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## HUMAN FACTOR — THE WEAKEST LINK OF SECURITY SYSTEM

### ABSTRACT

The authors of the following article reveal what happens with so-called ‘human factor’ on board during routine work as well as in life-threatening situations. They analyze two groups of variables, which determine safe behaviors: subjective (emotional, temperamental, sense of control, vocational experiences, individual experiences in emergencies) and social conditioning (organizational culture of workplace, safety culture). They point out, that in today’s maritime education the analysis of human behaviors on board and broadening of ideals of maritime safety culture, are being devoted not enough attention. No safety system, even the most advanced one in respect of procedures, law, technology or corporeality can reduce all the possibilities of making a mistake by a human being. Therefore the authors put forward a thesis that it is a human factor that is the weakest link of security system. Based on this theory future trainings of mariners should focus on reduction of human factor in the process of making mistakes.

### Keywords:

human factor, security system, maritime safety culture.

### INTRODUCTION

The changing world around us: the development of civilization, the increasing complexity of life, the new living conditions in the age of globalization, new and previously unknown threats — this all affects the way we think about security, changes our sense of security beginning with microstructures — among individual units, through mesostructures, up to the level of the macrostructures. These changes are also seen at work on board. There, security can be analyzed from many different perspectives, in many sizes and types. In order to discuss them fully we must be

aware of their transdisciplinary nature. Speaking of maritime safety we can discuss it from the environmental, economic, military, political, as well as health perspectives. Not only can we analyze the physical safety while working on board, but also its' legal aspects. We can talk about work at sea, in the context of international maritime safety, but we can also look at it from a much smaller perspective: the personal safety. The latter is the one we want to focus on in our article. Since it is impossible to analyze security without reference to a particular matter — the subject of our analysis will be a single person on board, regardless of whether it is a crew member, cook, master or passenger. Due to the fact that, along with the development of civilization not only the understanding of the concept of security changes, but also different types of resources for human development and security [4], we will focus on the psychosocial aspects of the security of the individual, its value system, espoused norms, attitudes, behaviors and actions of this range. We will try to show the change of a sense of security of an individual and its related reactions and behavior in the context of different types of risks to which it is exposed during their stay on the ship. We treat the safety of an individual as a process that continues during the action of an individual in everyday situations, normal situations (at work, at rest, under the influence of surrounding environment) and in crisis situations. At sea, there is no shortage of such situations. The reason for that may be one of the biggest, invisible enemies of every sailor, which is a daily routine, as well as stress and anxiety, which are capable of paralyzing any action during sudden, unexpected threat. In such conditions, it is not difficult to encounter so-called human factor error. It is worth mentioning, as noted by Jan Łopuszański that, paradoxically, the development of techniques and knowledge of the sea, which enables effective reduction of the risk of shipping, the human error factor associated with both the navigation and management of ship or land-based activities remains a major cause of accidents at sea [11].

## **PEOPLE'S ACTIONS IN THREATENING SITUATIONS**

Along with the change of approach towards the understanding of security, the approach towards the perception of crisis changes as well. Today, more and more often it is not seen as a one-off, but a continuous, permanent, and sometimes quite normal and typical event [17]. As noted by Ulrich Beck, the volatility of daily postmodern world requires from an individual continuous adaptation of actions.

There is also a lot of new threats that could cause a critical situation. Crisis can be thought of in an objective way: then, we call it an economic crisis, political crisis, social crisis and health crisis, but also in a subjective way. It has two dimensions: structural — a group; e.g. an occupational group or organization, and personal — respecting a specific person [5]. Critical situations usually have a mixed, subjective-objective dimension, which will be reflected in our further analysis, where the feeling of safety and security culture of an analyzed individual will be strongly influenced by for example an organizational culture of the vessel.

In our work, we will study the critical situation in its' most common, everyday meaning, where it is seen as a violent and dangerous change in environment, unpleasant event or a situation which eposes a threat to needs, objectives and interests of a human being. The individual is not capable of completing it and cannot deal with it. The critical situation in this approach is in most cases the narrow slice of time, a breakthrough, a turning point characterized by the complete or partial loss of control over events, which happen around an individual. It is accompanied by uncertainty in assessing the situation, psychological and social tensions, fears, decreased sense of safety, stress, anxiety — it can also lead to panic [5]. The critical situation is for us a psychosocial phenomenon, clearly distorting both the integration of the internal processes and its relationship with the social environment. Depending on the severity and extent, it has very different effects on the individual. It may be so large, that we will have to call it a disaster. Disaster is characterized by an insufficient amount of means and there is no way to gain control over it immediately. It happens in the most unpredictable place or time and is usually characterized by a broad range. Often there are not enough people who can provide immediate assistance. This situation has a particularly strong impact on an individual and arises a lot of emotions and behaviors, and because there is virtually no possibility that we would always be able to counteract it, in any time and place, in order to create procedures that will prevent disasters, we want to show what we can expect from the so-called 'human factor' in such situations. It is meant to help understand human actions, taken decisions and explain individual and collective behavior. The psychological and sociological literature includes a wide area of influence determining safe behaviors, which are reflected in the following variables:

1. Subjective variables:
  - emotional (e.g. stress, anger, curiosity);
  - temperament;

- a sense of control;
  - professional experience;
  - individual experience in emergency situations.
2. Social conditions:
- the overall organizational culture in the workplace;
  - safety culture of an individual.

## SUBJECTIVE VARIABLES

### **Emotional variables**

The role of stress in the critical situation behaviors is closely related to situational conditions. Stress, as an emotion, plays a favorable role in decision-making and additionally it motivates an individual in emergency situations. We have to keep in mind that — as every emotion — stress induces different reactions, depending on its severity. Excessive levels of stress can interfere with the perception of risks and might lead to taking incorrect decisions, which are inappropriate to the situation. Functional adequacy of safe behaviors is therefore closely linked to the level of stress resulting from a dangerous situation. This raises the difficulty: how to experimentally verify such a relationship. You can examine whether people with high levels of anxiety (relatively stable trait) are more likely to take risky or safe actions. This is evident in the works *Dziedzic i Szukiel*, where it has been found out that people with high levels of anxiety assess risks in higher levels and choose the action with a low probability of loss. Equally interesting result of the research is the preference of acceptable risk in case of some individuals (70% of respondents), which depends on the situation, and in case of remaining (30%) on personality variables [9]. It is noted that the decrease in level of anxiety goes along with the increasing experience. This is due to the growing sense of higher self-esteem. Experience is often the routine behavior — fixed as habits and customs — which can affect the low level of anxiety, and thus the low level of motivation. This does not mean, however, that habits are not necessary. Through systematic training sessions special kind of ‘mastery’ can be achieved, in the so-called impulsive behavior we can pass towards succeeding ‘degrees of initiation’, which are efficient actions (personal dimension) and synergisms (structural, group dimension). Optimal interaction between the various subjects promotes, among other things, greater predictability of behavior in critical

situations, which promotes a sense of confidence and security among the members of the groups.

### **Temperament traits**

Each of us has a different, and at the same time 'optimal' level of activation, which determines the efficiency and effectiveness of our actions. Temperament traits, which are variables of temperaments, determine what settings are required for an optimum performance of an individual. Temperament is considered to be a relatively constant representation of personality traits that are manifested in characteristic behaviors. Need for stimulation is a characteristic temperament trait of a very large individual diversity. The optimal level of arousal and individual need for stimulation in the context of the situation specifics, determine the method and effectiveness of performed activities. In accordance with the Strelau's Regulatory Theory of Temperament, people with little need for stimulation choose forms of activity at which they feel safe and have a tendency to engage in risky activities and by experiencing a situation which is rather stimulating, they may try to change them in order to increase stimulation. With the simultaneous, material occurrence of the risks it may lead to accidents [19].

### **A sense of control**

In accordance with Rotter's theory of sense of control [9] there are two types of interpreting control: as a personality variable and as a cognitive mechanism. This theory distinguishes two groups of people who perceive the source of events and behaviors. These are the inner-contained people, with a sense of internal control, where the individual sees the source of reinforcement in himself or herself, in his or her own actions, and those outer-contained, with a sense of external control, where an individual is looking for reinforcements sources in the environment, in factors beyond its control. On board individuals with a sense of internal control are much more successful. Those individuals are [8]:

- more sensitive to information and actively seek it;
- recognizing the many ways of doing certain things;
- behaving more realistically;
- having a lower tendency to conformism;
- effective against stress.

The need for control, as a personality trait, correlates with situational sense of ability to control hazards in the workplace. A sense of internal control can therefore condition the perception of risk, and thus may affect behavior in difficult and dangerous situations.

Along with the sense of control, the ability to perceive risks is also essential. There is no doubt that a person can take actions posing a serious threat to maritime safety as a result of an incorrect assessment of the risks. A characteristic feature of an individual's activities is the relationship between assessment and risk perception in relation to the occurrence of a specific or potentially possible situation. Very often it can be a major cause of taking such actions by a person, which he or she would not have taken while working at sea under normal conditions. Thus, the ability of proper assessment of the degree of risk, especially in a situation different from the normal operating conditions and established procedures for its implementation, is of great importance. It allows for almost immediate and effective elimination of negative phenomena and allows to take optimal action aimed at preventing the occurrence of an incident, accident or disaster at sea, and in particular its effects and serious consequences. Proper perception of risk is very important in situations where human activity cannot have any effect on avoiding an incident, accident or disaster. While explaining the causes of behaviors and reactions of people in a particular situations, you have to take into account all the circumstances that could have an impact (positive or negative) on their actions, in particular the ability of early perception and appropriate risk assessment.

The process of thinking and decision-making is one of the unique human abilities. It allows to make the analysis of data from many different sources, which on the basis of preparation for work at sea and gained practical experience gives you the opportunity to reach conclusions. The so-called 'common sense', is of great importance to maritime safety. A thorough analysis of the situation and correctly taken decision is inextricably linked to the degree of preparation for work at sea, based on experience and perception. The negative impact on the proper way of thinking and making certain decisions may also be the result of stress and personal characteristics of human, such as excessively unreasonable ambition, temperament or a tendency to ignore important matters still set aside 'for tomorrow', 'for later', etc.

Knowledge and practical preparation for work at sea are factors within the process of life-long education. This applies to all staff in the maritime area. New technologies, procedures and rules of national and international maritime surveillance

require maintenance of high level of work on board and increase the degree of interdependence of staff regardless of their position. It is not possible to separate the impact of the quality of work at sea, on its state of safety, by the use of a simple and seemingly clear distinction between activities, 'important and less important'. Such a schematic and inflexible way of thinking was repeatedly a cause of very serious and negative in consequences events.

### **Professional experience**

It is not unequivocally clear how the professional experience affects the safe behaviors. On one hand we are getting rich in knowledge and skills, which enable elimination of possible risks, on the other hand spontaneity of behaviors decreases, and awareness of hazards increases. Some researchers mention the decreasing sensory-motor efficiency and reaction time, which is increasing with age. Additionally they point out the so-called getting used to the place of work and daily activities which may result in reduced alertness and may decrease sensitivity to the potential threat. Professional experience has an impact on the safety behaviors through safety culture in the workplace.

### **Individual experience in emergency situations**

Each person experiences a lot of situations that are considered to be difficult. Evaluation of such situations is subjective. Trauma and emergency situations involve experiments overwhelming almost every individual, for example serious threat to life or physical integrity of self or another person, especially a close one. Extreme situation can also be caused by events (short-term or long-term) which are extremely frightening, having the characteristics of the disaster. In these types of events there are features of something touching the limits of human endurance to stress or even exceeding them. This is a common characteristics of the listed situations.

Nevertheless there are many factors that differentiate various events. If the event has the characteristics of a disaster, it is important whether a situation is caused by nature or its cause was a human error, lack of imagination or conscious action. An important factor is also the sense of loss, both material and loss of human casualties (the number and the degree of damage to the victims who survived the disaster, whether these losses affected us personally or we were only its observers). These and other factors have a significant and visible impact on the mental experiences of people who were part of the disaster. Any sudden, traumatic situation primarily

causes a terror. It usually occurs just before the event, during the event (this usually concerns fractions of a second), and also continues for some time after the event. The causes of this condition are: surprise, helplessness, lack of control, uncertainty and the very real threat to life. Immediately after suffering trauma there follows a shock. Its effect is complete numbness or on the other hand an emotional outburst. This usually continues for a couple of minutes, sometimes hours. These emotional and behavioral reactions are a direct response to the event and sustained injury. It is believed that this reaction has its phylogenetic basis. It is a reflexive reaction to the traumatic threat and caused physical and psychological injuries. It is a sign of the struggle (aggression), panic escape or complete immobility expressed in apathy and emotional numbness. Extreme situations, due to the exceptional strength of the stimulus, cause — almost in every case — a clear, often extremely violent psychological reaction. The spontaneous reaction of most people in emergency situations of direct threat to life, is a mix of numbness, confusion, shock, withdrawal, and other similar experiences. People in these circumstances may behave differently. Some people, after the resolution of the first shock are trying to take action towards saving themselves and often other people. Others numb still, experiencing a total dissociation. None of mentioned reactions can fully protect against the negative effects of psychological trauma, that an individual suffered. Proactive person attempting to save himself or herself, reduces the likelihood of sustaining deeper effects of trauma. Speaking of extreme situations, it is almost presupposed that there are no people who haven't experienced some distinct emotional response to such a strong stimulus. The difference lies in the intensity and duration of the negative effects of this reaction.

The most common disorders suffered as a result of trauma are: acute traumatic stress disorder, posttraumatic stress disorder (PTSD), and *complex PTSD*. There are also nonspecific disorders in the form of various depressive syndromes, anxiety disorders, eating disorders, addiction to drugs and others. In addition to the dominant psychopathological picture following trauma, sometimes there can also be seen some positive changes in people who have experienced extreme survival situation [2].

## SELECTED SOCIAL CONDITIONS

Every culture has its own patterns: most frequent, obligatory and approved in the country. They can relate to methods of work, the value of work, methods of management, collaboration, action or just the perception of safety. Organizations in



the country create their own work and management methods obligatory in their structures often based on patterns of their culture, for example: Americans manage work completely differently than the Japanese, etc. This is the organizational culture — or, in simple words: how we work here. Employees on each ship create their own, unique organizational culture. It includes: clear rules of communication (e.g. how to give orders and direction), lines of authority and hierarchical structure (both official and unofficial functioning outside the regular working hours), valuation, standards, policies, system of rules shared by the members of the board or the whole corporation [1]. The organizational culture includes our daily, visible at work and deeply rooted values and beliefs considered to be important, not only to individual employees, but also to the organization as a whole. How can organizational culture influence the behaviors increasing or decreasing the security? An example is the style and the quality of ship management or public acceptance of high-risk behaviors, which is an inhibitor of safe behaviors. It should be emphasized that the direct opinion of the closest associates is one of the main types of social influences having an important relationship with co-workers' safe behavior. Among the crew there can be a 'social approval' on certain behaviors which on the surface do not appear to be dysfunctional. An example would be so-called 'small' negligence at work, which can have serious, negative consequences in the future. Studying marine casualties we can observe very often so-called snowball effect, when 'small' negligence can lead to a great disaster. Another element of organizational culture, essential for building a culture of safety, is the issue of mutual trust to another man, to the procedures and to the equipment at our disposal on the ship. A sense of mutual trust among people working together is a condition of opening parties to the environment and cooperation with others, and this is indeed the basis for building security [17].

The problem may arise in the case when different nationalities work together. Each person carries a different pattern of thinking, feeling and behaving. It is very difficult to change it. This 'imprinted program' is called culture [10], in which we all educate. It includes the above actions, but also simple, everyday activities as for example a way of communication, showing or hiding emotions, patterns of own work and work expected from others. Too often we consider the cultural differences between people working together in small extent. Equally often they are replaced by a superficial 'political correctness' which consequently amounts to indifference and lack of desire to learn or understand different cultures. The problem with multiculturalism on board may reveal or worsen the critical situation, when the daily communication can be a big problem. As previously discussed, under stress, people act

differently than in their normal, everyday work. Strong stress and emotions can cause communication problems such as: the use of different, verbal communication styles, different ranks in sentences, another way of reading the signs, symbols and different reading of the importance of verbal context. While communicating, especially those issuing the command and directing people in critical situations, should be aware of the differences resulting from various cultural backgrounds such as different nationality, a different set of values, a different religion, different language and its grammar (even if an individual speaks English, he or she can use different word order or differently interpret the meaning of heard phrases). This will prevent and reduce the number of misunderstandings. Also, the recipient must be sensitive to these differences and not remain passive, by for example reading heard message directly, without the assumption of the possibility of some differences.

In the above an organizational culture was mentioned as an independent structure, but it can also be understood as a part of safety culture. Safety culture includes three elements (pillars of security) of reality [5], [6]:

1. The aforementioned realm of organizational culture, which here is mostly understood as the law and procedures for responding to emergencies, structures, methods of communication and information exchange; having subjective-objective character, in this perspective, organizational activity, by implementing procedures, which in this case acted as stimulating and regulating factors, should precede the physical and mental elements of a safety culture, referred to below.
2. Realm of material culture (physical) to which belongs the ship infrastructure and technology, having an objective character.
3. Realm of mental, awareness, spiritual and psychic culture consisting of: a way of thinking about safety, patterns of behavior, values, norms specific to the entity's assessment influencing the perception of safety (of his own and the surrounding society), thinking about it and associated with it way of behaving, acting and interacting — it has a subjective character.

Similar vision of safety culture can be seen in Cooper's model of culture [17], which distinguishes the three components. Two of these relate to work and organization and can undergo external assessment by observation of behaviors or supervision of the organizational issues related to workplace safety. The third element of safety culture — a unique set of attitudes, values and beliefs — is possible to be assessed through the psychological examination or security climate test. In the

latter area, we can look more closely at the third element, by assessing its impact on the behavior of security. It performs the following functions [6]:

1. Integrative — holds together different dimensions of security, links, integrates various bodies responsible for security, serves for the harmonious development of those responsible for security.
2. Adaptive — adapts individuals and groups to act in a new situation.
3. Stimulating — mobilizes and activates individuals and organizations to work together.
4. Regulatory — synchronizes and coordinates the activities of individuals and groups.

In this article, we focus on just one, psychosocial safety pillar, where as a culture of safety in the aspect of interest to us, we can consider the results of individual and social attitudes, values, perceptions, competencies, professionalism and behavioral patterns and the quality of safety management in the organization [17]. The authors also highlight the presence of several other cultural elements relating to the hazards, risks and safety. These are the standards, principles and awareness of security controls. Safety culture is passed on to us in the process of socialization, which is the accustomization to a way of life of one's own group and the larger society by learning the rules and ideas contained in one's surrounding culture [17]. Elements of safety culture, just like the other elements surrounding our social reality, are internalized or in other words they transform into individual beliefs, opinions, motivation and morale canons. Attitudes and certain tendencies to act in certain ways are being formed. To be effective safety culture must undergo a second stage of socialization, which is externalization. Behaviors absorbed by an individual will then be manifested not only in its structure of personality, but also in the form of unit operations. The socialization of the elements of safety culture will be more successful if the behavior encoded in the safety culture will be widely respected in the particular social system.

In the process of socialization an individual is forming his or her own system of values and norms. Our range of needs is associated with the system of values. In case of a stable situation, system of values of an individual is enlarging and stabilizes. In the situation of rapid changes, range of needs usually becomes narrower and changes into the hierarchy of values. Only the basic standards — for example saving one's life — become important (although it happens that as a result of sudden, shocking and unexpected events, individuals behave in an unexpected ways: for

example, in case of fire on board instead of evacuating or holding the fire-fighting equipment, a person can enter the burning board, because there are valuable items left in the cabins — such behavior may result in loss of person's life). Very often in those situations there appears a selfish thinking about the safety [6] dominant for many centuries in human consciousness, where the behavior of individuals in a critical situation are mainly aimed at ensuring the safety of a particular individual at the expense of others. Norms and values system of an individual gains in this situation a particular meaning: a person is able to rise above the selfish needs and to fight for survival, not only for yourself but for others, for whom he feels responsible [6]. This is the rule — according to the codes of honor — the captain of ship should follow<sup>1</sup>. In such situations, the safety culture is of particular importance: if its level is high an individual, becoming a leader, is able to work efficiently, interacts with other aid groups, gives a signal to other colleagues, and — in the case of tourist boats, passenger ships and line ships — to the average passenger, that the situation is under control thereby reducing the chances of panic formation. If the process of cultural assimilation does not work correctly, an individual will have a low level of safety culture. This will manifest itself primarily through non-compliance, the value system aimed at satisfying their own needs, but also the acceptance of risk and low risk awareness. These behaviors will not lead to the control of emergencies. To do so it is required to rise above the selfish thinking for the sake of group solidarity. Not only certain personality traits mentioned above are required for this, but also competence and skill. Simply having the material resources to enable the ship to rescue people in critical situations will be insufficient in the absence of adequate communication structures, which will be transmitting information resources smoothly, and also without individuals' ability to use them. Even if there are less material resources but greater skill in handling them, our chances of survival increase. In this case the ability to make difficult and complex decisions under pressure of time and accuracy of these decisions are essential. It is important to remember that during emergencies on board it is time, that plays a huge significance. For example, during

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<sup>1</sup> Recently, there are many controversies around the behavior of the master of the ship *Costa Concordia* — Francesco Schettino, considered by some environments to be unethical, especially in his profession. It is believed that after the ship struck protruding rocks, he evacuated himself from the ship on one of the first lifeboats avoiding responsibility, and even lying to an officer of the port of Livorno — Captain Gregorio de Falco, who in a very harsh words ordered the captain to return on board. In later interviews with the media Schettino explained that he slipped and fell into the raft 'accidentally'. Nevertheless, further investigation in this case does not confirm these activities. At present this case remains unclear but the public opinion was strongly moved by this event.

the evacuation the time at our disposal is reduced by the time required to realize the need to evacuate [13]. Individuals have very subjective sense of time and usually different time management skills. They also have a different ability to make decisions especially under time pressure. 'In sociology of decision making the internal system of decision-making group is taken under consideration: 1. group balance, 2. interactions, 3. communication, 4. common interests, 5. social contacts. A lot of importance is attributed to the size of the group as well (the nature of the relationship)' [7]. Additionally here comes the accuracy of decisions, where during critical situations there is a deficit of thinking and acting strategically in personal dimension. The situation is different in case of a trained crew, and quite different in case of passengers, who have much less knowledge and skills in the field of safety culture. Despite the fact that we live in the information society and the society of knowledge, the sphere of self-development in the field of safety culture is still left behind. There is a lack of forward-thinking among many individuals. What matters is the here and now, we reject the thought that we could ever find ourselves in critical situation. The mindset understood as an individual and collective strategy, and at the same time an important determinant of safety culture is not something common. This is due to the still poorly formed and settled in our culture 'sensing' of time and space [6]. Rarely do we have the awareness of the importance of knowledge of safety culture for our everyday life and too little emphasis is placed on the development of skills and competencies in this regard.

It also involves the last, important in shaping our behavior related to security, element of safety culture which is the way of thinking about the crisis in itself, the way it is perceived by an individual. Perception of an individual including the perception of space and time is in this case of huge importance. In most cases, a critical situation is perceived clearly negative. Meanwhile, thinking about the threat may have two opposite poles: it can be treated in a clearly negative way or as a challenge and an opportunity. The threat in itself is only the information about a particular state of the situation and a lot depends on how you read and interpret it — a lot of depends on the perception and reception of an individual, which is an appropriate recognition of the problem in time and space and on taking action and interaction adequate to the information received, at the right time and place and according to well-estimated needs. Much more often we encounter a situation where the improper reading of information, its misinterpretation or undetection at all, lead to the measures not being taken at all or being insufficient, inadequate or taken too late in time. Then we can clearly speak of a threat. With proper interpretation, the threat

can become an opportunity and it is more likely that an individual will cope with a difficult situation. It should be remembered that those who are able to maintain the so-called 'cold blood' do not panic, clearly analyze the situation and save themselves even from the worst situations. Unfortunately, thinking about risk in this way is rare. The impact on this type of perception of risk is the lack of preparation for an emergency situation and thinking in terms of 'these things happen to others, not me'. Marian Cieślarczyk [6] points out that in the conventional notion crisis means something sinister, that should be avoided, and best not thought about. This point of view is not conducive to exploration of activities in critical situations and ways of dealing with them. It also does not promote self-discovery or noticing weaknesses in the mental sphere, which should be alleviated in order to be able to cope with difficult situations. Let us note how this model of thinking may appear among the passengers boarding on to the ferry, where despite created conditions for the development of knowledge concerning safety during travel, most of the passengers do not pay any attention to safety signals while evacuating. They came to have fun, relax and nothing wrong yet can happen to them. Knowledge of coping with a critical situation or the ability to cooperate with the services in such a situation, is still not common among most people. What happens, however, when such a situation unexpectedly occurs? 'The crisis is characterized by gradual or sudden decrease in the subject's control both over his or her behavior and actions, but also the loss of control over events, with an increasing uncertainty and risk level. There follows a sudden or gradual change in the relationship between the subject and the surrounding environment. So far, adaptabilities developed by an individual turn out to be insufficient. At the same time the natural processes of integration in different spheres of life and activity of the entity are slowing down or stopping — an individual suffers from the physical, mental and moral disintegration, as well as encounters difficulties in achieving the objectives and satisfying the basic needs, including the need for security'. In this case, an individual may be subjected to different types of crises: mental, social and health. Psychological crisis may be due to a very strong event, physical and/or mental stimulus, which can interfere with mental processes such as: perception, communication and physiology, thereby contributing to a distortion of the important functions of life and the relationship with the environment, inadequate to the situation actions or taken decisions [6]. Health crisis often begins with a mental crisis or is caused by external factors, adversely affecting the human body and threatening his or her life. Injury, trauma or shock can cause an emotional disorder called posttraumatic stress disorder (PTSD) [16]. Long-term accumulation of tensions and conflicts, the

lack of a stable situation and poor social control can lead to a weakening of interpersonal relationships, increased levels of stress, lower sense of security and even social isolation, which is the genesis of social crises. In such cases, an individual cannot be left alone, because it is then unable to solve any problems. It requires support not only during, but also often long after the termination of critical situation.

## **CONCLUSIONS**

‘Accidents at sea are quite common, because it is still impossible to eliminate all risks to human life’ [12]. We are human being/individual/human factor endowed with certain psychosocial characteristics, having a particular culture of safety. No security system, even the most perfect in procedural, legal, technical or material terms can reduce all possibilities of making an error by an individual, and this is the reason, why we put forward the thesis that it is a human factor that is the weakest link in this system. It can be argued that everything is subject to modifications — also a human being. It is true, but at the same time it should be remembered that people and their safety culture change more slowly than other, more objectified elements of their defense system, such as new technologies, new laws or new regulations [6]. It is easier to change the law than human mentality. It is easier to add new items to ship equipment than to convince people they are needed, better than the previous ones and that they will improve crew’s and passengers’ safety. You can analyze some of the schoolings: on board there is a strong emphasis on training people in the field of security. Sailors participate in many, often regularly repeated courses, conduct drills, etc., and they still do not always produce positive results when it comes to activities in real danger. Why does this happen? You can give at least four groups of factors that affect it.

1. An individual fulfills his or her needs in a wide spectrum, is motivated to action and a comprehensive activity, and this depends on his or her mental and physical abilities. In turn these actions affect the security behaviors in his or her employment role. Studies concerning accidents indicate that its most common causes are human errors, including dangerous behaviors [3]. Most of the dangerous situations are the result of loss of control over risk and over oneself.

In the literature, there is an emphasis on safe behavior modification programs, where for example M. Goszczyńska [9] shows safe behaviors in the areas:

- function of the ability and motivation to safe performance of the task;
- in relation to risk — as the inverse of risky behaviors;
- as the attitude towards risk;
- as a final result of preventive measures.

The author states, that the behavior of a vocationally active individual in the risk situation may be the result of:

- conscious choices with full analysis of the advantages and disadvantages;
- customs and habits;
- following other's behaviors;
- complying with the rules and standards.

Situations in which decisions are not made consciously, but under the influence of habit, imitation or under stress, aggression and other emotional states can cause harm. If these conditions are of high intensity, they can directly affect the wrong decision, which is associated with impaired perception of the situation (e.g. exaggeration or underestimation of the situation) as well as the processing of information. Unfortunately, the human ability to perceive many potential hazards is not always adequate to the actual situation and this aspect is quite often dependent on the expectations of an individual.

2. Selfish thinking about the safety [6] dominant for many centuries in human consciousness, where the behaviors of individuals in critical situations are mainly aimed at ensuring the safety of a particular entity at the expense of others. What is essential is the education affecting social attitudes, which increases the sense of responsibility of individuals in relation to other people, raises mutual interdependence on a principle 'we're all in the same boat' and improves awareness of the responsibility for their own safety and the safety of the environment.
3. The asymmetry in the perception and thinking about the relationship with the environment [6]. This is somewhat related to the above point. An individual often does not perceive the relationship between 'I' and the environment as reciprocal, two-sided, but with a clear imbalance and displacement of environmental influence on him or her. Therefore, an individual is not prone to taking actions at the right time and place, throwing the responsibility on the others and the 'some other' environments. The negative consequences of this asymmetry can be seen the shift of time and space when for example improper exploitation of the vessel



and not paying attention to it will be revealed only after a certain time, or poor relations in the crew are manifested, for example, by the lack of mutual trust in a critical situations. This may also be the lack of construction and operation in the symbolic culture of normal information-and-control systems. Negligence and asymmetry in these relationships could adversely affect the safety of the entity and its environment in the least expected time, and the inappropriate communication will additionally aggravate already formed crisis. It is worth mentioning that the existence of public acceptance of certain behaviors do not seem to be dysfunctional at first glance. These are ‘minor’ negligences at work or unresolved communication issues. They are not seen and analyzed as those that accrue and swell over time, which may lead to a formation of a dangerous situation or may inhibit the proper course of action during a critical situation.

4. The quality and learning outcomes of people on courses depend, in large part, on previously owned safety culture, obtained during school, and perhaps even during preschool education. There is lack of sufficient knowledge about the nature of security. Without putting pressure on the educational processes associated with the formation of security culture of individuals from an early age the problem will not be reduced. This applies both to seafarers, for which training and alarms are a ‘necessary evil’ and passengers, whose expertise in this area is enclosed within a short instructional training, which takes place at the entrance to the ship/ferry or during the first hours of cruise. It is worth noting that for most of them, this training does not matter, because they came here for a different purpose and does not assume any problems. What can be done in order to improve safety in the future, is to take anticipatory actions of events through an extensive public education on safety issues. This may improve the sphere of public awareness and may lead to greater interest and commitment to self-education in this field. Formation of such attitudes will affect the coherent cooperation of conscious elements of safety culture with the other two spheres: organizational (law of the sea, emergency response procedures, the interaction of marine services, information flow system) and material (understood as financing, acquisition and exploitation of equipment and supplies). High level of safety culture will improve the understanding of the phenomenon of security, change the way of thinking about safety, enhance awareness of new threats and new dimensions of security. It will also provide practical solutions to problems related to operation of an individual in hazardous conditions.

We have been developing technical systems in order to improve the safety. We believe that we can overmaster nature using modern technology. Nonetheless, we still have a lot of maritime accidents. Maybe it is time to draw conclusions and after the era of technological development start putting stress on the development of safety awareness of individuals, groups, societies, and during sailors' courses spend more time getting to know each other, their abilities and other cultures, which are likely to work with together in multicultural crews.

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**STRESZCZENIE**

W artykule przedstawiono znaczenie tak zwanego czynnika ludzkiego w trakcie rutynowej podróży statku oraz w sytuacjach zagrożenia życia. Analizie poddano dwie grupy zmiennych, które określają bezpieczne zachowania: subiektywne (emocje, temperament, zmysły, doświadczenie zawodowe, indywidualne doświadczenia wyniesione z sytuacji krytycznych) i uwarunkowania społeczne (kultura organizacyjna oraz kultura bezpieczeństwa). Zwrócono uwagę na niedoceniające we współczesnym szkolnictwie morskim analizy ludzkich zachowań oraz potrzeby upowszechniania ideałów morskiej kultury bezpieczeństwa. Żaden system bezpieczeństwa, nawet najbardziej zaawansowany pod względem proceduralnym, prawnym, technologicznym czy organizacyjnym, wciąż nie potrafi wyeliminować ryzyka popełnienia błędu przez człowieka. Dlatego autorki wysuwają tezę, że czynnik

ludzki jest nadal najsłabszym ogniwem systemu bezpieczeństwa. Opierając się na takim założeniu, proponują, by podczas szkolenia marynarzy w większej mierze uczyć, jak redukować błędy czynnika ludzkiego.