

Guidance to Instructors on Subject Delivery

AIR NAVIGATION

Programme of learning:

- This is a suggested programme for the delivery of this subject.
- The main headings are the Learning Outcomes (LO1, LO2, etc), with sub headings related to topics within those Learning Outcomes (see Glossary of Terms).

Activities:

- Some practical activities are suggested throughout the programme as a way of reinforcing the learning and adding interest.
- It may be not be practical to undertake all of these activities at the suggested part of the programme.
- Instructors may have to adapt this programme to prevailing circumstances.

Method of delivery:

- Learning resources can be found on Ultilearn and may be adapted by the instructor, if required.
- Lesson delivery should be as practical as possible and should contain the maximum amount of cadet participation and interaction.

Check of understanding:

- Each lesson should contain a check of understanding (see Glossary of Terms).
- At the start of each lesson, the previous check of understanding should be reviewed in order to consolidate previous learning before moving on to new learning.

Formative assessment:

- There should be a formative assessment at the conclusion of each Learning Outcome (see Glossary of Terms).

Summative assessment:

- This is the Online Assessment, through Ultilearn, of the Assessment Criteria for this subject (see Glossary of Terms).
- Assessment Criteria (see Glossary of Terms) are found on the final page of this document.

AIR NAVIGATION
Introduction: <ul style="list-style-type: none">• Introduction to the subject and assessment method
LO1: Be able to carry out calculations to determine aircraft distance, speed and time travelled
Introduction: <ul style="list-style-type: none">• Introduce to the calculations to determine aircraft distance, speed and time
Measurement of distance: <ul style="list-style-type: none">• Introduce the measurement of distance• Explain the use of distance on nautical maps and charts• Explain the principle of one minute of latitude and a nautical mile• Explain principle of nautical miles shown along each meridian• Explain why scale along the parallels is not used• Explain the distances between the places on the same meridian
Measurement of aircraft speed: <ul style="list-style-type: none">• Introduce the measurement of aircraft speed• Explain units of speed, for example; knots - nautical miles per hour• Explain the method of measurement, for including:<ul style="list-style-type: none">○ Air speed indicator○ Definition of dynamic pressure○ Use of the pitot tube
Corrections: <ul style="list-style-type: none">• Introduce corrections• Explain the definitions of pressure error and instrument pressure• Explain how calibrated air speed is calculated• Explain how true air speed is calculated
Measurement of time: <ul style="list-style-type: none">• Introduce the principles of the measurement of time• Explain the 24-hour clock• Explain Greenwich Mean Time or Coordinated Universal Time• Explain nautical miles per hour or knots in relation to time
Calculation of time of flight in still air: <ul style="list-style-type: none">• Introduce the calculation of time of flight in still air

- Explain the distance, speed and time formula
- Explain the manipulations of equations

Review:

- Review the calculations that determine aircraft distance, speed and time

Formative assessment:

- Formative assessment of the calculations that determine aircraft distance, speed and time

AIR NAVIGATION
LO2: Understand principles of vectors and triangle of velocities to establish aircraft's track and ground speed
Introduction: <ul style="list-style-type: none">• Introduce the principles of vectors and the triangle of velocities to establish an aircraft's track and ground speed
Vectors and velocity: <ul style="list-style-type: none">• Introduce vectors and velocity• Explain the definitions, for example; direction and speed is called velocity and velocity represented by a vector
Vector triangle: <ul style="list-style-type: none">• Introduce the vector triangle• Explain the air triangle and its components, including:<ul style="list-style-type: none">○ Heading○ True air speed○ Wind velocity○ Track○ Groundspeed○ Drift• Explain the associated computers, for example; Dalton computer• Explain the examples and application of magic numbers, for example; six-minute magic
Review: <ul style="list-style-type: none">• Review the principles of vectors and the triangle of velocities to establish an aircraft's track and ground speed
Formative assessment: <ul style="list-style-type: none">• Formative assessment of the principles of vectors and the triangle of velocities to establish an aircraft's track and ground speed

AIR NAVIGATION
LO3: Understand principles of the 1-in-60 rule relating to air navigation
Introduction: <ul style="list-style-type: none">• Introduce the principles of the 1-in-60 rule
Wind: <ul style="list-style-type: none">• Explain how wind affects aircraft flight
1-in-60 rule: <ul style="list-style-type: none">• Introduce the 1-in-60 rule• Explain the definitions, including:<ul style="list-style-type: none">○ Track required○ Track made good○ Revised track• Explain the rule, for example; TMG 1 degree error from track is one mile off track after 60 miles• Explain the applications, including:<ul style="list-style-type: none">○ Halfway along track pinpoint○ Track error○ Closing angle
Review: <ul style="list-style-type: none">• Review the principles of the 1-in-60 rule
Formative assessment: <ul style="list-style-type: none">• Formative assessment of the principles of the 1-in-60 rule

AIR NAVIGATION
LO4: Understand types and limitations of compass systems used for air navigation
Introduction: <ul style="list-style-type: none">• Introduce the types of compass systems used for air navigation, how they work and their limitations
Magnetism: <ul style="list-style-type: none">• Introduce magnetism• Explain magnetic principles• Explain the earth's magnetic field
Direct indication compass: <ul style="list-style-type: none">• Introduce the direct indication compass• Explain the types, for example; Silva• Explain the limitations and reasons, including uses in aircraft• Explain the advantages, including:<ul style="list-style-type: none">○ Simple○ Reliable○ Cheap○ Lightweight○ Does not require power
Gyro magnetic compass: <ul style="list-style-type: none">• Introduce the gyro magnetic compass• Explain the propose and basic principle, for example; long-term accuracy of detector combined with short-term accuracy of a gyro• Explain the components, including:<ul style="list-style-type: none">○ Magnetic detector unit○ Gyroscope○ Error detector○ Controller○ Display• Explain gyro errors
Other navigation systems: <ul style="list-style-type: none">• Introduce other navigation systems• Explain the inertial navigation system, including:

- Benefits, for example; aligns to true north without need for variation
- Disadvantages
- Explain others, including:
 - Inertial referencing systems
 - Ring laser gyros
 - Fibre optical gyros
 - Global positioning systems

Review:

- Review the types of compass systems used for air navigation, how they work and their limitations

Formative assessment:

- Formative assessment of the types of compass systems used for air navigation, how they work and their limitations

AIR NAVIGATION

LO5: Know the hazards that weather presents to aviation

Introduction:

- Introduce the hazards that weather presents to aviation

Meteorological conditions:

- Introduce meteorological conditions
- Explain the purpose and uses of visual meteorological conditions
- Explain the visual circuit
- Explain surface wind
- Explain the wind component, including:
 - Headwinds
 - Crosswinds
 - Use of table

Weather hazards:

- Introduce weather hazards
- Explain the definition of shallow fog and measurement, for example; runway visual range
- Explain precipitation, including:
 - Rain
 - Sleet
 - Snow
 - Hail
- Explain airborne hazards, including:
 - Thunderstorms
 - Icing

Review:

- Review the hazards that weather presents to aviation

Formative assessment:

- Formative assessment of the hazards that weather presents to aviation

AIR NAVIGATION
Activity 1: <ul style="list-style-type: none">• Cadets should undertake a range of table top navigation exercises
Activity 2: <ul style="list-style-type: none">• Cadets should practice navigation principles on a flight simulator

AIR NAVIGATION

Subject review:

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| <ul style="list-style-type: none">• Review of the subject and activities |
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Preparation for summative assessment:
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| <ul style="list-style-type: none">• Prepare for Online Assessment on Utlilearn |
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AIR NAVIGATION	
Assessment Criteria for Each Learning Outcome	
Subject	Air Navigation
Classification	Senior Cadet / Master Air Cadet
BTEC Aviation Studies	Unit 16: Air Navigation for Air Cadets
Learning Outcome	Assessment Criterion
The learner will:	The learner can:
LO1: Be able to carry out calculations to determine aircraft distance, speed and time travelled	P1: Identify units used to measure distance, speed and time
	P2: Describe how measurements are made to determine aircraft speed, distance and time travelled
LO2: Understand principles of vectors and triangle of velocities to establish aircraft's track and ground speed	P3: Explain what is meant by 'vectors' and 'velocity' in aircraft navigation
	P4: Explain the components of the vector triangle
	P5: Explain how to carry out calculations using a Dalton computer to establish aircraft's track and ground speed
LO3: Understand principles of the 1-in-60 rule relating to air navigation	P6: Explain uses of the 1 in 60 rule
	P7: Describe how wind affects aircraft flight
LO4: Understand types and limitations of compass systems used for air navigation	P8: Describe types of navigation systems used in aircraft
	P9: Explain the working principle of magnetic compasses
	P10: Describe the use and components of a gyro magnetic compass
	P11: Describe limitations of aircraft compass systems
LO5: Know the hazards that weather presents to aviation	P12: Identify weather hazards that affect navigation
	P13: Identify the meteorological conditions that affect aircraft operation

ACO Aviation Training Syllabus

Glossary of Terms

Term	Meaning
Learning outcomes	What a cadet is expected to know, understand or be able to do.
Assessment criteria	The standard a cadet is expected to meet to demonstrate that a learning outcome, or set of learning outcomes, has been achieved.
Guidance to instructors on subject delivery	A programme that gives the instructor guidance on the content and suggested order of delivery for a particular subject. It will include the learning outcomes, what should be covered to achieve those outcomes and any relevant practical activities.
Formative assessment	Regular and informal assessment that provides feedback throughout the learning process that supports the cadet's progress. This can take the form of checks of understanding through question and answer sessions or demonstration of an activity.
Summative assessment	Assessment of learning by an HQ Air Cadets paper-based examination or online assessment. A cadet will have to correctly answer a question that directly relates to an assessment criterion.
Examination	Paper-based exclusive choice question paper for the old syllabus subjects for Leading, Senior and Master Air Cadet.
Online assessment	Online assessment process, accessed through Utlilearn, for Leading Cadet from Sep 10 and Senior and Master Air Cadet from Sep 11.
Lesson check of understanding	Throughout and at the end of each lesson there should be a check of understanding. At the start of the next lesson, the previous check of understanding should be reviewed in order to consolidate previous learning before moving on to new learning.
Check of understanding for First Class Cadet	This is a competence-based assessment process for First Class Cadet which should test understanding through practical demonstration, activity observation, oral questioning and inspection.