IALA Guideline No. 1107

on

The Reporting of Results of
e-Navigation Testbeds

Edition 1

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Document Revisions

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

Date	Page / Section Revised	Requirement for Revision

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The reporting of results of e-Navigation testbeds

1   INTRODUCTION

This document offers guidance on the reporting of results of e-Navigation testbeds.

2   BENEFITS AND SCOPE OF THE GUIDELINES

Harmonisation of the reporting of results from testbeds will allow the results of e-Navigation solutions being tested to be shared and compared effectively. Harmonisation also allows future meta-analyses[1] of specific aspects. Different organisations can recreate trials both to verify results and refine various factors within the trials, in order to further develop the concepts being trialled.

This guideline includes the following:

- Initial considerations when planning a testbed (0)
- Reporting the results of a testbed (ANNEX B)

3   BACKGROUND

The 58th session of the IMO Sub-Committee on Safety of Navigation agreed to the development of guidelines for the harmonisation of e-navigation testbeds.

The e-Navigation Underway 2013 Conference (January 2013) identified the need for a body to coordinate the harmonisation of testbed results. The conference concluded that *IALA could consider taking on this role and submit its results to the IMO*.

This guideline is in response to the above.

Some e-Navigation testbeds, such as MARNIS[2] and EfficienSea[3] have already taken place. Additionally, there are a growing number of testbeds currently under way. Some examples are:

- ACCSEAS[4] in the North Sea Region;
- MONALISA[5] in the Baltic Sea; and
- The Marine Electronic Highway[6] in the Straits of Malacca and Singapore.

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1 Meta-analyses are when results from a great number of experiments / tests are gathered, compared and trends, if any, analysed. A single experiment or test usually only offers limited information on a specific question / hypothesis; meta-analyses, however, can represent a bigger picture.

2 MARNIS was an Integrated Research Project in the 6th Framework Programme of EU aimed at developing Maritime Navigation and Information Services.

3 EfficienSea was a Baltic Sea Region project aimed at improving maritime safety and the environmental state of the Baltic Sea region, by the implementation of e-Navigation tools developed and improved with a transnational perspective. Website: www.efficiensea.org

4 ACCSEAS is a North Sea Region project to demonstrate how e-Navigation can assist accessibility of shipping to the region, whilst recognising the increased pressure of non-shipping use of the sea space. Website: www.accseas.eu

5 MONALISA is a Motorways of the Sea project within EU, contributing to the efficient, safe and environmentally friendly maritime transport through development and demonstration of innovative e-navigation services for the shipping industry. Website: www.monalisaproject.eu

6 The Marine Electronic Highway is a regional demonstration project aiming at enhancing maritime services, improving navigational safety and security and promoting marine environment protection and the sustainable development in the Straits of Malacca and Singapore.

4   TESTBEDS

A testbed (also commonly spelled as 'test bed' in research publications) is a platform for trialling development projects. Testbeds generally involve rigorous, transparent and replicable testing of, for example, scientific theories, computational tools and new technologies.

e-Navigation testbeds allow for early detection of new system functionality, operational usability, areas of enhancements and identification of weaknesses. Ideally, testbeds should be linked to human-centred design processes, to ensure any operational usability issues, are detected early. Testbeds should not, necessarily, be limited or restricted by current or planned architecture, data structures or existing procedures. Considerations when planning a testbed are given in 0.

Ideally, testbeds should be conducted in a controlled environment so that they do not adversely affect real-life situations, existing services and maritime safety. Conclusions can be drawn for many aspects of testbeds such as functionality, usability, feasibility and risk. As e-Navigation evolves from concept to operational reality, the importance of testbeds will continue to grow.

There are testbeds that, while being not directly identified as e-Navigation testbeds, are nevertheless relevant to e-Navigation. The reporting of results from such testbeds is encouraged.

5   HARMONISATION OF REPORTING OF TESTBED RESULTS

A number of testbeds are currently being established. Therefore, it is important that the results of testbeds are shared, as there could be outcomes and lessons learnt that will be useful to the maritime community. In order to do this and to allow for ready comparison of the relevant elements of testbed results (and map them to elements of the IMO e-navigation Strategy Implementation Plan), reporting of the results of testing of e-Navigation solutions, systems and services should be harmonised.

6   TESTBED RESULTS

For testbed results to be useful to other parties, tests/simulations/trials should ideally have scientific rigour for set-up, collection of data, analysis, etc. Additionally:

- the results presented should be objective;

- trials should be reproducible;

- data gathered should be statistically sound and meet generally accepted "scientific standards"; and

- testbed results should be presented in acceptable scientific formats (e.g. they should be suitable for publication in a peer-reviewed publication).

A framework, by way of a template for reporting has been developed (see Annex 2) that addresses the presentation of results. This should be taken into account when reporting results of testbeds related to e-Navigation. Once testbed results are available, organisations are encouraged to send these to the IALA Secretariat for publication on the e-Navigation portal (www.e-navigation.net).

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ANNEX A   CONSIDERATIONS WHEN PLANNING A TESTBED

It is advisable that the following considerations are taken into account when planning testbeds as it will assist in the harmonised reporting of testbed results.

When planning testbeds, the e-Navigation solutions selected should ideally be linked to user needs and the objectives of e-Navigation. Where possible, the solutions should address identified gaps in the e-Navigation gap analysis.

It is recommended that testbeds take into account a structured, transparent, objective and repeatable methodology. Where the output is in the form of software tools, these should ideally be open-source, with arrangements in place for collaboration, incorporating user feedback and identified improvements. Considerations include:

1. Architecture

It is advisable that, without restricting innovation, testbeds align with the IMO e-navigation architecture and the technical / operational services in the Maritime Service Portfolio.

2. User and stakeholder involvement

Testbeds should ideally involve users and stakeholders at every stage - from planning to implementation and assessment of results.

3. Human-centred design and quality assurance principles

Human-centred design and quality assurance principles should be taken into account during the development of e-Navigation solutions.

4. Data structures

The Common Maritime Data Structure (CMDS) agreed by IMO is the IHO S-100 Geospatial Information (GI) Registry. Testbeds should therefore preferably use the IHO S-100 framework for data modelling and exchange. Other data model frameworks may be used for testbeds. However, it is advisable that, for results to be of value to the development of e-Navigation, steps should be taken to incorporate solutions into the IHO S-100 framework.

5. Reference to the IMO e-navigation documentation

It is advisable that testbeds highlight links to user needs, gap analysis and solutions identified and documented by IMO.

6. Sharing of information

Information on testbeds should be provided on websites for the benefit of the maritime community. If possible, information should also be provided to the IALA Secretariat to be posted on its e-Navigation web portal (www.e-navigation.net).

An IALA on-line discussion forum titled 'e-Nav Test Beds', hosted on the Linked-In website (http://www.linkedin.com/groups/eNav-Test-Beds-5068692) is available for:

- discussions on methodology of testbeds;
- notifications of progress on testbeds;
- exchange of ideas and
- sharing of lessons learnt.

ANNEX B   REPORTING TEMPLATE

The purpose of this reporting template is to serve as a harmonised framework for reporting results from e-Navigation testbeds. In order to assist with the reporting of testbed results and to ensure these are valuable to the e-Navigation development community, it is advisable that all headings are completed - even those for which there is no information.

Testbed information will assist other organizations to learn more about the solution being tested. It may also offer other ideas to expand and further develop the solution.

Contents of the reporting template

1. General Information
- Name of testbed
- Location of testbed
- Time and duration of testbed
- Status (planned, completed or on-going)
- Contact person(s)
- Testbed website
- Organisation(s) involved
- Funding programme and budget

2. Executive summary

3. Testbed Information

- The type of user group/s involved in the test
    - *Shipboard users*
    - *Shore-based users*
    - *SAR users*

- Details of e-navigation gap/s considered for the testbed (*some examples are given below. For a complete list, please refer to the IMO MSC 91 report*):
    - *Information/data management*
    - *Effective and robust voice communication and data transfer*
    - *Systems and equipment*
    - *Ship reporting*
    - *Traffic monitoring; and/or*
    - *Training and familiarization*

- The category of e-navigation gap/s considered in the testbed
    - *Technical*
    - *Regulatory*
    - *Operational and/or*
    - *Training*

- Details of e-navigation solution/s considered in the testbed (*solutions prioritised by IMO are listed below. For a complete list, please refer to the IMO MSC 91 report*):
    - *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 available information in graphical displays received via communication equipment*

- o *S9: Improved Communication of VTS Service Portfolio*

- The category of e-navigation solution/s considered in the testbed
  - o *Technical*
  - o *Regulatory*
  - o *Operational and/or*
  - o *Training*
- Links to similar / relevant testbeds (if any)

4. Testbed methodology
- Methodology used for data collection
  - ➢ *Method*
  - ➢ *Validity*
  - ➢ *Reliability*

- Summary information on testbed respondents / participants
  - ➢ *Number*
  - ➢ *Background*
  - ➢ *Experience*
  - ➢ *Demographics (e.g. age, gender)*

- Procedure used in the testbed
  - ➢ *Testbed setup*
  - ➢ *Technical solutions used*
  - ➢ *Standards*
  - ➢ *Guidance documents*
  - ➢ *Standard Operating Procedures*
  - ➢ *Analysis of data*

5. Testbed results
- Summary of findings:
  - ➢ Presentation of data (e.g. statistics)
  - ➢ Users assessment and experience
  - ➢ Other comments

6. Conclusions and recommendations
- Conclusions
  - ➢ Lessons learnt
- Recommendations
  - ➢ Own plans
  - ➢ Suggested further studies

7. Publications
  - ➢ Peer-reviewed publications
  - ➢ Technical papers
  - ➢ Reports
  - ➢ Communication material (e.g. videos, flyers, pamphlets, etc.)

8. Reference material
  - ➢ List of reference material used in the testbed

Note: Symbols have the following meanings:
- *Sub-section / Sub-heading*
- o *Tick box (choose one or more)*
- ➢ *Free text field*

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