

Switching off DGPS in the UK

The UK's General Lighthouse Authorities (GLAs) are to close the DGPS service at the end of March 2022 – what does this mean for the seafarer?

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The General Lighthouse Authorities of the UK and Ireland (GLA) have taken the decision to close its DGPS service at the end of March 2022, following user consultation and a considered review of how the system is being used. Other national maritime authorities have also taken the decision to close their DGPS service, while others maintain operations for the foreseeable future – each administration provides the aids to navigation (AtoNs) they deem appropriate for the risks within their waters.

DGPS and Selective Availability

The GLA DGPS system was first introduced in 1995 as a trial system, being formally declared operational in 1997. The system consists of 14 DGPS reference stations (see Figure 1), six far-field monitoring sites and three monitoring and control sites. The system is operated as a single AtoN, albeit one operated and maintained by three authorities. Marine radio beacon DGPS was developed to counter Selective Availability (SA), a deliberate error added to the civilian GPS service to degrade positional accuracy. SA caused the reported position to wander even when the user was static, something that is clearly not ideal when trying to navigate a vessel. However, by comparing the reported GPS position of a receiver sited at a precisely known location, it is possible to calculate the amount of position error at any given time.

Error in position calculations is caused by many different factors, not just SA. Errors for each satellite are identified and a correction for each is provided to mariners operating nearby via the 300 kHz broadcast. Maritime receivers in the region can apply such corrections and improve the estimated reported position. At the time when SA was in use, this meant an improvement from approximately 50 metres to around five metres.

SA was discontinued in 2000 and today, GPS offers the civilian user a position accurate to around 3-5 metres. DGPS continues to improve positional accuracy, albeit with a smaller improvement, enabling positions in the region of 1-2 metres.

In addition to improving the estimated position accuracy, by assessing whether the error is within a given threshold, the reference station is able to monitor the performance of the GPS constellation and identify any faults. Faulty satellites

are removed from the position solution, therefore providing position integrity for the mariner. The integrity element remains unchanged and is often cited as the main benefit of DGPS in a world where SA is no longer an issue.

Stakeholder consultation

The GLA service was partially replaced around a decade ago. The current infrastructure is now approaching the end of its design life and the GLA conducted a stakeholder consultation to assess the requirements for the service going forward.

The consultation process sought input from stakeholders across the maritime sector and beyond through direct engagement and via a widely circulated user survey. GLA personnel interviewed vessel crews from across the UK and Ireland and 153 people responded to the survey. Figure 2 provides an overview of the different respondent groups along with the percentage of total responses.

It can be seen that the vast majority of responses were from mariners and maritime operators (e.g. engineers, scientific officers, operations managers and harbour masters). Responses came from mariners operating a wide range of vessels including ferries, container ships, tankers, liquid natural gas carriers, bulk carriers and leisure craft.

The survey resulted in a mix of responses. The majority of mariners report that they use the GLA DGPS system for accuracy improvements and integrity, as one may expect, while others reported that they do not use it.

Mariners were asked which GNSS constellations they used today and those they expected to use in the future. All mariners reported using GPS today, with around 40% also making use of GLONASS, and around 9% using Galileo too. From the response received, it is expected that more mariners will move to multi-constellation receivers over the next five to ten years, making use of GPS, GLONASS, Galileo and BeiDou.

Face-to-face discussions produced a similar mix of views. While the majority considered the GLA DGPS system a useful service, others reported that they didn't use it at all. It was noted that DGPS works quietly in the background and therefore can be inconspicuous on the bridge until it is unable to work correctly, at which point an alarm is raised to inform the bridge crew.

Alternative solutions

While marine radio beacon DGPS is not mandated by the International Maritime Organization for carriage on vessels covered by SOLAS, it is provided for in all maritime receiver standards and the spectrum is allocated

internationally. Marine radio beacon DGPS is a common method for receiving differential correction information at sea on many classes of vessel.

Following a change in maritime receiver standards in 2003, all receivers now include Receiver Autonomous Integrity Monitoring (RAIM). RAIM is a means of determining whether the resulting position estimate is safe to use through an algorithm within the receiver. As the name suggests, it is another means of determining integrity, i.e. whether the position solution is safe to use.

Differential corrections are also available from other sources, including Satellite Based Augmentation Systems (SBAS), which are primarily provided for aviation users. Work is under way in Europe to introduce a maritime service to the European Geostationary Navigation Overlay Service (EGNOS), the European SBAS. This service is expected to be available around 2022. It is important to note that today's maritime receivers are not tested for how they apply SBAS data, as that functionality is not currently part of the receiver standards. This is being addressed and those mariners wishing to take advantage of SBAS information in the future will need to upgrade their receiver to one that is type approved for SBAS use (expected 2022-2023).

Future of the GLA DGPS network

After careful consideration of the results of the consultation process, recognising that today's GNSS are able to meet all but the most stringent accuracy requirements, and that position integrity can be provided by alternative means, such as RAIM or by mariners validating their position via other visual and electronic aids to navigation, the GLA has concluded that their DGPS system is now redundant.

The GLA recognise the need to provide adequate notice and support continuity of service going forward. As such, the GLA DGPS system will remain operational until 31 March 2022, at which point the signals will cease.

While SBAS such as EGNOS should provide useful services to the mariner in time, there is no guarantee that this will come to fruition. However, it is anticipated that alternative sources of integrity will continue to improve as mariners move to multiple satellite constellation receivers with more satellites and signals available, and as RAIM algorithms advance.

The use of all available satellite constellations with advanced RAIM algorithms in the future is expected to provide greater positional accuracy and integrity than is available today with marine radio beacon DGPS.

The GLA advises mariners to consider their use of DGPS and to plan for its discontinuance accordingly.

Mariners should check their GNSS receiver(s) to confirm the presence of RAIM and consider upgrading to type approved SBAS receiving equipment when available.

Overall, the GLA encourages mariners to use all available AtoN, whether visual or electronic, and other sensors such as radar, to support their safe passage and the protection of the environment.

If readers have any questions or comments they are invited to contact the author, Dr Alan Grant, GLA DGPS System Director by e-mail at:
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A note on the GLA

GLA is the collective term for the three individual lighthouse authorities that provide marine aids-to-navigation around the UK and Ireland.

These are:

Northern Lighthouse Board – covering Scotland and the Isle of Man

Irish Lights – covering all of Ireland

Trinity House – covering England, Wales, Channel Islands and Gibraltar

Editor's Note

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