Aerospace Systems subject report

2023 cohort

February 2024

Queensland Government
QCAA Queensland Curriculum & Assessment Authority

240039

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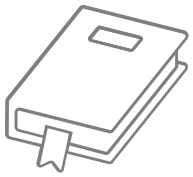
Introduction



Throughout 2023, schools and the Queensland Curriculum and Assessment Authority (QCAA) continued to improve outcomes for students in the Queensland Certificate of Education (QCE) system. These efforts were consolidated by the cumulative experience in teaching, learning and assessment of the current General and General (Extension) senior syllabuses, and school engagement in QCAA endorsement and confirmation processes and external assessment marking. The current evaluation of the QCE system will further enhance understanding of the summative assessment cycle and will inform future QCAA subject reports.

The annual subject reports seek to identify strengths and opportunities for improvement of internal and external assessment processes for all Queensland schools. The 2023 subject report is the culmination of the partnership between schools and the QCAA. It addresses school-based assessment design and judgments, and student responses to external assessment for this subject. In acknowledging effective practices and areas for refinement, it offers schools timely and evidence-based guidance to further develop student learning and assessment experiences for 2024.

The report also includes 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 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 internal and 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 senior subjects.

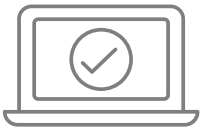
Report preparation

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.

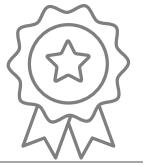
Subject highlights

9
schools offered Aerospace Systems

91.86%
of students completed 4 units



94.94%
of students received a C or higher



Subject data summary

Subject completion

The following data includes students who completed the General subject.

Note: All data is correct as at January 2024. Where percentages are provided, these are rounded to two decimal places and, therefore, may not add up to 100%.

Number of schools that offered Aerospace Systems: 9.

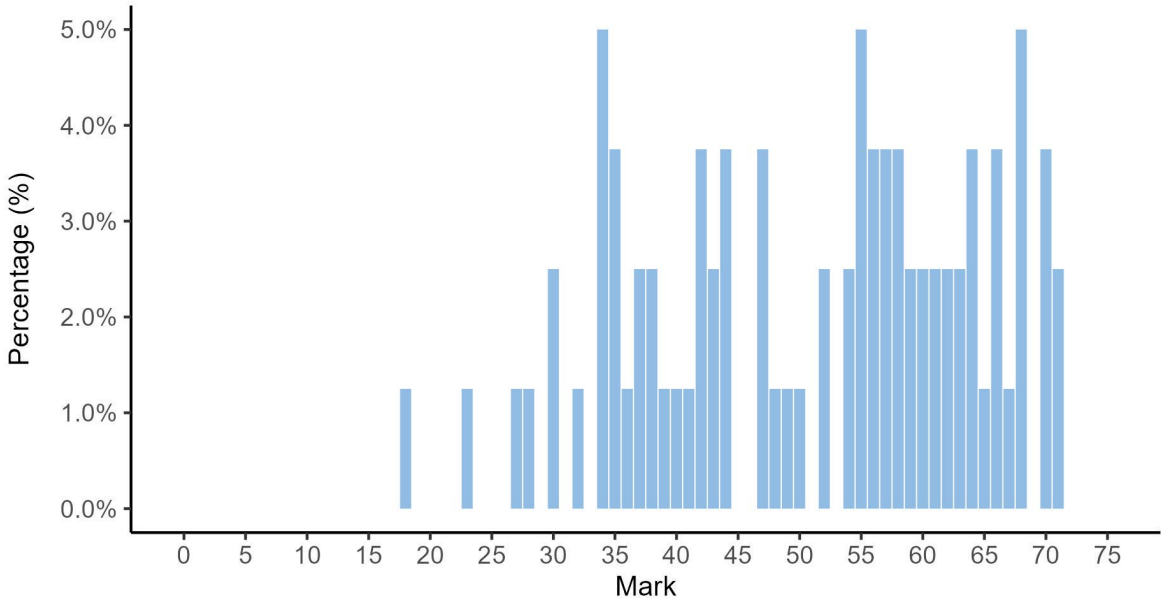
Completion of units	Unit 1	Unit 2	Units 3 and 4
Number of students completed	86	85	79

Units 1 and 2 results

Number of students	Satisfactory	Unsatisfactory
Unit 1	77	9
Unit 2	77	8

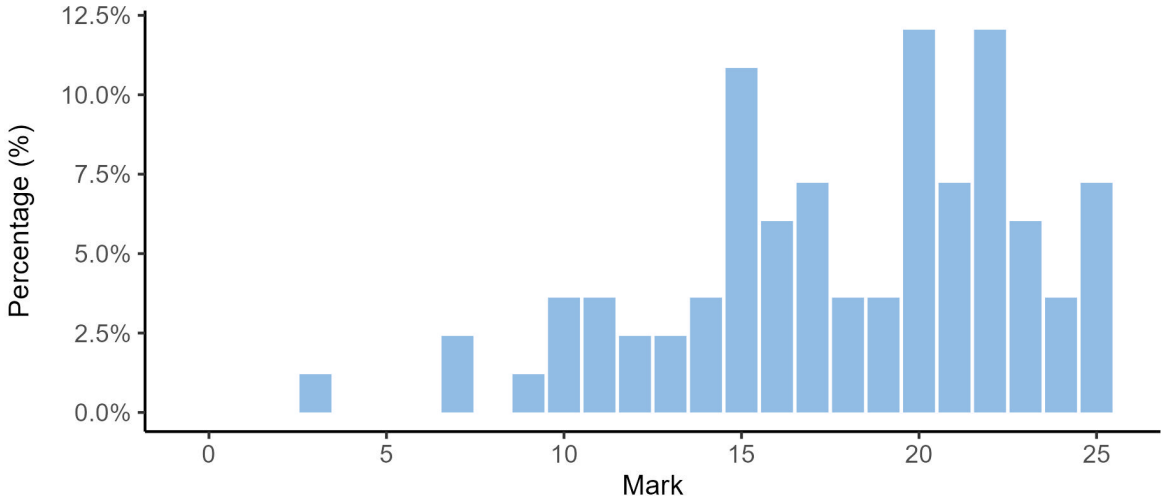
Units 3 and 4 internal assessment (IA) results

Total marks for IA

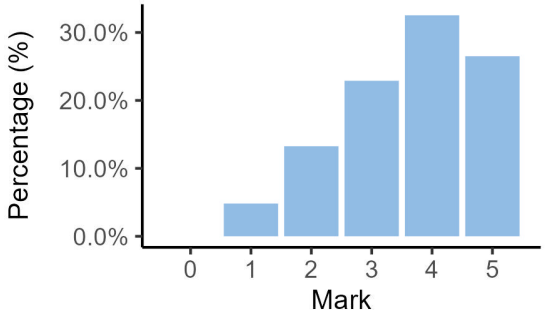


IA1 marks

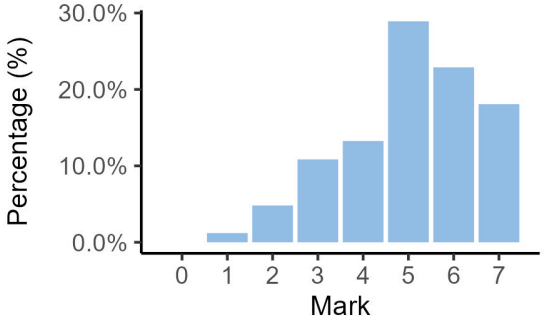
IA1 total



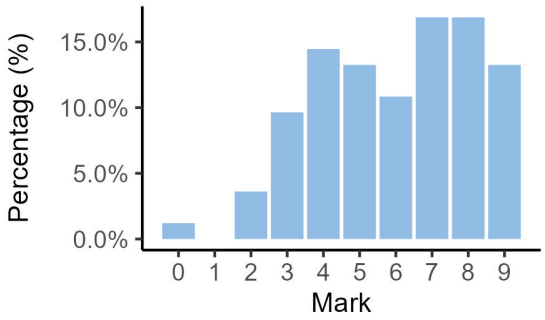
IA1 Criterion: Retrieving and comprehending



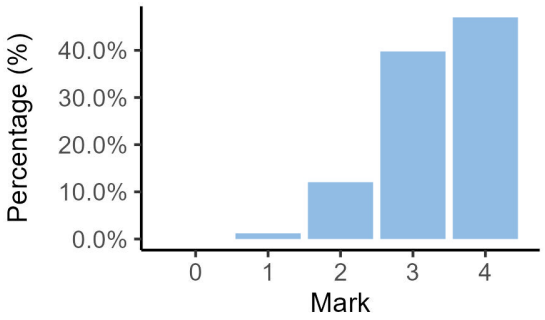
IA1 Criterion: Analysing



IA1 Criterion: Synthesising and evaluating

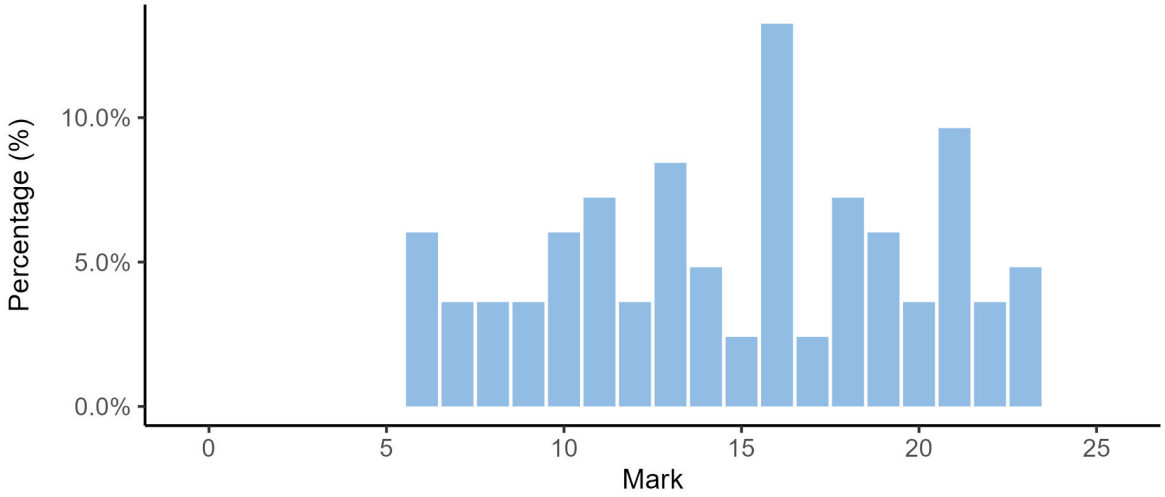


IA1 Criterion: Communicating

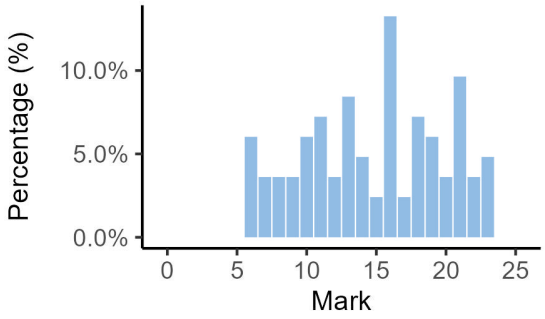


IA2 marks

IA2 total

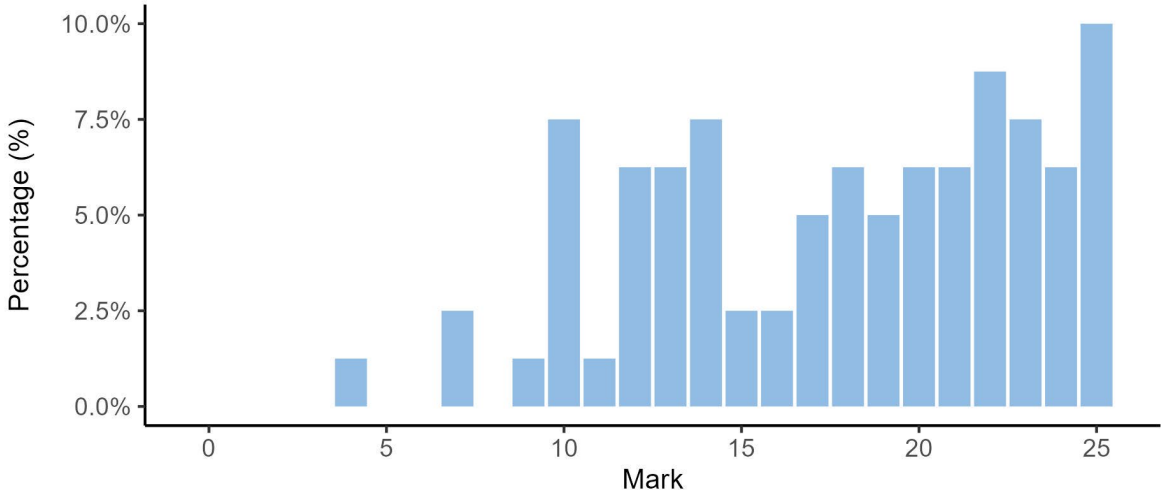


IA2 Criterion: Aerospace systems knowledge and problem-solving

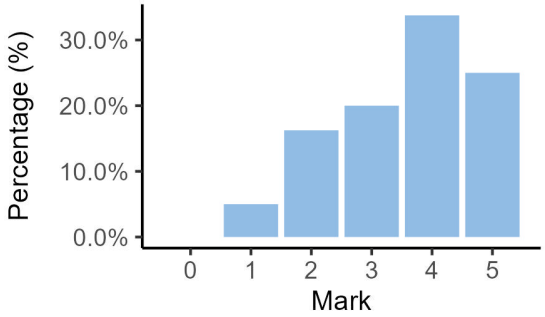


IA3 marks

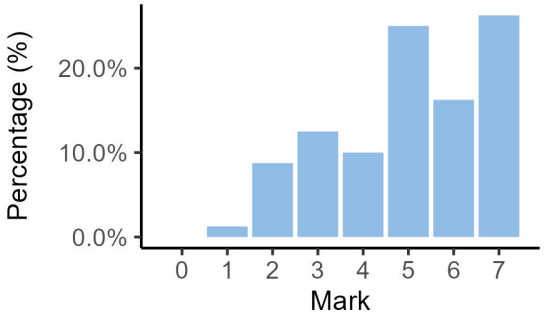
IA3 total



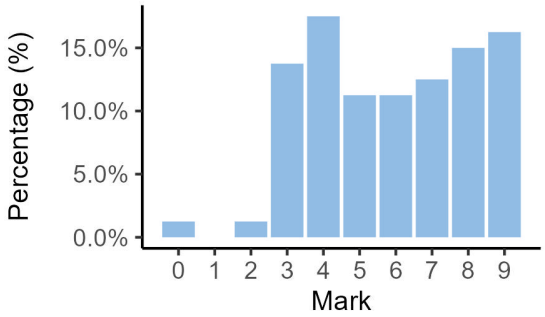
IA3 Criterion: Retrieving and comprehending



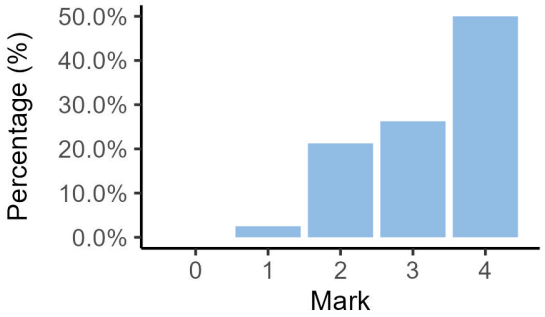
IA3 Criterion: Analysing



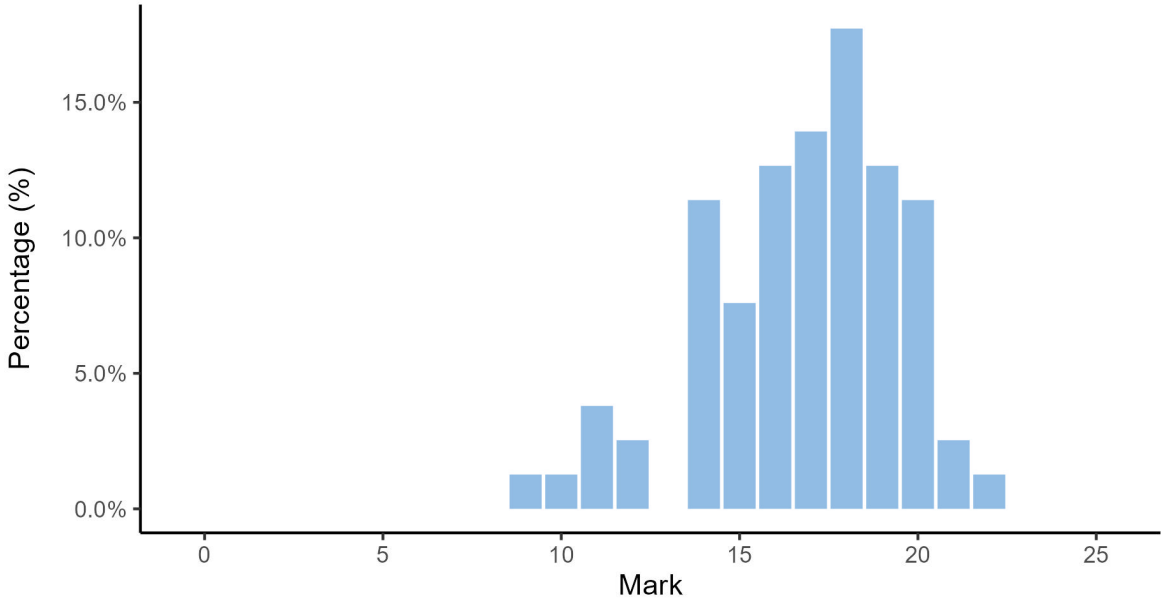
IA3 Criterion: Synthesising and evaluating



IA3 Criterion: Communicating

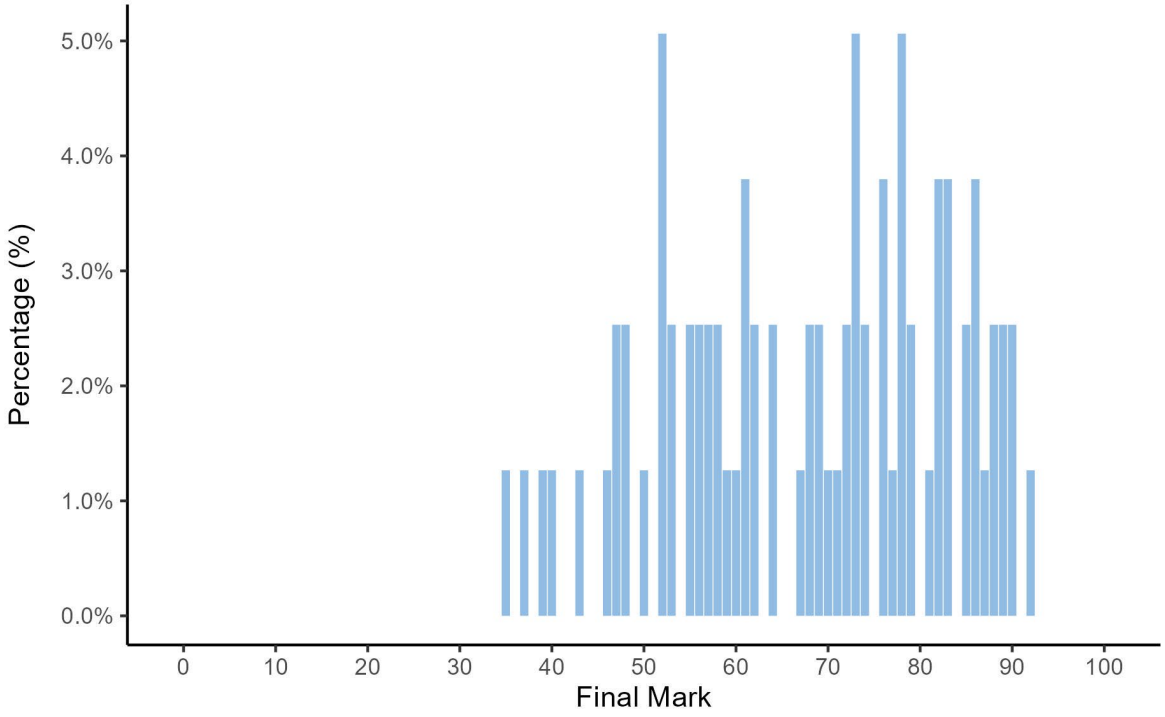


External assessment (EA) marks



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	16	29	30	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 v5.0*, Section 9.6.

Percentage of instruments endorsed in Application 1

Number of instruments submitted	IA1	IA2	IA3
Total number of instruments	9	9	9
Percentage endorsed in Application 1	77%	77%	66%

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 v5.0*, Section 9.7.

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	9	59	0	77.78%
2	9	45	0	100%
3	9	59	4	88.89%

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	2
Authentication	0
Authenticity	0
Item construction	2
Scope and scale	0

*Each priority might contain up to four assessment practices.

Total number of submissions: 9.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- provided appropriate scope and scale for students to develop unique responses within the syllabus conditions without compromising on complexity, e.g. requiring students to compare three aircraft and then make recommendations based on the aircraft that best suited the student's success criteria
- provided a clear overview and framework for the assessment task and a context related to the Unit 3 subject matter that included use of subject matter language (e.g. international and national operational and safety systems, airspace management, safety management systems, operational accident and incident investigation processes, airport and airline operation systems)
- contained authentication strategies that reflected the QCAA guidelines for assuring student authorship of responses.

Practices to strengthen

It is recommended that assessment instruments:

- reproduce Part A and B specifications directly from the syllabus, with the exception of replacing the words ‘specified client’ with the client’s name in Part B, e.g. replace ‘specified client’ with ‘CASA’
- indicate appropriate topic selection in the conditions section and describe aspects of the topics within the task. Please note
  - Topic 3: Safety Management Systems is a compulsory topic for IA1, so safety must be mentioned in the task
  - if the task does not include any optional topics, do not tick them in the conditions section. For instance, when creating the assessment instrument, tick Topic 4: Operational accident and incident investigation processes in the Endorsement application (app) only if the instrument involves that topic
- include the problem-solving process diagram and expectations from Syllabus section 1.2.4 at the end of 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	0
Layout	0
Transparency	0

*Each priority might contain up to four assessment practices.

Total number of submissions: 9.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- avoided bias and inappropriate content (e.g. gender stereotyping) and used gender-neutral language throughout contexts and task descriptions
- used high-resolution images, diagrams or other visual elements that were legible, clear and relevant
- provided clear instructions that were aligned to the assessment objectives and ISMG
- were free from errors, modelled correct spelling and grammar and did not contain any unnecessary jargon or colloquial language.

Practices to strengthen

There were no significant issues identified for improvement.

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	88.89%	11.11%	0%	0%
3	Synthesising and evaluating	77.78%	11.11%	11.11%	0%
4	Communicating	88.89%	11.11%	0%	0%

Effective practices

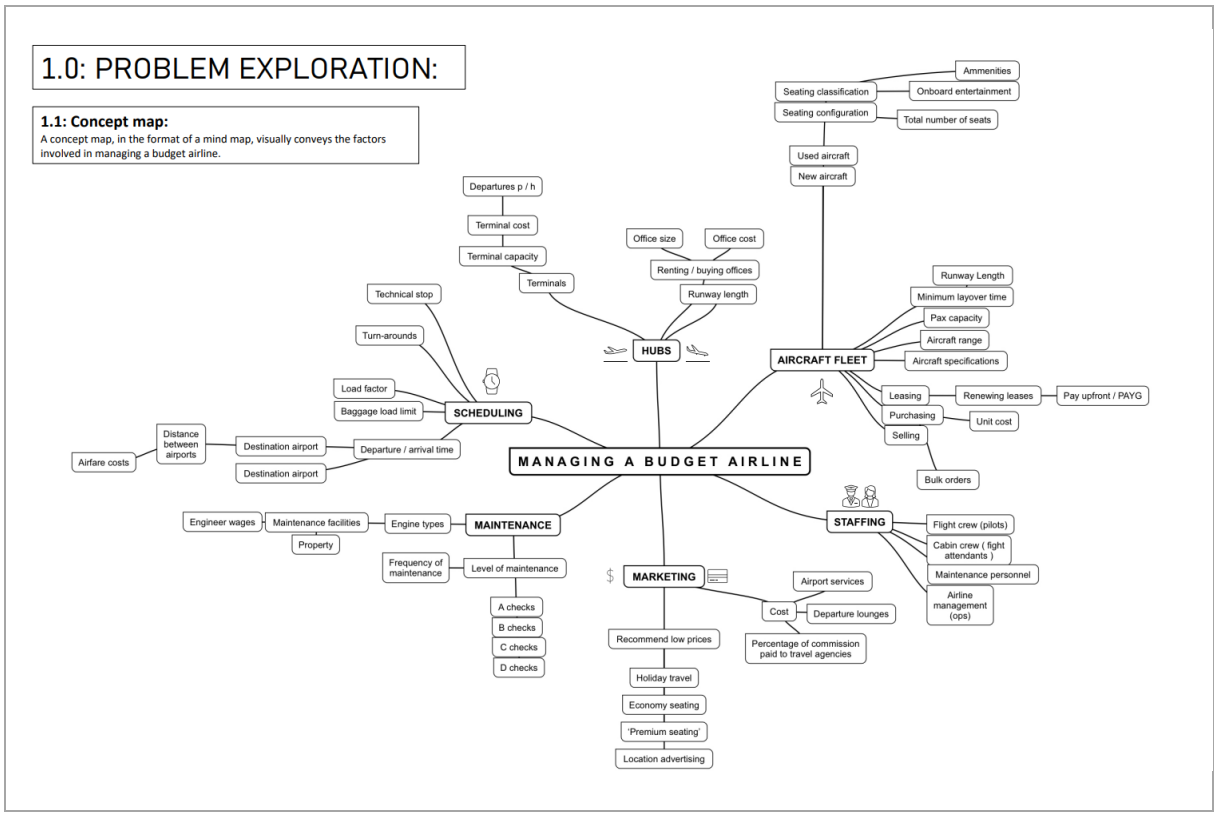
Accuracy and consistency of the application of the ISMG for this IA was most effective when:

- for the Synthesising and evaluating criterion, the third performance-level descriptor that refers to 'critical evaluations using success criteria to make astute recommendations' was clearly identified in student responses that featured the clear use of the success criteria that was linked to recommendations, e.g.
  - success criteria were clearly identified both for the second descriptor of Analysing (astute determination of essential solution success criteria for the operational systems problem) and for the third descriptor of Synthesising and evaluating (critical evaluation and discerning refinement of ideas and a solution using success criteria to make astute recommendations justified by data and research evidence)
- for the Communicating criterion at 4 marks, there was clear evidence of discerning decision-making about and fluent use of folio conventions, i.e.
  - headings were used to organise and communicate the student's thinking through the iterative phases of the problem-solving process
  - there was evidence of the problem-solving process being used
  - a table of contents page, a reference list and a recognised system of in-text referencing were included
  - page counts for Parts A and B (7–9 single-sided A3 pages or equivalent digital media and 2–3 single-sided A4 pages or equivalent digital media respectively, without the table of contents and reference list) were considered
- student samples were clearly annotated to acknowledge evidence of all these folio conventions.

Samples of effective practices

The following excerpt demonstrates a mind map that combines problem recognition with the use of symbolisation to meet the requirements of the Retrieving and comprehending criterion. Mind mapping may also be used to identify relevant elements, components and features, and their relationship to the structure of a problem.

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



The following excerpts demonstrate representations of ideas and relationships through the use of 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.

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

Excerpt 1

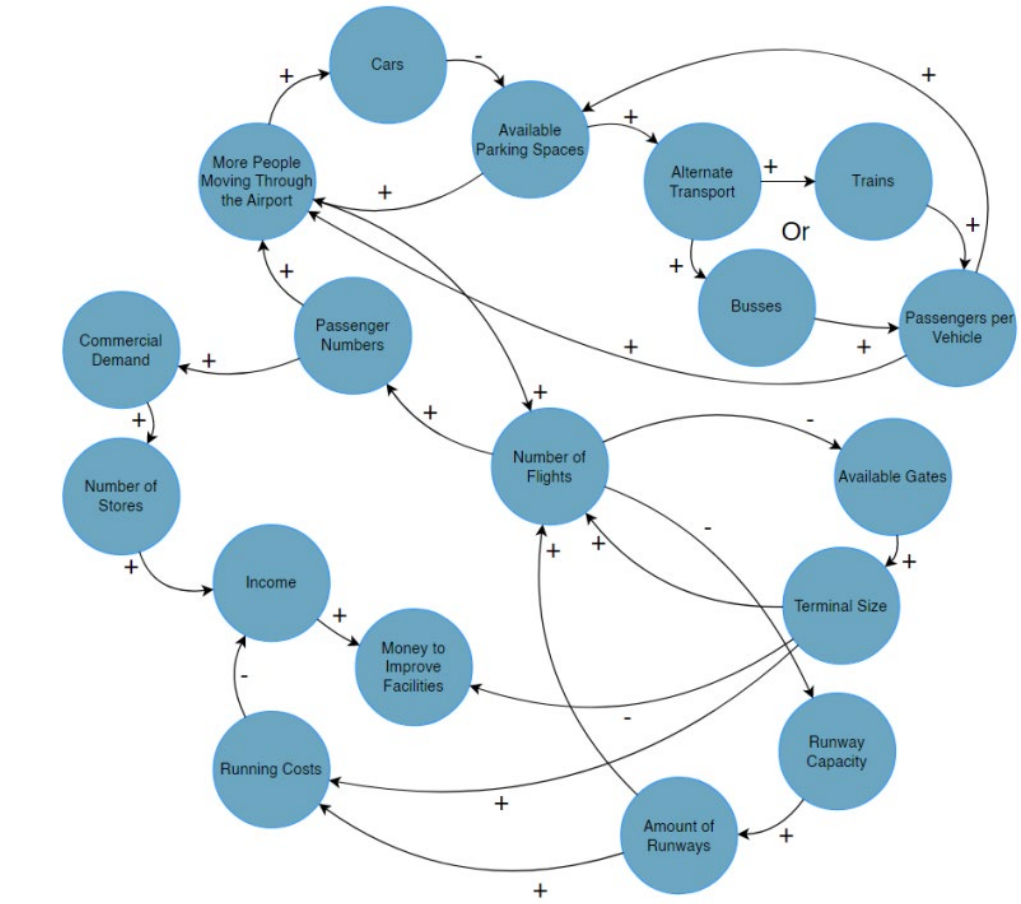
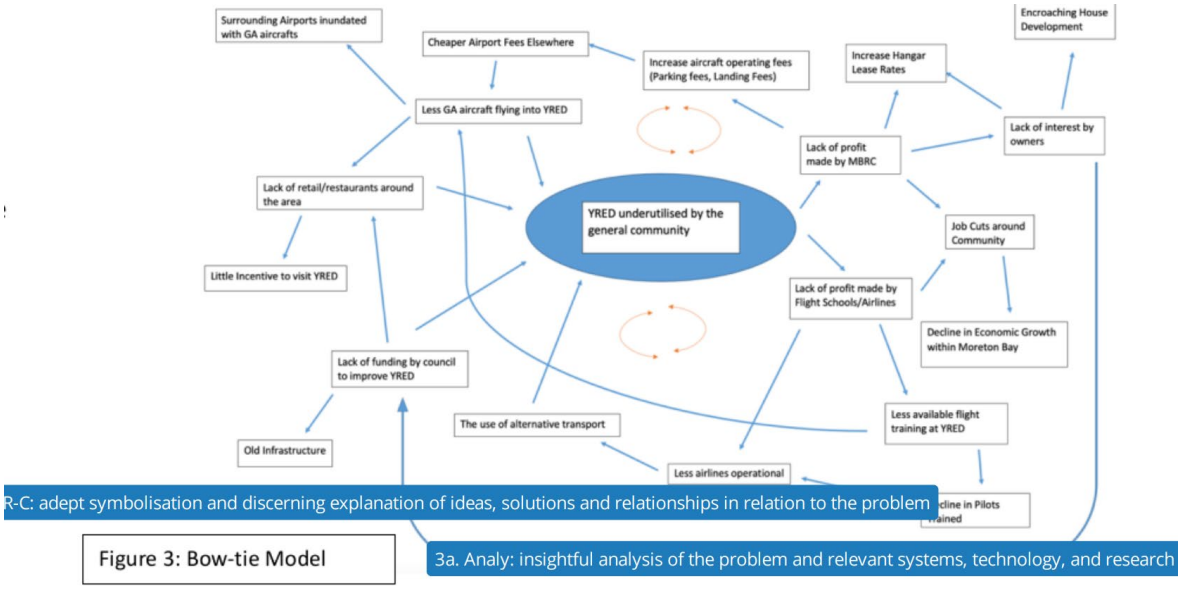


Figure 8: Feedback Loop

Excerpt 2



R-C: adept symbolisation and discerning explanation of ideas, solutions and relationships in relation to the problem

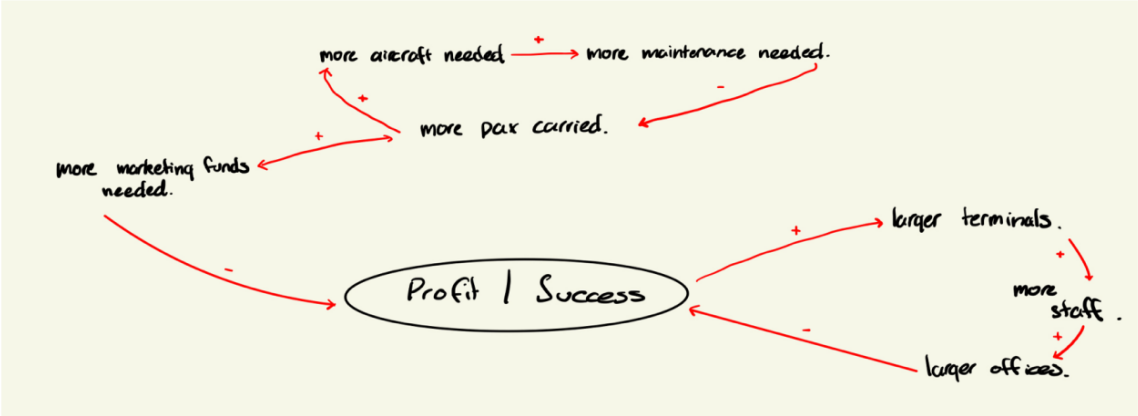
Figure 3: Bow-tie Model

3a. Analy: insightful analysis of the problem and relevant systems, technology, and research

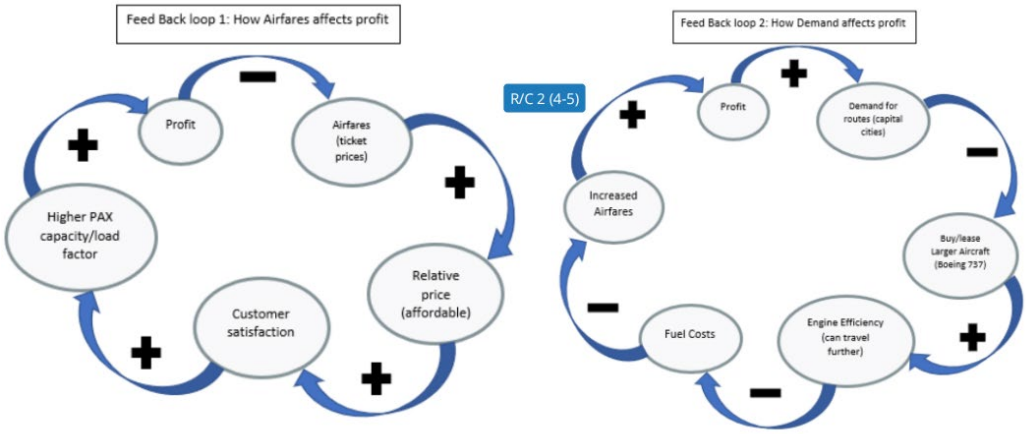
Excerpt 3

1.7: Causal Loop diagram

The causal loop diagram conveys the different variables, factors and their +ve/-ve relationships that which an airline company faces.



Excerpt 4



Systems thinking – Iceberg Model figure 7 (ResearchGate, 2018)

Redacted for copyright

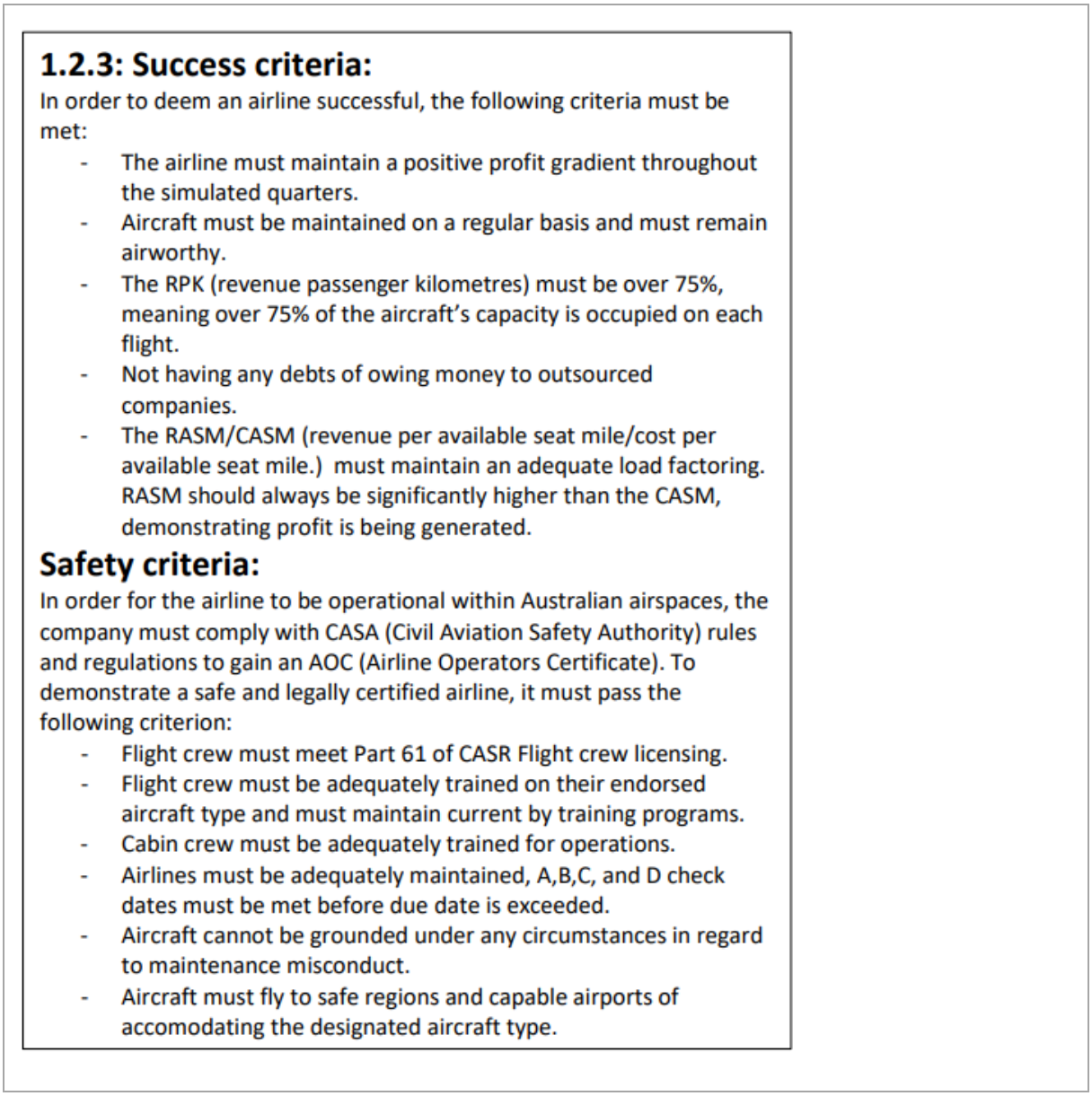
The iceberg visual illustrates that to see the "big picture" of a system, one must see beyond day-to-day events.

By lowering the water level, the iceberg helps us focus on patterns of change over time, the underlying system structure, and the mental models held by those involved in the system (System thinking Loops PowerPoint, 2022).

More info on how the iceberg model is used is listed in image 1

The following excerpt illustrates a success criteria that explicitly shows the student's ability to accurately assess situations.

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



1.2.3: Success criteria:

In order to deem an airline successful, the following criteria must be met:

- The airline must maintain a positive profit gradient throughout the simulated quarters.
- Aircraft must be maintained on a regular basis and must remain airworthy.
- The RPK (revenue passenger kilometres) must be over 75%, meaning over 75% of the aircraft's capacity is occupied on each flight.
- Not having any debts of owing money to outsourced companies.
- The RASM/CASM (revenue per available seat mile/cost per available seat mile.) must maintain an adequate load factoring. RASM should always be significantly higher than the CASM, demonstrating profit is being generated.

Safety criteria:

In order for the airline to be operational within Australian airspaces, the company must comply with CASA (Civil Aviation Safety Authority) rules and regulations to gain an AOC (Airline Operators Certificate). To demonstrate a safe and legally certified airline, it must pass the following criterion:

- Flight crew must meet Part 61 of CASR Flight crew licensing.
- Flight crew must be adequately trained on their endorsed aircraft type and must maintain current by training programs.
- Cabin crew must be adequately trained for operations.
- Airlines must be adequately maintained, A,B,C, and D check dates must be met before due date is exceeded.
- Aircraft cannot be grounded under any circumstances in regard to maintenance misconduct.
- Aircraft must fly to safe regions and capable airports of accomodating the designated aircraft type.

The following excerpt illustrates critical evaluation using language of the explicitly stated success criteria that directly connects to the recommendations.

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

Evaluation of design

Table 3: How Each Element Meets Success Criteria

Design Element	Must be able to accommodate comparable traffic to Brisbane International Airport due to possibility of diverted flights.	Facilities must be able to accommodate aircraft such as the Airbus A380.	Must have extensive cargo infrastructure separate from the passenger terminal.	Must have space for Wellcamp Aerospace and Defence Precinct as well as QANTAS Group Flight Academy.	There should be greater infrastructure for movement of people and goods in and out of the Airport
Runways	- Added runway increases flight per hour capacity which will allow more aircraft to move in and out of the airport.	- New runway is the correct length to facilitate an A380 Landing at the location.	- Double runway design will allow cargo aircraft to land separately from passenger aircraft.	- New runway leaves space for existing facilities.	- New runway will allow more flights to come in and out of the airport which increases passengers and tonnes of cargo that can move through the airport.
Taxiways	- Increased number of taxiways along with high-speed exits will allow more traffic to move on and off of the runway faster.	- Wide taxiways allow an A380 to manoeuvre around the airport.	- New taxiway system connecting to the cargo terminal will allow cargo aircraft to quickly go to the cargo terminal.	- New taxiways do not affect existing facilities.	- Expanded taxiways will allow more aircraft to move around the airport which may increase passenger and cargo numbers.
Terminals	- More gates will allow more aircraft to embark and disembark passengers.	- 6th gate has the infrastructure to allow an A380 to park at the location.	- Cargo terminal will free up space at passenger terminal and allow more cargo to be loaded and unloaded than previously capable.	- New terminal expands in opposite direction of the Wellcamp Aerospace and Defence Precinct.	- New terminals allow larger number of passengers and cargo.
Services and Facilities	- More aircraft parking spots which will allow more diverted aircraft to be at the airport.	- Aircraft parking can facilitate a diverted A380.	- New cargo equipment will allow cargo to loaded and unloaded quicker.	- Increased number of aircraft parking and maintenance will be useful to the Wellcamp Aerospace and Defence Precinct and QANTAS Group Flight Academy.	- New cargo equipment and aircraft parking will allow more cargo and private owners to use the airport.
Public Transport	- Increased public transport will allow diverted passengers to go to Brisbane via high-speed rail line.	- New rail lines will allow the large number of passengers from the aircraft to reach their destination.	- New freight rail line will allow cargo to move in and out of the airport to and from different locations along the east coast.	- Public transport will allow staff and students to travel to and from Brisbane.	- New freight line and high-speed line allow a greater number of people and goods to move in and out of the airport.

The following excerpt demonstrates the correct use of the ISMG. The highlighting clearly indicates the reasoned judgments made for each descriptor, and the awarded mark that follows the best-fit approach.

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

Instrument-specific marking guide (IA1): Project — folio (25%)

Criterion: Retrieving and comprehending

Assessment objectives

1. recognise and describe the operational systems problem, aerospace technology knowledge, concepts and principles, and systems thinking habits and systems thinking strategies in relation to aerospace management, safety, airline and/or airport operations
2. symbolise and explain ideas, a solution and relationships in relation to aerospace management, safety, airline and/or airport operations

The student work has the following characteristics:	Marks
• accurate and discriminating recognition and discerning description of the operational systems problem, aerospace technology knowledge, concepts and principles, and systems thinking habits and systems thinking strategies in relation to aerospace management, safety, airline and/or airport operations • adept symbolisation and discerning explanation of ideas, a solution and relationships in relation to aerospace management, safety, airline and/or airport operations with visual frameworks, causal and feedback loops, flow charts, diagrams, sketches and/or pictures.	4–5
• accurate recognition and appropriate description of the operational systems problem, aerospace technology knowledge, concepts and principles, and some systems thinking habits and systems thinking strategies in relation to aerospace management, safety, airline and/or airport operations • competent symbolisation and appropriate explanation of some ideas, a solution and relationships in relation to aerospace management, safety, airline and/or airport operations with visual frameworks, causal and feedback loops, flow charts, diagrams, sketches and/or pictures.	2–3
• variable recognition and superficial description of aspects of the operational systems problem, concepts or principles in relation to aerospace management, safety, airline and/or airport operations • variable symbolisation or superficial explanation of aspects of ideas, a solution, or relationships in relation to aerospace management, safety, airline and/or airport operations.	1
• does not satisfy any of the descriptors above.	0

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 mark performance level
  - responses show evidence of 'adept symbolisation and discerning explanation of ideas, a solution and relationships in relation to aerospace management, safety, airline and/or airport operations with visual frameworks, causal and feedback loops, flow charts, diagrams, sketches and/or pictures'. Adept symbolisation may be evidenced in a variety of modes, but the inclusion of a visual framework and causal loop has shown to be most effective
  - clear annotations are used where there are distinctions between the top two performance levels for the first descriptor, i.e. if 'accurate and discriminating recognition' and 'appropriate description' are identified, the lower mark for the 4–5 mark performance level in the ISMG should be highlighted.

Additional advice

- During the drafting and feedback process, schools should ensure that students are supported to develop skills in managing the length, scope and scale of their responses appropriately and within the syllabus conditions outlined in Syllabus section 4.8.1 (7–9 single-sided A3 pages or equivalent digital media for Part A, 2–3 single-sided A4 pages or equivalent digital media for Part B).
- 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 Assessment objective 7 (evaluate and refine ideas), ensures the evidence can be clearly identified.
- Appendixes are not assessable evidence and should not be included in student responses. If an appendix is included, it should contain only supplementary material that will not be directly used as evidence when marking the response (see *QCE and QCIA policy and procedures handbook v5.0*, Section 8.2.6).

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	1
Authentication	0
Authenticity	0
Item construction	1
Scope and scale	0

*Each priority might contain up to four assessment practices.

Total number of submissions: 9.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- included a range of item types (e.g. multiple choice questions, questions requiring single-word responses, short responses and/or calculations) that
  - represented a balance of subject matter from Unit 3 topics
  - aligned with real-world aerospace systems problems and contexts
  - required the application of all cognitions identified in the assessment objectives
  - allowed for unique student responses
- provided clear instructions regarding the scope of information, knowledge and skills students were required to demonstrate
- provided appropriate scale for students to complete the task within syllabus conditions, e.g. the length of the exam and questions aligned with Syllabus section 4.8.2.

Practices to strengthen

It is recommended that assessment instruments:

- assess a balance across the assessment objectives
- align with the percentage allocation of marks in the syllabus specifications (Syllabus section 4.8.2), e.g. approximately 20% of the questions are complex unfamiliar items. Complex unfamiliar questions are those which require students to choose and apply appropriate procedures in a situation where
  - relationships and interactions have a number of elements and connections are made with knowledge, concepts and principles in relation to aerospace operational systems
  - all information to solve the problem is not immediately identifiable, i.e. the required procedure is not clear from the way the question is posed, and in a context in which students have had limited prior experience
- follow the conventions for item construction as outlined in *Course 1: Attributes of quality assessment* (located in the Assessment Literacy app in the QCAA Portal). Multiple choice items should be carefully constructed to align with the conventions for this item type, e.g.
  - stems do not include information that helps students answer the item
  - all options are mutually exclusive (no two options are the same)
  - options include plausible distractors
  - all options follow the grammatical structure of the stem.

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: 9.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- avoided bias and inappropriate content (e.g. gender stereotyping) and used gender-neutral language throughout the context, stimulus and items
- provided sufficient response space for each item, as indicated by the length of the sample response in the marking scheme
- used high-resolution images, diagrams or other visual elements that were legible, clear and relevant

- were free from errors, modelled accurate spelling, grammar and punctuation, and avoided unnecessary jargon, specialist language and colloquial language that might confuse or mislead students and result in wasted time and effort during the examination.

Practices to strengthen

There were no significant issues identified for improvement.

Additional advice

- The marking scheme must align with the instrument created, and marking annotations must be clearly shown. For instance, if a question requires causal loops or other specific strategies for analysis in response to a systems thinking problem, then the marking scheme should provide a representation of the causal loop or strategy along with how the marks are allocated.
- It is recommended that a colleague works through the instrument to ensure
  - the assessment is achievable within the allocated time (Syllabus section 4.8.2)
  - marks can be correctly awarded when applying the marking scheme
  - the instrument is free from errors.

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:

- for the Aerospace systems knowledge and problem-solving criterion
  - marking was supported by student evidence that included clear working indicating the process for determination, evaluation and overall justification of a solution
  - ISMGs demonstrated clear working of percentage cut-offs using correctly tallied marks that aligned to the uploaded marking scheme.

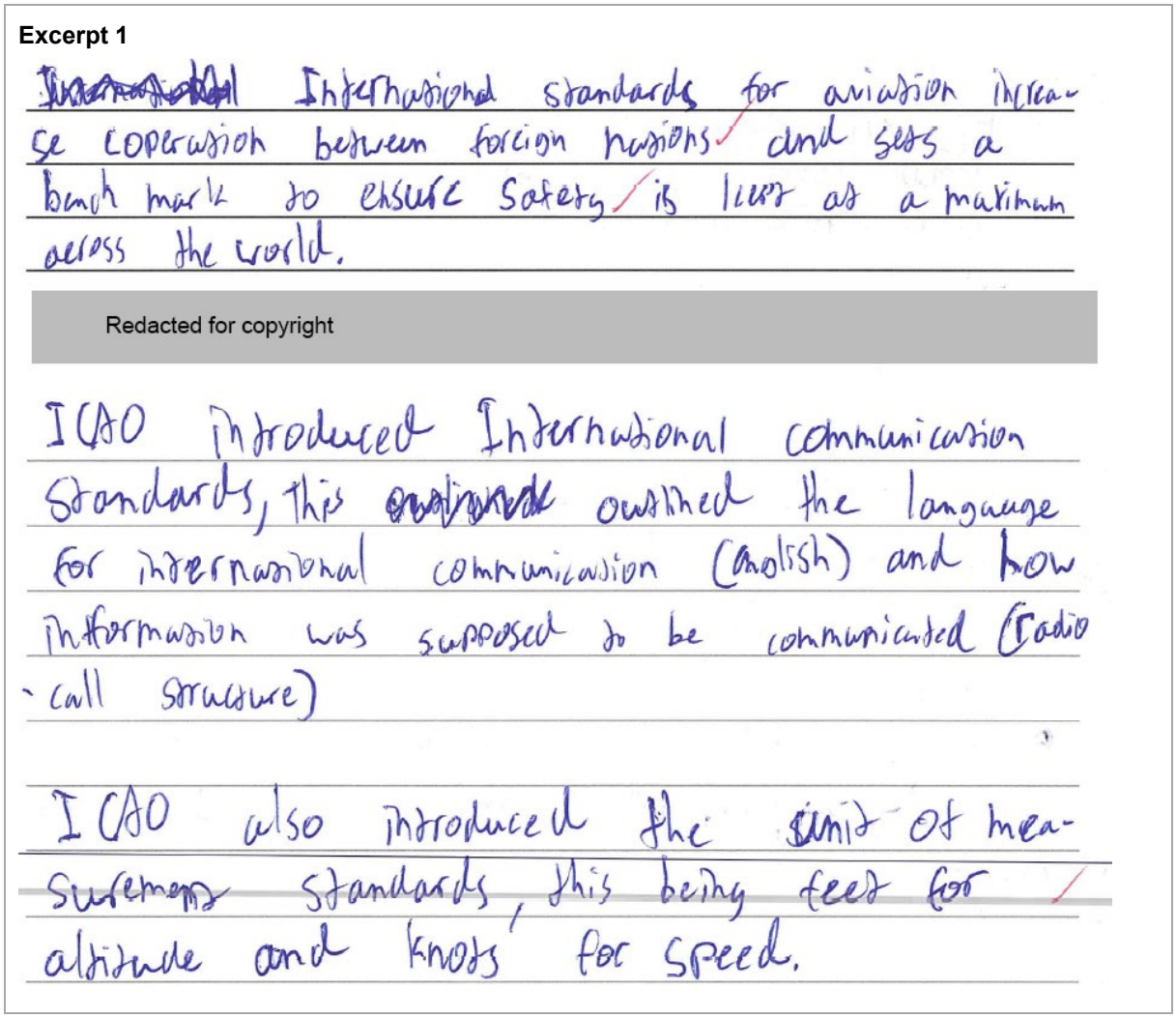
Samples of effective practices

The following excerpts illustrate 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 simple familiar contexts, e.g.

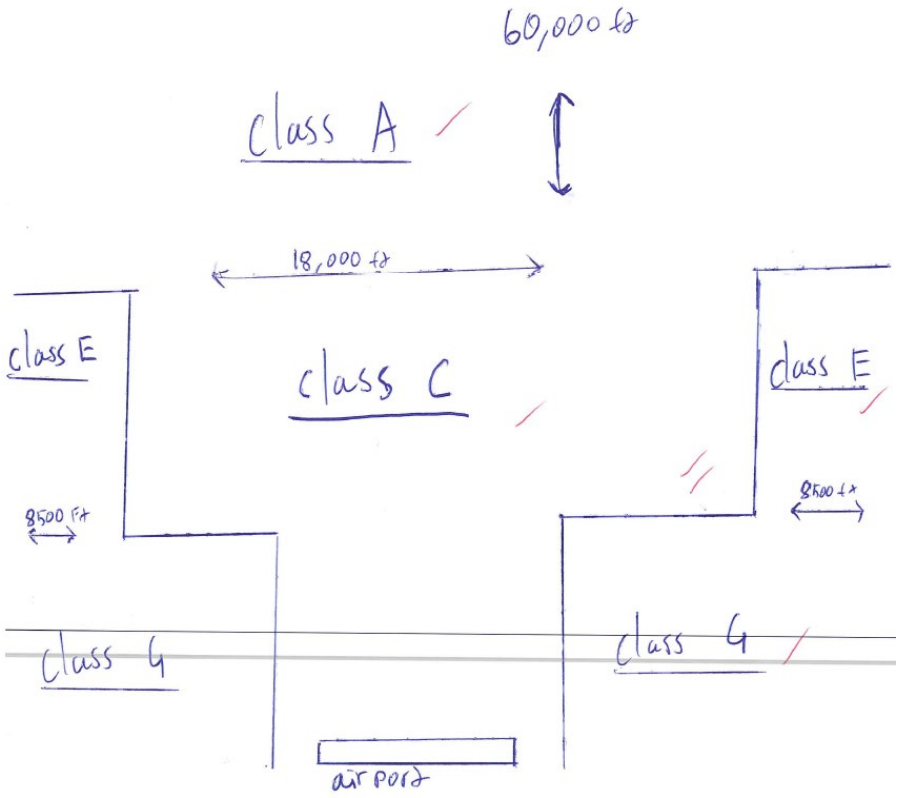
- Excerpt 1 demonstrates a discerning explanation of the importance of international standards in aviation in response to a 4-mark question. Part B accurately describes two examples of international standards that the International Civil Aviation Organisation (ICAO) introduced
- Excerpt 2 demonstrates a sketched response that appropriately describes airspace classes for an international airport in response to a 3-mark question
- Excerpt 3 demonstrates a discerning description of airport signage in response to a 2-mark question.

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

Excerpt 1



Excerpt 2



Excerpt 3

Pilot is currenly on taxiway B with taxi way A to their Left and taxiway C to their right.

The following excerpt illustrates a high-level response to a scenario that identifies the five steps the Australian Transport Safety Bureau (ATSB) would use after an incident, supported by examples that are relevant to each step.

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

Initiate investigation - ATSB decides whether or not to investigate incident. Significant injury or loss of life could have occured meaning this incident would be investigated.
Evidence collection - Evidence is collected, labelled and stored. For this incident evidence could include, The aircraft, interviews with ATC and pilots, Finding any available footage, weather conditions at the time of the incident.
Evidence Analysis - Collected evidence is analysed to understand situation and possible causes. Analysis of this incident may have included watching and analysing video footage, listening to ATC communication logs.
Report and review - A initial report is produced but not released, Past and current evidence and analysis is reviewed, possible third party review. ATSB may have come to conclusions that the aircraft -

EXTRA WORKING PAGE

Q 19)

- was in working order to quickly, this may be identified by ATSB or third party review.

dissemination - Final report is released, recommendations to ensure safety in the future are made. - Final report may state pilot error was at fault, may suggest retraining of all a-380 pilots of that airline.

Practices to strengthen

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

- when making judgments about the Aerospace systems knowledge and problem-solving criterion across performance levels, teachers
  - ensure that, when selecting the final mark on the ISMG, the calculated percentage is greater than and not equal to the aligning percentage and mark range
  - clearly show the marks allocated for each question as well as a total and how the percentage cut-offs have been applied. The use of half marks is best avoided for simplicity and to reduce confusion.

Additional advice

- The marking scheme must align with the endorsed assessment, and marking annotations must be clearly shown. For instance, if a question requires causal loops or other specific strategies for analysis in response to a systems thinking problem, then the marking scheme should provide a representation of the causal loop or strategy. The adjusted marking scheme can be uploaded any time through the Endorsement appl or with the confirmation samples.
- Schools are encouraged to use appropriate strategies to quality assure judgments for each assessment as part of the school's assessment policy (*QCE and QCIA policy and procedures handbook v5.0*, Section 8.4). Teachers should cross mark and re-review the requested samples for submission to avoid
  - incorrect application of cut-offs
  - errors in the addition of marks (sometimes unclear what marks had been awarded)
  - errors in the total number of marks in the task leading to the incorrect application of percentage cut-offs. It is very important to accurately use the cut-offs set out in Syllabus section 4.8.2, e.g.
    - 51 of 85 = 60% = 14 marks
    - 52 of 85 = 61.2% = 15 marks.

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	2
Authentication	0
Authenticity	0
Item construction	1
Scope and scale	1

*Each priority might contain up to four assessment practices.

Total number of submissions: 9.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- used suitable checkpoints and contained authentication strategies that reflected QCAA guidelines for assuring student authorship of responses
- provided a clear overview and framework for the assessment task and a context related to the subject matter that included use of subject matter language, including subject matter headings.

Practices to strengthen

It is recommended that assessment instruments:

- reproduce Part A and B specifications directly from the syllabus (Syllabus section 5.7.1), noting that these specifications are different from the specifications for IA1
- provide clear instructions regarding the scope of information, knowledge and skills students are required to demonstrate. The information should align with real-world aerospace systems

problems from Unit 4 subject matter. Schools must assess subject matter from Topic 1: Aircraft performance and Topic 4: Human performance and limitations. Schools can also choose to assess Topic 2: Aircraft navigation and/or Topic 3: Advanced navigation and radio communication technologies

- are of an appropriate scale to allow students to respond within the syllabus conditions, e.g. feature operational systems problems that are achievable within the syllabus conditions of 5–7 weeks
- include the problem-solving process diagram and expectations from Syllabus section 5.7.1 at the end of 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	0
Layout	0
Transparency	0

*Each priority might contain up to four assessment practices.

Total number of submissions: 9.

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. technical language from other units
- included appropriate formatting features (e.g. bold, italics) only where relevant and had a clear, unambiguous layout that used headings and subheadings
- used high-resolution images, diagrams or other visual elements that were legible, clear and relevant.

Practices to strengthen

There were no significant issues identified for improvement.

Additional advice

- During the drafting and feedback process, schools should ensure that students are supported to develop skills in managing the length, scope and scale of their responses appropriately and within the syllabus conditions outlined in Syllabus section 5.7.1. (7–9 single-sided A3 pages or equivalent digital media for Part A, 2–3 single-sided A4 pages or equivalent digital media for Part B).
- School-based assessment policies and procedures for managing response length should be applied clearly and consistently when making judgments about student responses to assessment. To assist confirmation processes, assessment responses that exceed syllabus

length conditions should be accompanied by clear annotations to indicate how the school's assessment policy has been applied and which evidence was used to make a judgment. Further information about managing assessment response length is outlined in the *QCE and QCIA policy and procedures handbook v5.0*, Section 8.2.6.

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	88.89%	0%	11.11%	0%
3	Synthesising and evaluating	88.89%	0%	11.11%	0%
4	Communicating	88.89%	0%	11.11%	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
  - responses used strategies such as visual frameworks and mind maps to demonstrate evidence of comprehension of the addressed problem while also providing evidence of adept symbolisation skills. This shows an efficient way of using the limits of the folio convention (for Part A, 7–9 single-sided A3 pages excluding contents page – Syllabus section 5.7.1) to provide sufficient evidence for this criterion. Mind mapping has also been useful in providing evidence of insightful analysis in terms of identifying the relevant elements, components and features, and their relationship to the structure of the problem
  - discerning explanations were evident with causal loops that demonstrated students' ability to explain ideas or the solution and relationships in relation to aircraft performance systems and/or human factors
  - at the top performance level, attention was given to the aviation charts selected. For instance, evidence reflected the syllabus guidelines and included correct aviation sources that aligned with industry, e.g. visual navigation chart (VNC), visual terminal chart (VTC), world aeronautical chart (WAC) (available online at Aeronautical Information Package En Route Supplement Australia (AIP ERSA)). To support this, the correct units were available as a reference when using aviation charts, e.g. nautical miles for distances.

Samples of effective practices

The following excerpts demonstrate high-level responses for the Synthesising and evaluating criterion that include:

- purposeful generation of an aircraft performance systems and/or human factors solution to provide valid data to critically assess the feasibility of a proposal
- reasoned evaluation with effective refinement of ideas and a solution using success criteria to make considered recommendations justified by data and research evidence.

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

Excerpt 1

Human factors

When it comes to aviation safety, organizations like the Civil Aviation Safety Authority (CASA) place significant emphasis on understanding and addressing human factors. CASA recognizes that human performance and behaviour play a crucial role in the safe and efficient operation of aircraft. The Yerkes-Dodson law is a model of the relationship between stress and task performance, as seen in Figure 4. It proposes that you reach your peak level of performance with an intermediate level of stress or arousal—too little or too much arousal results in poorer performance. In aviation, the stress curve refers to the relationship between stress and workload for pilots and other aviation professionals. The stress curve is often used to understand and manage pilot performance, particularly during critical phases of flight. It's essential for aviation professionals to manage their workload and stress levels effectively by maintaining optimal performance. Some factors that could influence the stress curve in aviation include the complexity of the task, time pressure, distractions, and the individual's experience and coping mechanisms. The pilots can work at optimal performance by implementing effective crew resource management (CRM) techniques, optimizing task distribution and scheduling, and providing adequate rest periods. S/E 5 (8-9)

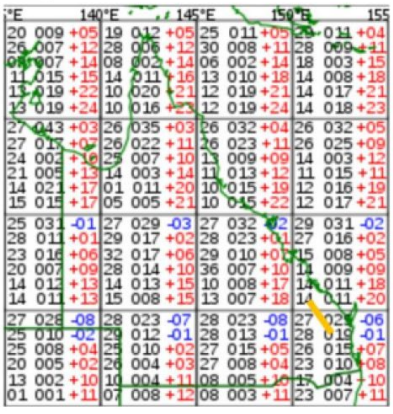
Figure 4: Stress curve (stress and workload) in aviation – image by (Stoten, 2020)

Redacted for copyright

Excerpt 2

Figure 8: Grid Point Wind and Temperature forecast – Image by (BOM,2023)

The chart to the right is A Grid Point Wind and Temperature (GPWT) forecast which provides a text-based display of forecast wind speed, wind direction and temperature at specified heights above mean sea level (AMSL). They follow the format ddfftt, where dd is the wind direction (true), ff is the wind speed (in knots) and tt is the temperature (in degrees Celsius). Subtracting 100 knots from the speed and adding 50 to the direction indicate wind speeds from 100 to 199 knots. For example, the yellow line indicated on the forecast shows the route from Gympie to Bundaberg on day 2. The line starts at YKRY where winds are 280/19 and the temperature is negative 1°C and crosses the next grid to YBUD where the winds are 140/11 and temperature is positive 20°C.



Excerpt 3

NAV/COMM LOG														
PSN	LSALT	ALT	TAS	TR(m)	Wind	HDG(m)	G/S	DIST	ETI	EET	PLN EST	REV EST	ATA EST	NAV/COM FREQ
YBAF														
DBO	1500	1500	120	325	190/10	322	90	24	16	16				
YGYM	4500	6500	120	342	290/20	334	106	55	31	47				
YBUD	4500	6500	120	335	220/10	331	123	85	41	89				
YBMK	5000	6500	120	313	180/08	310	124	281	136	225				
BLOM	4500	6500	120	292	200/10	287	119	42	21	247				
YBPN	3500	6500	120	354	340/10	353	109	19	11	257				
YBCS	4000	6500	120	316	070/15	323	125	268	129	386				
MISB	4500	7500	120	155	160/10	156	107	62	35	421				
YBTL	4000	7500	120	149	120/20	145	101	91	54	475				
YBPN	4000	7500	120	119	180/10	123	114	125	66	541				
MALB	4500	7500	120	144	210/08	148	116	158	82	622				
YGLA	4000	7500	120	122	200/15	129	115	97	51	673				
YHBA	4000	7500	120	124	220/10	129	120	125	63	736				
YAMB	4500	7500	120	173	190/10	174	109	139	76	812				
YBAF	4500	7500	120	064	180/08	067	122	16	8	820				

S/E 6 (8-9)

YBAF – YGYM (fuel burn 50L/hr)		
FUEL	MIN	LITERS
TAXI		10
TRIP	47	39
VRB RES	-	-
ALTERNATIVE	-	-
FIXED RES	45	37.5
HOLDING	-	-
FUEL REQUIRED	92	86.5
FUEL MARGIN	255	246.5
ENDURANCE	347	333

YBPN – YBCS (fuel burn 50L/hr)		
FUEL	**MIN**	**LITERS**
TAXI		10
TRIP	129	124
VRB RES	-	-
ALTERNATIVE	-	-
FIXED RES	45	37.5
HOLDING	-	
FUEL REQUIRED	174	171.5
FUEL MARGIN	173	161.5
ENDURANCE	347	333

Excerpt 4

Recommendations

S/E 7 (8-9)

Many recommendations could be made to improve this 3-week navigational trip to make it more viable in the future. Firstly, exploring new Routes for the next trip should be considered, by exploring new routes and destinations that weren't visited before, which will be an excellent opportunity to see new places that you may have never been to, enjoy time with your crew, and rest the next day of flying. This will provide fresh experiences and new challenges. Additionally, adding diversity to the journey, such as by Incorporating different types of flying experiences, such as mountain flying, or flying to remote destinations, to broaden your aviation skills and knowledge is recommended. This will allow pilots to gain experience in flying over this terrain and different airspaces and flight planning over mountains and remote areas. During the trip, all took off and began in daylight in the morning to get an early start on the day; however, night flying can be implemented into the trip to experience something new. To do this, a portion of the trip should be planned to include night flying, which will provide a different perspective and further develop your flying abilities while also being able to experience the night beauty down the coast of Australia. Finally, reflecting on the trip and the journey shared is an excellent way to end the trip. After completing the trip, taking time to reflect on the experiences, lessons learned, and areas for improvement in the flying and trip planning skills will allow for improvement in the future.

Excerpt 5

Aircraft performance:

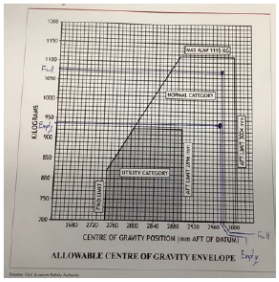
Loading chart:

Using the loading chart and Loading chart Charlie below, the required weight and balance for the aircraft can be calculated. Although the Piper Arrow has a usable fuel capacity of 260L, the required loading of three passengers would not allow for maximum capacity. With the longest Leg being 465nm and a cruising speed of 135 knots, it was calculated that the longest flight time (including the 45-minute flight time buffer) came to be 4.2 Hours. With this in mind, the approximate max fuel consumption used for this flight comes to 168L @ 40lph. As such, a fuel capacity of 200L will be sufficient for flying safely within the bounds of the Top Gun Aero Clubs requirements. Additionally, its assumed that the pilot and crew member each weigh 70kg, with a 10 kg luggage allowance, which includes vital resources like food and water while on route. In order to assure correct balance both passengers will be situated in row 2.

Loading chart data:

item	Weight(kg)	arm	moment
Empty weight	687	----------	19522
Full oil	7	1230	86
Row 1	70	2750	1925
Row 2	140	3600	5040
Baggage	30	4210	1263
Zero fuel weight	934	2980.3	27836
fuel	142	2950	4186
Max T/O weight	1076	2976	32022

Loading chart:



The loading chart suggest that the projected weight and balance of the aircraft is 1076kg at 2.976m arm, which is within the safe operating limits of the aircraft.

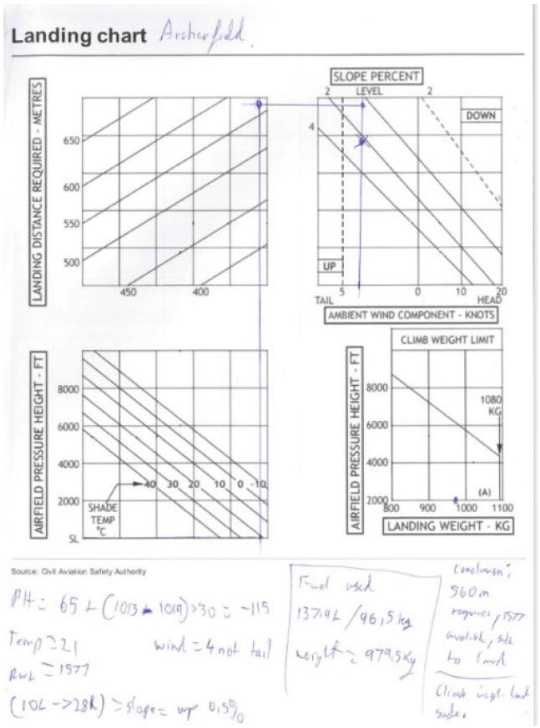
Excerpt 6

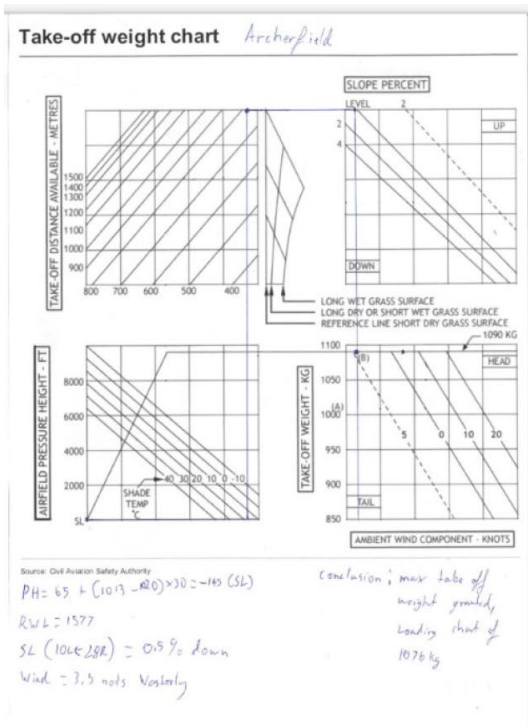
Take-off charts:

Take-off charts are an extremely important tool when it comes to determining the safety of landing at an aerodrome. The charts take into consideration of the pressure altitude, wind conditions, and runway condition such as the length and slope of the runway. The table below shows the aerodrome conditions, extracted from the required ERSA charts in the appendix, and the relevant weather forecasts from the Bureau of meteorology. The table below shows the results for all of the take-off charts and data used. With the takeoff chart to the right showing an example of the take-off chart for Archerfield. With the charts filled out, it can be concluded that every runway in the trip allows for maximum take-off weight.

Airport	Runway length	elevation	QNH	Temp	PA	wind	slope	Runway type	conclusion
Archerfield	1577(10L-28R)	65	1020	17	-145	3.5 tail	0.5% down	sealed	Max TOW
Walgett	1626 (05-23)	439	1018	17	289	1.2 head	level	sealed	Max TOW
Broken Hill	2512 (23-05)	959	1019.5	7	764	1.2 head	0.62 down	Sealed	Max TOW
Coober Pedy	1428 (04-22)	745	1013	15	745	3 head	0.24% up	sealed	Max TOW
Birdsville	800(03-21)	159	1014	17	129	2 head	0.1% down	Clay/ grass	Max TOW
Charleville	1524 (12-30)	1003	1019	22	823	2 head	0.3% up	sealed	Max TOW

Excerpt 7





Excerpt 8

Landing Charts:

Like take off charts, landing charts are a critical safety step in determining whether or not the runway presented will allow for a safe landing and whether or not the aircraft has enough distance for a go around in the event that a first attempt at landing was unsuccessful. Again, the required ERSA information and weather forecast from the bureau of meteorology were used in the charts. To find the climb weight limit, the landing weight can be used which can be found by subtracting the used fuel weights from the 1076kg starting weight used on every flight. In the table below is all the relevant data and decisions made as to whether or not the plane is able to safely land at the airport. And example of the Archerfield landing chart is above.

Airport	Runway length	elevation	QNH	Temp	PA	wind	slope	Runway type	conclusion	Climb weight limit
Archerfield	1577(10L-28R)	65	1019	21	-115	4 tail	0.5% down	sealed	Safe to land	acceptable
Walgett	1626 (05-23)	439	1018	17	289	1.2 head	level	sealed	Safe to land	acceptable
Broken Hill	2512 (23-05)	959	1020	15	749	6.2 head	0.62 down	Sealed	Safe to land	acceptable
Coober Pedy	1428 (04-22)	745	1013	15	745	4 head	0.24% up	sealed	Safe to land	acceptable
Birdsville	800(03-21)	159	1014	17	129	2 head	0.1% down	Clay/ grass	Safe to land	acceptable
Charleville	1524 (12-30)	1003	1019	22	823	3 head	0.3% up	sealed	Safe to land	acceptable

Excerpt 9

Aircraft performance:

Fuel used:

The fuel calculations below show the total fuel used according to the nav log on page 6. The importance of these calculation is critical to the safety of the aircraft as it ensures that the 45-minute reserve is met, protecting against liability claims. As labeled in the aircraft selection table, the piper arrow has a constant fuel consumption of 40Lph. The completed fuel calculations are shown in the table below. The longest flight time of 230 minutes from YWLG-YBHI still has a 25-minute extra fuel reserve on top of the 45-minute margin required by Top Gun Aero. As such, the 200L fuel reserve cap placed on the plane to reduce its weight is within the safety margin.

	YBAF--	--YWLG		YWLG--	--YBHI		YBHI--	--YCBP
	Min	Litres		min	litres		min	litres
Trip	138	103.5	Trip	230	153.33	Trip	190	126.6
Start-Taxi	-	10	Start-Taxi	-	10	Start-Taxi	-	10
Final Res	45	30	Final Res	45	30	Final Res	45	30
Total fuel req	183	143.5	Total fuel req	275	193.33	Total fuel req	235	156.6
Margin	117	56.5	Margin	25	6.66	Margin	65	43.4
Total fuel onboard	300	200	Total fuel onboard	300	200	Total fuel onboard	300	200
	YCBP--	--YBDV		YBDV--	YBCV		YBCV--	--YBAF
	Min	Litres		min	litres		Min	litres
Trip	130	86.67	Trip	155	103.33	Trip	200	133.33
Start-Taxi	-	10	Start-Taxi	-	10	Start-Taxi	-	10
Final Res	45	30	Final Res	45	30	Final Res	45	30
Total fuel req	175	126.67	Total fuel req	200	143.33	Total fuel req	245	173.33
Margin	125	73.33	Margin	100	56.7	Margin	155	26.7
Total fuel onboard	300	200	Total fuel onboard	300	200	Total fuel onboard	300	200
							Total	833.1L

Excerpt 10

Evaluation of success:

goal	achievement
• 4 days away from start point.	• The trip takes exactly 4 days to complete, while visiting several locations which meets this goal.
• Further than 800nm	• The trip has a total travel distance of 2211 nm, with a displacement between Archerfield to Coober Pedy of 971nm which exceeds this goal.
• Rest requirements are met	• The maximum flight time between sleep periods is 6 hours. Which falls with the limits of rest requirements.
• Safety requirements from Top Gun Club are met	• A 45-minute fuel reserve was maintained through the entire flight plan as shown by the fuel calculations, meeting this goal.
• Affordable solution is found.	• Effective cost analysis took place when selecting aircraft to fly and accommodation to book. As such, this trip is as cheap as is gets.
• Fun is had	• Opal mines were explored with friends.

Practices to strengthen

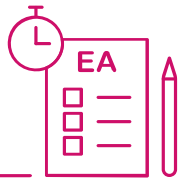
To further ensure accuracy and consistency of the application of the ISMG for this IA, it is recommended that:

- when matching evidence to descriptors for the Synthesising and evaluating criterion at the top performance level, attention should be given to 'purposeful generation of an aircraft performance systems and/or human factors solution to provide valid data to critically assess the feasibility of a proposal'. Critical evaluations should use and refer to the success criteria to make considered recommendations that are justified by data and research. For instance, synthesis requires valid aerospace data, not irrelevant data (e.g. football player social media statistics). Evaluation of data that is not valid results in students only being able to be partially assessed as per the second descriptor in the 2–3 performance level
- when matching evidence in responses to descriptors for the Communicating criterion at the top performance level, attention should be given to the use of folio conventions of the syllabus. For instance, referencing and labelling of images is required to be awarded the upper performance level, and student work that exceeds the specified page limits for both Parts A and B are unable to show discerning decision-making about folio and referencing conventions. Title pages are not part of the page requirements, and student responses may be formatted in a range of ways, provided the formatting falls within the syllabus conditions (Syllabus section 5.7.1).

Additional advice

- The best-fit approach must be used when awarding marks across all criteria. Marked ISMGs should indicate the characteristics evident in the student response and the mark awarded for each criterion (*QCE and QCIA policy and procedures handbook v5.0*, Section 9.7.1). Where there is a two-mark range within a performance level, evidence from the response should be used to determine whether on balance the higher or lower mark is awarded. If the evidence is matched to all characteristics in a performance level, then the higher mark should be awarded. If at least one characteristic is matched at a lower performance level, then the lower mark should be awarded. Refer to *Module 3 — Making reliable judgments* in the Assessment Literacy app and the *Making Judgments* webinar resource in the Syllabuses application in the QCAA Portal for further information and guidance.
- Before submitting files for confirmation, schools are responsible for ensuring the quality, accuracy and accessibility of the required files (*QCE and QCIA policy and procedures handbook v5.0*, Section 9.7.3). Schools should refer to the information contained in the *Confirmation submission information* for Aerospace Systems (available in the Syllabuses application in the QCAA Portal) to check the submission requirements and ensure all required documents are included — Parts A and B.

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 with 23 questions (80 marks):

- Paper 1, Section 1 consisted of multiple choice questions (10 marks)
- Paper 1, Section 2 consisted of short response questions (70 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
- Topic 4: Human performance and limitations.

The assessment required students to respond in various ways including:

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

The stimulus was purposefully chosen to elicit a range of unique responses linked to the syllabus objectives and to Unit 4: Topic 1 — Aircraft performance and Topic 2 — Aircraft navigation subject matter. The stimulus provided real-world contexts for students to demonstrate their knowledge of aeronautical charts and information.

The stimulus included a:

- pitot static system as part of the six flight instruments
- visual terminal chart (VTC)
- visual navigation chart (VNC)
- world aeronautical chart (WAC)
- En Route Supplement Australia (ERSA)
- CASA flight planning notepad SP107.

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	1.27	7.59	**63.29**	27.85
2	**29.11**	41.77	17.72	11.39
3	20.25	31.65	**35.44**	12.66
4	16.46	**54.43**	11.39	17.72
5	**81.01**	6.33	5.06	7.59
6	1.27	5.06	0	**93.67**
7	22.78	6.33	**35.44**	35.44
8	8.86	**63.29**	17.72	10.13
9	8.86	22.78	3.8	**64.56**
10	0	**81.01**	11.39	7.59

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

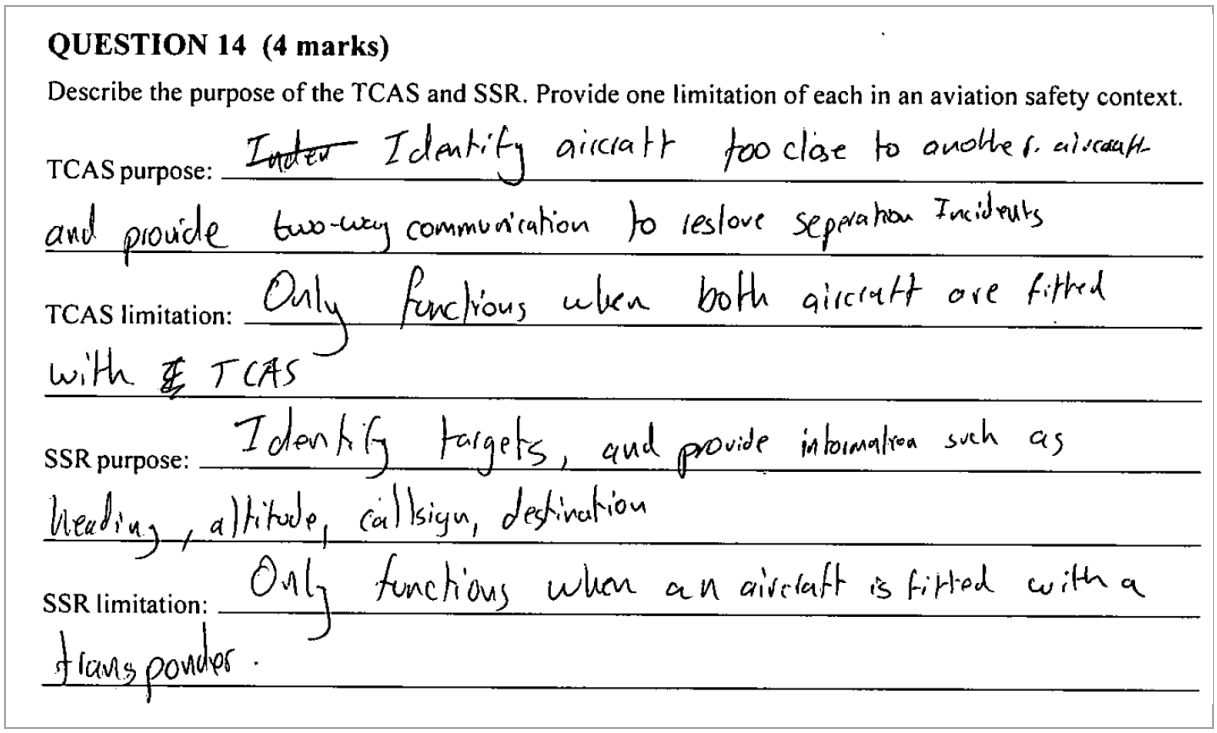
The following excerpt is from Question 14. It required students to describe the purpose of the traffic collision avoidance systems (TCAS) and secondary surveillance radar (SSR) while providing a limitation of each in an aviation safety context.

Effective student responses:

- described the TCAS purpose [1 mark]
- provided a limitation of the TCAS [1 mark]
- described the SSR purpose [1 mark]
- provided a limitation of SSR [1 mark].

This excerpt has been included:

- as it clearly describes the purpose of the TCAS along with a limitation within a real-world aviation context
- to demonstrate a description of a plausible purpose of the SSR along with a suitable limitation.



QUESTION 14 (4 marks)

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

TCAS purpose: ~~Inter~~ Identify aircraft too close to another aircraft and provide two-way communication to resolve separation incidents

TCAS limitation: Only functions when both aircraft are fitted with a TCAS

SSR purpose: Identify targets, and provide information such as heading, altitude, callsign, destination

SSR limitation: Only functions when an aircraft is fitted with a transponder.

The following excerpt is from Question 15. It required students to provide examples where safety may be impeded due to the human performance of aviation employees, with regard to smoking, poor general health and poor emotional health.

Effective student responses:

- provided an example where human performance could be affected by smoking [1 mark]
- provided an aviation context [1 mark]
- provided an example where human performance could be affected by poor general health [1 mark]
- provided an aviation context [1 mark]

- provided an example where human performance could be affected by poor emotional health [1 mark]
- provided an aviation context [1 mark]

This excerpt has been included:

- to demonstrate the provision of a real-world aviation context where flight crew would be affected by smoking
- to illustrate an explanation that poor general health choices of a pilot could lead to heart problems, which could then place crew members in danger
- as it highlights how emotional health could impact a pilot's decision-making regarding checklists.

QUESTION 15 (6 marks)

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

a) smokes. *[2 marks]*

Flight crew who smoke are at risk from hisoloxic hypoxia, as such potentially may face hypoxic symptoms at a lower altitude than ~~this~~ a counterpart who does not smoke. Hypoxic symptoms may ~~lead to~~ include fainting, as such putting the aircraft in an uncontrolled state.

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

Poor general health may lead to heart problems such as cardic arrest, putting ~~the~~ an aircraft with a single-pilot crew into danger

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

Poor emotional health may lead to distraction when flying, where a pilot may miss critical checklist items.

The following excerpt is from Question 16. It required students to analyse a pitot system diagram and then explain the functions of the labelled parts and determine the system's purpose.

Effective student responses:

- explained the system's functionality using wording that indicated that
  - airspeed indicator (ASI) receives dynamic pressure from the pitot tube and static pressure from the static ports [1 mark]
  - altitude (ALT) receives static pressure only [1 mark]
  - vertical speed indicator (VSI) receives 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]
- determined the system's purpose [1 mark].

This excerpt has been included to:

- illustrate an explanation of how the ASI receives dynamic pressure from the pitot tube and static pressure from the static ports
- illustrate a response that highlights that the ALT and VSI receive static pressure
- demonstrate an explanation that the system's purpose is to provide vital flight information to the pilot.

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

A: Provides Airspeed information by comparing dynamic pressure from the pitot tube with static pressure, from the static port. Airspeed indicator.

B: Vertical speed indicator, compares static pressure from the static port to pressure inside a capsule which slowly equalises with the static pressure.

C: Altimeter, compares static pressure from the static port with a capsule inside. Higher static pressure ~~is~~ to generates ~~less~~ more pressure on the capsule inflating it less, as such reading a lower altitude.

D: Static port, mounted generally on the side of the aircraft, the static port provides ambient pressure to all three pressure instruments

E: Pitot tube, mounted facing the direction of travel the pitot tube provides dynamic pressure to the system. This system provides flight information to pilots.

The following excerpt is from Question 19. It required students to analyse a scenario where an airspeed indicator was unreliable. Students were required to sketch a systems thinking feedback loop that explained the causal relationship between the unreliable airspeed indicator and the sensations felt by the vestibular system.

Effective student responses:

- provided an appropriately constructed acceleration loop [1 mark]
- provided an appropriately constructed deceleration loop [1 mark]
- explained the causal relationship between the aircraft's acceleration and deceleration and the vestibular system [1 mark]
- provided explanations that indicated
  - 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].

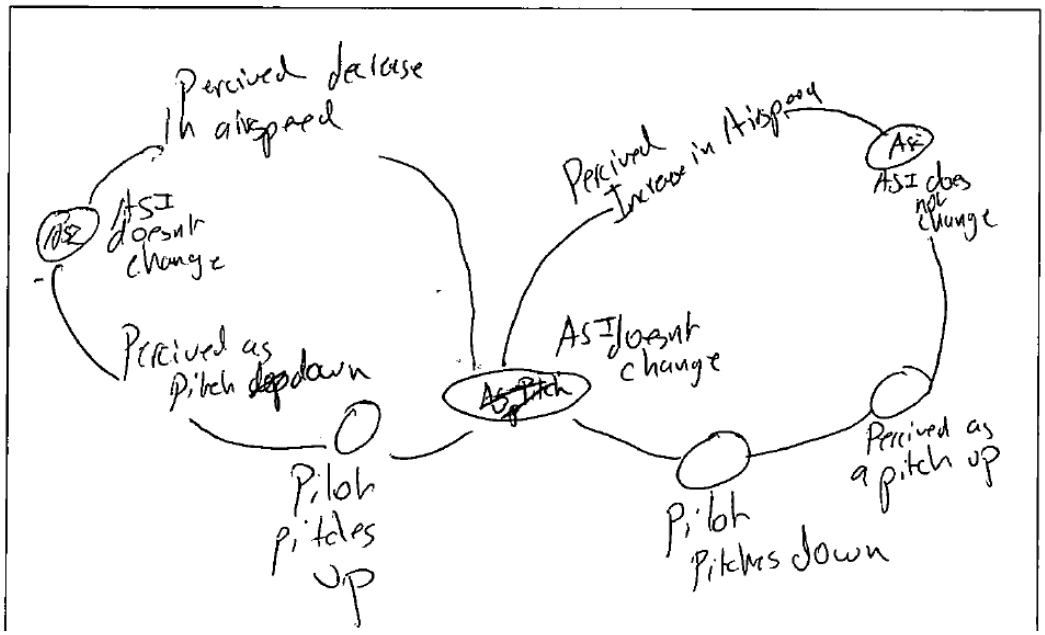
This excerpt has been included:

- to illustrate an appropriately constructed acceleration and deceleration loop

- to demonstrate a correctly constructed loop sketch with annotations that explain the causal relationship between the aircraft's acceleration, deceleration and vestibular system
- as it explains the causal relationships between acceleration, deceleration and the vestibular system from the scenario by using terms such as 'perceived increase and decrease' and 'pitches up and pitches down' to highlight the senses felt by the pilot's vestibular system.

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

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



The following excerpt is from Question 21. It required students to analyse a scenario and visual navigation chart (VNC), to identify and calculate bearing, magnetic bearing, distance, the highest point along the track and lower safe altitude (LSALT).

Effective student responses:

- determined
  - bearing [1 mark]
  - magnetic bearing [1 mark]
  - distance [1 mark]
  - highest point along the track [1 mark]
  - minimum safe altitude [1 mark].

This excerpt has been included to:

- illustrate a correct bearing of 267°T
- demonstrate a correct magnetic bearing of 264.5°M
- illustrate a correct distance of 31 NM.

In this response the student was not awarded the full marks as they did not correctly identify the safe altitude or the highest point on the track.

QUESTION 21 (5 marks)

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

Use Stimulus 2 in the stimulus book to determine:

- bearing 267°T
- magnetic bearing 264.5
- distance of the flight 31.67 NM
- highest point along the track 1775 @ tabletop range spot height
- minimum safe altitude. 1775

The track of the aircraft should be 267° true, or 264.5°M the distance is 31.67 NM, where the highest point is the tabletop range with a spot height of 1775'. As such the minimum safe altitude is 1775'.

The following excerpt is from Question 22. It required students to analyse a scenario in which a pilot loses consciousness. Students were required to identify and evaluate the causes that led to the pilot's loss of consciousness, and then determine if the decision to fly was sound and make justified recommendations outlining what the pilot could have done to avoid losing consciousness.

Effective student responses:

- converted Universal Coordinated Time (UTC) to local time [1 mark]
- identified causes for the pilot losing consciousness using wording that indicated
  - the pilot is experiencing physiological stress [1 mark]
  - fatigue and hypoxia are the underlying causes [1 mark]
- evaluated the scenario using wording that indicated
  - flying through the lowest point of circadian rhythm increases fatigue [1 mark]
  - physical activity (landscaping) added to the pilot's fatigue level [1 mark]
  - flying above 10 000 ft in a non-pressurised aircraft would cause hypoxia [1 mark]
- determined the pilot's decision was not sound [1 mark]
- provided a justified recommendation [1 mark]
- provided another justified recommendation [1 mark]

This excerpt has been included to:

- illustrate an explanation that flying above 10 000 ft in a non-pressurised aircraft would cause hypoxia (the response states that the pilot 'started to develop hypoxic conditions, as the aircraft's pressurisation system was not activated')

- demonstrate an indication that the ‘pilot failed to follow correct checklist procedures’
- illustrate an evaluation that the decision to fly was unsafe after the pilot conducted heavy landscaping that caused fatigue
- illustrate a justified recommendation that the pilot should have ‘set strict personal minimums outlining sleep and fatigue’, checklists should be followed and multi-crew operations should be employed
- demonstrate a response that does not convert UTC to local time and does not identify that flying through the lowest point of circadian rhythm increases fatigue but was still able to obtain 7 out of 9 marks for a complex unfamiliar question.

QUESTION 22 (9 marks)

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

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

As the aircraft climbed above 10'000ft, the pilot started to develop Hypoxic conditions, as the aircrafts pressurisation system was not activated. The pilot missed hypoxic symptoms, or failed to take action. As such after ~~decent~~ the engine failed due to the lack of fuel, the aircraft began to decend, The pilot regained conciassness after ~~passing~~ ~~Harry~~ a small while. The pilot failed to follow correct checklist procedure, and instad operated through ~~memory~~ ~~memory~~ ~~mem~~ memory items. As such ~~he~~ missed cabin pressurisation. The decision to fly was unsafe as after conducting landscaping work the pilot was fatigued. This caused a lapse of judement. In the future the pilot should set strict personal minimums outlining sleep, and fatigue throught the day. Additionally, checklists should be followed thoorally and checked before flying. The pilot may also limit flights to ~~to~~ 10000 during day, and 5000 during night to ensure the flight does not pose a risk to developing hypoxia. This ~~last~~ accident may have been prevented by employing multi-crew operations, and of strict personal minimums.

Practices to strengthen

When preparing students for external assessment, it is recommended that teachers consider:

- 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 expect students to refine ideas and solutions to make justified recommendations (Assessment objective 7). It is recommended that emphasis is placed on the selection and prioritisation 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, e.g. grid-point wind and temperature forecasts (GPWTs), WACs, VNCs, VTCs, ERSA, terminal area forecasts (TAFs) 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 to enable them to work more efficiently under examination conditions.

Additional advice

Teachers should:

- inform students of the importance of responding to examination questions in clear and legible handwriting
- 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
  - breaking down the elements of the question stem
  - reading all the answer options carefully
  - considering the validity of the options and having a decision-making process to determine the most correct one
  - attempting every question by filling out the answer bubbles in the question and response book
- support students to develop positive practices when responding to short response questions that involve
  - breaking down the question
  - identifying the relevant subject matter from the syllabus (and associated terminology)
  - understanding and responding to the cognition/s and separate or connected elements within the question
  - planning and completing a logical and well-sequenced response
  - checking their responses, ensuring that all elements of the question have been completed, should they have time.