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A report on the regulatory aspects (e.g. liabilities) of establishing the e-Navigation Zone

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Regulatory aspects of establishing the e-navigation zones

1. Scope

The aim of this paper is to analyze the regulatory aspects for establishing the e-navigation zones and for the operational testing of new equipment (mock-up) of novel design for the purpose of e-navigation.

This paper looks at the present regulations and performance standards concerning navigational equipment and possibilities and/or restrictions for the use of such equipment during tests of e-navigation systems.

The paper also covers the operational requirements for ship operations and in particular ship navigation. The role of the master and/or the officer on watch during navigation is described together with possibilities and restriction concerning navigation during the test of the e-navigation zones and new designed equipment.

An important part of the discussion concerning regulatory aspects is the possibility to perform the tests and possible liability issues that could occur during such tests. In regards to this the conclusions, presented in section 7, have been developed as a description of subjects and recommendations that needs to be in force during the tests in order to maintain at least the same level of navigational safety as outside the e-navigation zones and on ships not equipped with the additional equipment.

2. Existing regulations regarding navigational equipment

In order to describe the regulatory aspect and possible liabilities during the test of the “mock-up” which does not comply with any existing regulations and performance standards it is important that all involved parties are familiar with the existing regulations regarding navigational equipment.

2.1. SOLAS Chapter V

Chapter V in SOLAS is the part of the convention that covers the regulations regarding Safety of Navigation. The SOLAS regulation and linked guidance and performance standards sets the international carriage requirements for navigational equipment.

Regulation 19 and 20 of SOLAS Chapter V presents the requirements for navigational equipment for both cargo ships and passenger ship. The carriage requirement in SOLAS is different depending on the size and type of vessel but is applicable for the smallest to the largest vessels.

Regulation 18 of SOLAS Chapter V covers the regulation for approval, surveys and performance standards for navigational systems and equipment and voyage data recorders. This regulation describes what performance standards the equipment and systems required under regulation 19 and 20 needs to comply with and the processes for the Administrations to approve such equipment.

In short terms the SOLAS regulation provides requirements for what navigational equipment that is required onboard vessels and the performance standards that the equipment needs to fulfil in order to be approved to be used onboard.

2.2. EU-directive 96/98/EC on marine equipment

The Marine Equipment Directive (MED) (96/18/EC as amended) covers certain equipment carried and used on ships registered under the flags of European Union member states.

It is aimed at ensuring that equipment which has to meet the requirements of international conventions (e.g., SOLAS), additionally meets a common standard of safety and performance.

It also ensures a free movement of marine equipment within the European Union and that certificates issued by European Union member states, or on their behalf by notified bodies, are acceptable to each member state through the harmonisation of their approval requirements.

The directive (96/18/EC) covers the following categories of equipment:

- life-saving appliances
- marine pollution prevention
- fire protection
- navigation equipment
- radio communication equipment.

The directive applies to:

- Equipment for use on board a new ship, regardless of its place of construction.
- Equipment placed on board an existing ship, where equipment is replaced or where such equipment is carried on board for the first time after the entry into force date of the directive (1 January 1999).

The provisions of the directive do not apply to equipment which has been placed on board a ship before 1 January 1999.

The marine equipment concerned in the directive is listed in the annex to the directive. From its entry into force, newly manufactured equipment must conform to the international instruments referred to in the annexes, tested according to these standards and marked according to the procedures and provisions set out in the directive.

2.3. Performance standards

International organizations such as the International Electrotechnical Commission (IEC), the European Telecommunications Standards Institute (ETSI), International Organization for Standardization (ISO) and the International Maritime Organization (IMO) have produced testing standards for certain types of marine equipment.

It is to these standards that manufacturers need to manufacture and sell marine equipment and it is against these standards the equipment is required to be tested by Administrations, notified bodies or testing institutes.

By manufacture and test equipment against these performance standards the equipment, even though they differs between manufactures and countries, the performance standards contributes to the equipment and systems fulfilling the same level of safety and function requirements.

For equipment that has a performance standard set out by an international organization the requirements and the physical and the function performance of the equipment or system are well defined.

For equipment that does not fall under existing performance standards and for equipment that falls outside available performance standards the processes and the procedures to use such equipment is a more complicated issue for Administrations. Before a performance standard has been internationally adopted for such equipment or systems a thorough consideration by the Administrations is needed before approval is given for such equipment to be placed onboard vessels.

2.4. National regulations and exemptions from SOLAS

According to SOLAS Chapter V regulation 1.4 the Administration can determine to what extent the provisions of regulation 15-28 (SOLAS Chapter V) shall apply to certain categories of vessels. This means that the Administrations can determine the carriage requirements and what performance standards equipment and systems on some smaller vessels need to comply with. The categories of vessels under which this exemption applies to are:

- Ships below 150 gross tonnage engaged on national and international voyages.
- Ships below 500 gross tonnage not engaged on international voyages.
- Fishing vessels.

This exemption can and has the effect that the carriage requirements can be different between countries and Administrations and that different national regulations for equipment and performance standards might apply for the categories of vessels described above.

3. The use of equipment of novel design (Mock-up)

3.1 Exemptions from SOLAS

According to SOLAS chapter V regulation 3.2 the Administration may grant to individual ships exemptions or equivalents of a partial or conditional nature. Such exemptions or equivalents may be granted when a ship is engaged on a voyage where the maximum distance of the ship to shore, the length and the nature of the voyage, the absence of general navigational hazards, and other conditions affecting safety are such as to render the full application of the regulations in SOLAS chapter V are unreasonable or unnecessary. For

any decision described above the Administration has to take into account the effect of such exemption and equivalent may have upon safety of all other ships.

When such decisions are made by the Administration the exemptions or the equivalents and the reasons for them has to be submitted to IMO for circulation to other Contracting Governments.

3.2 Exemptions from EU-directive 96/18/EC

In article 14 of the directive the following text can be found:

Article 14

1. Notwithstanding the provisions of Article 5, in exceptional circumstances of technical innovation, the flag State administration may permit equipment which does not comply with the conformity-assessment procedures to be placed on board a Community ship if it is established by trial or otherwise to the satisfaction of the flag State administration that such equipment is at least as effective as equipment which does comply with the conformity-assessment procedures.

In the case of radio communications equipment, the flag State administration shall require that such equipment does not unduly affect the requirements of the radio-frequency spectrum.

2. Such trial procedures shall in no way discriminate between equipment produced in the flag Member State and equipment produced in other States.

3. Equipment covered by this Article shall be given a certificate by the flag Member State which shall at all times be carried with the equipment and which gives the flag Member State's permission for the equipment to be placed on board the ship and imposes any restrictions or lays down any provisions relating to the use of the equipment.

4. Where a Member State allows equipment covered by this Article to be placed on board a Community ship, that Member State shall forthwith communicate the particulars thereof together with the reports of all relevant trials, assessments and conformity-assessment procedures to the Commission and the other Member States.

5. Equipment such as is referred to in paragraph 1 shall be added to Annex A.2 in accordance with the procedure laid down in Article 18.

6. Where a ship with equipment on board which is covered by paragraph 1 is transferred to another Member State, the receiving flag Member State may undertake the measures necessary, which may include tests and practical demonstrations, to ensure that the equipment is at least as effective as equipment which does comply with the conformity-assessment procedures.

In article 15 of the directive the following text can be found:

Article 15

1. Notwithstanding Article 5, a flag State administration may permit equipment which does not comply with the conformity-assessment procedures or is not covered by Article 14 to be placed on board a Community ship for reasons of testing or evaluation, but only when the following conditions are complied with:

(a) the equipment must be given a certificate by the flag Member State which must at all times be carried with the equipment and which gives the flag Member State permission for the equipment to be placed on board the Community ship and imposes any restrictions or lays down any provisions relating to the use of the equipment;

(b) the permission must be limited to a short period of time;

(c) the equipment must not be relied on in place of equipment which meets the requirements of this Directive and must not replace such equipment, which must remain on board the Community ship in working and ready for immediate use.

3.4 Possibilities for the use of the “Mock up”

Even though Administrations, according to the SOLAS regulation may grant exemptions and equivalents for equipment not fulfilling international performance standards to be used on individual ships, the nature of the project and the area where the “mock-up” are to be tested in, are such as the application of the regulation describing exemptions and equivalents are not fully feasible. The navigational hazards and the safety for all other ships in these dense traffic areas are such as the regulations in SOLAS should be intact and that no equipment should be exchanged or replaced by new, untested equipment. In addition such exemption or equivalent also requires a notification process to IMO and is not an effective solution for this test study within the project

The information found in article 14 of EU directive 96/18, described in 3.3, is also more complex for the sake of the study within the project as it needs thorough considerations and approval procedures by the Administration for the vessels flying the member states flag. It also requires a notification process to the European Commission and other member states and is also not an effective solution for this test study within the project.

The alternative described in article 15 of EU directive 96/18, described in 3.3, of the EU-directive would be the possible solution for this project and for the testing of the “mock-up” in the e-navigation zones due to the fact that no performance standards will be available for the equipment.

For the nature of the project and the testing of the “Mock-up” the additional equipment to be tested should not interfere with the equipment required by the international regulations and should only be an addition to already existing equipment and systems.

4. Regulations regarding watch keeping and bridge operations

The aim of this section is to describe the legal framework regulating bridge operations on the ships used during testing the prototype live.

The officer of the watch (OOW) and the Master on a ship have the job to bring the ship safely over the sea. Doing this includes a number of tasks to be perform, such as ship handling, navigation, monitor other ship movement, communication and documentation. Navigating a ship is puts a high degree of responsibility on the OOW and the Master and they are very much liable to his or her actions.

4.1 STCW-95 code, Chapter VIII; Standards regarding watchkeeping

The core rules internationally regulating bridgework is IMO's **STCW-95 code; Standards of Training, Certification and Watchkeeping**. Chapter VIII sets the standards regarding watchkeeping. This covers certification, voyage planning, watchkeeping at sea and port.

The part here of most interest to this project, and regulating the Master and OOW duties, is **Part 3 Watchkeeping at Sea** and here principles is provided regarding look-out, watch arrangement, taking over the watch and performing a navigational watch.

In STCW-95 Chapter VIII part 3 the following extractions of the text can be found:

Point 9

The master of every ship is bound to ensure that watchkeeping arrangements are adequate for maintaining a safe navigational watch. Under the masters general direction, the OOW are responsible for navigating the ship safely during their periods of duty, when they will be particularly concerned with avoiding collision and stranding.

Point 12

The OOW is the master's representative and primarily responsible at all times for the safe navigation of the ship and for complying with the International Regulations for Preventing Collision at Sea 1972.

Point 14

The look-out must be able to give full attention to the keeping of a proper look-out and no other duties shall be undertaken or assigned which could interfere with that task.

Point 16

In determining that the composition of the navigational watch is adequate to ensure that a proper look-out can continuously be maintained, the master shall take in account all relevant factors, including those described in this section of the Code...

Point 17

When deciding the composition of the watch on the bridge, which may include appropriately qualified ratings, the following factors, inter alia, shall be taken into account:

...

4. use and operational condition of navigational aids such as radar or electronic position-indicating devices and any other equipment affecting the safe navigating of the ship;

...

8. any unusual demands on the navigational watch that may arise as a result of special circumstances.

Point 25

The OOW shall have full knowledge of the location and operation of all safety and navigational equipment on board the ship and shall be aware and take account of the operating limit of such equipment.

Point 26

The OOW shall not be assigned or undertake any duties which would interfere with the safe navigation of the ship.

Point 36

The OOW shall be thoroughly familiar with the use of all navigational aids carried, including it's capabilities and limitations, and shall use each of these aids when appropriate and shall bear in mind that the echosounder is a valuable navigational aid.

Rules quoted above shows among other things that the Master has not only the obligation but the possibility to adjust the bridge team to suit the situation and the OOW:s relation to bridge instrumentation. But most important it shows that many of them are affecting the possibility to extra workload, stressing the importance of safe navigation and also explains the responsibility, and liability, laid upon the Master and OOW.

4.2 International safety management Code (ISM)

The purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention. In order to comply with the ISM Code, each ship must have a working Safety Management System (SMS). This is in practice a manual carried onboard the ship stating for instance safety and environmental policy, procedures for responding to emergency situations and procedures for safety drills and also a work description for each level onboard the ship.

Compliance to the ISM code is mandatory for passenger ships and other ships of 500 GRT and upwards engaged on international voyages.

Every ship has a unique SMS so it is hard to tell if it apposes any limitations to the tests. But the project should be aware of its existence when performing the tests and that it is a document that very much effects and regulates the every-day routines and tasks onboard a ship.

5. Limitations and precautions to be considered during the test and the use of the prototype regarding bridge operations

When the actual operational test is done the legislation as mentioned earlier is stating the OOW responsibility to safe navigation and this is vital to bear in mind at all times.

Duties on the bridge of a modern vessel are complex and workload at times is very high. On top of this manning is kept to a minimum often resulting, on a typical cargo vessel, in a sole OOW at daytime with the addition of a look out during the dark hours of night. The Master is most of the time occupied with paperwork, attending the bridge only when navigating in confined waters, pilot operations and on arrivals/departures.

Therefore the additional equipment tested onboard, should not affect the OOW workload or his, or her, attention to the existing bridge instrumentation. This means that the tested systems, which are parallel to the obligatory equipment, could need to be operated by additional personnel. Though, it is important, that live testing is carried out by personnel normally involved in the ships handling and not by technicians. This is important, not only because of safety, but in order to get relevant test data. Stressing the issues occurring during live test that are vital to actual users, the mariner, is utmost important. Technicians etc can be present but should not interfere in navigational duties and navigational decisions must not be made by any other than the Master or the OOW.

6. Recommendations regarding aspects of communications and reporting.

A part of the proposed testing is involving communication and reporting. This could include among other things mandatory ship reporting in VTS area or ordering a pilot.

To avoid misunderstanding and conflict with local regulations all mandatory procedures should be done as normal parallel with the new way tested in the e-nav system. This would also make sure that ships and shore based stations that are not a part of the testing can over hear and make use of the information, e.g. a

ship reporting a passage in a VTS area. Another aspect is that this would be a way of confirming that information was properly received.

7. Conclusions and recommendations

In order to maintain the highest level of safety of navigation onboard ships participating in the tests and in the e-navigations zones, the following subjects and recommendations should be in force prior to the tests commences and continuously checked during the tests:

- Any equipment or system to be tested onboard, that does not fulfil performance standards set out by an international organization, should be approved to be tested on board by the ship's flag Administration.
- The additional equipment or system to be tested should not substitute the requirements and the functions of other equipment set out by international or national regulations.
- The functions and data from existing equipment required by international and national regulations could be used to feed the additional equipment or system to be tested as long as it does not affect the performance and display of the existing equipment.
- Functions and data from the additional equipment to be tested should not be used, linked and presented in any existing mandatory equipment according to national and international requirements.
- The additional equipment or system to be tested should be used parallel with existing equipment and should not cause any additional workload for the Master or OOW. In order to manage the equipment and system to be tested additional manpower on the bridge could be needed and should be evaluated prior to the test commence.
- The equipment or system to be tested should be operated with personnel normally engaged in duties concerning the navigation of the ship. Additional resources such as system technicians could be present as an additional resource but should not be involved with any navigational duties and should not interfere with the bridge operation and should not be part of any decisions concerning navigation.
- Prior to the operational test take place and before the equipment are used as monitoring tool during navigation in real time, the additional equipment should be tested separately to compare functions and data with the existing equipment.
- Regulated and mandatory reporting and communications tested in the new prototype system should be done parallel with the normal procedures to avoid legal issues, misunderstanding and that third party miss out on vital information.