Digital First: embracing electronic navigation together

Our goal

Our goal is to ensure the modern navigator recognises the importance of using digital tools and sources of information in a fully informed manner. By adopting a Digital First approach, supported by robust independent verification of position and progress, navigators should be able to recognise when the information provided is insufficient and know where and how to bridge the gap.

What do we mean by "Digital First"?

'Digital First' is the tagline we are using to describe our new approach to teaching navigation.

When planning a voyage, this means utilising digital sources to find crucial information such as tidal gates during a passage, expected weather, or sunset/sunrise times, before considering other methods. This approach allows us to allocate more time to understanding and interpreting the significance of the information we gather.

Key points of a Digital First approach:

- **Efficiency**: Using digital sources is typically faster, offering time efficient access to crucial information.
- **Teaching philosophy**: Our philosophy is to use digital sources and presentation of information as a starting point of our teaching to help students understand the bigger picture, or principles, of planning and executing a passage from the beginning. De-coupling the overarching principles from the long-winded calculations required to apply the principles will aid the students' understanding. The back-up system of calculating or estimating the answers manually can be introduced later; when the students understand the bigger picture and have some indication of what it should look like. It is a variation of the Whole Part Whole teaching model.
- **Balanced approach**: Digital First is not synonymous with 'digital only,' 'digital always,' or 'digital never.' It signifies a preference for starting with digital resources and techniques while recognising the importance of non-digital alternatives as an independent verification during a voyage and as back-up when digital sources or techniques are inadequate or unavailable.
- **Realistic expectations and understanding**: Whilst digital sources provide rapid information, it's essential that students develop their ability to question the reliability and tolerance of the information presented. To quote Andrew Moll, the Chief Inspector of Marine Accidents at the UK's Marine Accident and Investigation Branch, "There is a seductive side to technology". Unjustifiable confidence in the precision of data presented digitally is a real risk.

By adopting a Digital First strategy, we aim to make the planning process more efficient while ensuring the accuracy and reliability of the information we use.

Why change?

One argument supporting the phase out of paper charts is that paper-based navigation techniques provide historical information; a fix becomes instantly out of date, as does an EP. Additionally, due to the weekly Notices to Mariners updates, paper charts often reflect a world as it once was.

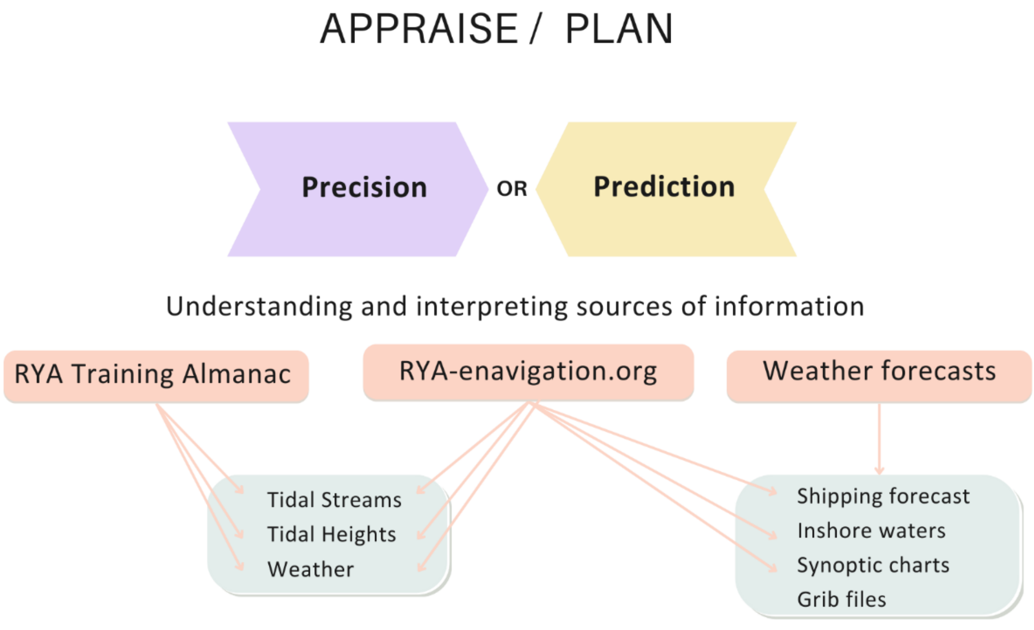
In contrast, digital navigation, when executed correctly, provides real-time information and projections of future positions. Regularly updated electronic charts reflect the present situation more accurately, and with modern developments in data transfer, e.g. VDES www.iala-aism.org/technical/connectivity/vdes-vhf-data-exchange-system/, we are approaching near real-time updates.

There is some truth in the above statements, but the true drive for our desire to begin the change is to ensure students are prepared for the reality of electronic navigation in an informed way. In a survey of over 4,000 boaters the response to the question, "Do you trust digital only navigation?" 74% responded with "yes, but I still use traditional methods as a back-up". 15% said they only used digital methods and 11% relied on non-digital methods only.

It is clear that we need to imitate the real-world experience in the classroom as best we can, and in doing so develop future skippers who can navigate our waters safely and confidently.

Therefore, in this initial phase, the RYA Day Skipper shorebased and later the RYA Yachtmaster shorebased course, are being updated to encourage the use of digital sources of information. The aim is to equip students with the skills to assess the accuracy and significance of the data presented.

Our core principles remain unchanged



Despite the move to prioritise digital tools, the fundamental principles of navigation remain the same: Appraise, Plan, Execute, and Monitor (APEM). Our objective is to integrate these principles with digital advancements to enhance effectiveness and decision-making.

Shorebased courses are focussed on the skills to appraise and plan, taking into account the future execute and monitor phases, for example, choosing waypoints that can be verified independently. Practical courses and exams put the whole process together, focussing on the seamanship elements of monitoring in the real world.

The overall process of voyage planning and execution still requires for following phases:

- **Appraise:**
  To aid digital gathering of information required for a comprehensive situational overview, the new RYA-enavigation.org website gives access to tidal height and stream data, together with some sample weather forecasts. By utilising digital sources in lieu of tidal curves or secondary ports calculations we can put more emphasis on understanding the principles at play and significance of the answers we gather rather than working through a calculation. Students must be able to develop an understanding of what information is precise and what is predicted. The time and VHF channel of a Maritime Safety Information broadcast is precise, the forecast you receive is a forecast/prediction. They should also be able to apply a tolerance value to predicted or forecast data, for example, a tidal height prediction can easily vary by 0.3m from changes in barometric pressure alone. and with more extreme weather conditions can vary by up to 1m, i.e. storm surges. That's without considering swell, silting etc.

  The importance of our students developing an understanding of the factors that may affect any predicted event in terms of the numerical values and timing is essential regardless of whether the detail came from a publication or a digital source.

  The need to use references such as almanacs remains relevant for specific pilotage details, optimal times and approaches for dealing with tidal races, locking in/out times, port facilities etc. While an electronic chart system (ECS) could have this level of detail it is not commonplace.

- **Plan:**
  Synthesising the information gathered into a coherent and efficient plan requires very similar skills regardless of whether the sources were digital or not. The exception is how to present the plan.

  Pilotage Waters: As it stands at present, most ECSs have limited ability to utilise pilotage techniques such as identifying sector lights or transits at a distance, or marking up clearing lines etc. Using GNSS does give us positions to within two metres most of the time, but not always and the RYA's stance is that pilotage techniques should be used whilst in pilotage waters, i.e. when we are closest to dangers we need robust monitoring. The course notes include all the techniques previously taught, but we also encourage the use of radar overlay features as a robust pilotage technique; when charted objects and land areas marry up with the radar returns, the position from a GNSS receiver should be both correct and in sync with the datum of the electronic chart. If not, then there may be GNSS errors, datum/survey errors, alignment errors for the radar, no heading input to give accurate north up, buoys have moved and many other reasons. Either way, at the point where things don't look right, we need to have a pilotage plan ready to use until such a time as we can identify the problem. For this reason, we expect most users to still create pilotage plans and not rely solely upon the GNSS position and route, unless the ECS enables the full use of pilotage techniques. APEM requires a plan to cover from berth to berth and we would suggest the route entered in the ECS matches that, even when we have a pilotage plan prepared separately.

  Open water: Techniques such as rubber banding, or auto-routing features can aid planning and the creation of routes on an ECS. A significant limiting factor is the size of screen to truly be able to manage a passage in full or to plan a route. It is only in recent years where some

ECS are produced with sufficient screen size and detail to enable a useful look ahead capability. Team Vistas grounding is an example where the filtering of detail when zoomed out contributed to a serious grounding, and there are other examples. A video of the grounding is available but be warned it includes strong language at the time of the grounding: https://youtu.be/lmw7_DzM2JI?si=UgJb4NwVoY6Wm_3y.

Incorrect use of scale was a factor in this incident and whether using rubber banding or autoroute you will start with the departure point and then add the end point. When rubber banding you work forward from the start to add suitable waypoints. The route from the new waypoint will always be taking you to the end waypoint. By introducing waypoints whilst looking at a detailed scale, you can ensure suitable depths and distances are checked, you should also ensure you identify any hazards or significant situations found in the appraisal format. Autoroute will give a suggested route, which you can modify to achieve the same aim as rubber banding. Whilst creating your route it is worth identifying the zoom level required to see the right information, and also identify whether you will be using split screen, radar, and any other setting changes such as alarm trigger distances. Where no scale is shown on an ECS use vector lengths to drive the zoom level. This typically means shorter lengths in pilotage areas, and larger lengths in open water. Good practice suggests you should typically be able to see the end of a COG vector within the appropriate zoom level as it indicates the timeframe before you enter an area of the chart you cannot yet see.

Waypoints: We should be considering a waypoint as a significant action or decision within a passage and ensure that it is clear why the waypoint exists. With a cursor or touch screen controlled ECS it is easy to dab many waypoints to create a nice-looking route. However, we would discourage this and ensure that each waypoint has a specific purpose beyond just joining the dots to make a nice-looking route on our screen. Examples for using waypoints include:

- Alteration of course or speed
- A suitable point to verify our position, e.g. a bay opens up at this position
- Helping to identify the next pilotage aid to navigation, e.g. as we pass the preferred channel mark, the rear transit for the marina entrance bears 140°M
- Call VTS or Harbour Office on VHF channel to advise you are 30 minutes from the entrance
- A cut-off point, e.g. if we arrive here after 1500, we will not get though the race, anchor in Waiting Bay until 2100.

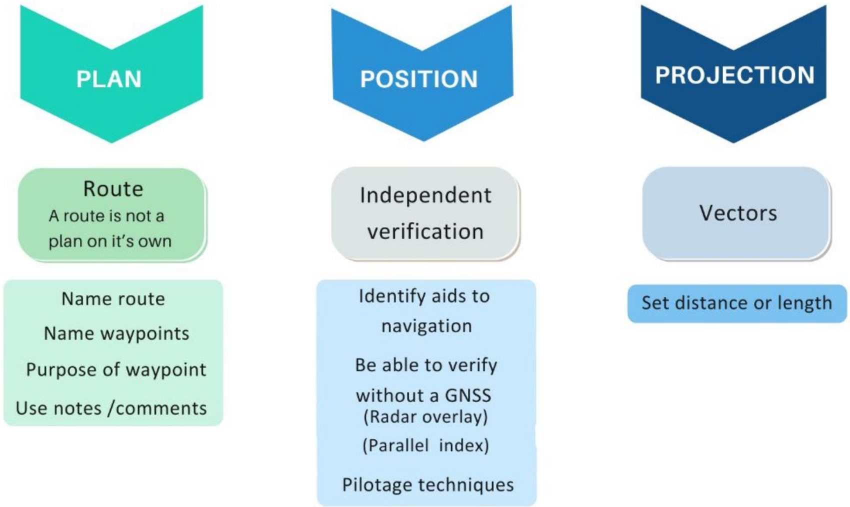
Regardless of using paper or digital charts, waypoints and routes should have meaningful names, not a randomised number. Names that relate to a geographical location, or an action to take, help to engage in the plan and aid situational awareness. We need to ensure students do not confuse a route with the full plan. There are many details outside of a route that are captured during the appraisal. These may be annotated on a paper chart or added as a waypoint comment or description if using an electronic chart.

Execute:

When implementing the plan, the navigator verifies any discrepancies between the planning information and real-time data, such as changes in the weather forecast. Incorrect usage of web or app-based weather information has contributed to numerous incidents. For instance, interpreting a graphical weather app that suggested gale force winds would not arrive until 1300 to mean that a fleet could wait until 1230 to end their dinghy sailing event. Or, failing to identify the difference between an analysis synoptic chart and a forecast chart, resulting in the use of three-day old data in the belief it was current.

- **Monitor:**
  Continuous monitoring of progress against the plan and of any variances in predicted data such as weather, speed, or vessel operational status is the fourth stage. Any deliberate or unforeseen deviation from the plan should be re-appraised from a safety, efficiency and resource availability perspective. Adjustments may range from a consideration to shorten the voyage to a near-by port as the crew are seasick, through to a safety-critical change that requires immediate action.

  To be able to effectively monitor progress you need three pieces of information: Where you planned to be at this point in the voyage, your current position, and are you actually travelling effectively to the next waypoint. The below diagram simplifies this to Plan, Position, and Project.



On an ECS the route is your benchmark of where you are expected to be, your position is your vessel position on screen, and your direction of travel is your COG vector. At a glance you can see if it is wildly incorrect. Independent verification and a knowledge of what will change in the near future will help you make the next decision. As mentioned earlier, radar overlay confirms whether your position is sufficiently accurate, or using traditional pilotage techniques.

Imagine you are crossing a tidal stream, in a wide waterway, on a course of 005°T. About halfway through the passage you look at the ECS and see you are one mile west of the route, the COG vector is also showing 005°T. If planned correctly you will have the additional tidal information available and will have a cross track distance (XTD) to indicate the expected maximum western drift due to stream and/or leeway. You had planned your departure so that the tide will turn halfway across the waterway, and the matching heading and COG has just confirmed the tide is slack and will start pushing you back to the track. It is similar to the paper technique of calculating the net set and drift over a voyage, but also the maximum XTD in either direction to set an alarm for XTD when we begin straying over the max.

If there is a significant net set and drift, then offsetting for this will be necessary. If you wish to shape a course and your ECS does not support this (and most don't), it can be carried out on separate paper using the information gained in the appraisal – net stream, desired COG, distance and time taken.

This framework fits the structure of all RYA Schemes.

Embracing a Digital First mindset

As we transition to a Digital First approach in our RYA navigation training programmes, we would like to address the mindset change that accompanies this shift. As a dedicated instructor, your role in this evolution is crucial, and we are committed to supporting you through this process.

Embracing this change in mindset requires a willingness to challenge the way you have always done things and being open to new and possibly unfamiliar perspectives. It involves accepting the discomfort that comes with growth and seeking new ways to deliver our navigation courses. The Digital First approach emphasises understanding and applying navigation principles through digital means first, rather than starting with manual calculations.

For example, when learning about tidal heights, the key principles involve understanding the relationship between tidal height, charted depths, and the tolerances applied for a safe passage. Such as, planning a boat trip into or out of a harbour, passing under a bridge with clearance limitations, or avoiding running aground in shallow waters.

As we embed the key principles and concepts underpinning the safe use of electronic navigation systems and digital sources of information, we can teach students how to interpret and synthesise the data effectively into a sound navigation plan or decision. The focus in the shorebased setting is to understand the principles and to understand the way information is presented in the digital world rather than learning menu structures. RYA practical courses will provide the real-world application of this knowledge as students plan and execute passages.

It is still worth noting that until an approved small craft chart system is in place, we can only really say paper is the back-up. This does not mean that an unapproved electronic chart system (ECS) cannot carry out a role in navigation; we currently have trusted (unofficial) sources of information such as Reeds almanac, Shell Channel Pilot, Cruising Association Guides etc.

As you can see, the shift to a Digital First approach in our RYA navigation training programmes is an essential evolution requiring a change in mindset. By embracing this new approach, and providing feedback, we can better prepare our students for the future of navigation and help inform the development of an approved system in the future.

Resources and support

To aid this transition, we are providing you with this instructor support document: Digital First: embracing electronic navigation together. This document outlines the areas that need to be integrated into both the RYA Day Skipper and RYA Coast Skipper theory courses, and to what level they need to be taught.

Please take time to read this document in its entirety and review all resources available on our [Digital First: embracing electronic navigation together] webpage:

Which includes:

- Digital First sample Exercise Questions and Answers
- How I prepared for Digital First by Joe Wallington-Lardi
- RYA Day Skipper Syllabus

Contents

To be integrated within the RYA Day Skipper course:

APPROVALS/STANDARDS

ECDIS/ENC

Clarify the relationship and differences between the SOLAS world and the non-SOLAS world. The latest information from the UKHO is that the route being explored is an ECS solution, not a mini-ECDIS solution.

RNC

Light touch with a caveat that these will go at the time paper goes.

EC – Vector or Raster

Vector is the smart format and the international standard for navigation. It requires more training to convert from paper to vector chart usage than converting to Raster chart. Vector is a continuous chart structure, contained as a database, which can be interrogated to gain further information. Caution is needed to avoid viewing an under or over zoomed display as this can either hide information or give the impression of unrealistic accuracy. Layers of data may be turned on and off to customise the display, therefore these intelligent charts require intelligent use by the navigator.

Sub-ECDIS standard?

A UKSON working group, chaired by the Royal Institute of Navigation, explored an approval for electronic navigational systems for non-SOLAS vessels, in response to the move to digital first navigation products announced by the UKHO and supported by the MCA. The UKHO are part of an IHO working group looking to develop an Electronic Chart System (ECS) standard that is not the same as mini-ECDIS (statement correct at time of publishing – July 2024).

SOURCE OF METEOROLOGICAL AND TIDAL DATA

Emphasise this data is still based on prediction, and that being digital does not make it 100% precise to the real time status. Importance of allowing sufficient tolerance for any variations and an understanding of how to check variance.

Official sources

UKHO (easy tide, total tide), Met Office shipping forecasts, synoptic charts, harbour websites, Imray, GRIB files, MSI. Understanding the key information in a shipping forecast compared to a mainstream forecast – visibility and sea state is significant information for navigators, as is the timeline of wind strength and direction changes in terms of imminent, soon, or later.

Unofficial sources

Chart plotters, GRIB based apps and GRIB viewers, boating websites and apps, commercial forecasters.

Trusted sources

Trusted sources are those that are proven to be reliable over time. They can include official and unofficial sources and include apps, websites or ECS.

SOURCES OF PASSAGE INFORMATION/SAILING DIRECTIONS

Official

National HOs, by-laws, harbour publications and websites

Unofficial

Reeds almanac, tourism orientated harbour plans, commercial pilotage publications

Trusted sources

Trusted sources are those that are proven to be reliable over time, albeit not from an official perspective. They can include official and unofficial sources.

SENSORS / RECEIVERS

Echo sounder

Offset/location on vessel/waterline or under keel etc, calibration and units. Understand the appropriate use and relations between charted depth, tidal height and instrument depth.

Log

Used for speed through water and associated distance travelled either as a cumulative log reading or a trip that can be reset. Units. MARPA function requires this input to work correctly.

Windspeed and direction

True vs Relative and necessary inputs for true wind speed and direction. Units.

GNSS

The different constellations (GLONASS/GPS/Galileo etc) and the pros and cons of having multiple in use. Methods of internally monitoring precision (HDOP/ SBAS). When integrated with an electronic chart system what redundancy is there should the GNSS fail, such as ECS defaulting to a DR?

AIS

Basics of broadcasting a vessel's position from a GNSS receiver using dedicated VHF frequencies (not a VHF radio channel), usually giving SOG/COG, vessel, and heading information. The position and information can be overlayed on ECSs and radar to assist in situational awareness. Whilst the Colregs do not mention the use of AIS, but it can be considered to be one of the 'all available means' of keeping a look-out.

NAVTEXT

Paper print-out or digital display of MSI

Digital/electronic compass

Variation and related installation to avoid/minimise deviation, and the pros and cons of using true or magnetic bearings on an ECS.

Radar

General principles

Measures range and bearing (relative or true).

Students should have a basic understanding of relative motion and the need for heading, water speed and GNSS inputs for MARPA or other ATA functions. Basic knowledge of the difference between Ground or Water stabilised.

Overlaying on an EC

Radar overlaid on an EC gives a simple verification of position.

ELECTRONIC CHART SYSTEMS

Overview of the multiple styles of ECS including MFD(s), standalone displays, PC based software, tablets and smart phone apps. Discussion around assessing a particular ECS's suitability. Factors to include:

- How much control does the navigator have? E.g., can routes be modified or set up manually?
- Integration with vessel sensors and data vs reliance on web-based input (e.g., AIS data or having ability to DR from log and heading input)
- Power supply
- Screen brightness/palette for suitability to be used in sunshine or at night
- Robust enough for marine environment
- Does the interface work when wet? E.g., capacitive screens do not work with wet hands
- Quality of data within the charts
    - Updated or updatable
    - Units used
    - Vertical and horizontal datum
    - Sources of weather and/or tidal data

CONCEPTS/TECHNIQUES

Navigating with an Electronic Chart System

GNSS

Quality of position – HDOP or augmented (SBAS e.g., EGNOS/WAAS etc). Understanding of limited coverage of SBAS and the need to monitor with independent means, particularly in pilotage waters.

DR mode or alternative approach in event of GNSS failure

Some ECSs use historical GNSS data to produce a position, whilst others use heading and water speed to calculate a DR. The latter will respond to alterations of course and speed, the former will not. Neither will be reliable.

Note: A pitfall common to modern systems is giving the impression of having all the sensors, so will present MARPA information with just GNSS or may project a position based on last SOG and COG without an obvious warning/alert. Essential to know your system.

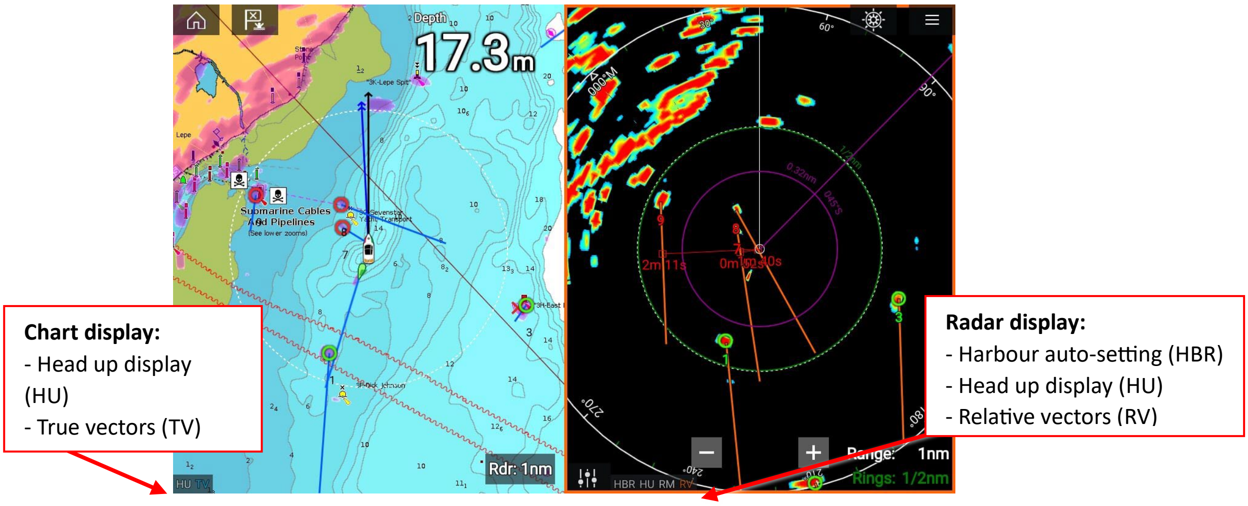
Relative vs True values

Teaching the concept of Relative versus True values can easily become complicated.

The follow are the key concepts:

- True and relative bearings from your vessel in the context of lines of position and/or assessing risk of collision.
- Vectors and trails shown on vessel targets on an ECS display, particularly using a MARPA function. True vectors/trails indicate their direction of travel, relative indicate their travel relative to you. E.g. If you can set a display to both relative vectors and true trails, the vector pointing at your vessel is the vessel with a risk of collision, the trail represents their wake, indicating their aspect. Note that it is rare to be able to do this as a single display with a vector and a trail on each target unless you are using an ECDIS or MINI-ECDIS system. It is possible with many systems to use a split screen, one utilising relative vectors or trails, the other utilising true vectors or trails, or vice-versa.

The image below represents using split screen to show true and relative vectors.



- True and apparent (relative) wind, True wind is what direction and speed over the water, Apparent is direction and speed experienced by a vessel moving through the water.
- The basics of relative motion on a radar display.

Settings and profiles

Historically setting-up a device has been viewed as a once only or an occasional function, think of tuning a TV for the right channels as a comparison. In modern digital equipment there are many settings that can, and should, be modified for each specific scenario to get the most out of the equipment. These are discussed more below but obvious ones are XTD, waypoint arrival alarms or depth alarms. We should normalise the adjusting of certain settings to make the best use of the equipment, reinforcing the need to always know the settings that are in place. Modern ECSs permit setting up profiles to save frequently used or personalised set ups.

Waypoints and Routes

Consider a waypoint as being a significant point in a passage that typically requires an action or a decision to be made.

How to use waypoints

Waypoints are typically created as a sequence to make a route but can be stored individually. With the increase of ECS usage the storing of individual waypoints is now less common. Whilst it is rare to create single waypoints, if they are created the risks associated with a ‘go to’ function must still be understood.

Choose a waypoint location carefully to ensure that, as far as possible, the position can be verified independently of a GNSS position. Create as many waypoints as necessary but be wary of overly complicating the plan with too many waypoints to realistically monitor.

Give a meaningful name to each waypoint. A relevant geographical point will aid situational awareness and engagement. For an action, a simple reminder such as ‘Call KHM’ will prompt the correct action. Where the system allows, additional comments should be added so that any watch keeper can access the information necessary for the action or decision.

Using routes
A route details the ground track that you intend to follow whilst on a passage. It is made up of a series of waypoints. **A route on its own, is not a plan**. Without the information gained during the appraisal stage it is too easy to plan a passage through unsuitable or dangerous areas.

Routes should have a meaningful name to aid finding them once saved. This also gives an opportunity to recognise a route that may have been reversed.

The full plan should detail any additional information, such as the maximum XTD, or required settings at various stages.

ECS FEATURES
Course and speed vectors
A vector has a direction and a length, usually set by time, e.g., how far will we travel in this direction in the next six minutes? The time frame can be changed in settings. Vectors predict a future position based on what has recently been happening. They are most reliable when no change of course or speed has taken place.

There are two types of directional vectors an ECS can display for your vessel.

- A heading vector, which needs a digital compass and water speed log integrated with the ECS. This vector can be considered the general water track without any leeway being applied, and
- A COG vector which uses GNSS input and can be considered as the ground track of an EP for the given time frame.

Therefore, vectors with a known time frame can be considered as the modern equivalent of a projected DR or EP. To effectively monitor our position against a plan we need to know three things:

1. Where did we expect to be at this time (shown by the route and specific waypoints)
2. Where we are (shown by the vessel position on the ECS)
3. Where are we going (shown by the SOG/COG vector)

This is a good example of the efficiency of using digital sources. The three points above give a visual summary of almost all the information you need to know to make an informed decision around short legs of a voyage. In longer cross-tide voyages the need to assess the net result of tidal streams and understand the maximum XTD still remains.

A by-product of using time limited vectors is the ability to get an instant feeling of scale. Setting vectors to a suitable length for each stage of a voyage will also aid setting an appropriate scale for the electronic chart. E.g., in pilotage water you set a short vector to ensure you zoom to an appropriate scale, whilst in open water you set a longer vector to reset the scale to for wider overview.

Profiles may be used in any plotters to pre-set parameters for different scenarios, such as pilotage versus open water.

Students need to understand what influences the difference between heading and COG vectors (leeway, tides, change of heading and/or speed), with a view to them making the right decisions and anticipating changes. E.g., knowing that on a coastal passage COG/SOG is going to change with tidal stream changes, and if they haven't planned an efficient tidal strategy, they could spend four or more hours off Portland Bill.

Buoyage

Highlight the various ways buoyage is displayed on charts from traditional, ECDIS simplified and the bespoke commercial charts (usually a representation of what the buoy looks like.

AIS and Virtual AIS buoyage to be covered:
www.nautinst.org/resources-page/virtual-aids-to-navigation.html

PRESENTATION OF INFORMATION

Do not assume you know what it's telling you – read the manual!

Charts

Orientation

North Up (NU), Head Up (HU), Course Up (CU) or Route Up (RU) and the sensors required. Pros and cons of each orientation.

Chart symbols

Variety of presentation styles used on ECs, particularly IALA buoyage (traditional, simplified, made up to look like a real buoy).

Layers of vector charts

Set recommended features for each stage of a passage. E.g., no need to show lights in daylight.

CUSTOMISING PLOTTER

Awareness of the customisation features – each plotter is different. No intention to get stuck into menus or have exercises but may give a range of representation in learning assets.

- Safety contours/depths
- Symbol style
- Palette/colour scheme
- Vector length
- Units/presentation for depth, distance, position.
- Compass notation (T/M)
- Customisable data boxes (including multiple display options)
- Position in latitude n longitude
- Cursor as range and bearing from your vessel
- Bearings true or relative
- Depth
- GNSS signal strength and quality of fix (HDOP/augmented)
- Wind speed, angle etc.
- Vessel heading from digital compass, water speed, SOG, COG or combinations of some of these
- Time

Need to provide an awareness to students about the difference between routing software as distinct from ECSs. https://fastseas.com/ is an example of routing. Note: Routing software was considered as a factor in the Team Vestas grounding, as there was confusion over whether they were relying on the full feature chart or the routing software.

DIGITAL SOURCES OF INFORMATION

When creating a voyage plan, we should be emphasising the importance of gathering and understanding all the relevant information efficiently. Whilst we will still cover the use of tidal stream atlases or tidal curves, less time in exercises should be spent calculating answers that are now readily available digitally. This will primarily be tidal and weather information. Just as we no longer create a synoptic chart from Coast Station reports, we do not need to interpolate stream information or secondary port calculations for all questions. At Day Skipper level an awareness of secondary ports is all that is necessary and being able to use the simple spring, neap or the middle range for tidal stream data using aid memoires is sufficient.

POSITION MONITORING

Lines of Position (LoP).

Carefully chosen waypoints should take advantage of LoPs available to you, subject to the equipment on board. Most ECSs should have depth contours, bearings (using cursor position set to range and bearing), and transits at their disposal (drawing a line or using a cursor). The variety of LoPs available and the principles of how they can be used on an ECS should be understood. For Day Skipper the radar overlay on an EC is a solid check of GNSS position.

Gross error check using DR/EP from last noted position

Note: ECDIS does/can do this in the background and provides alerts if the positions vary too much. Reinforce importance of navigational records to enable recovery or ongoing navigation from GNSS error/failure, e.g., it is good to have a history just in case you need it, and it's a legal document if commercial.

ALARMS (an awareness of the key ones at Day Skipper)

Alarms can be set on most electronic navigation equipment. It is important to understand what an alarm is used for. They are typically used as a warning or a reminder/notification. Caution against over reliance on alarms – only set the ones you need.

Depth alarm (variable parameter)

Uses echo sounder which is independent of GNSS. Can be used for max and/or minimum depth. Important to know the offsets so you know whether you run aground at 0 m (set under keel) or 2m (set to waterline).

Waypoint arrival alarm (variable parameter)

Uses GNSS. The range at which the alarm alerts can be set in settings. Too small and you may sail past the waypoint without it alerting, too large and it will alert when you're still half an hour away, which may be appropriate, but equally may not! Needs to be compatible with any XTD alarm setting i.e. XTD alarm distance should not be greater than any waypoint alarm in place within the XTD phase.

XTD/XTE alarm (variable parameter)

GNSS based. Used to alert when vessel exceeds the set XTD, typically set due to either proximity of dangers, the size of a waypoint alarm, the maximum offset from the route due to set, drift and leeway in a cross-tide passage. We want to move away from calling this a cross track error, as it is more useful considered as an aid to monitor when you at a limiting distance in from the desired track, rather than being an implied error.

Anchor alarm (variable parameter)

GNSS based. Alerts when drag more than the set distance. Set based on the scope of warp/chain to allow for swinging due to changing stream or wind direction.

Radar Target / CPA (variable parameter)

Needs radar equipped with a form of ATA or MARPA. Guard zones can be used to alert when targets enter. Caution needs to be used as not every object gives a radar return.

Wind speed (variable parameter)

Simple max wind speed (usually as anchor watch), not looking at the clever stuff.

Bilge/sealed compartment

Alerts you to water that, you cannot see, is somewhere it shouldn't be.

Rate of rise of heat

Usually in engine rooms or galleys (as opposed to smoke alarms).

Smoke alarms

Just like at home

Gas

Usually for gas cooking appliances (propane/butane)

CO

In accommodation areas and where exhaust fumes may accumulate from exhaust from engines, generators, or diesel fuelled heaters.