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ОПТИМІЗАЦІЯ КАПІТАНСЬКОГО БЕЗПЕКОВОГО МЕНЕДЖМЕНТУ

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Балобанов О.О., Федчун Н.О. Оптимізація капітанського безпекового менеджменту.

Стаття присвячена питанням забезпечення безпеки судноплавства в аспекті управлінської діяльності капітана. Досягнення ефективного та безпечного капітанського менеджменту визначено через з'ясування сутності та важливості врахування психофізіологічних факторів при відборі морських, в тому числі капітанських кадрів в сукупності з їх кваліфікацією менеджерів та високим рівнем правової культури (знанням та реальною готовністю неухильно слідувати правовим приписам та нормам), та використання методу формальної оцінки безпеки стосовно ризиків морського менеджменту. Зроблено висновок, що причини аварій кореняться в суперечності між суб'єктивним (поведінка особи – управлінське рішення) і об'єктивним (судно і ситуація), тобто полягають у невідповідності особистості (або поведінки) вимогам ситуації або технічного стану плавзасобу.

Психофізіологічний відбір має на меті виявлення здібностей і якостей, які відповідають вимогам професій, що супроводжуються значним нервово-психічним напруженням, можливістю виникнення стресових ситуацій та ін. Виявлено, що в третині аварійних випадків дефекти реакції, обумовлені психофізіологічними розладами, грають вирішальну роль. Відтак, зроблено висновок, що психофізіологічний відбір дозволить знизити аварійність, зокрема через дефекти реакції, на 20-25 %. Тому відбір капітанів на основі психофізіологічних станів та кваліфікації, а з другого боку, оцінки ризиків за методикою формальної оцінки безпеки, розглядається авторами як двоєдиний фундамент безпеки судноплавства. Запропоновано застосування методу формальної оцінки безпеки у поєднанні з психофізіологічним відбором в контексті оптимізації капітанського безпекового менеджменту. Визначена функціональна залежність безпеки судноплавства від політики судноплавних компаній щодо: а) оцінки ризиків, що дозволяє максимально зв'язати правові норми щодо безпеки безпосередньо з діями капітана, ґрунтуючись на моделюванні ситуації; б) кадрової діяльності, яка здійснюється на основі професійних та менеджерських здібностей капітанів та з урахуванням психофізіологічних станів; в) рівня правової культури (знання та неухильне дотримання норм та правил безпеки) капітана, який діє в комерційній, соціальній та безпековій сферах, спираючись на матрицю (комплекс) юридичних норм та правил, що регламентують ці сфери.

Ключові слова: безпека судноплавства, управління безпекою, аварійність, «людський» фактор, психофізіологічні стани, метод формальної оцінки безпеки, загрози, оцінка ризиків, управлінські рішення.

Balobanov A., Fedchun N. Optimization of captain's safety management.

The article is devoted to the maritime safety issues in terms of captain's management activity. Effective and safe management of captains can be achieved by identifying the importance of considering psychophysiological factors in the selection of seamen personnel, including captains, in conjunction with their managerial qualifications and high level of legal culture (knowledge and real willingness to strictly follow legal prescriptions and regulations), and by using a formal safety assessment method in relation to maritime crew management risks.

The authors made a conclusion that the causes of accidents are rooted in the conflict between two main components: subjective (behavior – managerial decision) and objective (vessel and situation), in fact, the captain's personality (or behavior) complies with the requirements of the situation or technical condition of the vessel.

Psychophysiological selection aims to identify abilities and qualities that appropriate professions, accompanied by significant neuropsychological strain, the severity of stressful situations, etc. It appeared that reaction disorder play a decisive role in one-third of all accidents, ergo, psychophysiological selection can reduce maritime casualties by 20-25%. In this respect, the application of the formal safety assessment method in combination with psychophysiological selection in the context of optimizing captain's safety management is proposed. The authors considered the professional selection of captains based on stable psychophysiological states and qualification while assessing the risks via formal safety assessment methodology as a dual basis of the maritime safety.

The functional dependence of maritime safety on the policy of the shipping companies is defined: a) risk assessment, which allows to connect legal norms of safety directly with actions of the captain as much as possible, based on modelling of a situation; b) personnel activity, carried out on the basis of professional and managerial abilities of captains and taking into account the psychophysiological states; c) the level of legal culture (knowledge and strict adherence to safety rules and regulations) of the captain, who operates within the commercial, social and safety sectors, based on the complex of legal rules and regulations governing these sectors.

Key words: maritime safety, safety management, accidents, human factor, psychophysiological states, formal safety assessment method, threats, risk assessment, managerial decisions.

Problem statement. Safety is a condition that is required for all transport modes involved in the logistics processes of world trade. Safety is especially important in shipping, since the seagoing vessel, as the main carrier on a global scale and shipping itself, is exposed to the greatest risks – so-called “hazards” of the sea. In maritime literature, such cause of accident as hazards of the sea occurs to be the most common and traditional. Nevertheless, mentioned is only the basis of an accident. Above all, exactly the “human” factor adds an impulse to dangerous conditions created by nature, what may lead to negative consequences for human, transport means, cargo, environment etc. Significant size of vessels, increasing speeds, increased traffic on the sea routes, navigation in difficult meteorological conditions, etc. make the problem of maritime safety the most priority and relevant in assessing the current state and development of shipping. Following this, maritime shipping is regulated by solid mass of international and national rules, defined by Conventions and laws. Therefore, the maritime shipping is well regulated and on the other side, it demands a specific management, considering many risks of natural, anthropogenic and human-made nature. Above all, organizational and technical standards and rules are enshrined in conventions, laws, regulations, instructions just for transport personnel, not for technical means.

Maritime practitioners and researchers explain the increased attention to the issues of maritime safety and investigations of accidents in the maritime transport sector by the necessity to identify the causes of casualties, such as loss of ships, severe environment damage or fatalities, hence – to elaborate measures on prevention or reduction the number of accidents (Eliopoulou, Papanikolaou & Voulgarellis, 2016). According to IMO (International Maritime Organization) data, received from the accident investigation bodies, approximately 80% of all maritime accidents are caused by human factor. This applies mostly to persons who are involved in shipping process, such as: captains, marine pilots, operators, dispatchers and others. The London P&I Club (abbreviated also London Club, and The London Steam-Ship Owners' Mutual Insurance Association Limited) calls the figure 70%.

The tasks of maritime management are not only commercial and technological solutions, but “the safety management” as well, regulated by the International Safety Management Code (International Management Code for Safe Operation of Ships and for Pollution Prevention) (hereinafter – ISM), chapter IX of the International Convention for the Safety of Life at Sea (hereinafter – SOLAS-74). However, in any management activity, a person, in fact “a doer”, is a key element, so the human factor has to be considered. Above-mentioned element is determined by the qualification level, psychophysiological specific features and legal culture. In fact, the prevention of the offenses on maritime transport. On the other hand, the human factor lies in the subject of management (namely shipping and safety), inter alia: in the complex of risks that must be controlled and managed. Otherwise, a risk (threat) has the consequences – the accident that causes harm to human life and health, property or the marine environment, disrupts the normal functioning of business. Particularly, the importance of the human factor in the process of ensuring maritime safety is confirmed by the International Maritime Organization (hereinafter – IMO), which adopted resolution A.772 (18) “Fatigue Factors in Manning and Safety” and resolution A. 947 (23) “Human element vision, principles and goals for the Organization”.

Mentioned resolution defines: “The human element (factor. – *The authors*) is a complex multi-dimensional issue that affects maritime safety and marine environmental protection. It involves the entire spectrum of human activities performed by ships’ crews, shore-based management, regulatory bodies, recognized organizations, shipyards, legislators, and other relevant parties, all of whom need to co-operate to address human element issues effectively”.

Additionally, numerous studies (Mikhajlenko, 2007; Ponomarev, 1976; Valkin, 1981; Grigor’ev, Dvinin & Yalovenko, 2007) of maritime safety issues indicate that, the analysis of the system of factors impacting on maritime safety is restricted to examining two main components: subjective (behavior – managerial decision) and objective (vessel and situation). It should be noted that the causes of accidents are rooted in the conflict between the two parties, in fact, inadequacy of the individual (or behavior) with the requirements of the situation or technical condition of a vessel.

There is a chain in maritime shipping: risks (threats) → reaction (adequate/inadequate actions) of the subjects of maritime operations → positive result (normal functioning of the transport system) or negative consequences (accident).

So, the maritime management proceeds in a constant set of continuous risks (safety, economic, environmental, technical, etc.). Therefore, the professional selection of captains on the basis of psychophysiological states and qualification while assessing the risks via formal safety assessment (hereinafter – FSA) methodology, recommended by IMO, are considered by the authors as a dual basis of the maritime safety.

Formal safety assessment issues are regularly included in the agenda of the meetings of the Maritime Safety Committee (hereinafter – MSC) and the Marine Environment Protection Committee (hereinafter – MEPC). Several completed formal safety assessment projects were reviewed at committee(s) sessions.

The largest projects are the formal safety assessment of bulk carriers, considered in an international project led by the United Kingdom (MSC 75/5 / 1,2002), IACO projects (MSC 74/5/4) and Japan (MSC 75/5). / 2 2002).

The **research** on possible use of peer review, its potentiality and usefulness, has been conducted for assessing the accident risks of bulk carriers, on managing the technical condition of ship power stations, for the strength assessment of hulls, on reducing possible oil spills, and concerning enhancing operational safety of drilling rigs and stationary platforms, for determination of methods of collision and stranding risk analysis (Reshetov & Zakharov, 2004).

The scientific study on organizational problems associated with application of FSA for reducing the frequency of risky events in the activities of classification societies (Lyubchenko, 2010; Lyubchenko, 2015) shall be emphasised separately.

The study of a wide range of problems related to this issue has a great theoretical and practical value for ensuring maritime safety, aimed primarily on prevention erroneous actions or inaction of specialists involved in the transport process, per se – on prevention offences affecting the maritime safety or the neutralization of factors that have the potential to give rise to commit such offences.

The **purpose** of this study is to achieve effective and safe management of captains by identifying the importance of considering psychophysiological factors in the selection of seamen personnel, including captains, in conjunction with their managerial qualifications and high level of legal culture (knowledge and real willingness to strictly follow legal prescriptions and regulations), and by using a formal safety assessment method in relation to maritime crew management risks. Taking into account the achievements of maritime

law, criminological researches, psychology, safety management theory, the significance and role of psychophysiological states of persons (captains of vessels) in the processes of ship management and their influence on administrative, professional qualities in sea conditions are considered. For its achievement, the following objectives have been defined: The determination of accident risks by: statistical analysis of maritime casualties; identifying the role of the human factor in ensuring maritime safety – namely professionally important qualities, psychophysiological states of a person, that determine his behavior (that is management decision) in a given situation; revealing of workability and the effectiveness of formal safety assessment method.

Presentation of the material. Analyzing the possibilities for practical implementation of management safety optimization through effective personnel work of the ship-owning company to recruit captains by qualification and psychophysiological factors, minimize the possibility of committing offences / violations of regulations in ship management (navigation, seaworthiness and safety) and commercial operation of the vessel (contract of carriage).

Hidden defects of vessels (in most cases are caused by deficiencies in maintenance) and 4% of accidents are determined by the situation (by the insurmountable natural disaster, so-called “hazards” of the sea). Evidently, one in five losses in 2019 was due to bad weather. During 2020, there were 726 very serious marine casualties, marine incidents, and occurrences, 80 less than during 2019. The number of marine casualties has shown a steady decline. Marine incidents have also fluctuated but there was a reduction during 2020. This downward trend in marine casualties is largely attributed to the reduction in severity of incidents occurring across the fleet. This is a direct reflection of improved training and safety awareness of vessels’ crewmembers, as well as the dedication to safety and environmental protection by the owners and managers of vessels (Annual Report on Marine Safety Investigations, 2020). Above all, among the violations of maritime safety rules the mindless behavior constitute the absolute majority. Psychological factors of mindless violations are primarily inattentive, irresponsible attitude towards the existing social rules of conduct. But, the fact that the long voyage due to permanent stay of crew members in the limited space, monotony activities, a sharp narrowing of the external social bonds, increased risk of accidents should be taken into account. In such cases, very often the injured party confines to financial compensation, that eventually leads to a leveling of general prevention. Identification and research of negative personality features of mindless delinquent helps to identify social needs and values for proper organization of preventive activities, in fact ensuring maritime safety. Overall, the human factor, first its psychophysiological aspect, affects maritime accidents. In modern industry, stable psychophysiological state is one of the most important safety conditions. In particular, the efficiency of exploitation and reliability of equipment and machinery depends on mentioned component.

A captain (like most seafarers) is a leader, a manager with special powers under the Convention and the law, tasked with managing a source of enhanced danger (which is a vessel) in a maritime dangerous environment. Under such circumstances, the master must be in a stable psychophysiological state to prevent inappropriate managerial decisions being made.

The captain’s duties in management, including navigation, are multifaceted and are defined by international treaties and Ukrainian maritime legislation, as well as by the shipowner’s instructions based on them. In fact, the captain implements risk management in commercial, social and safety areas, relying on a set of legal rules and regulations governing these areas.

In this way, as safety itself is divided into numerous aspects, so the managerial activity of the captain is multifaceted. But there is a particular emphasis on safety measures in the implementation of management functions. Inappropriate safety means in fact a real threat to people, property (vessel and cargo), environment, the technological process of transportation (or other processes), and legally, inappropriate safety is an offence and leads to consequences of varying degree of public danger. It should be noted that issues of maritime safety are professional and risky. The modern vessels represent highly automated engineering structures. This entails an increase in the complexity of the functions performed by ship professionals, in particular captains – the intellectual aspects related to the analysis of complex information models, generalization, logical conclusions and decision-making become the main ones (Evgraphov, 1979). Furthermore, due to their psycho-physiological characteristics, not everyone is able to perform functions involving increased danger and the need to make an adequate managerial decision, especially under limited time. Sometimes it is not even a matter of seconds, but a split second (Maklakov, 2008).

The “human” factor includes the features of professionally important qualities, psychophysiological states of a person, which determine the behavior of a person in a given situation. Among these are: moral and strong-willed qualities, adaptation, fatigue, interference of skills and other social and role functions stipulated

by the job position and conditioned by personal characteristics of the subject of activity or peculiarities of a given situation. The factor influencing operational reliability of maritime transport workers, in particular captains, is moral and strong-willed qualities of their personality, can manifest themselves in a negative (neglective) attitude of the subject to the performed duties. Among the components of moral and strong-willed sphere of an individual, the leading role belongs to the motivation of behavior. Motivation encompasses not only a person's psychological mobilization and readiness to perform certain actions, but also those factors that direct, regulate and support these actions or change their initial direction, having a significant impact on behavior at all its stages. Often the human factor as a cause of accidents can be linked to training or requalification problems. A skill is an algorithm for action developed through education or training and brought to automaticity. However, when learning and practicing new skills, we see the phenomenon of interference – the superimposition of newly acquired skills on existing ones. The interference of mental processes is caused by limited attention, especially when time is short, when a new skill is superimposed on an existing one. For instance, in shipping, when there is no time for reasoning about course, speed, maneuvers, decision-making is subordinated to the navigator's reflexive skills, which have been perfected and consolidated in the course of long-term training. If for some reason the crew has to retrain or acquire new skills instead of old ones, there is inevitably a phenomenon of skill interference – a weakened expression of new skills under the influence of previously developed ones, due to their similarity (in form and conditions of implementation, in the mechanisms of psychological content). Interference is particularly evident in altered psychophysiological states of the employee (exhaustion, illness, frustration, alcohol intoxication, etc.) and in circumstances that cause neuropsychological burnout (time pressure on the job, threat of punishment, no expectation of success) (Mikhajlenko, 2007).

Adaptation to danger occurs when a person, due to working in unsafe sea conditions, becomes accustomed to it, and an opinion about the safety of this type of activity is formed in his mind. The many-years of accident-free practice forms an opinion about the impossibility of occurrence and implementation of threats – there is an accumulation of negative thoughts related to excessive self-confidence and complacency, frequent disregard of the rule “consider yourself closer to danger”. The underestimation of danger is based on self-confidence in the absence of responsibility for one's mistakes and there is formed a kind of legal nihilism (Mikhajlenko, 2007; Ponomarev, 1976; Valkin, 1981).

The adaptation difficulties to extreme conditions (hazards of the sea, in conjunction with the exploitation of sources of increased danger), manifest themselves through: The perception problem – the person has not perceived information about the dangerous properties of the situation or the watercraft; The awareness problem – an incorrect assessment of the situation (the person has misjudged the perceived information and, as a result, has not foreseen possible consequences or has taken inappropriate measures); The decisiveness problem – taking the wrong decision (the person failed to find and take the right decision that could have prevented the danger); Reaction disorder – lack of reaction (psychophysiological characteristics of the individual) (Maklakov, 2008).

Such problems may be in the intellectual, volitional and emotional spheres of the individual. These disorders are expressed in a set of negative individual psychological traits such as carelessness, negligence, disregard for precautions, distraction, lack of concentration, etc.

The individual's psycho-physiological state plays a significant role in their behavior and is often one of the causes of accidents and serious incidents.

Thus, considering from the study data (Fedchun, 2016), 10.3% of accidents were the result of human tiredness; 2.6% were caused by confusion at a critical moment; 25.7% – by inattention and haste. Another 1.5% were ill at the time of the accident. In addition, if we take into account those who caused the accident being under the influence of alcohol, which markedly reduces a large number of psychophysiological functions of the person, it appears that reaction disorder play a decisive role in one-third of all crashes. The essence of the professional selection is the determination of a person's suitability for a particular job, i.e. compliance with the requirements of a particular activity, based on an examination of the educational, psychophysiological, socio-psychological and medical characteristics of the individual. The following are indications for the unconditional implementation of professional selection: extreme working conditions and difficult activity; high professional requirements; the presence of hazards and threats, i.e. the high social, economic and biological significance of the error. Psychophysiological selection is a part of professional selection that aims to identify abilities and qualities that are appropriate for certain professions, which are accompanied by significant neuropsychological strain, the possibility of stressful situations, etc. Experience with psychophysiological selection practices in industry, so in shipping, shows that it can reduce accidents due to reaction disorder by

20-25%. All of the above is entirely concerned with the captain's activities as the main manager of the vessel, the crew and the shipping process, which increases with the difficulties.

Conclusions. The results of the research showed that: In summary, maritime safety is based on an exhaustive set of measures, the implementation of which ensures safety. Maritime safety is a prerequisite for the normal functioning of global trade, and consequently for the order of international relations. The captain's managerial activity is multifaceted, but the managerial function should pay special attention to ensure the safety of navigation, namely the protection of people, property (vessel and cargo), the environment, the technological process of transportation and oth. The functional dependence of maritime safety on the policy of the shipping companies is defined: a) risk assessment, which allows to connect legal norms of safety directly with actions of the captain as much as possible, based on modelling of a situation; b) personnel activity, carried out on the basis of professional and managerial abilities of captains and taking into account the psychophysiological states; c) the level of legal culture (knowledge and strict adherence to safety rules and regulations) of the captain, who operates within an extensive system of international, national regulations and rules. The captain's managerial activity including navigation, are multifaceted and are defined by international treaties and Ukrainian maritime legislation, as well as by the shipowner's instructions based on them. In fact, the master implements risk management in commercial, social and safety areas, relying on a set of legal rules and regulations governing these spheres. Having determined that inadequacy of the captain's personality (or behavior) with the requirements of the situation or technical condition of the vessel is the main cause of accidents, so the conceptual mechanism of effective captain's safety management is presented (Scheme 1).

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