Aerospace Systems marking guide and response

External assessment 2023

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
- has been annotated using the marking guide.

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.

Where no response to a question has been made, a mark of 'N' will be recorded.

Allowing 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 still 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	C
2	A
3	C
4	B
5	A
6	D
7	C
8	B
9	D
10	B

Short response

Q	Sample response	The response:
11	1. procedures and rules 2. communication training 3. cultural diversity awareness training	• provides a risk mitigation strategy **[1 mark]** • provides a second risk mitigation strategy **[1 mark]** • provides a third risk mitigation strategy **[1 mark]**
12	Negative effects – high blood pressure – breathing problems Ways to reduce BMI – healthy diet – consistent exercise	• provides a negative effect **[1 mark]** • provides another negative effect **[1 mark]** • provides a strategy **[1 mark]** • provides another strategy **[1 mark]**
13	1. vision system 2. vestibular system 3. proprioceptive system	• provides a sensing mechanism **[1 mark]** • provides a second sensing mechanism **[1 mark]** • provides a third sensing mechanism **[1 mark]**

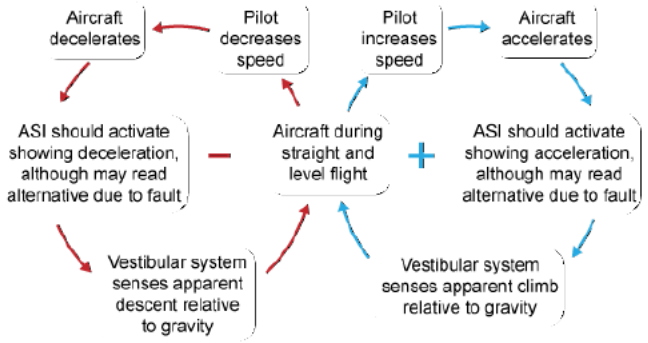
Q	Sample response	The response:
14	TCAS purpose: The TCAS provides collision avoidance protection for a broad spectrum of aircraft types. TCAS limitation: It doesn't take into consideration terrain/ground clearance for flight crew. SSR purpose: SSR improves the ability to detect and identify aircraft while automatically providing the flight level (pressure altitude) of an aircraft. SSR limitation: It relies on the transponder of the aircraft to be working in mode C.	• describes the TCAS purpose **[1 mark]** • provides a limitation of the TCAS **[1 mark]** • describes the SSR purpose **[1 mark]** • provides a limitation of SSR **[1 mark]**

Q	Sample response	The response:
15a)	Smoking causes elevated levels of carbon monoxide in the blood that can result in physiological effects similar to flying at 8000 feet. Therefore, smoking can impede an aircrew member's performance at altitude as it reduces the blood's capacity to combine with and carry oxygen.	• provides an example where human performance can be affected by smoking **[1 mark]** • provides an aviation context **[1 mark]**
15b)	Fatigue caused by cold or flu can degrade mental alertness in an aircrew member's performance during flight procedures, impeding safety operations.	• provides an example where human performance can be affected by poor general health **[1 mark]** • provides an aviation context **[1 mark]**
15c)	Relationship breakdowns (divorce/separations) can lead to distractions in a pilot's ability to safely navigate a flight, impeding safety operations.	• provides an example where human performance can be affected by poor emotional health **[1 mark]** • provides an aviation context **[1 mark]**

Q	Sample response	The response:
16	The ASI (A) receives dynamic pressure from the pitot tube (E) and static pressure from the static ports (D). The ALT (C) and VSI (B) receive static pressure only. If the static port (D) is blocked, the alternate static source is used and all three instruments would still be available. The pitot tube (E) receives a combination of dynamic and static air pressure. The pitot-static system (or static pressure) is a system of pressure-sensitive instruments most often used in aviation to determine an aircraft's airspeed, altitude and altitude trend.	• explains the systems functionality using wording that indicates – ASI receives dynamic pressure from the pitot tube and static pressure from the static ports **[1 mark]** – ALT receive static pressure only **[1 mark]** – VSI receive static pressure only **[1 mark]** – the alternate static source is used if the static port is blocked **[1 mark]** – the pitot tube receives a combination of dynamic and static pressure **[1 mark]** • determines the system's purpose **[1 mark]**

Q	Sample response	The response:
17	The pilot is experiencing autokinesis. As a result, the pilot may make off-course corrections that could have dangerous consequences or align the aircraft with the perceived moving light, potentially causing them to lose control of the aircraft. Pilots can rectify this illusion by continuing to move their eyes in a normal scan pattern, by monitoring the flight instruments more frequently to ensure correct attitude and by avoiding prolonged fixation on light sources.	• identifies visual illusion as autokinesis **[1 mark]** • determines a danger of this the illusion **[1 mark]** • determines another danger of this illusion **[1 mark]** • provides a solution **[1 mark]** • provides a second solution **[1 mark]** • provides a third solution **[1 mark]**

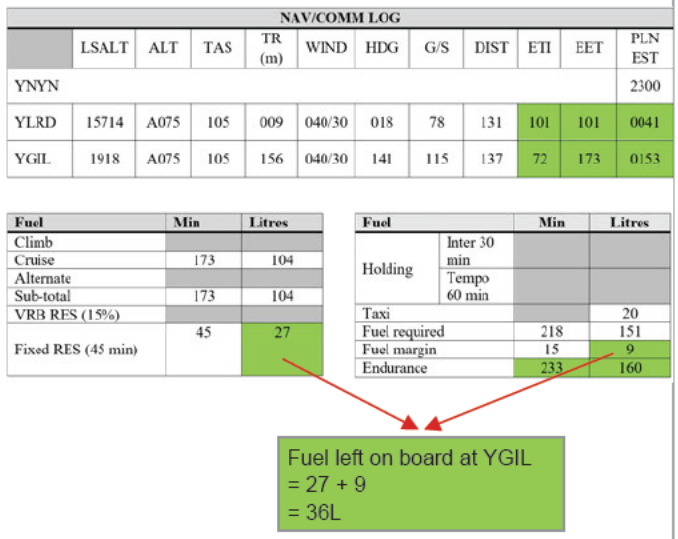
Q	Sample response	The response:
18a)	1. engine driven fuel pump 2. auxiliary fuel pump 3. fuel tank	• provides a fuel system component **[1 mark]** • provides a second fuel system component **[1 mark]** • provides a third fuel system component **[1 mark]**
18b)	1. cabin altitude controller 2. outflow valve 3. safety/dump valve	• provides an aircraft pressurisation system component **[1 mark]** • provides a second aircraft pressurisation system component **[1 mark]** • provides a third aircraft pressurisation system component **[1 mark]**

Q	Sample response	The response:
19		• provides an appropriately constructed acceleration loop **[1 mark]** • provides an appropriately constructed deceleration loop **[1 mark]** • explains the causal relationship between the aircraft's acceleration and deceleration and the vestibular system **[1 mark]** • explains using wording that indicates – the vestibular system during acceleration should sense climb relative to gravity **[1 mark]** – the vestibular system during deceleration should sense descent relative to gravity **[1 mark]**

Q	Sample response	The response:
20a)	**Quirindi** Flight calculator Tail wind of 17 kts GS = 115 + 17 = 132 kt Time = 18/132 Time = 8.18 min (8 min 10 sec) **Scone** Flight calculator Tail wind of 8 kts GS = 115 + 8 = 123 kt Time = 30/123 Time = 14.63 min (14 min 38 sec)	• determines flight time to Quirindi **[1 mark]** • determines flight time to Scone **[1 mark]**
20b)	Quirindi runway 14/32 is the longest runway option at 1770 m with a gravel surface, although it has a 20 kt crosswind. Scone has a runway of 1400 m with an appropriate runway surface of PCN as well as terminal facilities. However, the surface is uneven, which may cause a rougher landing, and the aerodrome is 6 mins 27 sec further away. Quirindi 06/24 has an appropriate surface of 'a', which is asphalt or bitumen, with a runway length of 1106 m. Furthermore, on landing at Quirrindi's RWY06, the pilot would gain a headwind of 20 kts with nil to minimum crosswind. It also has PAX facilities of a phone and bathroom. Therefore, the best choice is Quirindi RWY06 as it will take the least time to arrive, even with the headwind of 20 kts. It will also provide the smoothest landing for the passenger suffering a medical emergency.	• evaluates the ERSAs using wording that indicates – Quirindi RWY 14/32 is not appropriate due to the crosswind **[1 mark]** – Scone RWY 11/29 is not appropriate due to the longest ETA **[1 mark]** – Quirindi RWY 06/24 has the shortest ETA **[1 mark]** • decides that Quirindi RWY06 is the most appropriate runway for the diversion **[1 mark]** • supports decision with data **[1 mark]**

Q	Sample response	The response:
21	Bearing: 267°T Magnetic bearing: 267 – 2.5 = 264.5°M Distance: 31 NM Highest point along the track = 755 ft Minimum safe altitude = 1755 ft	• determines – bearing **[1 mark]** – magnetic bearing **[1 mark]** – distance **[1 mark]** – highest point along the track **[1 mark]** – minimum safe altitude **[1 mark]**

Q	Sample response	The response:
22	The pilot experienced physiological stress due to fatigue and hypoxia. When commencing the flight, the pilot had been awake for 15 hours, having woken at 7 am with the flight leaving at 10 pm. The flight was 6 hours long and due to land at 4 am. This required the pilot to be awake for 21 hours and work through the lowest point of the circadian rhythm cycle, thereby increasing their fatigue level. The heavy landscaping the pilot completed during the day would have increased fatigue levels at the start of the flight. This allowed the pilot to misidentify that the cabin pressurisation system was activated when it wasn't. With the cabin pressurisation system not working and flying above 10 000 ft, the pilot experienced hypoxia and blacked out until the plane ran out of fuel and started to descend, giving the pilot enough oxygen to come around. The pilot's decision to commence this flight while fatigued was not sound. The pilot should have slept during the day before the flight to reduce fatigue and used a checklist instead of doing it from memory.	• converts UTC to local time **[1 mark]** • identifies causes for the pilot losing consciousness using wording that indicates – the pilot is experiencing physiological stress **[1 mark]** – fatigue and hypoxia are the underlying causes **[1 mark]** • evaluates the scenario using wording that indicates – flying through the lowest point of circadian rhythm increases fatigue **[1 mark]** – physical activity (landscaping) added to fatigue level **[1 mark]** – flying above 10 000 ft in a non-pressurised aircraft would cause hypoxia **[1 mark]** • determines the pilot's decision was not sound **[1 mark]** • provides a justified recommendation **[1 mark]** • provides another justified recommendation **[1 mark]**

Q	Sample response	The response:
23		• determines – ETI for YLRD and YGIL **[1 mark]** – EET for YLRD and YGIL **[1 mark]** – PLN EST at YLRD **[1 mark]** – PLN EST at YGIL **[1 mark]** – endurance of the flight **[1 mark]** – fuel left on board at YGIL **[1 mark]**