

# The human element in shipping

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## Abstract

*Modern technology has revolutionised the way in which a ship is operated, but lack of attention to the human/system interface, in terms of the design, layout and integration of systems, and training in their use, is the root cause of many accidents today. The key to improvement is in the close involvement of all stakeholders to ensure that a ship is 'fit for purpose', and that the master and his crew are provided with the proper tools and are adequately trained to ensure the safe conduct of the ship and the safe and timely delivery of its cargo. The Nautical Institute and Lloyd's Register have recognised the need to improve the awareness of human element issues. To this end, in October 2003, they launched a project aimed at improving the awareness of the human element in the maritime industry, with the release of Issue 1 of the **Alert! Bulletin**, and the introduction of an associated website <www.he-alert.org>. In this paper the authors will outline the project and discuss some of the human element issues on which the bulletins have focussed.*

## 1. The human element

There is no accepted international definition of the term 'human element'. The aviation world describes it as an alternative to the term 'human factors' to "avoid ambiguity and aid comprehension"<sup>1</sup> and the US Coast Guard defines it as "human and organizational influences on marine safety and maritime system performance".<sup>2</sup> In the maritime context, the human element is taken to embrace anything that influences the interaction between a human and any other human or system or machine aboard ship. The International Maritime Organisation (IMO) has been addressing these issues since 1991.<sup>3</sup>

Although the human element has been with us since time immemorial, the issues are not constant. The humans, systems and machines have changed, not only through the increase in technology, but also because of the need for operators to maintain the competitive edge by reducing running costs. This has resulted in a reduction in manning scales and the employment of

multinational, multicultural and multilingual crews, which can lead to differing interpretations of international guidelines and inconsistent standards in lifestyle, training and education.

Furthermore, the introduction of new technology and computer-based systems has changed the way operators are presented with information. For example, the computer screen displays all information in the same way thus effectively filtering cues that exist on manual systems; navigators can see the style of survey on an old chart and are prompted to check its accuracy visually - computer based information does not discriminate between old and new surveys. Similarly, machinery control rooms display all sensor data to the same standard, but do not make allowances for the occasions when the sensor is misplaced or some other event makes the readings misleading.

Reviewing this evidence, it is possible to conclude that these comments simply reflect industrial practice and that levels of risk are compatible with design limitations and operational practices. From a professional point of view this position is unacceptable because improvements can be achieved through good safety management and can be demonstrated by those companies that apply consistent attention to human element issues.

There are no quick and easy ways to demonstrate how the human element is influencing shipping performance because there is no defined body of knowledge that is accepted as 'correct'; and, because the industry is so diverse and global. Incremental decisions taken in different organisations and aboard ship can lead to situations where the human element is not properly considered. Seafarers generally have developed a coping attitude and most hazards are noticed in time to prevent an accident. However, where situations affect individuals only occasionally, the potential risk may not be recognised.

The human element therefore is deserving of more attention across the maritime industry, because these issues are becoming more critical for the following key reasons:

- The norms of past experience amongst the seafaring population are not immediately transferable to computer based control systems and other new technologies.
- Competition in shipping services has reduced manning levels so that back up may not be available in critical situations.

<sup>1</sup> CAP 719 - Fundamental Human Factors Concepts, Chapter 1, Art 1.4  
([www.caa.co.uk/docs/33/CAP719.PDF](http://www.caa.co.uk/docs/33/CAP719.PDF))

<sup>2</sup> US Coast Guard Prevention Through People website  
(<http://www.uscg.mil/hq/g-m/nmc/ptp/>)

<sup>3</sup> IMO Resolution A.947(23), adopted on 27 November 2003 - *Human Element Vision, Principles and Goals for the Organization*. This Resolution supersedes Resolution A.850(20), which was adopted in November 1997

- Ships are operating to tighter schedules and to more critical tolerances.
- Ships are becoming more integrated into transport chains, thus the consequences of failure are greater.
- There is growing international public pressure to protect the marine environment.
- The majority of crews are employed from supplier countries having different cultures and languages and differing attitudes towards education and training.
- Shipyards and equipment manufacturers are concerned with optimising their production methods separately and do not always develop integrated, operator- focused systems.
- Ships trials do not adequately test all the ship systems.
- International regulation lags behind the operational needs of modern ship systems.
- There are a variety of ship types (container, passenger, gas etc) that are getting larger such that the consequences of a single failure are more significant.

## 2. The Alert! human element awareness project

There is no point of entry where a quick fix can be applied to mitigate the effects of human misunderstanding. For this reason The Nautical Institute identified the need for a broad approach, initially sustained for three years, and devoted to increasing awareness of human element issues amongst **maritime professionals**, ie: the day-to-day decision-makers who have the responsibility of implementing regulatory and social direction to better address these issues in the maritime sector.

The aim of the **Alert!** project, therefore, is to improve the application of human element principles in the design, construction and operation of ships.

The objectives of the **Alert!** project are to:

- **Explain** the relevance of the human element to ship operations;
- **Demonstrate** how human element awareness can improve performance;
- **Initiate** a forum for like-minded people to share ideas and solve problems;
- **Build** a reference resource for study and information;

- **Compare** shipping with other industries;
- **Develop** human element principles to facilitate the writing of operational procedures;
- **Examine** the relationships between design and operation;
- **Maintain** interest with cases, scenarios and discussions on critical issues;
- **Cooperate** with government departments and non-governmental organisations to improve legislation and administration;
- **Promote** the need for human element awareness at a well-considered professional level.

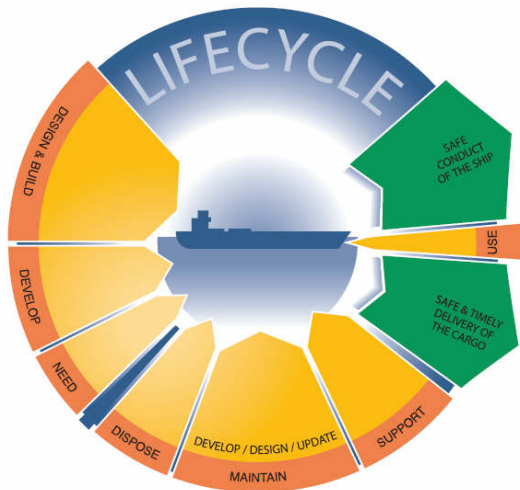
The **Alert!** project, therefore, is about human element awareness, across the whole of the maritime sector, on an international and interdisciplinary basis.

## 3. The International Maritime Human Element Bulletin



The articles contained in the International Maritime Human Element Bulletin (the **Alert!** bulletin) are written by, and for, maritime professionals from a broad interdisciplinary cross section of maritime and other industries. They are deliberately brief and, in many cases, are linked to longer articles, papers and presentations, which are held in the **Alert!** website database or in other websites. From the outset, it was decided that the articles should not be overly technical and that they must be written in a style that would be understandable to a multinational readership.

Each issue of the **Alert!** bulletin has focussed on a particular subject area; and each subject area has concentrated on one or more elements of the lifecycle of a ship - as a reminder that human element considerations do not just start at the design stage of a ship and finish at build, but that they must be applied throughout its lifecycle, especially when updating its role or its manning philosophies or when retro-fitting new systems or equipment.



Through issues 1 to 14 of the **Alert!** bulletin we have:

- Examined the various human factor and ergonomic issues that can influence the interaction between a human and any system aboard ship.
- Addressed some of the many physiological and psychological factors that can affect the ability of the mariner to do his job; and looked at the regulatory, business and ethical influences on the human element in the shipping industry.
- Established the importance of education and training in ensuring that seafarers are competent; and that those who are involved in the management and regulation of ships are trained in 'the ways of the sea'.
- Stressed the importance of user input, of the principles of human centred design and of human factors engineering in the design and build of a ship;
- Featured some of the day-to-day problems, both ashore and afloat, that might have an effect on the ability of the master and his crew to ensure the safe conduct of the ship and the safe and timely arrival of its cargo.
- Discussed the effects of regulation on modern day ship operations, and addressed some of the issues to be considered when integrating the human element.
- Examined the causes and effects of seafarer fatigue; offered some solutions and applications for mitigating fatigue; and advocated a proactive policy to mitigate the effects of fatigue through a range of management strategies.

- Focussed on the importance of effective communication, not only in terms of the spoken word but also through the exchange of ideas, information and knowledge between individuals, and between crew and management ashore; the provision of telephone communications and email and internet facilities to enable crew to keep in touch with their families; the dissemination of information through professional journals, company newsletters and notice board bulletins to inform the crew of important issues that have an effect on their professional life, health, safety and welfare; and the recognition, interpretation and correct reaction to people, incidences or situations that are open to misunderstanding due to cultural differences.

Another important aspect of each of the bulletins has been the feature on *Accident Investigation Reports*. It was not the intention simply to offer an executive summary of such reports, but more to bring out the human element connotations. Nevertheless, through this particular feature, a number of problems have been highlighted, not least:

- Inadequacies in design and implementation of systems, and in the procedures for their operation;
- Poor communication;
- Over-reliance on automation;
- Inadequacies in training - especially 'cascade training' - in the operation, maintenance and fault finding of technically complex, and multi-discipline systems;
- 'Routinisation';
- Failures in the effectiveness and spirit of application of shore and onboard ISM procedures;
- The proliferation and identification of alarms;
- Poor contingency planning for safety-critical situations on board;
- Inadequacies in procedures covering the dissemination of information from the International Maritime Organization.

**Centrespread features.** The aim of the centrespread features has been to provide the reader with a pictorial summary of some of the key issues to be considered within each subject area. These centrespreads are downloadable as stand-alone items on the website, so that they can be printed and displayed at the workstation

or used for presentation purposes. Subjects covered include:

- **Exploring the human element** which tells the story of the life of a modern ship and its systems - in human element terms. It identifies the various responsible stakeholders and their linkage, at each stage of the lifecycle, from conception to disposal.
- **Exploring human factors** considers the three main aspects of human factors - the Person, the Job, and Organisation and Management - and how they, together with the environment in which the organisation and person are operating, impact on the behaviour of people.
- **An A to Z of ergonomics** provides some user-friendly ergonomic definitions that are relevant to the design and operation of a ship and its systems.
- **People: Mind, Body & Spirit - The 7 needs of the mariner** examines the many and varied physiological, psychological and spiritual needs of the mariner.
- **A Total Quality lifecycle** suggests a potential organisational improvement in addressing the human element, from basic regulatory compliance through Corporate Social Responsibility to investment in a total quality lifecycle.
- **The development and maintenance of the human component of ship systems** provides a route map towards the ability to perform procedures (competence) to operate systems.
- **A human-centred approach to ship and system design** offers a set of checklists for the type and location of human factors data required during the planning and specification of a new ship or ship system.
- **Addressing the human element during build** looks at some of the human element issues to be considered in build.
- **Operations - keeping ahead of the game** emphasises the importance of continuous review and revision in terms of the competence of the people who crew the ship, and of the service it delivers.
- **The human face of regulation - good intentions and human nature** examines the emergent 'side-effects' of regulation.

- **Integrating the human element - a rough guide** provides a framework for addressing the integration of the human element.
- **A human element voyage** invites the reader to play the 'human element voyage' board-game, to try to achieve the ultimate goal of ensuring the safe conduct of the ship and the safe and timely delivery of its cargo.
- **Fatigue - causes, effects and mitigation** lists the causes and effects of seafarer fatigue and sets out a number of steps that can be taken by the seafarer, the master the shipowner/shipmanager and the naval architect/designer to mitigate both.
- **The alphabet of effective communication - 23 steps towards effective communication.**

#### 4. The Alert! website

The aims of the website (<http://www.he-alert.org/>) are:

- To provide access to the **Alert!** bulletin
- To establish a common database for information about human element issues pertinent to the shipping industry
- To add greater depth to the features in each of the bulletins.

The website contains all previously published editions of the bulletin - for online viewing, download or registering for free e-mail distribution. Stand-alone copies of the centrespread features (see **Centrespread features**, above) from each issue of the bulletin can also be downloaded.



**Database.** An online database has been incorporated into the site to provide a structure for holding information about human element issues pertinent to the shipping industry, in one location, and with a comprehensive search feature. Documents included in the database comprise of academic papers, technical papers, magazine articles, presentations and letters to

the editor. The website also offers a comprehensive list of links to other sites of interest.

## 5. Conclusion

**Alert!** has developed into a powerful tool for promoting the importance of the human element in shipping. The website is reaching a worldwide readership and there is sufficient variety of documents held in the database to attract the interest of maritime professionals across the industry.

Whilst there is much evidence to suggest that in recent years human element considerations have taken on a much higher profile across the maritime industry, there is nonetheless still much work to be done in promoting awareness and applying workable solutions towards improving the performance of the human element.

Through the **Alert!** project, we will continue to aspire towards improving the application of human element principles in the design, construction and operation of ships.

Future issues will focus on the application of the body of knowledge that has already been accumulated, to address the following specific human element issues:

- Automation/alarm management
- Complacency/routinisation
- Slips, trips and falls
- Health, safety and wellbeing
- Recruitment/retention
- Education/training/competence
- Information management

The **Alert!** project is making a significant contribution towards improving the awareness of the human element in the maritime industry. This awareness campaign has enhanced, and has further potential to enhance, ship safety and the quality of the marine environment.