LOSS PREVENTION
Briefing

NORTH
SERVICE, STRENGTH, QUALITY

LOSS PREVENTION BRIEFING FOR NORTH MEMBERS GENERAL / APRIL 2012

Principles of Risk Assessment and Risk Management

Contents

Introduction

It is crucial to manage risks at sea. Not only will risk management prevent or reduce the number of incidents, it will also have commercial benefits for the shipowner.

This briefing examines the background to risk management, and describes the use of a risk management system that is compatible with the ISM Code safety management system.

The Reasons for Managing Risks

Risks are managed so as to minimise damage or accidents to people, environment or property, and to minimise other losses. Sometimes these efforts to manage risks are undertaken willingly, sometimes in order to comply with the law or other rules and regulations.

The main reasons for managing risk can be summarised as follows:

- Legal requirements
- Insurance requirements
- Moral requirements
- Business requirements.

Each of these will be considered in more detail.

Legal requirements

A ship operator is exposed to the laws of their Flag State administration, the laws of the various countries its ships may visit and the laws agreed to in various commercial and employment contracts.

A number of specific legal requirements compel a ship operator to have systems in place to manage risk. Sometimes these requirements are very clear, sometimes they may contain only inferences to risk management.

For example:

- Most legal systems around the world will require an employer to have in place health and safety procedures to protect their employees.
- The health and safety of third parties will have to be protected; the ship operator will owe a 'duty of care'.
- Damage to the environment must be prevented.
- Cargo being carried in the ship operators' vessels should not be damaged.
- Damage to third party property, including other ships, should be prevented.
- National and international legislation must be complied with, such as the International Safety Management (ISM) Code.

Insurance requirements

Ship operators have various insurance requirements. The fundamental principles of marine insurance relate to hull and machinery (H&M), protection and indemnity (P&I) and freight, demurrage and defence (FD&D) cover, and can be summarised under the following headings:

- Compliance with classification and statutory requirements.
- The 'prudent uninsured' concept.
- Imprudent and hazardous trading.
- The concept of 'mitigation'.

Within these 'principles' there are specific or implied requirements to manage risk, even though there may be no clear guidelines on exactly how the insurers expect the ship operators to actually manage their risks.

Moral requirements

All persons owe a duty of care towards each other and their socio-economic environment. The moral areas of concern as follows:

- Prevention of injury to other people.
- Prevention of damage to the environment.
- Prevention of damage to property.

Business requirements

Whether risks are managed for legal reasons or to comply with requirements of insurers, the fact is that accidents are bad for business and expensive. The corollary is that if the various risks to which business is exposed are managed well then the profitability and overall success of the business will benefit.

The losses which a business will suffer if risks are not managed well would include:

- Insured losses
- Uninsured losses
- Inefficiencies
- Damage to reputation.

From a legal and insurance perspective the ship operator effectively has little choice about managing risks as a means to preventing accidents. From a moral perspective, individual persons do not want to cause unnecessary

injury or damage to other people, the environment or other people's property.

From a business perspective accidents and mistakes are expensive, and the management and control of the risks which might lead to those accidents and mistakes can avoid or at least minimise those consequential losses.

There are no losers in risk management.

How Risk Was Traditionally Managed at Sea

Ships and shipping have always operated in a dangerous and hostile environment. Whilst some of the methods of risk management might be relatively new, the management of risk has always been a high priority. In the past there have been different names for what we now call 'risk management', for example, good seamanship is a risk management method.

Shipping has moved through a number of phases where attempts were made introduce different ideas on how risks should be managed and the main developments can probably be classified as follows:

- Traditional seamanship.
- Prescriptive rules and regulations.
- Learning from mistakes.

These will be considered in turn.

Traditional seamanship

The craft of the professional seaman can be traced back over thousands of years. One generation of seafarers has traditionally taught the next generation how to perform the job of a seaman in an efficient and usually safe manner.

Over the years 'good seamanship' equated to 'best practice', and this 'best practice' should be adopted into modern management practices.

Prescriptive rules and regulations

For well over a hundred years, the shipping industry has been subject to a prescriptive approach to managing safety, with volumes of rules and regulations from the administrators, classification societies and others.

Typically the relevant authority prescribes the safety features, or rules and regulations, to be obeyed and the other ship owners, operators and seafarers comply with these requirements. The prescribing authority is usually the government of a country or its representative, or an international organisation in which a number of governments are participating, for example the International maritime Organization (IMO) and International Labour Organization (ILO).

If an injury or damage occurs because of a failure to comply with a part or section of the particular rules and regulations, a liability would probably arise as a consequence, and there may also be penalties imposed on the parties involved.

The merits of the prescriptive approach as follows:

- Reference standards are available.
- Experience is incorporated into the rules and regulations.
- The concept is straightforward.

The drawbacks of the prescriptive approach are:

- It may fail to deal with new developments.
- It is a problem keeping up-to-date.
- There is a lack of scope for innovation.
- Responsibility may not be developed or be too defined.

It could be suggested that genuine improvements to the management of safety by prescribing better rules and regulations will not be achieved because:

- Safety is dominated by human factors.
- It not possible to cater for all possibilities.
- Prescriptive rules and regulations are inflexible.

Rules and regulations tend to deal with the symptoms rather than the cause of the problem. Unfortunately, governments and administrations may still follow this approach.

Learning from mistakes

Lessons from experience have been passed on from one generation of seafarers to the next and are part of the concept of good seamanship.

To a limited extent, individual shipping companies and industry bodies disseminate accident and incident case studies in order to allow lessons to be learnt from the mistakes of others. But such attempts tend to be sporadic. This is for various reasons, including reluctance

of individuals to admit that they had made mistakes and also fear of legal repercussions.

Risk Management Definitions

In normal usage the terms 'hazard' and 'risk' would almost be interchangeable. However, in risk management they relate to quite different things.

Risk

Risk is the likelihood that harm will result from one or more particular hazards. Risk has two elements:

- The likelihood that a hazard may occur.
- The consequences of the hazardous event.

Hazard

A hazard is something with the potential to cause harm. The undesirable outcome could involve:

- Injury to personnel.
- Damage to property.
- Pollution of the environment.
- A combination of the above.

Safety

A related concept which we should also perhaps define is 'safety'. 'Safety' is freedom from danger (Oxford Dictionary).

'Safety' is a very broad concept, and the understanding of its actual meaning tends to vary widely.

Risk assessment

Finally, it would be useful to define what we mean by 'risk assessment' and 'risk management'.

Risk assessment is the process of establishing whether or not risks are adequately managed so that a safe system of work exists.

A risk assessment is simply a systematic way of establishing whether or not:

1. Risks are reduced to the lowest level that it is reasonably practicable to achieve.
2. Best practice is being followed.
3. Legal standards are being met.

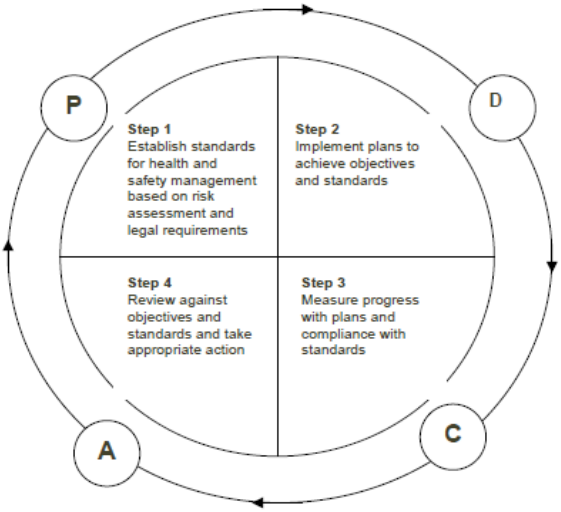
Risk management

Risk management is the application of a risk assessment, control and review process:

1. A risk assessment based on hazard identification and evaluation.
2. Implementation of control measures identified by the assessment as being necessary.
3. Regular monitoring and periodic review.

A Systems Approach to Risk Management

Management systems



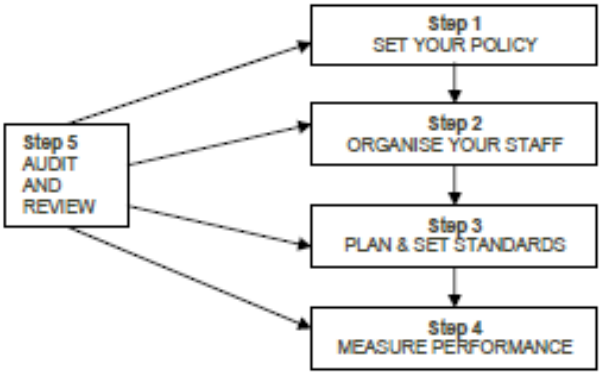
Management can be considered as the process of planning, organising, leading and controlling the efforts of organisation members, and of using all other organisational resources to achieve stated organisational goals.

Most management systems are based upon a **Plan > Do > Check > Act** model. This can be illustrated diagrammatically as shown above.

Managing is the process of making progress towards identified aims by making the best use of human, financial and material resources. Managerial activities include:

- Setting policy.
- Organising.
- Planning, setting objectives and implementing standards.
- Monitoring (measuring) performance.
- Learning from experience (audit and review).

These five steps are described in detail in the UK HSE's publication 'Successful Health and Safety Management' illustrated opposite.



This can be distilled into a 'threefold mantra':

- Say what you do
- Do what you say
- Show that you do what you say.

This management model can be seen in many 'systems' based methods, for example, quality management, safety management and risk management. The systems approach to management tends towards setting goals or targets to aim for rather than managing to comply rigidly with prescriptive rules and regulations. This method is often referred to as 'goal setting'.

Safety case

This approach was developed from what is known as 'systems principles' whereby the safety of a new venture or project can be found by seeking answers to a number of fundamental questions:

- What aspect can go wrong?
- What is the likelihood of specific aspects going wrong?
- What are the effects of a specific aspect going wrong?

Such an approach does not depend solely on previous operational experience but uses all the available information and expertise in a logical manner.

Many of the sources of information, including best practice and lessons learned, have been carried over from more traditional methods.

Risk Assessment and Management

Safety management system

The management and safety case concepts described above can be combined in a well structured Safety Management System (SMS) within the ISM Code.

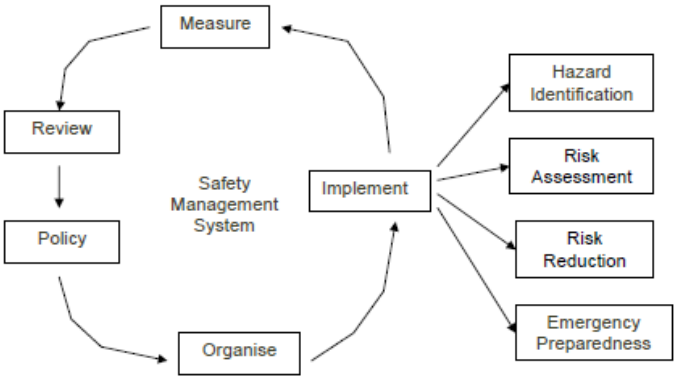
The concept can be illustrated as follows:

Question	Task and Scientific Term
1. What aspect can go wrong?	Identify hazards systematically (Hazard Identification)
2. What are the chances and effects?	Assess the risk levels of the hazards (Risk Assessment)
3. How can they be reduced?	Reduce risk levels of selected hazards (Risk Reduction)
4. What to do if an accident occurs?	Be prepared to respond to emergencies (Emergency Preparedness)
5. How can safety be managed?	Manage and control risk levels of hazards (Safety Management System)

From this the management cycle can be developed.

The Management Cycle Model of Risk Management

Kuo (1998) developed the safety case approach into a safety case concept featuring what could be described as a Management Cycle model of risk management as shown below:



Management systems are cyclical in nature – they represent a cycle of continual improvement. The system is dynamic, alive, ever changing and improving. Once the cycle has started there is then no starting or finishing point.

The central element to the Management Cycle model is the Safety Management System (SMS) which has five components:

- Policy formulation.
- Organise resources and the communication of information.
- Implement the agreed policies and actions.
- Measure that the required standards are being met.
- Review performance and make relevant refinements.

The other four elements of the concept, which form part of the implementation process, are:

- Hazard identification.
- Risk assessment.
- Risk reduction.
- Emergency preparedness.

(Kuo P.35)

The initial starting point will be to set the policy of the Company towards managing risk, identify who will be involved and what other resources will be required. Then it will be necessary to state what that policy is, how the resources are organised and set out how risk is to be managed.

That policy and processes must then be brought alive through implementation. It is then necessary, and very important, to check and make sure that the systems are working as intended, so that the risks are being properly managed. This would normally be achieved by a process of audits and verifications. Any problems, non-compliances or non-conformities should be the subject of corrective actions within the cycle of continual improvement.

How all this happens in practice will be determined by the individual company, the way it is structured, the types of ships they operate and many other factors. There is no single 'blueprint' which is suitable for all Companies in all circumstances.

The implementation procedures will now be considered in more detail.

Hazard identification

Initially it may be useful to identify separate work activities, or other categories of interest, and group them in a rational and manageable way, and to gather necessary information (or collate existing information) about them. Infrequent maintenance tasks, as well as day-to-day operations, should be included.

Asking these three questions should help to identify where there is a hazard:

- Is there a source of harm?
- Who (or what) could be harmed?
- How could harm occur?

(UK Code of Safe Working Practices, 2.1)

Common sense must always prevail, there is no intention within the risk management approach to try and manage every single hazard.

Hazards that clearly have negligible potential for harm should not be documented or given further consideration, provided that appropriate control measures remain in place.

To help with the process of identifying hazards the Code of Safe Working Practices (2.2) suggests that it may be useful to categorise hazards in different ways, for example by topic:

- Mechanical.
- Electrical.
- Physical.
- Radiation.
- Substance.
- Fire and explosion.

A complementary approach may be to develop a prompt list. For example, during work activities could the following hazards exist?

- Slips / falls on the level.
- Falls of persons from a height.
- Falls of tools, materials, etc, from a height.
- Inadequate headroom.
- Inadequate ventilation.
- Hazards from plant and machinery associated with assembly, commissioning, operation, maintenance, modification, repair and dismantling.
- Hazards from manual handling.

Risk assessment

The purpose of risk assessment is to enable decisions to be made on the need for action and on the priority of action. For example, a hazard assessed as high risk will require immediate action and perhaps considerable expenditure whereas a low or negligible risk can be given a timescale for action and costs expended may be limited.

Risk assessment requires assessment of two factors:

1. Estimated likelihood.
2. Potential severity.

Estimated likelihood

This requires an assessment of the likelihood (probability) of the hazard resulting in a loss.

Consideration will need to be given to the following:

- Where is the hazard?
- How many people are affected?
- How knowledgeable are they?
- How many times does the hazard occur?
- What is the extent of possible exposure (time concentrations etc.)?

Potential Severity

This requires an assessment of the possible outcome of the hazard. This can be assessed by relating to accident statistics or common sense. In some cases the information can be obtained from manufacturers data or other published information. In selecting the appropriate category, it is important to be realistic. For example, it is unlikely that someone tripping over a cable in an office will be killed, the most probable result is bruising, or at worst, a fractured bone. If however the cable is trailing across the top of a very busy stairs then a fatality could be a more appropriate assessment.

Quantitative assessment

A method of subjectively estimating likelihood and probability can be useful when determining priorities in a risk assessment exercise – for example as regards health and safety effort. There are many versions of the technique; the following is based on the example from the UK Code of Safe Working Practices (MCA,1998):

	Slightly harmful 1	Harmful 2	Extremely harmful 3
Highly unlikely 1	1	2	3
Unlikely 2	2	4	6
Likely 3	3	6	9

Risk Assessment and Management

Risks are classified according to their estimated likelihood and potential severity of harm.

The likelihood of harm

3 Likely - or high (where it is certain or near certain that harm will occur).

2 Unlikely - or medium (where harm will occur frequently)

1 Highly unlikely - or low (where harm will seldom occur).

The severity of harm

3 Extremely harmful – or major (for example death or major injury)

2 Harmful – or medium (for example injuries where people may be off work for more than three days)

1 Slightly harmful – (for example, all other injuries including those where people are off work for periods of up to three days).

Risk assessment factor

In this model a risk assessment factor is found by multiplying the severity number by the likelihood number to arrive at the risk factor for each hazard. This produces a number on a scale of 1 to 9. These numbers provide an indication of priority and the extent of the risk, the higher the number the greater the priority and risk and therefore the more resources which may be needed to control the risk.

Risk factors can also be described in terms of categories and these form the basis for deciding whether improved controls are required and the timescale for action. The table below suggests a possible simple approach. This shows that the effort made to control risk should reflect the seriousness of that risk.

Risk factor	Risk category	Action and Timescale
1	Trivial	No action is required and no documentary records need be kept
2	Tolerable	No additional controls are required. Consideration may be given to a more cost effective solution or improvement that imposes no additional cost burden. Monitoring is required to ensure that the controls are maintained.
3 & 4	Moderate	Efforts should be made to reduce the risk, but the costs of prevention should be carefully measured and limited. Risk reduction measures should be implemented within a defined time period. Where the moderate risk is associated with extremely harmful consequences, further assessment may be necessary to establish more precisely the likelihood of harm as a basis for determining the need for improved control measures.
6	Substantial	Work should not be started until the risk has been reduced. Considerable resources may have to be allocated to reduce the risk. Where the risk involves work in progress, urgent action should be taken.
9	Intolerable	Work should not be started or continued until the risk has been reduced. If it is not possible to reduce the risk even with unlimited resources, work has to remain prohibited.

Risk Management and the ISM Code

The role of the ISM Code

Safety is involved with the management, engineering and operation of a system and is underpinned by human factors. To address these issues the International Safety Management (ISM) Code was adopted by the International Maritime Organisation (IMO) in 1994. The purpose of the Code is to provide an international standard for the safe management and operation of ships and for prevention of pollution. The Code is based on general principles and sets out objectives to be achieved, because it was recognised that shipping companies and shipowners vary widely and that ships are operated under a wide range of conditions. The Code comprises two main sections split into 16 subsections that cover aspects from safety and environmental protection policies through the responsibilities and authority of individual organisations to documentation and certification, verification and control.

The ISM Code addresses very important issues relating to human factors and is one of the most significant documents to be produced by IMO.

Risk management

The ISM Code does not directly mention the concepts of risk assessment and risk management, although they are included by implication. The Code requires risks to ships, people and the environment to be identified, assessed and have appropriate safeguards put in place.

The Code requires a formal risk assessment of the identified risks, together with related control measures, to be in place for each of the identified risks. Clear references to risk are to be found in the stated objectives of the Code:

1.2 Objectives

1.2.1 The objectives of the Code are to ensure 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.

1.2.2 Safety management objectives of the Company should, inter alia:

.1 provide for safe practices in ship operation and a safe working environment;

.2 assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards; and

.3 continuously improve safety-management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.

The ISM Code requires that companies establish safety objectives as described in Section 2 of the Code and, in addition, that they develop, implement and maintain a Safety Management System (SMS) which includes functional requirements as listed in Section 1.4 of the Code.

Reactive and proactive approaches to controlling losses

The ISM Code advocates both a reactive and a proactive approach to managing safety and controlling loss.

On the reactive side Section 9 is being possibly the most relevant:

9 Reports and analysis of non-conformities, accidents and hazardous occurrences

9.1 The safety management system should include procedures ensuring that non-conformities, accidents and hazardous situations are reported to the Company, investigated and analysed with the objective of improving safety and pollution prevention.

9.2 The Company should establish procedures for the implementation of corrective action, including measures intended to prevent recurrence.

Although it would be preferable to prevent accidents happening in the first place, it should also be realised that if an accident has occurred then it should be used as a learning opportunity to learn the lessons and make sure that remedial steps or corrective action is applied to prevent a recurrence.

Near-accidents or near-misses as well as hazardous occurrences should also be used as learning opportunities. Analysis of any incidents will aid understanding of why the accident happened, or nearly happened, and from that position of knowledge steps can be taken to prevent a similar incident happening again.

On the proactive side the following sections of the Code are relevant:

7. Development of plans for shipboard operation

The Company should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel.

8. Emergency preparedness

8.1 The Company should identify potential emergency shipboard situations, and establish procedures to respond to them.

8.2 The Company should establish programmes for drills and exercises to prepare for emergency actions.

8.3 The safety management system should provide for measures ensuring that the Company's organisation can respond at any time to hazards, accidents and emergency situations involving its ships.

In addition, sections 3 & 4 set out the responsibilities of the company and establishes the position of the Designated Person to oversee the successful running of the SMS. Sections 5 & 6 ensure that the master and crew on board are duly empowered, properly trained and familiarised with the operation of their SMS. Section 10 requires procedures to be established to ensure that maintenance, repairs and surveys are carried out on a regular basis, which would typically take the form of a planned or preventative maintenance system.

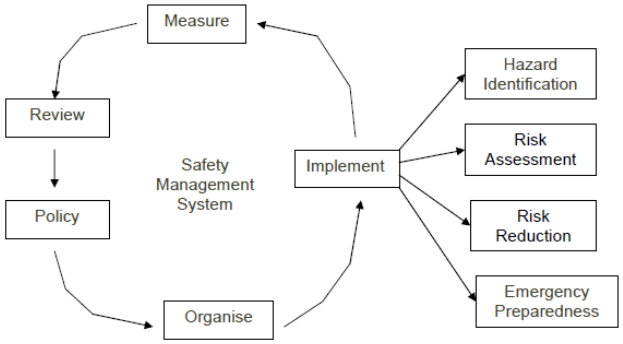
It can be appreciated that the proactive approach to managing safety figures strongly in the thinking behind the ISM Code. However, each Company is left to decide exactly how it is going to comply with these requirements in order to achieve the safety goal.

The safety goal set by the operator of the system or ship is to reduce identified potential hazards to tolerable or trivial risk levels by application of the safety management system. Risk management represents a particular method or approach to achieving this goal.

The ISM Code and the management cycle

Comparison of the Management Cycle model of risk management and the ISM Code shows that they are compatible in practice.

The Management Cycle



Each of the five components of the Safety Management System (SMS) can be identified with relevant sections of the ISM Code:

Policy formulation

Section 1.2 Objectives

Section 1.3 Application

Section 1.4 Functional requirements for the safety management system

Section 2 Safety and environmental protection policy

Organise resources and the communication of information

Section 3 Company responsibilities and authority

Section 4 Designated Person(s)

Section 5 Master's responsibility and authority

Section 6 Resources and personnel

Implement the agreed policies and actions

Section 7 Development of plans for shipboard operations

Section 8 Emergency preparedness

Section 9 Reports and analysis of non-conformities, accidents and hazardous occurrences

Section 10 Maintenance of the ship and equipment

Section 11 Documentation

It is within these areas of implementation that we can develop the other four elements of the risk management concept:

- Hazard identification.
- Risk assessment.
- Risk reduction.
- Emergency preparedness.

Measure that the required standards are being met

Section 9 Reports and analysis of non-conformities, accidents and hazardous occurrences

Section 10 Maintenance of the ship and equipment

Section 12 Company verification, review and evaluation

Review performance and make relevant refinements

Section 9 Reports and analysis of non-conformities, accidents and hazardous occurrences

Section 10 Maintenance of the ship and equipment

Section 12 Company verification, review and evaluation

Basic Rules of Risk Management

- Risk assessment and risk management are not excuses to stop thinking. It is crucial to the successful application of these concepts that levels of awareness, concentration and applied thought are increased.
- The processes identified and developed should be simple but meaningful. Remember to follow the 'KISS' principle:

  'Keep It Simple Sailor'
- Whilst certain key elements can be identified, there are actually no fixed rules about how risk assessments should be undertaken. The important point to remember is to keep thinking, consider the type of ship involved, the nature of the operations and the type and extent of the hazards and risks.
- A risk assessment should only include risks which could be reasonably identified as arising from the work activities of workers on the ship.
- Records of the outcome of risk assessments should be restricted to significant findings. Risks which are found to be trivial, and where no further precautions are required, need not be recorded.
- The ultimate responsibility for risk assessment will rest with the Company (as defined by the ISM Code) or otherwise the employer, which is usually going to be the shipowner or manager. In practice the operation may be undertaken by suitably trained and experienced staff acting on behalf of the Company.
- The assessment of risks must be 'suitable and sufficient'. The process should not be overcomplicated. This means that the amount of effort that is put into an assessment should depend on the level of risks identified and whether those risks are already controlled by satisfactory precautions or procedures to ensure that they are as low as reasonably practicable.
- Risk assessment should be seen as a continuous process. In practice the risks in the workplace should be assessed before work begins on any task for which no valid risk assessment exists. An assessment must be reviewed and updated as necessary, to ensure that it reflects any significant changes of equipment or procedure.

Summary

The risk based approach to managing safety is one method which can be used to comply with the requirements of the ISM Code. It is ideally suited to providing a compatible structure to the Safety Management System and will help move away from the trend which has developed in many systems of excessive amounts of detailed procedures and checklists.

Acknowledgements

The contents of this briefing were originally partly based on work by Dr Phil Anderson.

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