IALA GUIDELINE

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THE MANAGEMENT AND MONITORING OF AIS INFORMATION

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1. BACKGROUND

Automatic Identification System (AIS) is an autonomous and continuous broadcast system, operating in the VHF maritime mobile band. It exchanges information such as vessel identification, position, course, speed, etc., between participating vessels and shore stations. It can handle multiple reports at rapid update rates, using Time Division Multiple Access (TDMA) technology to meet these high broadcast rates, ensuring reliable and robust operation.

Chapter V of the 1974 *SOLAS Convention* (as amended) requires mandatory carriage of Automatic Identification System (AIS) equipment on all vessels constructed on or after 01 July 2002. Implementation for other types and sizes of *SOLAS Convention* vessels is continuing and is required to be completed not later than 31 December 2004.

SOLAS Chapter V, Regulation 19, paragraph 2.4.5 states that:

> "AIS shall:
>
> 1. provide automatically to appropriately equipped shore stations, other ships and aircraft information, including ship's identity, type, position, course, speed, navigational status and other safety-related information;
> 2. receive automatically such information from similarly fitted ships;
> 3. monitor and track ships; and
> 4. exchange data with shore-based facilities."

In addition, the IMO Performance Standards (1.2) for AIS state:

> "*1.2* The AIS should improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment, and operation of Vessel Traffic Services (VTS), by satisfying the following functional requirements:
>
> .1 in a ship-to-ship mode for collision avoidance;
>
> .2 as a means for littoral States to obtain information about a ship and its cargo;
>
> .3 as a VTS tool, i.e., ship-to-shore (traffic management).
>
> 1.3 The AIS should be capable of providing to ships and to competent authorities information from the ship, automatically and with the required accuracy and frequency to facilitate accurate tracking. Transmission of the data should be with the minimum involvement of ship's personnel and with a high level of availability."

AIS data can be gathered from local, regional, national or international network systems of AIS base stations and can be applied to Marine Aids to Navigation (AtoN) to further improve and enhance services provided to mariners.

1.1. SCOPE

The purpose of this document is to provide guidance for the management and monitoring of AIS information for and by authorities.

2. INFORMATION PROVIDED BY AIS

The information made available to authorities from AIS includes the number of vessels in an area, including identity, type, length, width, draught, type of cargo, destination, position, heading, course and speed over ground, manoeuvring status.

2.1. MANAGING AIS INFORMATION

AIS makes it possible to:

- Display traffic on electronic navigational chart and radar display.
- Provide information to VTS centres.
- Monitor shipping routes including mandatory and recommended routes (can be more cost effective than other options, e.g., radar).
- Calculate the required area (space) of fairway and ship's path width.
- Find trends from the analysis of AIS data:
  - Number and size of different types of ships
  - The use of different routes by different types of ships.
- Improve safety of navigation by improving the knowledge of the requirements for AtoN Systems and vessel traffic services.
- Improve the effectiveness and efficiency of planning, management and maintenance of waterways, including Marine Aids-to-Navigation and Vessel Traffic Services.
- Provide data for risk analysis.
- Provide data for long term planning.
- Provide data for marine accident investigation.

2.2. AWARENESS OF LIMITATIONS OF AIS INFORMATION

There are limitations to AIS that must be taken into account when using AIS information for the monitoring and analysis of traffic data:

- The data received is only as accurate as the data entered into the AIS.

  To ensure that correct AIS information is broadcast to other vessels and shore authorities, mariners are reminded to enter current voyage related data such as draught, type of hazardous cargo, destination and ETA properly at the beginning of each voyage and whenever changes occur.
- Not all ships carry AIS.

  In particular, pleasure craft and fishing vessels, may not be fitted with AIS. This could affect the completeness of the data used when analysing traffic movements in a given area.
- The AIS unit may not, in all cases, be installed in accordance with the IMO Guidelines.

  This can result in poor performance and erroneous transmissions.
- The AIS fitted on ships as a mandatory carriage requirement may, under certain circumstances, be switched off.

  This can occur particularly where international agreements, rules or standards provide for the protection of navigational information.
- AIS is subject to the discrepancies and limitations of VHF-FM propagation.
- AIS is subject to vulnerability aspects of GNSS.

Vulnerability of GNSS is further identified in IALA Recommendation *R0129 (R-129) GNSS Vulnerability and Mitigation Measure*s. At present, both non RAIM enabled, and RAID enabled equipment is identified for SOLAS vessels, depending on the date the equipment was fitted (prior to July 1, 2003 or after July 1, 2003). Ships fitted with older receivers will transmit an incorrect position and the Officer of the Watch (OOW) may be unaware that incorrect own ship's positions are being transmitted.

2.3. USE OF REAL TIME (ONLINE) AIS INFORMATION FOR MARITIME DOMAIN AWARENESS AND SAFETY

The use of real-time (online) AIS data for maritime domain awareness and safety includes:

- Monitoring of restricted areas.
- Monitoring mandatory routes.
- Providing and monitoring domains (guard zones) around specific objects (obstructions, new wrecks, anchored vessels, rigs, AtoN, etc.).
- Generating alerts in shore based monitoring centres.
- Providing data for port State controls, port authorities, coast guard centres and other authorities and services.
- Providing data for Search and Rescue.
- Monitoring vessels of particular interest.

2.4. AIS INFORMATION FOR MARINE ACCIDENT INVESTIGATIONS

AIS provides Marine Accident Investigation Boards with historical AIS-data to:

- identify historic location of a vessel (tracks) at a certain time in a certain area that could have caused an incident /accident; and
- analyse "behaviour" of vessels involved in accidents or near misses (replay of situation before and during the incident).

3. USE OF HISTORICAL AIS DATA FOR PLANNING AND EVALUATION PROCESSES

Historical AIS data should be used by waterways and shipping authorities including AtoN services for planning and evaluation of:

- Vessel traffic services (plan and optimise design and operation)
- AtoN (plan and optimise systems and single aids)
- Waterways/hydrography/dredging (planning and evaluation of fairways, channels, canals, traffic lanes, traffic separation schemes and routes)
- Tools for safe path guidance for particular vessel traffic (e.g., recommended routes for deep draught tankers)
- Search and rescue, icebreaking and pollution counter measures, oil and chemical spill recovery (to improve response efforts and coordination)
- Location of offshore wind farms and other offshore structures

- Monitoring programs both before and after improvement measures on ports and waterways (approval of the plan is a legal requirement in some countries and will include ongoing monitoring).
- Risk analysis/risk assessment (identify risk levels and evaluate risk control options).

3.1. INFORMATION GAINED FROM ANALYSIS OF HISTORIC AIS DATA

The information derived from historical AIS data can:

- Improve knowledge about the number and type of vessels in different areas and waterways.
- Improve knowledge about traffic density and waterways.
- Provide options for analysis and evaluation of traffic patterns and "behaviour" of different types of vessels.
- Identify near-misses to structures in and on the waterway.
- Identify near misses between vessels.
- Enable the replay of relevant situations to evaluate action taken by the authorities.
- Create realistic scenarios as background for simulations.
- Be used to calculate the width of the path actually used by the ship.

3.2. HISTORICAL AIS DATA FOR THE DAY-TO-DAY WORK OF AUTHORITIES

AIS data can be useful for tracking and detecting ships that caused:

- pollution; and
- damage to AtoN and other structures in the waterway.

4. DESIGN AND IMPLEMENTATION OF AIS DATA STORAGE, HANDLING AND PROCESSING SYSTEMS

4.1. DEFINING BASIC USER-REQUIREMENTS

To ensure that AIS data can be easily retrieved and analysed, it is important to define basic user-requirements:

- Data format is internationally standardized.
- Raw data should be stored.
- Filters of the available AIS-information (e.g., dynamic, static, voyage-related, density, geographical area) may be applied.
- Length of storage time for data and removal procedures must be specified.
- Procedures for redundancy and backup of stored data should be provided.
- Legal aspects (ownership of data, access to data, use of data, protection of data) should be determined.
- Connection to external databases (such as Lloyds Register) may be considered.

4.2. DATA STORAGE AND PROCESSING

When storing and processing data, the authority should:

- Ensure reliability of data.
- Ensure that data formats are standardized.
- Consider aspects of:
  - Data concentration
  - Data exchange
  - Storage retrieval
  - Presentation (predefined reports, user defined reports, graphical displays)
  - Replay functions
  - Use of filters
  - User-interfaces including web access
  - Charts

5. INFLUENCES ON THE AIS INFRASTRUCTURE

Influences on the AIS infrastructure, including costs, should be considered.

6. DEFINITIONS

The definitions of terms used in this Guideline can be found in the *International Dictionary of Marine Aids to Navigation* (IALA Dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

7. ABBREVIATIONS

AIS	Automatic Identification System
ANM	Aids to Navigation Management Committee (IALA), now named ARM
AtoN	Marine Aid(s) to Navigation
ETA	Estimated time of arrival
FM	Frequency modulation
GNSS	Global Navigation Satellite System
HANSA	Harbour Approach Channels & Guidelines (PIANC)
IMO	International Maritime Organization
IMPA	International Maritime Pilots Association
MARCOM	A PIANC technical working group
PIANC	The World Association for Waterborne Transport Infrastructure
RAID	Redundant Array of Independent Disks
RAIM	Receiver Autonomous Integrity Monitoring

SOLAS	International Convention for the Safety of Life at Sea (IMO 1974 as amended)
TDMA	Time-division multiple access
VHF	Very high frequency (30 MHz to 300 MHz)
VTS	Vessel traffic services

8. REFERENCES

[1] Alan L. Blume Toward a Better Understanding of Waterway Capacity. “ON COURSE”, PIANC magazine AISM No. 118 January 2005

[2] EU Directive 2002/59/EC Establishing a Community vessel traffic monitoring and information system European Parliament and the Council of 27 June 2002

[3] Helcom Copenhagen Declaration, 10 September 2001

[4] Helcom Expert Working Group on AIS (Documents from) available at www.helcom.fi

[5] IALA input paper, Risk Analysis of Navigational Safety in Danish Waters. submitted to IALA ANM Committee: ANM 3/16/2

[6] IMO input paper, Assessment of the traffic in the Baltic Sea West. submitted by Denmark and Sweden March 2005 to IMO Sub-Committee on Safety of Navigation 51st session

[7] IMO input paper, New traffic separation schemes in Bornholmsgat and North of Rügen, recommended route in the east Baltic Sea, amendments to the traffic separation schemes off Gotland island and South of Gedser and new areas to be avoided at Hoburgs Bank and Norra Midsjöbanken. submitted by Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden March 2005 to IMO Sub-Committee on Safety of Navigation 51st session

[8] IMO input paper, Results of a study on the effect of new routeing measures in the southern part of the western Baltic Sea. submitted by Germany March 3rd 2005 to IMO Sub-Committee on Safety of Navigation 51st session

[9] PIANC-Report Approach Channels, A Guide for Design, published April 1995, in co-operation with IAPH, IMPA and IALA

[10] PIANC-Report Wake Wash Guidelines for Managing Wake Wash from High-Speed Vessels, Report of PIANC Working Group MarCom WG 41 HIGH-SPEED Ferries

[11] Prof. R. Müller, A. Zolder, F. Hartmann, Historical AIS data use for navigational aids. “HANSA” International Maritime Journal No. 1 / 2005

[12] Royal Danish Administration of Navigation and Hydrography Maritime Safety Research in the Baltic Sea – a tool for common research areas. September 2004

ANNEX A RELATED DATABASES & PROJECTS

- Lloyds Register of ships
- Weather reports
- Dangerous goods databases
- Voyage data recorder
- Safe Sea Net
- IALA Risk Assessment Toolbox
- Marine Aids to Navigation database (general)
- Safety@Sea (European Marine Management Program)