IMO E-navigation Concept and MET trends

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Abstract The e-navigation Strategy Implementation Plan (SIP), which was approved by IMO Maritime Safety Committee (MSC 94) in November 2014 [1], contains a list of tasks required to be conducted in order to address 5 prioritized e-navigation solutions, namely:

- improved, harmonized and user-friendly bridge design;
- means for standardized and automated reporting;
- improved reliability, resilience and integrity of bridge equipment and navigation information;
- integration and presentation of available information in graphical displays received via communication equipment; and
- improved Communication of VTS Service Portfolio (not limited to VTS stations).

The paper reviews the IMO e-navigation papers and current trends related dynamics of MET stipulated by development of SIP, which can affect in the near future the STCW Convention and Code.

Keywords: e-navigation, Strategy Implementation Plan, MET, gap analysis, STCW 78.

1. Introduction

The shipping industry is constantly moving to digital world. As per paper [3], e-navigation is expected to provide digital information and infrastructure for the benefit of maritime safety, security and protection of the marine environment, reducing the administrative burden and increasing the efficiency of maritime trade and transport.

In this context the following questions can be raised: Is adequate MET system needed for seafarers in the era of e-navigation? Do maritime universities ready to meet the upcoming new ICT (Information and Communications Technology) challenges in shipping? Do they ready to equip their students with new thorough knowledge or may be the STCW Convention has enough well developed competencies, which are completely adequate to changing environment and nothing to be done?

The e-navigation SIP introduces a vision of e-navigation which is embedded in general expectations for the on board, on shore and communications elements. The main objective of the present SIP is to implement the five prioritized e-navigation solutions, taking into account the IMO Formal Safety Assessment (FSA), from which a number of required tasks have been identified. These tasks should, when completed in the period 2015-2019, provide the industry with the harmonized information, in order to start designing products and services to meet the e-navigation solutions.

2. Background

IMO has begun to develop Manila amendments and e-navigation concept practically in parallel ways in 2006. Let us recall some facts, which have occurred the last years and which might be linked in the near future as consistent events:

1. E-navigation SIP, which was approved by the Sub-committee NCSR 2 [3] and then also approved by Maritime Safety Committee (MSC) on its 94th session [1] actually represents the initial stage of the development of e-navigation and it is designed for the period 2015-2019.
2. Resolution 15 [4] “Future amendments and review of the STCW Convention and Code” adopted by Manila Diplomatic Conference in June 2010 recommends, that a comprehensive review of the STCW Convention and Code should, as far as possible, be carried out every ten years to address any inconsistencies identified in the interim; and to ensure that they are up to date with emerging technologies. So, in principle comprehensive changes might be initiated and stipulated in 2020 by the progress of fulfillment of e-navigation SIP, but

3. In 2011 STW 43 noted, that: some training elements, especially those that were, in general, covered by the STCW Convention and Code, might need to be reviewed in the future in light of the forthcoming developments on e-navigation and the revision, updating or development of training elements should only be considered in the future, after having a clear understanding of the potential technical, operational and regulatory e-navigation solutions that would be developed by the Organization [5].

4. IMO HTW 1 meeting of Sub-Committee in 2014 has agreed that it is premature to consider any training requirements on e-navigation, pending the finalization of the e-navigation SIP. HTW 2 meeting confirmed this solution.

5. However, at the same period IMO has developed the Gap Analysis and practical e-navigation solutions with Human Element, which include some important proposals for identifying gaps in training of seafarers and appropriate staff ashore. Some identified gaps might relate to STCW Code and they in turn also can be the basis for future consideration.

Contradictory views were sounded in 2012 during the International conference on e-navigation [6], for example:

6. ICS considers that training, but not necessarily a training course, may be required to introduce the concept of e-Navigation to users;

7. The automation, harmonization and integration driven by the definition of e-Navigation should ensure that training additional to that already required under the STCW is generally unnecessary.

8. E-Navigation improves situational awareness and decision making at sea and ashore. When used in conjunction with other communications and display systems it enables shore organizations to deliver more timely and relevant information to the mariner. And through its many levels of sophistication and scalability it can embrace all levels of system users from recreational craft to the largest and most modern commercial vessels. A drawback is that its use requires that there be a new level of sophistication and equipage on the part of the system users. And this in turn requires new levels of user training and certification.

So, a lot of things in MET are needed to think over and consider before the e-navigation SIP begins to start its implementation.

3. E-navigation and Situation Awareness

The IMO definition of e-navigation concept is as follows [7]: "E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board 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."

The following clarification of IMO definition is given in US e-navigation Strategic Action Plan [8]: e-Navigation is not about equipment, but is about the integration of information. There is and will be no such thing as an “e-navigation system,” nor will there be a carriage requirement for an “e-navigation
Eventually, equipment and systems may be required to be “e-navigation compliant” but such requirements are yet to be developed.

Let us try to combine the sense of definition and clarification above with definition of Situation Awareness (SA). SA is the safety driven perception of the elements in the environment within a volume of time and space (navigational area), the comprehension of their meanings (dangers, marks, ships, lighthouses…) and the projection of their status in the near future (developing of navigational situation), [9]. In other words SA involves the real-time processing of event-based information coming from an evolving situation in an attempt to understand what is happening, [10].

So, one of the goals of e-navigation, as globally integrated maritime network, is electronically to know what is going on around the ship. In principle, it has the task to support the proper level of Situation Awareness of personnel on board and ashore for safety and security at sea and protection of the marine environment.

One can say that e-navigation concept is also in line with the appropriate provision of STCW 78 and namely “obtaining and maintaining the situation awareness “, which is included into Column 2 «Knowledge, understanding and Proficiency» of STCW Code by Manila amendments (Tables A-II/1,2; A-III/1,2,6). In what way the e-navigation concept with its integrated approach can influence the STCW competences? Do only Section A-II, or possibly Sections A-III, A-IV and A-VIII also might be subjected to some changes?

From the viewpoint of training, the integrated information, in spite of human-centered design of equipment, might be less clear for operator than information obtained by traditional non-integrated approach that is why more deep understanding of principles of integration might be needed. It may be the additional subject for MET programs.

4. Gap analysis results: training

HTW2 Subcommittee adjourned the discussion of issues related to the training of seafarers, explaining that by number of uncertainties, but however carried out a gap analysis, allows pre-select the field that can change the training or affect the training of seafarers.

What one can say about the shore-based personnel training in field of e-navigation? If to follow principles of e-navigation, some training programs need to be also integrated with training programs for seafarers? Officers and shore staff should have an opportunity to be trained together. Perhaps, it would be reasonable to develop and include in STCW Convention or ISM Code the requirements for all types of joined training for crews and shore staff.

Some ideas and proposals extracted from gap analysis [3] in the area of e-navigation and related to staff training, both for onboard and ashore are as follows:

Training courses are proposed to be developed:

1) on automated procedure of ship reporting;
2) on procedure of data entry, using harmonized data format and related equipment;
3) on information management system;
4) on familiarization with new symbolic presentation environment (due to lack of standardized symbology of all information required to display on the navigational system);
5) on new communication equipment;
6) for shore based users to be familiarized with the CMDS (Common Maritime Data Structure) and its contents of their own work;

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5 The original wordings of referred document were kept.
7) for shore based users to be familiarized with new presentation and its contents (due to lack of harmonized presentation of domain awareness to improve situational awareness for allied and other support services.)
8) familiarization with the management system for report handling;
9) for shore based users to be familiarized with the information management system and its decision-making support function (traffic monitoring).

In principle, it can be seen that majority the proposals in the list above relate to communication, exchanging and sharing of information. There is no doubt that they are Situation Awareness items, which are included into the STCW Code and worded as “obtaining and maintaining situational awareness”.

Training courses are proposed to be revised:
10) on operation of identification procedure of the communication system;
11) current GMDSS for integrated GMDSS system;
12) on GMDSS should be revised based on the standard operational procedure;
13) on understand the system's automatic action and report to user (due to lack of self-checking functionality of the electronic equipment for improved reliability);
14) on familiarization with the new feature of maneuvering data presentation (due to lack in presentation of maneuvering information/data (engine-room telegraphs) on navigational display;
15) on ECDIS to be familiarized electronic procedure related passage plan (due to lack of standardization for operation of functions to observe the passage plan. Users require standardization on the level of function provided and the operating way of it);
16) on ECDIS as appropriate (due to lack of presentation of calling message of pilot on navigational display. Communication with pilot could be improved;
17) on operation on communication and navigation equipment involved within transfer of information;
18) on general skill on user computer to use the software for digital publication;
19) on Integrated Navigation Systems (due to ineffective access to information);
20) on simple and standardized procedure for priority message;

It can be seen also that majority the proposals of the second list above relate to communication, exchanging and sharing of information.

Mariners and shore personnel are proposed to be trained in the following fields:
21) For proper filtering of information. Some information should not be “filtered away”;
22) Familiarization to status information of each type of equipment. Training to respond the equipment status if necessary;
23) Consideration should be given to the revision of training/education for affected equipment and impact on Bridge Resource Management Training reflecting operational changes and how it is incorporated into practice of navigation;
24) Operator must be trained for operation of data systems;
25) Training should include standards and where to find them;
26) A basic level of relevant language competency should be required ahead of being able to use SMCP (Insufficient use of IMO Standard Marine Communication Phrases (SMCP));
27) Users need to be made aware of the vulnerability of GNSS and the lack of integrity. - users also need to be trained in procedures to be followed if GNSS is disrupted, or in the use of alternative systems;
28) On-line help function should be included in the systems, if available. Familiarization for using of automatic generated assessment results;
29) On-line help function should include self-descriptive information of system's characteristic in view of operational, technical, regulatory and training;
30) Control of software and hardware update should not require additional training of mariners. Human intervention of this procedure should be minimum but there are certain recognition of the certification status;
31) Familiarization for using digital publication on User's computer. Revise the training course for general skill on user computer to use the software for digital publication;

32) Training for a system should be focused to standardized operational procedure of e-navigation Functions dependent on manufacturer or type should be trained and covered by familiarization material and/or on-site training and on-line help function;

33) Stakeholders will need to be trained to comply with data security requirements;

34) Training should be provided for the procedures and use of the equipment both on board and ashore;

35) Identify training required for applying guidance (VTS)- Current VTS hardware may not have the capacity for increased collection, integration, exchange, presentation, storage and analysis of data;

36) Identify training required for the provision of NAS (Navigational Advice and Assistance) and TOS (Traffic Organization) - Current VTS hardware/software may not have the capacity for real time display of vessels’ track to provide a NAS or TOS service;

37) Provide adequate training for all communication needs;

38) Ensure training identifies AIS errors and their likely causes;

39) Training for NAS and TOS to be provided to ship and shore personnel. The use of simulation should be considered;

40) All VTS training courses to adopt V 103 model training courses;

41) V 103 model training courses and STCW need to include training in this regard;

42) SAR person should be familiarized with the shared information and its presentation to recognize whole status of SAR operation;

43) On scene operator and coordinator should be advised by the decision support system with enough information for situation awareness;

44) Explicit distress and safety training.

5. Conclusion

So, taking into consideration the proposals above and that e-navigation is about the integration of information, it is getting clear that MET process is waiting challenging changes.

Serious attributions involving SA occur when “Bridge (or Engine room) or Shore based Personnel” error due to loss of SA is listed as a cause of accidents. The results from maritime operations literature survey revealed that 71% of human errors were Situation Awareness related problems, [11]. Failure to mitigate accident due to poor SA also is pointed in frames of e-navigation concept [12,13].

IMO concept of e-navigation might provide ICT revolution initiating and launching the new paradigm of MET system for better SA at all three levels (perception, comprehension, projection) which should be resulted in better decision making on board and ashore for safety and security at sea and protection of the marine environment.

In spite of the viewpoint, that now it is premature to consider any training requirements on e-navigation, pending the finalization of the e-navigation Strategy Implementation Plan, for MET universities it is hot time to start the research in e-navigation field relating MET to march in step with Industry and be in advance ready for further phase of comprehensive review of STCW 78 Convention and Code.

References


