

# Aerospace Systems marking guide and response

External assessment 2025

## Combination response (80 marks)

### Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. recognise and describe problems, aerospace technology knowledge, concepts and principles, and systems thinking habits and systems thinking strategies in relation to aircraft performance systems and human factors
2. symbolise and explain ideas, solutions and relationships in relation to aircraft performance systems and human factors
3. analyse problems and information in relation to aircraft performance systems and human factors
5. synthesise information and ideas to propose possible aircraft performance systems and human factors solutions
7. evaluate and refine ideas and solutions to make justified recommendations.

**Note:** Objectives 4, 6 and 8 are not assessed in this instrument.

# Purpose

This document consists of a marking guide and a sample response.

The marking guide:

- provides a tool for calibrating external assessment markers to ensure reliability of results
- indicates the correlation, for each question, between mark allocation and qualities at each level of the mark range
- informs schools and students about how marks are matched to qualities in student responses.

The sample response demonstrates the qualities of a high-level response.

## Mark allocation

Where a response does not meet any of the descriptors for a question or a criterion, a mark of '0' will be recorded.

*Allow for FT error* — refers to 'follow through', where an error in the prior section of working is used later in the response, a mark (or marks) for the rest of the response can be awarded so long as it still demonstrates the correct conceptual understanding or skill in the rest of the response.

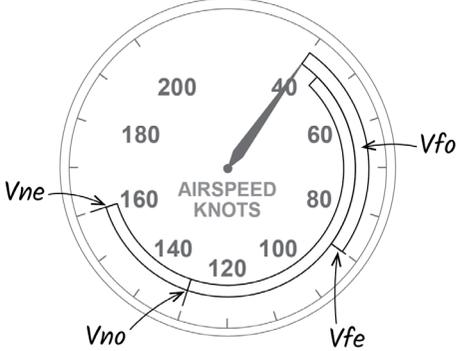
# Marking guide

## Multiple choice

Question	Response
1	D
2	D
3	A
4	D
5	B
6	A
7	C
8	B
9	A
10	C

## Short response

Q	Sample response	The response:
11a)	Ergonomics is the design of products or systems in aircraft ensuring that human interaction and experience is as efficient as possible.	<ul style="list-style-type: none"> <li>explains ergonomics in aircraft <b>[1 mark]</b></li> </ul>
11b)	<p>All light aircraft cockpits have a similar design; this increases pilot familiarity with flight controls, reducing the chance of error in take-off and landing operations.</p> <p>Primary instruments are large and feature centrally on the panel. This means they are easily seen, making them easy to use in high-stress situations.</p>	<ul style="list-style-type: none"> <li>provides a cockpit design example <b>[1 mark]</b></li> <li>explains how the example assists pilots during high-stress periods <b>[1 mark]</b></li> <li>provides a second cockpit design example <b>[1 mark]</b></li> <li>explains how the second example assists pilots during high-stress periods <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
12		<ul style="list-style-type: none"> <li>• provides appropriate annotations and labels on the airspeed indicator that clearly identify the position of: <ul style="list-style-type: none"> <li>- Vne [1 mark]</li> <li>- Vno [1 mark]</li> <li>- Vfe [1 mark]</li> <li>- Vfo [1 mark]</li> </ul> </li> </ul>

Q	Sample response	The response:
13	<p>Cultural background can negatively affect CRM, as a person's cultural beliefs may make them reluctant to challenge a captain's decision in flight. In this context, a copilot not speaking up may lead to unsafe situations.</p> <p>Language can positively affect CRM by improving clarity of communication. This can be achieved by standardising terminology to avoid misunderstandings.</p>	<ul style="list-style-type: none"> <li>• describes an effect of cultural background on CRM <b>[1 mark]</b></li> <li>• provides an example of cultural background affecting CRM <b>[1 mark]</b></li> <li>• describes an effect of language on CRM <b>[1 mark]</b></li> <li>• provides an example of language affecting CRM <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
14a)	<p>ADS-B operates by using GPS/GNSS and a datalink to provide information on the aircraft such as location, altitude and velocity.</p> <p>A limitation of ADS-B is that the transponder must be operational, and not all aircraft classes are mandated to have one.</p>	<ul style="list-style-type: none"> <li>• explains the operation of ADS-B [1 mark]</li> <li>• provides one limitation of ADS-B [1 mark]</li> </ul>
14b)	<p>PSR operates by emitting a radio wave pulse. When the wave hits an aircraft, it is reflected and returned to the radar.</p> <p>A limitation of PSR is it only provides the bearing and distance of the aircraft.</p>	<ul style="list-style-type: none"> <li>• explains the operation of PSR [1 mark]</li> <li>• provides one limitation of PSR [1 mark]</li> </ul>

Q	Sample response	The response:
14c)	<p>SSR operates by transmitting a pulse that is received by the aircraft's transponder. The transponder replies with information including location, identification and altitude.</p> <p>A limitation of SSR is it relies on the transponder to be working correctly.</p>	<ul style="list-style-type: none"> <li>• explains the operation of SSR [1 mark]</li> <li>• provides one limitation of SSR [1 mark]</li> </ul>
14d)	<p>TCAS operates by interrogating the mode C and mode S transponders of nearby aircraft and tracking their altitude and distance to issue alerts and resolution advice to pilots.</p> <p>A limitation of TCAS is that it relies on other aircraft having working mode C transponders.</p>	<ul style="list-style-type: none"> <li>• explains the operation of TCAS [1 mark]</li> <li>• provides one limitation of TCAS [1 mark]</li> </ul>

Q	Sample response	The response:
15a)	A pilot could prefer one approach procedure over a more appropriate one.	<ul style="list-style-type: none"> <li>provides an example of how bias can affect decision-making <b>[1 mark]</b></li> </ul>
15b)	A pilot could perceive the weather to be less threatening than it actually is.	<ul style="list-style-type: none"> <li>provides an example of how perception can affect decision-making <b>[1 mark]</b></li> </ul>
15c)	A pilot could incorrectly assume that the weather will clear by the time they reach the destination.	<ul style="list-style-type: none"> <li>provides an example of how assumptions can affect decision-making <b>[1 mark]</b></li> </ul>
15d)	A pilot could be unaware of their low fuel status.	<ul style="list-style-type: none"> <li>provides an example of how situational awareness can affect decision-making <b>[1 mark]</b></li> </ul>

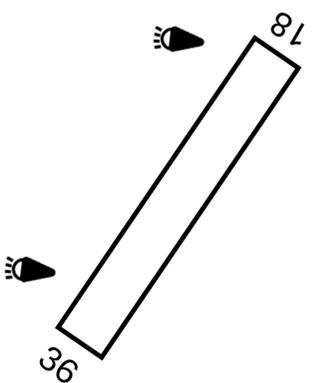
Q	Sample response	The response:
16a)	A HUD is a means of presenting information to the pilot in their line of sight. It projects important flight instrument data onto a small, transparent screen.	<ul style="list-style-type: none"> <li>• describes a HUD [1 mark]</li> <li>• provides an aerospace context [1 mark]</li> </ul>
16b)	<p>Vs: the minimum steady flight speed at which the airplane is controllable.</p> <p>Vs1: stall speed in a specific configuration, e.g. 'clean' configuration.</p> <p>Vs0: stall speed in the landing configuration.</p>	<ul style="list-style-type: none"> <li>• defines Vs [1 mark]</li> <li>• defines Vs1 [1 mark]</li> <li>• defines Vs0 [1 mark]</li> </ul>
16c)	Using a HUD ensures that a pilot's view is forward and outside the aircraft, allowing them to see airspeeds and other aircraft should they be flying close to Vs during approach and landing operations. Pilot and passenger safety is increased, as the HUD allows for better situational awareness, reduced pilot workload and reduced fatigue.	<ul style="list-style-type: none"> <li>• explains one HUD benefit with relation to Vs [1 mark]</li> <li>• justifies how the HUD improves safety [1 mark]</li> </ul>

Q	Sample response	The response:
17a)	Empty field myopia is when the eye focuses at a distance of only a few metres. In the absence of visual stimulus, the eye will settle to a natural focal distance of a few metres.	<ul style="list-style-type: none"> <li>• defines empty field myopia <b>[1 mark]</b></li> <li>• explains its physiological cause <b>[1 mark]</b></li> </ul>
17b)	A pilot experiencing empty field myopia will only be able to focus a few metres in front of themselves and may not see an aircraft in the distance, resulting in a midair collision. This often occurs in situations where there is no or limited visual stimulus, such as rainy or hazy conditions.	<ul style="list-style-type: none"> <li>• describes a scenario <b>[1 mark]</b></li> <li>• explains a resulting accident <b>[1 mark]</b></li> <li>• identifies the flight conditions with the greatest risk of empty field myopia <b>[1 mark]</b></li> </ul>
17c)	Pilots should have a routine scan that involves changing the focal distance from inside the cockpit to objects on the horizon.	<ul style="list-style-type: none"> <li>• describes a technique to minimise the risks of empty field myopia <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
18	<p>BMI, diet and hydration are important to being able to perform duties safely in an aerospace context, as they affect physical and mental performance. If a person has a good diet and hydration, they will generally have a healthy BMI.</p> <p>If a pilot has an unhealthy BMI, they may have an increased risk of heart attack or may not be able to manipulate aircraft controls correctly.</p> <p>Diet plays an important part in fuelling the brain for the day. It prevents fatigue, helping pilots stay alert and aware.</p> <p>If a pilot is dehydrated, they will become fatigued and may make errors in judgment.</p>	<ul style="list-style-type: none"> <li>• explains the relationships between human performance and these factors <b>[1 mark]</b></li> <li>• identifies a positive or negative effect of: <ul style="list-style-type: none"> <li>– BMI in a valid aviation context <b>[1 mark]</b></li> <li>– diet in a valid aviation context <b>[1 mark]</b></li> <li>– hydration in a valid aviation context <b>[1 mark]</b></li> </ul> </li> </ul>

Q	Sample response	The response:
19	<p>Aircraft A is the more suitable aircraft. With a 235 hp turbine engine, aircraft A will produce more power at altitude than aircraft B, which has a 230 hp piston engine. As a result, aircraft A has a higher service ceiling (20 000 ft) and a better cruise speed (165 kts), meaning it can safely fly higher than aircraft B, making it more suited to mountain flying. It will also reach altitude faster than the aircraft B's piston engine, which is important when flying at high altitudes. A turbine engine is more efficient at burning fuel at altitude than a piston engine, where less fuel gets into the engine. Turbine engine aircraft also have a better take-off performance at altitude than piston aircraft, which is useful for conditions that involve landing at over 14 000 ft. Turbine engines are more reliable than piston engines, so would be safer for mountain flying.</p>	<ul style="list-style-type: none"> <li>• identifies aircraft A as the more suitable aircraft <b>[1 mark]</b></li> <li>• provides one valid reason for the aircraft selection <b>[1 mark]</b></li> <li>• provides a second valid reason for the aircraft selection <b>[1 mark]</b></li> <li>• provides a third valid reason for the aircraft selection <b>[1 mark]</b></li> <li>• provides a fourth valid reason for the aircraft selection <b>[1 mark]</b></li> <li>• justifies aircraft choice with reference to the flying conditions <b>[1 mark]</b></li> <li>• justifies aircraft choice using data from the table <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
20a)	570 m	<ul style="list-style-type: none"> <li>determines a landing distance of 570 m <b>[1 mark]</b></li> </ul>
20b)	$\text{ISA dev} = 15 - \left( \frac{PH}{1000} \times 2 \right)$ $\text{ISA dev} = 15 - \left( \frac{4000}{1000} \times 2 \right)$ $\text{ISA dev} = 15 - 8$ $\text{ISA dev} = 7$ $\text{DA} = \text{PA} + 120(\text{OAT} - \text{ISA temp at PA})$ $\text{DA} = 4000 + 120(40 - 7)$ $\text{DA} = 4000 + (120 \times 33)$ $\text{DA} = 7960 \text{ ft}$	<ul style="list-style-type: none"> <li>calculates ISA dev as 7 <b>[1 mark]</b></li> <li>calculates density altitude (DA) as 7960 ft <b>[1 mark]</b></li> </ul>
20c)	<p>Using PA calculation to calculate elevation of the take-off (T/O) chart airport</p> $\text{PA} = \text{airfield elevation} + (1013 - \text{QNH}) \times 30$ $4000 = \text{airfield elevation} + 30(1013 - 983)$ $4000 = \text{airfield elevation} + 900$ $\text{Airfield elevation} = 3100 \text{ ft}$	<ul style="list-style-type: none"> <li>calculates airfield elevation using pressure altitude (PA) as 3100 ft <b>[1 mark]</b></li> </ul>
20d)	The arrival airport is Cooma — Snowy Mountains, and the departure airport is Glen Innes.	<ul style="list-style-type: none"> <li>determines: <ul style="list-style-type: none"> <li>Cooma – Snowy Mountains as the arrival airport <b>[1 mark]</b></li> <li>Glen Innes as the departure airport <b>[1 mark]</b></li> </ul> </li> </ul>

Q	Sample response	The response:
20e)	Cooma — Snowy Mountains airport 	<ul style="list-style-type: none"> <li>sketches runway 18/36 at Cooma — Snowy Mountains, identifying windsock/s to the west of the runway <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
21a)	<p>The attitude indicator (AI) has most likely failed. The ASI has increased, while the altitude has decreased, suggesting the aircraft is likely to be in a nose-down attitude, but the AI shows a nose-up attitude.</p> <p>The VSI reads a descent, which is also consistent with a nose-down attitude.</p>	<ul style="list-style-type: none"> <li>• determines the failed instrument as the attitude indicator (AI) <b>[1 mark]</b></li> <li>• provides a reason <b>[1 mark]</b></li> <li>• provides a second reason <b>[1 mark]</b></li> </ul>
21b)	<p>Without an attitude indicator, the pilot could use the turn coordinator for wings level in combination with the directional gyro (DG).</p> <p>Nose attitude could be compensated for by use of the altimeter, airspeed and VSI.</p> <p>Adopt a 'power + attitude = performance' strategy.</p>	<ul style="list-style-type: none"> <li>• provides one solution <b>[1 mark]</b></li> <li>• provides a second solution <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:																																								
22a)	<p>The control area (CTA) is the volume of controlled airspace that exists in the vicinity of an airport, which is at 4500 ft.</p> <p>Strathalbyn Hospital helipad is north-west of the flight path and requires the planned flight to cross VFR route No.1.</p>	<ul style="list-style-type: none"> <li>determines a valid CTA [1 mark]</li> <li>identifies a safety consideration [1 mark]</li> </ul>																																								
22b)	<table border="1"> <thead> <tr> <th colspan="10">SP107 — NAV/COMM LOG</th> </tr> <tr> <th></th> <th>L.SALT</th> <th>ALT</th> <th>TAS</th> <th>TR (m)</th> <th>WIND</th> <th>HDG</th> <th>G/S</th> <th>DIST</th> <th>ETI</th> </tr> </thead> <tbody> <tr> <td colspan="10">YGWA</td> </tr> <tr> <td>YMBD</td> <td>A024</td> <td>A035</td> <td>100</td> <td>036</td> <td>220T/13 220T/14</td> <td>040</td> <td>113</td> <td>34</td> <td>18</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Measured track 044T – 8° variation = 036M</li> <li>Altitude according to hemisphere rules is 3500 ft (A035) – odds + 500</li> <li>Wind at 3500 is 212M/13, 212M/14</li> <li>Left drift is 4°</li> </ul> <p>Therefore 036 + 4 = 040M</p> <p>G/S = 100 + 13 kts tail wind = 113 kts</p>	SP107 — NAV/COMM LOG											L.SALT	ALT	TAS	TR (m)	WIND	HDG	G/S	DIST	ETI	YGWA										YMBD	A024	A035	100	036	220T/13 220T/14	040	113	34	18	<ul style="list-style-type: none"> <li>determines <ul style="list-style-type: none"> <li>ALT [1 mark]</li> <li>track (magnetic) [1 mark]</li> <li>wind direction and speed from GPWT [1 mark]</li> <li>heading (magnetic) using correct variation [1 mark]</li> <li>ground speed [1 mark]</li> <li>distance [1 mark]</li> <li>ETI [1 mark]</li> </ul> </li> </ul>
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