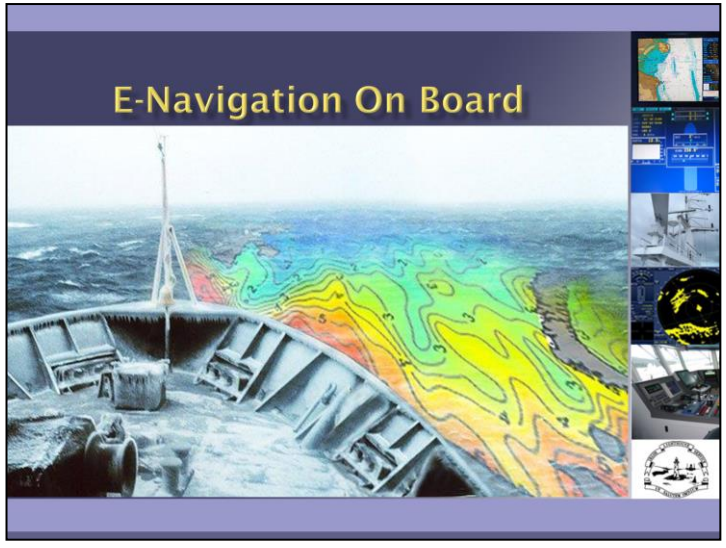


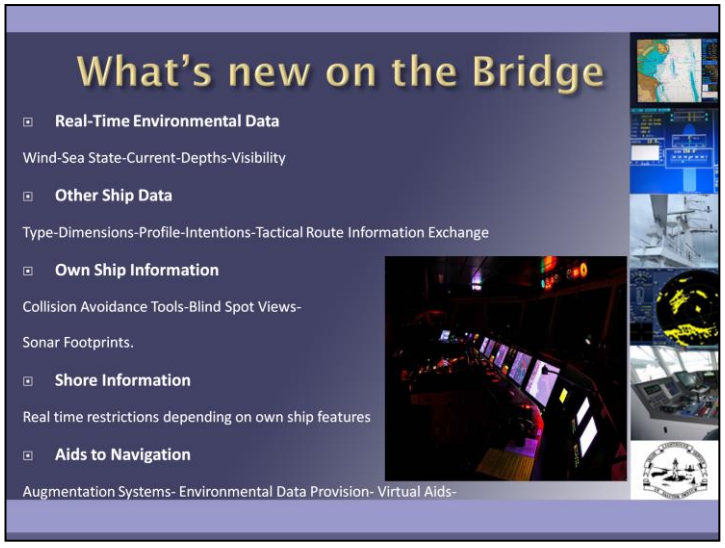
Slide 1

Notes:

Just to recap consider the Several “solutions” for eNavigation that are included in the Strategic Implementation Plan. In the context of the bridge five have been prioritized:

- 1.Improved, harmonized and user friendly bridge design.
- 2.Means for standardized and automated reporting.
- 3.Improved reliability, resilience and integrity of bridge equipment and navigation information.
- 4.Integration and presentation of available information on graphical displays received via communications equipment.

- 5.Improved communication of the vessel traffic service portfolio.



Notes:

What's New on the Bridge of the Future

We still have our normal systems such as Radar, Compasses, Electronic Charts, Depth Sounder, internal and external communications. So what will be different; Well there will be a lot more information digitally received, interpreted and displayed such as Real Time Environmental data like wind, sea state, current, depth, and visibility information. This will be graphically displayed so the navigation displays of tomorrow will show dynamic information, relative to the ship and its track. Potentially this information can save fuel and time as well as assisting in the passage plan to avoid cargo damage from heavy weather.

For collision avoidance there will be real time other ship data some of which we already get from Radar and AIS but with much more specific information showing ship type, dimensions and profile. For instance consider how we interpret a ship/target 6 miles from us, we can use binoculars and radar plotting to give us some sense of what it is doing but digital technology will allow us to "pull" an image of the vessel into view. This could be onto a computer

screen or even onto the bridge window itself. Powerful thermal imaging cameras located in optimum positions on the ship could also be used to detect targets and display onto full length windows. (Sort of next generation RADARs). These tools will assist the navigator in poor visibility including detection of small vessels in heavy seas or ice hazards.

All of this information will be displayed in an integrated and highly interactive manner to provide ergonomic spatial awareness to the navigator.

Shore Information

As ships enter national territory Maritime Services Portfolios will activate bridge systems to update charting/navigational information but also dynamic information such as environmental conditions, new regulations, national security status and traffic movements. In turn shore authorities will also automatically read and validate the ships information database to ensure compliance with national and international regulations.

Notes:

An Integrated Bridge System (IBS) is a combination of systems, which are interconnected to allow a centralized monitoring of various navigational tools. IBS allows acquiring and control of sensor information of a number of operations such as passage execution, communication, machinery control, and safety and security. Not all types of ships have the same type of IBS. According to SOLAS, the IBS should be arranged in such a way that failure of one subsystem does not cause failure of any other sub system. It should also be possible to operate other equipment attached to the IBS individually or as a part of the system.

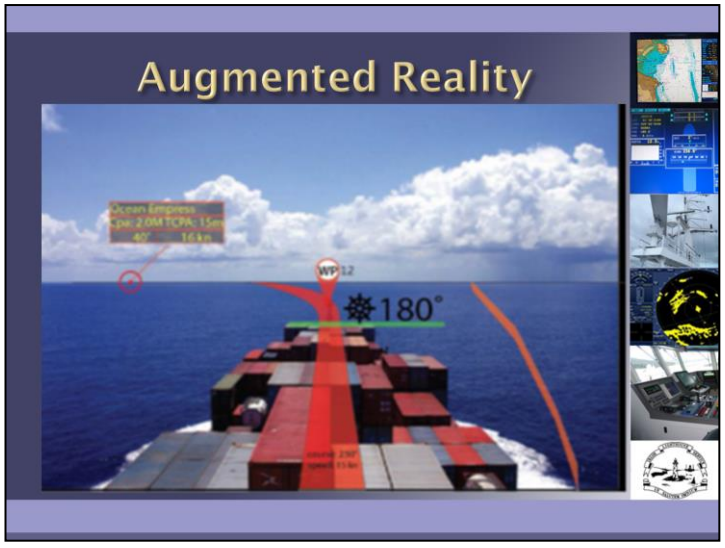
An integrated bridge navigation system is generally connected to autopilot, course tracker, radar, gyors, positioning fixing systems, ECDIS, Power distribution Systems, steering gear Sophisticated alarm systems links all the above.(There can be more systems connected to the IBS and to the alarm system)

The slide shows the Transas “T-Bridge”, which brings together data from diverse navigation and information systems into one single environment. At the core of T-Bridge, the Multifunction Display (MFD) can run various

functions simultaneously, such as ECDIS, Radar, Conning, Planner and Wave fuel efficiency systems.

An ‘Augmented reality’ display is an additional feature, with sensor input from the forward looking sonar, chart data or position and route data integrated with live video of the surroundings. In limited visibility (at night, in congested or shallow waters), the navigator can see on one screen a picture of the real surroundings combined with relevant information.

There is also an integrated a searchlight with camera and thermal imager into the bridge system, allowing detection and identification of objects in poor visibility.



Notes:

Augmented Reality

Augmented reality will be core to future situational awareness in the marine environment. The OOW does not have to look on multiple screens and can look outside while reading the data needed for navigation. One of the most important aspects and challenges of AR is that it is necessary that the view should align with the real view outside and static head up displays should allow this.

Multiple inputs into the AR system such as ECDIS and radar will identify potential hazards. The system can also automatically generate and show on screen alarms and warnings in dangerous situations.

Similar to any other navigational tool AR relies on accurate input from navigational equipment on board own ship

and other ships. You are therefore depending on other people to get it right. The big challenge here is to ensure that only validated information arrives at the end user display.

We will also see crew smart workstations, which automatically recognise individuals when they walk into the bridge, and adjust settings to their own preferences

- Windows double as augmented reality screens to alert operators to hazards such as icebergs, other ships including small vessels and of course Aids to Navigation.
- Research underway into entirely robotic ships that can be controlled remotely by operators from a central location

Systems will be able to, pinpoint tug boats and other craft that may not be visible to the crew, especially on blind spots on large container ships.

Industry Research and Development are pushing their ideas for a virtual bridge that could soon lead to a future where the line between Manned and Autonomous ships becomes blurred. Combining automated ship systems and consistent high-level data communications, is part of what manufactures see as the "next major transition for the shipping industry."

Notes:

Navtor

This is the Navtor NavStation or a ‘giant touch screen navigation iPad’. The world’s first ‘Digital Chart Table’.

“NavStation signifies a giant leap in the evolution of e-navigation it is based on the fact that so much information is available, and compulsory, today, but managing it is time-consuming, impractical and tiring. The Nav Station integrates everything into one place. An ENC service is employed as its ‘base layer’. Subscribers can then add and integrate additional e-navigation products and services, including weather overlay, all Admiralty’s digital products and publications, as well as services like piracy or iceberg updates. It includes automatic updating of charts and publications.

If you were looking to plan a route and wanted to optimise it for wind, wave size, direction and frequency, and so on, you’d have to download maybe 15 days of data. Even then, as you progress, the weather will change and therefore

so will the optimal route. With NavStation the planned route is shared with industry partners StormGeo, which constantly updates the weather data and provides a dynamically optimised route based on real-time conditions. It gives navigators a better standard of information, leading to better decision making, thereby achieving better time and fuel savings. The split screen option allows you to divide the screen and zoom in to see intricate details and important information on one half, while keeping an overview on the other.

Other Services

NAVTOR ENC Service – Pay As You Sail or Standard Subscription Area

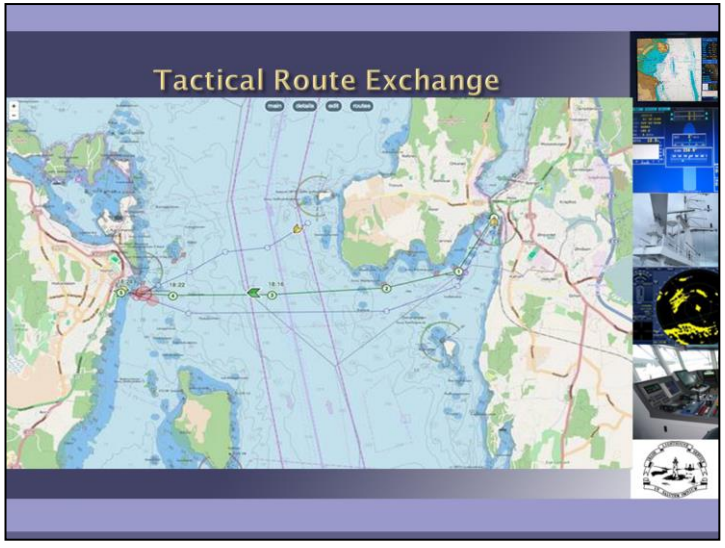
Pay As You Sail (PAYS) service makes all ENCs immediately available, free of charge for planning purposes. You only pay for ENCs used for navigation, based on tracking of vessel. Cost effective and easy to use!

NavTracker – monitor your fleet

NavTracker gives the navigator and ship management full overview of chart usage, chart update history, vessel track and service management, in addition to a 3-days free weather prediction.

NavBox – seamless chart updates

By using NavBox you get an automatic notice when new chart updates are available with an email notice. some ECDIS systems even get a notice button for new chart updates directly in the ECDIS display. With a few clicks, your chart database is up to date.



Notes: Tactical Route Information

Trials have are already underway in the Baltic on Tactical Route Information Exchange Services whereby a ship sends information on its future intended route from its present position which could be seen on other ships electronic chart systems by requesting “show intended route”.

An App has been created REX - Route Exchange App

This is a Sea Traffic Management solution allowing real time sharing and exchange of intended routes between ships and shore based VTS centres. It can be used on mobile devices as well as desktop computers.

Lets look again at route information exchange idea which is being promoted by shore authorities, hardware manufacturers and software/app developers and some mariners.

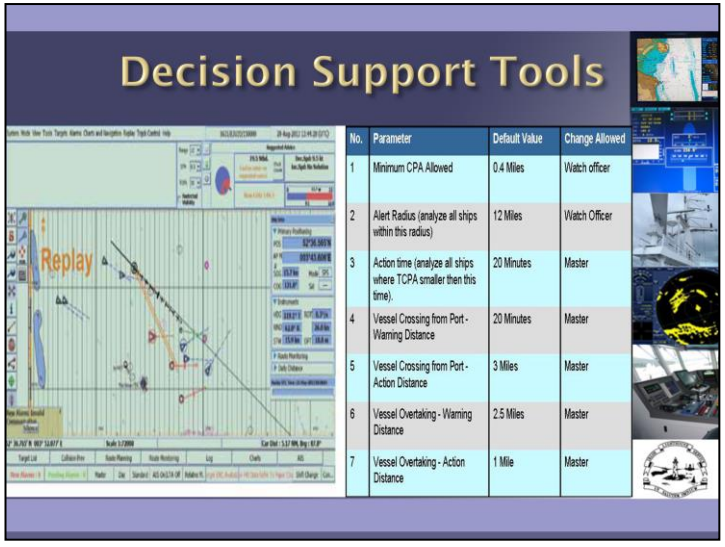
At the e Navigation 2014 Conference in Seattle a group of active mariners - ship masters and pilots – considered

route exchange and none of them thought that knowing another ship's predetermined route (voyage plan) would be valuable or worthwhile as a navigation or collision avoidance tool. In fact, many agreed that such knowledge would be dangerous in a high traffic area, such as pilotage waters. There are established systems in place to discern another ship's intentions and anticipate its movements, e.g., COLREGS and radio meeting arrangements. Wondering if a ship is going to follow its plan or why a ship may be diverting from its plan, which may no longer be valid, could interject uncertainty into the situation - in short, a loss of situational awareness and increased potential for error.

So just because something can be done, that doesn't mean it should be done.

My view is that the collision regulations are for “at this moment” movements so you apply rules to what you or everyone else is doing at a particular time. Therefore everyone can only be doing one particular thing at one particular time. You can bring in future potential activities but then every one can change what they are doing at any given time to give an infinite number of scenarios. In practical terms this means that while a ship might have legitimate intentions it also has the freedom to deviate from those intentions at any given time given the changing environment (small targets, changes in speed). Each player in the area must not have to take into account all potential changes.

So it has its uses but it is also potentially dangerous.



Notes:

Decisions Support Tools

Developments of Track Control and groundling avoidance systems are already available as mature products. So a well equipped modern ship can automatically navigate the globe with little margin for human error.

Tools for Collision avoidance, on the other hand, are still lacking, and some believe there remains a large margin for human error in applying and interpreting the COLREGS. The introduction of very important tools such as ARPA and AIS, and the presentation of target related information on ECDIS and radar monitors, certainly help but are they enough. The Officer of the watch still uses his/her instincts to react to changing situations in short notice which can lead to errors. To minimize such errors, a system was developed by the American company Totem Plus called the TOTEM DECISION SUPPORT TOOL.

This tool is an integral part of an ECDIS. It automatically analyses the data of all targets and advises the OOW on the required action.

The Course To Steer advice is based on analysis of data from all the ships in the vicinity, their CPA and TCPA (time to Closest Point of Approach), and their status according to the COLREGS. All the information is calculated automatically and is continuously refreshed.

To offer the correct Advice, all AIS and ARPA targets within the required “Alert Radius” are constantly processed and analysed for close proximity. The Alert Radius is set by default to 12 miles (open sea) but can be changed by the operator to other values. Same principle applies to the CPA (Closest Point of Approach). Other relevant values, e.g. Minimal Distance to act on Port Crossing, have default values that can be changed only by the Master. Minimal values that can be selected (e.g. minimal CPA allowed) are limited by specific vessel parameters such as ship’s length and turning radius.

In addition to the “Course to Steer” information, the system gives an alert on “Approaching from Port” situations or “Overtaken” situations. In such situations no “Course to Steer” advice is given as the ship is required by the COLREGS to maintain her course and speed as a “Stand On” vessel, and the approaching vessel should take action to give way. However, once the approaching ship is below the set distance the system advises the OOW on the necessity to give such ships a warning signal (see fig, 2). If the “Give Way” ship is below the threshold set for action - Action Distance - an advice on a new Course to Steer will be given in accordance with the COLREGS stipulations.

Notes:

https://www.youtube.com/watch?v=erl8z6oH9jE

The concept, Ship Intelligence, is based on a new bridge called the Future Operator Experience Concept or "oX." This turns bridge positions into smart work stations and the bridge itself into an augmented reality control centre. Rolls-Royce believe it could become a reality in ten years.

Bridge windows are actually augmented reality displays that overlay information and enhance visibility of the ship's surroundings by means of an array of cameras and other sensors. This display can show navigation tracks and hazards, provide warnings and data about other ships in the area, and highlight ice, shoals, and other things that might not otherwise be visible – including the ability to make the ship "invisible" and eliminate blind spots during manoeuvring and tug operations.

Notes:

https://www.youtube.com/watch?v=_nApv-C7qSg