



GLA Research and
Development C/O Trinity
House
The Quay, Harwich, Essex.
CO12 3JW

Re: Spectrum access for Enhanced Long-Range Navigation
(eLoran) systems at 90-100 kHz

10th July 2023

To whomever it may concern,

I write on behalf of the three General Lighthouse Authorities of the United Kingdom and Ireland (GLA) in response to the Ofcom consultation on “Spectrum access for Enhanced Long-Range Navigation (eLoran) systems at 90-100 kHz”. None of this response is confidential and we are happy for Ofcom to publish this response.

The GLAs have long advocated the need for resilient positioning, navigation and timing (PNT) across the maritime community, recognising early on the vulnerabilities to GNSS from natural and deliberate causes. We have conducted a number of projects and trials over the years to support resilience and have shown how eLoran can support a system-of-systems solution. As such, we support the licensing of this band, as that should help support the use of eLoran for maritime safety, amongst other uses.

GLA history with eLoran

The GLAs have a long and rich history working with Loran-C and eLoran. We have played an active role in the development of eLoran from Loran-C, working closely with national and international colleagues and stakeholders. eLoran makes use of traditional Loran-C signals, albeit with modernised transmitters capable of providing an addition of a data channel. eLoran moved away from the traditional hyperbolic positioning approach of Loran-C to provide greater accuracy by using an all-in-view approach, similar to that employed for GNSS. Overall, moving to eLoran improved accuracies by an order of magnitude.

In 2010, the GLAs considered the options for maritime resilience and having successfully developed our eLoran business case¹ implemented our Initial Operational Capability eLoran service. This saw the introduction of a trial eLoran service that provided equipped mariners with a positioning and timing source accurate to less than 10m (95%) within the major ports on the East coast of the UK².

The GLA Research and Development team (GRAD) has been actively engaged in eLoran standards and performance guidelines. This included supporting the development of “Enhanced Loran definition document”³, ‘Minimum performance standards for marine eLoran receiving equipment’⁴ and a number of IALA recommendations and guidelines⁵ on the topic.

¹ GLA, “Case study-business case to inform eLoran decision”, version 1.2, May 2011.

² Offermans et al, “eLoran initial operational capability in the United Kingdom – first results”, ION ITM, January 2015.

³ International Loran Association, “Enhanced loran definition document”, January 2007. (accessed via <https://rntfnd.org/wp-content/uploads/eLoran-Definition-Documents-0-1-Released.pdf>)

⁴ RTCM, “Minimum performance standards for marine eLoran receiving equipment”, December 2016.

⁵ IALA, “The performance monitoring of eLoran services”, R1011, Ed1.1, June 2017 & IALA, “The technical approach to establishing a maritime eLoran service”, G1125, Ed1.1, June 2017.

GRAD also developed techniques for modelling eLoran performance, guidelines for measuring and handling additional secondary factors and extensive software modelling capabilities.

Our IOC eLoran service used Loran-C signals provided by European nations, along with the station in the UK. Unfortunately, in 2016 most European nations took the decision to close their Loran-C stations, which also resulted in the closure of the GLA IOC project.

The need for resilient PNT has not waived since this time and the GLAs have continued to explore alternative means. The MarRINav project⁶ investigated maritime resilience for the UK and considered a wide range of candidate solutions. It recognised the need for a scalable approach and that different geographical areas may require different technical solutions, which lead to the development of the system-of-systems concept. The project concluded that a mixture of GNSS, e-Loran and VHF Data Exchange System (VDES) ranging was the most technically mature and cost effective approach for a sovereign UK solution.

International coordination

Building on the international nature of maritime operations and the distances at which eLoran signals propagate, there is a need for international coordination of eLoran stations to limit interference and maximise the benefit.

Loran stations broadcast at a set time offset for their area, historically set by the chain they were based in when operating in a hyperbolic mode. The Group Repetition Interval (GRI) is a key factor in determining the level of interference between services. If eLoran services are established, there will be a need to coordinate the GRI, not just with other users across the UK but over a wider geographical area, recognising that eLoran signals can be used for over 1000km. Our understanding is that currently there is no single point of contact to coordinate GRI's and this will need to be managed.

Finally, while outside the scope of this consultation, it is useful to recognise the need to ensure suitable maritime user equipment is available to benefit from any signal provided. The IMO approved the multi-system receiver (MSR) performance standard in 2015, but such receivers are not commonly available today due to the need to complete corresponding IEC test specifications. The MSR provides scope for a resilient PNT solution, using GNSS and terrestrial PNT signals in a collaborative manner. Consideration will need to be given to what maritime user equipment is expected and in what timeframe, in order to complement any available signal.

Response to consultation questions

Question 1: Do you agree in principle with our proposal to introduce a new licence product to enable authorisation of the use of the 90-110 kHz band for eLoran services?

GLA response to question 1: *Yes. eLoran is a proven means of achieving independent positioning and timing information and can serve as a component of the system-of-systems approach to maritime resilient PNT.*

Question 2: Are you aware of any alternative current or future uses for the 90-110 kHz band, including any which might preclude use of these frequencies for eLoran? If so, please provide details.

GLA response to question 2: *We are actively engaged in the eLoran signal transmitted from the station at Anthorn. As such, we are keen to ensure any transmissions in the band are suitably coordinated to limit mutual interference and do not hinder any future UK Government service.*

⁶ MarRINav project – www.marrinav.com

We are not aware of any non-eLoran current or future use for the band. We note that ITU recommendation M.589-3 provides technical characteristics for services within this band in support of Loran-C and Chayka⁷, and we believe this remains in force. We also note ITU Resolution 705 from WRC-15 (2015) on mutual protection of radio services operating in the frequency band 70-130 kHz⁸.

Question 3: Do you agree with the non-technical conditions we propose to include in the new 90-110 kHz licence? If not, please set out your reasons and provide any relevant evidence.

GLA response to question 3: *We support the non-technical conditions and welcome the sharing of information and coordination between licensees to ensure compatibility.*

Given the operational range of eLoran signals, licensees should coordinate with organisations providing signals in the band that originate outside the UK, especially those that have the potential to interfere with, or suffer interference from, any UK eLoran transmission.

This wider liaison raises a question on the need for international coordination of the group repetition intervals (GRI) to limit interference over wider areas. We support further investigation into how this could be realised.

Question 4: Do you agree with the technical conditions we propose to include in the new 90-110 kHz licence? Please set out your reasons and provide any relevant evidence.

GLA response to question 4: *For eLoran to complement the maritime use of GNSS, as a component of a resilient PNT solution, we invite Ofcom to consider offering protection to the band. GNSS is used to support maritime safety of life operations and any complementary solution would need to be relied upon in times of GNSS outage, therefore a level of protection should be considered.*

To minimise the risk of interference and to promote interoperability of systems, we believe it is important to include a definition of eLoran within the license, for example the SAE 9990 series of standards⁹.

⁷ ITU, "Technical characteristics of methods of data transmission and interference protection for Radionavigation services in the frequency bands 70 and 130 kHz", M.589-3, 2001.

⁸ ITU, "Mutual protection of radio services operating in the frequency band 70-130 kHz, Resolution 705, WRC-15, 2015.

⁹ SAE, "Transmitted enhanced Loran (eLoran) signal standard", SAE9990, September 2018