COMMUNICATIONS FOR MARITIME SAFETY AND EFFICIENCY

Francis Zachariae, Secretary-General, IALA
IALA and its Purpose

• Non profit, international technical association established in 1957

• Two Goals aimed at a harmonised and complete global aids to navigation system by 2026

• Standards, Recommendations, Guidelines, Manuals, Model Courses
Technical Committees

The “Power House” of IALA

- AtoN Requirements and Management (ARM)
- Engineering and Sustainability (ENG)
- Vessel Traffic Services (VTS)
- e-Navigation (ENAV)
Maritime industry drivers for future radio spectrum use

• IALA focuses on the safety and efficiency of navigation
  • Not concerned with spectrum for ship social & media needs, ship systems management, etc.

• Drivers are:
  • Maritime safety information, and weather and ice information
    • Using various channels, 500KHz up to satellite
  • Ship-ship and ship-shore interaction is most important in the coastal phase of a voyage
    • Vessel Traffic Services (VHF voice today)
    • Shore authority monitoring
    • Ship reporting for safety, for legal/customs/immigration/ port operations
    • Vessel tracking for safety and security
  • Aids to Navigation
    • Racons X and S bands, AIS Aids to Navigation in VHF band
  • Positioning services, space and terrestrial
New trends affecting spectrum and bandwidth needs

- Increased digital interaction in coastal and harbour phases of a voyage
  - Single window reporting requirements
  - Expected transition of VTS to digital data
  - Near real time flow of hydrographic and AtoN information
    - Continually updating ships’ charts and navigation data
- Piracy and illegal or suspicious maritime activity
  - Driving digital surveillance in oceanic and coastal phases
  - Presently AIS reception, in future by dedicated VDES channels
- Projects to increase the efficiency and sustainability of the maritime transport chain
  - Just in time
  - Collaborative decision-making within port services
  - Coordination of sea transport with land and river transport connections
- Autonomous ships
  - Communications needs for navigation and pilotage are presently unclear
Connectivity possibilities for navigation services are extensive

- VDES (includes AIS, ASM, VDE-T and VDE-S)
- DSC (VHF, HF, MF)
- NAVDAT (development of NAVTEX)
- Wifi
- 3G/4G (including WiMAX & LTE; LTE-A; LTE-M)
- 5G
- Satellite (GEO; MEO; LEO)
- Digital HF
- Maritime Broadband Radio developments
IALA’s radio communication plan for maritime

- Covers all spectrum requirements for maritime radio communications

- Reflect outcomes of WRC-15 and preparation for WRC-19

- Also takes into account the maritime communications requirements of other users, including domestic commercial vessels and recreational craft.
VHF Data Communications

• AIS was implemented worldwide for SOLAS ships
  • For ship-ship and ship-shore information exchange
  • For safety of navigation
• But channels AIS1 and AIS2 are increasingly occupied
  • Fishing net markers, transmitters used by divers, others
  • Disrupting navigation displays on-board
• Some authorities are having difficulty regulating these devices
VHF Data Exchange System, VDES

- Relieve VDL loading
  - Keep AIS1 and AIS2 for safety of navigation

- Move ASMs to separate channels
- Satellite channels for vessel detection and tracking (LRIT)
- Satellite up and down links for remote areas (Polar regions, oceans)
- Medium speed data channel (100KHz) for data exchange
VDES merits

• Technical standards near complete – ITU-R.M2092 and IALA Guideline
  • Frequencies allocated by ITU (awaiting satellite channels, WRC2019)

• Shore side
  • Easy conversion of existing AIS Base Station sites
  • Good coastal and harbour coverage

• Ship side
  • Requires update or replacement of AIS hardware
  • But cabling and antennas OK
  • No cost for messages
  • Trusted data over “closed” VHF system
VDES is already happening

- EU Efficiensea project
- Sesame (Malacca and Singapore) Straits
  - Route exchange between ship and shore using the VDE channels
- ESA projects
- STM Validation project – using VDE channels
- Kongsberg, CML, and others have equipment in manufacture
- Norsat 2 Satellite – tests of broadcast from LEO satellite now in orbit

![Diagram of satellite and ground track, showing VDE antenna and receiver antenna.]
Non SOLAS

- Korea is planning to use LTE/5G within its Smart Navigation project
  - For Fishing and leisure vessels
  - Where most accidents happen
- Japan and others have implemented smart-phone systems in local areas for small craft
Maritime Connectivity Platform

- Services can be easily registered, discovered, and used
- Identities can be verified
- Digitally signed data exchange
- Location used as a parameter for service discovery, identity verification and message transfer
Everyone uses satellite navigation

- Will become better in accuracy, availability, and resilience
  - GPS, GLONASS, Galileo, BeiDou
  - Supplemented by SBAS

- But all GNSS are susceptible to space weather and intentional disruption
IALA view on terrestrial backup for GNSS

- eLoran would be great
  - But there is limited national support
  - Probably no chance of extensive global implementation

- We can use existing assets to provide terrestrial PNT back-up in coastal and harbour areas
  - Where the RPNT need is greatest
  - DGPS stations
  - AIS/VDES base station networks

- Concept is called “R-Mode”
  - Accuracy tens of metres at MF, maybe a few metres at VHF
**R-Mode status**

- Concept developed within the EU ACCSEAS project
- “Baltic R-Mode Project” just started
  - With government & commercial partners and EU funds
- VHF R-Mode trials have already been conducted in China
  - Promising accuracies obtained
- Aim – an IALA-harmonised system for coastal and harbour areas globally
Autonomous Ships Will Be Great

Doing away with sailors will make the high seas safer and cleaner.

London Times – “We’d Be Lost Without GPS Says Royal Institute of Navigation”

December 5, 2017

Blog Editor’s Note: The British government has been actively addressing this issue. See the economic impact analysis they did earlier this year. We understand additional work...

About Sea Traffic Management

STM – THE NEXT STEP FOR A SAFER, MORE EFFICIENT AND ENVIRONMENTALLY FRIENDLY MARITIME SECTOR

ESA Director General Jan Woerner signed a Memorandum of Intent with Rolls-Royce today, as the two entities agree to investigate how space technology can be used to develop autonomous and remote-controlled ships.

Route plan exchange format - RTZ

Route plan exchange is used in conjunction with ECDIS to IEC 61174.

THE PORT CDM CONCEPT – A FINALIST FOR INNOVATION AWARD
The future for maritime communications for navigation

- Shore services from Competent Authorities
- Connectivity, ship-ship-, ship-shore, shore-shore
  - Harmonised digital connectivity
  - Coordinated digital services, global and regional
  - Harmonised messages allowing all stake-holders to create own services
- Future digital Vessel Traffic Services
- Resilient Position, Navigation and Timing (RPNT)
THANK YOU

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