LUI | | | | | | | | | | | School code | | | | |

School name

Given name/s

Family name

Attach your barcode ID label here

Book of books used

External assessment 2023

Question and response book

Aerospace Systems

Time allowed

- Perusal time — 10 minutes
- Working time — 120 minutes

General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator permitted.
- QCAA-approved flight calculator permitted.
- Protractor and ruler or plotter required.
- QCAA formula and data book provided.
- Planning paper will not be marked.

Section 1 (10 marks)

- 10 multiple choice questions

Section 2 (70 marks)

- 13 short response questions

Clear zone — margin trimmed off after completion of assessment

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

DO NOT WRITE ON THIS PAGE

THIS PAGE WILL NOT BE MARKED

Section 1

Instructions

- This section has 10 questions and is worth 10 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- Choose the best answer for Questions 1–10.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○

Ensure you have filled an answer bubble for each question.

Do not write outside this box.

Section 2

Instructions

- Write using black or blue pen.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.
- This section has 13 questions and is worth 70 marks.

QUESTION 11 (3 marks)

State three ways that an organisation can minimise the risk of accidents occurring due to cultural or environmental reasons.

QUESTION 12 (4 marks)

Identify two negative effects that a high body mass index (BMI) can have on pilots with a BMI greater than 30. Provide two strategies to reduce a pilot's BMI.

Do not write outside this box.

QUESTION 13 (3 marks)

Identify three sensing mechanisms that influence pilot disorientation.

QUESTION 14 (4 marks)

Describe the purpose of the TCAS and SSR. Provide one limitation of each in an aviation safety context.

TCAS purpose:

TCAS limitation:

SSR purpose:

SSR limitation:

Do not write outside this box.

QUESTION 15 (6 marks)

Health and fitness are vitally important to ensuring safe operation in the aviation industry.
Provide an example where safe operations may be impeded if a member of the ground or flight crew:

a) smokes. *[2 marks]*

b) has poor general health. *[2 marks]*

c) has poor emotional health. *[2 marks]*

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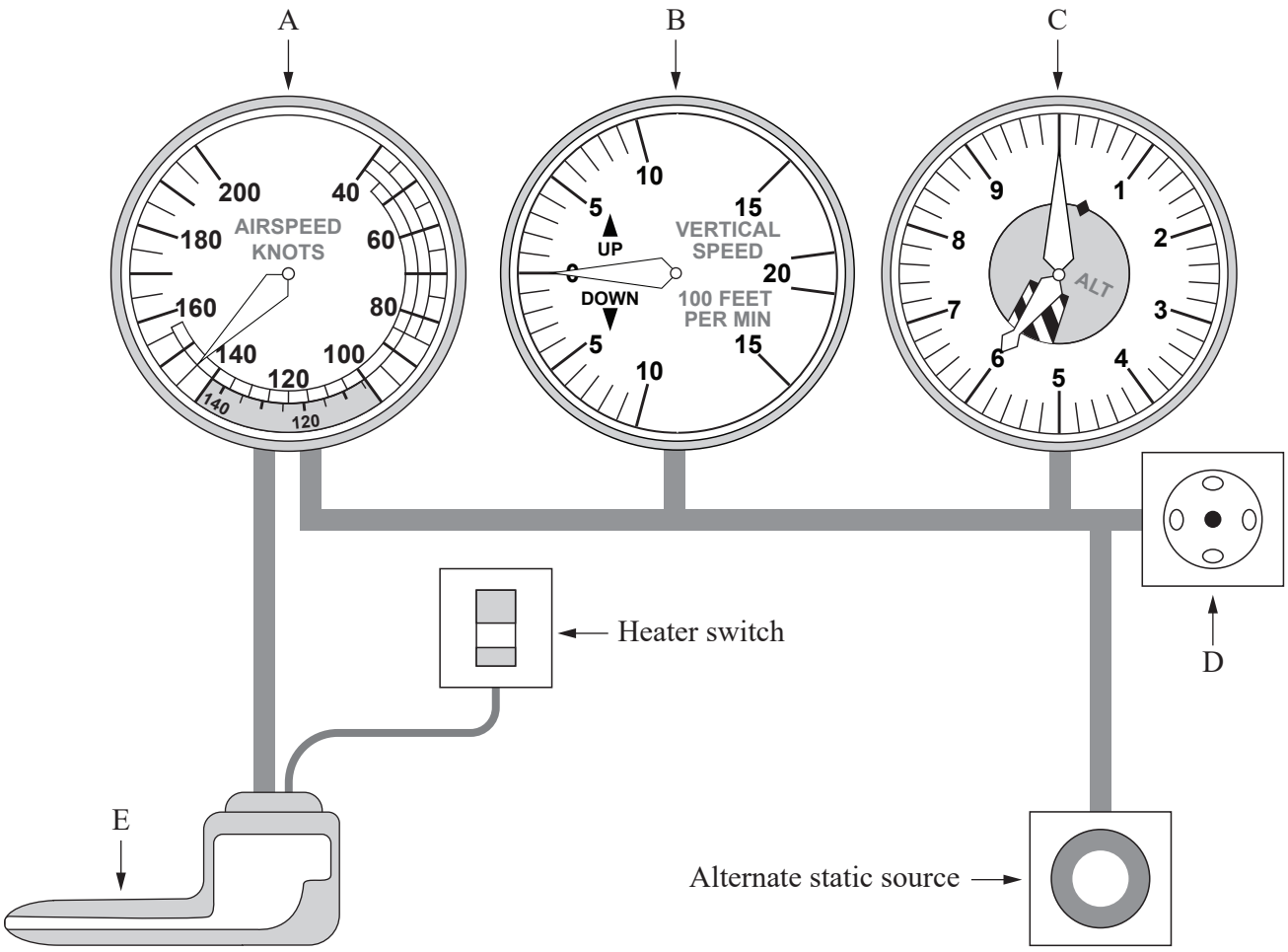
CONTINUE TO THE NEXT PAGE

QUESTION 16 (6 marks)



Do not write outside this box.

Explain the functions of the parts labelled A–E and determine this system's purpose.

Do not write outside this box.

QUESTION 17 (6 marks)

A pilot flying at night notices the stars ahead of them start to move in an oscillating fashion. Analyse the situation and identify what visual illusion the pilot is experiencing. State two dangers of this illusion and provide three solutions.

QUESTION 18 (6 marks)

a) List three components of an aircraft's fuel system. *[3 marks]*

b) List three components of an aircraft's pressurisation system. *[3 marks]*

Do not write outside this box.

QUESTION 19 (5 marks)

In a flight simulation, a pilot was notified that their airspeed indicator was unreliable and they had to provide a course of action to identify the instrument's reliability. The pilot chose to decrease and then increase their airspeed to work out if their senses and flight instruments behaved as intended during the straight and level flight manoeuvre.

Provide and annotate a systems thinking feedback loop to explain the causal relationship between an unreliable airspeed indicator and the sensations felt by the vestibular system.

Note: If you make a mistake in the sketch, cancel it by ruling a single diagonal line through your work and use the additional response space at the back of this question and response book.

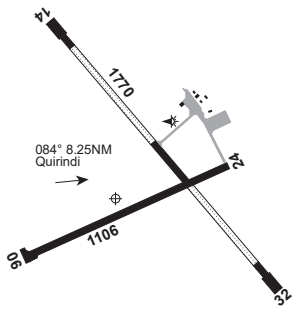
Do not write outside this box.

QUESTION 20 (7 marks)

ERSA update for Quirindi

QUIRINDI **ELEV 1058**

AVFAX CODE 2024



NSW UTC +10 YQDI
312955S 1503105E VAR 12 DEG E **CERT**
AD OPR Liverpool Plains Shire Council, PO Box 152, Quirindi, NSW, 2343.

REMARKS

1. AD Changes: RPT ACFT $2/PAX.
2. Other ACFT $5/landing/tonne.
3. Tie-down facilities - $105/ACFT/annum.
4. AG Facilities and Apron - $525/ACFT/annum.
5. Apron usage fee - $105/ACFT/annum.

PASSENGER FACILITIES

PT/WC

AERODROME OBSTACLES

Powerlines on APCH at NW end 1380M FM RWS end.

PHYSICAL CHARACTERISTICS

06/24	054	36a	5700/ Sealed.	WID 18	RWS 90
14/32	128	58c	5700/580 (84PSI) Gravel. 185M FM each RWY end and central 295M sealed only.	WID 30	RWS 150

AERODROME AND APPROACH LIGHTING

RWY 14/32 LIRL PAL125.3

ATS COMMUNICATIONS FACILITIES

FIA BRISBANE CENTRE 127.1 Circuit Area

RADIO NAVIGATION AND LANDING AIDS

NDB QDI 386 312934.2S 1503125.6E Range 40 (HN 40) (1)

(1) Pilot monitored.

LOCAL TRAFFIC REGULATIONS

1. All ACFT movements restricted to designated RWY, TWY and APN only.
2. Light ACFT with tail skid must not taxi on gravel.

CTAF 127.8

ADDITIONAL INFORMATION

1. Bird hazard exists.
2. Loose SFC stones.
3. High intensity military CT4B operations are likely MON-FRI 0800-1700 local in Quirindi CTAF and D523, SFC to A080. Aircraft conducting instrument approach training and circuits will broadcast as callsign Roller, Charlie or Check on CTAF 127.8 and monitor BN CEN 127.1. Information regarding scheduling can be requested from BAE Operations.

CHARTS RELATED TO THE AERODROME

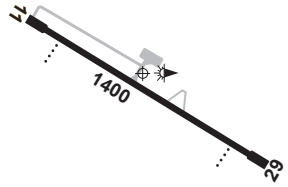
1. WAC 3357.
2. Also refer to AIP Departure and Approach Procedures.

Do not write outside this box.

ERSA update for Scone

SCONE **ELEV 745**

AVFAX CODE 2023



NSW		UTC +10	YSCO
320214S	1504956E	VAR 12 DEG E	CERT

AD OPR Upper Hunter Shire Council, PO Box 208, Scone, NSW, 2337.

REMARKS

AD Charges: Refer to http://upperhunter.nsw.gov.au/ for current fees and charges. Bookings for ACFT PRKG is compulsory over 5,700KG.

HANDLING SERVICES AND FACILITIES

Aero Refuellers - H24 AVGAS bowser. Accepts Aero Refuellers cards, V and MC.

PASSENGER FACILITIES

Terminal facilities AVBL in Scone Aero Club. Access is via door FM carpark.

METEOROLOGICAL INFORMATION PROVIDED

1. TAF CAT D, METAR/SPECI.
2. AWIS PH 02 9353 6449 - Report faults to BoM.
3. AWIS FREQ 134.55 (requires 1 second pulse to activate) - Report faults to AD OPR.

PHYSICAL CHARACTERISTICS

11/29	110	46	PCN 15 /F /C /1200 (174PSI) Uneven SFC due to soil movement WID 30	RWS 90

RWS not AVBL due soft and rough SFC.

AERODROME AND APPROACH LIGHTING

RWY 11/29 AD LGT on HN.

RADIO NAVIGATION AND LANDING AIDS

NDB	SCO	209	320205.1S	1504951.7E	Range 40 (HN 40)	(1)

(1) Pilot monitored.

LOCAL TRAFFIC REGULATIONS

1. Exit TWY at the RWY 11 end is 7.5M wide.
2. Two gravel TWY to the fire bombing base is restricted to fire bombing ACFT only.
3. Main TWY BTN ‘Air Pasture’ and hangars not AVBL due to uneven SFC.

CTAF 128.0

ADDITIONAL INFORMATION

1. Animal hazard (kangaroos, foxes and birds) exists WI VCY RWY 11/29.
2. Caution: The pilot in command should be aware of the terrain and obstacles in the circling area prior to conducting Night IFR OPS into Scone.
3. Caution: During rain, GA APN holds excessive water at entrance and near refuelling bowser.

CHARTS RELATED TO THE AERODROME

1. WAC 3456.
2. Also refer to AIP Departure and Approach Procedures

Do not write outside this box.

A pilot is flying due north towards Tamworth when a passenger has a medical emergency that requires an emergency landing. Quirindi and Scone are the closest available airports. The aircraft is currently 18 NM and a 265° M bearing from Quirindi and 30 NM and a 172° M bearing from Scone. The aircraft has a TAS of 115 kts and the wind throughout the flight and at both aerodromes is 058/20.

Use the ERSA extracts on the previous pages to:

a) determine the flight time to both aerodromes. *[2 marks]*

b) evaluate, with supporting data, which runway would be the most appropriate for the diversion. *[5 marks]*

Do not write outside this box.

QUESTION 21 (5 marks)

A pilot is flying from Albany Park to Labelle Downs. The minimum safe altitude limit is 1000 ft above all obstructions 10 NM either side of the flight. For this flight there is a variation of 2.5° E.

Use Stimulus 2 in the stimulus book to determine:

- bearing
- magnetic bearing
- distance of the flight
- highest point along the track
- minimum safe altitude.

Do not write outside this box.

QUESTION 22 (9 marks)

An aircraft operated by a single pilot took off from Airport A (UTC+10) at 1200 UTC and was due to arrive at Airport B at 1800 UTC. The pilot had a normal night's sleep before waking at 2100 UTC the morning of the flight and performed some landscaping, including moving heavy rocks. The pilot always did their checklist from memory, but missed that the cabin pressurisation system was not activated. The aircraft climbed to 15 000 ft and commenced its cruise to Airport B. The pilot lost consciousness en route, and when they awoke, the aircraft was out of fuel and descending, having flown past Airport B.

Identify and evaluate the causes that led to the pilot's loss of consciousness. Determine if the decision to fly was sound and make justified recommendations outlining what the pilot could have done to avoid losing consciousness.

Do not write outside this box.

Do not write outside this box.

QUESTION 23 (6 marks)

A pilot is planning a flight from Nyngan (YNYN) to Gilgandra (YGIL) overflying Lightning Ridge (YLRD) in a Cessna 172 with an ETD of 2300 UTC.

- Wind = 050°/30
- TAS = 105 kts
- Usable fuel = 160 L
- Fuel rate = 36 L per hour
- Magnetic variation = 10° E
- Taxi fuel = 10 L at YNYN and YGIL
- Cruise altitude will be reached while on track.
- Climb fuel and time are assumed as part of cruise fuel and time.
- Regulatory requirement for fixed fuel reserve is 45 mins of flight time.

Using Stimulus 3 in the stimulus book, complete a flight plan and fuel log forms. Provide an ETI, EET, PLN EST, endurance for the flight and fuel left on board on engine shutdown at YGIL.

NAV/COMM LOG											
	LSALT	ALT	TAS	TR (m)	WIND	HDG	G/S	DIST	ETI	EET	PLN EST
YNYN											2300
YLRD	15714	A075	105	009	040/30	018	78	131			
YGIL	1918	A075	105	156	040/30	141	115	137			

Fuel	Min	Litres
Climb		
Cruise	173	104
Alternate		
Sub-total	173	104
VRB RES (15%)		
Fixed RES (45 min)	45	

Fuel		Min	Litres
Holding	Inter 30 min		
	Tempo 60 min		
Taxi			20
Fuel required		218	151
Fuel margin		15	
Endurance			

Note: If you make a mistake in the flight plan or fuel log forms, cancel it by ruling a single diagonal line through your work and use the additional response space at the back of this question and response book.

Do not write outside this box.

END OF PAPER

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

ADDITIONAL RESPONSE SPACE FOR QUESTION 23

If you want this flight plan or these fuel log forms to be marked, rule a single diagonal line through your original response.

NAV/COMM LOG											
	LSALT	ALT	TAS	TR (m)	WIND	HDG	G/S	DIST	ETI	EET	PLN EST
YNYN											2300
YLRD	15714	A075	105	009	040/30	018	78	131			
YGIL	1918	A075	105	156	040/30	141	115	137			

Fuel	Min	Litres
Climb		
Cruise	173	104
Alternate		
Sub-total	173	104
VRB RES (15%)		
Fixed RES (45 min)	45	

Fuel		Min	Litres
Holding	Inter 30 min		
	Tempo 60 min		
Taxi			20
Fuel required		218	151
Fuel margin		15	
Endurance			

Do not write outside this box.

References

Question 16

Adapted from diagram in:
Aviation Safety Magazine 2013, 'Pitot-Static Systems', www.aviationsafetymagazine.com/features/pitot-static-systems.

Question 20

Airservices Australia, Aeronautical Information Package, March 2021, https://www.airservicesaustralia.com/aip/aip.asp?pg=10. Used by QCAA with permission.

Question 23

Adapted from CASA 2023, 'Flight planning notepad', Australian Government Civil Aviation Safety Authority, https://shop.casa.gov.au/products/flight-planning-notepad-flight-planning-notepad Available under Creative Commons Attribution 4.0 International Licence.