APPLYING THE ISM CODE TO ENHANCE MARITIME SAFETY

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ABSTRACT

Maritime Safety Committee of the IMO at its 84th session in May 2008 adopted a new code of international standards and Recommended Practices for a safety Investigation into a Marine Casualty or Marine Incident (the casualty Investigation code). The Relevant amendments to SOLAS chapter XI-1 were adopted to give the code a mandatory status. The code requires that safety investigation should be conducted into each very serious marine casualty, which is defined as a casualty involving a total loss of ship or a death or severe damage to the environment (IMO, 2008). Main purpose of the new code is for the administrators to obtain and disseminate information that could be used to prevent future accidents. The new regulations expand on SOLAS regulations I/21, requiring each administration to investigate any casualty occurring to any of its ship ''when it judges that such an investigation may assist in determining what changes in the presents regulations might be desirable" (SOLAS, 2004).

Safety measures based on the outcomes of the investigations of accidents and the lessons learnt from them have been the cornerstone of IMO's rule making process. International safety conventions under aegis of the IMO and those prior to its establishment were mainly developed and adopted in response to accidents and disasters of high consequential loss of life, property or damage to the marine environment, with an objective of implementing design and operation standards for preventing reoccurrence of similar diastases. It is a common saying in the maritime sectors that:

Titanic created the SOLAS:

Torrey Canyon created the MARPOL:

Amoco Cadiz created the MARPOL amendments and STCW:

Exxon Valdez gave us the OPA 90 (USA)

Herald of Free Enterprise created the ISM Code. (Sagen, 1999)

Since the establishment of the IMO fifty years ago, over fifty international conventions have been developed and adopted by its member states. In addition to these conventions hundreds of other measures such as protocols, codes , guidelines and recommended practices have been developed that influence practically every aspect of shipping and shipping and ship operation, including ship design, construction, maintenance manning and eventual disposal—literally from the drawing board to the scrap yard. (IMO, 2008). These concerted efforts of the international maritime fraternity under the auspices of the IMO and other international organizations have met with remarkable success in promoting maritime safety. Over the past 35 years the number of significant oil spills has been reduced from over 25 per annum to less than four per annum (ITOPF,2006). During the years 2005 and 2006 there has been, though insignificant increases in the tanker incidents since the year 2004 when they were the least, they are now less than 20% of what they were in 198, (INTERTANKO, 2007 weekly news 27/2007). In terms of total loses there are 13% lesser number of ships and 25% lesser tonnage lost over a period of last ten years (ISL, 2003).

Notwithstanding such commendable achievements in maritime safety we are still faced with, though lesser in number, maritime disasters of high magnitude claiming valuable lives, damage to property and the marine environments. According to the casualty reports from Lloyds Register of Shipping on an average nearly a hundred ships, and valuable lives, are still being lost annually. Within the period between 1987 and 1996 just thirteen ship casualties accounted for 7299 lives and ingress of over half a million tones of crude oil from ships into the sea (Mejia 2005).Such lesser than desired achievements from the globally accepted regulatory regimes, notwithstanding the shortcomings and lacuna in their own inadequate implementation, culminate from number of widely diversified technical as well as non –technical, socio-economic, socio-cultural and socio-technical reasons (Prasad,2007).

KEYWORDS: ISM Code, Ship Operations, Human Error, Management of Safety of Operations, Organizational Culture, Effectiveness of the ISM Code

INTRODUCTION

Research Problem

Most of ship crews facing lack of awareness in each of maritime safety and maritime environment protection from pollution and they didn't differentiated between them. So this research tries to answer the main question which is: Are the seafarers exactly known the maritime safety regulations, managements, and code. Are the seafarers exactly has sufficient training for awareness situation to facing emergency situation?

Aims of Research

The aims of the research are: study the improvement of the maritime safety aware and its culture in the maritime industry, establish safety and pollution prevention objectives and that develop. Implement and maintain a SMS and a systematic approach to the safe management of ships and compliance with mandatory rules and regulations related to the safe operation of ships and protection of the environment.

Research Objectives

The objectives of this research are highlighting of the concept of maritime safety awareness and it affects on maritime accident by the investigation the follow: investigation the causes of lack of maritime safety Awareness, the relation between Maritime Accident and Human Element and the effect of ISM code in maritime safety in order to ensure safety at sea, prevention of human injury, loss of life and the avoidance of damage to the environment, in particular to the marine environment.

Research Methodology

This research has been written with the analysis descriptive and uses many sources which are listed in the list of references.

REGULATORY CONTROL OF SHIP OPERATIONS

Regulatory control of shipping that was historically based on mutually binding agreements through conventions adopted at international conferences called at the behest of one of the traditional maritime nations has now been consolidated under the aegis of IMO, but the development and revision of conversions still continues to be driven mainly as a direct result of accidents involving loss of life or property or marine pollution damage (Morrison, 1997). The 'lessons learnt', from the investigation reports of accidents do provide valuable information on the most portable causes and for making amicable and consensual decision on the precautionary measures to avoid recurrence. Such measures have greatly

enhanced maritime safety through improved ship designs based on sound scientific principals; adequate workmanship during construction through quality control systems; installation of better equipment to suit the needs of modern ships. The overall effect of these technical measures was improved reliability of the ships and the equipment on them.

At the same time however validity of the results of a formal investigation that could provide meaningful lessons for prescribing preventive measures depends on the objectives and rigors of such investigations and on their success in determination of actual causes. If the investigations are conducted for the purpose of insurance claims, litigations or for the purpose of assigning blame against an individual, then scope of such investigations is limited to the extent of achieving such an objective. It eludes search for the real cause of an accident and consequently falls short of identifying the most appropriate measures necessary for preventing its recurrence (Prasad, 2007).

Human Element in Ship Operations

Searching enquires into the spate of accidents in the late eighties and early nineties of the twentieth century directed attention of the regulators towards 'human error' which came to be realized as the main causation factor for majority of accidents in other industries such as aviation, nuclear, chemical processing, railways etc. That 80% of accidents are caused by human error became a commonplace in the maritime safety parlance also. There were two most compelling reasons for such overwhelming culpability bias towards human error. First one stems from enhanced reliability on technical systems in view of the improvements in the ship and equipment design better materials for construction and good quality control on the construction and manufacturing processes.

Attribution of causes of failures, breakdown and accidents that were hitherto ascribed to the technical aspects of ship and its system progressively diminished and consequently a greater proportion of accidents became to be attributed to non-technical human related causes or the 'human factors'.

The second reason for this change in emphasis towards human element was the incontrovertible signs of degradation in the competence of some seafarers in the global pool. The gap between the available and the necessary competence of the seafarers widened due to number of factors in the aftermath of oil crises of the seventies and the global trade recession of the eighties which brought sweeping changes in ship management patterns. Cost cutting measures prompted the ship-owners to economize on crew wages which accounted for 30 to 40 percent of the ship operating costs (Stoford, 2000). Number of Seafarers on board was reduced by replacing part of the crew by technology. The ships were increasingly equipped with automatic surveillance, alarm, control and remote operating systems. Unfortunately the crew reduction strategies got extended even to those ships that were not equipped with the sophisticated technologies of automation and control systems. Concomitant to this development was the diminished availability of well trained seafarers from traditional maritime nations because of stifling interest from seafaring profession amongst the young school graduates of developed nations. This prompted the ship-owners to flag out their ships so as to facilitate employment of seafarers from wherever they could manage to get who, in favor of their interest, also worked at comparatively much lesser wages. This 'globalization of the crew' was not without repercussions. According to IMO the process of globalization has introduced a broad social and ethnic diversity as a result of multinational crew with varying and inadequate professional standards (IMO, 2002). The labor supplying countries viewing this situation as a great opportunity for employment for their nationals and enhancing their foreign exchange earnings resorted to produce a large number of seafarers. Unfortunately the standards of training provided by their institutions could not cope with the demands of inculcating requisite skills in their seafarers to match the contemporary shipboard technologies and social environments. This was primarily due to lack of training

facilities, trainers and berths for on job training on board ships, an important gradient in the maritime education and training.

Human Error

The process of flagging out also resulted in ship-owners getting distanced from their ships and seafarers. In a substantial number of cases the management of the ships was passed on to the ship management companies who in many cases further subcontracted manning of ships to the crewing companies. These formidable developments in the ship management patterns are believe to be responsible for greater attribution of failures and accidents to human related causes, the human error being overwhelmingly identified as the causation factor. It is common to come across statements suggesting that over 80% of maritime casualties are directly attributed to human error, which more often than not refer to an error on part the front line operator. When the actions or inactions of operators, who are inevitably at the man-machine interface, produce undesirable outcomes they are termed as human errors or human failures and such action/inactions of theirs as the direct causes of accidents.

Active and Latent Failures

These active failures at the 'sharp end' are easily palpable and the operators are conveniently blamed for the accidents. These errors are however only symptoms of the contributing cause responsible for creating conditions for operators at the sharp end to commit them. The errors of commission or omission due to slips, lapses, mistakes and violations on part of the operators may be the final straw that broke the camels' back but the situations that lead the operator to commit errors had probably been burgeoning for long within system.

Secondly operators at the sharp end are not the only humans in a techno-social system. There are others in the hierarchical echelons of a techno-social structure who, like front line operators are liable to commit errors. These are also human errors but committed away from the sharp end are not easily noticeable and may have been committed much earlier on time scale of accident causation chain of events. These are also human errors but committed away from the sharp end are not easily noticeable and may have been committed much earlier on time scale of accident causation chain of events. These errors in the form of wrong decision on policies and procedures, inadequate supervision, lack of concern for ergonomics, health, safety etc. committed at higher levels of management are termed as 'latent errors or latent failures' which are as responsible for accidents as the human errors at the sharp end. A strategy that addresses avoidance, mitigation, control and recovery from both types of errors only can provide effective safeguard against incidents/accidents.

Seafarers' competence is the most basic human factor responsible for human errors at the sharp end, be it operation of equipment, watch-keeping, maintenance, or making decision in response to emergencies. Each of these activities requires adequate knowledge, skills and right attitude developed through education, training and experience. IMO has rightly placed competence of seafarers on top in the international agenda. The revised STCW convention lays emphasis on the seafarer's ability to apply the learnt knowledge and skills. It stipulates seafarers to demonstrate this ability prior to being certified as competent for specified shipboard functions and levels of management.

HUMAN AND ORGANIZATIONAL FACTORS

Number of accidents, in the eighties and the nineties of the last century, brought to the fore serious inadequacies in the organizational control and deficiencies in management of ships that led to the unfortunate consequences.

Report of enquiry into the sinking of "passenger ferry Herald of Free Enterprise" in 1987 claiming 192 lives, conducted by justice Sheen under the Merchant Shipping Act of 1984 of the UK, pointed to serious lapses on part of

company's shore management at all level from director level downwards. The problem was identified as lack of communication between the ship and shore management. It pointed to the prevalence of only one way communications from ship to shore. Concerns from different Masters of this vessel to the top management at various times regarding safety matters were consistently ignored by the company management. Excerpts from the report "…a full investigation into the circumstances of the disaster leads inexorably to the conclusion that the underlying or cardinal faults lay higher up in the company. The board of Directors did not appreciate their responsibility for the safe management of their ships. They did not apply their minds to the question: What order should be given for the safety of our ships? The directors did not have any proper comprehension of what their duties were. This squarely identified error on part of the management yet the predictable reaction of the senior management to the 'failure to close the bow doors prior to the departure' was to assign blame to the Assistant Bosun for being asleep at his post" (Whittingham, 2004), a human error at the sharp end. Report of investigation by the United States National Transportation Safety Board into the grounding of Exxon Valdez pointed inadequacies on part of the company management: "the failure of the third made to properly maneuver the vessel because of fatigue and excessive work load; ..the failure of the Exxon company to provide a fit master and rested and sufficient crew…" Although the error committed by the third mate eventually resulted in the accident but he did not have control over the conditions that created situation for his errors. Research has shown that out of 80% of the human errors, commonly stated as being responsible for accidents, only 20% are under the control of operators and remaining 80% are those that only management can control. These are the actual or root causes that the management can control. These are the actual or root causes that the management controls through defining its policies through proper procedures, commitment and supervision. The actions of the employees, whether ashore or on board, are not in isolation but are intertwined with and are influenced by the situational factors engendered by the organizational polices, directions and controls, which are referred to as organizational factors. The active errors at the sharp end therefore culminate from the human and organizational factors 'HOF'.

Management of Safety of Operations

Resolution adopted at the 15th Assembly meeting of the IMO in 1987 "...to develop guidelines concerning shipboard and shore management for safe operations" recognized the need for addressing the organizational and management structures, a preamble to the now in force International Code for Safe Operation of ships and for pollution Prevention, the ISM code. The code has been hailed as the path breaking amendment to SOLAS as through it, for the first time, the management of safety has been addressed and shore managements' responsibility to safety of ships has been recognized. The code stipulates ship operating companies to define their safety management policies and strategies for achieving these through their commitment that is seen by the employees at all levels ashore and on board. The main contention being to internalize the safe practices at the organizational and individual levels through self motivation engendered by the commitment of the top management towards safety as it permeates downwards. Conscientious implementation of the ISM code provision implies developing a 'safety culture' within the organization where safety is practiced by internal self commitment rather than external compulsions from the regulatory bodies like flag state or port state controls .It is hard to ignore the fact that this initiative has to come from the ship-owner or the shipping company management as defined in the ism code.

According to Mr.william o,neill's statement in 1996:the implementation of the code will provide the owners with the positive and real business advantage provided they truly want to change and move towards a safety culture in their business philosophy. The change referred to here is a paradigm shift from the traditional management philosophy towards modern management techniques adopted by other industries (sangen1999). Change is needed in the attitudes and the values

that a management places on safety concerns when addressing policies and strategies, I.e. a change in the organizational safety culture.

ORGANIZATIONAL CULTURE

The term safety culture was used first time in 1987 in the summary report on the post accident review meeting on the Chernobyl accident.

While exact definition of safety culture does not exist but is used in the safety literature to describe organizations that give top priority to safety of people, property and environment.

Safety culture is a subset of total organizational culture .An organization's culture is known by the success of an organization in it's quality of operation, least down time or off hires, injuries and accidents, good market standing ; confidence of it's stake holders ; employee awareness and understanding of organization's mission, goals and policies ; low employee turnover and their loyalty . Organization culture develops side by side and concomitant with sets of various sub culture over the life of an organization and undergoes a regular change under the influence of surrounding political ,technical, economic and social environments .

These influencing factors are interdependent on each other and a desirable variance in one may have an adverse effect on the other e.g. exigencies of economic pressure may prompt a deferment in maintenance activities to a later time period.

Consequently the change that may lead to a refinements or a regression in an existing organizational culture is governed by the joint effect of changes in different subcultures that form the total organizational culture.

Culture is the way we perceive things in an existing situation and act on them. The Confederation of British Industry defines culture simply as 'the way we do things around here'. To know the culture of an organization is to find how the things are managed in it. One has to look if there exists a written mission statement of the organization with its goals, and the strategies and if does, to see further if these have been disseminated in an organized manner to all concerned that need to contribute to the achievement of policies, goals and objectives.

Whether there exists a good management structure, procedures, instructions, guidance and appropriate communication system to promote implementation of national and international legal requirements. Whether those at different hierarchical levels in the organization are serious about really implementing the laid down policies or these are only exhibits to fulfill some statutory requirements. Whether implementation of the organizational policies and procedures by senior management is by leading through setting examples, 'walk the talk' as they say, or by one way communication to those at the lower rungs of hierarchy who are expected to inexorably implement them without having an intricate understanding of the need or importance of such policies and procedures. -Whether those who have the responsibility of execution of the organizational policy at the operational level are treated as members of the team and encouraged to provide feedback on difficulties in implementation and suggestion on improvements. Whether the organization invests in technology demanded by competitive commercial needs without investing in its personnel through need based training to upgrade their skills to handle new the technology.

Safety Culture

Safety culture being a subset of organizational culture evinces organization's attitude towards operational safety, emergency response and towards its employees' vis-à-vis its commercial interests. The term relates to managements commitment to safety through acknowledgement of potential risks from hazards that are regularly assessed and acknowledgement of error prone nature of human activities. If 80% of accidents have their causes in human factors then

incontrovertibly there is a close link between the human factors responsible for accidents and safety culture. As mentioned above culture is based on perception which is guided by an individual's psyche, knowledge, competence, past professional experience, social background etc. and will therefore vary from person to person in line with these personal attributes. These personal attributes not only play a dominant role in influencing performance shaping factors at the individual level but also in influencing group behavior. It is the product of various individual personal attributes and values that determines group behavior, towards commitment to safety. As regards knowledge and competence, especially in the shipping industry, there can hardly is any controversy that there exists a wide variety in these personal attributes of the seafarers.

Employment of seafarers of different nationalities and cultures as a group on board a single: ship is a widely accepted norm today. Level of seafarers' knowledge and competence although internationally governed by the standards stipulated in the STCW Code understandably varies depending on the region where they have been educated and trained. When individuals bringing their own knowledge, competence, experience and culture are required to work in a group. The outcome of the group is severely affected by the factors such as dominance, diffidence, exuberance, power differential, communication skills etc. These factors need to be controlled and utilized amicably for strengthening safety culture.

Success or failure of the SMS is dependent on the safety culture of the shipping company: Professor Jim Reason defined safety culture as " a way we do things around here".

According to the UK's Health and Safety Executive, (HSE), the safety culture of an organization is a product of individual and group values, attitudes, competencies and patterns of behavior that determine style and proficiency of the organizations safety programs.

The shared perception of the importance of safety, confidence that safety measures are experienced at all levels of the organization and sense of personal responsibility for safety are measures of an organization's safety culture.

The ISM Code can foster these values among shore and sea staff. The concept of shared responsibility is particularly encouraging, as it can bring with it a greater awareness of how an individual fits into a particular situation and how his/her actions can influence the final outcome.

With the trend towards minimalist crewing levels, and the increasing use of multinational crews, a sense of personal responsibility can be effective in minimizing the likelihood of an accident occurring.

However, society's blame culture instills into managers and seafarers a fear of blame and criminalization. It encourages mistrust, preventing them from being open and honest, by covering up mistakes when things have gone wrong. Further, it can give a sense of anxiety to individuals who think that by taking personal responsibility, they may be held responsible for an accident simply by following the dictates of the ISM Code.

Also, the Code has many generalizations, all of which are open to differing interpretations, making managers slightly cautious when developing procedures to satisfy the Code.

The influence of this blame culture, with its consumer driven desire for personal accountability, punishment and compensation, hinders the chances of universal success for the ISM Code.

When accidents happen, rather than learning the lessons, the probability of blame inhibits effective safety action to prevent similar accidents in future.

HSE list six factors that create a positive safety culture within an organization. These are:

- Leadership and the commitment of the chief executive

- A good line management system for managing safety

- The involvement of all employees

- Effective communications and understood/agreed goals

- Good organizational learning/responsive to change

- Manifest attention to workplace safety and health

- A questioning attitude and rigorous approach by all individuals

Accident investigation has found that if one or more .of these factors is lacking, the organization is prone to comer cutting, poor safety monitoring and poor awareness of safety issues.

Cultural Transformation

Research in industrial safety identifies attitude of management as the most influential factor in promoting safety culture. Same would be true for the shipping industry as well where the main thrust of promoting and sustaining safety culture would fall on the ship owner. Increase in regulations has significant effects of cost of seaborne transportation, According to Philippe Boisson of Bureau VERITAS introduction of 1SM code would have resulted in an expenditure of between 50000 to 400000 USD for a company in initial phase plus an annual cost of 10000 USD (Boisson, 2004). A ship owner, not withstanding expenditure, needs to establish safety systems with an understanding and belief that compliance with the national and international rules is in effect a route not only for safety of ship operations but also for long term profitable business. Those operational standards are set not only as demanded by the rules and regulations but also based on the assessment of perceived risks with their achievement encouraged through adequate resources, procedures and guidance. Clearly there is a need for cultural transformation from the practices that lay emphasis on blind compliance of safety regulations towards that of promoting safety culture where individuals feel ownership of safe practices and procedures and comply with them with internal self control. To enhance safety of ship operations on global bases and to lift the image of shipping the ship owning and ship operating organizations need to go through a cultural transformation. Some of these organizations, though very few, are already operating at high levels of safety the others need to reach that level with varying degree of cultural transformation. This cultural transformation poses a great difficulty for the organizations that need to abandon the cults of evasion and compliance in favor of genuine safety culture.

Culture of evasion found a niche among some of the ship operating organizations in extremely competitive market where costs of conforming to regulations were so high that business took precedence over ethics (Lloyds List, 1997).

Under buoyant market conditions on the other hand, where some fly by night operators enter the shipping business with an aim to usurp a fast booty, these organizations may be operating even outside the evasion culture where their operations may be characterized under an 'uninformed culture'. Such organizations, against their willingness, are prone to taking risks unaware of the safety requirements. Such a culture is symbolized by ignorance of regulatory requirements, inadequate knowledge and skills for safe operations and grossly lacking emergency preparedness. Such uninformed culture at operational level onboard ships may flourish as a result of organizational inadequacies in much needed attention" to the seafarers' competence during selection for employment and later in their in-service training to prepare them to handle developments in the regulatory requirements and procedures applicable to the ship operations. Evasion culture on the other hand is characterized by an organization's philosophy of compliance with bare minimum necessary standards. Emphasis here is on showing to the authorities as being 'in compliance' through immaculate paper

work rather than forceful intentions of actual compliance. In such a culture the operating staff lacks actual competence, experience and proper need based training.

Transformation from Compliance to Safety Culture

Most ship owners and operators strive for compliance with regulatory requirements for promotion of safety on their ships, not only by establishing safety policies and procedures but their dissemination to all concerned. Adequate guidance, instructions and encouragement for compliance is the hallmark of such a compliance culture.

The management encourages and facilitates the employees to learn about the new regulatory and technical requirements by organizing need based training for development of their skills to use new technology. The communication is however mostly one way, top-down, with vehement emphasis on conformity. To the rules, procedures and immaculate record-keeping. Confirmation of conformity with rules and procedures is attempted through regular inspections of ships and records.

The reverse communication is normally by way of reports confirming compliance with the prescribed procedures and instructions. At times the seafarers perceive these procedures and instruction as being thrust upon them by the company management especially in absence of proper background and underlying intentions. This results in undesirable consequences leading to violations as the procedures and instructions are seen as restrictive and even unnecessary by the operators.

Unfortunately such an environment also leads 'blame culture' developing an attitude of submissiveness amongst the seafarers as nonconformities are blamed for disobedience and seeking causes of accidents limited to finding scapegoats for leveling blames (Boisson, 2004). Under such an environment of submissiveness and fear the seafarers get into the attitude of obeying orders irrespective of their appropriateness and keeping their record clean rather than seeking better solutions. Admitting non-conformities are regarded as inadequacies on part of the seafarers with an undesirable result of hiding and non-reporting of minor incidents and near misses. There can hardly be any disagreement that compliance with rules, regulations, procedures and instructions is essential but it must come through a genuine willingness from the seafarers who need to ensure compliance on board.

An atmosphere of safety culture promotes suffusion of much needed awareness of the spirit and real intentions behind safety regulations and procedures promoting conscious intentions for compliance as against forcing measures prevalent under compliance culture. Two way communications where not only those with direct responsibility for compliance but also those involved or affected by such compliance are encouraged to express their views on development of better procedures. Safety culture encourages the persons at operation level to report deficiencies, minor incidents and hazardous situations encountered without fear, which on the long run have immense benefits in achieving safety of systems and quality of operations.

Such a culture promotes creative abilities of employees in the organization at all levels not only for identification of risks and hazards but also in responding to the potential situations created by such hazards. With their creativity and ingenuity supported by the management they can modify their responses to deal with exigencies in the interest of ship safety and efficiency. With their involvement in contribution to the procedure development the employees feel part of the process, feel ownership of the procedures and committed to voluntary implementation. Involvement in such process promotes in the employees a sense of status elevation from those exhibiting mere obedience to those being part of the process. Such involvement in a blame free culture motivates the employees to contribute to safety and consequent profitability of the organization.

EFFECTIVENESS OF THE ISM CODE

Section 10.2.2 of the ISM Code requires the company to ensure that any nonconformity is reported with possible cause, if known.

Although the safety management system may have a system of reporting incidents and defects, views on what ought to be reported as a non-conformity can differ within the same Company.

Management can have conflicting views on what defects critical to safe operation ought to be reported. For example, one management department considered that violations, such as smoking in the laundry and action to prevent recurrence had to be reported to the "Designated Person". Yet, another department considered that defective and seized safety valves subject to routine maintenance on board, need not be reported up the management chain.

Management's acceptance of not reporting such safety critical items inhibits correct and timely safety action, and new awareness of its responsibilities to ensure equipment is maintained in good condition.

Often consistent reporting of non-conformities is dependent on trust between ship's crew and the different levels and disciplines within of the management organization. Defects or incidents caused by poor maintenance and supervision are not reported to higher level of management, often because of fear of blame or criticism. Such a situation fosters a negative perception among ship staff of management's commitment to safety.

If management is unaware of defects and incidents, it is unable to properly identify and evaluate risk so that suitable controls are not put in place to manage the risk.

Operational Requirements

Masters and crew are not always convinced of the value of the ISM Code. The reason for this view is not based just on the perception that application of the Code makes for more paperwork. Often it is because of short-comings in their understanding of the aims of the system. Crew fails to realize that the ISM Code not only gives them clear authority, but it also allows them to share responsibility for a vessel's safety with shore management.

In one case investigated, a master felt obliged to carry out a hazardous operation at sea, requiring hatch covers to be removed, because that had become company practice. He did not consider voicing his concerns or discussing alternatives with management.

Investigators have found that companies do not encourage such a questioning attitude. Individuals who have questioned the operational safety have sometimes been rebuffed and intimidated. Some leave the company because of this treatment, while others stay on subdued and discouraged.

This situation does not support and encourage the commitment to values and beliefs which the ISM Code is meant to foster.

Monitoring Effectiveness

The view of some management is that because STCW certified officers should have sufficient knowledge and experience to know how to operate a vessel safely, they alone are responsible for on-board supervision and operations. Consequently, management discharges its obligation to ensure that operation and maintenance of the vessel is properly supervised and executed. Such a view inhibits management to ensure that proper and relevant documented procedures and guidance are available on board and that crew training needs are properly assessed.

Although officers are expected to have a detailed knowledge of good operational practice, they may not have specific knowledge of particular makes of systems and components. Inadequate instructions and guidance, or lack of them, have led to inconsistent and unsafe maintenance and operation, inaccurate fault finding and accidents.

Having instruction 'and guidance in place does not of course guarantee that seafarers will follow them. Often they are unable to do so because manuals have not been translated into the working language of the crew, which has changed with vessel ownership and registration.

Also, instructions have been found to be unclear and/or relate to equipment not fitted on board the vessel. Management relies too heavily on instruction and guidance manuals provided by equipment manufacturers and suppliers without properly assessing their relevance to the operation of their ship.

Instructions and guidance manuals, relevant and clearly expressed, provide a statement to crew, managers and auditors of the company standard of how things should be done safely and consistently on board ship.

The absence of a company standard leads to inconsistent and unsafe operation and short cuts. Moreover, seafarers not having a common understanding what the standard ought to be leads to inadequate assessment of what defect or unsafe operation should be reported. This leads to management unawareness, of how the vessel is being operated, so is less likely to properly assess safety of operation.

Above all, the effectiveness of the SMS is dependent on the conviction and enthusiasm of senior staff, particularly the "Designated Person, the vessel's master and the chief engineer. Without their understanding of the philosophy and objectives of the ISM Code and the associated SMS, the SMS will only exist as a pile of worthless paper. Training alone cannot bring this about; a process of education is required.

Change of Crews and Ownership

The risk of an accident during a crew change over-period can be high when the crew is unfamiliar with the ship. The risk is compounded when change of ownership takes place at the same time. In two separate instances of change of crew and ownership. After having been given only a few minutes to familiarize themselves with the ship's lifeboat launching and recovery equipment, the launching crew lowered then recovered the lifeboats. In both cases the lifeboats inadvertently released from their lifting hooks and fell into the sea injuring crewmen.

Often there is an urgency to complete the change of ownership and registry within one or two days of the arrival of new crews. Not all management considers properly the risks arising from such an action. Consequently, crew do take operational short cuts. During lifeboat drills for instance, life jackets have not been worn because they were ashore having the ship's new name printed on them. Flag State and classification society surveyors and managers alike witnessed the drills content that crew operates the launching equipment without them.

On the day of these accidents, flag State and classification society surveyors, as well as the master and crew were under time pressures to complete a multitude of tasks necessary to enable the vessels to sail. Consequently an effective program of familiarization, risk assessment and planning was ignored.

Change of ownership can bring on other problems. There is no requirement that ISM Code documentation, such as maintenance records and defect and non-conformance reports, stay with the vessel once the vessel has changed owners. Consequently without this documentation at hand over, the new owners are unaware of the vessel's safety and maintenance history.

In one case a master who had taken over a vessel for new owners had problems associated with head of the anchor cable which led to grounding. Investigators found inherent problems with the ship which tended to ride up over the anchor. Consequently, the anchor became trapped in the angle between the bulbous bow and the sharp rake of the stem and the cable jammed preventing the windlass from heaving.

This knowledge was lost to the previous owner and master. Had the new master been fully aware of the inherent problem associated with heaving the anchor cable he might have acted differently to prevent the accident.

The incident highlights the importance of recording such problems and passing them on to subsequent owners.

Removing maintenance and safety history record from the ship on change of ownership has potentially serious consequences for the safety of the vessel. These records should remain on board for the duration of the ship's life, otherwise the owner has to develop its SMS from scratch every time it buys a second-hand ship.

Shared Responsibility between Master and Owner

The ISM Code is a tool for masters to ensure that management is aware of issues that could affect the safety of the vessel. The Code requires that if for any reason a vessel cannot comply with the Safety Management System, this must be reported to the company who should ensure corrective action.

This requirement does encourage some companies to ensure shared responsibility between management and vessel. In one case a faulty generator reduced the ship's electrical capacity. Despite the threat of loss of cruising time and compensation bills, shore management made it clear to the master that it would support his decision whether or not to sail.

However, anecdotal evidence suggests that management does not always give such positive support to the master when commercial and career threatening pressures have been brought to bear on him not to record and report non-conformities.

Measuring Progress in the Improvement of Safety Management

Only when the ISM Code is well established and accident data-bases have been sufficiently populated, and the effect of new and incoming legislation accounted for, will it be possible to measure the Code's effect on global improvement in safety and reduction in pollution.

Although this global improvement cannot yet be measured, any company adopting the ISM Code has potential for improving its safety record. Different companies start from different base lines of experience of safety management, which will affect individual improvement rates.

Any improvement in the safety management system is more obvious with the least experienced companies, compared with companies having a safety management system in place long before ISM became mandatory.

Once a structured safety management system has been established, a company is in a better position to investigate incidents, identify weaknesses and risks in its operation and the root causes of incidents. In turn, this analysis helps the company develop safer working practices.

Effectiveness of the analysis is dependent on the:

- Quality of investigation of human factors and reporting of root cause of accidents;

- Expertise of accident investigators and auditors;

- Co-operation between seafarers and management;

- Making publicly available accident reports and databases of human factor causes

- Sharing of evidence with the flag State or other interested States investigating for the purpose of improving safety rather finding someone to blame.

Global improvement in safety and environment prevention is dependent on shipping companies and States disseminating findings of investigations to industry, and the willingness of the industry to act on the lessons learned.

IMO, through the FSI and its Casualty Statistic working group, is actively analyzing member State investigation reports for human factor causes of accidents. The IMO database is being populated with causal factors and conclusions of its analysis is being forwarded to IMO committees for further analysis. The information accumulating on the database will eventually be an invaluable resource for assessing ISM Code's effectiveness and its need for improvement.

IMO's Code for the Investigation of Marine Casualties and Incidents, gives guidance on the principles for investigating to uncover root causes and for co-operation between interested States.

Although the Code is directed to interested States, its principles apply equally to a company or companies involved in incidents. There is room to amend this Code in recognition that a shipping company is an interested party to the investigation. This sharing of responsibility with the interested States would increase the chance that thorough investigation is undertaken and effective safety actions taken.

Including the shipping company on an investigating State's investigation team would help dilute the culture of blame, and ferment a positive safety culture within the industry.

CONCLUSIONS

A major benefit of the ISM Code is that it encourages lessons to be learned from incidents. Although these incidents may not be significant, they could, in other circumstances, have endangered life and the environment. By learning lessons, safety procedures can be reviewed and amended to reduce risk of occurrence.

Global improvement in safety management as a result of ISM Code implementation is dependent on the willingness of flag States and companies to investigate incidents and share the safety lessons without looking for someone to blame.

The sharing of responsibility between companies and interested States will increase the chance that a thorough investigation is undertaken and effective safety action taken.

Implementation of the ISM Code offers the opportunity for the industry to move away from a culture biased towards blame to one of shared sense of personal responsibility for safety throughout the organization. It is the shipping companies who can provide the driving force needed for this cultural change.

RECOMMENDATIONS

This research points to several opportunities to improve both our understanding of the contribution of human factors to marine accident and the implementation of prevention measures that effectively target these human factors which include:

Creating a mandatory near miss reporting system for maritime industry and analyzing near miss data for lessons learned; Promoting and applying best industry practices that have been recognized to reduce accident risks from human

factors; Focusing on crew endurance management and other practices to reduce fatigue through promoting an environment where all personnel are comfortable expressing concerns or uncertainties; and ensuring that all personnel understand the risk consequences of their actions and job duties.

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