitude • Personality • Judgement • Leadership style. Review ballooning accidents which resulted from poor crew co-ordination	C

3.6.7 Principles of first aid and survival

Subject area	Standard
The student should be aware of the first aid and survival information contained in ERSA and preferably be exposed to practical instruction in the terms of first aid given in this document	B

Study guides

CASA publication Safety Behaviours: Human Factors for Pilots.

3.7 Recommended pre-study

3.7.1 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
- ratio and proportion
- direct and inverse proportion
- representative fractions (map scales)

Physics

The requirement is to:

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

3.7.2 Study Material for CP(B)L

Civil Aviation Regulations

- CASRs:
  - CASRs 21,31,39,99
- CARs especially:
  - CAR 2—definitions: especially 2(7) and 2(7A) def. private etc flights
  - CARs 41, 42A, 42E, 42ZC, 43A & 43B (aircraft log book), 50A
  - Part 5 Div 1, 2 and 11
  - CAR 92
  - CARs, 99AA, 99A
  - CARs, 140, 143, 144, 145, 146, 150, 156, 159, 159A, 159B
  - Part 12 Div 1,2,3
  - Part 13
  - Part 14 especially 206, 210 A, 215, 216, 219, 220, 233, 234, 239, 243, 248, 255, 256, 259, 260
  - CARs 298A to 298E, 299, 302, 309
  - Schedule 7 Part 5 and Schedule 8
  - plus Parts 21, 31, 39 of the CASRs.

Civil Aviation Orders

CAOs especially:

- CAO 20.16.1 and 20.16.3 Appendix 6A
- CAO 20.18 especially Appendix X
- CAO 40.2.2 relating to balloons
- CAO 40.7
- CAO 48.1 Appendix 4A
- CAO 82.7
- CAO 95.53 and 95.54.

The current CAR 259/260 Permit issued to balloon AOC holders

Civil Aviation Advisory Publications (CAAP)

CAAPs and ACs especially:

- AC 131-1 Manned free balloons – airworthiness and operations
- CAAP 92-3 Balloon launch and landing areas
- CAAP 157-1 Balloon flight over populous areas
- CAAP 234-1 Guidelines for aircraft fuel requirements
- CAAP 235-1 Standard passenger and baggage weights

Aeronautical Information Publication

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

Any standard **aviation meteorology text** (southern hemisphere version)

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

CASA publication safety behaviours **Human Factors for Pilots**