



IALA GUIDELINE

1060

RECAPITALISATION OF DGNSS

Edition 2.0

June 2011



DOCUMENT REVISION

Revisions to this IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision



CONTENTS

1. INTRODUCTION	4
2. REPLACEMENT OPTIONS	4
3. PROGRESS TO DATE	4
4. GUIDANCE	4
5. ACRONYMS.....	5
6. REFERENCES	5
ANNEX A STATUS OF DGNSS RECAPITALISATION WITHIN IALA MEMBERS (MARCH 2011)	6



1. INTRODUCTION

IALA has recommended that members operating the beacon DGNSS service, which is the international standard for maritime augmentation, should consider modernisation to ensure that levels of service can be maintained and future requirements can be met [1]. This recommendation took into account various potential alternatives, including Satellite Based Augmentation Services (SBAS) and the Automatic Identification System (AIS).

These Guidelines should be viewed in the context of the development by IALA of a World Wide Radio Navigation Plan (WWRNP) [2] in support of e-Navigation. One key concept in this Plan is the separation of the generation of correction data from the means of transmission, to facilitate broadcasting by a variety of methods. This could lead to the integration of terrestrial systems (DGNSS beacons, eLoran, AIS) to provide shared data channels and common correction sources, as well as additional ranging signals, contributing to a redundant position-fixing solution, complementary to, but independent of GNSS.

Recapitalisation of DGNSS should be considered in the context of position-fixing requirements for e-Navigation, noting that DGNSS is likely to be an essential part of the WWRNP.

2. REPLACEMENT OPTIONS

The simplest recapitalisation option may be replacement of existing hardware with similar dedicated Reference Stations and Integrity Monitors (RSIM), but this may limit the potential for future development. Other possibilities include:

- Software Reference Stations and Integrity Monitors (RSIM);
- Virtual Reference Station (including the option of incorporating reference station data from other competent authorities);
- SBAS Integration.

These options are explored further in IALA Recommendation R-135 on the Future of DGNSS.

3. PROGRESS TO DATE

IALA members are currently at different stages of developing varying solutions based on their individual requirements, timelines, geographical coverage area, size of network and budgetary constraints (see ANNEX A). All of these solutions will meet the needs of existing users.

4. GUIDANCE

IALA members are encouraged to:

- Recapitalise existing DGNSS systems prior to their obsolescence, noting the advice given in IALA Recommendation R-135 on the Future of DGNSS and IALA Recommendation R-121 on the Performance and Monitoring of DGNSS Services in the Frequency Band 283.5 – 325 kHz [3];
- Consider the options for replacement systems, with reference to the documents listed below;
- Share information regarding studies carried out and specifications of replacement solutions and report progress to IALA;
- Investigate potential future developments to be compatible with the development of shore based e-Navigation architecture;
- Investigate techniques for adding value to transmissions, such as transmission of safety related information and/or backup positioning and timing capabilities.



5. ACRONYMS

AIS	Automatic Identification System
DGNSS	Differential Global Navigation Satellite System
DGPS	Differential Global Positioning System
GLA	General Lighthouse Authority
GNSS	Global Navigation Satellite System
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
kHz	kilohertz
MF	Medium Frequency
RSIM	Reference Stations and Integrity Monitors
SBAS	Satellite Based Augmentation Services
UK	United Kingdom
US	United States of America
USCG	United States Coast Guard
WWRNP	IALA World Wide Radio Navigation Plan

6. REFERENCES

- [1] IALA Recommendation R-135 on The Future of GNSS.
- [2] IALA World Wide Radio Navigation plan.
- [3] IALA Recommendation R-121 on the Performance and Monitoring of DGNSS Services in the Frequency Band 283.5 – 325 kHz.
- [4] DGNSS Modernisation: Recapitalisation of the GLA's DGPS Network (A.Grant, N.Ward, M.Pattinson, M.Dumville), NAV07, Royal Institute of Navigation, 2007.
- [5] Invitation to Tender for the Recapitalisation of the Differential Global Positioning Service (DGPS) operated by the General Lighthouse Authorities of the United Kingdom and Ireland, March 2008.
- [6] German Federal Waterways and Shipping Administration. Installation of a Virtual Reference Station - Test Pilot for the transmission of GNSS corrections using MF radio beacons and AIS base stations. Input to IALA e-NAV 8, September 2010.
- [7] Swedish Maritime Administration. Report of Virtual Reference Station Workshop held in Malmö February 2010. Input to IALA e-NAV 8. September 2010.



ANNEX A STATUS OF DGNSS RECAPITALISATION WITHIN IALA MEMBERS (MARCH 2011)

- The US implemented software RSIM equipment across all USCG and Inland Waterways transmitter sites. Trials of High-Accuracy Nationwide DGPS are continuing.
- The UK and Ireland conducted a study of replacement options which concluded that the lowest risk option for the GLAs would be hardware replacement, although the flexibility provided by the software option would better meet emerging requirements and should not be ruled out [4]. The GLAs have tendered for new RSIM equipment, which may be fulfilled by either hardware or software solution [5].
- Germany is planning to implement a first realisation of a Virtual Reference Station concept, based on the separation of generating differential corrections from signal transmission, which could use MF beacon and/or AIS carriers. Germany is also planning a feasibility study to investigate the addition of Ranging signals (R-Mode) on MF beacon and AIS carriers [6].
- Australia is investigating software RSIM solutions.
- Malaysia has recapitalised their service and increased the number of stations in 2008.
- Vietnam implemented a service in 2009.
- Poland has replaced their RSIM equipment with an L1/L2 hardware solution, and plans to transmit Virtual Reference Station data via MF beacons in the future.
- Sweden is currently studying options for software RSIM solutions and plans to implement a Virtual Reference Station test site in 2011/2012 [7].
- China is expanding coverage with the construction of three additional stations in 2008.
- The Netherlands have a requirement to replace equipment in 2011, and are considering both hardware and Virtual Reference Station solutions.
- Denmark installed replacement hardware in 2009.
- Finland plans to implement a Virtual Reference Station test site in 2011.
- Norway has prepared a tender for the replacement of its existing system.
- Other administrations, including those of Canada, France, Portugal, Republic of Korea and South Africa are currently studying options for recapitalisation.
- The number of administrations providing DGNSS services is continuing to increase.