

# Unit 19: Fundamentals of Nautical Studies

<b>Unit code:</b>	<b>F/600/5373</b>
<b>QCF Level 2:</b>	<b>BTEC National</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

The aim of this unit is to provide learners with some of the knowledge and practical skills necessary to undertake short passages in inshore waters. The unit supports the development of skills in navigation and practical seamanship, weather forecasting and an awareness of the maritime emergency services.

## ● Unit introduction

Within this unit, learners will begin to develop knowledge and skills needed to undertake short passages in inshore waters. The unit follows a logical progression split into distinct sections.

The navigational section introduces learners to various types of charts and their information which is of relevance for the practical work that follows at a later stage. Learners will learn how to use charts to plot positions and calculate bearings and distances between two points. The unit gives learners an understanding of the characteristics of weather fronts and the formation of sea and land breezes. They will learn the sources of weather information and, using an example of an inshore forecast, they will be able to interpret this information in the context of a vessel at sea. They will gain an understanding of the specific effects on boat handling of wind, fog and rainfall, which prepares them for water-borne practical activity. Their understanding is developed to a level where they can produce a viable plan for a short sea passage, which takes into account nautical hazards plotted on their route and possible alternative harbours which could be used should weather or sea conditions change.

The unit supports the development of practical skills in seamanship, rope work and boat handling under power or sail and it is expected that all learners will undertake at least 12 hours, practical boat handling to include manoeuvring under power or sail. This can be achieved either by short regular experience in boats or by a single practical session of two or three days aboard a large vessel, such as through a sail training trust for those establishments not close to a marine environment. This unit develops an understanding of the types of local public services operating in a marine context as well as specialised agencies such as the Maritime and Coastguard Agency and the Royal National Lifeboat Institute. Learners will cover a variety of methods for summoning assistance from these agencies and reach an understanding of the applicability and limitations of these methods.

This unit supports the development of self-confidence and teamwork and provides the framework for learners to gain a better understanding of incidents at sea and the prevention of such incidents. The unit covers some of the Royal Yachting Association (RYA) Day Skipper Shore-based course and Level 2 RYA Dinghy Sailing, Level 2 RYA Power Boating and Level 2 RYA Competent Crew.

## ● Learning outcomes

### On completion of this unit a learner should:

- 1 Understand the fundamental elements of navigation
- 2 Know how to receive and interpret weather information
- 3 Be able to demonstrate the ability to handle a boat under sail or power
- 4 Understand how to summon assistance from the emergency services when in distress.

# Unit content

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## 1 Understand the fundamental elements of navigation

*Navigational skills:* different types of nautical charts eg Admiralty, Imray, Stanfords; conventional symbols including finding a position using latitude and longitude; True North; Magnetic North; coastline; depth contours; yacht marina; visitors mooring; visitors berth; jetty; breakwater; harbour; slipway; anchorage; ferry; castle; church; spire; fort; lighthouse; leading lights; sector lights; rock which does not cover; rock which covers and uncovers; rock awash at the level of chart datum; wreck showing any portion of hull or superstructure at the level of chart datum; wreck over which the exact depth of water is unknown and which is considered dangerous to surface navigation; compass rose; variation and deviation; application of compass deviation to courses; International Association of Lighthouse Authorities (IALA); Region A buoyage system ie lateral marks; cardinal marks; isolated danger marks; safe water marks

*Chartwork:* meaning and use of common chart symbols; measuring distance between two points using minutes of latitude; plotting positions using latitude and longitude; dead reckoning (DR); passage planning; three point position fixing (given bearings)

*Seamanship:* rules of the road applicable to vessels under way and making way in sight

*Rope work:* reef knot; figure of eight; bowline; round turn and two half hitches; clove hitch; sheetbend; meaning of basic nautical terminology eg bow, stern, cockpit, pulpit, cleat, fairlead, port, starboard, windward, leeward, astern, ahead

## 2 Know how to receive and interpret weather information

*Meteorology:* sources of weather information eg inshore shipping forecast, local radio and television, coastguard VHF radio, newspapers; sea breezes; land breezes; weather fronts; extraction of basic information on the effect of weather on visibility; boat handling and sea state eg fog, rainfall, wind

## 3 Be able to demonstrate the ability to handle a boat under sail or power

*Under sail:* sailing a boat through a triangular course which includes a windward leg; taking in a reef; man overboard drill; use of warps in mooring; basic bends and hitches in preparation of running gear ready for sailing and coming alongside

*Under power:* stop and start engine with appropriate checks and precautions; getting under way; turning within a boat's length using forward and reverse gears; picking up a mooring; use of warps in mooring; basic bends and hitches in preparation of running gear ready for sailing and coming alongside

## 4 Understand how to summon assistance from the emergency services when in distress

*Types of emergency services available to assist personnel and vessels in distress at sea:* Royal National Lifeboat Institution (RNLI); Maritime and Coastguard Agency; Air Sea Rescue Services; Harbour Masters

*Methods of summoning assistance in times of distress:* Very High Frequency (VHF) radio; Immediate Assistance (MAY DAY) and Urgency (PAN PAN) calls; distress flares – red, orange smoke, parachute rocket, mini flares; sound signals, eg voice and fog horn

## Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<b>P1</b> use a range of types of charts identifying conventional symbols	<b>M1</b> plot dead reckoning (DR) using a named chart, explaining the difference between true and magnetic bearings	<b>D1</b> produce a simple passage plan including alternative harbours taking into account tidal and weather information.
<b>P2</b> plot position by latitude and longitude, measuring distance between two points on a named chart by minutes of latitude, showing the true bearing between two named points		
<b>P3</b> apply the main rules of the road applicable to vessels in sight under way and making way		
<b>P4</b> list the sources of weather information available for those undertaking a coastal cruise	<b>M2</b> analyse a given inshore weather forecast and predict its effect on a vessel undertaking a short passage	
<b>P5</b> prepare a powered or sailing vessel for sailing and coming alongside [SM4, EP3 ]		
<b>P6</b> use sailing skills in a vessel under power or sail whilst under close supervision with an instructor on board [SM5]	<b>M3</b> use sailing skills in a vessel under power or sail under the supervision of an instructor who may or may not be on board the vessel	
<b>P7</b> list the emergency services available to assist vessels in distress at sea.	<b>M4</b> explain the methods which could be used to summon assistance in the event of an emergency at sea and explain their use.	

**PLTS:** This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

<b>Key</b>	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

# Essential guidance for tutors

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## Delivery

This unit should be delivered as a close balance of practical and theory to encourage learners to appreciate how an understanding of the more theoretical aspect is essential to the success of the water-borne activities. While selecting a suitable location for the practical components of the unit, centres should ensure that reasonable and appropriate steps are taken to create a secure and safe environment for learners. Instructors might consider the use of a RYA recognised training centre for the practical components of the unit. Learners should wear personal safety equipment at all times when afloat and when on jetties. The time of year and weather conditions may have an effect on the timing of outdoor activity with regard to safety.

The use of visual aids such as sailing videos and display of items of boating equipment will enhance learners' interest and learning progress. They should be provided with opportunities to view a variety of types of charts and vessels to widen their understanding and experience. Visits to or talks by members of the maritime emergency services will enhance understanding of how these services are able to assist vessels in distress and how they could be summoned.

Tutors should plan the teaching and learning programme to allow the introduction of a more learner-centred approach to take into account the differences in learner ability and progress. Within the unit tutors, should combine and highlight the linked subject areas. Initially, an understanding of charts and their symbols can be achieved through simple exercises in identification and interpretation. This theoretical side can be developed by moving on to the measurement of distance and direction on a chart and the plotting of dead reckoning positions. Tutors can introduce the practical side with explanations of parts of a vessel and their purpose. The use of flipcharts or cards would make this a more informal and effective activity. This area of study can be further extended to cover zones around a vessel so that learners become familiar with, and are able to make effective use of, nautical terminology.

The use of a boat requires an understanding of rope work so knowledge and ability to tie specific knots is essential at this stage. This skill can be conveniently taught in the classroom using short lengths of rope or cord, with learners arranged in pairs. The importance and application of these specific knots in a sailing context should be fully explained by the tutor.

For the achievement of the necessary level of competence in boat handling, learners would be expected to have had at least 12 hours' practical experience in a sail or powered vessel. Initially, learners would be guided through the use of boat controls on the water with close support from a tutor. Over a period of time learners would gain confidence and ability so that they could become more independent of the tutor in their handling of the vessel. They would, at this stage, be ready to take into account other factors such as rules of the road and buoyage systems, which could be introduced in the theory sessions.

At a more advanced stage, learners could progress to passage planning, which would necessarily include a consideration of sources of weather information and its interpretation. In this context a local inshore forecast or weather announcement would provide sufficient material for discussion and interpretation. The relevance of the emergency services and a consideration of the means by which they might be summoned needs to be covered as a penultimate section. Once this has been accomplished and learners have shown the necessary ability, they would be able to move on to show their sailing skills in an appropriate vessel while under more limited supervision by the tutor.

## Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Unit introduction and assessment methodology.
Health and safety briefing to ensure that all learners are aware and acknowledge the health and safety requirements of the unit.
Teaching activity – learning outcome 1 introduction to charts and their symbols.
Learner-led activity – examination of various charts, measuring distances using minutes of longitude and latitude.
Teaching activity – seamanship and rules of the road applicable to vessels.
Learner activity – case study analysis to apply knowledge of seamanship.
Teaching activity – demonstration of various knots and techniques involved in rope work.
Learner activity – practical rope work.
<b>Assignment 1: Charts and Chart Use (P1, P2, P3, M1)</b>
Practical assessment exercise involving tutor observation and questioning in a simulated scenario.
Assessor feedback and learner reworking.
Introduction of learning outcome 2.
Teaching activity – sources of weather information.
Learner research – investigation of a variety of weather information sources.
Preparation for assessment of learning outcome 2.
<b>Assignment 2: The Weather and its Effects (P4, M2, D1)</b>
Learner presentation and passage plan.
Assessor feedback and learner reworking.
Introduction of learning outcome 3.
Teaching activity – demonstration of practical skills required to handle a boat under sail <b>or</b> power.
Learner activity – practical skills development of handling a boat under sail <b>or</b> power.
<b>Assignment 3: Practical Boat Handling Skills (P5, P6, M3)</b>
Observation of learner skills.
Assessor feedback and learner reworking.
Introduction of learning outcome 4.
Teaching activity – emergency services available to assist in a distress situation and ways to summon assistance.
Learner case study analysis, using videos or journals as appropriate looking at distress situations and the assistance that was given.
<b>Assignment 4: Assistance Available</b>
Formal report linked to a case study analysis (P7, M4).
Assessor feedback and learner reworking.
Unit evaluation and review.

## Assessment

The unit is practically assessed but supported by theoretical input in the classroom and applied while afloat.

Assessments can be both written and practical. A number of assessment activities can be used to measure the achievement of learning outcomes. Assessment evidence for theoretical sections can be in the form of assignments, navigation exercises/tests, notes, or written interpretations such as of the influence of forecasted weather on a sailing trip. Assignments and tests constructed by centres should be valid, reliable and centred on the assessment criteria. Personal chartwork exercises will extend understanding and the written evidence can be used to authenticate outcome achievement. The production of diagrams, illustrations or models by learners can also be used, both as assessment and self-teaching material.

For P1, the assessor could construct a number of stations for learners to move around. On each of the stations there could be a chart and learners could be asked what the symbols on these charts mean. Other stations could have exercises requiring learners to plot positions for P2 and M1.

For P3, learners must apply the main rules of the road applicable to vessels in sight, under way and making way.

For P4, learners could be asked to list the variety of sources of weather information, taking one such source and analysing a forecast to meet the M2.

They could then apply the knowledge gained to meet D1 through the production of the passage plan.

Assessment of P5 and P6 would be best achieved through tutor or appropriate witness observation of the learner's practical skills on the water. The level of support provided to the learner will distinguish between the pass and M3 here. If the learner has required considerable support, and at times needed assistance with the practical skills, but has demonstrated competency, then it would be fair to award P6. If the tutor has been onboard, but not provided assistance or support, or if the tutor has observed from another vessel or the shore, then the learner may be deemed to have achieved M3.

Evidence for P7 can be a written or verbal where the learner utilises case studies to demonstrate their knowledge of the services that are available to assist in distress situations on water. A basic list will be sufficient to achieve the pass criterion, but explanation of methods of summoning assistance will be required to for M4.

Practical boat-handling skills should be assessed while afloat in a suitable vessel. It is a requirement of health and safety that an instructor is on board a vessel at all times. The level of competence and ability of the learner will determine the level of supervision appropriate for the assessor or tutor. Practical boat-handling sessions can also be occasions for assessing the learner's ability to apply theoretical aspects covered in the classroom. Evidence for practical activity can be produced through a logbook of activities supported with a witness statement by a suitably qualified RYA instructor for the type of vessel used.

Achievement of RYA Level 2 qualifications in sail or power, eg RYA Day Skipper Shore-based, RYA Level 2 Power or Sail, or RYA Day Skipper Practical could provide evidence for Recognition of Prior Learning.

## Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, M1	Charts and Chart Use	Skills-based scenario assessment involving part of a selection process for a nautical team in the public service.	Observed demonstration
P4, M2, D1	The Weather and its Effects	As part of the induction to the nautical team you have been charged with investigating weather information sources and then developing a passage plan utilising the skills gained so far.	Presentation with accompanying passage plan
P5, P6, M3	Practical Boat Handling Skills	To continue working in the nautical team, you must demonstrate competent skills when handling a boat.	Learner skill demonstration
P7, M4	Assistance Available	As part of your induction to the nautical team you have been asked to prepare a report on the assistance available and how to access it.	Report

## Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Public Services sector suite. This unit has particular links with the following unit titles in the Public Services suite:

Level 1	Level 2	Level 3
Practical Teamwork in the Public Services	Sport and Recreation in the Public Services	Leadership and Teamwork in the Public Services
Developing Personal Skills for Leadership	Adventurous Activities and Teamwork for the Public Services	

## Essential resources

This unit has the following requirements:

- the learner must have demonstrated before commencing the unit that they can swim a minimum of 200 yards and can tread water for three minutes
- the centre must guarantee that the following health and safety controls are in place:
  - radio control will be maintained from the sailing vessel to the shore
  - clearance for the activity to take place will be given only if the conditions are suitable
  - each leg is checked by a qualified instructor prior to the activity taking place
  - one qualified adult assessor (minimum coastal instructor qualified) to five learners
  - either RYA Rules and Regulations or Royal Navy Regulations will be followed at all times.

Learners who have achieved their RYA qualifications in sailing and/or power boating could use accreditation of prior learning (APL) for this unit using an appropriate mapping to the competencies within it. This will identify the level of exemption. The RYA qualification must have been certificated within three years before the APL being carried out.

Links with marine units of the public services, coastguard and voluntary services such as the RNLI need to be made so that information on marine incidents can be obtained. The following publications are essential for the completion of this unit and are available from the United Kingdom Hydrographic Office, Taunton, Devon, Somerset, TAI 2DN ([www.ukho.gov.uk](http://www.ukho.gov.uk)):

- *Admiralty Chart 5011*
- *Admiralty Nautical Charts*
- *Imray Nautical Charts*
- *Stanfords' Nautical Charts*

(Chart scales: 1:20,000, 1:50,000, 1:75,000).

## Employer engagement and vocational contexts

Tutors will benefit from an understanding of the requirements of the maritime emergency services and the Royal National Lifeboat Institute and those involved in teaching outdoor and adventurous activities to the public. The skills and knowledge required by instructors and coaches should be aspirations for learners. Links via work experience or visits can be helpful in demonstrating what is required of an employee.

## Indicative reading for learners

### Textbooks

Dedekam I – *Illustrated Navigation* (Fernhurst Books, 2004) ISBN 9781904475132

Judkins S and Davison T – *Knot Know-How* (Fernhurst Books, 2003) ISBN 9781898660989

### Journals

*Motor Boats and Yachting*

*Yachting Monthly*

## Websites

Maritime and Coastguard Agency	<a href="http://www.mcga.gov.uk">www.mcga.gov.uk</a>
Royal National Lifeboat Institution	<a href="http://www.RNLI.org.uk">www.RNLI.org.uk</a>
Royal Yachting Association	<a href="http://www.rya.org.uk">www.rya.org.uk</a>
Weather information site	<a href="http://www.worldmarineguide.com/website-content/weather.htm">www.worldmarineguide.com/website-content/weather.htm</a>
<i>Yachting Life</i>	<a href="http://www.yachting-life.net">www.yachting-life.net</a>

## Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
<b>Self-managers</b>	when preparing the sailing vessel for sailing and coming alongside, ensuring that due care and attention are taken and that sufficient awareness is paid to health and safety considerations when using the sailing skills in the practical scenario
<b>Effective participators</b>	when considering the steps that need to be taken when preparing the vessel for sailing, ensuring all steps are carried out.

## ● Functional Skills – Level 2

Skill	When learners are ...
<b>ICT – Find and select information</b>	
Select and use a variety of sources of information independently for a complex task	searching for accurate and reliable weather information for those taking a coastal cruise
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	analysing a given weather forecast
<b>Mathematics</b>	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	plotting positions using longitude and latitude and measuring distance
Select and apply a range of skills to find solutions	plotting positions using longitude and latitude and measuring distance
<b>English</b>	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	listing the emergency services that are available to assist vessels in distress at sea.