Maritime

GNSS MARKET REPORT
ISSUE 5

Excerpt from the GNSS MARKET REPORT, ISSUE 5 (2017)
GNSS applications

According to the distinction provided by IMO Resolution A.915(22), **GNSS applications** can be split into navigation and positioning:

**Navigation**

- **Sea**
  - SOLAS vessels: All passenger ships, cargo ships larger than 500 gross tonnage or larger than 300 tons if engaged on international voyages are regulated and rely heavily on GNSS to support navigation activities. At least 3 devices are typically fitted on vessels for redundancy reasons.
  - Non-SOLAS vessels: GNSS-based systems for maritime navigation are widespread not only across commercial, but also recreational vessels. They are used both for overseas and high traffic areas.
- **Inland Waterways (IWW)**: GNSS is used to ensure safe navigation also in inland waterways (rivers, canals, lakes and estuaries).

**Positioning**

- **Traffic management and surveillance**: These activities are supported by GNSS-based systems including Automatic Identification System (AIS) and Long-Range Identification and Tracking (LRIT) both in sea and inland waters.
- **Search and Rescue** is the search for and provision of aid to people in distress or danger. Different types of devices can make use of GNSS positioning:
  - In the frame of the Cospas-Sarsat programme, ship and person-registered beacons, i.e., Emergency Position Indicating Radio Beacons (EPIRBs) and Personal Locator Beacons (PLBs) transmit, once activated, the necessary information for rescue to authorities via satellite communication;
  - When activated, AIS Search and Rescue Transponders (AIS-SART) and AIS Man Overboard (AIS-MOB) devices continuously transmit an alert message including ID number and GNSS-based location, which triggers an alarm on all AIS equipped vessels within Very High Frequency (VHF) range.
- **Fishing vessel control**: GNSS positioning enables Vessel Monitoring Systems to check the position of fishing vessels, as well as the time spent in international and foreign waters, protected marine areas, etc.
- **Port operations**: Transit progress, docking and loading-unloading operations are monitored through GNSS-based technologies.
- **Marine engineering**: GNSS is used to support marine construction activities (e.g. cable and pipeline laying).

**What you can read in this chapter**

- **Key trends**: Multi-constellation GNSS is becoming the go-to solution for a wide range of maritime applications.
- **User perspective**: GNSS offers significant benefits to both the direct users and beyond.
- **Industry**: List of main players by value chain segments.
- **Recent developments**: Maritime GNSS shipments witness a year-to-year growth, with recreational navigation dominating the segment.
- **Future market evolution**: In a connected maritime environment, GNSS is a key enabler for both traditional and innovative shipping operations.
- **Focus on European GNSS**: EGNSS set to be a key differentiator in the maritime domain with special focus on Navigation and SAR applications.
- **Reference charts**: Annual evolution of GNSS devices’ installed base and revenues by by application and region.

**AIS-SARTs and AIS-MOBs** quantified in this edition of the GNSS Market Report.
Multi-constellation GNSS is becoming the go-to solution for maritime applications

Key Market Trends

- GNSS has become the primary means of obtaining Position, Navigation and Timing (PNT) information at sea.
- SAR beacon manufacturers are preparing for multi-constellation GNSS, opening the path for Galileo penetration in all type of SAR beacons.
- GNSS is a key enabler for both traditional and innovative maritime applications and operations such as the use of drones and the development of smart ships.

Galileo receives important IMO recognition for adoption in maritime

Since May 2016, Galileo can be put on the same level as the American GPS, the Russian GLONASS and the Chinese BeiDou as it was recognised by the International Maritime Organization (IMO) as a part of the World-Wide Radio Navigation System (WWRNS). Galileo, with the Return Link functionality expected by 2018, will offer a unique contribution to the industry of maritime GNSS applications. This official recognition represents a major milestone for the adoption of Galileo for use in commercial shipping and a boost for the current trend towards multi-constellation GNSS receivers.

GNSS plays an important role in offshore oil and gas activities

The offshore energy industry uses augmentation systems and services (SBAS, DGNSS, PPP and RTK) that improve GNSS performance for various activities ranging from the initial surveying and offshore construction phase to drilling and the dynamic positioning of vessels near the platforms and construction sites. This industry requires precise, repeatable and reliable positioning information and therefore opts for commercial solutions.

During the construction phase of offshore platforms the use of GPS/GLONASS dual-constellation receivers is currently the go-to choice, as the higher availability allows for continuous operations. The inclusion of GLONASS is especially useful for offshore activities in the northern hemisphere as the Russian satellite constellation provides a better service in this region due to the abundance of ground stations.

Once the oil and gas platforms are operative, they follow extremely stringent safety regulations according to which they need to use two independent GNSS systems. This is to ensure redundancy at all times and to enable dynamic comparison between both systems for integrity. All these requirements are made to ensure maximum safety for operators, equipment and environment. Due to these stringent requirements, all market solutions rely on the full use of all available GNSS constellations. Once Galileo is fully operational it will provide increased availability contributing to a resilient PNT solution and to the efficiency of search and rescue operations.

GNSS is ubiquitous in a wide range of SAR beacons

The COSPAS-SARSAT programme recognises all beacons that transmit a signal on the 406MHz distress frequency band. In the maritime domain the EPIRBs and EPIRB-AIS are the main types of Search and Rescue (SAR) beacons used as they are mandatory and registered to a unique vessel. PLBs, which are registered to individuals, are often additionally used on-board of maritime vessels. Both of these beacons are GNSS-enabled providing the SAR response teams with a more accurate estimation of where the distress call is coming from. Several beacon manufacturers already offer multi-constellation SAR beacons.

On top of these beacons, the maritime user also has the choice to equip an AIS-SART or AIS-MOB. These SAR devices use Automatic Identification System technology to communicate through the VHF band with nearby vessels transmitting a GNSS position. This feature enables nearby vessels to receive the distress signal on their chart plotter or ECDIS allowing them to provide first assistance. Whereas a SART is mandatory for all SOLAS vessels above 300GT, AIS-MOBs are often used by fishermen, off-shore installation personnel and recreational boaters.

European and global installed base of SAR beacons (2016)

The numbers refer to GNSS-enabled devices only, given prices are market averages.
Overview of the main user requirements in Maritime
The table depicts, in alphabetical order, the key user requirements as assessed through the GSA’s continuous monitoring with the user community. Only high priority requirements are shown, i.e. other requirements might also be relevant for considered applications, and the table is subject to updates. Information on the parameters is provided in Annex 2.

Use of Big Data and AIS analytics on the rise in the maritime industry
Similar to other industries, digitalisation is also entering the maritime segment. One of the most sophisticated examples so far is the use of AIS data for Big Data analytics.

The Automatic Identification System (AIS), which automatically shares vessel information with other vessels and coastal authorities, is perceived as a major added value in the aid for collision avoidance between vessels. However, AIS data has proven to offer a whole lot more than just collision avoidance assistance.

The existence of dedicated web services that collect AIS-data on a daily basis across the world have shown how this data and the information it contains is shaping the future of the maritime industry. By collecting the AIS-data of all maritime vessels an enormous database can be constructed, with both historical and real-time data.

These data can be transformed into information on port calls, time spent in ports, passage crossings, etc. providing valuable information to fleet managers and shipping companies. However, it doesn’t stop there.

The combination of this information allows for a swift and coordinated response. This significantly reduces the time needed to reach the people in distress and increases the chances of survival. In case of EPIRB-AIS, AIS-SART and AIS-MOB the GNSS position is transmitted via AIS, which may be received by the rescue boats and helicopters in a typical range of 4nm.

The use of GNSS, the availability of digital maps plotting the position of ships and the SAR beacon registry have significantly improved the response rate of SAR teams and contributed to numerous lives saved over the past decade.
Maritime Value Chain

CIRM is an international association for marine electronics companies
EFCA European Fisheries Control Agency
EMSA EU agency charged with reducing risks of maritime accidents, marine pollution and loss of human lives at sea
IALA is an international technical association harmonising aids to navigation
IAPH and ESPO port & harbour associations
ICS and BIMCO shipping associations
IMO sets the standards for safety, security of shipping and pollution prevention
IMPA and EMPA maritime pilots associations

**New lay-out of the value chain**

In this edition of the Market Report, additional attention is given to the key market players in the field of Search and Rescue along the value chain. SAR beacon manufacturers and the users of positioning data for SAR response have been added.

The Value chain considers the key global and European companies involved in the GNSS downstream activities.

* European based companies. The world region is referred to the headquarter of the company, the actual area of activity might be wider.

**The European GNSS industry in the global arena**

In 2015, European companies led by Hexagon, Orolia and Cobham, generated 43% of the global GNSS revenues of the component and receiver manufacturers industry. They were in second place behind Asian companies, which retained 47% of the global market share. Global revenues generated by system integrators are dominated by Garmin (28%) and Navico (23%), which both have a focus on the mass market of recreational navigation. European companies, including Navico, Kongsberg Maritime and Safran, retained altogether a share of around 35% of the global revenues, putting the European companies at the same market share of North-American companies.

1 In the market share analysis, Europe is defined as EU28 plus Norway and Switzerland.
Maritime GNSS shipments witnessed a sustained growth, with recreational navigation dominating the segment

The total amount of GNSS shipments for 2016 accumulated to 1.7 mln units across the three main categories of applications (i.e. navigation, positioning and Search and Rescue) considered in this market report. Since 2006, when the total amount of shipments accounted for 700,000 units, the maritime GNSS unit shipments saw a 9% CAGR.

Around 83% of the total 2016 shipments, or 1.4 mln units, are shipments of recreational navigation devices. With an estimated addressable market of 30 mln vessels worldwide, this market segment presents the largest customer base for maritime GNSS devices (see box below for more info).

The application group comprising all type of Search and Rescue (SAR) beacons accounted for 135,000 shipments in 2016 with the shipments of PLBs accounting for 40% of total SAR beacon shipments. PLBs are extremely popular in North America and the increasingly higher uptake of GNSS in PLBs plays an important role in the increase of GNSS shipments. Since the market introduction of AIS MOBs in 2012, the large majority of the shipments were registered in the EU28.

Finally, merchant navigation units reached annual sales of 45,000 units, whereas GNSS units used for inland waterways navigation and the monitoring of fishing vessels both reached 27,000 units in 2016.

GNSS for recreational boating is more than just navigation

With approximately 30 mln recreational vessels worldwide, the addressable market for GNSS far exceeds the market of commercial and fishing vessels (almost 3 mln vessels worldwide). As the current penetration rate of GNSS devices on-board recreational vessels is around 22%, there is still a high market potential for the adoption of GNSS equipment.

Looking at the different types of applications tailored to the recreational segment, there are the more traditional applications such as navigation devices up to high-end solutions such as autopilot and automated docking applications. More and more recreational boaters are also equipping AIS-MOB SAR beacons when they travel near the shores and coastlines or opt for PLBs when they sail across the oceans.

When it comes to EGNSS, EGNOS is also playing an upcoming role in the recreational maritime segment as is evident in the example of the EGNOS S2 Super Series Regatta that took place in Cascais, Portugal in October 2016.

EGNOS gave its name to this regatta, playing an important role during the most critical part of the race: at the start. By using EGNOS, navigators were given the means to be at the right place at exactly the right time.
Due to a significant untapped addressable market of recreational vessels, the recreational navigation segment is expected to continue dominating the annual shipments of GNSS devices with expected shipments of 1.7 mln units in 2020 and 2.1 mln units in 2025. By 2025, it is estimated that sales of recreational navigation units will generate more than €800 mln in sales, 57% of the total maritime GNSS market value.

Shipments of all types of Search and Rescue beacons are expected to reach 240,000 units by 2025 and are likely to continue growing during the second half of next decade. The combination of regulated beacons such as EPIRBs and SARTs, commercial success of GNSS-enabled beacons with AIS technology and the recent launch of the Galileo Search and Rescue Service is likely to boost the uptake of search and rescue beacons beyond 2025.

Merchant navigation device shipments will hit 70,000 units by 2025 up from 43,000 in 2015. The installed base of GNSS-enabled navigation systems in merchant vessels is forecasted to approach 400,000 units in 2025.

Over the next decade, North America followed by Asia-Pacific and the European Union will remain the largest market in terms of shipments and installed base. Global revenues will grow by a CAGR of 5.2% between 2015 and 2025, achieving total revenues of €1.4 bln.

A look into the future: Smart Ships navigate our oceans

Similar as to how connected and autonomous cars will become a reality in the not so distant future, our seas and oceans might see the advent of Smart and Autonomous Ships. It is expected that 20 years from now, ship intelligence driven by the smart use of Big Data will shape the maritime industry in general and the type of vessels in particular.

One of the biggest drivers behind the idea of these Smart and Autonomous Vessels is to increase the overall safety of vessels and crew. Smart Ships will be able to support the crew in avoiding human errors which are still seen as the main cause (60%) of collisions and groundings. Another important driver is to lower annual costs. With fuel, CAPEX and crew costs accounting for an overwhelming share of the total costs, the vessels of the future will allow for reduced crew expenses, efficient fuel consumption and result in lower total CAPEX costs.

First steps towards Smart Ships are taken by the strategic partnership between Rolls-Royce and the Finnish VTT Research Centre to launch a first remote-controlled local vessel at the end of this decade and Kongsberg's involvement in the opening of a first test bed for Autonomous Ship technology in Northern Norway.
EGNSS set to be a key differentiator in the maritime domain

With the launch of the Galileo Initial Services, the Galileo Search and Rescue Service will help operators in a more efficient and effective way when responding to an emergency distress alert.

The Galileo SAR Service will also act as Europe’s contribution to the international COSPAS-SARSAT programme and due to their operation in the Medium-altitude Earth Orbit will complement the existing LEOSAR and GEOSAR systems.

The Galileo system will comprise two components, namely an automatic forward link distress call (initial service declared on Dec 2016) and a unique return link alert service that will inform the sender of the distress call that their message has been received (initial service to be declared by end 2018). These features, combined with the official IMO recognition of Galileo will pave the way for the adoption of multi-constellation Search and Rescue beacons worldwide.

EGNOS

With the official IMO recognition of Galileo as part of WWRNS, the next step for EGNSS in the maritime segment is to receive official recognition for EGNOS.

For several years, EGNOS is being used by the maritime and inland waterways community. The launch of a new study by the GSA in the field of an EGNOS Maritime Safety Service will only further strengthen the use and the potential of EGNOS in maritime applications.

Focusing on navigation in harbours and inland waterways, this Safety Service is expected to provide another source of differential corrections and integrity information to complement the current IALA DGNSS infrastructure.

SAT406M project: first affordable wrist-worn satellite PLB for maritime users with Galileo return link

Designed for anybody performing outdoor, remotely and often risky activities including sole mariners, sailors, travellers and pilots, the wrist-worn PLB improved during the H2020 project SAT406M is an affordably produced, easy-to-carry and user-friendly Search and Rescue beacon. Moreover, the developed PLB is designed to process the Galileo Return Link Messages.

Designed and developed by Mobit Telecom, based on already existing registered patents, the aim is to make the use of search and Rescue beacons popular, affordable and usable for every person needing one. Despite its relative small size compared with a regular PLB, the SAT406M is able to stay in operation for 24h in harsh environments and temperatures of -20°C and has around 10m water resistance.

SAT406M was a 2014 regional winner of the European Satellite Navigation Competition.

More information on: http://www.sat406.com/

New SafePilot version available on iTunes to improve pilotage operations

Marimatech, a Danish manufacturer of maritime equipment and a key stakeholder to the FP7 SafePort project concluded in 2012, introduced the first release of SafePilot iPad software for Portable Pilot Units in June 2013.

Today, Marimatech as part of Trelleborg Marine Systems continues developing new versions of the software in close cooperation with the marine pilot community that can be downloaded from iTunes.

SafePilot offers the best possible user experience adding unbeatable features with integration of requirements from pilots of practical functions, easy and handy operations as well as flexible software packages.

Whereas the basic version is designed for internal GNSS usage only, users can download a Pro Navigation module that supports external GNSS and has AIS device support.
GNSS Penetration

GNSS penetration is defined as proportion of all possible vessels that are equipped with GNSS.

Installed base of GNSS devices by region

Installed base of GNSS devices by application

Revenue of GNSS device sales by region

Revenue of GNSS device sales by application

Merchant navigation, traffic management, search and rescue and marine engineering show SOLAS and Non-SOLAS vessels combined.

Merchant navigation, traffic management, search and rescue and marine engineering show SOLAS and Non-SOLAS vessels combined.