CORPORATE | SECURITY | TEAMWORK | EVENTS




02 Issue

e-Navigation News

GNSS Vulnerability

Dublin Bay Digital Diamond e-Navigation Demonstrator Update

International e-Navigation update

Commissioners of Irish Lights

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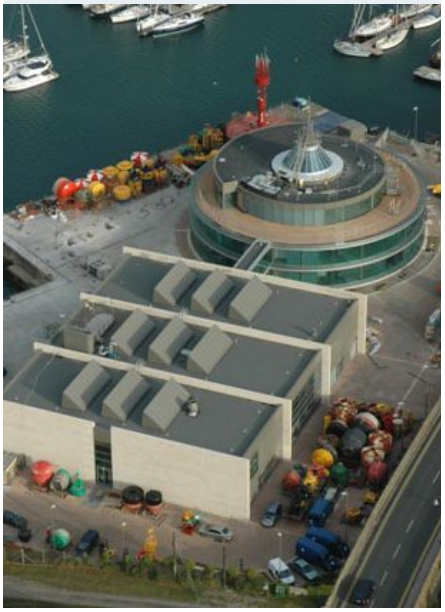
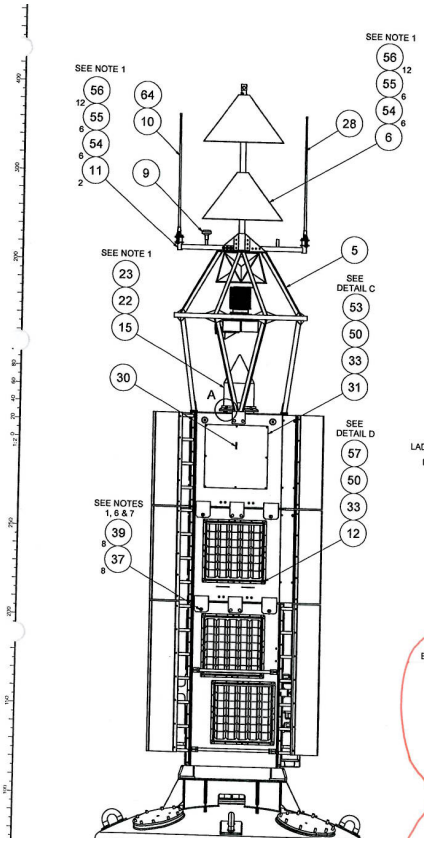
We welcome all feedback from our readers!

Your feedback is essential to ensure the on-going development of e-Navigation is user focused. This issue of e-Nav News will focus on advancements in the Dublin Bay Digital Diamond Demonstrator Project since the last issue. There is a technical piece on GNSS Vulnerability and the newsletter concludes with developments in e-Navigation at the International Maritime Organisation.





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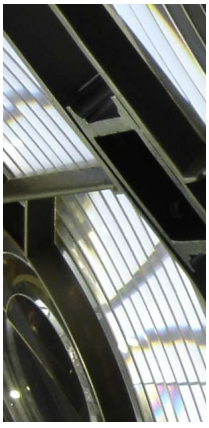


A DUBLIN BAY DIGITAL DIAMOND

This is the second in a series of newsletters aimed at informing the maritime community of the CIL e-Navigation Dublin Bay Digital Diamond demonstrator project as well as gathering feedback on user experience and requirements.

B TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee (TAC) comprises of representatives across the maritime and technology sector to explore the potential of e-Navigation services. This group will take advantage of existing CIL and partner organisation infrastructure to provide platforms for the core communications network required.

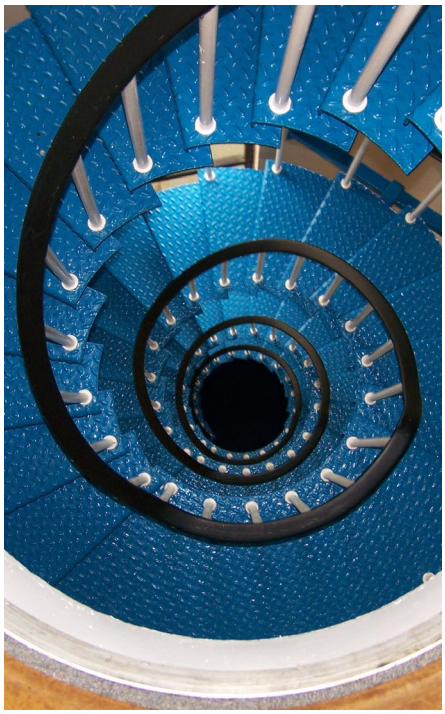
C GNSS VULNERABILITY

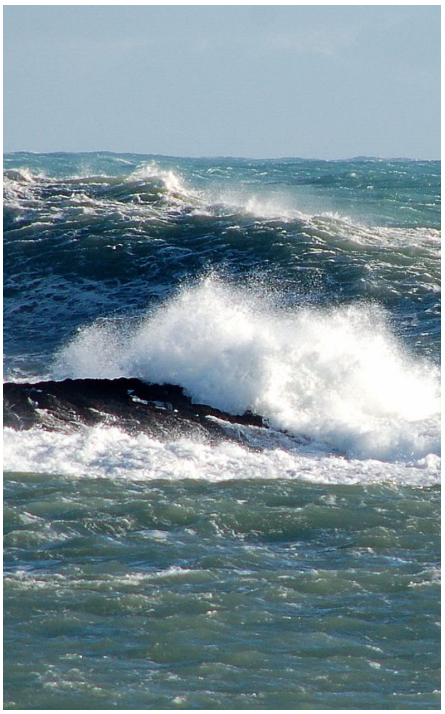
The General Lighthouse Authorities (GLA) recognise that GPS is the primary means of navigation for most of our users. However, mariners should never rely on a single source of position. GPS is a very accurate and reliable system but it can and does fail and is particularly vulnerable to jamming.

D INTERNATIONAL e-NAVIGATION

The e-Navigation Strategic Implementation Plan (SIP) is to be finalised for approval at the International Maritime Organisation (IMO) Maritime Safety Committee. It is thought that the SIP should be kept general as being too descriptive or prescriptive should be avoided in order to allow a certain level of flexibility in future required developments.

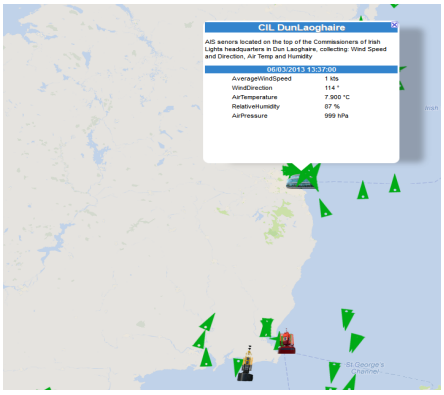
> A clear and compelling need to equip the master of a vessel and those ashore responsible for the safety of shipping with modern, proven tools to make maritime navigation and communications more reliable and user friendly and thereby reducing errors





DIGITAL DIAMOND

FACTS



The Dublin Bay Buoy, part of the first phase of the Dublin Bay Digital Diamond e-Navigation Demonstrator, was deployed on the 30th January 2014 and thanks to a suite of sensors is now tweeting met/ocean data available for all users on

Twitter: @DublinBayBuoy

MetOcean Charts:

http://cilpublic.cil.ie/MetOcean/MetOcean.aspx

The International Maritime Organisation (IMO) is keen that e-Navigation is user driven and for this reason, CIL carried out consultation with users in the area prior to commencing the demonstrator. One of the main requirements identified was for accurate Metrological and Hydrological data, not only for use at the pilot boarding station but for use by all vessel types in the area.

The following sensors have been fitted to the Dublin Bay Buoy:

1. Wave Height Sensor

Gimballed accelerometer calculating significant wave height and wave period averaged over a 10 minute period.

2. Wind Direction Sensor

Wind vane type sensor calculating average direction over the last 10 minutes.

3. Wind Speed Sensor

Cup anemometer type sensor calculating average wind speed and maximum wind gust over the last 10 minutes.

4. Water Temperature Sensor

Thermistor Bridge type sensor giving a continuous reading of the water temperature.

5. Buoy Orientation Sensor

Solid state compass measuring the earth's magnetic field, acts as a reference input for the the wind direction sensor. Data Logger

Sensor data is collected by the logger and sent to the KanAtoN, AIS, AtoN unit which transmits the AIS Met/Hydro message every 6 minutes.

This Metrological and Hydrological data is being transmitted from Dublin Bay Buoy via VHF.

TECHNICAL COMMITTEE

SHORT ARTICLE

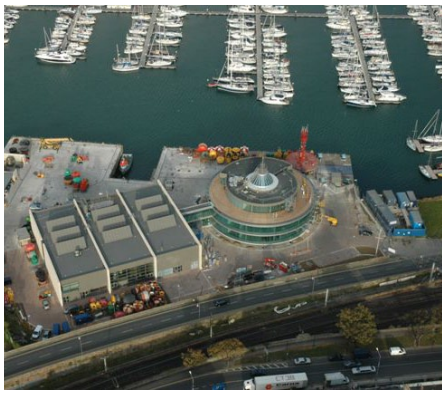
The Technical Advisory Committee (TAC) comprises of representatives across the maritime and technology sector to explore the potential of e-Navigation services. This group will take advantage of existing CIL and partner organisation infrastructure to provide platforms for the core communications network required.

The TAC are responsible for:

- Reviewing draft demonstrator plans
- Providing advice on the technical feasibility, resource requirements, environmental issues and scheduling of proposals for the demonstrator
- Considering project outputs, presentation of technical material, strategies and recommendations for action
- Advising on issues referred to it for consideration
- Assisting with infrastructure and expertise

The TAC is made up of representatives from the following organisations which include the Irish Naval Service, Dun Laoghaire Harbour, Dublin Port, NUI Maynooth, IMERC, Irish Cruising Club, University of Limerick, BIM, Smart Bay, Irish Ferries, INFOMAR, Irish Coastguard, Sea Safari, Burkes & Seatech. The TAC meets quarterly or more frequently where necessary and is accepting new members.

Updates on the DBDD are available on our website http://www.cil.ie/technology-data-services/digital-diamond.aspx



E-NAV AT THE IMO

FEATURE

The e-Navigation Strategic Implementation Plan (SIP) is to be finalised for approval at the International Maritime Organisation (IMO) Maritime Safety Committee. It is thought that the SIP should be kept general as being too descriptive or prescriptive should be avoided in order to allow a certain level of flexibility in future required developments. There are five main e-Nav solutions in the SIP.

> "better integration of ship and shore-based systems; leading to better utilisation of all human resources;

S1 improved, harmonized and user-friendly bridge design

S2 means for standardized and automated reporting

S3 improved reliability, resilience and integrity of bridge equipment and navigation information

S4 integration and presentation of received information in graphical displays

S9 improved Communication of VTS Service Portfolio

These solutions have served as the basis for the creation of Risk Control Options that were believed to be tangible and manageable in terms of quantifying risk reducing effect and related costs.

The Risk Control Options (RCO's) are as follows:

RCO1: Integration of navigation information and equipment including improved software quality assurance
RCO2: Bridge Alert Management
RCO3: Standardised Modes for Navigation Equipment
RCO4: Automated and Standardised ship-shore reporting
RCO5: Improved reliability and resilience of PNT systems
RCO6: Improved shore based services
RCO7: Bridge and Workstation layout and standardisation

What do you, the mariner feel about the Strategy Implementation Plan? Is it realistic? More at: http://www.imo.org/OurWork/Safety/Navigation/Pages/eNavigation.aspx

VHF Data Exchange

The success of Automatic Identification System has resulted in the need to increase VHF channel capacity. Both the International Association for Marine Aids to Navigation and Lighthouse Authorities (IALA) and our colleagues in the General Lighthouse Authorities Research and Radionavigation (R&RNav) are currently working on VHF Data Exchange (VDES). VDES has the capability to reduce workload on the bridge watchkeeping officer (e.g. automatic chart updates, more efficient ship routeing). The extra data channels will allow for more automated transfer of information from ship to shore. IALA has asked that the International Telecommunications Union (ITU) designate more channels for the VHF Data Exchange of Safety and Security Related Information. The plan is to designate channel 27 and 28 for use for AIS Application Specific Messages and channel 24, 84, 25, 85, 26 and 86 for VHF Data exchange between ships, shore and via satellite.

If you wish to see how e-Navigation is progressing around the world in real time the IALA e-Navigation web portal is an excellent source of information including updates on test beds, portrayal examples, demonstration software and IALA conferences on the topic. http://www.e-navigation.net/

LOSS OF GPS (GNSS)

FEATURE

The General Lighthouse Authorities (GLA) recognise that GPS is the primary means of navigation for most of our users. However, mariners should never rely on a single source of position. GPS is a very accurate and reliable system but it can and does fail and is particularly vulnerable to jamming.

While GPS is the system generally used in Ireland there are a number of Global systems included under the term GNSS such as GPS (United States), GLONASS (Russian), Beidou (Chinese) and Galileo (European). All of these systems transmit on similar frequencies and suffer from a common vulnerability due to their very low signal strength.

Low signal strength makes these systems particularly vulnerable to jamming (intentional and accidental). There are already a number of recorded instances of such jamming and the increased use of GNSS for security and tolling applications increases the likelihood of such events. Sunspot activity can also adversely affect GNSS reception. Because the risk is common to all systems additional satellites will not mitigate these risks.

System failures such as the recent disruption of all satellites in the Russian GLONASS system for 11 hours can also occur as can more sinister "spoofing" incidents whereby false GPS signals are transmitted so that a receiver can be made to go slowly off course in a manner that may not be detected by the user.

Good navigational practice can address the risk of GPS denial incidents. Monitoring your position by other means such as visual or Radar aids, monitoring depth and the use of parallel indexing techniques will make any loss of GPS immediately apparent.

In a future e-Nav environment an alternative electronic positioning system to backup GNSS will be required. A number of possible solutions are under consideration.

eLoran is the only electronic system presently in operation that can provide a backup to GPS with the required levels of accuracy and reliability. eLoran is a new generation system that replaces the old Loran C system. As a terrestrial low frequency system it does not share any of the vulnerabilities of GPS. The GLA provide eLoran signals from a station in Anthorn in Cumbria as part of an overall European system and have demonstrated the seamless switchover from GPS to eLoran in cases of GPS denial.

RMode or Ranging Mode is

> Improved decision support enabling the mariner and competent authorities ashore to select relevant unambiguous information pertinent to the prevailing circumstances

another candidate system that is presently under consideration. This system involves deriving a position through electronic ranging from existing stations such beacon DGPS or digital signals of opportunity. Recent trails under the ACCSEAS project have shown that such a system is feasible and work is ongoing on producing a working system.

NT Radar and Racons are also under consideration as a potential source of a positioning data feed as are ePelorus and other devices.

GNSS System Improvements will also contribute to mitigating jamming risks. New satellite message types will enable the development of more robust receivers that can reject jamming or spoofing signals. Such measures will further improve reliability but cannot entirely remove the risk from high powered jamming signals.

GNSS vulnerability is not just about potentially losing Position and Navigation. The Timing function is vitally important in our modern world of navigation in particular for use with AIS. Raising awareness of GNSS vulnerability and demonstrating how it can be addressed are key objectives for the DBDD project.

The reality is that the future backup for GNSS has yet to be finally determined. A mix of these and other systems is likely and regional variations may well arise. Good practice will still be required regardless of the solutions adapted.