

## Conceptual Grounds of Navigation Safety

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**ABSTRACT:** The most important global problem being solved by the whole world community nowadays is to provide sustainable mankind development. Recent research in the field of sustainable development states that civilization safety is impossible without transfer sustainable development. At the same time, sustainable development (i.e. preservation of human culture and biosphere) is impossible as a system that serves to meet economical, cultural, scientific, recreational and other human needs without safety. Safety plays an important role in sustainable development goals achievement. An essential condition of effective navigation functioning is to provide its safety. The "prescriptive" approach to the navigation safety, which is currently used in the world maritime field, is based on long-term experience and ship accidents investigation results. Thus this approach acted as an the great fact in reduction of number of accidents at sea.

Having adopted the International Safety Management Code all the activities connected with navigation safety problems solution were transferred to the higher qualitative level. Search and development of new approaches and methods of ship accidents prevention during their operation have obtained greater importance. However, the maritime safety concept (i.e. the different points on ways, means and methods that should be used to achieve this goal) hasn't been formed and described yet. The article contains a brief review of the main provisions of Navigation Safety Conceptions, which contribute to the number of accidents and incidents at sea reduction.

### 1 INTRODUCTION

The symposium dedicated to the problems of sustainable maritime transportation system creation was held under the auspices of the IMO in London on 13 September, 2013. Such perspective efforts of shipping industry subjects' correspond with the policy of conversion to the mankind sustainable development declared on the UN conference in Rio de Janeiro (1992), which should be followed by all fields of the world economy. Navigation safety is named among the main features of sustainable maritime transportation system in the concluding document approved at the symposium. Due to this

fact elaboration of the generally accepted navigation safety concept is supposed to conform to successful creation of sustainable maritime transportation system. The abovementioned concept implies organizational and technical strategy of safety at sea with the use of means and methods complex which meets modern requirements and conditions of shipping industry. This article is concerned with certain fragments of such concept, which could serve as the basis for its formation and development.

Sustainable mankind development has been much paid attention to recently. It concerns our civilization transfer to a new development strategy which should

provide survival and further constant society development. Sustainable development is the world community response to the crisis phenomena in biosphere, economy, social sphere, foreign affairs which may cause the global disaster and apocalypse some day. The term "sustainable development" was implemented for the first time at the UN conference on environment and development (Rio de Janeiro, 3-14 July 1992) as an alternative to the prior "unsteady" course followed by the mankind. At this conference the concept of sustainable development was put across and the policy paper "Agenda 21" was approved. Since then numerous international events concerning the realization of different provisions of the Agenda were held in different countries. The IMO as the specialized agency of UN was fully engaged in this work, aiming its activity at maritime safety improving and environmental pollution protection while vessel operation.

Consequently, all IMO regulatory documents have formed the single complex, and each of these documents fulfills an important protection function of vessels, people and environment from current harmful factors. These documents are being constantly modified, improved and amended according to the changes in construction, equipment, ships operating conditions and arising requirements of their industrial use.

Intentional efforts of the IMO, classification societies, flag states, ship-owners resulted in merchant fleet accident reduction. The World's Oceans pollution from ships has also considerably decreased.

Some outstanding tendencies of maritime safety improvement and environmental protection enhancement can be observed. It is necessary to support steadiness of these tendencies with universal application of either traditional standards or by means of new approaches and methods development, corresponding to the international shipping needs and requirements.

## 2 STATEMENT OF THE PROBLEM

The regular UN conference on sustainable development, known as the Rio +20, was held in Rio de Janeiro in June, 2012, where results of the work carried out during the last 20 years were summed up and tasks for the future were established. The idea of the sustainable maritime transportation system creation aimed to develop action program was chosen as the subject of discussion during the celebration of the Day of the Seafarer in 2013.

The symposium on this topic was held on the initiative of Koji Sekimizu, the IMO Secretary-General, at the IMO Headquarters in London on 26 September, 2013. It was further agreed that the main goal of such system creation is to ensure that «this system will offer the entire planet a safe, efficient and reliable means of transportation of goods, all the while reducing pollution, maximizing energy, efficiency and ensuring the conservation of resources». The fundamental principles of the sustainable maritime transportation system creation

are: development of «global standards that support level playing fields across the world, supporting global safety and environmental standards, addressing technical and operational requirements for ships as well as the appropriate education and training of crews». In addition: «All actors will need to collaborate with the aim of achieving the three dimensions – the economic, social and environmental dimensions – but with the safety of navigation always being the overriding priority». The safety culture is needed to be formed on global standards should be promoted and developed in the sustainable maritime transportation system. The principle «Safety and environmental awareness should be the priorities» should be followed under professional seafarer's training.

Thus, conceptual grounds of international navigation safety development could contribute to successful achievement of these goals.

It should be noted that issues on people on-board and vessel safety were paid much attention to during the merchant shipping developmental period. System of principles about ways, means and methods to be applied to achieve safety (i.e. maritime safety concept) wasn't described and formulated in appropriate way.

The number of essential propositions, which should be used while creating of such concept are discussed below. Offered recommendations, methods and means are fragmentary, but together they provide a clear idea of its possible structure and separate components.

## 3 SAFETY OF NAVIGATION – CONCEPTUAL FOUNDATION

It is commonly known that to a wide extent a concept is a system of views on any fact, way of understanding and explaining of any facts, the main idea of any theory. Therefore, maritime safety concept is a system of views on providing safety of the operations at sea, description of its facts and processes. However, «navigation safety» is defined as a relatively constant state, clear of dangers provided by the system of international and national technical, organizational, economical, social, and juridical standards, which are aimed at the reduction and prevention of accidents at sea to provide safety of life and property at sea and marine environmental protection.

The Maritime Safety Concept, formed under the influence of numerous and contradictory factors, according to the needs of the world economy in accordance with prevailing political, economical and ecological conditions, shouldn't be presented as a still form of the defined content. As shipping is an activity which maintains mankind varying needs under environmental protection provision, its conditions require flexibility of safety concept as well as allowance to make necessary modifications in existing principles and methods according to the changes in the maritime transportation system and its functional environment. The navigation safety concept is aimed to form a comprehensive picture

about ways, principles, methods, means of vessels and other maritime objects safety provision as well as its staff and environment under modern conditions of industrial activity. It is aimed to reduce vessel accident and injury rate by means of concept provisions to the lowest possible level.

It defines goals, objectives, principles, key activities undertaken to reduce accidents and incidents at sea. It establishes a single conceptual and technological system in this field and aimed at formation of global system which provides navigation safety.

The currently scientifically grounded maritime safety concept allows:

- 1 undertaking effective measures to ensure protection of vessels, people and environment from dangerous factors;
- 2 responding quickly to the changes in fleet operation, application of newest achievements in the field of ship navigation, marine engineering and technology;
- 3 developing appropriate methods of vessel operation safety improvement;
- 4 providing crew training conforming to further requirements;
- 5 ensuring appropriate support of transfer to mankind sustainable development policy implemented by UN.

Subjects of navigation safety are: the member states of corresponding international conventions and intergovernmental agreements, represented by its bodies of legislative, executive and juridical power as well as ship-owners, masters and crew members. Objects of navigation safety include vessels, people on board, shipping ways with appropriate navigation means of navigation equipment and natural environment influenced by the vessel operation. Navigation safety should provide vessels' operation condition which is responsible for its use as intended. Negative impacts on the vessels are dangerous factors for navigation. Level of maritime operation safety depends on the interaction of favorable and unfavorable factors in following areas related to the navigation safety:

- 1 Technical and technological;
  - 2 Organizational and managerial ;
- Anti-terrorist (protection of maritime objects from illegal actions).- Fig. 1

The key issues of technical and technological factor of the navigation safety are:

- technical condition and applicability of vessels, its equipment, port infrastructures, coastal and maritime facilities of navigation equipment, etc.
- ensuring the functioning reliability of the ship's "Man-machine-environment" systems.
- Principal means for achieving the objectives of this navigation safety field include:
- providing of all the parties involved in navigation with necessary technical standards and norms in time;
- systematic monitoring of vessels and other objects technical condition;
- maintenance and repair of vessels and fleet serving objects;
- scientific and technical progress ensuring in the maritime industry;

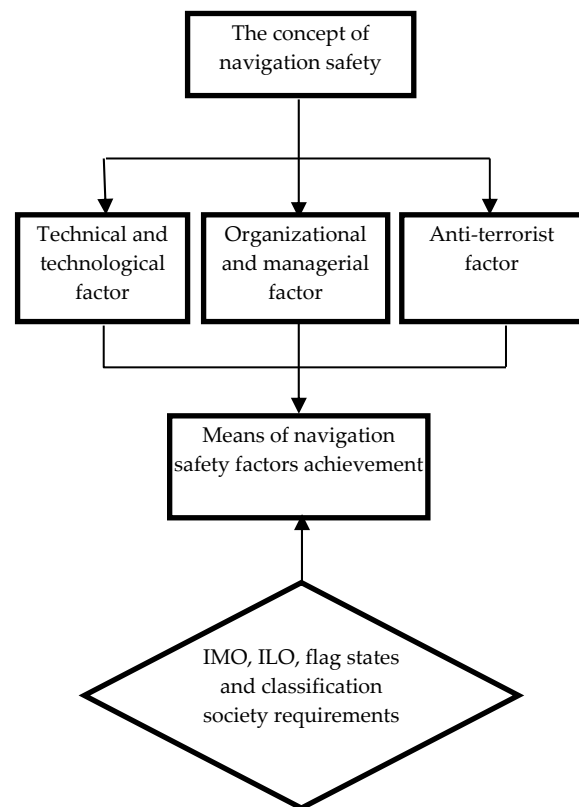


Figure 1. The structure of navigation safety concept

- corresponding staffing and resources provision of enterprises and organizations engaged in maritime operations.

There are numerous methods related to this area of navigation safety. They are usually subdivided into the following groups:

- 1 Technical;
- 2 Organizational;
- 3 Ergonomic;
- 4 Informational;
- 5 Juridical;
- 6 Social.

Each of these methods can't be characterized separately because of the limited article length. It should be noted that they have different degrees of development and implementation in the safety providing practice. Technical methods are more commonly used in practice, including the stages of shipbuilding and operation. Ergonomic and social methods are less developed and implemented restrictedly.

The issues of organizational and managerial factor of navigation safety are:

- organization and maintenance of navigation safety services at the national level, shipping companies and ports;
- development and application of standards aimed at proper organization and control of staff of on-board, enterprises and fleet serving organizations, safety management systems (SMS);
- improvement of navigation safety management bodies and systems at all levels – according to the conditions and requirements of fleet operation practice.

There are the following means of the above mentioned objectives achievement:

- creation and improvement of methods of vessel operation safety management and environmental pollution prevention;
- organizational and managerial provision of search and rescue of persons under distress;
- application of the assessment methodology and risk management on the objects of maritime safety;
- formation of the safety culture elements at shipping companies and on vessels;
- organization and maintenance of safety international standards monitoring on vessels, at enterprises and in maritime institutions.

Provision of the navigation safety anti-terrorist factor covers an ample amount of problems, connected with planning and adoption of protective measures from terroristic acts and other illegal actions against vessels and port facilities, enforceability of onshore personnel and other persons involved in activities on prevention and protection of maritime objects from terroristic acts and pirate attacks, elimination of its consequences for vessels, people and environment.

Main means to achieve the anti-terrorist safety objectives include: international treaties and national legislative acts against terrorism at sea, creation of accepted legal framework related to self protection of vessels and maritime navigation from armed attacks, etc. (Fig. 2)

1	Definition of the general structure of navigation safety concept
2	Information collection and analysis on every constituent element of the Safety of Navigation Conception
3	Correspondence assessment of the parts of Navigation Safety Conception with update and perspective requirements of navigation industry
4	Definition of main research and development fields within the framework of the structure of navigation safety conception
5	Measures elaboration of enhancement of informative and regulatory provision of navigation safety

Figure 2. Stages of safety of navigation concepts development

## 4 CONCLUSIONS

Practical realization of maritime safety concept provisions should be carried out under support and control of states possessing fleet by means of necessary application of corresponding standards, rules and methods regulated by the international and national sea safety documents at the maritime field objects.

Therefore, systematic approach to the navigation as the marine transportation system functioning aimed to meet needs of the world community in cargo shipment and passengers transportation should be the basis of the modern navigation safety concept.

The «prescriptive» approach to the navigation safety provision, adopted by the IMO, and legal documents developed for its practical implementation should remain at the centre of the maritime operations safety concept. The existing standards and regulations of vessel safe operation should be supplemented by the rules reflecting modern navigation conditions, new means and methods of vessel and environmental protection from unfavorable and dangerous factors.

A message from Koji Sekimizu, the IMO Secretary-General (IMO News #1, 2013) noted that: «The world relies on the safe, secure, efficient and clear international shipping industry. And the comprehensive regulatory framework developed and maintained by IMO creates the conditions in which shipping can achieve those objectives». In our opinion, the navigation safety concept should be considered as one of the necessary IMO regulatory instruments.

## REFERENCES

- Kuo Ch.1998. Managing Ship Safety.LLP London – Hong-Kong, -189 p.
- Lutzhof M. 2005.. Maritime Technology and Human Integration on the Ship's Bridge. «Seaways», NI.
- Joykody N., Zhengiang Liu. Modern Technology. «Seaways», NI.
- T. Crowch, 2013. Navigating the Human Element, MLB Publishing.
- Torskiy V.G., Topalov V.P. 2011. Ship's crew management .Second ed. – Odessa, Astroprint, - 244 p.
- Torskiy V.G., Topalov V.P., Pozolotin L.A. The hazards for navigation. 2009, Odessa, Astroprint, -240 p.
- Guidelines for the Investigation of Human Factors in Marine Casualties and Incidents. Res.IMO A.884(21), 1999.