Trend of International Maritime Safety

Digital Ship - Korea

2012. 10. 31
Current Trend of International Maritime Safety
1. Current Trend

1) Global Trends

- Increasing need of efficient maritime traffic and logistics
  - Today, more than 80 percent of international trade goods are carried by sea. (source: Berg Insight)
- Increasing numbers and costs related to groundings and collisions
  (source: International Union of Marine Insurance)
- 60% of these accidents are caused by direct human failure
  (source: Nautical Institute)
1) **Background**

- In 2005, the British Minister of Transportation contacted the US Coast Guard concerning the lack of coordination in the field of electronic maritime navigation and related regulatory development.
- UK asked for the support of USA, wanting IMO to address the need for more uniform coordinated effort in the development of all these electronic systems.
- The result was a request from UK – supported by Japan, the Marshall Islands, Netherlands, Norway, Singapore and USA – to IMO’s Maritime Safety Committee to undertake a major new work program, with the intention to realize the vision of global e-Navigation.
- In 2009, IMO agreed on a strategy plan for e-Navigation.

2) **Background - organization**

- The Work Programme was elaborated by the IMO Maritime Safety Committee (MSC).
- It implied chairing 3 working groups under the sub-committees of Safety of Navigation (NAV), Radio-communication and Search and Rescue (COMSAR) and Standards for Training and Watchkeeping (STW) but also the coordination of a Correspondence Group to prepare the reports for the 3 sub-committees.
2. e-Navigation

3) Definition

“e-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information onboard and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment”

(IALA: International Association of Marine aids to Navigation and Lighthouse Authorities)

4) Key Goals of e-Navigation

• Improve the safety of marine navigation for all vessels and protection of the environment
• Improve the efficiency of marine navigation and vessel traffic services
• Provide opportunities for improving the efficiency of transport and logistics
• Improve the monitoring of and communication with sea-borne transport therefore enabling competent authorities to provide enhanced security and other allied services
• Support SAR services and incident management, and
• Provide improved tools to facilitate optimum support and to engage mariners and shore based users whilst maintaining high levels of attention without causing distraction or undue burden
2. e-Navigation

5) Why e-Navigation?

- Many complicated systems onboard and ashore need a coordinated and harmonized development
- Increasing demands for safer maritime traffic and better security measures, including official requirement for civil traffic monitoring and communication, and exchange of information ship-shore and shore-ship
- Increasing demands for better coordination and effective actions related to search and rescue services, oil protection etc
- Coordination and presentation of information:
  - User friendly data solutions onboard and ashore to enhance safe navigation, to reduce the risk for users misunderstandings and confusion
  - Simplify the users work load
- Improve the Human Machine Interface to reduce accidents and human failure
- Increased demands for training and users competence onboard and ashore
2. e-Navigation

**Inputs**

- Real-time (or near real-time) update information
  - AtoN (e.g. position/status)
  - Maritime Safety Information (MSI)
  - Radar
  - Position fixing systems
  - Ships sensors (e.g. heading, log etc)
  - Echo sounder
  - Sonar (optional)
  - Inertial navigation system
  - Ship to Ship & Ship to Shore & Shore to Shore communications
  - AIS data
  - Meteorological
  - Updates to charts & publications

- Long-lead (reference) information
  - Digital charts & publications
  - AtoN infrastructure and relevant AtoN information
  - Predicted meteorological, oceanographic and hydrographic data (e.g. Seasonal weather patterns, tides etc)

- Organisational
  - Training & procedures
  - Quality management processes
  - Data access and security protocols
  - Conventions, Regulations & Guidelines (IMO, ITU, IALA, & IHO)
  - Communication protocols (ITU)
  - International standards (ISO, IEC, other)
  - Legal instruments

**E-Nav Core**

- Shipborne e-nav system
- Integrated communications (includes AIS & LRIT data, standardised reports etc)
- Shore e-nav system
- person

**Outputs**

**Safe Navigation**

- Enhanced:
  - anti-collision and anti-grounding processes
  - route planning & monitoring
  - pilotage & berthing
  - under keel and air-draft clearance management

**Efficiencies and other benefits**

- Standardised and automated maritime reporting
- Logistics efficiencies (including Port State Control, port operations)
- Potentially reduced insurance costs
- Improved security
- SAR & pollution response
- Strategic analysis for infrastructure refinement
- Incident analysis and investigation
- other
3. IMO’s Approach

- Shipboard navigation systems
  - Integration of ownship sensors
  - Supporting information
  - Standard user interface
  - Comprehensive systems for managing guard zones and alerts

- Core elements include:
  - High-integrity electronic positioning (e.g., GNSS)
  - Use of ENCs and ECDIS
  - An analysis capability to reduce human error

- All while actively engaging the mariner in the process of navigation while preventing human error.
E-Navigation is about getting ships safely, securely and efficiently from berth to berth in an environmentally friendly way, using globally enhanced systems for navigation, communication and related services – with the human element in focus.

- **on board** – harmonization of navigation systems, thereby actively engaging the mariner in the process of navigation to carry out his duties in a most efficient manner, while preventing distraction and overburdening;

- **communications** – providing an infrastructure which allows seamless information transfer on board ship, between ship and shore authorities and other parties with many related benefits; and

- **ashore** – management of Vessel Traffic Service (VTS) and related services, such as search and rescue, port and MSI services, through better provision, coordination, and exchange of comprehensive data in formats that will be more easily understood and utilized in support of vessel safety and efficiency.

*prerequisites: ENC with navigation area, strong positioning system, agreed infrastructure of communications between vessels and shores*
3. IMO’s Approach

Overarching e-Navigation Architecture

Shipboard environment
- Shipboard user
  - Stated information needs/information items requested
  - Data provided in required format

Shipboard technical equipment supporting e-Navigation (Incl. its Human-Machine-Interface(s))
- Functional links used by Technical services
- Physical links used by Technical services

Common technical shore-based system harmonized for e-Navigation (Incl. its Human-Machine-Interfaces)
- Stated data request
- Data provided in required format

Maritime Service Portfolio
- "common data structure" = proposed Common Maritime Data Structure (CMDS)

Operational services
- VTS Operator
- MRCC Operator

Shore-based authority, such as IALA National Member etc.
- Stated information needs/information items requested
- Data provided in required format

World Wide Radionavigation System (WWRNS) of IMO (Incl. GNSS, GNSS augmentation and terrestrial backup)
3. IMO’s Approach

IMO e-navigation Work Program

- 2009: Survey and prioritizing of User Needs
- 2010: Description of functions and services. Selection of system architecture
- 2011: Gap analysis
- 2012: Risk and Cost/benefit analyses
- 2013: Proposal for a final Strategy Implementation Plan for e-Navigation (operational, technical, regulatory, training), including promotion and funding.
- 2014: Final decision by IMO.
4. IALA’s Approach

- Working groups
  - WG 1: Operation and Strategy
    Information Portrayal (Drafting group)
  - WG 2: PNT (Positioning, Navigation & Timing) / Sensors
  - WG 3: AIS
  - WG 3/4: AIS & Communication Systems
  - WG 5: Technical Architecture
  - WG 6: Data Modeling and Interfacing

- Review and update IALA Strategy for e-Navigation
  - Review of e-Navigation Roadmap
  - e-Navigation Platform suite

- Guideline on Harmonized Portrayal of e-navigation-related information

- Review of Monitor developments in ECDIS, INS, and ENCs

- Developing the AIS and VDE Plan for e-Navigation
4. IALA’s Approach

**e-Navigation Roadmap**

- ECDIS implementation (to 10,000 Ton) 
- Standard default settings, save/recall settings, S-mode and define resiliency for INS/ES
- Electronic Charts for other vessels
- Develop Concepts for default settings / S-Mode
- e-Navigation, INS/ES Availability
- Develop integrated PNT including WWRNS, resiliency and multi-system receiver
- Implement integrated PNT including WWRNS, resiliency and multi-system receiver
- AIS development / implementation
- Identification / development future applications and VHF Comms (VDE)
- AIS & VHF Comms (VDE) implementation
- Identification / development other communications
- Migration “old” / “new” communications into 1 concept
- GMDSS Review
- AIS development / implementation
- Migration GMDSS
- Application for standard reporting
- Implementing IHO registry applications
- Development of IHO registry applications
- Migration of IHO registry applications
- Single window implementation
- Shore based single window development
- MSP Applications
- MSP Applications
- Review of competency and training
- Review of regulatory process
- Review of legacy systems (LRIT, paper charts, NAVTEX, etc.)

2012
2014
2016
2018
2020
5. e-Navigation Test Bed

- Projects under the EU Baltic Sea Regional Programme
  - 16 partners from Denmark, Sweden, Norway, Finland, Poland and Estonia
  - Budget: 8M€
- The Baltic Sea e-Navigation Test bed
- Overall Purpose
  - Prepare the participating organizations for the e-Navigation “revolution”
  - Assist the overall e-Navigation process as conducted by the IMO and others
MONALISA – Motorways & Electronic Navigation by Intelligence at Sea
Development, demonstration and dissemination of innovative e-navigational services to the shipping industry
- SMA (Swedish Maritime Administration)
- Budget: 22.4M€ from EU

Dynamic & Proactive Route Planning – “Green Routes”
ACCSEAS (ACCessibility for Shipping, Efficiency, Advantages and Sustainability)

Part of the INTERREG IVb North Sea Region (NSR) Programme
- 11 partners from Denmark, Germany, Netherlands, Norway, Sweden and UK (GLA, WSV, DMA, RWS, SMA, NCA, FUAS, NHL, CTH, SSPA, WMU)
- Budget: €5.6M

Cooperate with and build on the achievements of the ‘EfficienSea’ and ‘Monalisa’ projects
Develop an innovative test-bed of e-Navigation solutions & robust e-Navigation services
Establish prototype solutions based on IMO’s e-Navigation concept to ‘bring maritime navigation into the digital age’
5. e-Navigation Test Bed

MEHDP (2010~2012)

- MEHDP (Marine Electronic Highway Demonstration Project)
- Organized by the International Maritime Organization (IMO) which primarily aims to contribute to the marine environment and safety of the Straits of Malacca and Singapore.
  - Indonesia, Malaysia, Singapore, IMO, World Bank, Korea, and GMT
- Navigational Safety & Environment Protection in the Straits
  - Establishment of Hardware & Network Infrastructure
  - Linkage of E-MIO Data and Weather Information (Wind, Current, Tide)
  - Provision of Information via Web Services to Ships & Centers
  - Provision of ENC-based Monitoring Service
5. e-Navigation Test Bed

MEHDP (Marine Electronic Highway Demonstration Project)

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<th>e-Navigation</th>
<th>MEH Project</th>
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<tbody>
<tr>
<td>what¹)</td>
<td>collection, integration, exchange, presentation and analysis of marine Information</td>
<td>marine information, including E-MIO, weather, and vessel information</td>
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<td>where²)</td>
<td>onboard and ashore</td>
<td>onboard and ashore</td>
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<td>how³)</td>
<td>by electronic means</td>
<td>through the integrated surveillance and monitoring system</td>
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<td>why⁴)</td>
<td>for safety and security at sea and protection of the marine environment.</td>
<td>for the marine environment and safety of the straits of Malacca and Singapore</td>
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- MEHDP will be closed in the end of 2012
- MEH project will be linked to Co-operative Mechanism and become a permanent agenda.
Application of e-Navigation in Korea
GICOMS (General Information Center on Maritime Safety & Security)

National system for monitoring and management of safety, environmental protection and Security at sea. It aims at prevention of marine casualty, swift reaction to marine casualty and minimization of damage by system integration of regarding vessel, people, traffic, security, Port Facility and cargo.

Main functions:
- Analysis - Tracking and Analysis historical movement
- Safety - Forecasting & Preventing Collision
- Safety – Metrological service
- Arrival/Departure with non-reporting Alert system
- Accident Analysis
2. Standardization

1) Vision & Goal

- Step 1: Participation in International Standardization Process of e-Navigation
- Step 2: Securing National Competitiveness
- Step 3: Creation of e-Navigation Market

2) Expected Effectiveness

- Economic Effect
- Technology Effect
- Impacts on Society
2. Standardization

1) Definition of Core Technologies and Standardized Items

- Vessels’ Safe Navigation
- Vessel Safety Management
- Vessel Traffic Monitoring
- Vessel Cargo Data Management
- Maritime Communications

2) Analysis of Related Technologies

3) Carry forward a plan for internationalization
Future Direction and Prospects
1. Future Outlook

- More Focus on e-Navigation
- Increased integration of sensors, information and communication
- Changing Times
  - Navigation equipments and systems are evolving: increasingly more complex and sophisticated
- Global Cooperation
  - Information must be exchanged globally
  - Role of International Organizations (IMO, IALA, so on)
  - Effective Utilization of Testbed
- Future GICOMS Plan (2012-2016)
  - The GICOMS, a base-model of e-navigation in Republic of Korea
  - Expansion to ship-user oriented system/service as well as shore-user
  - Strengthened prevention of marine disaster through intelligent predictive system and decision support system
  - Globalization of the GICOMS by establishing a global marine safety information sharing network
  - Strengthened provision of marine accidents through reinforced marine surveillance

e-Navigation: A New Paradigm is on the way.
Thank You