



Government of **Western Australia**  
School Curriculum and Standards Authority

# **AVIATION**

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ATAR course

**Year 12 syllabus**

## **Acknowledgement of Country**

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

## **Important information**

This syllabus is effective from 1 January 2024.

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## Rationale

Aviation involves flying by mechanical means, especially with heavier-than-air craft. The study of aviation, therefore, encompasses the application of skills and understandings about the nature of the atmosphere, aerodynamics, and the systems and structures designed to achieve safe and efficient flight.

Aviation has transformed the world in which we live. Efficient and reliable air transport has changed the way people travel, work, communicate and relate to each other. Simultaneously, developments in military aviation and aerospace technology have redefined approaches to national and international security. Aviation contributes significantly to the global economy and both directly and indirectly affects the lives of all the world's citizens. The nature and scope of aviation is constantly changing, driven by major developments in technology, science, education and economics. In Australia, aviation has been fundamental to overcoming problems associated with the country's physical size and population distribution.

The Aviation ATAR course draws from such diverse disciplines as science, engineering, environmental science, the social sciences, mathematics, English and information technology. It encompasses a range of mathematical, technological and humanities concepts and draws together a broad variety of skills, processes, understandings and strategies that promote the safe and effective operations of the aviation industry. The course provides students with the opportunity to investigate the importance of aviation to our society and learn the skills and knowledge required to make informed decisions on issues relating to aviation and associated industries.

## Course outcomes

The Aviation ATAR course is designed to facilitate achievement of the following outcomes.

### Outcome 1 – Aviation systems

Students understand components of, and interactions between, aviation systems.

In achieving this outcome, students:

- understand the components of aviation systems
- understand the interactions between aviation systems.

### Outcome 2 – Aviation operations

Students apply processes to plan aviation operations.

In achieving this outcome, students:

- collect, organise and interpret operational information
- plan aviation operations.

### Outcome 3 – Aviation applications

Students apply a range of skills and processes to perform specific aviation operations.

In achieving this outcome, students:

- apply operational, organisational,, and communication skills and processes appropriate to aviation operations
- monitor and evaluate variables in aviation systems
- implement a course of action and manage resources.

### Outcome 4 – Aviation development

Students understand the influences on aviation developments and their impact on society.

In achieving this outcome, students:

- understand significant aviation developments and their impact on society
- understand that significant aviation development is influenced by the needs of society.

## Organisation

This course is organised into a Year 11 syllabus and a Year 12 syllabus. The cognitive complexity of the syllabus content increases from Year 11 to Year 12.

### Structure of the syllabus

The Year 12 syllabus is divided into two units which are delivered as a pair. The notional time for the pair of units is 110 class contact hours.

#### Unit 3

Students develop their understanding of aerodynamics and examine rotary wing, and advanced aerodynamic features. They apply the terminology and principles of navigation to learn how to prepare aeronautical maps for visual navigation and learn to complete flight plans. Students explore the formation and interaction of weather on aviation operations and the rules for visual flight.

Students understand the principles, purpose and need for safety management in aviation, including communication, leadership, assertiveness, judgement and decision making. They understand issues associated with flight crew resource management and the development of threat and error management (TEM). In considering the development of aviation, students study a selection of current developments in aviation, looking at the factors driving the developments, and their likely impact.

#### Unit 4

The focus for this unit is aviation concepts related to flying operations and general aviation. In this unit, students further their understanding of aircraft engines, including the principles associated with turbine engines. They investigate different types of propeller design and their operation, and further develop their ability to interpret performance charts for light aircraft. Students are introduced to advanced cockpit displays, examine various aircraft navigation and electronic aids, and gain an understanding of how these are used in flight operations.

Students examine human physiology pertinent to flight, and the cause and effects of inappropriate consumption of drugs and alcohol. They consider the effects of toxic substances and acceleration forces on flight crew. Visual and physiological deficiencies and their implications for flight are also explored.

In considering the development of aviation, students study a selection of current issues facing the aviation industry and consider their likely impact on aviation and the community.

Each unit includes:

- a unit description – a short description of the focus of the unit
- unit content – the content to be taught and learned.

## Organisation of content

The course content is divided into five content areas:

- Aerodynamics
- Performance and operation
- Aviation skills
- Human factors
- Aviation development.

### Aerodynamics

#### Principles of flight

The nature of air as a fluid interacting with an aircraft underpins the understandings of aerodynamics (Bernoulli's Principle, Newton's Third Law of Motion). Various factors affect the capacity to generate and/or influence the aircraft's lifting and controlling forces (lift/drag formulae). The forces acting on an aircraft or helicopter in all phases of flight, including subsonic through to hypersonic flight, turning, climbing, descending, cruising and within space are explored, together with aircraft controls and their effects in the air, on the ground and in space, stability and instability of aircraft, and the ability of aircraft to manoeuvre.

### Performance and operation

#### Navigation, meteorology and radio communication

The fundamental function of aviation is to move aircraft through the sky from one point to another in a variety of meteorological conditions. Communication supports the safety of aircraft in the air and on the ground. Understanding of basic principles of navigation, propagation and communication, interpretation of aviation charts and forecasts, development of navigation processes and techniques and applying meteorological influences, and the development of correct use of radio communication and phraseology, ensures safer skies and airports.

#### Propulsion

Since the first official powered flight in 1903, aircraft have been powered by an array of different engines, ranging from the basic two-stroke reciprocating engine to the supersonic combustion ramjet engine (Scramjet). Knowledge of the basic structure, principles of operation and operating procedures are explored, leading to a comprehensive understanding of aircraft propulsion.

#### Aircraft performance

The limiting effects of environmental conditions and aircraft power factors are evaluated and applied to the operation of the aircraft during ground movement and throughout the flight. Aircraft limitations include weight and balance of the aircraft through loading, take-off and climb performance, altitude, endurance, range and speed, according to available engine power and atmospheric conditions. A number of processes are involved to select information accurately, calculate, interpret and apply performance and operational data.



## Aviation law

Aviation operations in Australia are governed by a legislative framework that stems from association with the International Civil Aviation Organisation (ICAO). Knowledge of the structure of legislation and other documents outlining aviation regulations and requirements in Australia is examined. Rules and regulations governing pilot operations are identified, and appropriate regulatory publications and documents used to extract this information.

## Aviation skills

The following skills are developed progressively across Year 11 and Year 12:

### Practical flight skills

- normal take-off and landing
- climb, descend, turns (Rate 1, 30, 45, 60 degrees)
- use of flaps
- entry and recovery from power off stall
- interpretation of the automatic direction finder (ADF), VHF omnidirectional radio beacons (VOR), instrument landing system (ILS), visual approach slope guidance system, including visual approach slope indicator system (VASIS), T-VASIS and precision approach path indicator (PAPI) and distance measuring equipment (DME)
- homing using an ADF and identification of station passage

### Process skills

- identify potential safety hazards
- communicate effectively with others in verbal or written forms
- record observations verbally and graphically
- research and extract relevant information
- make reliable measurements and record data accurately
- manipulate aviation navigation equipment to derive information necessary to complete flight plans

## Human factors

### Aviation safety

Aviation safety relates to the recognition of responsibilities in operating and working with aircraft and at airports. Knowing normal operational and emergency procedures and processes and safety management strategies protects lives in the aircraft and on the ground. The provision of a secure operational aviation environment, free from deliberate interference due to sabotage or terrorism, has become an area of increasing concern in both commercial and military aviation. Lessons of safety and security have been learnt from past incidents and accidents. Case studies are used to identify causal factors in aviation incidents and accidents, and to investigate aviation occupational safety and

health (OSH) issues. Australia's attitude towards safety has proved outstanding. However, some parts of the world have a less-stringent attitude toward safety, resulting in aircraft losses and fatalities.

### **Human performance and resource management**

The physical, psychological and emotional makeup of the human organism places limitations on safe human performance in aviation operations. This strongly influences resource management in aviation, including the effective use of human resources, physical resources and information. Resource management involves team strategies, problem-solving strategies, clearly-defined tasks, effective decision-making strategies, understanding of culture within decision-making processes, leadership and communication, workload management, situational awareness, and managing workplace relations. Tools, such as checklists, are utilised to self-assess an operation and one's ability to perform it.

### **Aviation development**

#### **Aviation history and developmental influences**

Many individual achievements and technological developments have resulted in the rapid expansion of the aviation industry. While early aviation was driven by the desire to fly, subsequent advances in technology have impacted significantly on aviation development and our society. The recognition of the achievements of pioneering individuals, and an understanding of the technological advancements in aviation, provide an insight into the future trends of air travel.

The development of the physical structure and design of aircraft must take account of the stresses acting on an aircraft during every flight. Knowledge of the evolution of aircraft systems and structures leads to a clearer understanding of present design, and appreciation of future innovations.

#### **Mathematical skills expected of students studying the Aviation ATAR course**

The Aviation ATAR course requires students to use the mathematical skills they have developed through the Year 7–10 Mathematics curriculum.

It is assumed that students will be able to:

- perform calculations involving addition, subtraction, multiplication and division of quantities
- perform approximate evaluations of numerical expressions
- express fractions as percentages, and percentages as fractions
- calculate percentages
- recognise and use ratios
- substitute physical quantities into an equation using consistent units so as to calculate one quantity and check the dimensional consistency of such calculations
- solve simple algebraic equations
- translate information between graphical, numerical and algebraic forms
- construct and interpret frequency tables and diagrams, pie charts and histograms.

## Representation of the general capabilities

The general capabilities encompass the knowledge, skills, behaviours and dispositions that will assist students to live and work successfully in the twenty-first century. Teachers may find opportunities to incorporate the capabilities into the teaching and learning program for the Aviation ATAR course. The general capabilities are not assessed unless they are identified within the specified unit content.

### Literacy

Literacy is important in students' development of inquiry skills and their understanding of content related to aviation as a human enterprise. Students gather, interpret, synthesise and critically analyse information presented in a wide range of formats and representations (including text, flow diagrams, symbols, graphs and tables). They evaluate information sources and compare and contrast ideas, information and opinions presented within and between texts. They communicate processes and ideas logically and fluently and structure evidence-based arguments, selecting genres and employing appropriate structures and features to communicate for specific purposes and audiences.

### Numeracy

Numeracy is key to students' ability to apply a wide range of inquiry skills, including making and recording observations; ordering, representing and analysing data; and interpreting trends and relationships. They employ numeracy skills to interpret complex spatial and graphic representations, and to appreciate the ways in which systems are structured, interact and change across spatial and temporal scales. They engage in analysis of data, including issues relating to reliability and probability, and they interpret and manipulate mathematical relationships to calculate and predict values.

### Information and communication technology capability

Information and communication technology (ICT) capability is a key part of aviation skills. Students use a range of strategies to locate, access and evaluate information from multiple digital sources; to collect, analyse and represent data; to model and interpret concepts and relationships; and to communicate and share science ideas, processes and information. Through exploration of aviation concepts, students assess the impact of ICT on the development of aviation, particularly with regard to collating, storing, managing and analysing large data sets.

### Critical and creative thinking

Critical and creative thinking is particularly important in the science inquiry process. Science inquiry, as it is applied in aviation, requires the ability to construct, review and revise questions and hypotheses about increasingly complex and abstract scenarios, and to design related investigation methods. Students interpret and evaluate data; interrogate, select and cross-reference evidence; and analyse processes, interpretations, conclusions and claims for validity and reliability, including reflecting on their own processes and conclusions. Science is a creative endeavour and students devise innovative solutions to problems, predict possibilities, envisage consequences and speculate on possible outcomes as they develop Science Understanding and Science Inquiry Skills. They also appreciate the role of critical and creative individuals and the central importance of critique and review in the development and innovative application of science.

## Personal and social capability

Personal and social capability is integral to a wide range of activities in the Aviation ATAR course. Students develop and practise skills of communication, teamwork, decision-making, initiative-taking and self-discipline with increasing confidence and sophistication. In particular, students develop skills in both independent and collaborative investigation; they employ self-management skills to plan effectively, follow procedures efficiently and work safely; and they use collaboration skills to conduct investigations, share research and discuss ideas. Students also recognise the role of their own beliefs and attitudes in their response to issues and applications pertaining to aviation, and consider the perspectives of others.

## Ethical understanding

Ethical understanding is a vital part of science inquiry. Students evaluate the ethics of codes of practice, and the use of information and its applications. They explore what integrity means in an industry like aviation, and they understand, critically analyse and apply ethical guidelines in their investigations. They consider the implications of their investigations on others and the environment. They use scientific information to evaluate the claims and actions of others and to inform ethical decisions about a range of social, environmental and personal issues and applications of science.

## Intercultural understanding

Students appreciate the contributions of diverse cultures to developing and applying understanding, and the challenges of working in culturally diverse collaborations. They develop awareness that raising some debates within culturally diverse groups requires cultural sensitivity, and they demonstrate open-mindedness to the positions of others. Students also develop an understanding that cultural factors affect the ways in which aviation influences and is influenced by society.

## Representation of the cross-curriculum priorities

The cross-curriculum priorities address contemporary issues which students face in a globalised world. Teachers may find opportunities to incorporate the priorities into the teaching and learning program for the Aviation ATAR course. The cross-curriculum priorities are not assessed unless they are identified within the specified unit content.

## Aboriginal and Torres Strait Islander histories and cultures

Students can appreciate the role of Aboriginal and Torres Strait Islander Peoples' knowledge in developing richer understandings of the nature of the Australian environment, for example, its physiography and its seasons.

## Asia and Australia's engagement with Asia

Contexts that draw on Asian scientific research and development, and collaborative endeavours in the Asia Pacific region, provide an opportunity for students to investigate Asia and Australia's engagement with Asia. Students examine the important role played by people of the Asia region in such areas as materials science, nanotechnology and energy security. They consider collaborative projects between Australian and Asian scientists and the contribution these make to scientific knowledge.

## Sustainability

In the Aviation ATAR course, the Sustainability cross-curriculum priority provides an authentic context for exploring, investigating and understanding the function and interactions of systems. The study of aviation invites the exploration of a wide range of biological, physical and chemical systems that operate at different time and spatial scales. By investigating the relationships between these systems and system components, and how systems respond to change, students develop an appreciation for the ways in which interactions between matter and energy connect human and machine function to change in the earth's hydrosphere and atmosphere. They understand the importance of using science to predict possible effects of human and other activity on such things as air quality, the use of fossil fuels, and to develop management plans, alternative technologies or approaches, such as green chemistry, that minimise these effects and provide for a more sustainable future.

## Unit 3

### Unit description

Students develop their understanding of aerodynamics and examine rotary wing and advanced aerodynamic features. They apply the terminology and principles of navigation to learn how to prepare aeronautical maps for visual navigation and learn to complete flight plans. Students explore the formation and interaction of weather on aviation operations and the rules for visual flight.

Students understand the principles, purpose and need for safety management in aviation, including communication, leadership, assertiveness, judgement and decision making. They understand issues associated with flight crew resource management and the development of threat and error management (TEM). In considering the development of aviation, students study a selection of current developments in aviation, looking at the factors driving the developments, and their likely impact.

### Unit content

An understanding of the Year 11 content is assumed knowledge for students in Year 12. It is recommended that students studying Unit 3 and Unit 4 have completed Unit 1 and Unit 2.

This unit includes the knowledge, understandings and skills described below. This is the examinable content.

### Aerodynamics

#### Principles of flight

- review disposition of forces of an aircraft in level flight, a climb with power, descent, glide and turn
- aerodynamic characteristics of stalling and spinning
- wing loading and load factor calculations and consequent increase in stall speed
- factors affecting directional stability: position of centre of gravity, size of the fin and rudder moment
- factors affecting lateral stability: high and low wing configurations, dihedral, sweepback
- factors affecting longitudinal stability: position of centre of gravity, movement of centre of pressure, changes in thrust, tailplane movement
- spiral instability, static and dynamic stability
- purpose and operation of trim tabs, stability
- controllability during ground operation
- purpose and function of aerodynamic design features: anhedral, spoilers, speed brakes
- purpose and function of unconventional controls: stabilators, ruddervators, elevons, flaperons, canards, and speed brakes
- vortex generators and boundary layer control, high lift devices

## Performance and operation

### Navigation, meteorology and radio communication

- air navigation terminology including: indicated air speed, calibrated air speed, drift, estimated time of departure, actual time of departure, estimated time of arrival, actual time of arrival, estimated time interval, actual time interval, air position, dead reckoning position, track required, track made good, cross wind component
- principles of air navigation including:
  - magnetic compasses – review limitations of use in an aviation environment
  - application of magnetic variation and deviation in the operation of the compass
  - understand the relationship between heading/true air speed (TAS), wind speed and direction, and track and ground speed (triangle of velocities). Compute, using a map or a flight computer, one of the velocities given the other two
  - determination of drift angle. Determination of track error and correction angle in order to return to the required track by a given point using the 1 in 60 rule
  - performing speed/time/distance/fuel flow and volume calculations mentally and using flight computer
  - determining head/tailwind and crosswind components, given a wind velocity and direction
  - use of flight computer to calculate triangles of velocities, track and ground speed, conversion of calibrated air speed (CAS) to TAS, fuel calculations, conversion of fuel volumes given specific gravity
  - use of radio navigation aids to obtain position lines and fixes
  - 10 minute markers
- time
  - effects of Earth's rotation and revolution around the Sun in relation to beginning and end of daylight and period of daylight
  - determination of local mean time from first light and last light tables
  - effect of changes of longitude on local mean time
  - calculation of Coordinated Universal Time (UTC) from local mean time
- flight planning
  - purpose and use of area QNH, local QNH, QFE, transition layer, transition level, flight level and altitude
  - pressure height and density height, and their calculation using a formula or flight computer
  - planning a visual flight rules (VFR) flight with consideration given to route selection, cruising altitudes, departure time, weather, terrain, aircraft performance, alternative aerodromes, beginning and end of daylight

- general concepts of meteorology
  - cloud formation processes, including calculation of cloud tops and bases and temperatures at various levels
  - atmospheric stability and instability, adiabatic process, environmental lapse rate
  - synoptic chart interpretation
  - seasonal weather conditions in different regions of Australia with respect to visibility, prevailing winds, typical cloud patterns and precipitation, seasonal pressures and frontal systems, and tropical cyclones
  - the purpose of the current weather forecasts and reports used by general aviation
  - current aviation terminology describing cloud cover and visibility
  - occurrence and formation of thunderstorms, low cloud, fog (advection and radiation), poor visibility, turbulence, thermals, dust devils, wind shear, microbursts, tropical cyclones; and the nature of the hazard which each poses to aircraft operations

## Aviation skills

### Practical flight skills

- use of Microsoft Flight Simulator – Cessna 172 to demonstrate general handling of aircraft including:
  - normal take-off and landing
  - straight and level flight
  - climbing, descending
  - medium turn, Rate 1 turn, steep turn
  - transition from climb to level flight
  - transition from level flight to climb
  - transition from level flight to cruise descent
  - entry and recovery from power off stall
- demonstrate homing to a station using an ADF, and demonstrating station passage

### Process skills

- identify potential safety hazards
- communicate effectively with others in verbal or written forms
- record observations verbally and graphically
- research and extract relevant information
- make reliable measurements and accurately record data
- operate and interpret indications on aviation navigation equipment
- devise accurate flight plans



## Human factors

### Aviation safety

- common causes of general aviation aircraft accidents
- effects on aviation safety of human factors, including stress, training, fatigue, communication skills, assertiveness and judgement, cockpit culture
- effects on aviation safety of aircraft design, ergonomics, maintenance, air traffic control and meteorological factors
- the importance of situational awareness on decision-making associated with safe flight
- the development of TEM today
- the integration of TEM into flight crew training
- reasons for incorporating threat and error management into aircraft operations

### Aviation development

- factors influencing the ongoing development and/or likely impact of:
  - unmanned aerial vehicle (UAV)
  - aircraft noise
  - composite materials
  - ageing general aviation (GA) aircraft fleet, metal fatigue and maintenance

## Unit 4

### Unit description

The focus for this unit is aviation concepts related to flying operations and general aviation. In this unit, students further their understanding of aircraft engines, including the principles associated with turbine engines. They investigate different types of propeller design and their operation, and further develop their ability to interpret performance charts for light aircraft. Students are introduced to advanced cockpit displays, examine various aircraft navigation and electronic aids, and gain an understanding of how these are used in flight operations.

Students examine human physiology pertinent to flight, and the cause and effects of inappropriate consumption of drugs and alcohol. They consider the effects of toxic substances and acceleration forces on flight crew. Visual and physiological deficiencies and their implications for flight are also explored.

In considering the development of aviation, students study a selection of current issues facing the aviation industry and consider their likely impact on aviation and the community.

### Unit content

This unit builds on the content covered in Unit 3. It is recommended that students studying Unit 3 and Unit 4 have completed Unit 1 and Unit 2.

This unit includes the knowledge, understandings and skills described below. This is the examinable content.

#### Aerodynamics

##### Principles of flight

- rotary wing
  - principles of lift and drag
  - flight manoeuvres – hovering, transition and translational lift, cruise, descent, vertical ascent and descent, autorotation
  - principles associated with helicopter operation, including gyroscopic precession, retreating blade stall, coning, Coriolis effect, tail rotor drift
  - forces acting on helicopters in flight
  - helicopter controls

#### Performance and operation

##### Navigation, meteorology and radio communication

- development of electronic flight information systems (EFIS)/head-up display (HUD) glass cockpit
- presentation of information on EFIS and HUD displays, advantages and disadvantages of each on aircraft operations

- principles of operation, purpose and limitations of the:
  - inertial navigation system (INS)
  - global navigation systems (GPS, Galileo, Glonass)
  - primary surveillance radar (PSR)
  - secondary surveillance radar (SSR)
  - instrument landing system (ILS)
  - automatic dependent surveillance broadcast (ADSB)
- visual approach slope guidance systems (T-VASIS, VASIS, PAPI)

### **Aircraft Performance**

- air speed limitations: normal operating speed ( $V_{no}$ ), never exceed speed ( $V_{ne}$ ), maximum manoeuvring speed ( $V_a$ ), turbulence penetration speed ( $V_b$ ), flap operating speed ( $V_{fo}$ ), flap extension speed ( $V_{fe}$ ), stall speed ( $V_s$ ) in clean and landing configuration
- configuring an aircraft for maximum range or maximum endurance
- the effect of altitude on engine performance
- design and operation of turbochargers and superchargers
- purpose, components and operation of basic aircraft electrical, hydraulic, pressurisation, and de-icing systems
- principles of operation of constant speed propeller engine
- coordinated use of throttle and propeller pitch to maintain a desired power setting
- variation of propeller design, including full feathering and reverse pitch
- correct use of mixture control, manifold air pressure, and engine RPM controls
- purpose of engine manifold air pressure gauge
- principles and operation of turbine engines; Newton's Third Law of Motion
- differences between turbofan, turbojet and turboprop engines, and their individual advantages and limitations
- thrust reversal systems
- issues associated with the operation of jet engines, including environmental issues
- using the Piper Turbo Lance aircraft determine, under a range of parameters:
  - fuel use, time and distance to climb and descend
  - TAS, cruise power settings and associated rates of climb
  - calculation and adjustment of position of centre of gravity
  - take-off and landing distances
  - weight and balance

## Aviation skills

- use of Microsoft Flight Simulator – Cessna 172 to demonstrate general handling of aircraft including:
  - normal take-off and landing
  - straight and level flight
  - climbing, descending
  - medium turn, Rate 1 turn, steep turn
  - transition from climb to level flight
  - transition from level flight to climb
  - transition from level flight to cruise descent
  - entry and recovery from power off stall
- demonstrate homing to a station using an ADF, and demonstrating station passage interpretation of the information displayed by the automatic direction finder (ADF), VHF omnidirectional radio beacons (VOR), instrument landing system (ILS), visual approach slope indicator system (T-VASIS, PAPI) and distance measuring equipment (DME)

## Human factors

- causes, symptoms and remedies of hypoxia and hyperventilation
- causes and effects of decompression sickness after scuba diving and its relation to flight
- role of the semi-circular canals in visual meteorological conditions (VMC) and instrument meteorological conditions (IMC)
- physiological effects of noise
- effects and dangers of spatial disorientation
- effect on visual acuity of acceleration forces, dietary deficiencies, hypoxia, and carbon monoxide poisoning
- problems in flight associated with colour blindness, smoking, drugs, flicker vertigo, night operations
- effects of colour vision defects in aviators
- effects of common eye deficiencies, including myopia, hypermetropia, astigmatism and presbyopia, on flight if uncorrected
- common visual illusions that affect aircrew
- sources, symptoms and effects of carbon monoxide poisoning, and the effect of breathing air contaminated by other noxious products, including fuel
- effects on pilot performance of smoking, alcohol and drugs, including both medical and illegal drugs

- regulations pertaining to drugs and alcohol in aviation
- causes, symptoms and treatment for motion sickness
- effects on the human body due to positive and negative accelerations (G-forces)
- gravity-induced loss of consciousness (G-LOC) and methods of reducing adverse effects of G-LOC, such as pressure suits
- stages leading to G-LOC

### Aviation development

- issues affecting aviation development and their likely impact on the aviation industry, the community and the environment, including:
  - air traffic growth in Asia
  - air traffic congestion in Europe and USA
  - low cost carriers

## School-based assessment

The *Western Australian Certificate of Education (WACE) Manual* contains essential information on principles, policies and procedures for school-based assessment that needs to be read in conjunction with this syllabus.

Teachers design school-based assessment tasks to meet the needs of students. The tables below provide details of the assessment types for the Aviation ATAR Year 12 syllabus and the weighting for each assessment type.

### Assessment table practical component – Year 12

Type of assessment	Weighting	To SCSA	Weighting for combined mark
<b>Practical examination</b> Typically conducted at the end of each semester and/or unit and reflecting the examination design brief and practical examination requirements document for this syllabus.	20%	100%	20%

### Assessment table written component – Year 12

Type of assessment	Weighting	To SCSA	Weighting for combined mark
<p><b>Investigation</b></p> <p>Students plan, conduct, process and interpret data; they evaluate their plan, procedures, data and findings; and communicate their conclusions.</p> <p>Types of evidence can include: validation exercises based on laboratory work, brief, formal investigation or laboratory report, report of literature search, exercises requiring qualitative and/or quantitative analysis of second-hand data, reports of simulated laboratory or flight activities, electronic, video or audio presentation of findings and recommendations, self or peer-evaluation tools and observation checklists.</p>	10%		80%
<p><b>Test</b></p> <p>Students apply knowledge and skills in aviation to analyse and interpret data, solve problems and answer questions in supervised classroom settings.</p> <p>These tasks require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills, and knowledge of factual information, including aviation law.</p> <p>Types of evidence can include written or oral responses to: summative tests, comprehension and interpretation exercises, and exercises requiring analysis and evaluation of both qualitative and quantitative physical information.</p>	20%	100%	
<p><b>Examination</b></p> <p>Typically conducted at the end of each semester and/or unit and reflecting the examination design brief for this syllabus.</p>	50%	100%	80%

Teachers are required to use the assessment table to develop an assessment outline for the pair of units.

The assessment outline must:

- include a set of assessment tasks
- include a general description of each task
- indicate the unit content to be assessed
- indicate a weighting for each task and each assessment type
- include the approximate timing of each task (for example, the week the task is conducted, or the issue and submission dates for an extended task).

In the assessment outline for the pair of units, each assessment type must be included at least once over the year/pair of units.

The set of assessment tasks must provide a representative sampling of the content for Unit 3 and Unit 4.

Assessment tasks not administered under test/controlled conditions require appropriate validation/authentication processes. For example, student performance for an investigation in Aviation could be validated by a task (such as a structured essay, extended answer or oral response) which is completed in class after the final presentation is submitted.

## Grading

Schools report student achievement in terms of the following grades:

Grade	Interpretation
A	Excellent achievement
B	High achievement
C	Satisfactory achievement
D	Limited achievement
E	Very low achievement

The teacher prepares a ranked list and assigns the student a grade for the pair of units. The grade is based on the student's overall performance as judged by reference to a set of pre-determined standards. These standards are defined by grade descriptions and annotated work samples. The grade descriptions for the Aviation ATAR Year 12 syllabus are provided in Appendix 1. They can also be accessed, together with annotated work samples, through the Guide to Grades link on the course page of the Authority website at [www.scsa.wa.edu.au](http://www.scsa.wa.edu.au).

To be assigned a grade, a student must have had the opportunity to complete the education program, including the assessment program (unless the school accepts that there are exceptional and justifiable circumstances).

Refer to the *WACE Manual* for further information about the use of a ranked list in the process of assigning grades.

## ATAR course examination

All students enrolled in the Aviation ATAR Year 12 course are required to sit the ATAR course examination. The examination is based on a representative sampling of the content for Unit 3 and Unit 4. Details of the written and practical ATAR course examinations are prescribed in the examination design briefs on the following pages.

Refer to the *WACE Manual* for further information.

### Practical performance examination design brief – Year 12

#### Time allocated

Examination: 20 minutes

#### Preparation time

The candidate will have 15 minutes to review the flight data before the examination.

#### Examination

A flight simulation of 20 minutes will follow the 15 minute preparation time.

#### Provided by the supervisor

Computer preloaded with Microsoft Flight Simulator X (FSX)

Logitech Extreme 3D Pro joystick

Flight data setting out the flying sequence to be completed

Section	Supporting information
100% of the practical examination Duration: 20 minutes	<p>The candidate is required to simulate a flying sequence in a Cessna 172 aircraft using Microsoft Flight Simulator X (FSX). The sequence comprises a series of non-aerobatic manoeuvres that can be legally accomplished in an actual Cessna 172 in the time allocated.</p> <p>The candidate is assessed on their ability to complete the manoeuvres by complying with the examiner's instructions. These are given in a manner similar to that expected from a flight instructor who is instructing in a real aircraft.</p> <p>If the candidate is unable to comply with any particular instruction, the marker will guide the candidate through the required action, but the candidate will not receive any marks for that part of the sequence.</p> <p>If, due to inaccurate manipulation, the candidate loses control of the aircraft, or the aircraft moves outside the limits of the 'exercise area', the marker will assume control and return the aircraft to its correct attitude within the intended pattern. The candidate will not receive any additional penalty specific to the marker's intervention.</p>



## Written examination design brief – Year 12

### Time allowed

Reading time before commencing work: ten minutes

Working time for paper: two and a half hours

### Permissible items

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course examination, navigation plotter (or ruler and protractor), flight computer

Section	Supporting information
<p><b>Section One</b>  <b>Multiple-choice</b>            20% of the written examination            20 questions            Suggested working time: 30 minutes</p>	<p>Nil</p>
<p><b>Section Two</b>  <b>Short answer</b>            80% of the written examination            20–30 questions            Suggested working time: 120 minutes</p>	<p>This section can include both open and closed questions. The questions can have sub-parts that increase in complexity.</p> <p>Questions can require answers comprising short paragraphs, dot points and diagrams. The candidate should use examples and fully labelled sketch maps and diagrams to illustrate and support their responses, wherever appropriate.</p> <p>Where stimulus or support material is provided, it can include: diagrams, short excerpts from journal articles, screen captures, photographs, maps and/or charts.</p>

## Appendix 1 – Grade descriptions Year 12

A	<p><b>Understanding and applying concepts</b></p> <p>Applies concepts and models to describe aircraft systems, performance and operation, offering detailed explanations.</p> <p>Applies principles to comprehensively explain and link complex systems and processes, with accurate application to familiar and unfamiliar contexts or examples.</p> <p>Supports responses with a range of appropriate examples and accurate, well-labelled diagrams.</p> <p>Selects and accurately evaluates information from a broad range of appropriate sources to present well-developed arguments which are supported by relevant, detailed evidence.</p> <p>Communicates detailed information and concepts logically and coherently, using correct terminology, and appropriate conventions.</p> <p>Accurately performs calculations related to navigation and flight planning using appropriate tools. Provides logically sequenced working and expresses answers using correct units.</p>
	<p><b>Investigation</b></p> <p>Designs investigations to identify and control appropriate variables.</p> <p>Describes the method in detail and accurately collects data.</p> <p>Presents data in a range of forms, including graphs, tables and charts to reveal patterns and relationships; organises data logically and accurately.</p> <p>Comprehensively explains trends using numerical data, where appropriate, and uses evidence to draw conclusions.</p> <p>Evaluates and makes specific relevant suggestions to improve the design of an investigation.</p>
	<p><b>Performance</b></p> <p>Consistently applies theoretical concepts and appropriate technology and aviation skills to complete aviation operations in a range of situations.</p> <p>Finds appropriate solutions for performance inaccuracies, and corrects them within set parameters.</p> <p>Demonstrates increasing independence when solving a range of unfamiliar problems.</p>
B	<p><b>Understanding and applying concepts</b></p> <p>Applies concepts and models to describe aircraft systems, performance and operation offering explanations, sometimes omitting detail.</p> <p>Applies principles to accurately explain and link simple, and some complex, systems and processes, with accurate application to familiar and unfamiliar contexts or examples.</p> <p>Supports responses with appropriate examples and accurate diagrams.</p> <p>Selects and evaluates information from a range of sources to present logical arguments which are supported by relevant evidence.</p> <p>Communicates information logically and coherently, using correct terminology, and appropriate conventions.</p> <p>Performs calculations related to navigation and flight planning with minor errors. Provides adequate working and generally expresses answers using correct units.</p>

**Investigation**

Designs investigations to identify and control appropriate variables.

Describes the method and accurately collects data.

Presents data in a range of forms, including graphs, tables and charts to reveal patterns and relationships; organises and processes data accurately.

Explains trends using numerical data, where appropriate, and uses evidence to draw conclusions.

Evaluates and makes relevant suggestions to improve the design of an investigation.

**Performance**

Applies a range of skills to perform aviation tasks effectively.

Recognises and acts appropriately to correct most performance inaccuracies within set parameters. Demonstrates increasing independence in most instances when solving a range of unfamiliar problems.

**Understanding and applying concepts**

Describes some aircraft systems, performance and operation, offering general explanations.

Describes some relationships within and between systems and processes.

Provides responses to unfamiliar contexts which are generic and lack specific application of knowledge.

Provides examples in some responses; draws diagrams that contain minor inaccuracies or omissions.

Selects information to provide generalised arguments which are supported by some evidence.

Communicates information and concepts, without detail, using some correct terminology and appropriate conventions.

Performs calculations related to navigation and flight planning.

Provides adequate working, that may contain errors, and expresses answers with some errors in units.

C

**Investigation**

Designs investigations to identify and control some variables.

Briefly outlines the method and collects data.

Presents data using basic tables and graphs; organises and processes data with some errors or omissions.

Describe trends in the data and draws simple conclusions.

Describes difficulties experienced in conducting an investigation and suggests general improvements.

**Performance**

Applies a range of skills to perform aviation tasks.

Demonstrates some emerging independence, and solves a range of familiar problems within broad parameters.

D	<p><b>Understanding and applying concepts</b></p> <p>Recalls aspects of aircraft systems, performance and operation with a few inaccuracies.</p> <p>Recalls some systems and processes; inconsistently applies principles to familiar and unfamiliar contexts or examples.</p> <p>Omits examples in responses and draws diagrams which include many errors.</p> <p>Presents statements of ideas with limited development of an argument.</p> <p>Provides limited supporting evidence.</p> <p>Communicates information using everyday language with some errors in the use of conventions.</p> <p>Performs calculations related to navigation and flight planning with errors and omissions.</p> <p>Provides working out that is confused and consistently expresses answers without appropriate units.</p>
	<p><b>Investigation</b></p> <p>Identifies a limited number of variables; describes a method that lacks detail.</p> <p>Presents data that is unclear, insufficient and lacks appropriate processing.</p> <p>Identifies some trends in the data correctly; offers simple conclusions that are not always supported by the data.</p> <p>Identifies difficulties experienced in conducting an investigation.</p>
	<p><b>Performance</b></p> <p>Performs aviation tasks relying on guidance and close supervision; applies a limited range of skills.</p> <p>Demonstrates limited independence when addressing a defined range of problems.</p>
E	<p>Does not meet the requirements of a D grade and/or has completed insufficient assessment tasks to be assigned a higher grade.</p>



