Government of **Western Australia**
School Curriculum and Standards Authority

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education Examination, 2013

Question/Answer Booklet

AVIATION

Stage 3

Please place your student identification label in this box

Student Number: In figures | | | | | | | | |

In words _____

_____

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time for paper: two and a half hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer Booklet
Multiple-choice Answer Sheet

Number of additional answer booklets used (if applicable): ☐

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in the WACE examinations, navigation plotter (or ruler and protractor), flight computer

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

2014/6889
Web version of 2013/44640

Ref: 13-014

Structure of the examination

The WACE Aviation Stage 3 examination consists of a written component worth 80 per cent of the total examination score and a practical (performance) component worth 20 per cent of the total examination score.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of total exam
Section One: Multiple-choice	20	20	30	20	16
Section Two: Short answer	20	20	120	140	64
				Total	80

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

   Section One: Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

   Section Two: Write your answers in this Question/Answer Booklet.

3. Working or reasoning should be shown clearly when calculating or estimating answers.

4. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

5. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

See next page

Section One: Multiple-choice **16% (20 Marks)**

This section has **20** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 30 minutes.

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1. Cloud coverage of 1 OKTAS would be described in a TAF as

   (a) SKT.
   (b) FEW.
   (c) BKN.
   (d) OVC.

2. You need to work out the mass in kilograms of 100 L of fuel. If you know the specific gravity (SG) of this fuel, then the volume of fuel must be

   (a) multiplied by the SG.
   (b) divided by the SG.
   (c) added to the SG value.
   (d) ignored because it is not a factor in the conversion.

3. To achieve maximum endurance, a helicopter must be operated

   (a) in the hover to minimise the drag forces.
   (b) at an airspeed that minimises the lift required from the rotor.
   (c) at the cruise speed to maximise the amount of lift produced by the fuselage.
   (d) at the maximum range airspeed.

4. During a take-off, the tip path plane of a helicopter rotor

   (a) rises above the rotor head to maintain a constant coning angle.
   (b) does not move with respect to the rotor head.
   (c) falls below the rotor head as the centripetal reaction increases.
   (d) rises above the rotor head as the thrust is increased.

5. Workers at an airport can suffer from the effects of noise. The **most** damaging effects are caused by the

   (a) low frequencies of jet turbines.
   (b) high frequencies of the propellers on turboprop engines.
   (c) high frequencies of jet compressors.
   (d) low frequencies of large piston engines.

See next page

6. Jill has hypermetropia. If she goes flying without corrective spectacles, she will have difficulty in

(a) seeing distant objects.
(b) seeing near objects.
(c) distinguishing colours at night.
(d) seeing both near and distant objects.

7. Peter is red-green colourblind. Compared with a pilot having normal colour vision, Peter will, at night, have difficulty in

(a) reading the instrument panel.
(b) determining the correct glide path based on the runway lights.
(c) determining if an aircraft to his right or left is on a collision course.
(d) determining if an aircraft ahead if him is tracking toward or away from him.

8. If a 5G loading is maintained in a positive manoeuvre, the pilot is likely to experience

(a) dimmed vision.
(b) loss of vision.
(c) loss of consciousness.
(d) tunnel vision.

9. An aircraft is cruising at FL120 where the outside air temperature is –10 °C. The corrected airspeed (CAS) is 165 kt. What is the aircraft's true airspeed (TAS)?

(a) 165 kt
(b) 188 kt
(c) 198 kt
(d) 205 kt

10. If a constant IAS and Pressure Altitude are maintained, what effect will a flight into a colder air mass have on CAS?

(a) CAS will not change.
(b) CAS will reduce.
(c) CAS will increase.
(d) CAS is only affected by a change in pressure.

11. A force applied to a gyroscopic instrument that acts 90º in the direction of rotation is known as

(a) wander.
(b) drift.
(c) precession.
(d) tilt.

See next page

12. An aircraft is being flown at the lowest possible safe height and least amount of power to maintain that height. The aircraft is being flown to achieve

(a) maximum range.
(b) minimum drag.
(c) maximum endurance.
(d) best lift to drag ratio.

13. Which of the following statements is **false**?

(a) An aircraft's track and heading will be the same when there is no wind.
(b) Heading is associated with ground speed and track is associated with TAS.
(c) The magnetic heading displayed by a GPS is not affected by the location of the unit in the aircraft or the magnetic fields in and around it.
(d) Deviation needs to be applied to a heading but not to a track.

14. If an aircraft is tracking 045º M and the variation is 6º E, the true track is

(a) 051º.
(b) 039º.
(c) 045º.
(d) 060º.

15. If an aircraft enters a shock stall it is usually because

(a) it is flying too slowly.
(b) the angle of attack of the wing is too large.
(c) it is flying too fast.
(d) the wing loading is excessive.

16. Consider the reports METAR and SPECI. Which of these could include a wind direction of 060º M?

(a) only METAR
(b) only SPECI
(c) both
(d) neither

17. The greatest hazard that thunderstorms pose to landing aircraft is the possible presence of

(a) microbursts.
(b) heavy rain.
(c) hail.
(d) severe turbulence.

See next page

18. The position of the North Magnetic Pole is

(a) a fixed point on the Earth's surface.
(b) continually varying and variation must be adjusted whenever it is applied to a true track.
(c) continually varying but the annual change will not normally cause a significant navigational error if it is ignored in Australia.
(d) continually varying and deviation must be adjusted whenever it is applied to a true track.

19. When using a magnetic compass, readings should only be taken when

(a) compass deviation is zero.
(b) the aircraft is in straight and level flight.
(c) the landing lights are off.
(d) the aircraft is not accelerating or decelerating.

20. The F–111 aircraft had a variable geometry wing that allowed the pilot to change the angle of wing sweepback. For a cross-section of the wing parallel to the relative airflow, what happened to the ratio below as this angle increased?

$$\frac{\text{wing chord}}{\text{thickness of wing}}$$

(a) The ratio increased.
(b) The ratio decreased.
(c) The ratio stayed the same.
(d) The ratio cannot be determined.

End of Section One

See next page

Section Two: Short answer **64% (140 Marks)**

This section has **20** questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

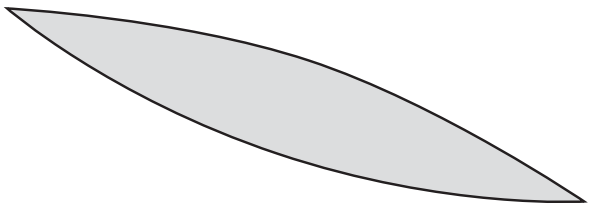
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 120 minutes.

Question 21 **(6 marks)**

A wing designed for supersonic flight is in an airflow of Mach 1.7. Mark up and label the cross-section of the wing below, showing

- a region where the airflow has a velocity of Mach 1.7
- the region where the airflow velocity is less than Mach 1.7
- the region where the airflow velocity is greater than Mach 1.7
- the region of highest pressure
- any shock waves (identified as either normal or oblique).



See next page

Question 22 **(8 marks)**

Using the extract from ERC 5 below showing the region to the south and west of Darwin airport, answer the questions that follow.

See next page

(a) What is the approximate magnetic track and distance from Darwin Airport to Port Keats (to the east of Kununurra)? (2 marks)

Track: _____ Distance: _____

(b) What is the lowest safe altitude for flights in the vicinity of Port Keats? (1 mark)

_____

(c) What is the latitude and longitude of Port Keats (to the nearest 1 minute)? (2 marks)

Latitude: _____ (N or S) Longitude: _____(E or W)

(d) What is the lower limit of Class A airspace in the vicinity of Port Keats? (1 mark)

_____

(e) An aircraft is tracking on W843 from Darwin below A100. When the aircraft is 130 nm from Darwin, what VHF frequency should the pilot be listening to? What is the call sign of the Air Services unit monitoring the frequency? (2 marks)

Frequency: _____

Call sign: _____

Question 23 **(4 marks)**

METAR YMEK 230430Z 160/18KT CAVOK 18/10 Q1012
RMK RF00.0/000.0 5CU062

The METAR above is being used by the pilot planning a take-off from Meekatharra. The runways at this airfield are 09/27 and 15/33.

(a) Which runway would be more appropriate for take-off? Justify your answer. (2 marks)

_____

_____

(b) The aircraft has a maximum takeoff crosswind component of 15 kt. Is either of the runways unusable because the crosswind component is too high? Justify your answer. (2 marks)

_____

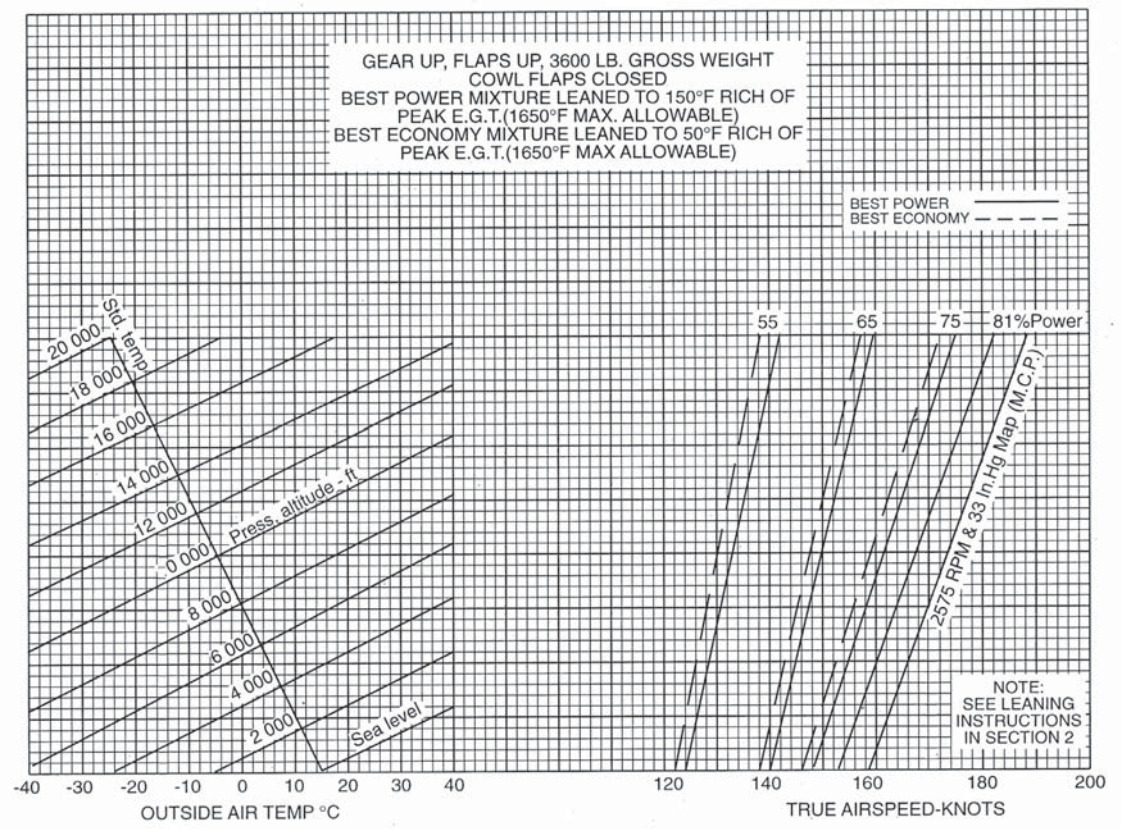
_____

See next page

Question 24 **(8 marks)**

Samantha is planning a VFR flight from Darwin to Kununurra in a PA-32RT. She wants to get there with the least amount of flight time. The use of power settings greater than 75% is prohibited in her company's Operational Manual.

(a) Using the PA-32RT Performance Chart below, what power setting and height should she select, assuming standard temperature and variable winds at all altitudes? What TAS can she expect with these selections? Ignore any VFR cruise level restrictions. Show your workings. (2 marks)



Power setting: _____

Cruise height: _____

TAS: _____

Samantha notes that the track from Darwin to Kununurra is 209º M and the distance is 207 nm. She then obtains an Area Forecast containing the following wind data.

WIND:

3000	5000	7000	10000	14000	18500
350/15	355/15	010/15	020/20 PS12	040/25 PS05	070/10 MS0

See next page

(b) What **two** heights in the forecast offer the best ground speed? Explain your answer. (2 marks)

(c) Samantha also notes that there is a layer of cloud at 10 000 ft that will preclude VFR flights above this level. She selects 8500 ft as her cruise altitude and opts to use the forecast wind of 015/17 and a TAS of 158 kt to determine her heading and ground speed.

VFR cruise levels		
Magnetic track	From 000º through east to 179º	From 180º through west to 350º
Cruising altitudes	Odd thousands + 500 ft	Even thousands + 500 ft
Cruising flight levels	Odd flight levels + 500 ft	Even flight levels + 500 ft

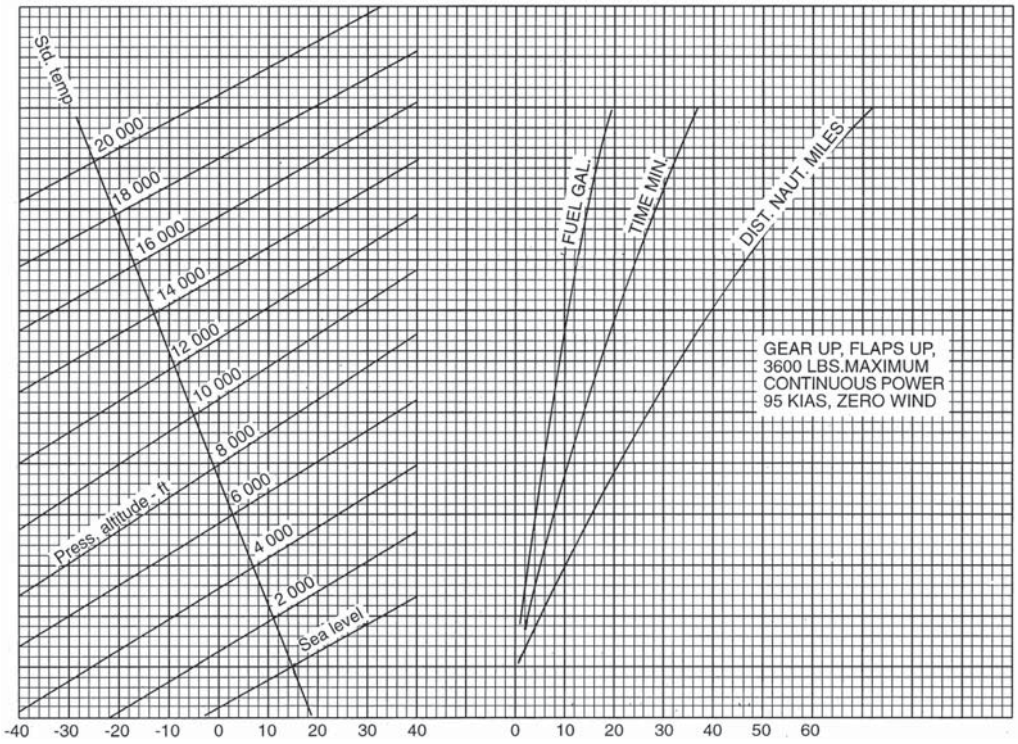
IFR cruise levels		
Magnetic track	From 000º through east to 179º	From 180º through west to 350º
Cruising altitudes	Odd thousands	Even thousands
Cruising flight levels	Odd flight levels	Even flight levels

Complete the right hand column in the table below and use your flight computer to determine the ground speed and heading components. (4 marks)

Item	**Value**	**Adjusted for magnetic variation (3º E) if applicable**
Track	209º	
TAS	158 kt	
Wind direction	015º	
Wind speed	17 kt	
Heading		
Ground speed		

See next page

Question 25 **(7 marks)**



Departure aerodrome	Cruise altitude
Pressure height 3000 ft	12 000 ft
OAT +9 °C	OAT –7 °C

Using the data in the table and using the PA-32RT climb chart above, determine the following:

(a) (i) Fuel consumed (2 marks)

(ii) Time to climb (1 mark)

(iii) Distance to climb (1 mark)

(b) Which, if any, of the numbers above would change if there was an average headwind of 20 kt throughout the climb? Calculate the revised number(s). (3 marks)

See next page

Question 26 **(11 marks)**

Mal is planning a flight from Port Hedland to Broome (17º 57' S, 122º 14' E) on 21 November 2013. The distance is 252 nm and he is expecting a ground speed of 180 kt. The passengers on the flight have requested an arrival time of 1815 WST.

(a) Calculate how long the flight will take. (1 mark)

_____

_____ minutes

(b) Mal subsequently obtains a revised meteorological forecast and calculates a revised time interval of 87 minutes. At what time will he need to depart from Port Hedland to meet the requested arrival time at Broome? Show your workings. (2 marks)

_____

_____

_____ WST

(c) Using the last light chart below, demonstrate that last light on 21 November is at 1842 LMT. (1 mark)

See next page

Question 26 (continued)

(d) Determine the equivalent time in UTC and WST. Note: the location of Broome is 17° 57´S, 122° 14´E Show your workings. (3 marks)

For copyright reasons this chart cannot be reproduced in the online version of this document.

(e) Given that the requested arrival time is 1815 WST, will the aircraft arrive at Broome before **or** after last light, and by how many minutes? Show your workings. (2 marks)

Circle the correct answer: Before After

Number of minutes: _____

Show your workings: _____

See next page

(f) In the last light graph, on 22 March, the LMT indicated is the same for all latitudes. Why is this so? (Hint: no adjustment is required on 22 September either and the same situation exists on the first light charts.) (2 marks)

Question 27 **(4 marks)**

In flight, the advancing and retreating blades of a conventional helicopter produce varying amounts of lift.

(a) Explain why this difference in lift occurs. You may use a diagram to assist with your explanation. (2 marks)

(b) What design features help to overcome the adverse consequences of the differences in lift? (2 marks)

See next page

Question 28 **(9 marks)**

TAF YSCR 290200Z 2904/2916 12012KT CAVOK
RMK T 37 38 35 33 Q 1010 1008 1009 1010

The above TAF is being used by the pilot of a light aircraft planning a flight to Southern Cross arriving at 290900Z.

The elevation of Southern Cross is 1163 ft.

(a) Using a formula, show that the pressure height is 1313 ft. (1 mark)

(b) Using the information in the TAF complete the table below. Show that the landing distance required at YSCR is 580 m using the data in the Piper Model PA32RT-300T Landing Weight chart on page 17. (4 marks)

Pressure height	1313 ft
Temperature	
Surface	Long wet grass
Slope	2% up
Runway direction	120º
Variation	0
Headwind/tailwind component	
Landing weight	1500 kg
Runway length available	550 m
Estimated fuel remaining on arrival	200 L
Freight on board	200 kg
Passengers on board	3 (each weighing 70 kg)

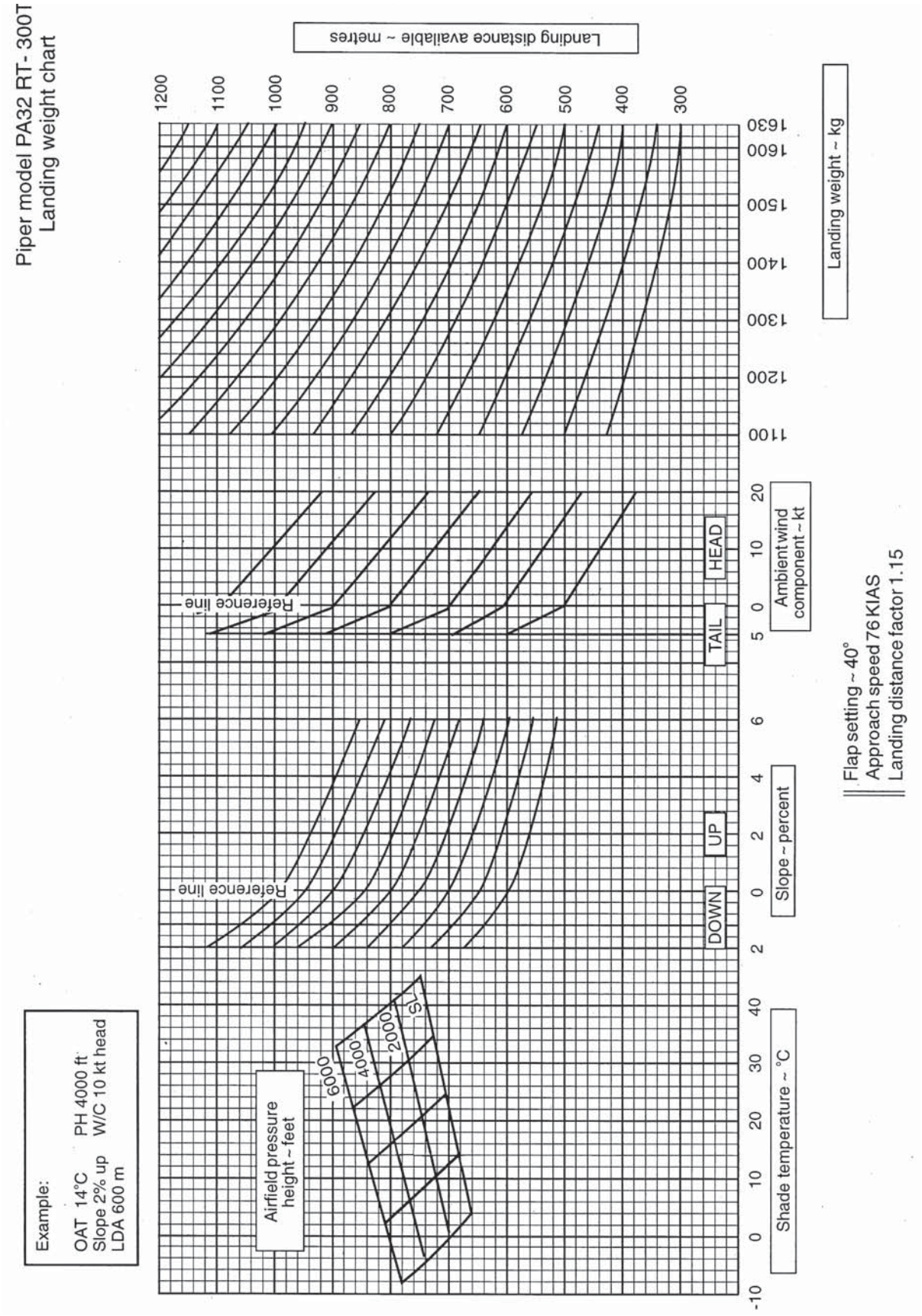
(c) Noting that runway length available is insufficient, determine the maximum landing weight permitted by the chart. (1 mark)

(d) The pilot decides that he wants to reduce the aircraft take-off weight by 100 kg before undertaking the flight to YSCR. List **two** options that he could consider. (2 marks)

One:

Two:

See next page



See next page

Question 28 (continued)

(e) For all flights above the transition layer, a standard barometric pressure (1013 HPa) is used during cruise to ensure that all aircraft are using the same reference.

Why is using a standard 1013 setting at all times **not** suitable in airport circuit areas and for approaches and departures? (1 mark)

_____

_____

Question 29 **(10 marks)**

Mel is planning an IFR flight departing from Rottnest (elevation 12 ft), where the air temperature is 18 ºC and QNH is 1013. Her aircraft is certified for flight in known icing conditions. She has been given the following table showing the current temperatures at each 1000 ft altitude increment above Rottnest. She also observes that there is a broken layer of cloud that she will enter as the aircraft climbs out on departure from Rottnest. She estimates that the base of the cloud is at 3000 ft.

Mel is cleared to climb to her planned cruising altitude of FL120 on a heading of 045 ºM.

Assuming that the DALR is 3 ºC/1000 ft and the SALR is 1.5 ºC/1000 ft, answer the following questions, showing your workings in the table below.

Altitude	Temperature		
16 000	–16		
15 000	–12		
14 000	–8		
13 000	–6		
12 000	–4		
11 000	–2		
10 000	1		
9000	3		
8000	3.5		
7000	4		
6000	4.5		
5000	5		
4000	5.5		
3000	6		
2000	10		
1000	14		
SL	18		

See next page

(a) Determine the dew point temperature. (1 mark)

(b) Calculate the ELR at 2000 ft. (1 mark)

(c) At what altitude might Mel expect to see ice accumulating on the airframe? (2 marks)

(d) At which Flight Level is the top of the cloud expected? (2 marks)

(e) When the aircraft levels off at its assigned altitude, will it be operating in IMC or VMC at that time? Justify your answer. (2 marks)

(f) If Mel's aircraft was **not** certified for flight at altitudes where airframe icing is predicted, what is the maximum suitable altitude that Mel could have planned? Use the tables below to explain your answer. (2 marks)

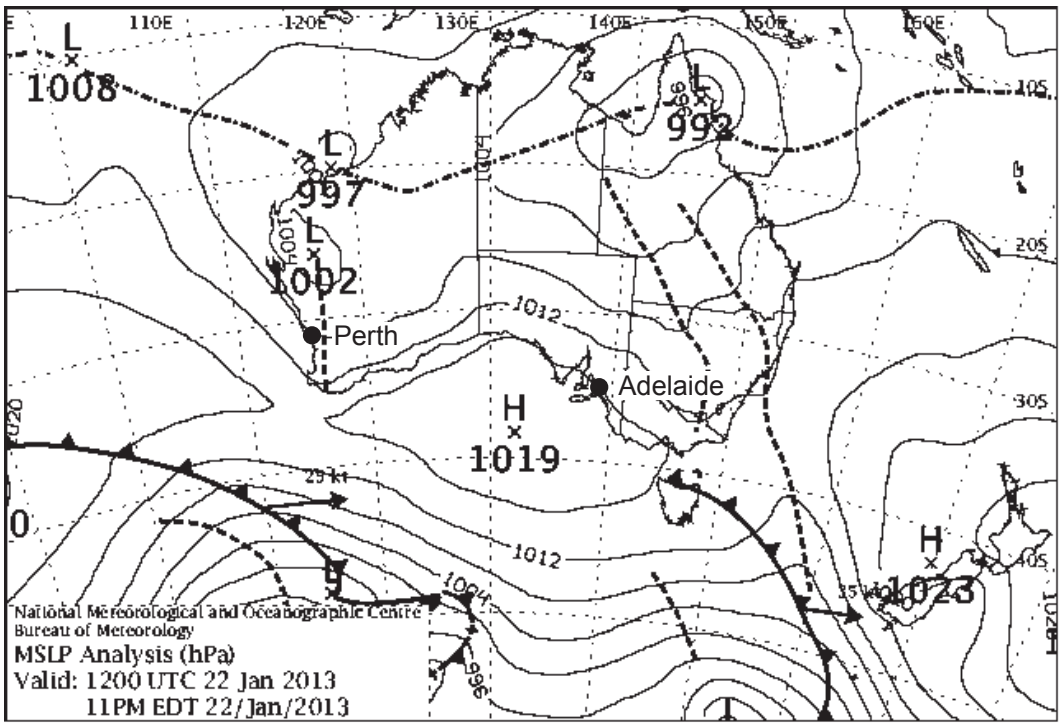
VFR cruise levels		
Magnetic track	From 000º through east to 179º	From 180º through west to 350º
Cruising altitudes	Odd thousands + 500 ft	Even thousands + 500 ft
Cruising flight levels	Odd flight levels + 500 ft	Even flight levels + 500 ft

IFR cruise levels		
Magnetic track	From 000º through east to 179º	From 180º through west to 350º
Cruising altitudes	Odd thousands	Even thousands
Cruising flight levels	Odd flight levels	Even flight levels

See next page

Question 30 **(7 marks)**

The questions below are based on the following weather map:



(a) (i) There is a low pressure trough along the west coast. What is the primary characteristic of the air mass within the trough that has been responsible for the pressure being so low? (1 mark)

_____

(ii) From which general direction would the captain of an aircraft flying from Adelaide to Perth at 4000 ft expect the wind to be blowing? (1 mark)

_____

(iii) What is the speed of the cold front located south of Western Australia? (1 mark)

_____

See next page

(b) Indicate with an X on the weather map on page 20 the weather feature with the **least** predictable behaviour. Explain your answer. (2 marks)

(c) The weather map on page 20 is a Mean Sea Level analysis. The captain of an aircraft flying from Perth to Adelaide at 39 000 ft would, however, be using an upper air analysis for the cruise phase of the flight. From which general direction would the captain expect the wind to be blowing? Explain your answer. (2 marks)

Question 31 **(4 marks)**

(a) What are the **three** stages in the life of a thunderstorm? (3 marks)

First: _____

Second: _____

Third: _____

(b) In which stage is the presence of downdraughts most prevalent? (1 mark)

See next page

Question 32 **(6 marks)**

List the **three** primary flight controls that are used by the pilot to manoeuvre a helicopter and identify the effect that each of them has on the helicopter.

Primary flight control	Effect on helicopter
One: _____	
Two: _____	
Three: _____	

See next page

Question 33 **(8 marks)**

An aircraft with a TAS of 150 kt departs from Broken Hill at 0100 UTC on a heading of 120º M. The ARFOR indicates the wind to be 'variable'.

At 0140 UTC the DME indicates the aircraft is 90 nm from Broken Hill. The pilot is able to make a positive fix and determines that the aircraft is 8º south of the intended track.

Show your workings to answer the following questions.

(a) What is the magnitude and direction of the turn necessary to correct the track error? (2 marks)

(b) Has the aircraft experienced a headwind or a tailwind? What is the magnitude of the headwind or tailwind component? (2 marks)

At 0145 UTC the pilot notices a significant wind change and adjusts the aircraft's heading. One hour later the pilot confirms that he is paralleling his intended track and is 12 nm to the south of it. At 0300 UTC, he notes that he is 120 nm from his destination. His heading since 0200 UTC is 125º M.

(c) Using the 1 in 60 rule, show the workings necessary to calculate the closing angle and direction to turn in order to track toward the destination. (2 marks)

(d) Calculate the new heading required if the pilot is to track directly to the destination. (2 marks)

See next page

Question 34 **(6 marks)**

When flying – an environment that is not natural to the human body – pilots can be susceptible to strange visual effects and altered perceptions, such as:

1. empty field myopia
2. autokinesis
3. night lights
4. failure of depth perception
5. 'rounding out' too high when landing on broad runways.

Select any **three** of the above illusory errors and explain briefly what illusions are experienced and what causes them to occur.

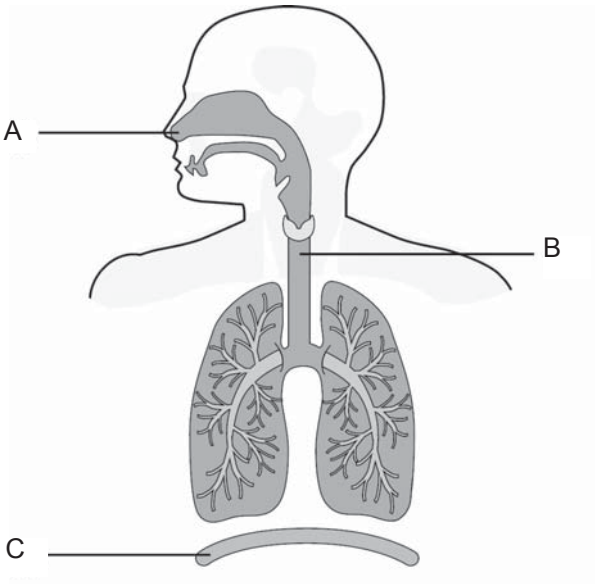
Illusion number: _____

Illusion number: _____

Illusion number: _____

See next page

Question 35 **(9 marks)**



(a) Referring to the above diagram of components of the human respiratory system, identify the labelled items. (3 marks)

A: _____

B: _____

C: _____

(b) Explain the role of haemoglobin in the body's process of respiration. (2 marks)

_____

_____

_____

_____

_____

_____

See next page

Question 35 (continued)

(c) Before and during World War II, aircraft crew routinely experienced the symptoms of insufficient oxygen in the blood.

(i) What is this condition called? (1 mark)

_____

(ii) Describe **two** major symptoms of this condition. (2 marks)

One: _____

Two: _____

(iii) Why does it occur so rarely nowadays? (1 mark)

_____

Question 36 **(5 marks)**

(a) Consider the weather patterns that exist during the year across the area shown below. Identify the general region to which the statement is appropriate. In each case, circle the correct answer. (3 marks)

Which region:

is prone to cyclones between November and April?

A B C D E

is at the centre of a series of high pressure systems in winter?

A B C D E

is under the influence of moist south-easterly winds for most of the year?

A B C D E

(b) The west coast of Australia experiences strong summer sea breezes. List **two** factors that contribute the strength of these breezes. (2 marks)

One: _____

Two: _____

See next page

Question 37 **(8 marks)**

Perth Airport is currently unable to handle the number of aircraft departures during the morning peaks between 0500WST and 0830 during week days. Most of the aircraft are on scheduled flights to mine sites transporting Fly-In-Fly-Out (FIFO) workers. The mining industry is pressing for more flights. A study has identified that the only way to meet the current and future demands efficiently is to construct an additional runway that can be used in parallel to the present main runway. The earliest that the runway could be brought into service is 2017.

There are two other aerodromes in the Perth area that have runways with sufficient length and pavement strength to handle the aircraft being used for the FIFO operations. They are the RAAF bases at Pearce and Gingin. These aerodromes are, 35 km and 55 km respectively north of the city centre.

At a number of airports around Australia, agreements exist whereby civil operations can be conducted from military aerodromes when capacity and operational requirements permit. Darwin and Learmonth airports are examples.

The RAAF is unlikely to agree to Pearce or Gingin being used after 0830WST because of the intensity of flying training activity. The returning FIFO flights would therefore have to land at Perth Airport. The airport can handle the return flights if an arrival slot time system is implemented noting that the arrivals occur over a six hour period.

What would be the impact on each of the following if one or both of the RAAF aerodromes were used to ease the congestion?

(a) FIFO workers (1 mark)

(b) Airline aircraft scheduling (1 mark)

(c) Airline crew scheduling (1 mark)

See next page

Question 37 (continued)

(d) Communities in the vicinity of the Perth Airport (1 mark)

(e) Passenger check-in and security screening (1 mark)

(f) Fuel and catering (1 mark)

(g) Communities in the vicinity of the RAAF aerodromes (1 mark)

(h) Aircraft maintenance planning (1 mark)

See next page

Question 38 **(6 marks)**

Global Positioning System (GPS) and Inertial Navigation System (INS) are used in the majority of airline operations for navigation en route.

(a) Identify **two** ways in which GPS is superior to INS and explain your answers. (4 marks)

One: _____

_____

Two: _____

_____

(b) Identify **one** way in which INS is superior to GPS and explain your answer. (2 marks)

_____

_____

Question 39 **(4 marks)**

Carbon monoxide (CO) poisoning is dangerous to aircrew if it enters the cabin of a light aircraft in flight.

(a) Where would the CO gas be likely to have originated in the aircraft? (1 mark)

_____

_____

(b) What are **two** of the major symptoms experienced by aircrew suffering from CO poisoning? (2 marks)

One: _____

Two: _____

(c) CO is extremely poisonous, because it attaches permanently to one component of the blood. Name the blood component affected by CO poisoning. (1 mark)

_____

_____

See next page

Question 40 **(10 marks)**

Sam's employer asked Sam to undertake a flight from Kalgoorlie to Brolga Station, 400 nm to the north east. He was to take two of his work colleagues. They needed to spend at least four hours on site to complete their work assignment. Sam estimated that the flight time would be approximately two hours each way.

On the morning of the flight, overcast conditions were forecast for the Kalgoorlie area, with drizzle and light rain above 9000 ft. There were also broken areas of cloud above 3000 ft.

Fine conditions were forecast for Brolga but on Sam's return flight he could expect to encounter deteriorating conditions as he approached Kalgoorlie. The cloud base would be lower but visual meteorological conditions should still exist in the Kalgoorlie circuit area.

After take-off from Kalgoorlie, Sam noted that the cloud base was 3000 ft as forecast but the areas of rain were heavier than had been forecast.

Approximately 100 nm from Brolga, the weather cleared and he carried out a visual approach to the station's airstrip.

After landing, Sam asked Flight Information Service (FIS) if there had been any update to the Kalgoorlie TAF but was advised that none had been issued. Sam was concerned that if the weather deteriorated further than that forecast, he might need to depart with full fuel tanks to allow him to either remain airborne while the conditions improved at Kalgoorlie or to divert to another aerodrome.

Fuel was available only in 200 L drums at Brolga and only full drums could be purchased, so any unused fuel would just be wasted. Sam calculated that he would need 1½ drums to refuel the aircraft fully. One drum of fuel would be enough to return to Kalgoorlie, but should the Kalgoorlie weather deteriorate to become worse than forecast, he might not have enough fuel to fly to another aerodrome. Sam decided to purchase two drums.

The work took longer than anticipated. The three had missed lunch and departed an hour later than planned.

On departure, the flight encountered cloud and rain much closer to Brolga than in the morning and the aircraft was soon in IMC. Sam again asked FIS whether an update to the TAF had been issued but was again advised that none had been.

About an hour from Kalgoorlie, Sam began to hear radio communications from aircraft in the Kalgoorlie area. He was alarmed to hear that VFR traffic was being advised to divert elsewhere due to low cloud and the IFR aircraft were conducting instrument approaches. He again asked FIS for an amended TAF. FIS read back the current TAF. The forecast conditions in it were far worse than the forecast that he had been issued. It now appeared that FIS had assumed that Sam had been given the current TAF. The current TAF clearly required that Sam plan for an alternate.

Sam felt relieved about his decision to depart Brolga with full tanks. His attention was now focused on planning an instrument arrival into Kalgoorlie. He knew that in addition to aircraft already in the circuit area, a jet airliner was due to arrive at Kalgoorlie around his ETA. Sam entered the holding pattern for the approach to the into-wind runway, 09.

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Sam was concerned when he heard the pilot of the aircraft that immediately preceded him declare that he had aborted his landing. The pilot could not see the runway, and had decided to divert to an alternate aerodrome.

Sam knew that the instrument approach for RWY 27 offered a much better chance of becoming visual on final and the downwind component was only 5 kt. He therefore advised the other aircraft in the holding pattern that he was changing to that runway. Sam was aware that all the other aircraft would need to make allowances for his action to maintain flight safety.

Due to the concentration needed, Sam was starting to feel fatigued and struggling to fly as accurately as he wished. Since he expected the aircraft to be in cloud for much of the approach, he asked the passenger sitting in the seat next to him to advise him as soon as he saw the ground on final approach. This helped him to concentrate on flying the aircraft accurately.

Just before the position on the approach where Sam needed to be visual to continue, the passenger advised that he could see a break in the clouds. Sam looked left and determined that he could manoeuvre the aircraft to stay clear of cloud and land on the runway. A safe landing followed.

(a) Identify **five** threats or errors that Sam faced during the flight. (5 marks)

One: _____

_____

Two: _____

_____

Three: _____

_____

Four: _____

_____

Five: _____

_____

See next page

Question 40 (continued)

(b) For **three** of the threats or errors you have listed in (a), indicate the actions that Sam took to reduce their impact **or** actions that he should have taken. Identify clearly the threat or error that you are referring to at the start of your answer (3 marks)

Threat number: _____

Action : _____

_____

Threat number: _____

Action : _____

_____

Threat number: _____

Action : _____

_____

(c) If an opened drum with sufficient fuel to fill up the tanks in Sam's aircraft had been available at the station and Sam had elected to use it, would this have introduced another threat? Circle the appropriate answer below. (2 marks)

Yes No

Explain your answer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

End of questions

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ACKNOWLEDGEMENTS

Section Two

Question 22 Chart adapted from: Airservices Australia. (2012). *ERC Low L6* [effective 15 November, 2012]. Canberra: Airservices Australia. No part of this work may be reproduced in any form without the prior written consent of Airservices Australia. Not for operational purposes.

Question 24 (a) Chart from: Yeo, M., Bowers, G., & Bennett, K., (2001). PA-32RT cruise performance. *Handbook of flight* (2nd ed.). Perth: WestOne Services, p. 170. Not for operational purposes.

Question 25 (a) Chart from: Yeo, M., Bowers, G., & Bennett, K., (2001). PA-32RT fuel, time and distance to climb performance. *Handbook of flight* (2nd ed.). Perth: WestOne Services, p. 169. Not for operational purposes.

Question 26 (c) Chart from: Airservices Australia. (2004). End of daylight. *Aeronautical information package (AIP) Australia GEN 2.7–5* [issue date 25 November, 2004]. Canberra: Airservices Australia. No part of this work may be reproduced in any form without the prior written consent of Airservices Australia. Not for operational purposes.

Question 26 (d) Chart from: Airservices Australia. (2004). Conversion of arc to time. *Aeronautical information package (AIP) Australia GEN 2.7–5* [issue date 25 November, 2004]. Canberra: Airservices Australia. No part of this work may be reproduced in any form without the prior written consent of Airservices Australia. Not for operational purposes.

Question 28 Chart from: Yeo, M., Bowers, G., & Bennett, K., (2001). PA-32RT landing weight. *Handbook of flight* (2nd ed.). Perth: WestOne Services, p. 155. Not for operational purposes.

Question 30 Bureau of Meteorology. (2013). MSLP analysis – 1200 UTC 22/01/2013 [Chart]. Retrieved January 22, 2013, from www.bom.gov.au/australia/charts/synoptic_bw.shtml

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