Aerospace Systems subject report

2022 cohort

February 2023

Queensland Government
QCAA
Queensland Curriculum & Assessment Authority

230039

For all Queensland schools

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Introduction

Throughout 2022, schools and the QCAA worked together to further consolidate the new Queensland Certificate of Education (QCE) system. The familiar challenges of flood disruption and pandemic restrictions were managed, and the system continued to mature regardless.
We have now accumulated three years of assessment information, and our growing experience of the new system is helping us to deliver more authentic learning experiences for students. An independent evaluation will commence in 2023 so that we can better understand how well the system is achieving its goals and, as required, make strategic improvements. The subject reports are a good example of what is available for the evaluators to use in their research.

This report analyses the summative assessment cycle for the past year — from endorsing internal assessment instruments to confirming internal assessment marks, and marking external assessment. It also gives readers information about:

- how schools have applied syllabus objectives in the design and marking of internal assessments
- how syllabus objectives have been applied in the marking of external assessments
- patterns of student achievement.

The report promotes continuous improvement by:

- identifying effective practices in the design and marking of valid, accessible and reliable assessments
- recommending where and how to enhance the design and marking of valid, accessible and reliable assessment instruments
- providing examples, including those that demonstrate best practice.

Schools are encouraged to reflect on the effective practices identified for each assessment, consider the recommendations to strengthen assessment design and explore the authentic student work samples provided.

Audience and use

This report should be read by school leaders, subject leaders and teachers to:

- inform teaching and learning and assessment preparation
- assist in assessment design practice
- assist in making assessment decisions
- help prepare students for external assessment.

The report is publicly available to promote transparency and accountability. Students, parents, community members and other education stakeholders can use it to learn about the assessment practices and outcomes for General subjects (including alternative sequences (AS) and Senior External Examination (SEE) subjects, where relevant) and General (Extension) subjects.

Report preparation

The report includes analyses of data and other information from endorsement, confirmation and external assessment processes. It also includes advice from the chief confirmer, chief endorser and chief marker, developed in consultation with and support from QCAA subject matter experts.

Subject data summary

Subject completion

The following data includes students who completed the General subject.

Note: All data is correct as at 31 January 2023. Where percentages are provided, these are rounded to two decimal places and, therefore, may not add up to 100%.

Number of schools that offered the subject: 13.

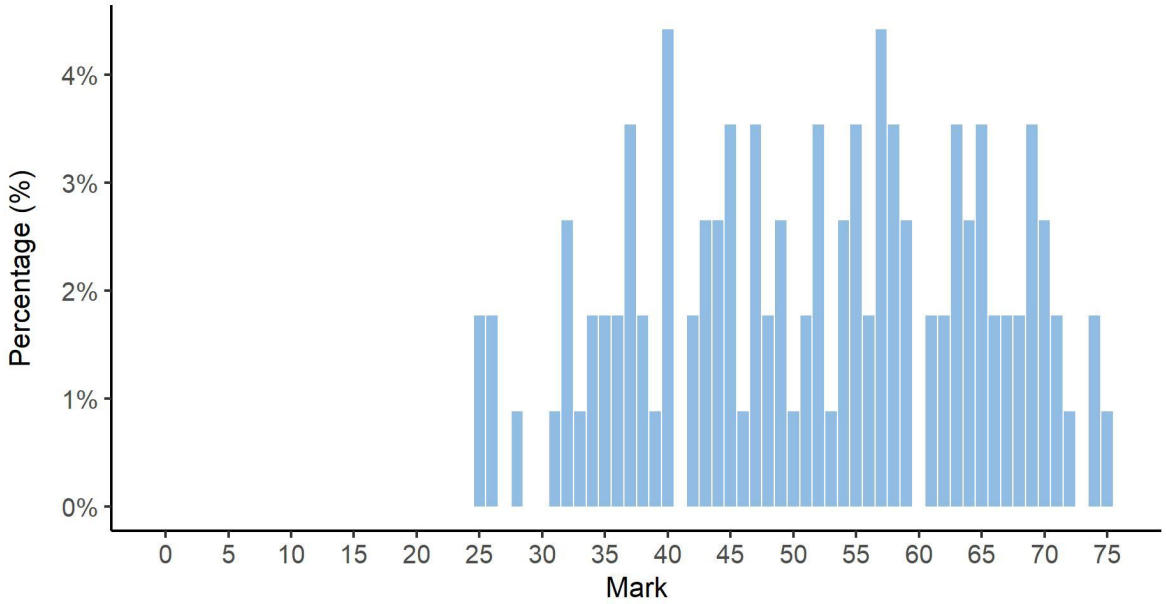
Completion of units	Unit 1	Unit 2	Units 3 and 4
Number of students completed	160	131	112

Units 1 and 2 results

Number of students	Satisfactory	Unsatisfactory
Unit 1	131	29
Unit 2	120	11

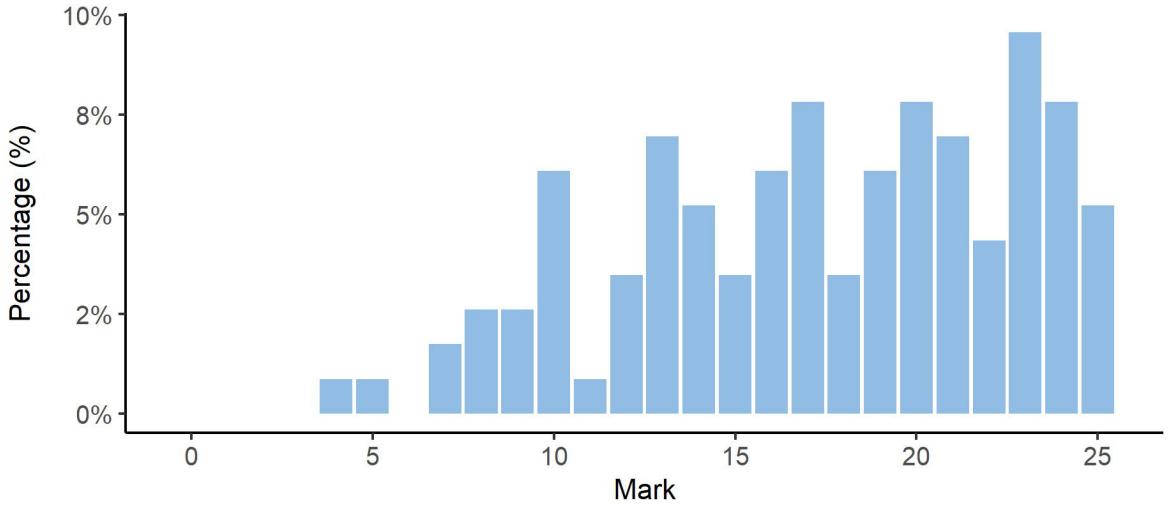
Units 3 and 4 internal assessment (IA) results

Total marks for IA

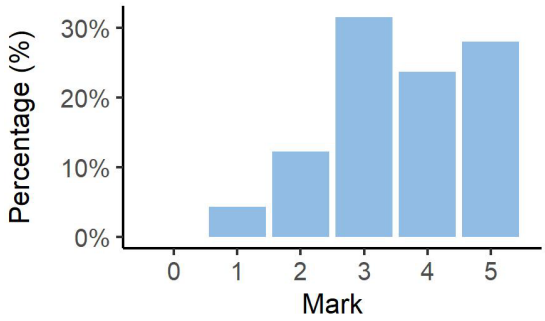


IA1 marks

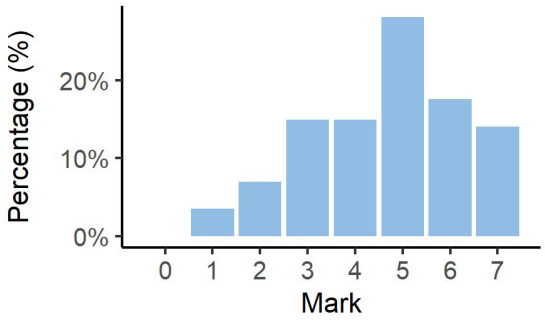
IA1 total



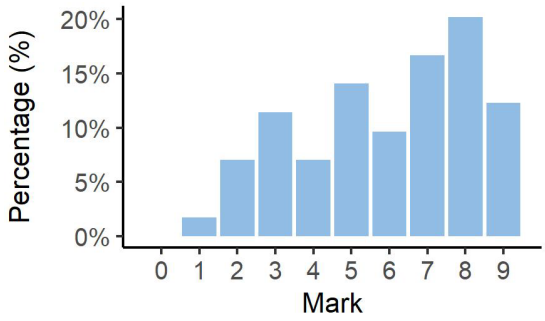
IA1 Criterion: Retrieving and comprehending



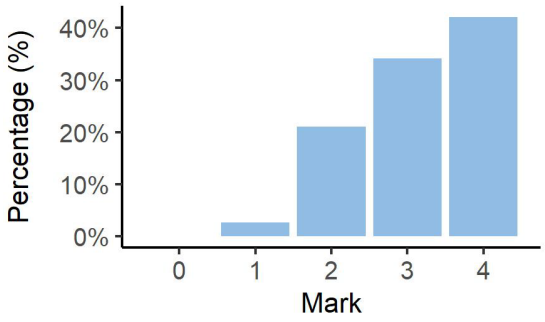
IA1 Criterion: Analysing



IA1 Criterion: Synthesising and evaluating

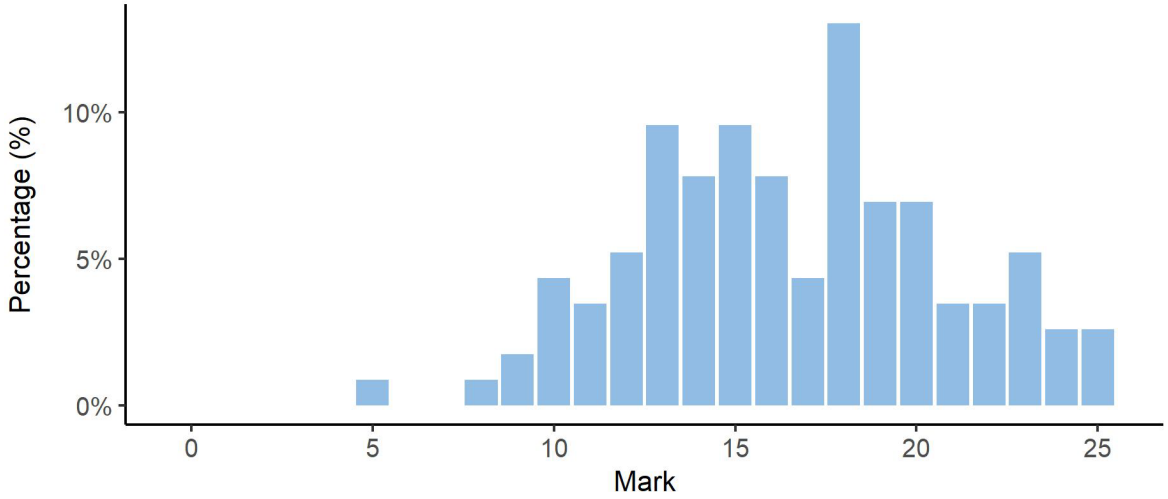


IA1 Criterion: Communicating

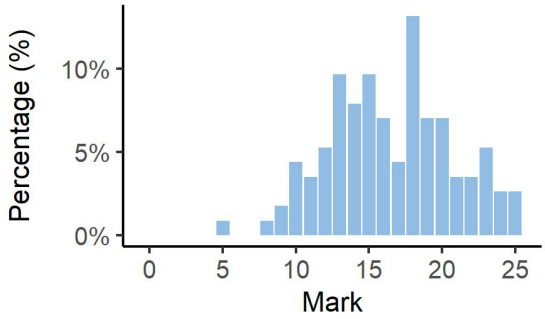


IA2 marks

IA2 total

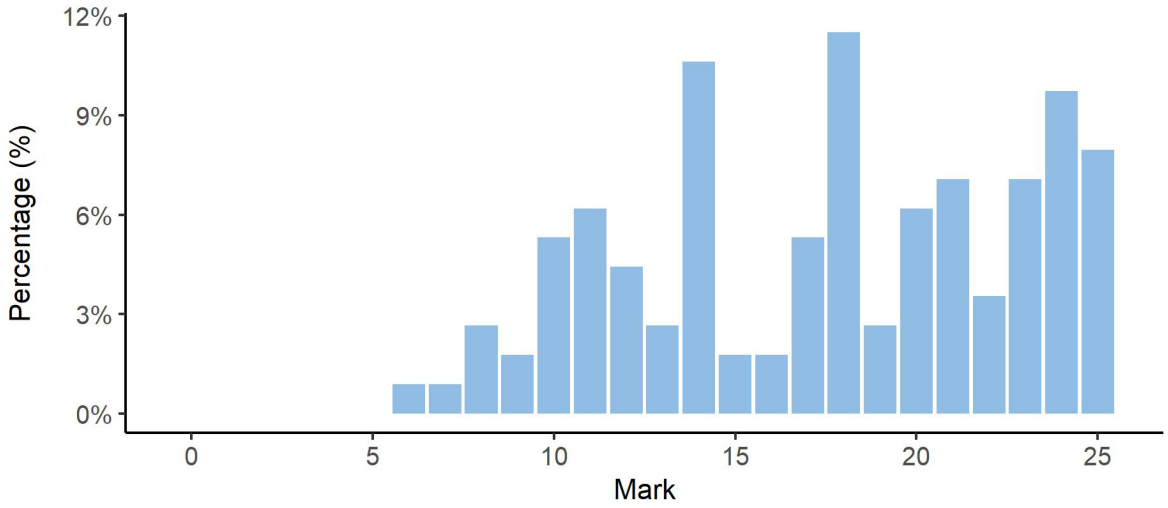


IA2 Criterion: Aerospace systems knowledge and problem-solving

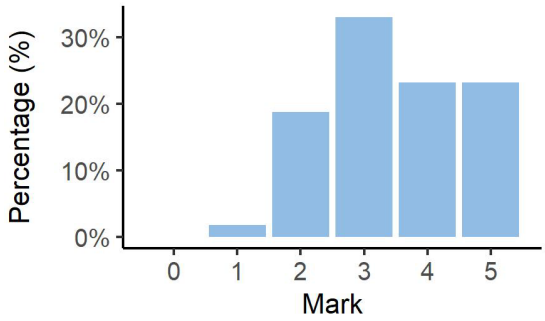


IA3 marks

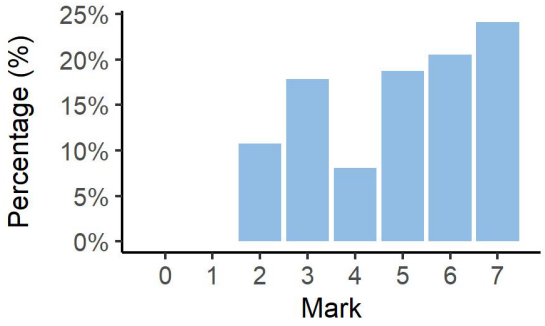
IA3 total



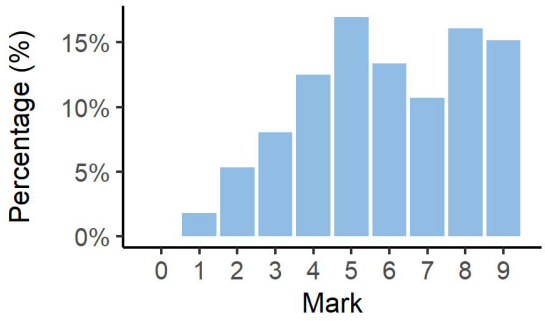
IA3 Criterion: Retrieving and comprehending



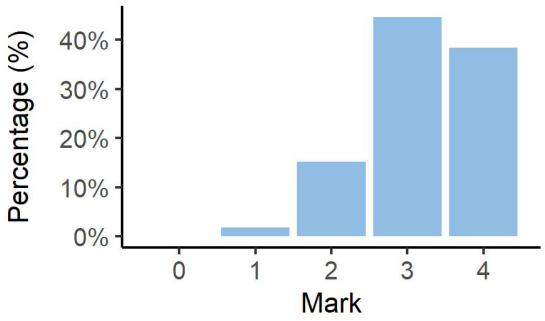
IA3 Criterion: Analysing



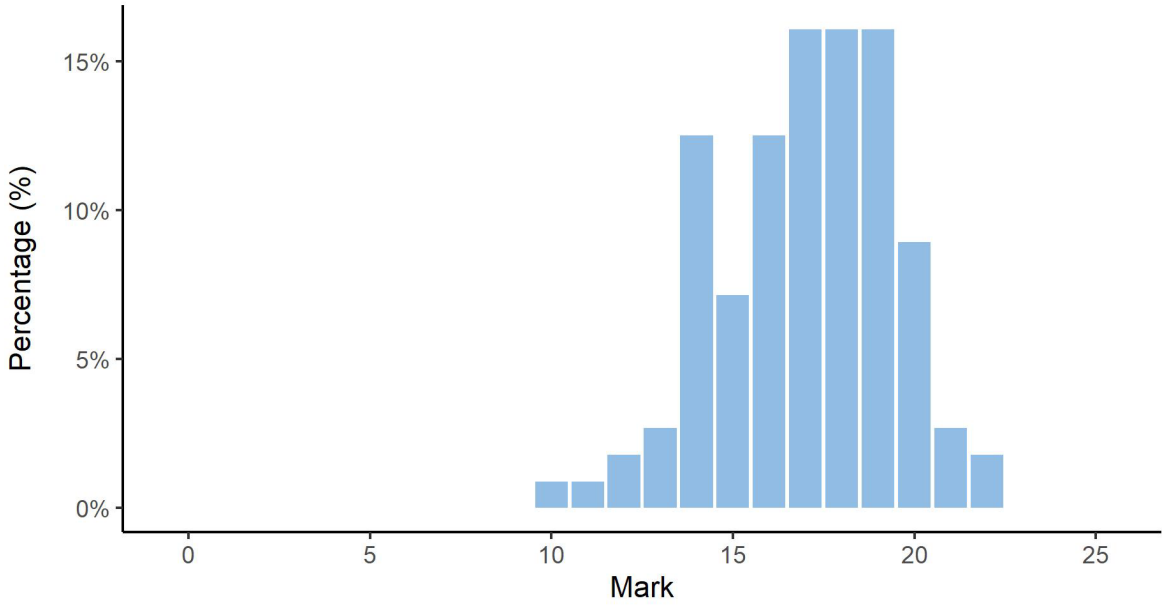
IA3 Criterion: Synthesising and evaluating



IA3 Criterion: Communication

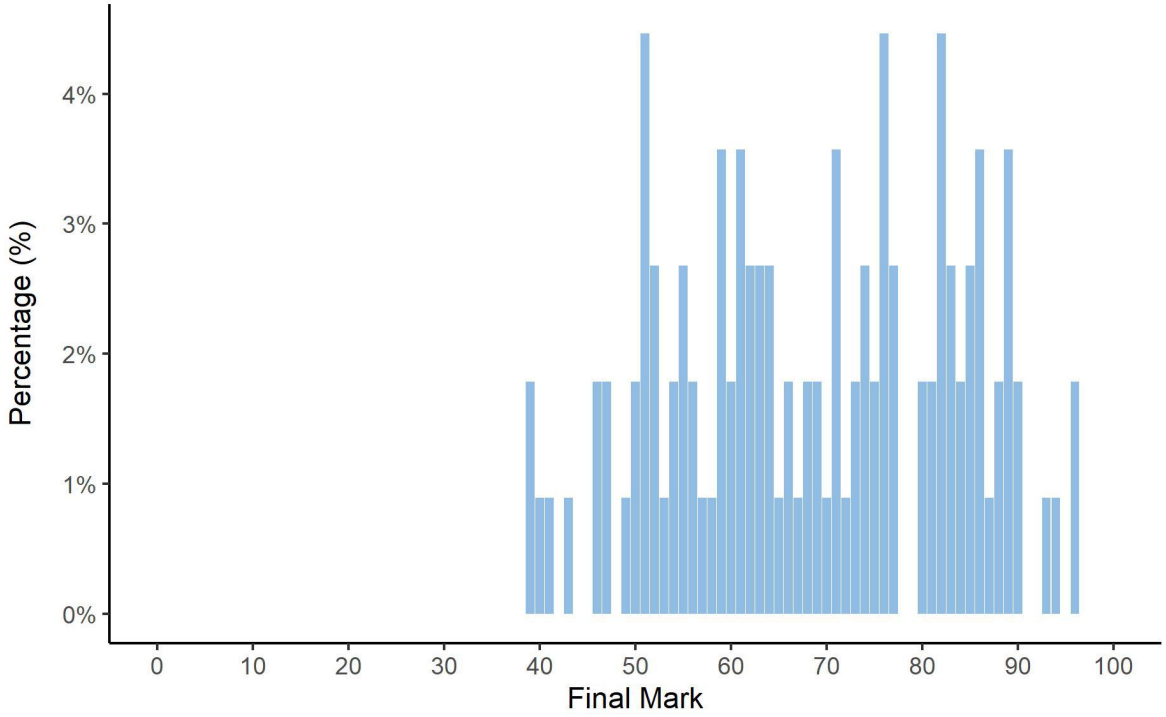


External assessment (EA) marks



Final subject results

Final marks for IA and EA



Grade boundaries

The grade boundaries are determined using a process to compare results on a numeric scale to the reporting standards.

Standard	A	B	C	D	E
Marks achieved	100–83	82–66	65–43	42–19	18–0

Distribution of standards

The number of students who achieved each standard across the state is as follows.

Standard	A	B	C	D	E
Number of students	25	37	46	4	0

Internal assessment

The following information and advice relate to the assessment design and assessment decisions for each IA in Units 3 and 4. These instruments have undergone quality assurance processes informed by the attributes of quality assessment (validity, accessibility and reliability).

Endorsement

Endorsement is the quality assurance process based on the attributes of validity and accessibility. These attributes are categorised further as priorities for assessment, and each priority can be further broken down into assessment practices.

Data presented in the Assessment design section identifies the reasons why IA instruments were not endorsed at Application 1, by the priority for assessments. An IA may have been identified more than once for a priority for assessment, e.g. it may have demonstrated a misalignment to both the subject matter and the assessment objective/s.

Refer to *QCE and QCIA policy and procedures handbook v4.0*, Section 9.5.

Percentage of instruments endorsed in Application 1

Number of instruments submitted	IA1	IA2	IA3
Total number of instruments	10	10	10
Percentage endorsed in Application 1	30%	50%	30%

Confirmation

Confirmation is the quality assurance process based on the attribute of reliability. The QCAA uses provisional criterion marks determined by teachers to identify the samples of student responses that schools are required to submit for confirmation.

Confirmation samples are representative of the school's decisions about the quality of student work in relation to the instrument-specific marking guide (ISMG), and are used to make decisions about the cohort's results.

Refer to *QCE and QCIA policy and procedures handbook v4.0*, Section 9.6.

The following table includes the percentage agreement between the provisional marks and confirmed marks by assessment instrument. The Assessment decisions section of this report for each assessment instrument identifies the agreement trends between provisional and confirmed marks by criterion.

Number of samples reviewed and percentage agreement

IA	Number of schools	Number of samples requested	Number of additional samples requested	Percentage agreement with provisional marks
1	10	53	6	70%
2	10	45	0	100%
3	10	53	0	80%

Internal assessment 1 (IA1)

Project — folio (25%)

This assessment focuses on a problem-solving process that requires the application of a range of cognitive, technical and creative skills and theoretical understandings. Students document the iterative process undertaken to develop a solution to a problem. The response is a coherent work that includes written paragraphs and annotations, diagrams, sketches, drawings, photographs, tables, spreadsheets and prototypes. This assessment occurs over an extended and defined period of time. Students may use class time and their own time to develop a response.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions*
Alignment	5
Authentication	0
Authenticity	2
Item construction	1
Scope and scale	2

*Each priority might contain up to four assessment practices.

Total number of submissions: 10.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- enabled students to demonstrate their understanding of the subject matter for the unit and topics covering the required assessment objectives and performance-level descriptors of the ISMG
- provided assessment tasks clearly framed within a context relating to the subject matter for the unit/topic, e.g. contexts that related to
  - current events, such as COVID-19 disruptions, airport expansions, airline profitability and local airport problems
  - future events, such as the 2032 Brisbane Olympics
- outlined authentication strategies that reflected the QCAA guidelines for assuring student authorship.

Practices to strengthen

It is recommended that assessment instruments:

- indicate appropriate topic selection in the conditions and describe aspects of the topics in the task, e.g. Topic 3 Safety Management Systems is compulsory for IA1. For this reason, safety must be mentioned in the task
- demonstrate appropriate scope and scale to allow students to respond within the syllabus conditions, i.e. the task needs to be able to provide clear parameters, but also provide sufficient complexity to cover the objectives and enable students to develop unique responses. An example of this is to have students select and compare three aircraft and make recommendations for one aircraft rather than supplying them with a task about just one aircraft
- address all assessment specifications for Part A and Part B unaltered (Syllabus section 4.8.1), i.e. reproduce the Part A and B specifications directly from the syllabus
- use the problem-solving process diagram and expectations directly from Syllabus section 1.2.4, positioned either at the end of the task in the task section or in the scaffolding section.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions*
Bias avoidance	0
Language	2
Layout	0
Transparency	1

*Each priority might contain up to four assessment practices.

Total number of submissions: 10.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- provided school contexts and tasks that used gender-neutral language throughout and avoided biases and inappropriate content to avoid gender stereotyping
- used high-resolution images, diagrams or other visual elements that were legible, clear, relevant and accessible.

Practices to strengthen

It is recommended that assessment instruments:

- use language drawn from Unit 3 subject matter and avoid jargon or technical language not contained within the unit
- provide clear instructions using cues that align to the specifications, objectives and ISMG to enable students to easily understand the instructions. This may require providing specific details while not giving so much detail that it constrains students' unique responses. For example, tasks could be designed to consider all aspects of airport design including; airspace

management, safety management systems; airport design and layout; airline business needs and customer experience, but allow the student to prioritise the importance of each aspect depending on the context of the task.

Additional advice

- The 'specified client' in Part B should be drawn from the Part A documentation.
- Students should not be asked to compare five aircraft or the whole Cessna range as the syllabus conditions do not allow for that level of analysis.

Assessment decisions

Reliability

Reliability is a judgment about the measurements of assessment. It refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Retrieving and comprehending	90%	0%	10%	0%
2	Analysing	100%	0%	0%	0%
3	Synthesising and evaluating	90%	10%	0%	0%
4	Communicating	90%	10%	0%	0%

Effective practices

Accuracy and consistency of the application of the ISMG for this IA was most effective when:

- the Analysing criterion at the 6–7 performance level demonstrated evidence and understanding of complex situations by breaking down the information into elements of the problem
- the Analysing criterion at the 4–5 performance level demonstrated evidence of explicit, logical reasoning to determine solution success criteria for the operational systems problem included
- the Synthesising and evaluating criterion at the 4–5 performance level demonstrated clear progression through the problem-solving process (as per syllabus Section 1.2.4), with evaluation of findings using some success criteria. Feasible evaluation was evident in student work using tabulated data and research evidence to justify recommendations
- the Communicating criterion at the 1–2 performance level demonstrated variable judgments about the presentation of visual features. This was demonstrated in folios that only used tables, graphs or diagrams.

Samples of effective practices

The following excerpt demonstrates insightful analysis of the problem using tables, including a PMI chart, to clarify interconnected elements.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

Airports	Positive	Minus	Interesting
Bundaberg Airport	• Asphalt runway measuring 6,562 ft x 98 ft with a psi of 205 which is sufficient for aircrafts such as a dash 8-400 or a Fokker 70 • 2 asphalt and 1 bitumen taxiways • Asphalt apron capable of storing 3-4 dash-8's • 19 hangars of various sizes, also including 3 maintenance hangars. • Terminal made up of 3 buildings which is sufficient for accommodating departing and arriving passengers. • Big car parking facility • Perimeter security fencing, security screening, customs checking, boarding stairs, etc. • No potential environmental hazards • Close to the city which means emergency units are nearby.	• No docking capability for aircraft at the terminal	• Special emergency hangar • Discrete CTAF • Most used aircraft at the airport is a Dash 8-400 • Class G airspace
Roma Airport	• Sufficient Psi rating and runway length • 2 asphalt taxiways • Asphalt apron capable of parking 3 dash 8-400's at once. • 4 hangars of various sizes • Terminal is slightly smaller than Bundaberg but provides the same features • CTAF • No environmental hazards • Connected to the highway which leads straight to the city in 5 minutes • Perimeter security fencing, boarding stairs, customs checking • Very large parking facility	• 1 clay surfaced taxiway • No docking capability • No maintenance hangars	• Fully functional aero medical base inside the airport. • Most used aircraft at the airport is a dash 8-400 and a Fokker 70 • Class G airspace
Longreach Airport	• Longest runway than the above airports with a PSI of 174 • 3 asphalt taxiways • Asphalt apron capable of parking 3 dash 8-400's • 6 hangars of various sizes • Car parking facility • Perimeter security fencing, boarding stairs, customs checking, etc. • CTAF • Very close to the city which means emergency units can reach the emergency in time.	• Wildlife hazards occur year-round at the airport. • Small terminal	• Car renting facility • 1 extra-large hangar capable of storing a Boeing 747 • Most used aircraft is a dash 8-400 and a Saab 340.

Fig 22. PMI chart on the selected airports

The following excerpt illustrates logical success criteria and reasoning in accordance with the principles/rules of logic. This enables the student to develop a descriptive list of essential features against which success can be measured.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

1.2 Success criteria

Criteria	Roadmap for success
Expansion capitalizes on the existing industries present in Townsville.	Identify existing industries and make partnerships throughout the region which mutually benefit.
Is a cost-effective solution.	Maximises the functionality of existing assets limiting the capital that needs to be invested.
Brings revenue/ business to the region and airport.	The airport should be exporting a substantial percentage of Queensland's meat within 3 years of the international borders opening.
Expansion of airport, including the passenger/ cargo movements and physical infrastructure.	Profitable operation with the existing assets, leading to the financial freedom to expand.

The following excerpts illustrate high level responses to the Synthesising and evaluating criterion and the Communicating criterion. They achieve this as follows:

- Excerpt 1 demonstrates coherent and logical synthesis with critical evaluation
- Excerpt 2 shows discerning refinement of ideas and a solution using success criteria to make astute recommendations justified by data and research evidence
- Excerpt 3 demonstrates discerning communication using systematic referencing conventions that allow the reader to easily access sourcing information from the reference list.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

Excerpt 1

1.3.5 Consumers

Consumer perceptions and values are important in the design of a flight operation as they determine the demand for the service offered. Generally, consumers value affordability, comfort and efficiency in their air travel. The value they prioritise is dependent on the purpose of their travel.

This operation will be aimed at both, locals travelling with the purpose accessing metropolitan area, and tourists travelling with the purpose of a holiday. These purposes require the operation to aim to combine affordability, comfort and efficiency.

This aim describes a 'hybrid' airline. Hybrid airlines refer to operations which put emphasis on great service while operation with a low-cost business model (Alternative Airlines, 2021).

Another feature that consumers highly value is reliability. This includes stable ticket pricing and minimal cancellations. To achieve these things the following ticket-selling techniques should be considered.

Overbooking

Overbooking refers to when an airline sells more seats than their aircraft has available to ensure that there are no empty seats on take-off. This technique is used to account for two main things. The first is that, in almost every flight, there are passengers who don't show up without cancelling their tickets. The second is loss of passengers caused by the delay or cancellation of connecting flights in 'hub and spoke' operations (Travel Perk, 2021).

Airlines have calculated that the statistical likelihood of all passengers with a valid ticket checking in on time is less than 1 in 10,000. As a result, they use the overbooking technique to maximise profits (Travel Perk, 2021)

An advantage of overbooking is that it can allow airlines to offer more affordable ticket prices to their consumers while maintaining the same amount of profit. A disadvantage of overbooking is that when passengers are bumped from a flight because there are no available seats. This can create the perception of unreliability in consumers which may deter them from using your provided service.

Price differentiation

When selling tickets airlines provide different prices depending on the date of booking (Aerocorner, n.d.). This technique aims to maximise profits by changing the ticket price to match the demand of the specific time period before the flight. This technique can allow more competitive prices for flights for an operation and thus should be a consideration in the solution development.

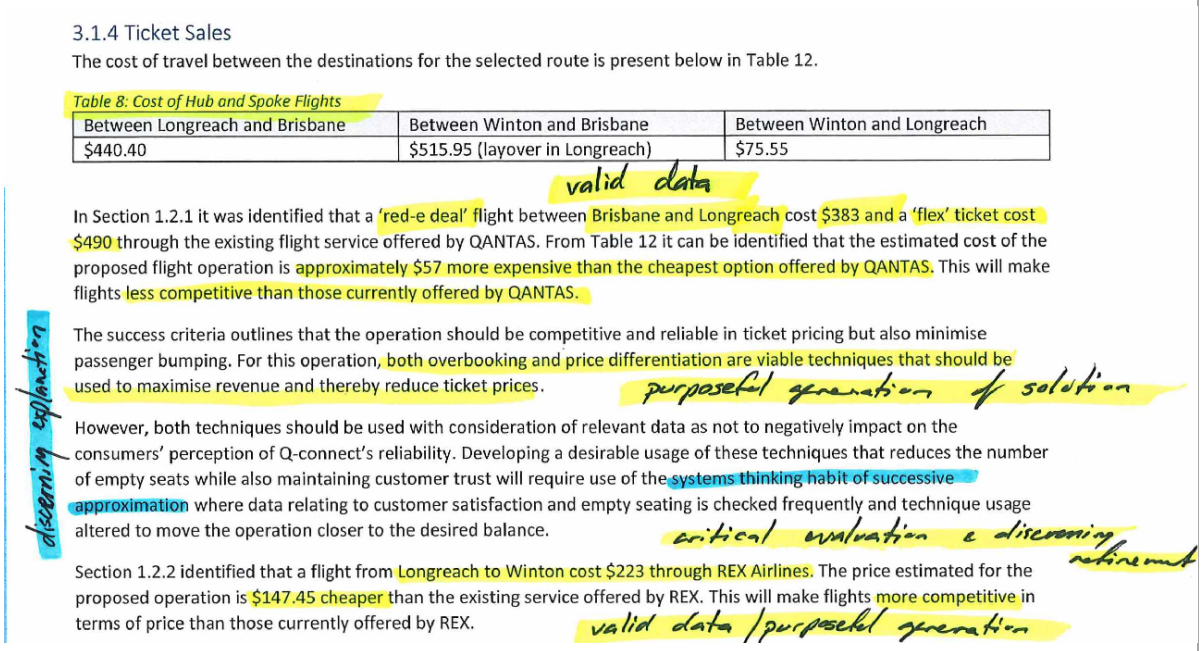
Excerpt 2

Table 11 presents the relevant calculations for determining the costs associated with the aircraft presented in Tables 6 and 8. These include the ASK, RASK, CASK and fuel consumption.

Table 11: Operation Calculations

Formula	DASH 8-400			ATR 42-500		
	Brisbane to Longreach	Longreach to Winton	Winton to Brisbane	Brisbane to Longreach	Longreach to Winton	Winton to Brisbane
Available Seat Km (ASK) = Availanble seats × distance	78 × 991 = 77298	78 × 170 = 13260	78 × 1156 = 90168	48 × 991 = 47568	48 × 170 = 8160	48 × 1156 = 55488
Q-connect has specified that tickets must have a profit of $4 per passenger every 100km This is equal to $0.04 per ASK According to the QANTAS cost structure (Figure 7), profit makes up 9% of the revenue of an airline. Therefore, RASK = 0.4444 & CASK = 0.4044						
Revenue per Available Seat Km (RASK) = Total Revenue (TR) / ASK	TR = 0.4444×77298 =$34354.67 = $440.44 per ticket	TR = 0.4444×13260 =$5893.33 =$75.56 per ticket	TR = 0.4444×90168 =$40074.67 =$513.78 per ticket	TR = 0.4444×47568 =$21139.22 =$440.40 per ticket	TR = 0.4444×8160 =$3626.304 =$75.55 per ticket	TR = 0.4444×55488 =$24658.87 =$513.73 per ticket
Cost per Available Seat Km (CASK) = Total Cost (TC) / ASK	TC = 0.4044×77298 =$31262.93 =$400.80 per ticket	TC = 0.4044×13260 =$5362.93 =$68.76per ticket	TC = 0.4044×90168 =$36467.95 =$467.54 per ticket	TC = 0.4044×47568 =$19236.50 =$400.76 per ticket	TC = 0.4044×8160 =$3299.90 =$68.75 per ticket	TC = 0.4044×55488 =$22439.35 =$467.49 per ticket
Total fuel consumption = fuel consumption × time	1465.77×1.65 =2418.5205L	1465.77×0.7 =1026.039L	1465.77×1.85 =2711.6745L	875.7×1.65 =1444.905L	875.7×0.7 =612.99L	875.7×1.85 =1620.045L
Total Fuel Cost = Litres × Fuel Price	2418.5205×0.71 =$1717.15	1026.039×0.71 =$728.49	2711.6745×0.71 =$1925.29	1444.905×0.71 =$1025.88	612.99×0.71 =$435.22	1620.045×0.71 =$1150.23
Additional Costs (not fuel)	$29545.78	$4637.44	$34542.66	$18210.62	$2864.68	$21289.12

Excerpt 3



3.1.4 Ticket Sales

The cost of travel between the destinations for the selected route is present below in Table 12.

Table 8: Cost of Hub and Spoke Flights

Between Longreach and Brisbane	Between Winton and Brisbane	Between Winton and Longreach
$440.40	$515.95 (layover in Longreach)	$75.55

valid data

In Section 1.2.1 it was identified that a 'red-e deal' flight between Brisbane and Longreach cost $383 and a 'flex' ticket cost $490 through the existing flight service offered by QANTAS. From Table 12 it can be identified that the estimated cost of the proposed flight operation is approximately $57 more expensive than the cheapest option offered by QANTAS. This will make flights less competitive than those currently offered by QANTAS.

The success criteria outlines that the operation should be competitive and reliable in ticket pricing but also minimise passenger bumping. For this operation, both overbooking and price differentiation are viable techniques that should be used to maximise revenue and thereby reduce ticket prices.

purposeful generation of solution

However, both techniques should be used with consideration of relevant data as not to negatively impact on the consumers' perception of Q-connect's reliability. Developing a desirable usage of these techniques that reduces the number of empty seats while also maintaining customer trust will require use of the systems thinking habit of successive approximation where data relating to customer satisfaction and empty seating is checked frequently and technique usage altered to move the operation closer to the desired balance.

critical evaluation & discerning refinement

Section 1.2.2 identified that a flight from Longreach to Winton cost $223 through REX Airlines. The price estimated for the proposed operation is $147.45 cheaper than the existing service offered by REX. This will make flights more competitive in terms of price than those currently offered by REX.

valid data / purposeful generation

discerning application

Practices to strengthen

To further ensure accuracy and consistency of the application of the ISMG for this IA, it is recommended that:

- for the Retrieving and comprehending criterion at the 4–5 performance level
  - the explore phase of the problem-solving process develops an understanding through recognition, description and analysis of a problem to identify its characteristics to determine solution success criteria
  - thoughtful and astute decisions are made to prioritise aspects of ideas or information based on solution success criteria with an understanding of the characteristics of the operational systems problem gained through research and data analysis
- for the Synthesising and evaluating criterion at the 8–9 performance-level
  - solution success criteria, relevant research information and valid data are used to make justified recommendations with development and refinement of ideas throughout the problem-solving process. For example, the response should be well-structured, rational, and realistically combine and integrate pertinent aerospace systems, technology and research information, data and ideas that have a direct bearing on the operational systems solution
- for the Communicating criterion at the 3–4 performance level
  - the written and visual features are well structured and provide an articulate and thoughtful presentation of information to a technical audience
  - a consistent and articulate reference list is developed and supported by a recognised system of in-text referencing throughout the folio. For example, folios should acknowledge sources for both textual and visual information included in Part A and Part B.

Additional advice

- The conditions for a Project — Folio Part A is 7–9 A3 pages and Part B is 2–3 A4 pages. Schools should ensure that students are supported to develop skills in managing the length, scope and scale of their responses appropriately.
- Appendixes are not assessable evidence and should not be included in student responses. If an appendix is included, schools must be aware that it should contain only supplementary material that will not be directly used as evidence when marking the response (see Section 8.2.6 of the *QCE and QCIA policy and procedures handbook v4.0*).
- Teachers should encourage students to demonstrate success criteria that are apparent, rather than implied. The inclusion of explicit, measurable success criteria, which are required for Assessment objective 4 (determine solution success criteria) and for Assessment objective 7 (evaluate and refine ideas), ensures the evidence can be clearly identified.

Internal assessment 2 (IA2)

Examination (25%)

This assessment is a supervised test that assesses the application of a range of cognitions to multiple provided items — questions, scenarios and problems. Student responses must be completed individually, under supervised conditions, and in a set timeframe.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions*
Alignment	3
Authentication	0
Authenticity	0
Item construction	0
Scope and scale	1

*Each priority might contain up to four assessment practices.

Total number of submissions: 10.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- enabled students to demonstrate their understanding of the subject matter for the unit and topics covering the required assessment objectives and performance-level descriptors of the ISMG
- featured a range of Unit 3 subject matter, assessing a balance across the assessment objectives, and using a range of item types, including multiple choice, single-word, sentence, short-paragraph and calculation responses that allowed for unique student responses, e.g. analysing an aircraft crash using the SHELL Model or stating the function of CASA.

Practices to strengthen

It is recommended that assessment instruments:

- provide a range of questions that assess a balance across the assessment objectives, with the percentage allocation of marks matching the following question specifications: ~20% complex unfamiliar, ~20% complex familiar and ~60% simple familiar. These questions must also be correctly labelled (see Syllabus section 4.8.2)

- feature questions that reflect the syllabus conditions with regard to scope and scale, e.g. short paragraph questions must adhere to the syllabus conditions of 50–150 words. It is not appropriate to set a word limit greater than 150 words
- adhere to the conventions for item construction outlined in Section 9.5.2 of the *QCE and QCIA policy and procedures handbook v4.0*, e.g. include multiple choice items that have been constructed according to conventions for that item type.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions*
Bias avoidance	1
Language	3
Layout	0
Transparency	1

*Each priority might contain up to four assessment practices.

Total number of submissions: 10.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- featured an appropriate layout that was user-friendly for students
- avoided bias and inappropriate content and used gender-neutral language throughout contexts, stimulus and items.

Practices to strengthen

It is recommended that assessment instruments:

- provide clear instructions aligned with the cognitions in the assessment objectives using cues to give clarity of expectations to provide a suitable response
- should be free of errors and model accurate spelling, grammar, punctuation and other textual features
- feature images, diagrams or other visual elements that are legible, clear, relevant and accessible. In particular, airport diagram reproductions should be large enough and clear
- provide clear alignment between the stimulus and the question, e.g. students should not be able to construct a response without the stimulus. If a response to the item can be constructed without using the stimulus, the stimulus serves no real purpose for that question.

Additional advice

- The examination assessment should be proof-read to ensure there are no errors. For example
  - allocations of marks on the marking schemes should be checked to ensure they add up to the nominated total or marks
  - percentage allocations of marks for CUF, CF and SF should align to the syllabus conditions.

Assessment decisions

Reliability

Reliability is a judgment about the measurements of assessment. It refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Aerospace systems knowledge and problem-solving	100%	0%	0%	0%

Effective practices

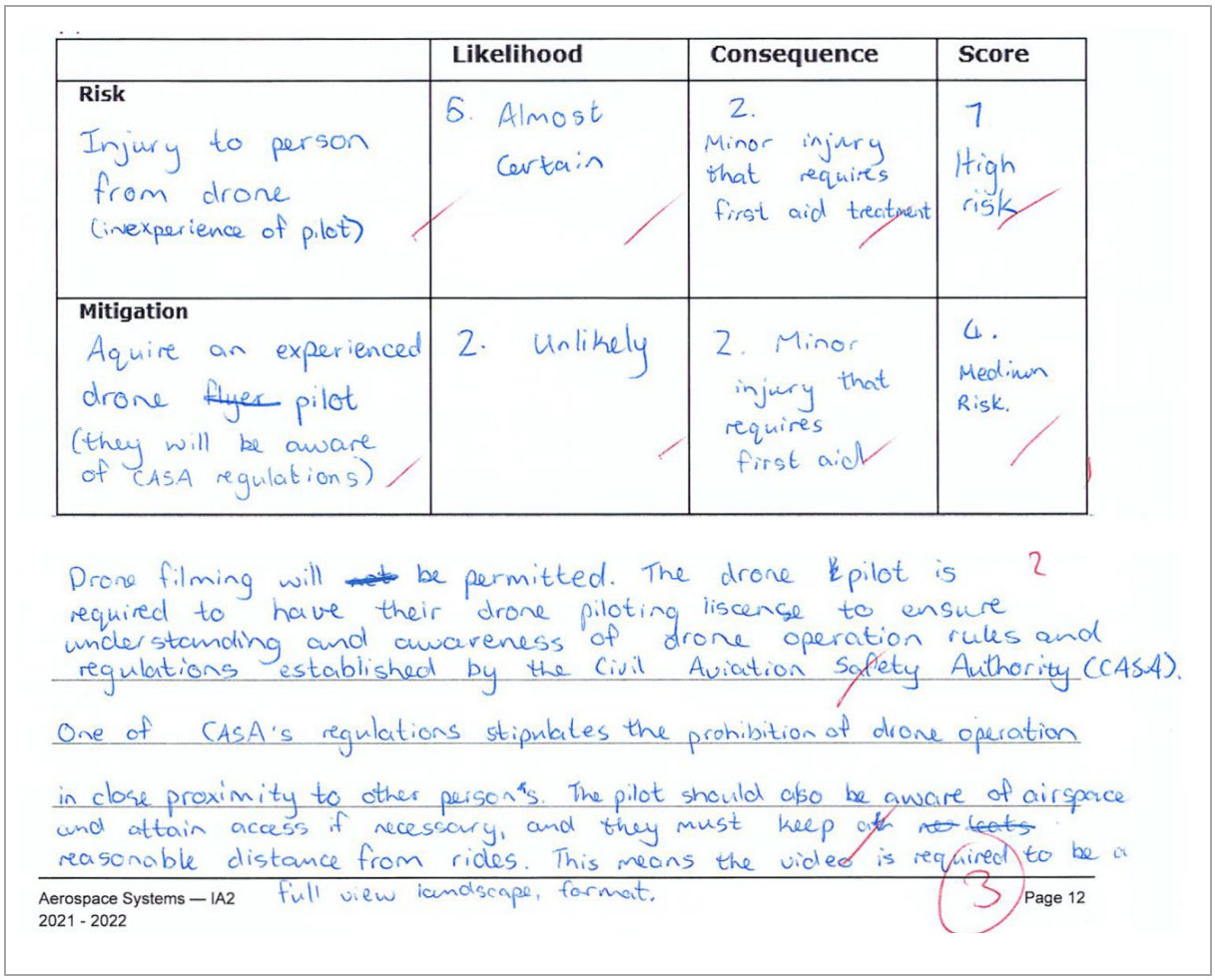
Accuracy and consistency of the application of the ISMG for this IA was most effective when:

- the Aerospace systems knowledge and problem-solving criterion demonstrated
  - explanations of ideas in aerospace operations. For example, students provided evidence of the relevant facts to make a situation plan about concepts such as Just Safety Culture and organisational bodies in the aviation industry
  - symbolisation and explanation of causal loop diagrams. Students used annotated diagrams to explain relationships, with variables nominated and links shown with arrows and loops annotated to describe the changes in variables
  - clear evaluations to make justified recommendations. For example, students provided evidence of the appraisal of strengths and weaknesses to make judgments based on criteria
- evidence provided in student responses to the short paragraph was consistent and made reference to the questions using key terms and ideas that were clearly identified in the marking scheme.

Samples of effective practices

The following excerpt illustrates a critical evaluation with astutely justified recommendations. The question required students to complete a risk analysis and evaluation of an aerospace scenario that provided students the opportunity to develop justified recommendations.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.



	Likelihood	Consequence	Score
Risk Injury to person from drone (inexperience of pilot)	6. Almost Certain	2. Minor injury that requires first aid treatment	7 High risk
Mitigation Aquire an experienced drone ~~flyer~~ pilot (they will be aware of CASA regulations)	2. Unlikely	2. Minor injury that requires first aid	4. Medium Risk.

Drone filming will ~~not~~ be permitted. The drone pilot is required to have their drone piloting liscense to ensure understanding and awareness of drone operation rules and regulations established by the Civil Aviation Safety Authority (CASA). 2

One of CASA's regulations stipulates the prohibition of drone operation in close proximity to other persons. The pilot should also be aware of airspace and attain access if necessary, and they must keep ~~at~~ ~~not~~ ~~feets~~ reasonable distance from rides. This means the video is required to be a full view landscape, format. 3

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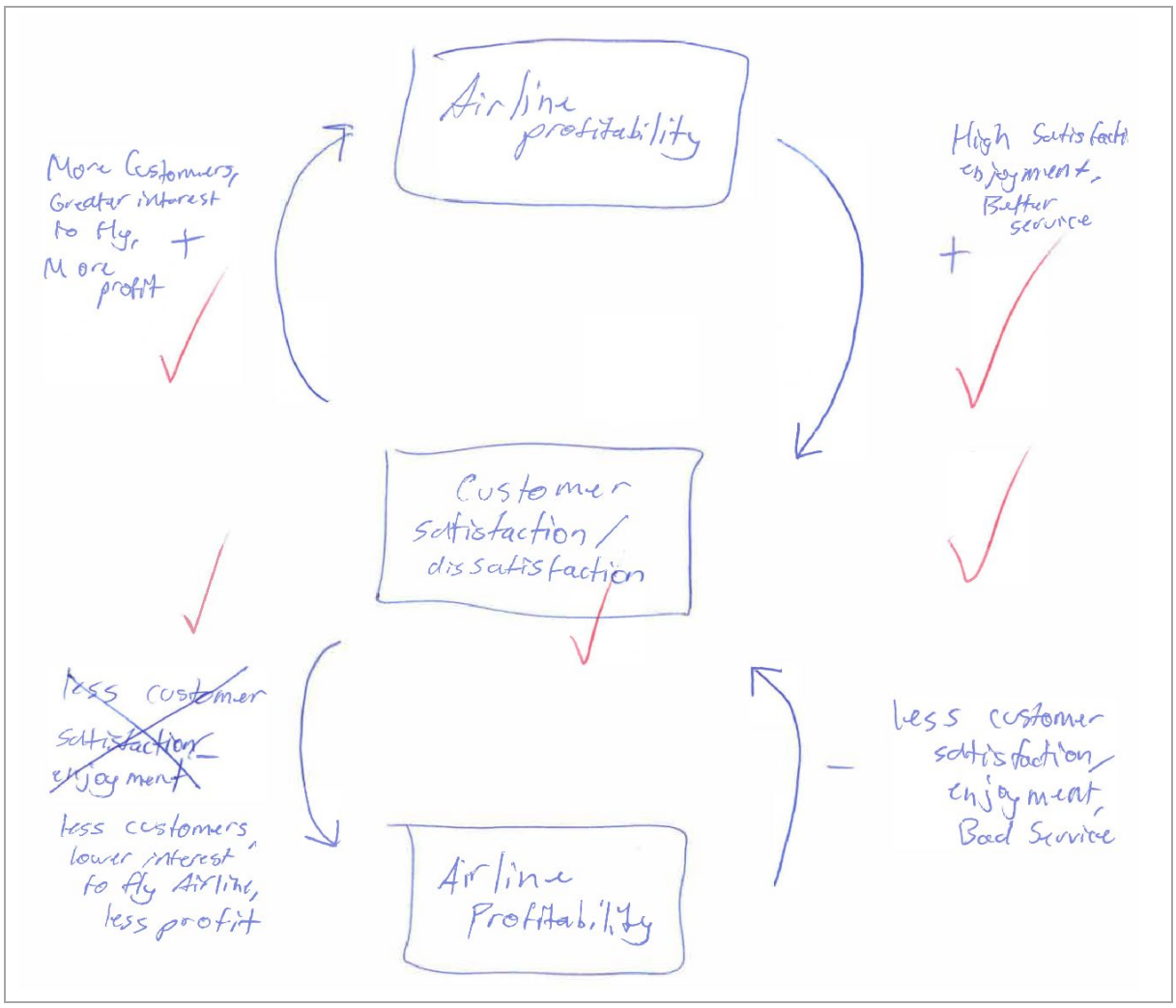
The following excerpt demonstrates adept symbolisation in response to a question about airline customer satisfaction and airline profitability. The causal loops show comprehension of the nature of the interdependence between variables in a system.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.



The following excerpts demonstrate high-level responses with accurate and discriminating recognition and discerning description of aerospace operational systems problems, knowledge, concepts and principles, and systems thinking habits and systems thinking strategies in a range of contexts. They achieve this as follows:

- Excerpt 1 identifies the relationship between ATC and aircraft in a holding pattern
- Excerpt 2 determines the classes of Australian airspace and their differences
- Excerpt 3 highlights a sketched safety maturity model and explanation of an airline's safety culture.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

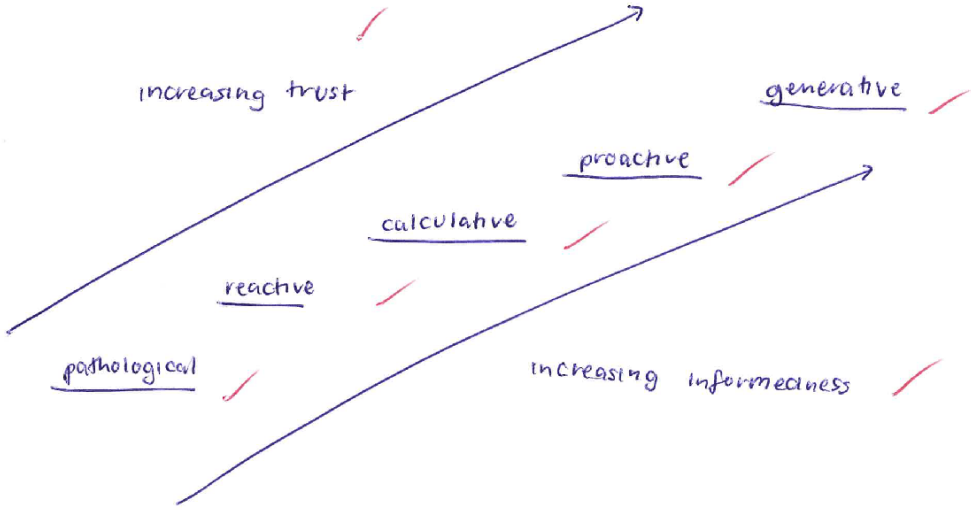
Excerpt 1

1. weather conditions preventing safety in landing (eg storm) ✓
2. an accident has occured on the runway required by aircraft. ✓

Excerpt 2

Australian Airspace is spit into 5 classes, ~~A, E~~ including A, C, D & G. Each class of airspace has specific requirements and conditions. Class C airspace refers to the airspace around a controlled aerodrome like major airports ~~and is with~~ with radar and tower on site. Class D airspace often refers to smaller regional airports that do not have radar but do have a tower on site. Class G airspace refers to 'general' or uncontrolled airspace. In this airspace IFR aircraft are require to maintain communication with ATC, but both IFR & VFR do not require clearance. Class A airspace refers to high altitude airspace, 18000ft and above. This airspace can only be used by IFR aircraft and is used en route travel.

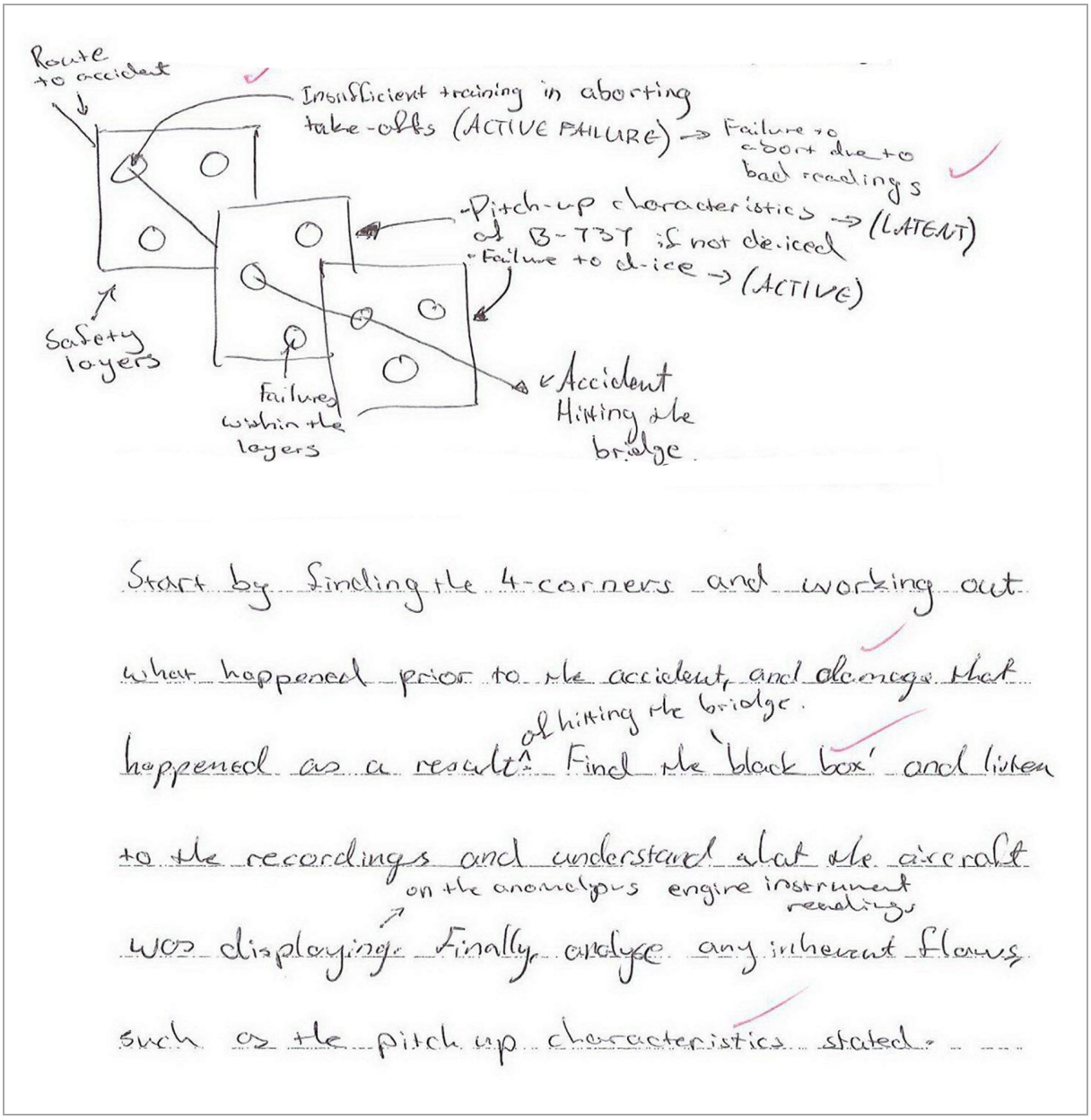
Excerpt 3



Vivo airlines is currently in the reactive stage of Patrick Hudson's Safety maturity model, having implemented procedures after an accident occured. For this airline to improve its safety culture it must reach the generative stage. To do this it must first ~~implement~~ reach the calculative stage by developing safety procedures and systems for workers to follow. By refining and improving these procedures Vivo airlines will reach the proactive stage of the model. To become 'generative' in its approach to safety the safety systems put in place must be effective at preventing accidents and the company should conduct risk assessments to anticipate accidents.

The following excerpt illustrates coherent and logical synthesis of information and ideas to propose a possible solution in response to a synthesise question that required students to analyse an investigation and identify potential causes of an accident.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.



Practices to strengthen

To further ensure accuracy and consistency of the application of the ISMG for this IA, it is recommended that:

- examination questions provide more opportunities for students to engage with real world operational systems problems and stimulus that require calculations, synthesis and evaluation
- percentage allocation of marks consists of at least two complex unfamiliar questions, while still maintaining the 60%, 20%, 20% split, to provide multiple opportunities for students to engage with complex unfamiliar questions.

Additional advice

- Schools should upload a marking scheme that clearly indicates the mark allocations for all examination questions to support the confirmation process. A version control issue was evident with some submissions, and it is advised that marking schemes should match all questions of the endorsed task and clearly show the marks available for each question.
- Schools should deliver the endorsed task unaltered from the QCAA's Endorsement application or ensure any amendments to the task are approved through the Endorsement application prior to distribution.
- Schools should develop internal assessment tasks with ten multiple choice questions worth one mark each to create a more realistic understanding of the time demands required of students in the external assessment.
- Schools should check item stimulus, graphs, tables and diagrams for clarity and to ensure they match the question.
- Teachers should indicate the marks to be awarded as per the mark allocation specifications for complex unfamiliar questions within the marking scheme. Some questions were nominated as complex unfamiliar but did not enable students to provide a sustained analysis, synthesis and evaluation of relevant information to develop their responses.
- Schools should ensure students complete examinations with non-erasable pens, as erasable pens may result in student work being very difficult to read when scanned. Scans of student work should be checked to ensure they are clear and legible.
- Marking schemes should be transparent and clearly show marks allocated per question as well as a total tally and how the percentage cut-offs are applied. Teachers should cross-mark to check that marks are calculated correctly, and the percentage cut-offs are applied accurately for each sample. Use of half marks is best avoided for simplicity and to reduce confusion.

Internal assessment 3 (IA3)

Project — folio (25%)

This assessment focuses on a problem-solving process that requires the application of a range of cognitive, technical and creative skills and theoretical understandings. Students document the iterative process undertaken to develop a solution to a problem. The response is a coherent work that includes written paragraphs and annotations, diagrams, sketches, drawings, photographs, tables, spreadsheets and prototypes. This assessment occurs over an extended and defined period of time. Students may use class time and their own time to develop a response.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions*
Alignment	3
Authentication	0
Authenticity	3
Item construction	2
Scope and scale	1

*Each priority might contain up to four assessment practices.

Total number of submissions: 10.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- utilised appropriate checkpoints in line with authentication procedures that represented QCAA standards for ensuring student authorship

Practices to strengthen

It is recommended that assessment instruments:

- stipulate the scaffolding used, particularly when using specific charts as laid out in the QCAA Aerospace Systems Formula Sheet. The reference for these worksheets, via the CASA website for RPL, PPL & CPL (Aeroplane) Workbook Version 3.0a – 02 December 2021, is https://www.casa.gov.au/sites/default/files/2021-08/rpl-ppl-cpl-aeroplane-workbook.pdf.
- have appropriate scope and scale to allow students to respond within the syllabus conditions, e.g. schools need to set boundaries that are small enough for the task to be achievable, but

large enough to provide students the opportunity to give a unique response with enough depth to cover the objectives. For example, the scale of the task below is too complex because it requires a highly detailed solution that would exceed syllabus conditions.

  - Tourism Australia has approached your Charter Company to create a new niche flight market opportunity. They want consumers to experience the vast array of destinations and experiences within Australia. You will need to create a mid-year and a Christmas holiday option for 6–12 passengers. To ensure your guests get the best possible experience, you plan to visit three locations with at least one overnight stop.

- use unaltered assessment specifications for Part A and Part B (Syllabus section 4.8.1), e.g. schools should use the language from the syllabus and reproduce Part A and B specifications directly from the syllabus.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions*
Bias avoidance	0
Language	1
Layout	0
Transparency	0

*Each priority might contain up to four assessment practices.

Total number of submissions: 10.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- used appropriate language drawn from Unit 4 subject matter that avoided unnecessary jargon, e.g. tasks that used language from the unit and avoided technical language outside the topics in Unit 4
- used appropriate formatting features, e.g. tasks with a clear, unambiguous layout that used headings and subheadings and did not overuse bold or italics
- used images, diagrams or other visual elements that were legible, clear, relevant and accessible, e.g. tasks that provided images, diagrams or other visual elements with high resolution.

Practices to strengthen

It is recommended that assessment instruments:

- have correct grammar to promote better understanding of the expectations required to complete the assessment. It would be valuable to have colleagues proof-read the assessment for spelling, grammar and ease of understanding.

Assessment decisions

Reliability

Reliability is a judgment about the measurements of assessment. It refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Retrieving and comprehending	100%	0%	0%	0%
2	Analysing	80%	0%	20%	0%
3	Synthesising and evaluating	100%	0%	0%	0%
4	Communicating	100%	0%	0%	0%

Effective practices

Accuracy and consistency of the application of the ISMG for this IA was most effective when:

- for the Retrieving and comprehending criterion at the 4–5 performance level, the application of the ISMG
  - demonstrated clear evidence of accurate and discriminating recognition of systems thinking strategies. Explicit use of habits of a systems thinker or systems thinking models, such as the iceberg model, ensured students provided evidence of the first assessment objective. Encouraging students to include systems thinking habits and systems thinking strategies in relation to the folio context is required
  - demonstrated adept symbolisation in diagrams. Folios provided evidence of adept symbolisation in a variety of forms including mind maps, visual frameworks and causal loop diagrams supported by graphs, tables and picture annotations
- for the Synthesising and evaluating criterion at the 8–9 performance level, the application of the ISMG
  - demonstrated use of discerning solution success criteria, relevant research information and valid data to make justified recommendations with development and refinement of ideas throughout the problem-solving process
- for the Communicating criterion at the 3–4 performance level, the application of the ISMG
  - demonstrated well-structured written and visual features and provided an articulate and thoughtful presentation of information to a technical audience, with consistent and articulate use of a reference list using a recognised system of in-text referencing
  - included both Part A and Part B of the project folio including headings that showed understanding of the organisation of student thinking during the problem-solving process in Aerospace Systems and that were easily followed using a correctly formatted contents page.

Samples of effective practices

The following excerpt illustrates astute success criteria: the student provided evidence of sound reasoning by justification and explanation of the criteria and sub-criteria. This allowed for later evaluation of the solution.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

2.4 Success criteria

Table 3: Solution Requirements and Self-Determined Criteria

	Success Criteria The proposed solution must…
1	**Be cost effective** – The proposed solution must reduce costs (i.e. aircraft hire, fuel, airport fees, accommodation, food, etc.) without jeopardising safety of the pilot or passengers.
2	**Be time-efficient** – The proposed operation should be as time-efficient as possible to reduce costs and maximise the time spent in the desired holiday location: Jandakot.
3	**Be comfortable –** Given that the operation is a holiday, the flight plan should aim to maximise comfort and enjoyment of the passengers. This includes allowing for rest time between flight legs, landing at locations with accessible amenities including accommodation, restaurants/shops, and scheduling flights at reasonable times of the day to reduce early starts and late nights of travel.
4	**Maximise safety** – The proposed operation should maximise safety by operating with consideration of human factors. Major human factors that will impact the safety of this operation include the requirement for the operation to… 1. **Be suitable for inexperienced pilot** – The proposed operation should be achievable for an inexperienced pilot who may be unfamiliar with flight instruments, navigation, landscape, etc. Appropriate measures should be put in place for pilot's comfort, safety and the overall success of the operation. 2. **Put safety procedures and fail-safes in place in case of emergency** – The proposed solution should consider the chance of an emergency landing and thus should research alternate airports to land at in case of an emergency. 3. **Follow safety regulations** – The proposed solution should take safety regulations of relevant authorities into account. This includes the consideration of the regulated maximum flight and rest times for a pilot, and consideration of the fuel reserves required.
5	**Select an appropriate aircraft and route for operational requirements –** Thus, the flight plan should use research to justify decisions and ensure a safe and successful journey. Important factors that should be considered in the selection of an aircraft for this operation include… 1. **Baggage capacity –** The proposed solution's aircraft selection should provide a reasonable allowance for baggage weight (10kg per person) to be considered a feasible solution. 2. **Suitable for average weather conditions** – The proposed solution should take the average weather conditions (wind, temperature etc.) of the locations along the route into account to ensure that the proposed operation is feasible given the aircrafts' performance capabilities (i.e. the flight distance capable of each leg in the journey).
6	**Ensure airports stopped at have appropriate resources** – For the proposed operation to be successful, the airports elected for stopovers must be suitable for the selected aircraft and crew requirements. 1. **Accommodation:** The airports selected for overnight stopovers should be in close proximity to affordable, comfortable accommodation for the pilot and crew to ensure that the pilot receives restful sleep. 2. **Runway:** The proposed solution should take the take-off and landing capabilities of each aircraft into consideration for the airports selected to ensure that the route selected is feasible. 3. **Refuelling:** The proposed solution should select airports which provide the appropriate refuelling facilities for the selected aircraft.

The following excerpts demonstrate:

- in Excerpt 1, systems thinking models, such as the Iceberg Model, which was used to analyse contexts and explain relationships. The components of a situation were identified and the relationships to the structure of the problem were clarified
- in Excerpt 2, astute success criteria: the student provided evidence of sound reasoning through justification and explanation of the criteria and sub-criteria. This allowed for later evaluation of the solution
- in Excerpt 3, analysis using various models that break problems down into components and elements. The Swiss Cheese Model of Accident Analysis and SWOT analysis models were tools used effectively to demonstrate analytical skills

- in Excerpt 4, explicit use of success criteria to evaluate the solution. The use of a table to organise information and clearly show the assessment of the solution against the earlier identified success criteria.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

Excerpt 1

Iceberg model - Mobile Phone Distractions

Figure 7

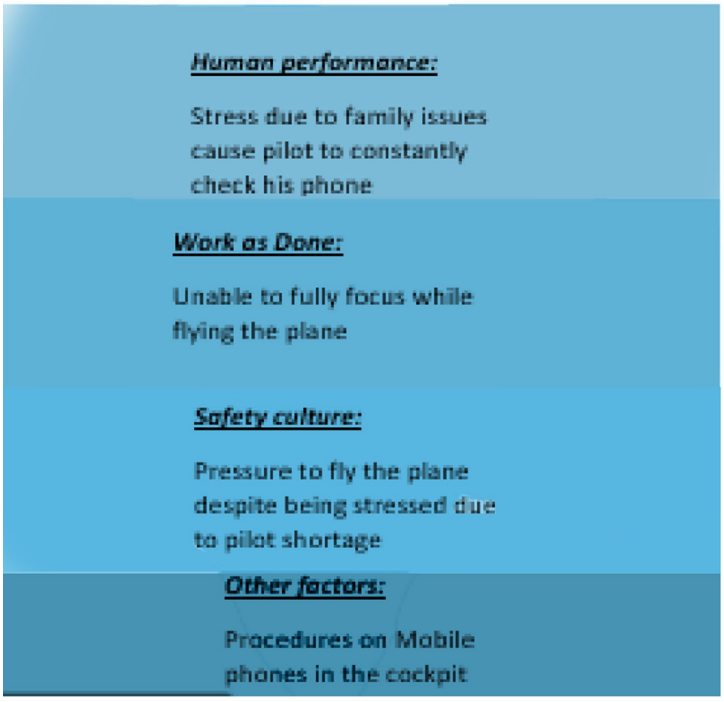


Diagram on the left is an Iceberg model for Mobile phone distractions. At the tip of the iceberg, everyone can see that the pilot crashed because he was distracted on the mobile phone. However, there could have been many underlying factors that led to the crash. The human factor that led to the pilot checking his phone e.g., stress from family issues at home. The work as done, how the pilot performed before checking his phone. This could have been overlooked by investigators who jumped straight to the conclusion that the mobile phone was the direct cause of the crash. The safety culture is invisible, therefore hard to identify, however the pressure of the pilot to fly due to staff shortage caused the pilot to fly in the first place. Other factors such as procedures regarding mobile phones usage in the cockpit may also be overlooked. The example of the iceberg model demonstrates the importance of looking beyond the visible and easy to blame problem to find an effective solution to human factors such as distractions.

Excerpt 2

SWOT Evaluation of Solution

Strengths • Helps pilots remain calm in stressful situations • Pilots develop a focused instinct before their first flight • Drastic decrease in pilot distractions • Pilots have higher confidence before their first flight • Less safety procedures needed	**Weakness:** • Expensive to maintain simulators • Expensive to buy quality simulators • Hard to incorporate course into pilot flight school syllabus • Will take long to incorporate as it must be approved by CASA • Take even longer before the world incorporates the course
Opportunities: • After the success of the simulator training course, CASA could start other courses for other human factors. • All pilots around the world can learn the course at their local flight school	**Threats:** • Some flight school's may not be able to afford extra simulators and instructors, leading to closure of flight schools • CASA could remove their financial support from the program which will cancel the training course

Excerpt 3

Evaluation of the Success Criteria

To effectively decrease distractions in the cockpit	The success criteria say 'effectively', which means being successful in producing a desired result. The solution not only helps pilots deal with all types of distractions but reduces the need for more safety procedures. Therefore the expected number of accidents/incidents relating to distractions will minimise. This means the solution has effectively achieved the success criteria.
Success will be achieved if pilots can maintain focus during expected and unexpected situations.	Other previous solutions such as the sterile cockpit rule, only minimises distractions however doesn't help pilots focus during distractions; therefore it doesn't achieve the success criteria. However the new training course teaches pilots to maintain focus during expected and unexpected situations, thus the solution has achieved the success criteria.
The solution must be cost effective for airlines/flight schools to use worldwide.	Cost effective means airlines, flight schools and pilots must be able to afford the solution over many years without exceeding the budget. The simulator course is quite expensive as flight schools must purchase at least 5 full flight simulators totalling $50 million, while new pilots must pay an extra fee, (still unknown if government can financially support the solution). Therefore the solution has not met the success criteria of being cost effective for flight schools.
Pilots should be able to easily deal with distractions before their first commercial flight	The Sterile cockpit rule and other standard operating procedures are not a proactive solution at minimising pilot distractions; thus many incidents/accidents still occur. Therefore the success criteria states pilots should easily deal with distractions before their first flight. The training course must be completed before a pilot can obtain a pilot license to ensure all pilots have the confidence to deal with distractions, therefore the solution has effectively achieved the success criteria.

Excerpt 4

Refinements

Due to the high costs of the solution, a better solution would be to stay affordable and attractable to new pilots while effectively helping them deal with distractions. This can be done by minimising the need for extra simulators. Each simulator costs $10 million, therefore if each flight school only required two full flight simulators, flight schools would save approx. $30 million which would result in the deduction of training course fees for new pilots. By changing the structure of the course, this can be possible. Instead of each pilot learning and flying on the simulator every day, flight instructors will teach pilots in classrooms beforehand, then pilots will be tested on the simulators when it is their turn. This reduces the time spent in simulators as more time will be spent learning in the classroom, reducing the need for extra simulators.

The following excerpts demonstrate:

- in Excerpt 1, representations of ideas and relationships using highly skilled causal and feedback loops with valuable and relevant annotations that display intellectual perception about ideas and a solution in relation to the problem
- in Excerpt 2, systems thinking considerations that are clearly identified with evidence of research information that describes the contributing factors and weaknesses that have direct bearing on the aircraft performance systems and/or human factors problem.

Note: The characteristic/s identified may not be the only time the characteristic/s has occurred throughout a response.

Excerpt 1

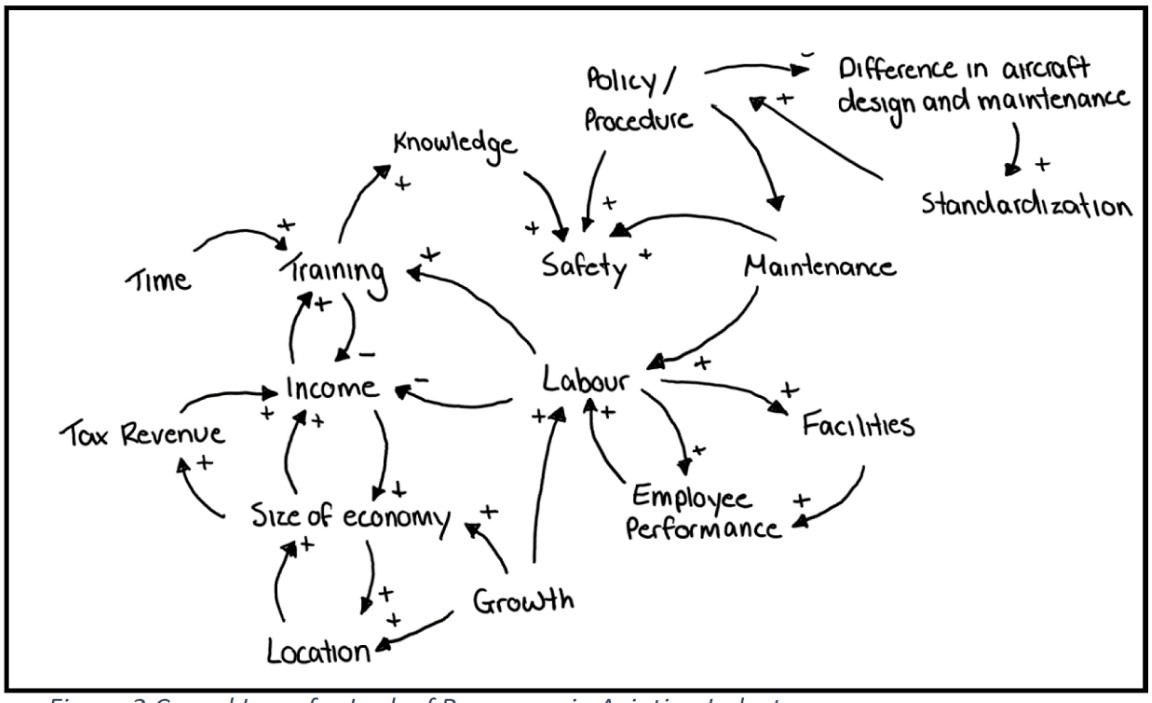


Figure 2 Causal Loop for Lack of Resources in Aviation Industry

Excerpt 2

Systems Thinking Habits:

Changes perspective to increase understanding:

While it seems straight forward to build and develop more maintenance hubs across the country, the inevitable costs and long-term effects can have a significant effect on performance. The cost of building adequate more facilities that can contain all aircraft up to an A380 poses a few problems. The A380 and other long-haul aircraft require several kilometers of runway to land, therefore, making them restricted to larger airports. However, this gives opportunity for smaller aircraft to conduct their maintenance at other locations to make room for more aircraft at different airports. The cost of establishing more facilities passes on to the labour as well. Having larger amounts of labour can significantly add to the total cost, as well as posing risks of fatigue and pressure from smaller amounts of labour at each facility.

Practices to strengthen

To further ensure accuracy and consistency of the application of the ISMG for this IA, it is recommended that:

- for the Analysing criterion at the 6–7 performance level
  - folios clearly indicate the relevant elements, components and features to evaluate aspects of the aircraft performance systems and/or human factors solution. The problem-solving process focuses on development of the real-world solution with relevant aerospace systems, technology, and research information to generate data that supports the solution success criteria
  - folios display evidence an understanding of the relationships that exist in complex situations to distinguish the aircraft performance systems and/or human factors problem's characteristics developed through research and data analysis
  - specific success criteria are identified at the beginning of the problem-solving process and later used to effectively evaluate the proposed solution
- for the Analysing criterion at the 4–5 performance level
  - folios demonstrate logical determination of success criteria and considered analysis is given a prominent position, with explicit information about the criteria used to illustrate how the relationships that exist in complex situations have been addressed.

Additional advice

- The condition for Project — Folio Part A is 7–9 A3 pages and for Part B is 2–3 A4 pages. Schools should ensure that, during the drafting process, or when providing feedback, students are supported to develop skills in managing the length, scope and scale of their responses appropriately and within the syllabus conditions.
- Teachers should encourage students to demonstrate success criteria that are clearly apparent, rather than implied. The inclusion of explicit, measurable success criteria, which are required for Assessment objective 4 (determine solution success criteria) and for Assessment objective 7 (evaluate and refine ideas), ensures the evidence can be clearly identified.

- Teachers should review the QCAA Making judgments webinar to apply the best fit model for marking based on student evidence using the ISMG to make appropriate judgments. This is important to ensure the selection of correct performance level and to mark within performance level.
- Schools should take care when uploading files to the Confirmation application in the QCAA Portal. Ensure all required documents are included and all pages are orientated correctly.

External assessment

External assessment (EA) is developed and marked by the QCAA. The external assessment for a subject is common to all schools and administered under the same conditions, at the same time, on the same day.

Examination (25%)

Assessment design

The assessment instrument was designed using the specifications, conditions and assessment objectives described in the summative external assessment section of the syllabus. The examination consisted of one paper:

- Paper 1, Section 1 consisted of multiple choice questions (10 marks)
- Paper 1, Section 2 consisted of short response questions (70 marks).

The assessment instrument was designed using the specifications, conditions and assessment objectives described in the summative external assessment section of the syllabus. The examination consisted of 23 questions (80 marks).

The examination assessed subject matter from Unit 4. Questions were derived from the context of:

- Topic 1: Aircraft performance
- Topic 2: Aircraft navigation
- Topic 3: Advanced navigation and radio communication technologies.

The assessment required students to respond with activities including:

- sketching, drawing and creating graphs, tables and diagrams
- writing multiple choice, single-word, sentence or short-paragraph responses drawn from Unit 4 subject matter
- calculating using formulas drawn from across Unit 4 subject matter
- responding to unseen stimulus materials.

The stimulus was purposefully chosen to elicit a range of unique responses linked to the syllabus objectives and Unit 4: Topic 2 Aircraft navigation subject matter. The stimulus provided real-world contexts for students to demonstrate their knowledge of aeronautical charts and information, which was designed to elicit unique responses to unfamiliar contexts.

The types of stimulus used were:

- basic flight instruments
- Visual Navigation Chart (VNC)
- Primary flight display illustration (PFD)
- Terminal Area Forecasts (TAF).
- En Route Supplement Australia (ERSA)

- CASA flight planning notepad SP107
- Visual Terminal Chart (VTC).

Assessment decisions

Assessment decisions are made by markers by matching student responses to the external assessment marking guide (EAMG). The external assessment papers and the EAMG are published in the year after they are administered.

Multiple choice question responses

There were 10 multiple choice questions in Paper 1.

Percentage of student responses to each option

Note:

- The correct answer is **bold** and in a blue shaded table cell.
- Some students may not have responded to every question.

Question	A	B	C	D
1	7.27	5.45	5.45	**81.82**
2	12.73	**30.91**	37.27	19.09
3	**76.36**	8.18	10.91	3.64
4	4.55	**56.36**	24.55	14.55
5	**12.73**	6.36	9.09	70
6	25.45	18.18	26.36	**29.09**
7	0.91	36.36	**52.73**	10
8	7.27	3.64	14.55	**73.64**
9	10.91	10	**64.55**	13.64
10	60.91	**25.45**	1.82	10.91

Effective practices

Overall, students responded well to:

- questions requiring recognition and description of aerospace technology knowledge, concepts and principles across simple familiar and some complex familiar questions
- questions requiring explanation of ideas, solutions and relationships in relation to aircraft performance systems and human factors
- analysis of aerospace problem scenarios and information that focused on aircraft performance systems and human factors across simple familiar and some complex familiar questions
- questions requiring solutions to problems supported by calculations where relationships and interactions were obvious and had few elements, and all the information to solve the problem was clearly provided in the question.

Samples of effective practices

Short response

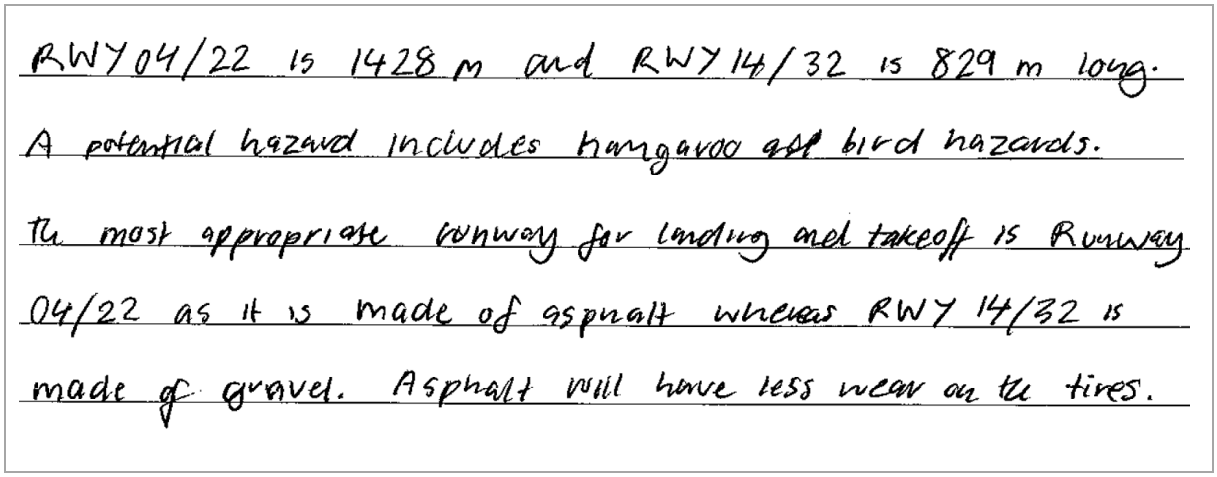
The following excerpt is Question 14. It required students to analyse a scenario and ERSA extract to identify runway lengths and a potential hazard. Part B required students to determine the most appropriate runway for landing and take-off operations and to support their answer with a reasoned explanation.

Effective student responses:

- identified one runway length in metres [1 mark]
- identified another runway length in metres [1 mark]
- identified a potential hazard [1 mark]
- determined RWY 04/22 as the most appropriate runway for landing and take-off [1 mark]
- provided a reasoned explanation [1 mark].

This excerpt has been included:

- to demonstrate correct runway lengths for RWY04/22 at 1428m and RWY14/32 at 829m
- as it states that kangaroos and birds are the identified potential hazards in the ERSA
- to demonstrate a suitable explanation of why RWY04/22 is more appropriate for take-off operations.


RWY 04/22 is 1428 m and RWY 14/32 is 829 m long.
A potential hazard includes kangaroo and bird hazards.
The most appropriate runway for landing and takeoff is Runway 04/22 as it is made of asphalt whereas RWY 14/32 is made of gravel. Asphalt will have less wear on the tires.

The following excerpt is Question 15. It required students to analyse a real-world aerospace scenario to identify three factors adversely affecting situational awareness and explain how one factor would lead to poor decision-making.

Effective student responses:

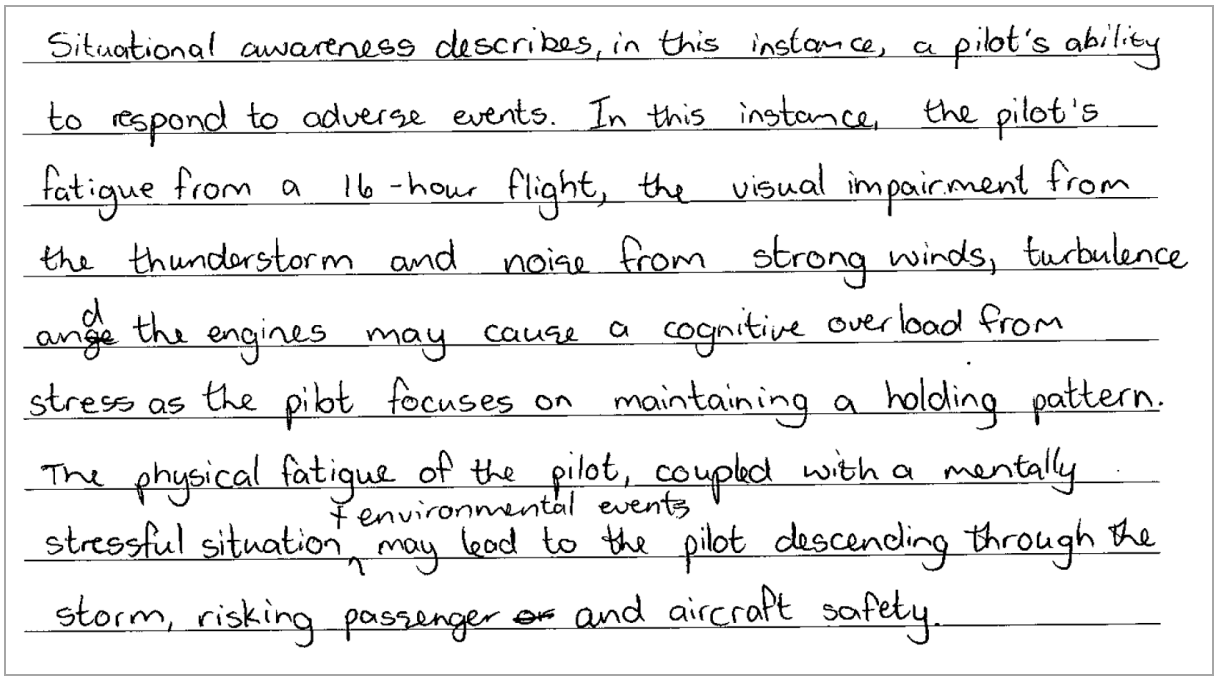
- provided one situational awareness factor [1 mark]
- provided a second situational awareness factor [1 mark]
- provided a third situational awareness factor [1 mark]
- explained how one factor leads to poor decision-making [1 mark].

This excerpt has been included:

- to demonstrate a situational awareness factor of fatigue, stress/workload and distractions/interruptions described in the following statements: ‘fatigue from the 16-hour

flight'; 'the visual impairment from the thunderstorm and noise'; 'cognitive overload from stress as the pilot focuses on the holding pattern'

- to show a plausible situational awareness factor and explanation that could lead to the pilot's poor decision-making.


Situational awareness describes, in this instance, a pilot's ability to respond to adverse events. In this instance, the pilot's fatigue from a 16-hour flight, the visual impairment from the thunderstorm and noise from strong winds, turbulence and/~~ge~~ the engines may cause a cognitive overload from stress as the pilot focuses on maintaining a holding pattern. The physical fatigue of the pilot, coupled with a mentally stressful situation, + environmental events may lead to the pilot descending through the storm, risking passenger ~~or~~ and aircraft safety.

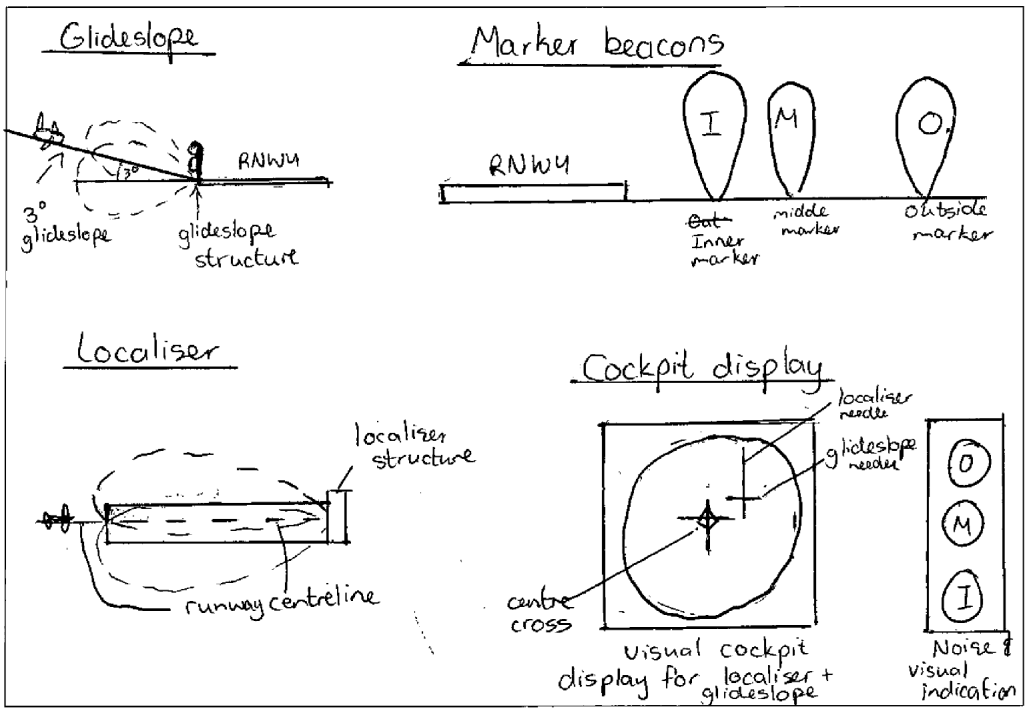
The following excerpt is Question 16. It required students to explain the purpose of an instrument landing system (ILS) and how it operates with sketches to support their explanation.

Effective student responses:

- provided a sketch of the localiser [1 mark]
- provided a sketch of the glideslope [1 mark]
- explained that
  - ILS is a precision runway approach aid employing two radio beams [1 mark]
  - the localiser (LOC) provides azimuth guidance [1 mark]
  - the glideslope (GS) defines the correct vertical descent profile [1 mark].

This excerpt has been included:

- to show sketched examples of the glideslope and localiser that complement the explanation of the purpose of the ILS and how it operates
- as it illustrates that the ILS is used to assist approaching aircraft upon runway approach using radio beam lobes, as seen in the sketch
- because it provides an explanation of azimuth guidance for the localiser and the correct vertical descent profile of 3 degrees for the glideslope.



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.

Instrument landing systems (ILS) are used to assist approaching aircraft onto the centreline of the runway (using localiser at the far end of the runway) and with a descent glideslope of 3° (using glideslope at near end of runway). The cockpit receive the aircraft position in relation to the runway. This visual indicator is used by the pilot by lining the centre cross with the localiser and glideslope needles and is an aid for low visibility approach.

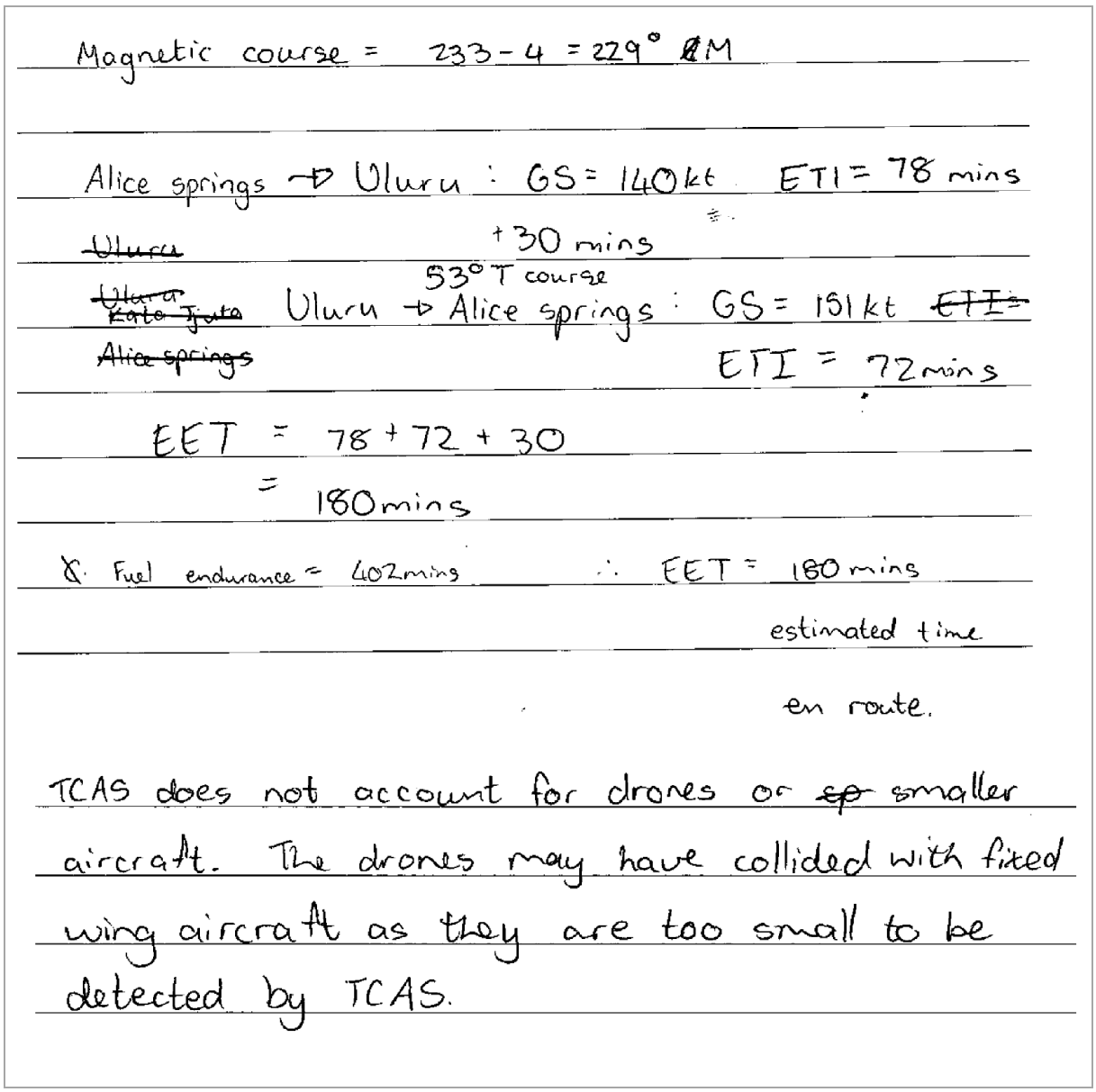
The following excerpt is Question 17a and Question 17b. It required students to analyse a scenic flight scenario to determine the estimated time en route. Students were then required to explain a limitation of traffic collision avoidance systems (TCAS) in the scenario.

Effective student responses:

- determined the ground speed to the destination [1 mark]
- determined the ground speed from the destination [1 mark]
- determined ETE [1 mark]
- explained a limitation of TCAS [1 mark].

This excerpt has been included:

- as it correctly calculated a groundspeed of 140kts to Uluru
- as it correctly calculated a groundspeed of 151kts from Uluru
- as it correctly calculated ETE of 180 mins
- because it provides a valid limitation of TCAS.



The following excerpt is Question 19. In Part A, it required students to analyse a real-world aerospace scenario to complete flight plan and fuel log using a flight computer. Students were also required to determine track error, track made good, closing angle and a new heading to the destination. In Part B, students were required to analyse the causal loop and evaluate whether the pilot's decision to continue the flight was sound given the provided assumptions and supporting data.

Effective student responses:

- determined
  - fuel log [1 mark]
  - track error of 19° [1 mark]
  - track made good of 280° M [1 mark]
  - closing angle of 11° [1 mark]
  - new heading to YBKE of 239° M [1 mark]
- evaluated that the decision was unsound, using the reasoning that
  - there is not enough fuel to continue to YBKE and be within the 45 min fixed fuel reserve regulations [1 mark]
  - the pilot's decision-making was affected by dehydration [1 mark]
- supports the decision with data [1 mark].

This excerpt has been included:

- to demonstrate an evaluation that assesses strengths and weaknesses with reasoning that shows the pilot's decision to continue the flight was unsound due to dehydration
- as it includes supporting data, such as 'the pilots drank coffee', the flight took place on a 'hot summer's day' and that temperature and humidity were factors that increased the pilot's dehydration.

Information provided shows that the pilot had flown a 6 hours journey before commencing this flight. ~~His~~ Their break was conducive to physical fatigue and dehydration as, assuming they did not drink water, the pilot only consumed coffee and the break time was brief. The natural climate on the day, being a hot summer's day, would have reinforced the pilot's dehydration, subsequently ~~impair~~ reinforcing judgement impairment. As the pilot went off track, the flight time would have extended, increasing fatigue ~~the~~ from prolonged cognitive use. This reinforcing loop can be seen in the above illustration.

The pilot's decision to further prolong flight time by continuing their flight heightens the previously mentioned affect. Their decision was unwise as increasing fatigue ~~in~~increased poor decision making. ~~This may~~ The pilot should have planned an alternate destination, ~~Although~~ as their is sufficient fuel for this action. Their dehydration and temperature discomfort is based on the assumption that the pilot was not in a controlled air temperature and humidity environment while on their break.

The following excerpt is Question 23. It required students to analyse a real-world aerospace scenario to determine the circumstances that led to a runway excursion. As part of the response, students were required to define situation awareness, discuss crew resource management and explain three factors that affected the pilot's situation awareness.

Effective student responses:

- drew a conclusion about the circumstances that led to the runway excursion [1 mark]
- provided a definition of situational awareness [1 mark]
- explained one contributing factor affecting situational awareness [1 mark]
- explained a second contributing factor affecting situational awareness [1 mark]
- explained a third contributing factor affecting situational awareness [1 mark]
- analysed CRM, using the reasoning that the pilot's CRM was not effective for
  - communication [1 mark]
  - leadership [1 mark]
  - the environment [1 mark].

This excerpt has been included:

- to demonstrate a conclusion about the factors that led to the runway excursion, in the statement 'pressure altitude/density changed and caused the aircraft weight to be too high to complete the landing in the given space'
- to demonstrate an explanation of two contributing factors affecting situational awareness. For example, the 'pilot was likely inexperienced' and 'they were put under a lot of stress which led to them freezing up'
- to demonstrate a suitable definition for situational awareness, in the statement 'Situational awareness refers to the state in which a pilot has full awareness of contributing factors to an operation and is able to conduct flight safety and effectively'
- as it identifies that the pilot could have increased their communication with the passengers to reduce their stress.

From the information provided above, it can be identified there ~~that the cause~~ where numerous factors which lead to the incident of the aircraft being unable to stop in time and running off the end of the runway. Firstly, statements identified that the weather took a turn without warning. Secondly, they identified that there was a lot of luggage but they took off fine. This information indicates that due to change in weather conditions ~~the loading of the aircraft~~ the pressure altitude/density changed and caused the aircraft weight to be too high to complete a landing in the given space. Another factor contributing to this incident would be the pilot being young and 'looking drained and tense'. This info indicates that the pilot was likely inexperienced and as a result, when weather conditions changed, freezing up they were put under a lot of stress which lead to them not being able to ~~communicate~~ instruct with the passengers. Situational Awareness refers to the state in which a pilot have full awareness of contributing factors to an operation and is able to conduct flight safely and effectively. Factors impacting the pilot's situational awareness include. their stress, inexperience reacting to the situation and the added pressure of passengers unable Q23 – to aid landing. Enhanced crew resource management would have increased the situational awareness of the situation, potentially reducing the pilot's stress by increasing communication with passengers and ensuring appropriates skills were had.

Practices to strengthen

It is recommended that when preparing students for external assessment, teachers consider:

- increasing student exposure to and opportunities for developing assessment literacy skills relating to the dissecting of multiple-choice questions and interpreting the requirements of short response items

- providing more opportunities for students to engage with complex unfamiliar situations that require an in-depth analysis of problems and information (Assessment objective 3) and evaluation where students are required to refine ideas and solutions to make justified recommendations (Assessment objective 7). It is recommended that emphasis be placed on the selection and prioritising of relevant criteria that are used to weigh up or assess an aerospace systems issue or circumstance using knowledge drawn from Unit 4 subject matter
- increasing students' knowledge and use of different aeronautical charts and stimulus information from Unit 4, such as Grid-Point Wind and Temperature Forecasts (GPWT), World Aeronautical Charts (WAC), Visual Navigation Chart (VNC), Visual Terminal Chart (VTC), En Route Supplement Australia (ERSA), Terminal Area Forecasts (TAF) and CASA flight plan format (SP107)
- providing further learning experiences that require students to use the aerospace systems formula sheet, flight performance parameter charts, flight computers and plotters, which will enable them to work more efficiently under examination conditions.

Additional advice

Teachers should:

- provide exposure to the subject matter prescribed in the syllabus, making specific reference to the terminology, areas of study, cognitive requirements and specified examples.
- support students to develop positive multiple-choice practices that involve the breakdown of the elements of the stem, the reading of all distractors, the consideration of validity arguments for each distractor and the decision-making processes to determine the most correct response.
- support students to develop positive practices when responding to short response questions that involve the breakdown of the question, identification of and alignment to the relevant syllabus prescribed subject matter and associated terminology, acknowledgement of the question cognition/s and separate or connected elements within the question, planning, and the completion of a logical and sequential response. Should students have time, they should be encouraged to proofread the response and check that all elements of the question are reflected.