A regulatory approach to the human element

Captain Paul Townsend, M.Mariner, BSc (Hons.), MNI, MRIN
Keith Tatman, MBA, FCMI
Andrew Sillitoe, BSc (Hons.)

Maritime and Coastguard Agency, UK

SYNOPSIS

Effectively addressing the human element of maritime safety presents a challenge to regulators. This paper will describe how one regulator approaches this for the section of the industry it has direct responsibility for, and how it tries to exert international influence. Its response involves both proactive and reactive initiatives, to provide guidance on concerns identified within the industry and to make interventions as appropriate, using a risk-based decision process. Innovation is often crucial in responding to the constantly evolving field of the human element, especially given the increased use of automated technology and the closer coupling of systems, which reduce the opportunities for human involvement to crosscheck and mitigate for errors.

INTRODUCTION

This paper is intended to explain the challenges faced by regulators in addressing the human element, and outline some possible solutions. It does so by reference to some of the activities of one national administration, but with a view to demonstrating the need for both international cooperation and acceptance of shared responsibility for risk mitigation by the industry itself. Any regulatory body, whether national, regional or international, has a range of options available to it. The effectiveness of these options will be affected by the wider context of the industry’s structure and interrelationships, and by attitudes towards both safety and cooperation for mutual benefit.

THE WORK OF THE MCA

The Maritime and Coastguard Agency (MCA) is the body responsible for implementing the UK Government’s maritime safety and environmental protection policy. That includes coordinating search and rescue at sea and ensuring that UK-registered ships and those using UK ports meet UK and international...
safety standards. The MCA works to improve the safety of vessels on the UK Shipping Register and the conditions for those on board, and to eliminate substandard ships from UK waters. This is carried out through its main areas of responsibility in:

- Enforcement
- Search and Rescue
- Receiver of Wreck
- Cargo Ship Security
- Seafarer Certification
- Ship Survey and Inspection
- Counter Pollution and Salvage
- Registry of Shipping and Seamen

The MCA’s work can be summarised as preventing the loss of lives at sea and on the coast, ensuring that ships are safe, and preventing coastal pollution – or “safer lives, safer ships, cleaner seas”. In a typical year the MCA deals with:

- 15,000 reports to Coordination Centres
- 8,000 rescue missions
- 3,500 surveys of UK registered ships
- 7,000 inspections of foreign and UK ships
- 8,000 vessel registrations/renewals
- 10,000 seafarer documents
- Involvement in at least 90 pollution incidents
- Representing UK at IMO, ILO and EU
- Investigating 100 breaches of Merchant Shipping legislation
- 550 new officer starts under SMarT scheme
- 50,000 pieces of correspondence
- Answering 300 Parliamentary Questions or MPs’ letters
- Managing hydrographic survey programme
- Working with the Meteorological Office on Shipping Forecasts

A RISK-BASED APPROACH

The MCA applies a risk-based approach to its activities and interventions in achieving these aims. This means that resources are employed in the most effective manner, balanced against the other demands on them across the maritime sector. Information on the frequency and severity of potential consequences is combined to decide on the highest risk operations, allowing an analysis of the costs and benefits of any planned mitigation activities.

The literature about assessment of risk is extensive, and the MCA follows good practice in the maritime sector. One broadly acceptable measure is the equivalent fatality rate (EFR). This uses the computation that 100 minor injuries and 10 major injuries are each equivalent to a single fatality. The notion of an equivalent fatality rate is drawn from the ‘value of preventing a fatality’ (VPF) and ‘willingness to pay’ (WTP) concepts which underpin the economic evaluation of casualties in the UK. Coupled with the ALARP and tolerability principles expounded by the Health and Safety Executive¹, and the FSA principles from the IMO², this provides a method by which an assessment can be made of whether a particular risk is tolerable. This is illustrated in Figure 1.
Figure 1: Matrix showing risk tolerability, based on frequencies per ship year

The MCA gathers and accesses a wide range of data to inform such analyses, from sources including:

- The Marine Accident Investigation Branch (MAIB);
- The Coastguard Incident Management System (IMS);
- MCA’s Ship Inspection And Survey (SIAS) databases;
- The Confidential Hazardous Incident Reporting Programme (CHIRP);
- International Safety Management (ISM) Code and Port State Control (PSC) records in international maritime databases such as Ship Inspection Report Exchange (SIRENAC) and European Quality Shipping Information System (EQUASIS);
- Those insurers (hull/machinery/P&I) and classification societies that release accident and incident data into the public domain.

With regard to UK commercial shipping, recent years have seen a sustained downward trend in the overall number of accidents (as shown in figure 2). However data and reports from various sources indicate that within these figures, accidents that do occur predominantly result from the human element.

“As in previous years, human error dominates the underlying causes of major claims.”

UK P&I Club Analysis of Major Claims 1997

Indeed a 15-year analysis of major claims (costing over US$100,000) by the UK P&I Club (1987-2003) found that the human element was a contributory factor in 54% of these by number, or 62% by cost. Extrapolating this across the worldwide industry gives a directly attributable cost of US$2.6 billion.

“...one of the fundamental reasons why so many accidents occur is because the human factor is consistently ignored.”

MAIB Annual Report 2000

“It’s now well known that around 80% of accidents at sea (and more than 90% in cases of collisions and groundings) involve so-called 'human factors'.

MAIB Safety Digest 1/2005
"The Marine Accident Investigation Branch (MAIB) continues to report that accidents that do occur are mainly as a result of human factors, and addressing those human element and operational safety aspects of shipping remains the focus of our commercial shipping strategy."

MCA Annual Plan and Accounts 2005

Analysis of the focus of MAIB’s recommendations during the 15-year period from 1989 to 2004 shows that 45% focus directly on the human element: 3.89% “human factors” and 41.12% “operational practice”. However, a range of other human element-focused recommendations are likely to be found within the remaining 55%, for example within “safety of navigation” (10.83%).

The Swedish Club recently analysed its hull and machinery claims costing over US$2 million in the 18 months from February 2004 to July 2005. Collisions accounted for 6 of the 15 claims assessed, and of these 6, 5 were the consequence of human factors such as lack of situational awareness and failure to adhere to rules and correct procedures.

Figure 2: The rate of accidents involving UK-registered merchant ships (1998-2004 data) (Sources: MAIB, Department for Transport Statistics, Registry of Shipping and Seamen)

WHY ARE HUMAN ELEMENT-RELATED RISKS PREVAILING?

The influence of the human element on the safety and profitability of commercial shipping has grown in prominence over recent years. In part this is a result of the increased reliability of technology – developments in the past few decades have brought improvements in structural integrity and the reliability of machinery and electrical systems, bringing the total number of incidents down. As a result, the proportion which can be attributed to the human element has risen to become the majority – and thus awareness of its influence, and pressure to reduce its negative effects, have grown.

“...improvements on the ‘hardware’ side (for instance, in structural failure) point up the fact that while many forms of major claims are decreasing at a significant rate, those resulting from human error are by and large decreasing at a slower rate than most. Consequently, because of the significant diminution of ship failure claims, the relative impact of human error as an underlying cause of loss is of increasing importance.”

UK P&I Club Analysis of Major Claims 1997
In addition to this proportional increase, changes to the structure of the industry have increased the pressures on those working within it. For example, management systems have become more complex, and the global competitiveness of the industry has increased the financial pressure by reducing operating margins. Systems and processes have become more closely coupled, leading to a ‘domino effect’, whereby less leeway is available to correct errors. This shorter control loop increases the likelihood of severe consequences from what may start as a relatively minor circumstance.

This rise in prominence has increased awareness of the human element and by consequence inspired a range of efforts to maximise its positive aspects and minimise its negative aspects. However some common misconceptions or attitudes exist which can restrict the effectiveness of these efforts.

For example, the cause of an incident or accident with a high human element involvement is often automatically labelled as ‘human error’. This stance can be unhelpful in that it implies that the root cause of the problem always lies with an individual operator. This might be a watchkeeper who falls asleep before a collision or grounding, or a cargo handler who inadvertently opens the wrong valve and releases a hazardous substance into the environment.

The assumption is that if it wasn’t for their action or inaction at a particular time, the incident would not have happened, and therefore responding to the incident simply requires apportioning blame to them. Notwithstanding the rare occasions when individuals do deliberately violate rules for malicious reasons or by wilful negligence, the behaviour of the individual who appears most obviously ‘at fault’ may in fact be a consequence of the predominantly unsafe conditions within which he or she works. Investigating or analysing the immediately observable cause, known as the active failure, will often reveal deeper-rooted organisational or cultural problems. These hidden or latent failures may lie dormant until ‘activated’ by particular conditions. The full chain of causation may lead back to the management and the environment within which all the employees work, including the equipment available to them. Latent failures such as these lead to conditions developing which make accidents and incidents more likely. They may not be apparent until a problem results, unless a proactive method of seeking out risk control measures is in place.

The following two examples describe some of the latent deficiencies which might be shown up by either an active failure or a thorough and proactive analysis of risks:

1) A seafarer may make a mistake while working with a particular piece of equipment, such as pressing the wrong button at the wrong time or failing to respond when action is required. The underlying reasons for this could include one, some or all of the following:

a) The seafarer may be inadequately trained in or familiarised with the equipment;
b) There could be an ambiguous design which does not clearly display the current state of the equipment or the function of its controls;
c) The various items of equipment on board may be poorly integrated such that it becomes difficult to establish the source of an alarm or the correct method of reacting;
d) Poor lighting of the controls may hinder accurate operation;
e) The operator may be fatigued, perhaps as a result of too few rest hours or poor sleeping accommodation.

2) If a crew member is seen without a hard hat on in an area where signs indicate that one must be worn, it would be easy to assume that this is a deliberate violation and the crew member is at fault. While he or she undoubtedly has a vital role to play in their own safety, a range of other factors could be influencing the apparent violation. For example:

a) There may not be enough hard hats available for every employee in that area to wear one;
b) There may be enough, but they are not stored within a reasonable distance, which may discourage those who are in the area only briefly from fetching one, especially if their work schedule is already forcing them to rush;
c) If the master or local supervisor does not wear one, a bad example is set which suggests they are not necessary;
d) The culture on board may be that this safety procedure is never followed, and no one is ever punished. This also sets a precedent discouraging the use of hard hats;

e) An individual might make a choice not to wear one because they have never had the reason for the rule explained to them, and the hazard is not immediately obvious to them. If employees do not understand the purpose of mitigation measures, they may be less likely to follow them.

A REGULATORY RESPONSE TO THE CHALLENGE

The responsibilities of a regulator in the face of such issues are wide-ranging, and include not only the need to focus efforts on shipboard occupational health and safety, but also to understand the broader contribution and consequences of human and organisational behaviour. In fulfilling both of these roles, but especially the latter, action is frequently required at an international industry-wide level to be most effective.

Recognising this challenge, amongst others, important regulations such as the International Safety Management (ISM) Code have been introduced by the IMO. As IMO state, the ISM Code “addresses the responsibilities of the people who manage and operate ships and provides an international standard for the safe management and operation of ships and for pollution prevention”. Regulators such as the MCA can and should provide support to managers and operators, as well as seafarers, owners and other key stakeholders, in meeting the objectives of the ISM Code and of other efforts to address safety and environmental protection. An effective regulatory approach needs to take account of the human element in design, construction, operation, maintenance and disposal of ships, i.e. the entire lifecycle. Innovative responses to this challenge are often required, given the new methods of working which result from today’s highly commercially pressurised industry and the increasingly automated and closely coupled systems.

In order best to meet the challenges posed by the human element, the MCA has found a wide range of activities and interventions to be useful. These include statutory inspections, audits and surveys, including the ISM Code as mentioned above, Port State Control inspections, and shipboard occupational health and safety inspections to assess compliance with the International Labour Organisation’s (ILO) requirements for living and working conditions (especially the Merchant Shipping (Minimum Standards) Convention 1976, No. 147). The MCA also develops, interprets and implements national and international policy governing competency standards and minimum safe manning levels. This includes implementing IMO’s International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (known as the STCW Convention).

On top of enforced regulations such as these, which can be imposed at either a national or an international level, there exists a role for providing guidance for self-improvement. These two broadly grouped types of intervention do not have to be mutually exclusive, with a coordinated combination often proving the most effective. For example, fixed rules can set the minimum criteria which must be met in essential areas, but a less prescriptive, guidance-based, approach may be sufficient to offer recommendations to address other areas. This allows operators to tailor their practices to suit their individual circumstances, allowing flexibility, and indeed encouraging innovation, in meeting the overall requirement of safe operation.

One such effort by the MCA includes current work to develop a ‘human element guidance manual’. This is intended to become a source of information for both MCA employees and the wider shipping industry. The main objective of the manual will be to help in the development of practical solutions for managing human element-related risks, and it will introduce a selection of tools to help in this.

Self-regulation is encouraged where possible, as part of efforts to help develop a safety culture in the industry. This encourages every worker to take responsibility for areas of safety they can influence, and encourages them and owning and operating companies to give safety the highest priority in their working practices. Self-regulation can be the best response to identified needs or recurring problems which would be satisfactorily addressed by providing shipping companies and seafarers with information to help them implement effective solutions. Figure 3 shows that since 1997 the balance of recipients of the majority of MAIB recommendations has shifted towards the industry as opposed to the regulator. While there may be
several influences at work here, the introduction of the ISM Code in 1997 and the responsibilities it brings for the ship and the company could well be an important factor.

![MAIB recommendations 1994-2004](image)

**Figure 3:** UK Marine Accident Investigation Branch recommendations, 1994-2004

*MAIB = Maritime and Coastguard Agency; SCOM = Shipping companies, owners and masters*

When prescriptive or enforced interventions are necessary, applying a risk management approach serves to improve operating efficiency while helping to prevent accidents and incidents. While the primary responsibility of the regulator is to protect lives, avoid economic loss and prevent environmental damage, there is also a responsibility to take account of the industry’s need to balance safety and profitability. By taking a system-based approach to the human element, interventions can be developed which focus on not only the ‘front-line’ operator or crew member but also the organisational and regulatory framework within which he or she works. In this way a wide range of influences on quality and performance are addressed, including both active and latent failures.

**Human Element Assessment Tool**

A key recent initiative by the MCA is the development of a Human Element Assessment Tool (HEAT). This tool is designed to be applied in conjunction with ISM audits, with two forms having been developed. HEAT-C assesses the consideration of the human element within operating companies, and HEAT-S is concerned with the human element on board ships. The two versions are applied in conjunction with, respectively, the Document of Compliance (DOC) and Safety Management Certificate (SMC) audits for ISM Code certification. HEAT-S is currently being trialled for validation purposes around the UK. The findings will inform future plans for both forms of HEAT.

HEAT has been designed as a complement to the ISM Code, but most importantly as an extension. It offers most value by expanding into areas which are not covered by ISM and crucially by encouraging continuous improvement and control over risks, rather than the superficial compliance which can be achieved with ISM. A safety management system will not work effectively unless the values of a safety culture are held by the people involved, and HEAT aims to measure their capability to operate it.

The MCA identified the need for HEAT not only to address those vessels and companies which choose to aim for merely a surface-level compliance, but also in response to the growing likelihood of ships and companies meeting the Code’s requirements year after year, and not receiving any non-conformity notices.
This is of course to be praised, and would be recognition of effective work by those responsible for the safety management systems involved. However, it is unlikely to signify a complete absence of areas where further improvement is possible. HEAT will discourage any complacency which may follow a cycle of compliance, by outlining the current level of achievement and what actions are needed to advance to a higher level or to avoid dropping to a lower level. To do this HEAT uses the principles of the Capability Maturity Model. This has been used to assess organisational maturity in a wide range of contexts, and with HEAT the MCA is focusing on behavioural and cultural aspects of the maritime industry.

Once HEAT has provided an evaluation of the effectiveness of the safety management system in place, potential areas of improvement can be outlined. Any mitigation measures which may follow can then be assessed to see if the benefits they would bring will justify the costs. HEAT can also help with balancing resource use over the whole operational spectrum. For example, if a ship or company is consistently far exceeding the requirements for training, but has a poor system of recording and acting on near-miss information, their overall safety management effectiveness might be increased by redeploying employee time or other financial resources from one to the other.

While the focus is on the actions, behaviour and attitudes of individuals, in developing HEAT it is not the intention of the MCA to identify underperformers with a view to criticising them. The purpose is to draw information from any negative observable behaviour which may be symptomatic of deeper-seated organisational problems, or latent failures. If the results of the trial support its implementation, HEAT will help to target mitigations at the root causes of observable unsafe behaviour.

Research

Another option for regulators in addressing the human element is to carry out or commission research into particular topics of concern. This is often the best response when trying to develop solutions to problems not previously experienced. It can include learning lessons and good practice from other high-hazard or transport industries, or establishing if possible solutions already exist within sections of the industry, either within or outside the home country of the regulator. Below are some examples of previous and current research commissioned by the MCA, as well as a brief overview of the European Union’s research programmes.

- **Driving Safety Culture: Identification of leadership qualities for effective safety management.** (April to November 2004)

  A desire was identified for best practice guidance in implementing the ISM Code, specifically regarding the importance of leadership and ‘commitment from the top’ in an effective safety culture. The decisions and behaviour of operational managers are key factors in meeting the requirements of the Code. By commissioning research into this area, the MCA aimed to help safety managers to improve their abilities to make the most effective decisions in their operational safety responsibilities.

  The resulting project identified ten core leadership qualities which are considered best in promoting a safety culture, as well as a range of constraints and enablers to bringing about improvements. Data was gathered through a literature review and through discussions with maritime leaders and crew, as well as representatives of organisations such as the MCA, MAIB and Nautical Institute.

  The findings regarding ideal leadership qualities were summarised in a concise guidance booklet, of particular benefit to masters and other maritime leaders. The ease of use of this offering meant that it received a very positive reception from a range of industry sectors, including shipping companies of various sizes, training centres, professional institutions, and industry publications. This observation will inform future methods of disseminating safety guidance. The full research report provides additional information on the improvement of safety leadership, including describing best practice. The findings can be applied to training, recruitment and promotion, as well as the daily working practices of leaders in ISM Code implementation and safety culture improvements. The booklet and report are...
available for free download from the MCA\textsuperscript{11, 12}, ‘Alert!’\textsuperscript{13} and United States Coast Guard\textsuperscript{14, 15} websites. The findings are also summarised in Marine Information Note 215\textsuperscript{10}.

- **Development of guidance for the mitigation of human error in automated ship-borne maritime systems.** (July 2005 to January 2006)

Increasing automation commonly results in an increasingly passive monitoring role for those on the bridge and in the engine control room. The research is a proactive means of guiding future system developments in light of this trend. It is also a reaction to past incidents which have highlighted the possible consequences of poor human-machine interfaces, especially when the current status of a system is not clearly apparent to its operator. For example in 1995 the Royal Majesty grounded after the Global Positioning System (GPS) defaulted to dead reckoning for 34 hours without its crew noticing. Only when the vessel had grounded, 17 nautical miles off the planned course, did anyone on board realise there was a problem. This project will investigate how people can most safely and effectively work with automated systems, including specific or specialist training requirements for those monitoring automated systems.

- **Development of a human cognitive workload assessment tool.** (July 2005 to May 2006)

This second project aims to develop a cognitive workload assessment tool, which will enable a better understanding of the safety of different crew work/rest patterns. It was partly inspired by the MAIB 2004 Bridge Watchkeeping Safety Study\textsuperscript{17}, which highlighted the risks of not addressing this need. Other high hazard industries such as aviation are facing similar problems, with risks coming not only from excessively high mental task demands, but also from cognitive ‘under stimulation’. This latter situation can arise in circumstances such as a watch keeper on a bridge at night in calm, open seas with little other traffic. Vigilance levels will naturally drop if the role becomes too passive.

The tool will help to guide task designs and work patterns to avoid subjecting seafarers to unsafe peaks and troughs in their mental processing during their work. The findings of the project will be applied in conjunction with those for the automation guidance project described above – the relationship between increasingly prevalent automation and decreasingly active monitoring is a clear one. In vessel, equipment and task design, the requirements and limitations of their human operators must be given a greater priority, and by investigating how best to do so, the MCA can provide information which assists this.

- **Organisational structures: the influence of internal company management structures and external industry structures on safety management performance.** (October 2005 to April 2006)

As well as the role of leadership as previously investigated, another substantial constraint to the delivery of a viable safety culture, i.e. one which balances safety and commercial pressures, is the influence of the internal company organisational structure. This includes the designation of individual roles and responsibilities. An additional factor is the structure of the overall maritime industry itself, including how it is organised and the influences this creates. Maritime organisations operate under these pressures, and can be controlled by them in the case of regulatory or financial influences etc.

This project will examine the influence of the structure of both maritime companies and the wider maritime industry itself on safety management performance. It aims to propose improvements to the structure of the industry and companies, which the MCA can either enforce within the UK, recommend in guidance to the industry, or forward to IMO for wider consideration. This final option may be the most appropriate if recommended alterations to the structure of the industry in general are developed.

- **Research within the European Union (EU)**

In addition to participating in IMO’s efforts, the MCA endeavours to select and participate in EU research programmes with a cross-cutting human element input. This helps to ensure that the views of
the UK industry are represented in EU transport safety research, and to maintain UK policy within the EU framework. The Community Research and Development Information Service (CORDIS) provides the latest news, progress and initiatives in innovation, research and development within the European Research Area (ERA).

The current mechanism for research funding, Framework Programme 6, finances the activity areas of:

a) Aeronautics and Space – improving aircraft safety and security; and

b) Sustainable Surface Transport – safer, more effective and competitive rail and maritime transport.

Previous project titles have included:

i) The human element in the man/machine interface and interaction to improve safety and effectiveness transport for the European fleet;

ii) Advanced Technology to Optimize Maritime Operational Safety, Integration & Interface; and

iii) Casualty Analysis Methodology for Maritime Operations.

The latter piece of research relates to planned activity by the MCA of liaising with the European Maritime Safety Agency (EMSA) and the MAIB on development of a human element taxonomy for accident investigation. The purpose of this is to obtain a regionally agreed taxonomy and a common understanding of the human element in maritime accidents, to enable equal treatment of human element issues across the EU and possibly in wider contexts.

**THE INTERNATIONAL SCENE**

To be fully effective in improving and maintaining standards of safety and environmental protection, regulators cannot work alone and must be involved at an international level. This includes not only the regional level (in the UK’s case, Europe), but also the wider scope for influence and debate afforded by the IMO and its membership. In October 2005 this included 166 member states, 36 inter-governmental organisations (with agreements of cooperation), and 63 non-governmental organisations (in consultative status).

One of IMO’s principal vehicles for action on the human element is the ‘Joint Maritime Safety Committee (MSC)/Marine Environment Protection Committee (MEPC) Human Element Working Group’. This was most recently convened at MEPC 53 in July 2005. The 25 member states and 6 non-governmental organisations which were represented drafted four MSC/MEPC Circulars to raise human element awareness and encourage further action by IMO and its members, as outlined below. These documents were approved by MEPC 53, but also need approval from MSC at the next session (MSC 81, May 2006) for full ratification.

- **The Organization’s strategy to address the human element**, including an ‘action plan’ for several key issues;
- **Checklist for considering human element issues by IMO bodies**, to encourage IMO bodies to consider human element issues when developing and amending mandatory and non-mandatory instruments;
- **Strengthening of human element input to the work of IMO**, as encouragement for those with human element expertise, knowledge or interest to participate in relevant Sub-Committees;
- **Framework for IMO consideration of ergonomics and the work environment**, in order to reduce the incidence of personal injuries and human errors.

The human element working group also endorsed, with some minor comments, a draft Circular from the Sub-Committee on Bulk Liquids and Gases (BLG); “Guidelines on basic elements of a shipboard occupational health and safety programme”.

In addition to IMO’s work, ILO is due imminently to introduce a ‘Consolidated Maritime Labour Convention’ which will combine around 60 current ILO maritime conventions into one coordinated and easily understandable instrument18.
SUMMARY

The challenges posed to maritime safety and environmental protection by the human element are extensive in scope and deep in influence. In acting to address them, the UK regulator applies a risk-based approach, enabling it to target resources for the most cost-effective benefit to lives, the environment and the economy. It has been shown that a regulatory approach will be most effective by taking a comprehensive view of observable problems, including analysing and responding to failures both at the ‘front line’ and deeper within the organisational and industrial structure. The full chain of causation, and thus the scope for improvements to be introduced, will often encompass both active and latent failures. In order most effectively to govern the geographical area and vessels for which they have direct responsibility, regulators must contribute to and learn from the international regulatory arena. While mandatory regulations must sometimes be introduced and enforced, there are other occasions when it is more appropriate to encourage self-regulation, and to facilitate this by providing the guidance or tools to do so.

REFERENCES


14. US Coast Guard/IMO Human Elements Bibliographic Database  
   http://www.uscg.mil/hq/g%2Dm/mse/humanelements/data/sumguibook.htm

15. US Coast Guard/IMO Human Elements Bibliographic Database  
   http://www.uscg.mil/hq/g%2Dm/mse/humanelements/data/leadfinreport.htm

   [Available at: http://www.mcga.gov.uk/c4mca/min_215.pdf ]
