Aerospace Systems General Senior Syllabus 2019 v1.1

Subject report 2020

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Queensland Curriculum & Assessment Authority

QCAA

For all Queensland schools

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Introduction

The first summative year for the new Queensland Certificate of Education (QCE) system was unexpectedly challenging. The demands of delivering new assessment requirements and processes were amplified by disruptions to senior schooling arising from the COVID-19 pandemic. This meant the new system was forced to adapt before it had been introduced — the number of summative internal assessments was reduced from three to two in all General subjects. Schools and the QCAA worked together to implement the new assessment processes and the 2020 Year 12 cohort received accurate and reliable subject results.

Queensland's innovative new senior assessment system combines the flexibility and authenticity of school-based assessment, developed and marked by classroom teachers, with the rigour and consistency of external assessment set and marked by QCAA-trained assessment writers and markers. The system does not privilege one form of assessment over another, and both teachers and QCAA assessors share the role of making high-stakes judgments about the achievement of students. Our commitment to rigorous external quality assurance guarantees the reliability of both internal and external assessment outcomes.

Using evidence of student learning to make judgments on student achievement is just one purpose of assessment. In a sophisticated assessment system, it is also used by teachers to inform pedagogy and by students to monitor and reflect on their progress.

This post-cycle report on the summative assessment program is not simply being produced as a matter of record. It is intended that it will play an active role in future assessment cycles by providing observations and findings in a way that is meaningful and helpful to support the teaching and learning process, provide future students with guidance to support their preparations for summative assessment, and promote transparency and accountability in the broader education community. Reflection and research are necessary for the new system to achieve stability and to continue to evolve. The annual subject report is a key medium for making it accessible to schools and others.

Background

Purpose

The annual subject report is an analysis of the previous year's full summative assessment cycle. This includes endorsement of summative internal assessment instruments, confirmation of internal assessment marks and external assessment.

The report provides an overview of the key outcomes of one full teaching, learning and assessment cycle for each subject, including:

- information about the application of the syllabus objectives through the design and marking of internal and external assessments
- information about the patterns of student achievement in each subject for the assessment cycle.

It also provides advice to schools to promote continuous improvement, including:

- identification of effective practices in the design and marking of valid, accessible and reliable assessments
- identification of areas for improvement and recommendations to enhance the design and marking of valid, accessible and reliable assessment instruments
- provision of tangible examples of best practice where relevant, possible and appropriate.

Audience and use

This report should be read by school leaders, subject leaders and teachers to inform teaching and learning and assessment preparation. The report is to be used by schools and teachers to assist in assessment design practice, in making assessment decisions and in preparing students for external assessment.

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

Report preparation

The report includes analyses of data and other information from the processes of endorsement, confirmation and external assessment, and 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 enrolments

- Number of schools offering the subject: 13.

Completion of units	Unit 1	Unit 2	Units 3 and 4
Number of students completed	140	148	157

Note: Units 3 and 4 figure includes students who were not rated.

Units 1 and 2 results

Number of students	Satisfactory	Unsatisfactory	Not rated
Unit 1	140	10	0
Unit 2	148	7	0

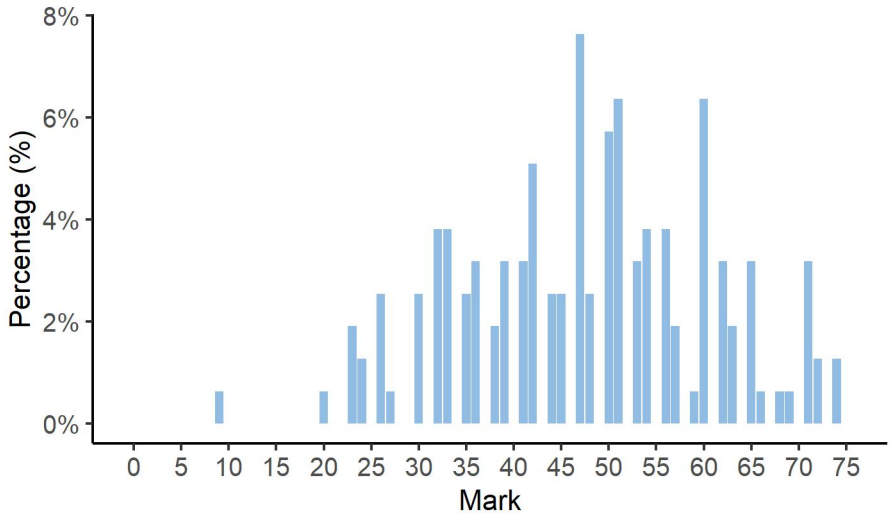
Units 3 and 4 internal assessment results

2020 COVID-19 adjustments

To support Queensland schools, teachers and students to manage learning and assessment during the evolving COVID-19 pandemic in 2020, the QCAA Board approved the removal of one internal assessment for students completing Units 3 and 4 in General and Applied subjects.

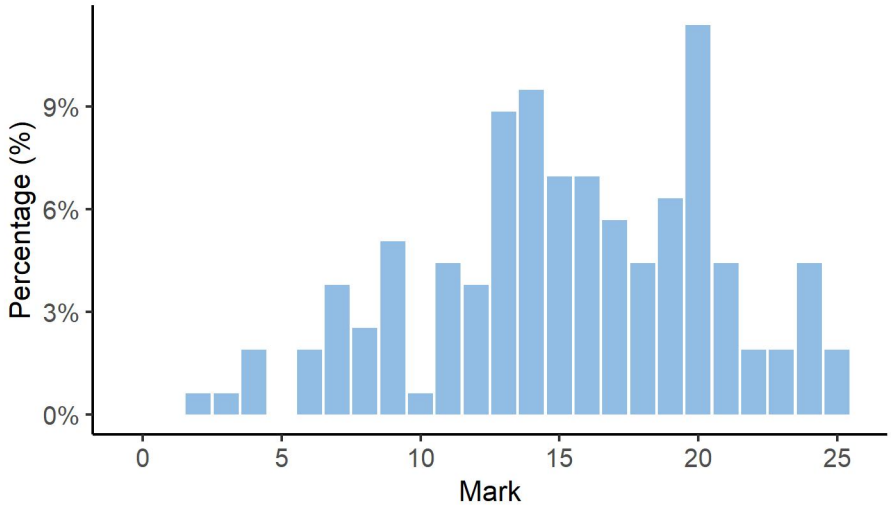
In General subjects, students completed two internal assessments and an external assessment. Schools made decisions based on QCAA advice and their school context. Therefore, across the state some instruments were completed by most schools, some completed by fewer schools and others completed by few or no schools. In the case of the latter, the data and information for these instruments has not been included.

Total results for internal assessment

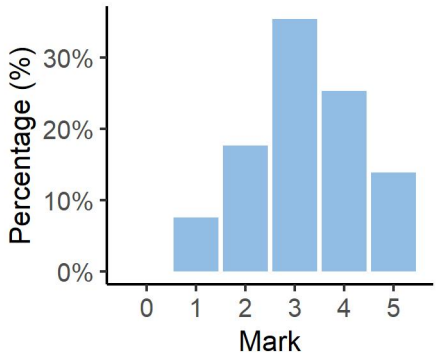


IA1 results

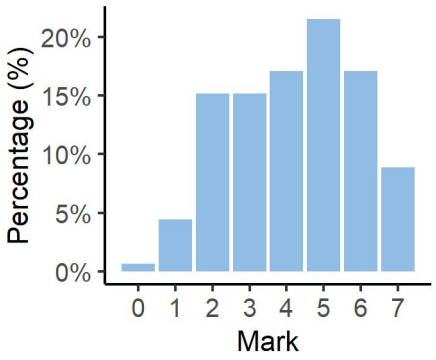
IA1 total



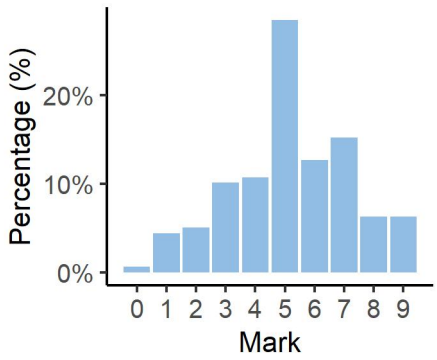
IA1 Criterion 1



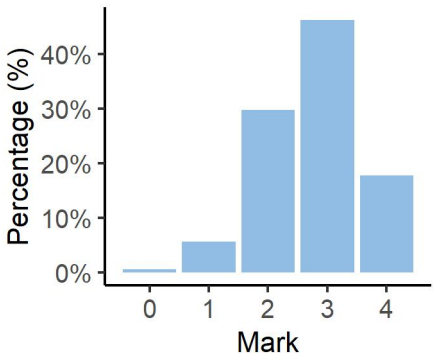
IA1 Criterion 2



IA1 Criterion 3

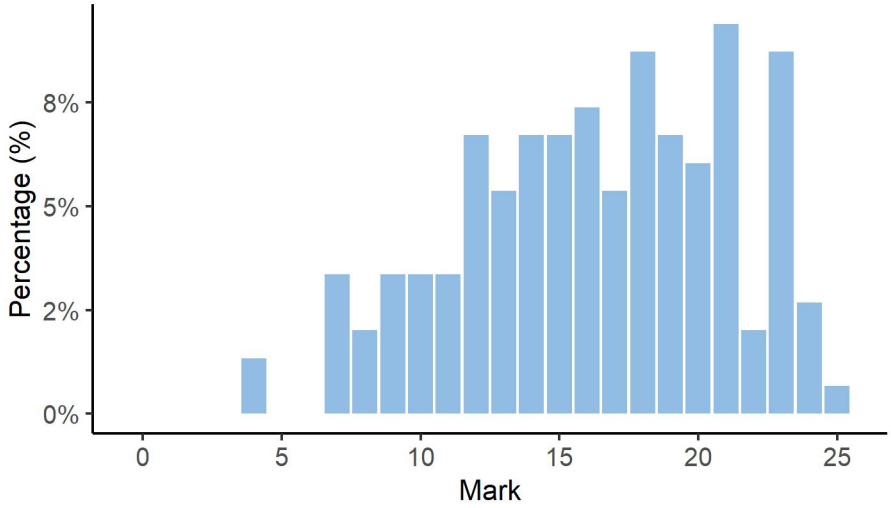


IA1 Criterion 4

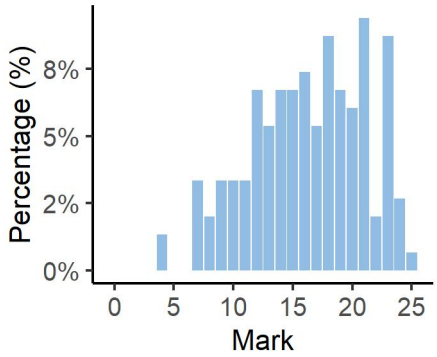


IA2 results

IA2 total



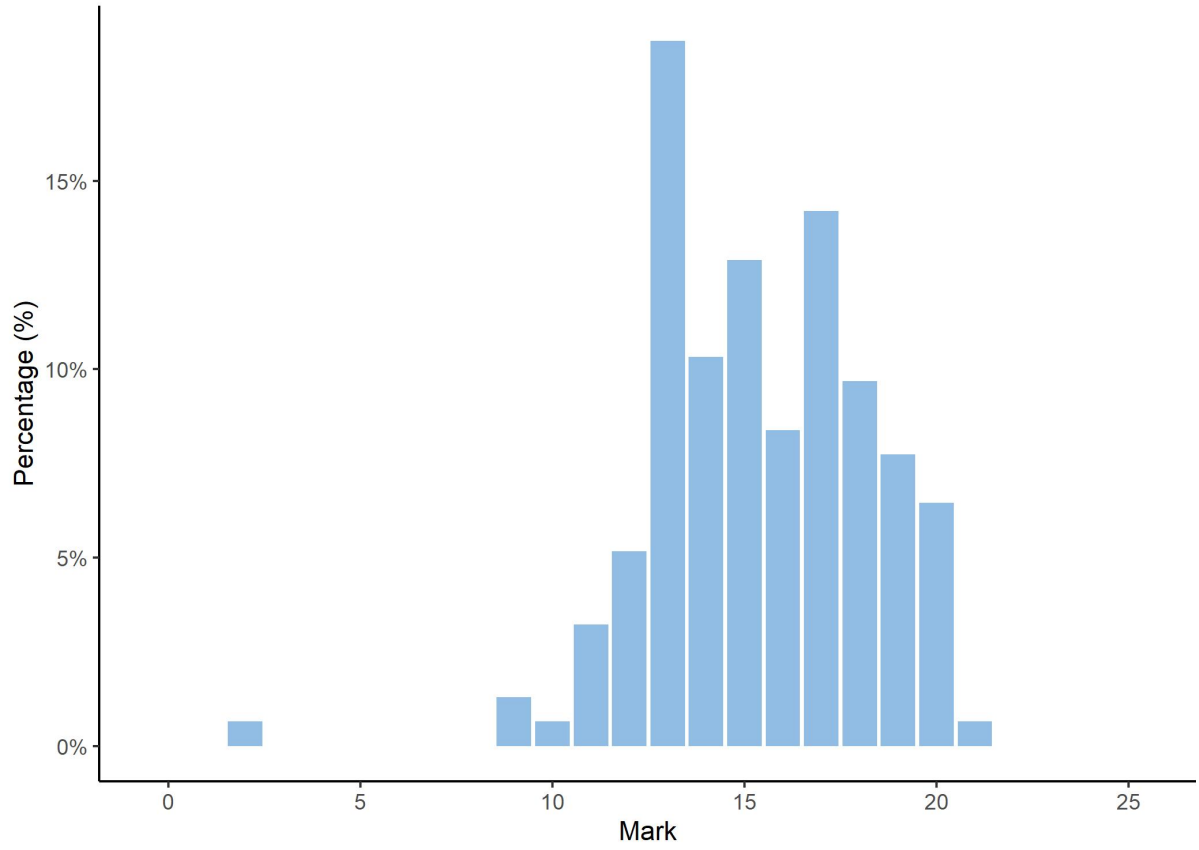
IA2 Criterion 1



IA3 results

Due to COVID-19 pandemic adjustments, there were insufficient student responses to this instrument to provide useful analytics.

External assessment results



Final standards allocation

The number of students awarded each standard across the state are as follows.

Standard	A	B	C	D	E
Number of students	18	52	75	10	0

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	100–82	81–66	65–43	42–20	19–0

Internal assessment

The following information and advice pertain 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 sections 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 subject matter and to the assessment objective. Refer to the quality assurance tools for detailed information about the assessment practices for each assessment instrument.

Total number of items endorsed in Application 1

Number of items submitted each event	IA1	IA2	IA3
Total number of instruments	13	13	13
Percentage endorsed in Application 1	31	31	15

Confirmation

Confirmation is the quality assurance process based on the attribute of reliability. Teachers make judgments about the evidence in students' responses using the instrument-specific marking guide (ISMG) to indicate the alignment of students' work with performance-level descriptors and determine a mark for each criterion. These are provisional criterion marks. The QCAA makes the final decision about student results through the confirmation processes. Data presented in the assessment decisions section identifies the level of agreement between provisional and final results.

Number of samples reviewed at initial, supplementary and extraordinary review

IA	Number of schools	Number of samples requested	Supplementary samples requested	Extraordinary review	School review	Percentage agreement with provisional
1	13	65	6	0	0	94.87
2	12	66	0	0	0	100
3	1	5	0	0	0	100

Internal assessment 1 (IA1)

Project — Folio (25%)

In Aerospace Systems, a folio involves students documenting the application of a problem-solving process in response to an identified real-world aerospace problem. Students will develop a range of cognitive, technical and creative skills and theoretical understandings to provide a solution to an operational systems problem drawn from Unit 3 subject matter.

This may include problems where students are required to:

- investigate why the current location of an airport has created a concern for local community
- investigate an aircraft accident or incident
- investigate an airline that is experiencing a financial loss on several of its routes.

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 practices

Validity priority	Number of times priority was identified in decisions*
Alignment	3
Authentication	0
Authenticity	5
Item construction	1
Scope and scale	2

*Total number of submissions: 13. Each priority might contain up to four assessment practices.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that featured:

- suitable checkpoints aligned to the authentication strategies reflecting QCAA guidelines for assuring student authorship
- scaffolding that provided clear instructions to inform students about the processes they could use to complete the response.

Practices to strengthen

It is recommended that assessment instruments:

- provide students opportunities for unique responses to real-world aerospace problems, e.g. contextualise their tasks to ensure relevance to the students and school setting. The context should relate to subject matter for the unit/topic and provide a clear overview and framework for the assessment task. The task should outline a real-world aerospace operational systems problem that requires students to engage with all cognitions from the objectives of the syllabus at a range of performance levels. Schools should create problem contexts and tasks that

students explore to develop a solution that will vary year to year and are sufficiently different from the QCAA sample assessment instrument

- address all assessment specifications for Part A and Part B unaltered, as defined in the syllabus (Section 4.8.1), e.g. schools should use the syllabus language to reproduce Part A and B specifications directly from the syllabus
- provide clear instructions regarding the scope of information, knowledge and skills students are required to demonstrate to complete the task, aligning with real-world aerospace systems problems from Unit 3 subject matter, e.g. schools must assess subject matter from Topic 2: Airspace management, Topic 3: Safety management systems and Topic 5: Airport and airline operation systems as prescribed in the assessment objectives. Schools can also choose to assess Topic 1: International and national operational and safety systems and/or Topic 4: Operational accident and incident investigation processes
- are of an appropriate scale to allow students to respond within the syllabus conditions, e.g. schools that developed operational systems problems that were achievable within duration conditions of the syllabus of 5–7 weeks showed a better alignment to the assessment priorities. Schools should apply the school policy for managing response length, e.g. marking to correct task length or allowing students to redact to correct task length so responses do not exceed the syllabus conditions.

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 practices

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

*Total number of submissions: 13. Each priority might contain up to four assessment practices.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that featured:

- tasks that avoided bias and inappropriate content, e.g. schools that avoided gender stereotyping and used gender-neutral language throughout contexts and tasks better aligned to the assessment priorities
- images, diagrams or other visual elements that were legible, clear, relevant and accessible, e.g. schools that provided images, diagrams or other visual elements with high resolution made it easier to view and more accessible for students.

Practices to strengthen

It is recommended that assessment instruments:

- provide clear instructions using cues aligning to the specifications, objectives and ISMG, e.g. schools should develop real-world aerospace operational systems problems to allow for all cognitions from the objectives of the syllabus to be demonstrated. The instructions in the task should provide cues to students and use the syllabus specifications language to prompt students to meet the task response requirements
- use appropriate language drawn from Unit 3 subject matter that avoided unnecessary jargon, e.g. schools that used language from the syllabus and avoided technical language outside the topics in the unit better aligned to the assessment priorities
- use appropriate formatting features such as bold, italics only where relevant, e.g. schools that had a clear, unambiguous layout that used headings and subheadings and did not overuse bold or italics were more accessible for students.

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 final results

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional
1	Retrieving and comprehending	93.59	0	6.41
2	Analysing	96.79	0	3.21
3	Synthesising and evaluating	95.51	0	4.49
4	Communicating	93.59	0.64	5.77

Effective practices

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

- the Retrieving and comprehending criterion at the 2–3 performance level demonstrated
  - accurate recognition and appropriate description of the operational systems problem with aerospace technology knowledge clearly annotated to support evidence identified in student responses with the characteristics from the performance-level descriptors
  - competent symbolisation and appropriate explanation of some ideas and a solution were consistently applied using the glossary definitions of the qualifiers from each performance-level descriptor
- students demonstrated careful and deliberate thought to distinguish the problem characteristics using aerospace systems, technology, and research information, with clear and sound reasoning of the problem characteristics to establish success criteria for the Analysing criterion. This meant the student response aligned to the characteristics and performance-level descriptors in the Analysing criterion at the 4–5 performance level.

Samples of effective practices

The following is an excerpt from a response that illustrates the characteristics for the criteria at the performance level indicated. The sample may provide evidence of more than one criterion. The characteristics highlighted may not be the only time the characteristics have occurred throughout the response.

Retrieving and comprehending (4–5 marks) The evidence includes aspects of consistently correct identification of the characteristics of the operational systems problem. It includes thoughtful and astute choices made in the selection and use of aerospace technology knowledge, aerospace concepts and principles and systems thinking habits and systems thinking strategies in relation to aerospace management, safety, airline and/or airport operations.	2.3 Security, Customs and Quarantine Inside every international airport around the world are security customs teams working around the clock to ensure the safety of the passengers, crew, airport workers, airlines and civilians outside the airport. The new international terminal for the Sunshine Coast will need security, customs and quarantine to ensure a high level of safety for everyone. Currently, the domestic terminal is capable of handling international passengers when the seasonal flights from New Zealand arrive. Therefore, the main concern for the security and customs would be the ability to handle larger cohorts. This is easily mitigated by hiring a larger amount of people and providing them with a larger, permanent facility to process the international passengers. This would entail a whole customs facility to be installed inside the new international terminal, hiring more crews to manage them.

Analysing (6–7 marks) The evidence supports an understanding of the relationships that exist in complex situations to distinguish the problem characteristics using pertinent aerospace systems, technology, and research information in relation to aerospace management, safety, airline and/or airport operations that have a direct bearing on relationships that exist between the elements, components and features of the operational systems problem, including contributing factors and areas of weakness.	The runway must be built to be able to support this technical data. The CASA Manual of Standards Part 139, Aerodromes, specifies the exact standards and legislation of runaway building. This manual will be referred to when designing the runway and taxiways. The following points are refereeing to Chapter 6.2. • Length – the only specification for the runway length is in section 6.2.2. It states that 'the length of a runway must be adequate to meet the operational requirements of the aeroplanes for which the runway is intended.' Therefore, the runway must be at least 2900m in length. Therefore, the length of the runway will be 3000m to allow for any uncertainty or preferable weather conditions. • Width – the specifications in section 6.2.2 for the width of a runway is given in a code and a letter. There is no specific information concerning what determines the width should be in correlation to the landing gear width, nor the width of the aircraft. The Airbus a380 is permitted to operate off runways with a code of 4E. Given the a380/s larger width, the runway will be constructed to this requirement and will be fine to operate 787-9's. This will also allow for emergency landings for larger aircraft like a380's or 747's if they need to.

Analysing (4–5 marks) The evidence supports clear and sound reasoning of the problem characteristics to establish success criteria that meet the assigned purpose.	Determining a solution The following mind map identifies areas in which must be investigated to further secure the growth of the Sunshine Coast airport. A new international terminal will be built, therefore security gates, baggage reclaim stations, comfort, transport, border control and customs must be considered in the design of this terminal. The safety of the airport must be revaluated as the increase in customers may compromise safety. Additional aircraft will be landing at the airport thus, meaning more maintence facilites will be required.

Practices to strengthen

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

- the syllabus glossary be used to unpack the cognitions and qualifiers, along with the assessment specifications to analyse each performance-level descriptor to determine the evidence that would be expected in student responses at each level
- schools provide students with opportunities to practise evaluating and refining ideas with a solution to make justified recommendations
- teachers use the checkpoints and draft to make sure that students submit their responses within the specified limits of the syllabus. Apply the school assessment policy and refer to the

QCE & QCIA policy and procedures handbook, e.g. mark to correct task length or allow students to redact to correct task length.

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 drawn from Unit 3 subject matter.

This may have included items which ask students to respond to the following activities:

- sketching, drawing, graphs, tables and diagrams
- writing multiple-choice, single-word, sentence or short-paragraph responses
- calculating using concepts and principles drawn from Unit 3 Topic 5 subject matter
- responding to seen or unseen stimulus materials.

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 practices

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

*Total number of submissions: 13. Each priority might contain up to four assessment practices.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that featured:

- a range of Unit 3 subject matter assessing a balance across the assessment objectives using a range of item types, including multiple-choice, single-word, sentence, short-paragraph and calculation responses that allowed for unique student responses
- clear instructions regarding the scope of information, knowledge and skills students are required to demonstrate to complete the task aligning with real-world aerospace systems problems from Unit 3 subject matter.

Practices to strengthen

It is recommended that assessment instruments:

- follow the conventions for item construction as per the *QCE & QCIA policy and procedures handbook* (Section 9.5.2). Multiple-choice items should be carefully constructed to align with the conventions for this item type, e.g. schools should develop multiple-choice items that have
  - stems that do not include information that helps students answers the item

  - options that are mutually exclusive (no two options are the same)
  - options listed in logical order (shortest to longest)
  - options that provide plausible distractors
  - options that follow the grammatical structure of the stem
- include items that match the degree of difficulty specifications: ~20% complex unfamiliar, ~20% complex familiar, ~60% simple familiar and do not match or share similar characteristics of QCAA sample assessment items (Syllabus section 4.8.2)
- include an appropriate number of questions and expected student response space that adhere to the syllabus conditions for the technique (Syllabus section 4.8.2).

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 practices

Accessibility priority	Number of times priority was identified in decisions*
Transparency	6
Language	1
Layout	1
Bias avoidance	0

*Total number of submissions: 13. Each priority might contain up to four assessment practices.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that featured:

- items that avoided bias and inappropriate content, e.g. schools that avoided gender stereotyping and used gender-neutral language throughout contexts, stimulus and items better aligned to the assessment priorities
- an alignment of the response space available for each item with the length of the sample response in the marking scheme.

Practices to strengthen

It is recommended that assessment instruments:

- provide clear instructions using cues that align with the cognitions in the assessment objectives with items that did not place the student in professional roles or unsuitable aerospace contexts
- include appropriate and technically correct language, and the meanings for terms and definitions aligns with the syllabus (Section 6)
- use aerospace technology knowledge and operational systems situations to contextualise items
- 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.

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 final results

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

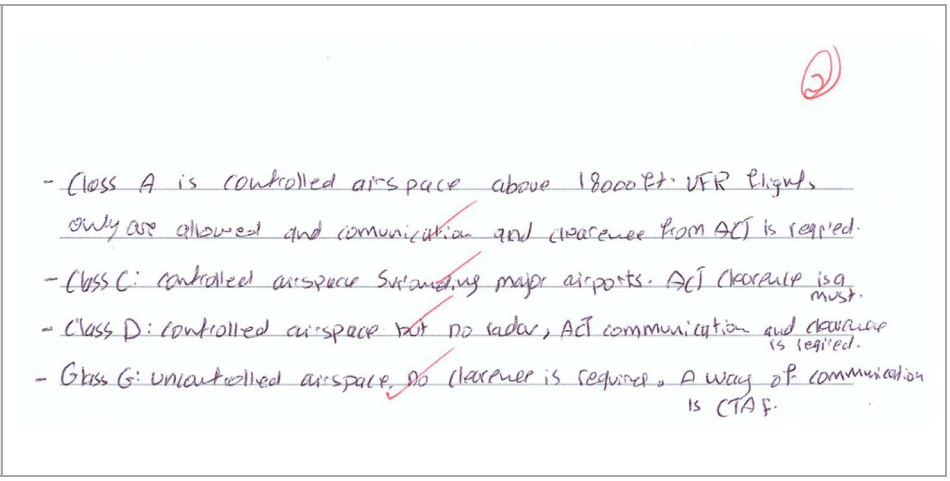
Effective practices

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

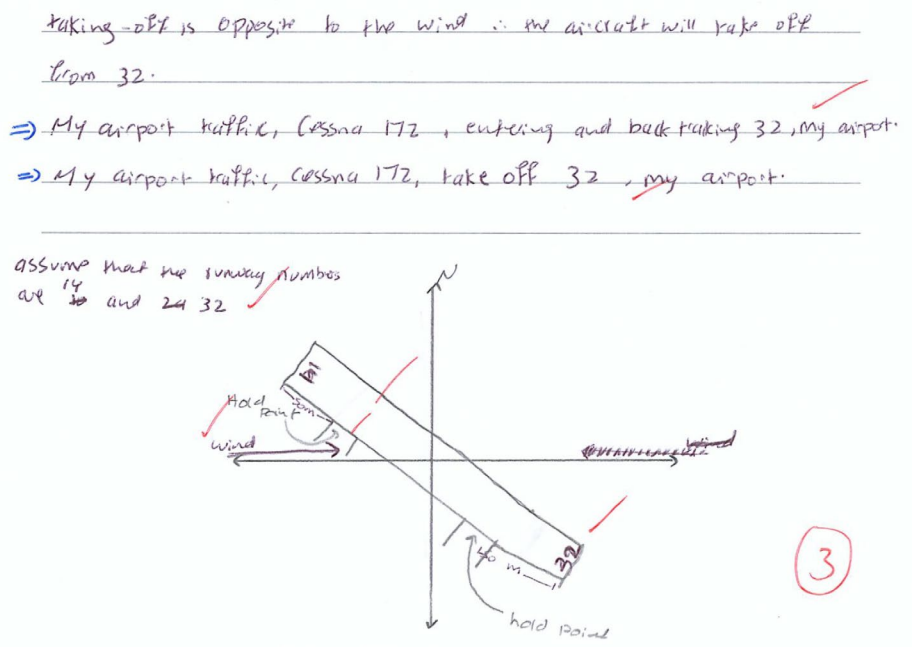
- marking schemes provided a clear indication of how marks were allocated
- marks from the exam were clearly tallied and applied to the ISMG percentage cut-offs.

Samples of effective practices

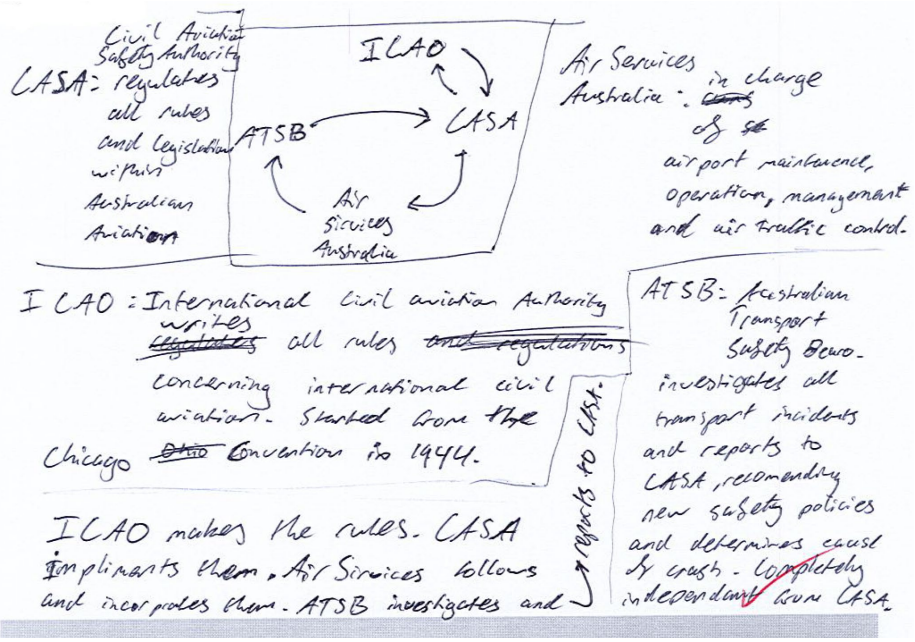
The following is an excerpt from a response that illustrates the characteristics for the criterion at the performance level indicated. The sample may provide evidence of more than one criterion. The characteristics highlighted may not be the only time the characteristics have occurred throughout the response.

Aerospace systems knowledge and problem-solving (>93% and 24 marks) This first response demonstrates full marks for a two-mark question. It provides evidence of accurate recognition of aerospace technology knowledge with a discerning explanation of ideas, solutions and relationships to an explanatory question about classes of airspace.	

This second response demonstrates full marks for a three-mark question. It provides evidence of adept symbolisation and discerning explanation of ideas, solutions and relationships. It has aspects of insightful and accurate analysis of the problem with logically synthesised information of ideas to propose a solution to an analysis question about an aerospace operational systems problem.



Aerospace systems knowledge and problem-solving (>93% and 24)
This response demonstrates full marks for a six-mark question. The item required students to explain the relationship between ICAO, CASA, Airservices Australia and the ATSB with a feedback loop to support the analysis of the relationship. The evidence supports an accurate and discriminating recognition of aerospace operational systems problems, with adept symbolisation and discerning explanation of ideas, solutions and relationships. The response has aspects of insightful and accurate analysis that are coherent and logical through the use of synthesised information and ideas developed to demonstrate the relationships that exist in complex situations.



Practices to strengthen

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

- schools correctly apply percentage cut-offs for school cohorts
- marking schemes
  - indicate the marks to be awarded as per the mark allocation specifications for complex unfamiliar questions, e.g. questions were nominated as complex unfamiliar. However, the questions did not enable students to provide any sustained analysis, synthesis and evaluation of relevant information to develop responses
  - align with each question
  - include specific information about how marks are allocated and provide clarity about how marks are compiled and determined
- item stimulus, graphs, tables and diagrams are checked for clarity and match the question
- teachers cross-mark to check that the marks are added correctly with the percentage cut-offs applied accurately for each sample
- the scan quality of student work is clear and legible and uploaded correctly, with accurate marks transcribed in the application.

Internal assessment 3 (IA3)

Project — Folio (25%)

In Aerospace Systems, a folio involves students documenting the application of a problem-solving process in response to an identified real-world aerospace problem. Students will develop a range of cognitive, technical and creative skills and theoretical understandings to provide a solution to an aircraft systems and/or human factors problem drawn from Unit 4 subject matter.

This may have included problems where students were required to investigate:

- an aircraft's cockpit design to support greater pilot situational awareness
- the planning of a multi-stage flight with diversions
- a case study of an aircraft accident associated with human factors to develop an education program.

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 practices

Validity priority	Number of times priority was identified in decisions*
Alignment	7
Authentication	0
Authenticity	4
Item construction	1
Scope and scale	2

*Total number of submissions: 13. Each priority might contain up to four assessment practices.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that featured:

- suitable checkpoints aligned to the authentication strategies that reflected QCAA guidelines for assuring student authorship
- scaffolding that provided clear instructions to inform students about the processes they could use to complete their response.

Practices to strengthen

It is recommended that assessment instruments:

- provide students opportunities for unique responses to real-world aerospace problems, e.g. contextualise the task to ensure it is relevant to the students. The context should relate to subject matter for the unit/topic and provide a clear overview and framework for the assessment task. The task should outline a real-world aircraft performance systems and/or human factors problem that requires students to engage all cognitions from the objectives of

the syllabus at a range of performance levels. Schools should create problem contexts and tasks that students explore to develop a solution to that varies year to year and are sufficiently different from the QCAA sample assessment instrument

- address all assessment specifications for Part A and Part B unaltered, as defined in the syllabus (Section 5.7.1), e.g. schools should use the syllabus language to reproduce Part A and B specifications directly from the syllabus
- provide clear instructions regarding the scope of information, knowledge and skills students are required to demonstrate to complete the task aligning with real-world aerospace systems problems from Unit 4 subject matter, e.g. 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. schools that developed operational systems problems that were achievable within syllabus duration conditions of 5–7 weeks showed a better alignment to the assessment priorities. Schools should apply the school policy for managing response length, e.g. marking to correct task length or allowing students to redact to correct task length so responses do not exceed the syllabus conditions.

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 practices

Accessibility priority	Number of times priority was identified in decisions*
Transparency	4
Language	0
Layout	0
Bias avoidance	0

*Total number of submissions: 13. Each priority might contain up to four assessment practices.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that featured:

- appropriate language drawn from Unit 4 subject matter that avoided unnecessary jargon, e.g. schools that used language from the unit and avoid technical language outside the topics in Unit 4 better aligned to the assessment priorities
- appropriate formatting features such as bold, or italics only where relevant, e.g. schools that had a clear, unambiguous layout that used headings and subheadings and did not overuse bold or italics better aligned to the assessment priorities
- images, diagrams or other visual elements that were legible, clear, relevant and accessible, e.g. schools that provided images, diagrams or other visual elements with high resolution made it easier to view and more accessible for students.

Practices to strengthen

It is recommended that assessment instruments:

- provide clear instructions using cues that align to the specifications, objectives and ISMG, e.g. schools should develop real-world aerospace aircraft performance systems and/or human factors problems to allow students to demonstrate all cognitions from the syllabus objectives. The task instructions should provide cues and use the syllabus specifications language to prompt students to meet the task response requirements
- avoid unsuitable subject matter from Units 1, 2 or 3, e.g. schools that avoided subject matter from other units better aligned to the assessment priorities as students could respond to the school-designed task that met the instrument objectives.

Assessment decisions

Due to COVID-19 pandemic adjustments, there were insufficient student responses to this instrument to provide useful analytics.

External assessment

Short response — Examination (25%)

Assessment design

Assessment specifications and conditions

Short response

- consists of a number of items that may ask students to respond to the following activities
  - sketching, drawing, 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
- where applicable, students are required to write in full sentences, constructing a response so that ideas are maintained, developed and justified
- the examination must assess a balance across the assessment objectives
- the percentage allocation of marks must match the degree of difficulty specifications: ~20% complex unfamiliar, ~20% complex familiar, ~60% simple familiar.

Conditions

- Time: 2 hours plus perusal (10 minutes)
- Length: 800–1000 words in total or equivalent, including a number of
  - multiple-choice, single-word or sentence response items
  - short-paragraph response items of 50–150 words per item
  - items requiring calculations
- Other
  - only the QCAA formula sheet must be provided
  - notes are not permitted
  - use of technology is required: non-programmable scientific and flight calculator only permitted
  - protractor and ruler required.

The assessment instrument consisted of two sections. Questions were derived from the context of Unit 4 subject matter in Topic 1: Aircraft performance, Topic 2: Aircraft performance, Topic 3: Advanced navigation and radio communication technologies and Topic 4: Human performance and limitations.

The subject matter examined included:

- aircraft performance
  - basic aircraft de-icing systems,

  - six flight instruments
  - airspeed limitations and landing charts
- aircraft navigation
  - aeronautical charts, ERSAs and area forecasts
  - calculations for track error and closing angles
  - ETA and headings
- advanced navigation and radio communication technologies
  - electronic flight information systems (EFIS), head-up (HUD)
  - primary surveillance radar (PSR)
- human performance and limitations
  - effects of alcohol and drugs on human performance
  - relationship between human error, human behaviour, sleep, stress and fatigue
  - cockpit design, including ergonomics
  - hypoxia, hyperventilation and crew resource management.

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

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

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

Section 1 included 10 multiple-choice simple familiar questions worth 1 mark each, totalling 10 marks.

Section 2 included 13 short response questions making up 70 marks. Simple familiar questions made up 8 questions totalling 38 marks. Complex familiar questions made up 3 questions totalling 16 marks and complex unfamiliar questions including sketching and calculating made up 2 questions with a total of 16 marks.

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:

- World Aeronautical Charts (WAC)
- Visual Navigation Chart (VNC)
- En Route Supplement Australia (ERSA).

Assessment decisions

Overall, students responded well to the following assessment aspects:

- recognition and description of aerospace technology knowledge, concepts and principles across simple familiar and complex familiar questions
- explanation of ideas, solutions and relationships in relation to aircraft performance systems and human factors
- in questions that required EFIS and HUD subject matter, responses demonstrated a clear understanding of evaluation with justified recommendations in terms of aircraft performance systems.

Effective practices

The following samples were selected to illustrate highly effective student responses in some of the assessment objectives of the syllabus.

Multiple-choice item response

QUESTION 5

An aircraft en route to an airfield at a GS of 145 kt has an ETA of 1425 local time. At 1100 local time the aircraft experiences a tailwind of 15 kt. What is the revised ETA at the airfield?

(A) 1357 local time

(B) 1401 local time

(C) 1406 local time

(D) 1425 local time

Key (C) 1406 local time — at 145 kts from 11.00 the plane would travel 495 nm to land at 14.25. At 160 kts, allowing for 15 kts tailwind, it would take the plane 19 minutes less time to reach the airfield.

Validity argument:

- (A) 1357 local time is incorrect through use of 3.25 (i.e. hrs and minutes) in the calculation rather than 3.42 hrs (not converting minutes to hrs)
- (B) 1401 local time is incorrect as the calculation method has been applied correctly, although by not converting 3.01 hrs travel time to hours and minutes an incorrect local time was provided.
- (D) 1425 local time is incorrect as there is no difference to the ETA, as an understanding of GS has not been impacted by the tailwind to change the GS.

QUESTION 8

An aircraft is en route on a 490 nm flight from Nightcliff to Kununurra. After travelling 210 nm, the pilot realises that they are 14 nm off track to the left. What is the closing angle required for a landing at Kununurra airfield?

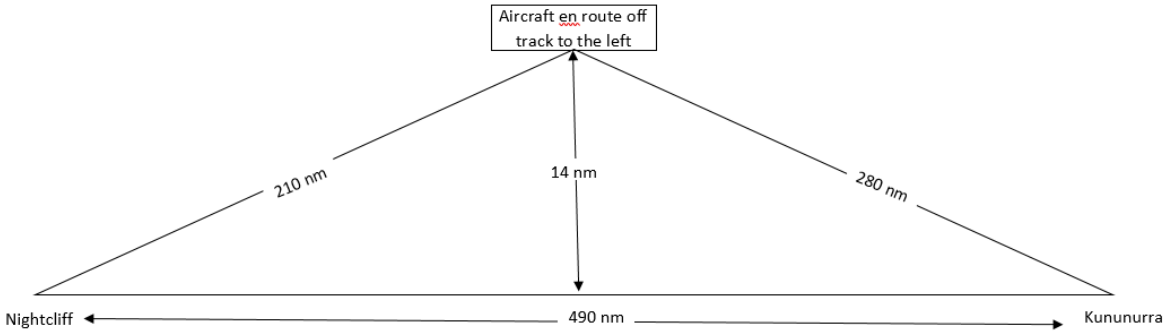
(A) 7º right

(B) 4º right

(C) 3º right

(D) 1º right

Key (A) 7º right — the response calculated the closing angle correctly between Nightcliff and Kununarra with use of the 1 in 60 rule shown below.



1 in 60 rule Closing angle = distance off / Distance travelled x 60 CA = DO/Dtx60 CA = 14 nm / 210 nm x 60 CA = 4º	1 in 60 rule Closing angle = distance off / Distance travelled x 60 CA = DO/Dtx60 CA = 14 nm / 280 nm x 60 CA = 3º
Therefore 4º+3º = 7º right	

Validity argument:

- (B) 4^0 right — incorrectly calculated closing angle where 3^0 was not added to 4^0.
- (C) 3^0 right — incorrectly calculated closing angle where 4^0 was not added to 3^0.
- (D) 1^0 right — incorrectly calculated closing angle where 3^0 was subtracted from 4^0.

Short response

Assessment objective: 1

Item: 11

This question required students to list the types of information provided by a primary flight display (PFD).

Effective student responses:

- recognised and described types of correctly identified information provided by a primary flight display (PFD) drawn from electronic flight information systems (EFIS) subject matter
- correctly provided information such as altitude, attitude (artificial horizon), heading, vertical speed (climb or descent rate), airspeed and the rate of turn (turn coordination) they presented attributes of a high-level response to the PFD question.

Student sample of effective responses

This excerpt has been included to:

- illustrate a high-level response that clearly demonstrates the recognition and description of aerospace technology knowledge, concepts and principles in simple familiar contexts from Topic 3: Advanced navigation and radio communication technologies.

High-level response (6 marks) The item required students to respond to information provided by a primary flight display (PFD) as part of electronic flight information systems (EFIS) subject matter. The evidence supports an accurate recognition and understanding of information provided on primary flight displays.	**QUESTION 11 (6 marks)** List six types of information provided by a PFD. 1. Airspeed 2. Vertical Speed 3. Artificial horizon / Pitch and roll angle 4. Altitude 5. Heading 6. Turn co-ordination

Assessment objective: 1 and 2

Item: 14

This question required students explain the relationship between hypoxia and hyperventilation using an example aerospace context.

Effective student responses:

- explained the relationship between hypoxia and hyperventilation by providing the aerospace situation or by clearly describing it in more detail to reveal relevant facts of hypoxia and hyperventilation. The responses did so in an aerospace context with definitions that were appropriate and acceptable.

Student sample of effective responses

This excerpt has been included to:

- illustrate a high-level response that clearly demonstrates the student's ability to identify, recall and explain aerospace definitions with supporting detail to reveal relevant facts or particular features of the relationship between hypoxia and hyperventilation in an aerospace context.

High-level response (4 marks) The item required students to explain the relationship between hypoxia and hyperventilation drawn from Unit 4 subject matter. The evidence supports an accurate recognition and understanding of hypoxia and hyperventilation causes and symptoms. The response explains the relationship between hypoxia and	**QUESTION 14 (4 marks)** Explain the relationship between hyperventilation and hypoxia using an example aerospace context. If an aircraft's oxygen supply is decreasing or there is sudden decompression within the cabin, the pilot may need to breathe much faster and harder to obtain as much oxygen as possible to stay conscious. Once the air becomes too thin, although the pilot may be rapidly breathing, or hyperventilating, their oxygen blood oxygen saturation is too low, which will cause them to become hypoxic, meaning not enough oxygen is getting to their brain.

hyperventilation using highly skilled intellectual perception provided by the aerospace context where there was a sudden decompression in the pilot's cabin.	

Assessment objective: 5 and 6

Item: 17

This question required students to engage with the provided context and then analyse two strengths and two limitations of HUD systems to evaluate their impact on aircraft safety.

Effective student responses:

- demonstrated an ability to evaluate based on aircraft performance system information that was synthesised to provide strengths and limitations of a head-up display (HUD) in an aerospace context with justified recommendations relating to aircraft safety
- provided HUD information that determined that safety was improved as it provided pilots with key flight information in the line of their external forward vision that limited distractions
- established that HUD has the potential to totally capture the pilot's attention and cause other important sources of flight information to be overlooked. They also established that HUD could partially obscure the pilot's view of the environment outside the aircraft
- provided a judgment concerning HUD strengths and limitations for aircraft safety, e.g. the growth in use of HUDs would indicate that their strengths as an aerospace technology outweigh any potential limitations, which results in improved aircraft safety.

Practices to strengthen

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

- further practise of acronym-based and initialism-based questions as it was evident that some students had a lack of understanding of the subject matter acronyms and initialisms that prevented students recognising and describing their aerospace technology knowledge
- more opportunities for students to engage with complex unfamiliar questions that required analysis of problems and information (Objective 3) and evaluation where students are required to refined ideas and solutions to make justified recommendations (Objective 7). It is recommended that teachers re-engage students with the process of evaluating and ensure that when students evaluate they make an appraisal by weighing up or assessing strengths, implications and limitations or make judgments about ideas, works, solutions or methods in relation to selected criteria to determine the value or significance of something, based on criteria
- further practise in the attributes of assessment literacy, as students at times overlooked key pieces of information in the questions. This led students to provide an incorrect solution to some questions, e.g. in Question 23, students overlooked the note 'Donald airfield is closed due to flooding'. If students overlooked this information, they may have specified a correct HDG and ETI to Donald airport, which was an incorrect response to the question

- greater emphasis on and development of knowledge and use of different aeronautical charts and information from Unit 4 Topic 2: Aircraft navigation such as World Aeronautical Chart (WAC), Visual Navigation Chart (VNC), Visual Terminal Chart (VTC); En Route Supplement Australia (ERSA) and CASA flight plan format (SP107).
- providing learning experiences that require students to use the aerospace systems formula sheet, including using and further understanding flight performance parameters to use take-off, landing and loading charts.