

The International Maritime Human Element Bulletin

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Alert!



Responsibilities come before skills. Each of the **Alert!** bulletins in this series is about defining the responsibilities of a particular stakeholder group with respect to addressing the Human Element. From these we intend to develop descriptions of the knowledge and skills necessary to discharge those responsibilities.

But, we would not be 'user-centred' if we did this on our own. Contributions from those who have already benefited from the right training and experience will be essential to ensure that we get it right. What we offer in the centrespreads will serve as a 'first draft', which we will ultimately develop through the **Alert!** website, with a view to providing a comprehensive human element skills framework for all the various stakeholders by the end of this series of bulletins. Feedback, therefore, is essential – and very welcome.

Through the **Alert!** bulletins and the website, we seek to represent the views of all sectors of the maritime industry on human element issues. Contributions for the Bulletin, letters to the editor and articles and papers for the website database are always welcome.

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Alert!

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The engineer's role in addressing the human element ...

In ensuring the safe conduct of the ship and the safe and timely delivery of its cargo the technical operation of a ship is as important as its navigation. The machinery and systems are what makes the ship work, and it is the engineers, both ashore and afloat, who make sure that it works efficiently, effectively and in a manner acceptable to the crew.

Years ago, when ships were less complex, engineers were more or less left to 'get on with the job'. If something needed fixing, the chief engineer and his team would set about solving the problem using their combined knowledge, skills and experience, and reference to drawings and handbooks. Occasionally the chief engineer would seek advice from the technical superintendent in head office; but, if he did, it was for reassurance from someone who was just as experienced as him.

Time has moved on, so has the technology, and there is a perception that the knowledge, skills and experience, both ashore and afloat, are not keeping pace with the technological revolution. Increasingly, safety investigation reports tell us that a causal feature of a breakdown was a failure to diagnose the problem, largely because the technical team had not been properly trained on that system; or because the manufacturer's handbook and ship system operating

procedures were not written in the native language of the reader and were difficult to understand; or that the signage or system labelling was not in the native language of the crew. We have moved to the era of condition-based maintenance, repair by replacement (often directly by the system manufacturer) such that traditional engineering skills are being rapidly diminished. We read also of poor leadership and communication, between the chief engineer and the master, and the mixed-nationality crew.

The onboard team is becoming 'hands off', reduced to ensuring that the regulations are complied with, supervising riding crews, maintaining installed systems, and managing technical, commercial and environmental risk for the duration of a charter. Meanwhile, technical superintendents (who themselves may be of limited experience) risk making technical decisions with a financial focus; and with an inexact knowledge of the systems on a particular ship.

Any visit to an operational ship will reveal adaptations by the engineers that improve workability, controllability or maintainability for the crew. This issue explains how the engineer's role in addressing the human element continues, despite the increasing complexity of ship systems.





The human elements are what they are, and they are what make us human

Brady Hogg, Curriculum Leader,
Marine Engineering & John Leyland,
Lecturer in Management Fleetwood Nautical Campus

The human element is a generic term to describe what makes humans behave the way they do and the consequences that result.

As a subject it is of great importance to everyone in the maritime industry because we all rely on the contributions of each other to succeed in our business. Understanding how and why people do things and developing the skill of correct interpretation is a key element in the learning process of a ship's Engineering Officer.

The engine department on a ship may have completely different priorities to the deck. What may be the most important thing in the Chief Engineer's day could be the least important factor for the Officer of the Watch or Captain. A large part of the human element revolves around understanding the contribution of everyone in the ship's management team and taking these into account for day to day operations.

The UK Maritime and Coastguard Agency (MCA) publication *The Human Element – a guide to human behaviour on the shipping industry* lists eight basic aspects of human nature. These can be applied to the marine engineer as follows:

1. Making sense of things. How does an engineer make sense of the things going on around them in machinery spaces on board? Situational awareness is affected by noise, vibration, touch, temperature, smell and appearance; all these give clues, but how much information is collected and processed in order to make valued decisions? The information we decide to use is the human element in us; if we believe we have all the information required to reach a successful outcome then we may disregard all other information. Experience plays a big part here but it does not always come with wisdom! Experience, however, allows us to

reflect on training and previous situations that have required a similar outcome.

2. Taking risks. When working with equipment that could cause damage to yourself and other machinery we try not to take risks as this can have devastating effects in the Engine Room. Instead we turn to our training, and experiences to make decisions and create logical answers. The main factors that influence risks outline the reasoning for Engineers not to take them: the amount of control we think we have; the amount of value something has for us; the extent to which things are familiar to us. However, the best option is not to take any risks, but little would ever be achieved if this was a golden rule.

3. Making Decisions. How do people make decisions? To make a good decision requires experience but often they are made on a whim with little information. Then the amount of time available to think is also crucial. Picture a sudden unexpected explosion and fire in an engine room. Do the Engineers have time to think about what to do next? Or has the thought process been reduced because they have trained and drilled for this contingency all their working lives? Whilst learning we may think that we have made a good decision but as our experience grows we may realise that our decision making is quite different. We must recognise when we are about to make a bad decision and this will only come with experience.

4. Making Mistakes. Every mistake we make (and everyone makes them) is an opportunity to learn. Simple mistakes, if not corrected, can lead to bigger problems, such as reading a gauge incorrectly. Temperature or pressure may build to a point that is disastrous, and it all began with a small error. A fundamental human strength is to recover from mistakes. This is essential for learner development.

5. Fatigue and stress. Fatigue and stress affect all the processes described above. Fatigue is the most common factor found in accident investigation and stress levels

are often amplified by constant exposure to noise, vibration, fumes, lighting, ship motion and temperature.

6. Learning and Developing. That we learn from experience is well documented. But, we also learn from working with others who have experience. Every experienced engineer has a responsibility to those learning the craft. Colleges and Universities can provide a solid foundation for 'experiential learning' in the workplace and, combined, they provide a solid platform for development. Learning should be managed in order that correct and safe procedures allow and encourage those developing their skills to do 'the right things right'.

7. Working with others. Effective people skills are key to working in a team and even alone (where our work affects others). Sharing common, clearly defined goals and objectives can help this process as can remembering it's not just 'the task' that's important, but that individuals in the team have opinions, views and contributions to make.

8. Communication. Clear communication is essential; we must check that others understand what we want by incorporating a feedback loop. This is required practice in marine and air radio communications to ensure correct understanding, but humans rarely do it when it is only an option. Clear communication (simple language instead of complicated jargon) is critical to safe working at all times.

These human elements affect everyone who works in the maritime industry. For engineers, an awareness and appreciation of them can help strengthen practice and procedures in safety-critical areas such as engine rooms and other machinery spaces. The human elements are what they are, and they are what make us human.

The Human Element – a guide to human behaviour in the shipping industry is downloadable from: www.dft.gov.uk/mca/the_human_element_a_guide_to_human_behaviour_in_the_shipping_industry



Alert! Vodcasts

The Nautical Institute has created a series of vodcasts (video podcasts/shareable video clips) for students and lecturers to use to share knowledge of some of the key human element issues that affect shipping.

The Alert! vodcasts aim to raise the awareness of maritime human element issues amongst the estimated 500,000

students engaged in all disciplines of maritime study. Sponsored by The Lloyd's Register Educational Trust, these vodcasts exploit the power of high quality multimedia presentation specifically designed to be viewed and shared by international maritime students.

The 3-5 minute videos are designed to engage the younger generation of

students studying disciplines such as navigation, engineering, naval architecture, surveying, law, finance, insurance and administration - many of whom may have never experienced the environment of a ship at sea.

The first 7 vodcasts can be downloaded from: www.he-alert.org/user/vodcasts.asp, a further 14 will be available for download during the course of the next year.



An essential skill for anyone in a position of responsibility at sea is the ability to make decisions based on information presented to them; this may be as part of the normal operational activities of the ship or during emergency events. Whilst a number of STCW courses are now required to be completed by key members of a ship's staff to cover obvious emergencies, such as fire fighting, command and control, and crowd management, there are a number of areas which are less obvious and which may need to be addressed if we are to successfully manage the growing risks to safe and efficient operations presented by factors such as system complexity, and retro-fit issues.

Alarm systems onboard are required to differentiate information presented to the operator, even when displayed chronologically. This is generally achieved by visual indication through the use of pre-set levels or groups; the expectation is then that the operator understands the information presented and prioritises responses and curative actions accordingly. It is well known that the ability to prioritise effectively is gained and developed by experiencing suitable events, hence the requirement for onboard drill regimes.

By carrying out machinery breakdown, reversionary control and emergency response drills on a regular basis these events may be practised. As a result the participating staff develop the ability to make decisions and take appropriate actions to deal with a diverse range of situations presented, as long as this form of training is undertaken in such a way to promote these actions rather than merely repeatedly performing the same actions in a routine or checklist type response to drills.

Operators must know what needs to be done in various circumstances and to know why it is being done in order to adapt the specific response and the actions taken to suit individual situations. Within the commercial sector of the industry little opportunity exists to conduct drills in this format and to the required high frequency due to prevalent operational conditions, the most effective execution of these activities being essentially the exclusive reserve of the naval sector.

The reversionary control of machinery for example tends to be restricted to a task within the ship's planned maintenance system, allocated to a member of the engineering or navigational staff, to select the mode and function test the equipment by operating through the full range whilst in port. However, there are a number of elements that may be introduced into the

ship's operating and maintenance regimes which may lead to an overall improvement in the crew's ability to gain and develop these essential decision making skills, an example being the regular emergency response drills; while remaining representative of potential incidents must be diverse in nature and encourage 'on the spot thinking' with generic use of checklists as appropriate.

Obsolescence and the implementation of retroactive regulations necessitate retrofit to systems. However, unless replacement systems and equipment are properly designed, integrated and installed, taking cognisance of the full functionality of the original systems, operational issues often arise as a result of the interaction of the upgrade, enhancement or replacement with the original or other retrofits.

Another of the key skills required of seagoing technical staff is the ability to fully understand the service systems provide and to establish procedures for the operation of often complex systems which have been retrofitted, in such a way as to ensure that an equivalent service to that provided by the original is delivered. This can only be achieved through the development of a thorough understanding of system engineering principles and their application.

The need for Human Factors Engineering skills

Gerry Miller, HFE consultant

Throughout its useful lifetime a ship may undergo numerous alterations, changes, additions, or retrofits to its machinery, equipment, systems, or to the vessel's configuration and arrangement. In each of these cases it is incumbent upon those persons responsible for either managing the project, selecting the hardware and software to be added or altered, and/or completing the technical design changes that might be needed to the vessel, to consider whether the changes will impose the need for Human Factors Engineering (HFE) to be included in the project.

To make the proper decision requires certain skills and knowledge of HFE by those responsible for, and design of, the equipments, systems and machinery to be included in the project.

The first three skill sets needed by the persons responsible for the project are:

1) a sufficient knowledge of the HFE discipline to understand how the changes in hardware and software, or ship con-

figuration or arrangement may directly impact how safely and efficiently the ship's crew performs with the changes;

2) knowing how to determine if HFE inputs are needed for the specific project they are involved with;

3) knowing if, when and how outside HFE assistance is needed.

As for whether the specific project they are involved with needs HFE input, answering a number of questions as they apply to their specific ship project, can be a good approach toward deciding whether or not to include HFE in any ship alteration or upgrade project. (These questions are set out in a longer version of this article and can be downloaded from: www.he-alert.org/documents/published/he01010.pdf)

A YES answer to one or more of the questions would indicate that there should be some HFE involvement: The more YES answers, the greater should be the HFE effort.

The exact amount and type of HFE involvement can only be determined by knowing more about the proposed project other than

there were YES answers to one or more of the above questions. However, by using a qualified HFE professional with ship design experience, the amount and type of HFE support can be quickly ascertained.

The fourth skill set needed by those responsible for ship re-work projects is a working knowledge of an acceptable HFE based ship design standard that can be applied to the new project, such as those produced by the American Bureau of Shipping (ABS) and the American Society of Testing and Materials (ASTM).

It is understood that not every ship alteration or upgrade project will require HFE involvement. But it is also understood that every ship alteration or upgrade project should at least be reviewed for possible HFE involvement.



Human element knowledge & skills framework –

Traditionally the crew will identify something and ask engineers to fix it. Increasing constructional and system complexity, especially the use of software, means that some sorts of change can no longer be made on the ship. However, if properly described and justified, a change or replacement can be considered by the company, or the manufacturer. Both ships' engineers and service engineers are in a position to identify the need for revisions.

Technical Directors/Superintendents/Chief Engineers

Be fully conversant with and fully understand the need to implement:

- pertinent IMO, ILO, WHO and other regional instruments relevant to maritime safety and protection of the marine environment
- international codes, guidelines and standards in the context of SOLAS 1974 (as amended), STCW 1978 (as amended), and MARPOL 73/78 (as amended)
- the provisions of the ILO Maritime Labour convention 2006 (MLC, 2006)
- other regional instruments relevant to maritime safety and protection of the marine environment
- Company regulations relevant to the safe conduct of the ship, the safe and timely delivery of its cargo and the health, safety and wellbeing of the crew
- IMO Guidelines for Engine-Room Layout, Design and Arrangement (MSC/Circ.834), as appropriate

Superintendents

Fully understand the need to:

- take account of the human element in the acquisition, supply and operation of systems and the management of services
- include human element issues in decision making, trade-off and risk management studies, in order to mitigate the risk to safe and effective ship and company operation
- ensure that human element issues arising from the technical operation, support and maintenance of the ship and its systems are given sufficient attention
- ensure that the human element is given sufficient attention throughout the introduction and validation of a new system
- facilitate information feedback, exchange and other communication about human element issues, including the provision of human element data in standard formats
- effectively involve and consult crew and support staff on each significant aspect of the ship and its systems in order to improve its usability, health and safety, or technical performance
- ensure that modifications to the ship and its equipment take account of human element issues identified in service, and that the human element is managed during major work originating from the company office
- present the needs and represent the interests of the crew and support staff to naval architects, designers, equipment manufacturers in the specification, design and acceptance of a ship or its systems
- provide data on ship technical operations in order to improve staffing provision and deployment, ship and system design, and operational deployment
- ensure the usability of a system, by selecting and applying appropriate practices that use human element data
- ensure that all manufacturers' handbooks and ship system operating procedures are written in the native language of the reader and are not technically complicated or difficult to understand
- ensure that all technical officers have the necessary experience and skills base to translate their certificates of competency from a point assessment into genuine capability to perform their functions onboard at the required level

Recognise:

- the importance of safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property, in accordance with the requirements of the ISM Code
- the Master's responsibility with regard to: implementing the safety and environmental-protection policy of the Company; motivating the crew in the observation of that policy; issuing appropriate orders and instructions in a clear and simple manner; verifying that specified requirements are observed; and reviewing the safety management system and reporting its deficiencies to the shore-based management
- that the master has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary

Chief Engineer

Recognise:

- the importance of properly addressing the human element in the provision of a safe, efficient, effective and acceptable working environment.
- the importance of safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property, in accordance with the requirements of the ISM Code
- his/her responsibilities with regard to scope and use of the safety and work management systems; motivating the crew in the observation of the policy; planning work, issuing appropriate orders and instructions in a clear and simple manner; and ensuring that specified requirements are observed

Ensure that:

- the overall performance of the ships and its systems is consistent with required capability
- ship maintenance and maintainability requirements for support are met by the ship and its systems in conformity with the provisions of relevant rules and regulations and Company instructions
- crew are effectively involved and consulted on each significant aspect of the ship and its systems so as to improve its usability, health and safety, or performance and are notified of changes made to design, operation, training or manning as a result of their input
- the technical officers, ratings and officer trainees are aware of human element issues and are engaged in the feedback process.
- all technical officers, ratings and officer trainees are fully conversant with the Company's safety and work management systems the identity and role of the DPA, and the results of audits and reviews
- newly-joined technical officers, ratings and officer trainees are familiar with their duties
- all technical officers, ratings and officer trainees have an adequate understanding of relevant rules, regulations, codes and guidelines
- non-conformities, accidents and hazardous situations are reported in accordance with the SMS, timely corrective action is taken on deficiencies identified in audits and reviews
- appropriate training (including onboard continuation training) is provided for all technical officers, ratings and officer trainees
- all work to be carried out by technical staff is effectively planned and controlled
- relevant information is provided in (a) language(s) understood by crew members
- technical officers, ratings and officer trainees are able to communicate effectively in the execution of their duties
- plans and instructions for shipboard technical operations are available; tasks involved are defined and assigned to qualified crew members
- procedures are in place to identify, describe, prepare for and respond to potential machinery breakdowns and emergency shipboard situations
- valid documents are available on board; changes to documents are reviewed and approved by authorized personnel; obsolete documents

Technical

are promptly removed. All documents and data relevant to the safety and work management systems are properly controlled.

- handover documents to provide continuity in the completion of scheduled inspection and maintenance programmes and in the smooth functioning of the technical department are prepared by all technical officers

Technical officers

Be fully conversant with and fully understand the need to implement:

- the provisions of MARPOL 73/78 (as amended)
- other regional instruments relevant to maritime safety and protection of the marine environment
- Company regulations relevant to the safe conduct of the ship, the safe and timely delivery of its cargo and the health, safety and wellbeing of the crew
- the principles of Engine Room Resource Management, safe working and Ergonomics.
- procedures for responding to system failures and emergency situations
- the importance of properly addressing the human element in the provision of a safe, efficient, effective and acceptable working environment

Ensure that:

- ship systems are maintained in a workable and controllable condition.
- all work is effectively planned and controlled in accord with the requirements of the safety, environmental and work management systems
- handover documents are prepared, to provide continuity in the completion of scheduled inspection and maintenance programmes and in the smooth functioning of the technical department
- he/she is aware of human element issues and is engaged in identifying and reporting these
- crew are effectively involved and consulted on each significant aspect of the ship and its systems so as to improve its usability, health and safety, or performance

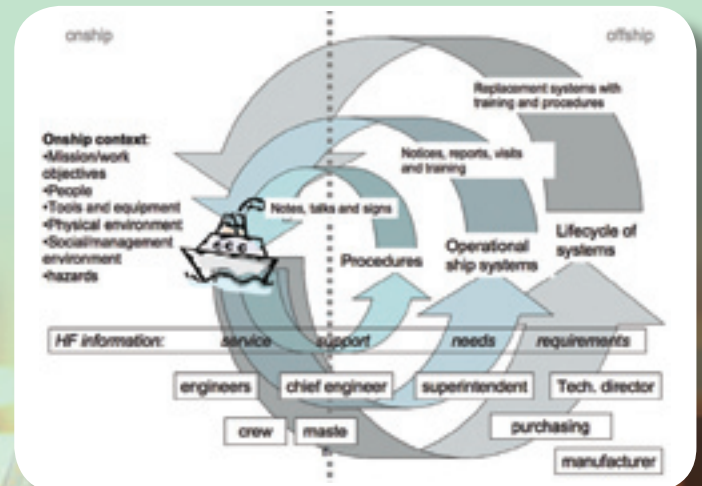
Specialists/service engineers

Be aware of:

- regulatory requirements and guidance on the installation and testing of equipment to ensure its safe and effective operation
- particular requirements for installation and training associated with equipment required for regulatory compliance

Fully understand the need to:

- ensure that the location of equipment accords with regulations for layout, relevant handover information and documentation
- ensure that equipment is in accordance with ship, working practices and documentation processes
- collect feedback/information on usability and suitability of equipment
- ensure that installed and maintained systems are properly (re)integrated with other equipment and systems
- ensure that the installation report includes usability and ergonomic issues and how these were addressed



A remarkable lack of practical skills something we all need to address

Phil Deegan, Chief Engineer

My seagoing career spans some 23 years and encompasses a variety of vessel types; I have been appointed as Chief Engineer for the last 12 years, the latter half of which has been exclusively on DP11 vessels. In common with many of my industry colleagues, I sail with multinational crews with a wide variety of experience and ability. I have sailed with Third Engineers who have absolutely no experience of machinery operation or maintenance; others have been gifted and talented engineers who can turn their hand to the broad range of skills that are required for the busy engine room to function efficiently.

As vessels become more and more technologically advanced, it is no longer sufficient for them to be manned solely by fitters and machinists. Engineers need more and more to turn their hands to the solving of IT issues and working with complex electronics with their diagnostic

programs, often being expected to perform tasks for which they have received no training or instruction. In these times of minimum manning, it is vital that all members of the engineering department are competent in the many skills engineers are required to have - be that fitting, machining, refrigeration, welding, electrical or any of the other tasks we are called upon to perform.

Many see the training of engineers as a responsibility of the colleges ashore, but realistically much of that training must be conducted afloat. When I was cadet in the late 1980s, many of the older generation engineers criticised our training, with its perceived lack of workshop time and lack of sea time before undertaking the Class IV certificate of competency. The workshop time and sea time requirements have again been shaved, and it is now vital that the training cadets receive ashore is relevant, and no longer completed on

time expired and redundant machinery that they are unlikely to find afloat. Their sea time must encompass as wide a variety of machinery and vessel types as can be found in order to give a broad based training, and despite the constraints of the training officer's available time he or she must ensure that all aspects of the cadet's training are completed.

The Companies then have their obligations to complete the training of their junior officers; they need to understudy experienced personnel before they can successfully undertake the roles for which they have studied. The Officers coming through the system now, many of whom are degree qualified, sometimes show a remarkable lack of practical skills despite having followed an approved training course. This is something that cannot be blamed on any one aspect alone; it is something that all of us in the industry need to address.

What has the human element got to do with marine engineers?

Dondon Crisaldo, Training Director and Marine Engineering Lecturer, FMFI Maritime Foundation, Inc.

Ship machineries have come a long way with the innovations and incorporation of the highest of technologies such as predictive tools, warning devices, automation, and process based systems such as failure analysis, root cause analysis etc.

The most critical asset in machinery operation is its personnel - marine engineers. However, there is a need to recognize and fully determine what elements are required for them to be able to fully cooperate and contribute to the overall effectiveness of the operation. But what has the human element got to do with it? Marine engineers are highly technical people having years of experience such that they are able to finish their contracts without any unresolved engine problems. So, what are those human elements a marine engineer should possess? Here are some that I would like to share:

- Ability to make decisions
- Ability to complete tasks with minimum supervision
- Ability to forecast required spare parts through proper recording & inventory
- Ability to operate main and auxiliary machineries

- Ability to perform risk analysis and use hazard assessment checklists
- Ability to manage risks and/or hazards
- Ability to correctly use special tools & equipment
- Ability to write clearly, concisely & legibly
- Accurately analyze and interpret test results
- Accurately assess and respond to malfunctions and abnormalities
- Active and full participation in emergency drills and safety meetings
- Anticipate problems and possible requirements during manoeuvring
- Awareness of the importance of calibration
- Awareness of the importance of safety, cleanliness, proper housekeeping, and hygiene
- Computer literate
- Contribute to the team and be recognized as a contributor
- Develop good leadership, personal and working relationships
- Ensure safety awareness of newly joined personnel
- Familiarity with all piping and plant arrangements

- Forward planning
- Full knowledge of safety requirements and reliable operation for systems or machineries
- Good understanding of budgeting and ability to recognize and implement cost effective measures

Keep abreast of changes in technology

- Maximizing personnel's potential through training and delegation
- Must have concern and commitment to the company
- Open to comments, suggestions, recommendations and feedback
- Perform regular checking and monitoring of all machineries or systems
- Planned maintenance to be performed and completed as scheduled
- Possess a good understanding of MARPOL Regulations and the actions needed to comply during machinery and cargo operation
- Proper documentation and recording
- Self-motivation

Knowledge and understanding of the human element need to be given full awareness through training, briefing, awareness seminars etc, as frequently as possible.

Rajendra Prasad, Assistant Professor, World Maritime University

The role of the human element is emphasised by the commonplace remark that human actions or inactions are responsible for over 80% of accidents. Researchers claim that 20% of such errors directly relate to the operators' personal attributes. Professional engineering knowledge, skills, proficiency, experience, capabilities, aptitude and attitude form the core of a marine engineer's competence, a dominant human element in operational safety. Research indicates that deficiency in knowledge about shipboard engineered systems is a cause of about a fifth of all the machinery space accidents.

Competence of seafarers has been advocated by the maritime community through the STCW Convention. Widely prevailing methods of maritime education and training, focused on explicit tasks and their mastery achieved through drill and practice, compounded with the prevailing assessment systems however prompts the incumbent engineers to limit their efforts to surface learning sufficient only for obtaining requisite certificates.

Knowing 'what' and 'how' is vital but equally important is the background knowledge to understand the 'why' aspects of the technical systems to promote the effective and dispositional changes in the

learner's psyche. Educational institutions need to ensure that alongside acquiring comprehensive understanding of engineering concepts the skills of learning to learn are developed. These are essential for continual professional development by learning from the opportunities ushered by the work place environment.

Shipboard operation is a team endeavour, a feat impossible without interdisciplinary contributions from each staff member. Effective interpersonal communication is paramount for such contributions. Accuracy of relevant information and promptness in its transfer is crucial for making appropriate decisions, especially so during critical operations.

Good communication is not merely the accurate use of a specific language for information transfer but it is also aimed to persuade the recipient of information to act in an intended manner. Gaps in communication or misunderstandings arise when cultural, hierarchical, educational or experiential differences among people purport different meanings to the information conveyed.

Information transfer is more effective if those involved in communications have a common mental model of the subject,

reinforcing the need for deep and comprehensive understanding.

The shipboard engineers need to have good communication skills and must know that the actual meanings in the transferred information are not contained in the words and gestures but in their interpretations by those receiving the information. They need to be aware that symbols, words and gestures carry different meanings depending on the educational and cultural background of persons.

Knowledge of the barriers to communication that may further get accentuated due to the workplace environment is essential for the shipboard engineers to make allowances and adjustments while engaged in team operations. The shipboard engineers must have amicable social skills inculcated through suitable education and training programmes that provide intricate team working knowledge and opportunities to apply that knowledge.

The full paper is downloadable from: www.he-alert.org/documents/published/he01015.pdf



The management of maintenance and repair

Roy Chenery, Consultant Marine Engineer

Look through any advertisement for Technical Superintendents and in most cases you will see words such as "ensure the safe and efficient technical operation of the ship and its systems" somewhere under job requirements or responsibilities. The words may also be part of the responsibilities for a ship's Chief Engineer. Providing this assurance is undoubtedly an ideal that all stakeholders in our industry would like to see fulfilled; indeed all stakeholders have a part to play in its achievement. However the focus of this article is on those at the coalface, i.e. the technical management team ashore and afloat.

The technical management team is generally associated with the management of maintenance and repair (M&R), in its broadest sense. Traditionally M&R has been dealt with under a prescriptive regime laid down by regulators and equipment manufacturers, supporting the comment made in an earlier issue of **Alert!** that our industry has a strong culture of compliance.

An added 'compliance' issue is that M&R appears as a budget item in the operational cost sheet.

Safety and efficiency depend on the effective management of risk and resources, with the overall aim of providing dependability. However, effective management requires a proper management systems approach and as such M&R should follow a plan-do-check-act philosophy, as is now being applied to environment, safety and security demands, and as intended by the ISM Code.

The increasing awareness of modern asset care techniques involving risk and reliability methodologies coupled with advances in equipment health monitoring technology, mean that there is the potential for the technical management team to better control the management of their own particular assets. This would allow a more structured and focused approach to the identification of an effective maintenance programme with a view to improving reliability – and hence safety – through

defect elimination. This in turn would drive efficiency by optimisation of resources.

This change of focus from maintenance to reliability has been successfully applied in other industries, but is not a 'quick-fix' solution. It is a long-term move that requires rethinking and acceptance by operators, maintainers, legislators, auditors, insurers and other relevant stakeholders.

There is an abundance of information available about various tools and techniques that may support the maintenance programme; long term successful application of these requires skill and knowledge. The process must start with education in the strategy of reliability and maintenance management; a good place to start this process would be in the training and certification process for marine engineers, ideally at cadet level.



Grounding of ro-ro cargo ship following electrical blackout

This report relates to the grounding of a 5881GRT ro-ro cargo ship, following an electrical blackout, during a routine shift of berth. It highlights a number of human element issues, not least poor ship knowledge, complacent procedures, and weak departmental management and communications.

Just before the ship left the quay, the port generator high fresh water temperature alarm sounded. The second engineer was working under pressure and unsupervised during the critical time of preparing to leave the berth. He was unable to determine the cause of the alarm and did not alert the chief engineer or master to the problem. Soon after leaving the quay, with the vessel proceeding astern, the starboard generator also alarmed, and shortly afterwards, a total blackout occurred. The controllable pitch propellers (CPP) defaulted to the full astern position and the ship continued her sternway until she grounded.

It transpired that none of the deck and engineering officers, or the shore management team were aware of the default setting for the CPP system on the loss of electrical supplies; and the

emergency generator had failed to start automatically because it had been left in hand control. This was due to a long-standing defect that the chief engineer was unaware of.

The chief engineer and his team arrived at the Engine Control Room, and the main engines were immediately shut down without approval from the bridge and without knowledge of the navigational situation. The situation in the engine room became chaotic, and the British chief engineer had difficulty establishing his authority because his Polish engineers discussed fault finding options, in Polish, without consulting him.

The generators overheated because the isolating valve supplying the sea water to the generators had not been opened, or at best had been only partially opened, during the system re-configuration. The report concludes that it is probable that because of the second engineer's workload, and the valve ergonomics, he either set the valve in an unintended intermediate position or omitted to open the valve at all. The report suggests that, had the valve been more accessible at waist or chest height, then it would have

been far easier to operate and to notice if it was set in the wrong position.

Many of the routines on board were lax. The move between berths was considered by senior staff on board to be a routine operation. But, complacency led to insufficient manning levels on the bridge and in the engine room, which contributed to the accident.

Both cultural and personality factors affected the efficient and effective collaboration between the chief engineer and his team, such that the team failed to look to the chief engineer for guidance during the emergency, the second engineer failed to report the overheating problem when it first came to his attention; and in the electrician failed to inform the chief engineer of the state of the emergency generator.

The purpose of this summary is to highlight certain human element issues arising from this incident; there are many other issues highlighted in this very comprehensive accident report. Those who are involved in the management and operation of ships are strongly advised to read the whole report which can be downloaded from:

www.maib.gov.uk/cms_resources/Moondance_Report_.pdf

Reports & Studies

Deepwater Horizon Investigation Report (Volume 1) US Coast Guard

This report examines the various causal factors surrounding the explosion, fire, sinking, and loss of crew members onboard the mobile offshore drilling unit (MODU) Deepwater Horizon in the Gulf of Mexico between April 20-22, 2010. The Joint Investigation Team comprised of members from the U.S. Coast Guard and Bureau of Ocean Energy Management, Regulation and Enforcement and examined five aspects of this disaster relating to areas of responsibility of the U.S. Coast Guard: the explosions, the fire, the evacuation, the flooding and sinking of the MODU, and the safety systems of Deepwater Horizon and its owner-operator, Transocean.

Downloadable from:
www.hssl.org/?view&did=6700

Self awareness - a powerful people skill

Simon Harvey
N2People Skills

An essay on self-awareness based on modern brain science understandings, human factor knowledge, systems thinking and the principles of Crew Resource Management. Simon Harvey wrote this piece to bring light to self-awareness issues, in that hope that a slightly different view of the human factor may break down some old assumptions that accidents are caused by 'a single human'.

Downloadable from:
www.he-alert.org/documents/published/he01020.pdf

Recruitment and retention - Crew Quality

Alistair Evitt
President, InterManager

Taken from a speech to the Connecticut Maritime Association – Shipping 2011 Conference, March 2011

Downloadable from:
www.he-alert.org/documents/published/he01025.pdf

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