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INCREASED SAFETY FOR HIGH-SPEED MARINE CRAFT BY FOCUSING ON OPERATORS AND ORGANIZATION

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High Speed Marine Craft (HSMC) place new and higher demands on safety and the prevention of accidents. Increased speed must, by definition, increase both risks and possible consequences, thereby decreasing safety at sea compared to conventional crafts. This statement is, however, valid only on condition that all other variables are constant, i.e. when no changes are made in other safety-related areas. As technology changes make us more vulnerable and expose us to greater risks, we must make improvements in other significant areas to at least maintain the necessary level of safety.

This paper focuses on the crew, the operators, of the HSMC and takes a more systematic look at the risks involved along with our efforts to counteract these risks by various measures. In doing so, I am, of course, aware of the fact that the "human factor" is involved in most, if not all, maritime accidents.

All operators in any risky profession rely on a continuous flow of information which forms the base for their understanding, decisions and activities. Of paramount importance are therefore the quality and availability of relevant information and how the operators involved process, understand and use this information. The quality and availability of information has to do with such things as technical aids, displays, indicators, ergonomics, design, architecture and other built-in qualities. There is, of course, a strict causality between the quality and availability of information and the quality and rationality of an operator's activities. No operator can be expected to form good decisions and base accurate activities on bad, ambiguous, absent or insufficient information.

But even if the physical conditions are perfect, things can go wrong depending on how the operators use the available resources and how they interpret information. Perfect and accurate information can be neglected, misunderstood or otherwise not used properly and activities can be omitted, faulty or poorly timed. Errors like these have less to do with the physical environment but can be attributed to the operators, their characteristics and qualities.

Thus we have to focus on the operator and determine the characteristics involved in how an operator acts upon and handles information. The major characteristics are:

**Personality
Knowledge
Experience
Attitudes
and
Organization**

With the exception of organization, all these characteristics are the operator's personal qualities. I would like to discuss each of these items, the shortcomings involved and what we can and should do to counteract any negative influence.

Personality

Personality has to do with differences between people rather than similarities. Keeping in mind that we probably are more alike than different, it is still the differences that attract our attention.

The contact every human being has with the outer world is through the senses. But the senses have limitations and physical characteristics and, furthermore, we collect and acknowledge information differently. The influx of information is not a passive process, it is very active. We seek and avoid information depending on our preferences and psychological make-up, and most of this happens out of the reach of our consciousness. The information that reaches the conscious mind is thus selected and filtered in a very personal way. Involved in the process are things like motivation, personal experiences, upbringing and development, perceptual defence mechanisms and other avoidance structures. Together these qualities form the base of the personality.

These mental structures manifest themselves in differences in behaviour and reactions between people to similar sensual input. In a risky environment, some behaviour is beneficial and some is not. It is, for example, not desirable for operators to suppress or alter alarming information in order to protect their harmony; to become paralyzed when information is ambiguous; to become hyperactive when information is unexpected; to react emotionally, to become overwhelmed, to have emotional outbursts or to have their knowledge and training suddenly amount to nothing when stressed or under tension.

In short, the individuals who are to operate HSMC must be selected carefully using somewhat higher-than-usual demands on their suitability. We must define the desirable personal qualities and characteristics required for maintaining the needed level of safety. This is achieved by modern psychological selection procedures, e.g. as used by most airline companies. Marine Profile has helped all major Swedish HSMC owners with psychological support in their selection processes. By using modern personality assessment methods we have supplied relevant information which the shipowners have used to make decisions for employment and promotion.

In cooperation with shipowners we have identified desired personal qualities and by using psychological assessment methods, our maritime psychologists are able to shed light on and comment upon these. For the individual this process takes a day comprising a meeting with a maritime psychologist, two or three psychological tests and a fact-finding interview, guided by the results from the tests. When the interview is completed, the assessed individual is given a full feedback so that he is aware of the information that will be conveyed to the shipowner and our following recommendation.

The major personality qualities that we focus on in the assessment and feed-back are, together with some explanations, the following:

- **Safety aspects**
 - Reality testing; swift and accurate perception, even under stress
 - Sound, unbiased judgement of own resources and of situational demands
 - Sense of responsibility
- **Maturity**
 - Personal stability in different contexts
 - Self-control; not being impulsive or erratic, nor inhibited at the expense of expressiveness or approachability
 - No strikingly naive or childish characteristics
- **Stress reactions**
 - Not easily stressed
 - Ability to function unaffected in a state of stress
- **Intellectual capacity and communicative skills**
 - Ability to grasp different aspects of shipping: technical, economic, social etc.
 - Verbal clarity and pedagogical skills
 - Ability to listen and to read people
- **Drive and activity**
 - Commitment to one's work
 - Ability to enthuse people
 - Self-reliance, energy and stamina
 - Initiative; to be self-motivated and able to see what is required in a given situation
- **Social skills**
 - Ability to make and maintain contact with people
 - Openness and accessibility
 - Interest in people
- **Leadership and management skills**
 - Ability to plan, implement, delegate, coordinate and evaluate tasks
 - Ability to motivate, assist and counsel people and to handle conflicts and grievances

- Sociability and cooperativeness
- **Development**
 - Growth potential; abilities and characteristics to cultivate or moderate
 - Priorities, life situation, motivation and loyalty
 - Ambitions

The first three headings; Safety Aspects, Maturity and Stress Reactions, are of course most vital for safety and must therefore reflect a reasonable level. These headings normally form the base for any negative recommendation. The other headings are more of a "soft" but desired quality and are weighed and judged from person to person in discussion with the shipowner. Shortcomings are also thoroughly discussed with each assessed individual throughout the feedback situation in a positive and supporting way and we often recommend ways for further development. Shipowners are often interested in helping with programmes and other means to facilitate further individual development.

Knowledge

Knowledge is likewise a mental quality and has to do with how to seek, evaluate and use information. Knowledge has a significant effect upon perception inasmuch as a knowledgeable person perceives more and has more structured and distinct perception than a person without knowledge. One example is that a trained air pilot has more structure and a better perception of the instruments in a cockpit than someone with an untrained eye who probably would be confused. Another is that a trained radiologist derives more information from an X-ray picture, and even sees other things, than a layman. A nautical officer gets useful and structured information from a radar screen, where someone without training has difficulty in seeing anything meaningful at all.

Another aspect is that we normally are unable to see a thing that we don't have a word for while, after learning the word, we can't avoid seeing it. A greater vocabulary thus enhances our ability to perceive distinctions between similar things. An extreme case is that Eskimos have more words for snow than we have and consequently see more qualities and differences in snow than we do. The same is probably true for Arabs who are said to have quite many words for different sorts of camels.

Knowledge sharpens our senses and decides what information is relevant, how to seek it, how to interpret and how to use and act upon it.

Assessing an individual's level of knowledge is somewhat easier than assessing his personality. Besides establishing the level of formal training by looking at evidence of exams and certificates, a shipowner normally has his own expertise in judging the skills and knowledge of an operator. Shortcomings in knowledge are also more

easily detected by tests and easily improved by traditional and well-established means, such as training programmes and complementary studies.

To meet the new challenges of HSMC we must therefore acknowledge the increased risks involved and select the most skilful operators and supply them with the best possible training programmes in order to maintain the desired level of safety.

The training programmes Marine Profile can offer are training in leadership and training of instructors in Crowd Management. Training in Crisis Management is currently under development and will be launched early next year. Both Crowd Management and Crisis Management Training are in line with the STCW and the High-Speed Code requirements.

Experience

Experience is also one of the personal and individual qualities that determine how an operator uses information and how he deals with reality. Experience varies of course, but the normal way of assessing someone's experience is to measure the time the person has been active in his profession and, so to speak, been out in the real world. Long experience is obviously better, and seafarers traditionally refer to how long they have been at sea. Nevertheless, it may be wise to avoid exaggerated emphasis on time only. Parallel with quantity of experience we should also emphasize quality or content. Even vast experience from traditional ferries and other tonnage is not necessarily related to High Speed Marine Craft and the amount of experience from high-speed vessels still tends to be rather limited.

We seldom refer to the actual content of experience. It is possible that a person, even with long experience, hasn't met many situations from which he could benefit professionally, nor faced many critical or hazardous situations. Most work onboard a ship involves routine and repetitiveness in such a way that another year does not necessarily add much to anybody's competence. Some repetitive experience can also be detrimental inasmuch as it induces a sense of routine, safety and normality in an otherwise risky environment. Complacency is only one, albeit well-known example of such a negative effect of experience.

Another way of maintaining or heightening the level of safety on HSMC should therefore be to choose the most experienced seafarers but also to continuously expose them to further experience. For this reason there are various training programmes in simulators where it is possible to design exercises and safely cope with most conceivable situations. The major features and advantages of simulator training are their close approximation of reality, without real risks and that we afterwards are able to analyze and gain further knowledge and scrutinize the alternative solutions of any given situation. The personal gain from such exercises is that they provide quality and content to the seafarer's experience. Quality in experience is superior to other types of knowledge because of its greater impact on behaviour.

Attitudes

In spite of what is said above about personal suitability, knowledge and experience, attitudes are of paramount importance for safety. No matter how suitable, how knowledgeable and how experienced a person might be, wrong attitudes might still have the stronger influence on someone's behaviour. Thus, in order to achieve a sufficient safety level we must also focus on attitudes. One way is by using careful selection procedures of operators in order to avoid employing those with wrong attitudes. It must be noted, however, that attitudes can also change and be perceptibly or imperceptibly altered over time.

As attitudes are the consequence of the prevailing culture we must constantly nourish a good safety culture as well as a good company culture. In these efforts we are supported by regulatory bodies such as the ISM Code and other QA systems but there must also be constant awareness and care of the culture in question. Cultures and value systems generally emanate from the top of the organization and should be written as policies and visions and be subject to rigorous and constant management check-up. When not constantly nourished, a culture tends to be altered over time and unwanted subcultures, manifesting themselves in bad attitudes, may develop onboard individual ships or in teams.

The shore as well as the shipboard organization in companies operating HSMC should therefore gain from being very meticulous about their safety culture. Responsible people should constantly be monitoring the operations so that they are able to forcefully react to any development of unwanted subcultures, of wrong attitudes and unhealthy practices.

Bad attitudes might be revealed and also rectified in simulator training, exercises and other training programmes. The development of cultures, policies, values and visions throughout an organization, in order to influence attitudes and thereby behaviour, most often needs another approach. In such organizational work, Marine Profile consultants have gained extensive international experience.

Organization

A suitable organization has proved to be one of the most effective means to keep human factor problems under control in all areas where risks are involved. A suitable organization should be very clear and transparent to all. It should divide tasks and responsibilities, utilizing all available human and other resources, formalize work, information and communication and allow for constant management check-up and monitoring. Still, the organization should be flexible enough to deal with possible overload and with possibilities to embrace and deal with most situations.

The aids for the onboard organization normally consists of manuals, checklists and rules, but we also have several training programmes such as BRM or CRM courses, training in teamwork and leadership courses all designed to facilitate cooperation,

communication and to improve safety. The pilot-copilot system is of course also a valuable organizational tool onboard any ship but especially on HSMC where time may be limited and where organizational reflex actions therefore must be quick and distinct. Most of these training courses have been adapted to the maritime field from other areas such as the aviation industry, the military, the nuclear industry and the ordinary shore-based industry.

The advantages of a better organization, even at the expense of a more formalized manner of work and communication may, however, not be obvious to all. Sometimes learning from courses fails to influence the onboard practice because of reluctance to discipline the work, culture reasons, old habits and insufficient management check-up.

Courses should therefore be complemented by company rules stating normal operating procedures and by thorough training of organization, interpersonal behaviour, personal skills and communication parallel with other training exercises in simulators. For the future improvement of training and other safety-increasing services and to take advantage of our combined competence, the Danish Maritime Institute (DMI) and Marine Profile are now collaborating.

It is, however, wise to not limit organization-improving efforts to the onboard organization only. Sometimes the word "teamwork" seems to apply solely to those still at sea and not to the shore organization as well, and much "heat" is therefore generated by friction in the ship/shore interface.

Teamwork should apply to the entire organization, and ship and shore should be perceived and cooperate as integrated parts. Like a company culture or a safety culture, teamwork also emanates from the centre of an organization, spreads through all levels, ultimately having an impact on the most distant parts of the organization.