Best Management Practices For Implementing An Effective Safety Culture

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1. Introduction

Safety at sea has improved enormously over the last 100 years, and continues to do so. Rules and regulations, beginning with SOLAS have given the industry a compulsory framework to follow. Furthermore with advances in engineering and technology, unexpected mechanical or structural failure is rare, and the influence of the elements becomes less and less of a factor. However, in one five year period, 2869 commercial crew and passengers have lost their lives at sea[1].

Safety at sea has developed through many phases, from the reactive seeking of guilt and apportion of blame, to compulsory adherence to rules and regulations. It is now time to fully embrace a third phase: that of a "just-culture" and self-regulation.

A positive safety culture depends on two factors, the development and implementation of a proportionate and suitable safety management system that reports-on and examines its own failings, and a positive culture at all levels so that management and crew truly understand that safety is in their best interests.

The bedrock of these two factors is training: Training arms senior management with the skill and knowledge required to develop a practical safety management system, and gives the crew the perspective and attitude to *want* to follow it.

2. Scope & Purpose

The purpose of this document is to discuss and investigate the meaning of "an effective safety culture", the positive financial, moral and legal implications of implementing one, the potential threats, barriers and pitfalls precluding the successful adoption of an effective safety culture and, most importantly, offer guidance on how to overcome these obstacles.

It is intended to be a frank and open discussion, to seek to educate and inform the general reader (without overcomplicating the issue), as well as stimulate dialogue with the health and safety professional.

It is offered as a free and open-source document in order to generate interest and raise awareness of a crucial and significant issue, one of great consequence to the maritime industry due to the perilous nature of living and working at sea, in a heavily industrialised context. It satisfies our ambition to fulfil our moral duty of care to the seafarer, who provides an increasingly vital service to human society, under increasing economic pressure, with ever more demanding expectations of efficiency, productivity and compliance.

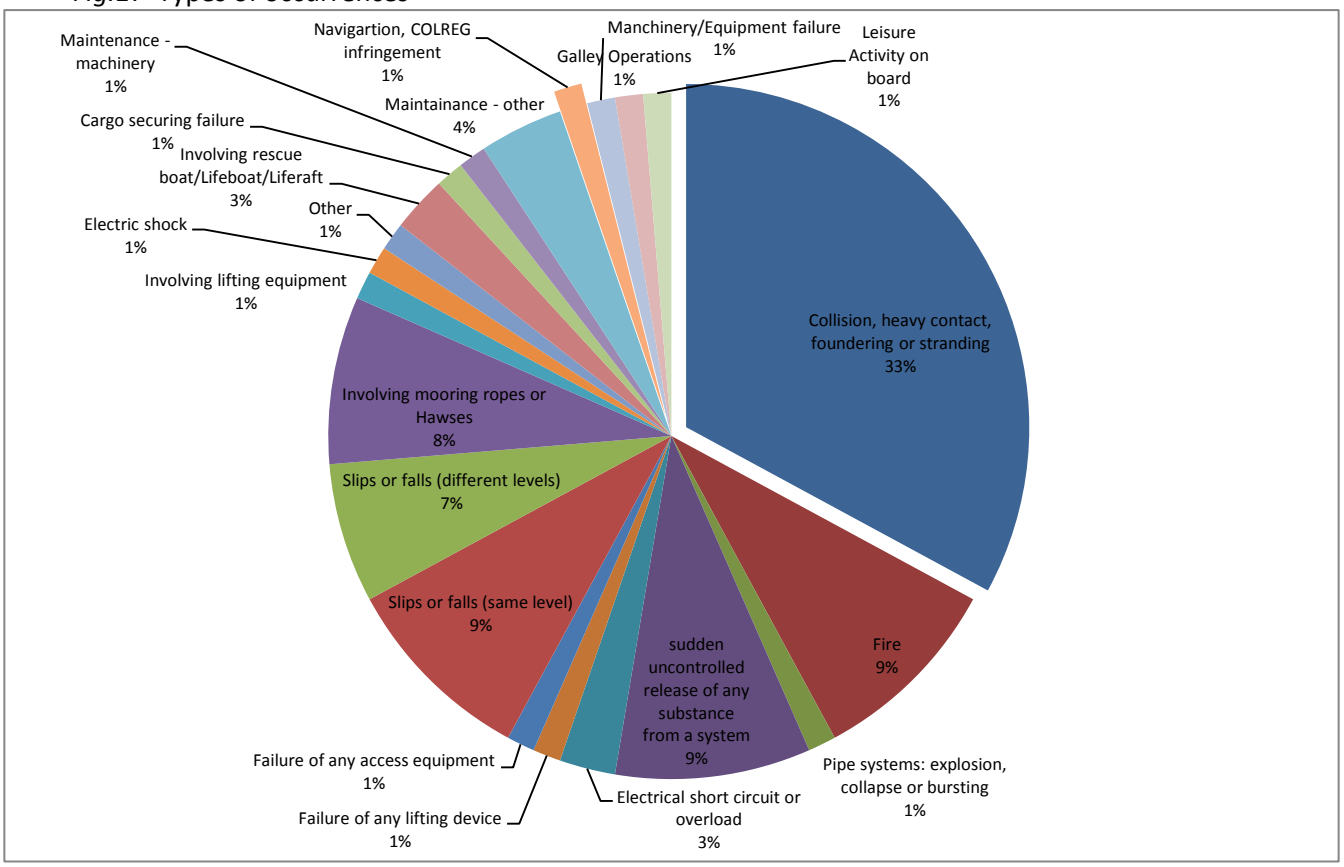
It forms part of a suite of educational, supportive and consultative services provided to the maritime industry.

[1] IMO, "Casualty Statistics And Investigations" *FSI 20/INF.17,* (2012)

Contents

3. Statistics

Fig.1: "Types of occurrences[2]"



In order to effectively mitigate the effects of incidents, accidents and dangerous occurrences we must first investigate the nature and cause of these occurrences. Above we can see a typical example for the types of occurrences from a Red Ensign Group Flag administration's annual safety report (over 1000 registered vessels).

At first glance it becomes obvious that the figures appear counter-intuitive. The figures are wildly over-representative in favour of serious, damaging or life threatening occurrences. To examine the most obvious example: how is it possible to have 33% of the incidents involving "Collision, foundering, heavy contact or stranding" but only 1% of incidents involving a ("consequence free") COLREG Infringement (See "Expanded" wedges in *fig.1*).

The short answer is, "***It isn't***".

The anticipated ratio of near misses and dangerous occurrences to "consequential" incidents, based on long term and exhaustive study across industry, is expected to be in the region of 15:1[3][4][5]

This tendency to under-report "near misses" is well documented, and is examined in detail in this document (See below, 7.1 "Reporting").

The negative impact of this tendency, the underlying reasons for it, and solutions to mitigate this trend is one of the central themes of this document.

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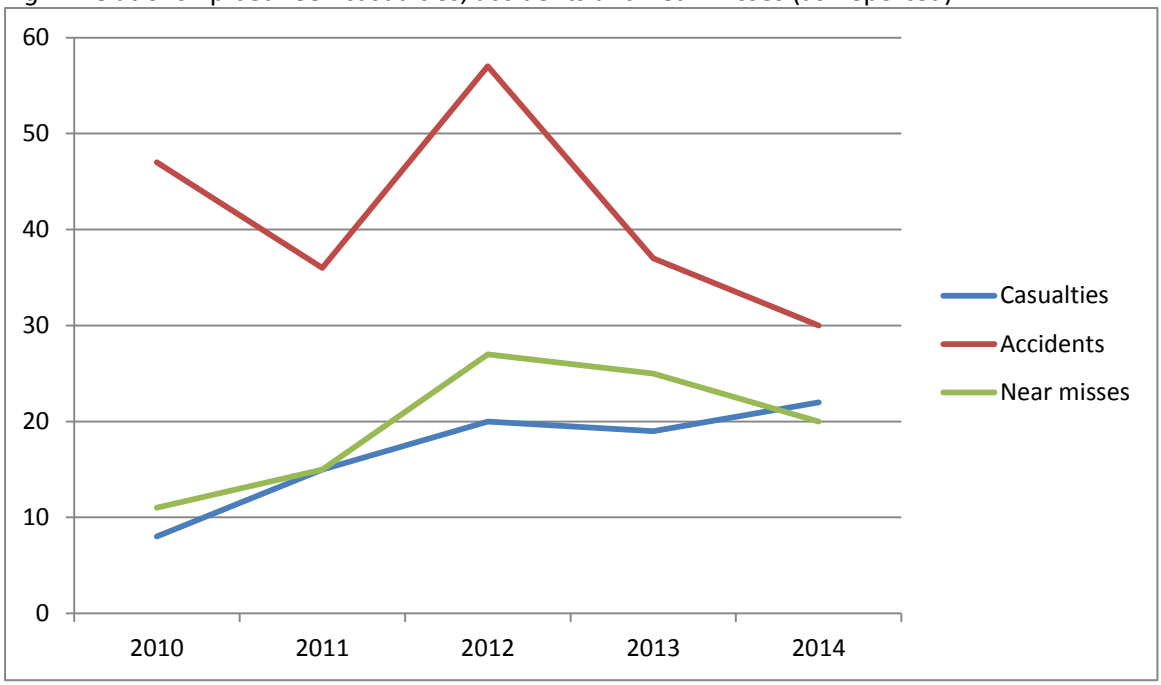
[2] [A Red Ensign/"White" Flag Ship Registry], *Summary of Casualties, Accidents and Incidents on […] Registered Vessels*, (2014)

[3] ConcocoPhillips Marine (2003)

[4] Bird, Frank E., (1969)

[5] Heinrich, H.W., Industrial Accident Prevention, (1931)

Fig.2: Relationship between casualties, accidents and near misses (as Reported)[6]



The consequences of under-reporting are made clear in the above chart. While the frequency of accidents outnumbers the occurrence of casualties (as would be expected according to empirical evidence[789]), the number of near misses reported is proportionately lower than would be expected.

Though this sample is too small to be statistically significant[10], it is difficult not to notice (in an anecdotal sense) that the decline in the number of near misses reported is mirrored by a commensurate increase in the number of casualties.

With this problem in mind, and to further explore the causal relationship between dangerous occurrences (or near misses) and damaging or deadly incidents and accidents, we must now investigate the pathology of an accident – namely "how and why do they happen".

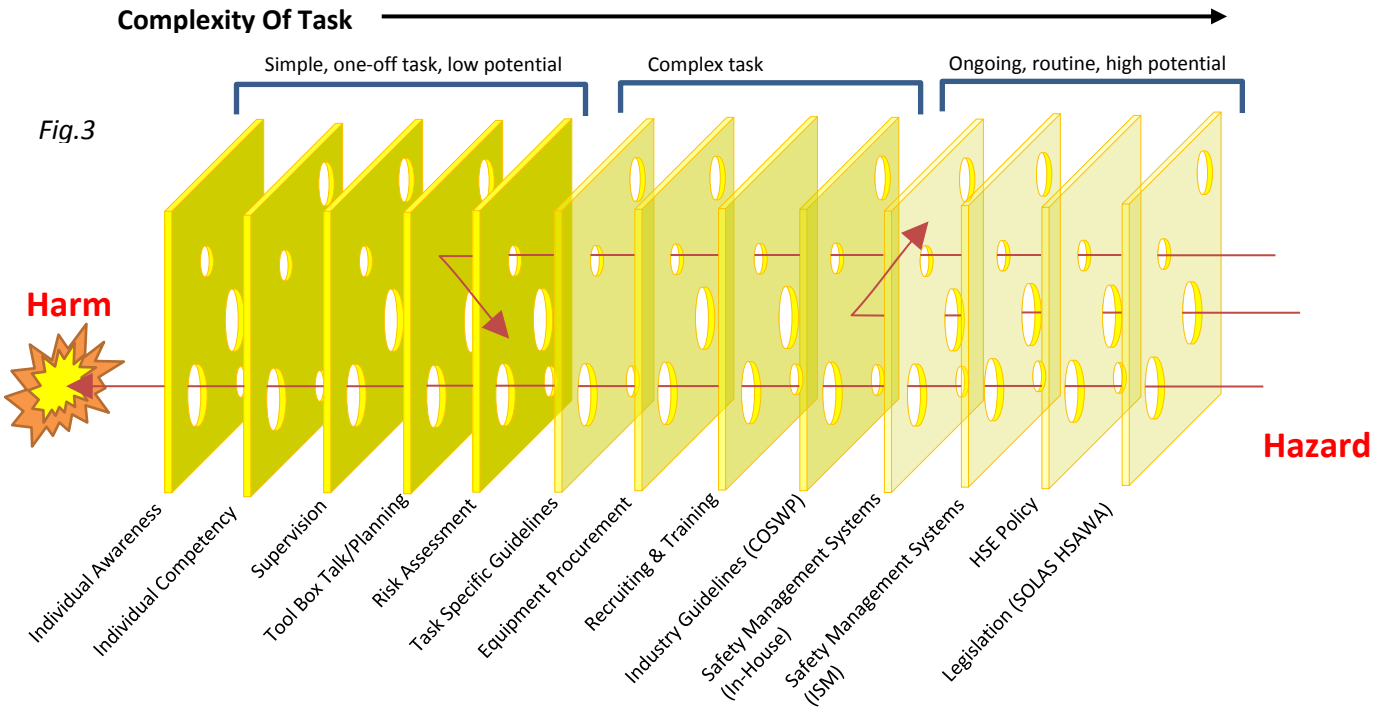
[6] [A Red Ensign/"White" Flag Ship Registry], *Summary of Casualties, Accidents and Incidents on […] Registered Vessels*, (2014)
[7] ConcocoPhillips Marine (2003)
[8] Bird, Frank E., (1969)
[9] Heinrich, H.W., Industrial Accident Prevention, (1931)
[10] Cumming, Geoff (2012). Understanding The New Statistics: Effect Sizes, Confidence Intervals, and Meta-Analysis. New York, USA: Routledge. pp. 27–28.

4. Accident Causation

Accidents do not just "happen"[11], and to think logically about how they happen is a useful preventative tool, if done pre-emptively as part of a risk assessment, or to prevent re-occurrence if done as part of an accident investigation.

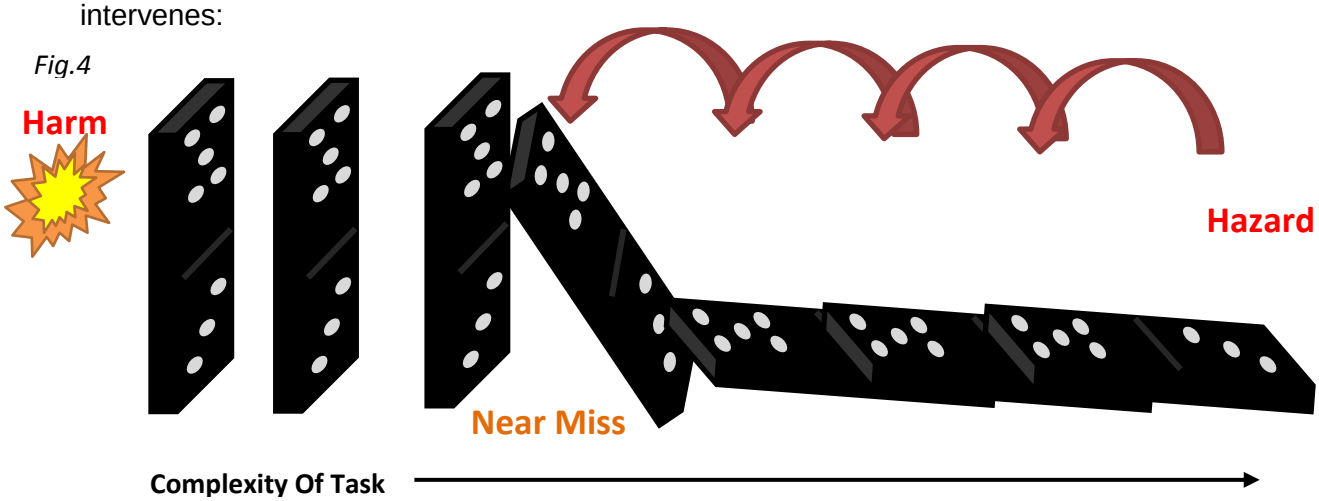
Many Health and Safety studies cite the "Swiss Cheese" model[12], with the layers of cheese representing preventative and control measures. Only when the "holes" line up, do accidents occur. To expand on this, it is useful to think about the relative complexity of a task and significance of the consequences of failure. A relatively simple task, involving few people and with minor potential risk will be covered by a few (hopefully common sense) risk controls resulting from a simple risk assessment and/or pre task planning (see 6.3 "Planning and Implementation"). A more complex task, involving a larger or more technically complex system, or an ongoing routine task implemented across a fleet or industry will be governed by increasingly more layers of safeguards:

Fig.3



It may also be useful to think of accident causation as a set of dominoes falling, representing a chain of events that, once started will result in harm – unless a control measure, or luck, intervenes:

Fig.4



[11] ICS, *Implementing An Effective Safety Culture*, (2013)

[12] Reason, University of Manchester

This, “Fortuitous break in the chain of events[13]” would lead to a “hazardous occurrence” or “near miss” rather than causing harm. (See 7.1 “Reporting”). In a safety management system where only “harm” is recorded and measured, and near misses/hazardous occurrences are overlooked or under-reported for any reason, (see 7.1.1 “Barriers to Reporting”) the hazard goes unnoticed, and the failings (the fallen dominoes) remain unidentified and unrectified until it does, eventually, result in harm.

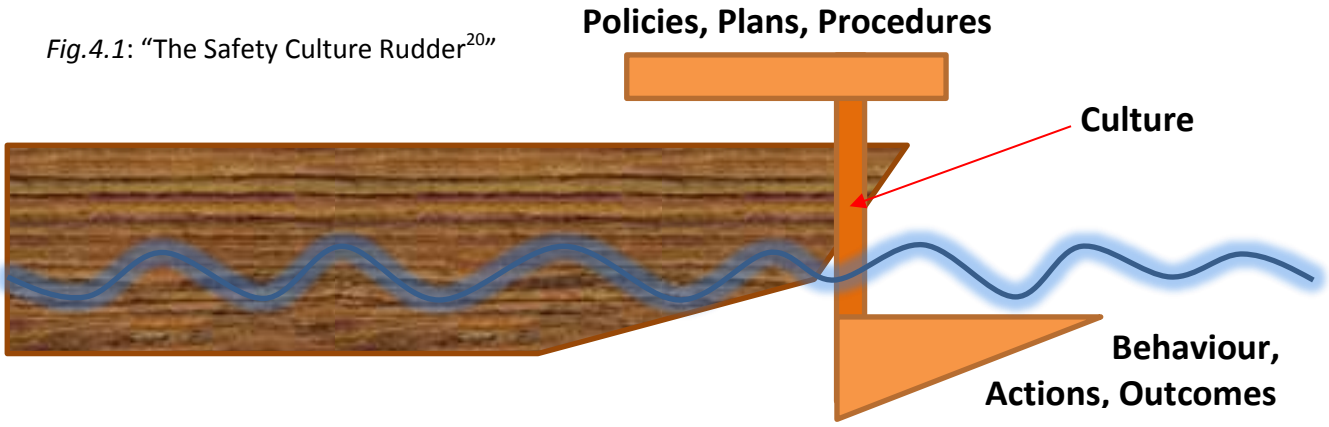
5. Health And Safety Culture and the “Just Culture Approach”

Before moving onto discuss differing types of safety culture, their utility and their impact on safety performance, it is useful to discuss what “Safety Culture” is and where it fits within the management of Health and Safety.
The UK’s Health and Safety Executive’s Advisory Committee on the Safety of Nuclear Installations defines safety culture as[14][15][16]:

> *The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation’s health and safety management.*
> *Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures.*
>
> **HSE, ACSNI, 1993**

Other definitions follow a similar pattern and tone[17][18][19]
In simple terms, “safety culture” forms the link between policies, plans and procedures (driven by acts, regulations and guidelines) and actions/events. An effective safety culture will be a strong link between the “upstream” policies and the “downstream” results, and transmit their intent and direction accordingly. An ineffective safety culture is the break in the chain, whereby no amount of input from the top will ever influence what happens at the bottom. To use a suitably nautical analogy, this relationship can be seen as a tiller, stock and rudder on a ship.

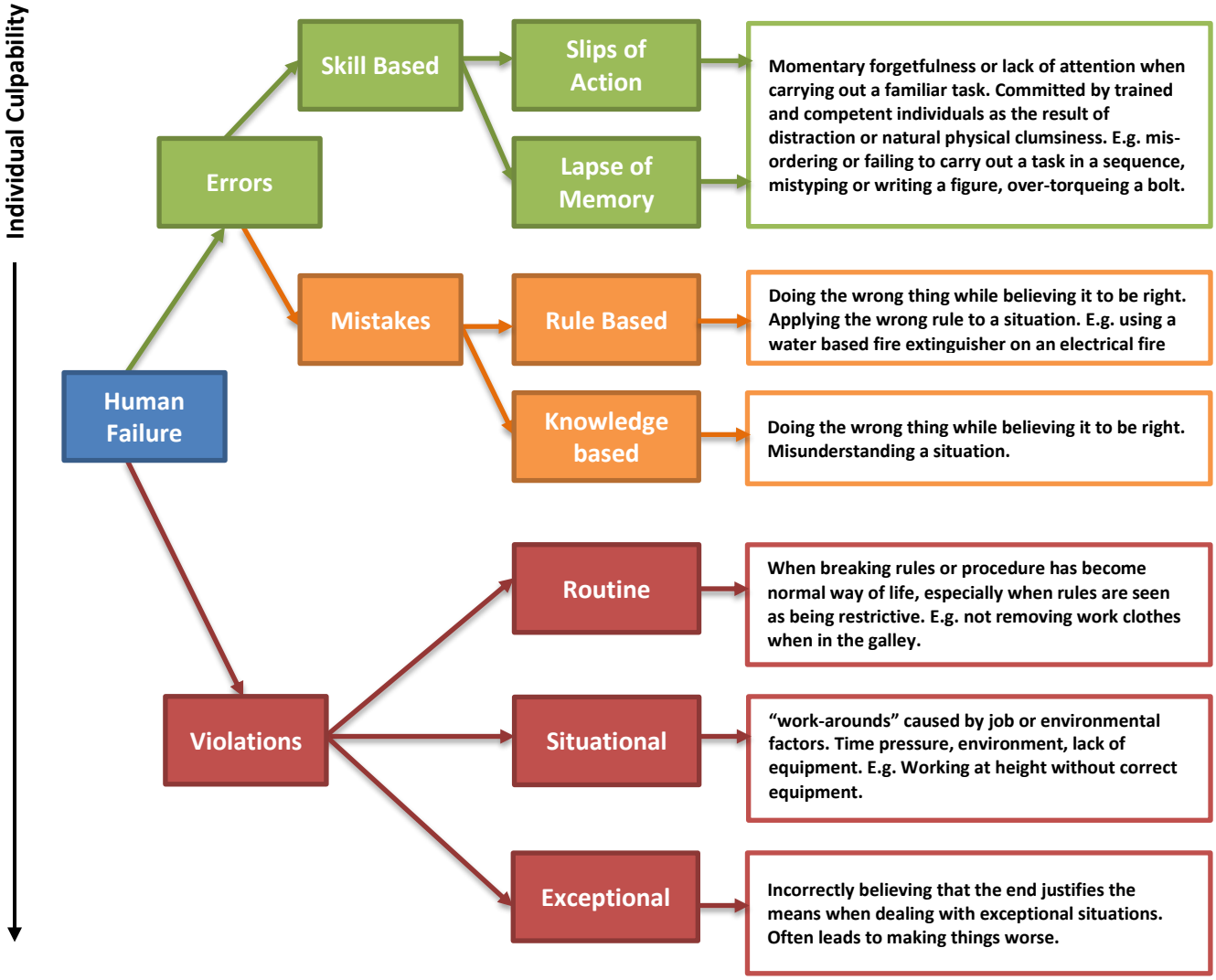
Fig.4.1: “The Safety Culture Rudder[20]”



[13] IMO, “Guidance on Near-miss Reporting”, (2008).
[14] HSE, Advisory Committee on the Safety of Nuclear Installations, *Study Group on Human Fastors, Third report: Organising for Safety*, (1993).
[15] Lee, T., *Work and Stress, Vol. 12, No.3*, “Assessment of safety culture at a nuclear reprocessing plant”, pp 217-237. (1998).
[16] Gadd & Collins, HSE, Human Factors Group, *Safety Culture: A Review of the Literature HSL/2002/25*. (2002)
[17] Guldenmund, FW. *Safety Science, Vol.34, No1-3*, “The nature of safety culture: A review of theory and research”, pp 215-257. (2000).
[18] Hale, AR. *Safety Science. vol.34, no1-3*, “Culture’s Confusions”, p 1-14. (2000)
[19] Lee and Harrison, *Safety Science, 30,* “Assessing Safety Culture In Nuclear Power Stations”, pp 61-97. (2000)
[20] Author’s interpretation

The ISC Brochure, "Implementing An Effective Safety Culture[21]" helpfully outlines the progression of health and safety culture through three stages. However, it is useful to further investigate these stages in order to understand their value to fostering an effective safety culture. In order to do this, it is useful to first understand some of the reasons why people make mistakes[22], in order to, in-turn, understand which of the three approaches would be most useful in averting them:

Fig.5: "Human Failure"



As the human failures decrease from culpable bad practice ("Exceptional/Situational/Routine Violations") to natural human error, they can be addressed by varying different levels of health and safety culture.

5.1. Culture of Punishment: "Blame Culture"

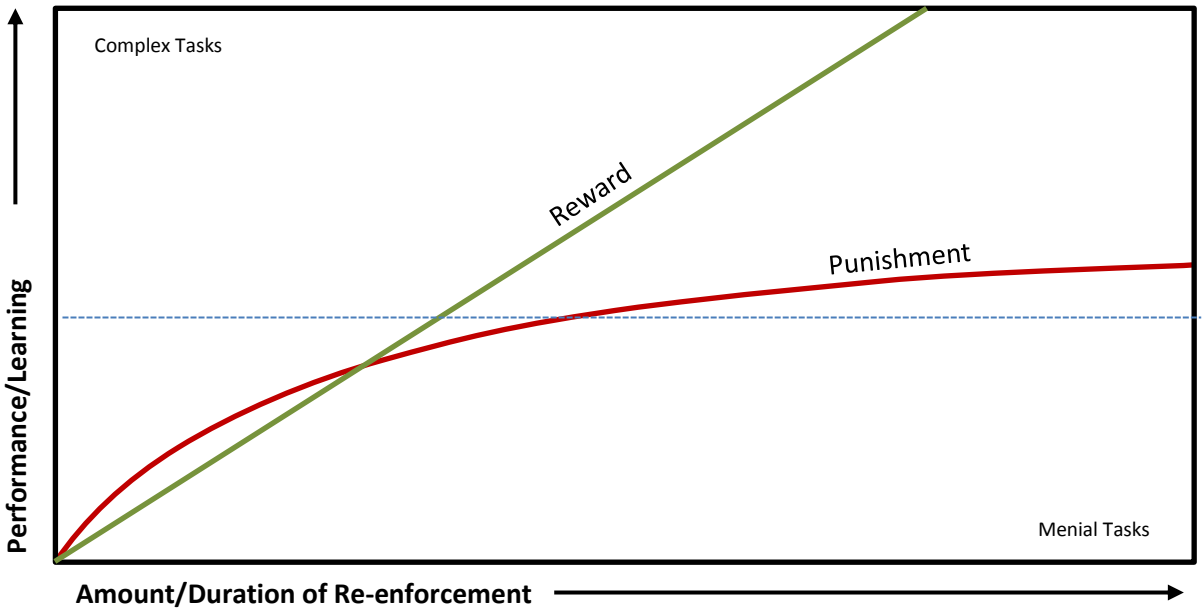
The earliest stage of health and safety management was to seek to apportion blame. This blame would often fall on the last individual in the causal chain – the man nearest the accident at the time[23], the immediate supervisor (or even the injured party himself). When seeking to change behaviour, this approach was useful, but only op to a point. When serving to deter "violations" (*Fig. 5* "Human Failure") the threat of punishment will influence behaviour and provoke a sense of individual responsibility for one's actions. However, this will only serve to increase individual awareness of negative consequences and "avert"

[21] ICS, *Implementing An Effective Safety Culture*, (2013)
[22] HSE, "HSG 48", (2015)
[23] ICS, *Implementing An Effective Safety Culture*, (2013)

accidents at the last safe moment (the last slice of cheese (*Fig.3*) or the final Domino in the chain (*Fig.4*)). As it is purely retroactive, It will not assist in identifying or mitigating root causes, especially in a climate where health and safety performance is measured negatively (total number of accidents) rather than positively (compliance with safe working practices, or the number of near misses identified and rectified).

Medical and behavioural research has shown that, while negative reinforcement (punishment, or the threat of) can improve the efficiency of learned, manual, repetitive tasks, it will not lead to an enhancement in learning or foster improvement[24].

Fig.6: "Punishment Vs Reward"



To seek to change behaviour by positive re-enforcement also gives more opportunity to adjust behaviour quickly, as positive feedback can be performed daily for a job well done, whereas negative feedback will (hopefully) occur less frequently –only when something has gone wrong

To rely only on punishment as a lever to modify behaviour will only work to a certain degree, and only when the crew *know* they are doing something wrong ("Violations"). In the same way that a dogmatic adherence to "Goal Zero" (See 6.1 Policy & Goal Setting) merely serves to camouflage the true cause of a problem by only measuring the negative outcome, a culture of punishment will encourage covering-up of mistakes, under-reporting and a lack of openness. The focus becomes avoiding blame or loss of face, rather than solving the problem. This culture can be divisive and adversarial, creating and "Us vs Them" attitude between crew and management, or even within the crew itself.

[24] Neurosci, "Differential Effect of Reward and Punishment on Procedural Learning", (2009)

5.2. Culture of Compliance

The second stage in attempting to improve safety performance by modifying behaviour was the development and instigation of rules, codes and regulations. This "regulation of safety by prescription[25]" made some progress in addressing the root causes of problems by attempting to address problems before they caused harm, and increasing knowledge and guidance by giving the seafarer and management a set of rules to follow. Complete knowledge of, and adherence to, these rules would serve to reduce "rule-based" and "knowledge-based" "mistakes" (*Fig.5* "Human Failure").

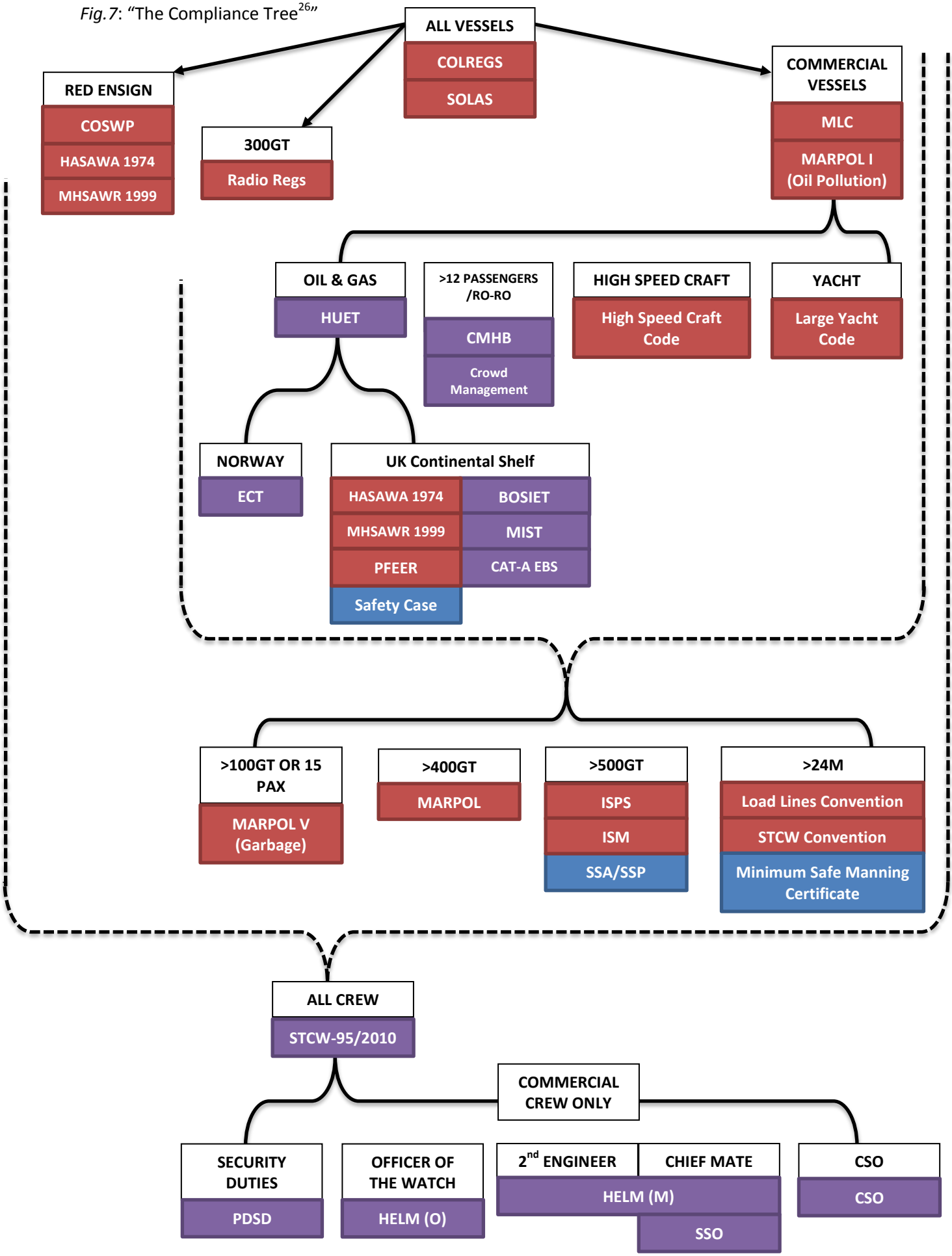
The following Table and chart (*Fig.7* "The Compliance Tree") goes some way to outlining the complexity and burden of complying with regulations, and the extent to which they have multiplied over time. While not an exhaustive list, it demonstrates the amount of agencies, bodies and governments involved in the regulation of the maritime industry, and the (often complex) issue of applicability. It must also be noted that some regulations, conventions and guidelines are not strictly compatible with each other – careful judgement must be exercised in order to make the right decision when faced with contradictory regulations. (e.g. Safety vs security when comparing SOLAS with ISPS Code & BMP4)

Table 1: Sources of Compliance Documentation			
Body		**Acronym**	**Full Title**
IMO	IMO	SOLAS	Safety Of Life At Sea 1974
		COLREGS	International Regulations For Preventing Collisions At Sea
		Radio Regs	Marine Radio Regulations
		MLC	Maritime Labour Convention
		MARPOL	International Convention on the Prevention of Pollution from Ships
		MARPOL I	Annex I: Oil Pollution
		MARPOL V	Annex V: Garbage
		High Speed Craft Code	
		Large yacht Code	
		ISPS	International Ship & Port Facility Security Code
		ISM	International Safety Management Code
		Load Lines Convention	
		STCW Convention	
mca	MCA	COSWP	Code of safe Working Practices
	UK Govt	HASAWA	Health and Safety At Work Act 1974
		PFEER	Prevention of Fire & Explosion, and Emergency Response
	EU	MHSAWR	Management of Health And safety At Work regulations 1999
OPITO	OPITO	HUET	Helicopter Underwater Escape Training
		BOSIET	Basic Offshore Induction & Emergency Training
		MIST	Minimum Industry Safety training
		CAT-A EBS	Category "A" Emergency Breathing System
	Norway	ECT	Norwegian Escape Chute Training
IMO	IMO	CMHB	Crisis Management & Human Behaviour
		Crowd Management	
		STCW 95/2010	Convention On Standards of Training, Certification and Watchkeeping
		PDSD	STCW - Proficiency in Designated Security Duties
		HELM (O)	Human Element, Leadership & Management (Operational)
		HELM (M)	Human Element, Leadership & Management (Managerial)
		SSO	Ship Security Officer
		CSO	Company Security officer
		SSA/SSP	Ship Security Assessment/Plan
		Safe Manning Certificate	
HSE	UK HSE	Safety case	

Colour	Meaning
	Regulation
	Mandatory Training
	Mandatory Documentation

[25] ICS, *Implementing An Effective Safety Culture*, (2013)

Fig.7: "The Compliance Tree[26]"



[26] Author's interpretation

However, as can be proven by a number of large scale incidents where procedures proved to be insufficient, or were not followed that this, in-itself, is not enough. It does not fully take into account what has become known as "the Human Element[27]" i.e., why a trained, qualified and experienced person, who is aware of all the rules and regulations will – with no malicious intent – still cause or allow an accident.

If people are only good because they fear punishment, or hope for reward, then we are a sorry lot indeed.

Albert Einstein

While a "culture of compliance" does imply a sense of collective responsibility, in that rules are agreed upon and produced as and industry, this imposition of dictates from external agencies, backed up by the threat of fines or imprisonment, can be seen as just as negative and adversarial as the "Culture of Punishment" discussed previously. It may be seen as a burden, irrelevant and inconvenient, as an alien imposition from the outside – especially when the "new" methods of work or management systems are deemed to be time consuming, expensive or in conflict with previously accepted practice.

This unthinking compliance with externally imposed rules and regulations, under the threat of punishment, does not engender an effective safety culture until management and crew understand *WHY* the rules say what they say, *WHY* it is in their own best interests to follow them and (in the third and final stage of developing an effective safety culture), *WHY* it is in their best interests to seek to continually improve them and their compliance with them.

5.3. Culture of Self-Regulation

The development and adoption of the ISM code in 1998 represented a "step-change[28]" in health and safety management for the maritime industry, in that it espoused the in-house development of fully fledged company and ship specific safety management systems (see 6.0 Safety Management systems) and the continual improvement of such systems based around a set of general guidelines, principles and objectives. It also "recognis[ed] that no two shipping companies or ship-owners are the same, and that ships operate under a wide range of different conditions[29]". While being enforced via a mandatory regime[30], the development and implementation of the code was left up to individual shipping companies – fostering a sense of ownership and commonality of purpose in achieving broadly defined objectives[31].

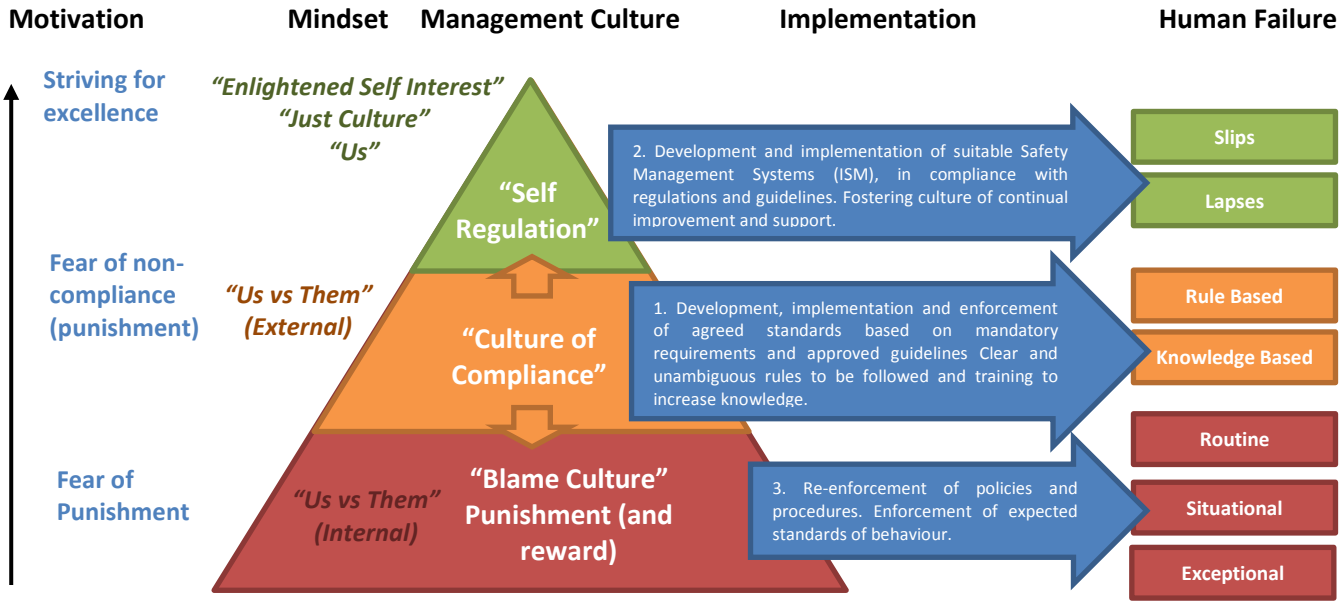
If I have seen further than others, it is by standing on the shoulders of giants

Isaac Newton

This approach by encouraging shared ownership and self-imposed objectives allows shipping companies to mitigate the negative factors and shortcomings of the two previous models. However, it is NOT a replacement for the other two models (both of which serve a useful purpose) but sits atop them as the next positive step in achieving results – it cannot function without the intelligent application of the other two.

[27] MCA, *The Human Element*, (2010)
[28] www.stepchangeinsafety.net to us Oil & Gas parlance
[29] ISM Code, Preamble, 4
[30] SOLAS, Ch IX
[31] ISM Code, 1.2

Fig.8: "Not Mazlow's Hierarchy of Safety[32]"



It is necessary for all of these approaches to co-exist in order to function as a working system[33]. We must follow the principles of self-regulation, but this must be backed up by standardised guidelines to follow (compliance), and people taking responsibility for their own actions (whether good or bad), backed up with reward and punishment as necessary.

Fig.9: IOGP "Safety Culture Ladder"

Level 5: Generative
- Managers know what's happening – the workforce tells them
- Bad news is sought out so failures can be learned from
- People are constantly aware of what could go wrong
- Safety is seen as a profit centre

Level 4: Proactive
- Resources are allocated to anticipate and prevent incidents
- Management is open to bad news, but still focused on statistics
- The workforce is trusted and feels involved in safety

Level 3: Calculative
- There are lots of audits and lots of data to describe things
- The new Safety Management System is assumed to be enough
- People are surprised when incidents still happen
- Bad news is tolerated

Level 2: Reactive
- Safety is taken seriously every time there is an accident
- Managers try to force compliance with rules and procedures
- Many discussions are held to re-classify incidents
- Bad news is kept hidden

Level 1: Pathological
- We leave it to the lawyers or regulators to decide what's OK
- There are bound to be accidents – this is a dangerous business
- If someone is stupid enough to have an accident, sack them
- Bad news is unwelcome – kill the messenger

The Progression of health and safety culture can also be seen as a ladder, with each rung being a step towards the goal of a mature, "just" culture of effective self-regulation. The international association of Oil and Gas producers (IOGP) uses a 5 level model[34] which has since been adopted by numerous large oil companies[35].

One disadvantage with this as a model, however, is that only organisations who are open an honest with themselves will be able to see where they fit on this ladder – those at the bottom will not be able to tell they are at the bottom, impartial external advice and training may be needed.

[32] Author's interpretation
[33] ICS, *Implementing An Effective Safety Culture*, (2013)
[34] IOGP, "Human Factors", (2015)
[35] MCA, (2010)

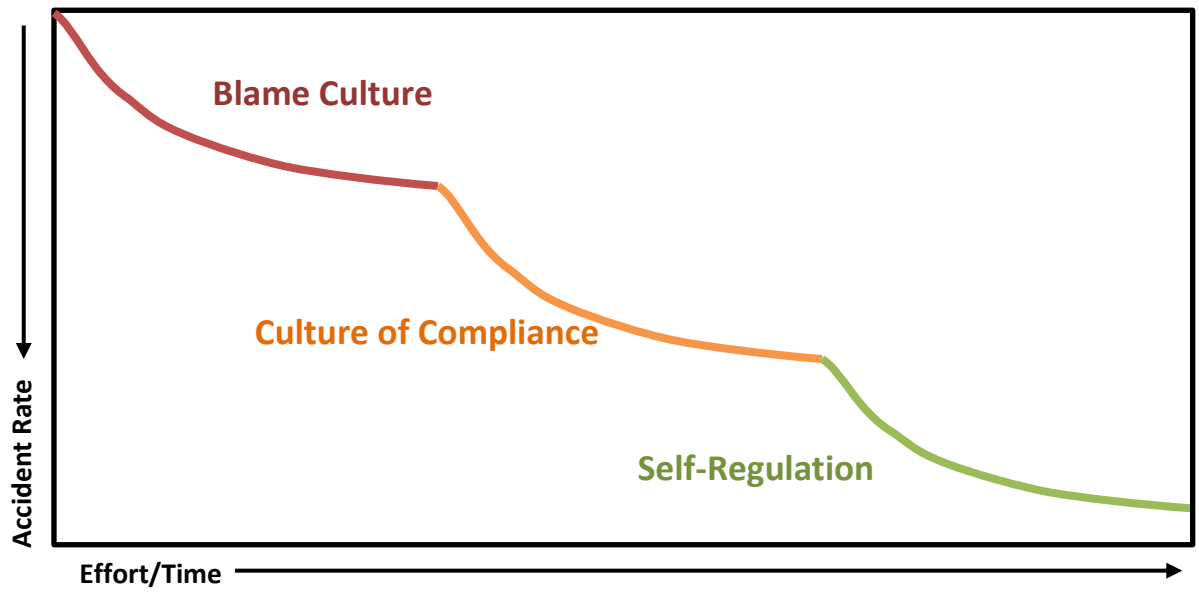
5.4. The "Just Culture" Approach

This process of progressing away from a "blame only culture" to a culture of progressive self-regulation has been described as the "Just Culture[36]" approach (initially implemented by the Airline and Healthcare industries). This model is characterised by an atmosphere of trust where "people are encouraged to provide essential safety related information without fear of punishment[3738]". It is an approach, or mind-set held within the organisation which is accommodating of the making (and reporting of) mistakes in the interests of learning and improving. It is "fair" rather than "blameless"; unacceptable behaviour, gross negligence and illegal or malicious acts are still punishable. The approach will balance the aspiration to improve safety by learning, with the retention of a sense of individual responsibility and accountability.

The most effective mechanism by which to achieve (and measure) this has to be the reporting of near misses (and commendations for good practice) via behaviour based safety reporting system. (see 7.1.3 Behaviour based reporting systems). This can only be possible when senior management understands the definition of a near-miss[39] and best practice in management of the reporting and intellectual processing of near misses[40]. This must be backed up by the employee/crewmember having received assurances that such reporting will not result in punitive measures, qualified and outlined by a clearly defined policy. They should also receive training in the theory, practice and purpose of making such reports. This policy shall not, however, guarantee immunity from punishment for unacceptable behaviour or illegal acts[41].

This can be developed further, by creating an attitude and atmosphere whereby the reporting of near misses will not only *not* engender any formal punitive measures, but also *not* informally jeopardise the reputation, standing or career of those making the report. This is easy to say, but often difficult to achieve – however it is more likely to be successful when crew/employees and managers at all levels have received suitably informed and progressive health and safety training from industry specialists and bodies committed to the development and promulgation of the "just Culture" (see 8.2 Training).

Fig. 10: The Law Of Diminishing Returns[42]



[36] Dekker S. *Just Culture: Balancing Safety And Accountability*, (Ashgate, 2012)
[37] ICS, *Implementing An Effective Safety Culture*, (2013)
[38] IMO, *Guidance on Near Miss Reporting*, (2008). 1.1.
[39] IMO, (2008). 1.2
[40] Erdogan, *Best Practices in Near Miss Reporting*, (2011)
[41] IMO, (2008). 1.3-4.
[42] Norder, *Goal Setting For Safety*, (2011)

The consistent application of the same "method" of health and safety management can only improve performance a certain amount before its inherent weaknesses and shortcomings are exposed and it begins to become ineffective.

5.5. "Enlightened Self-Interest": Commitment From The Top

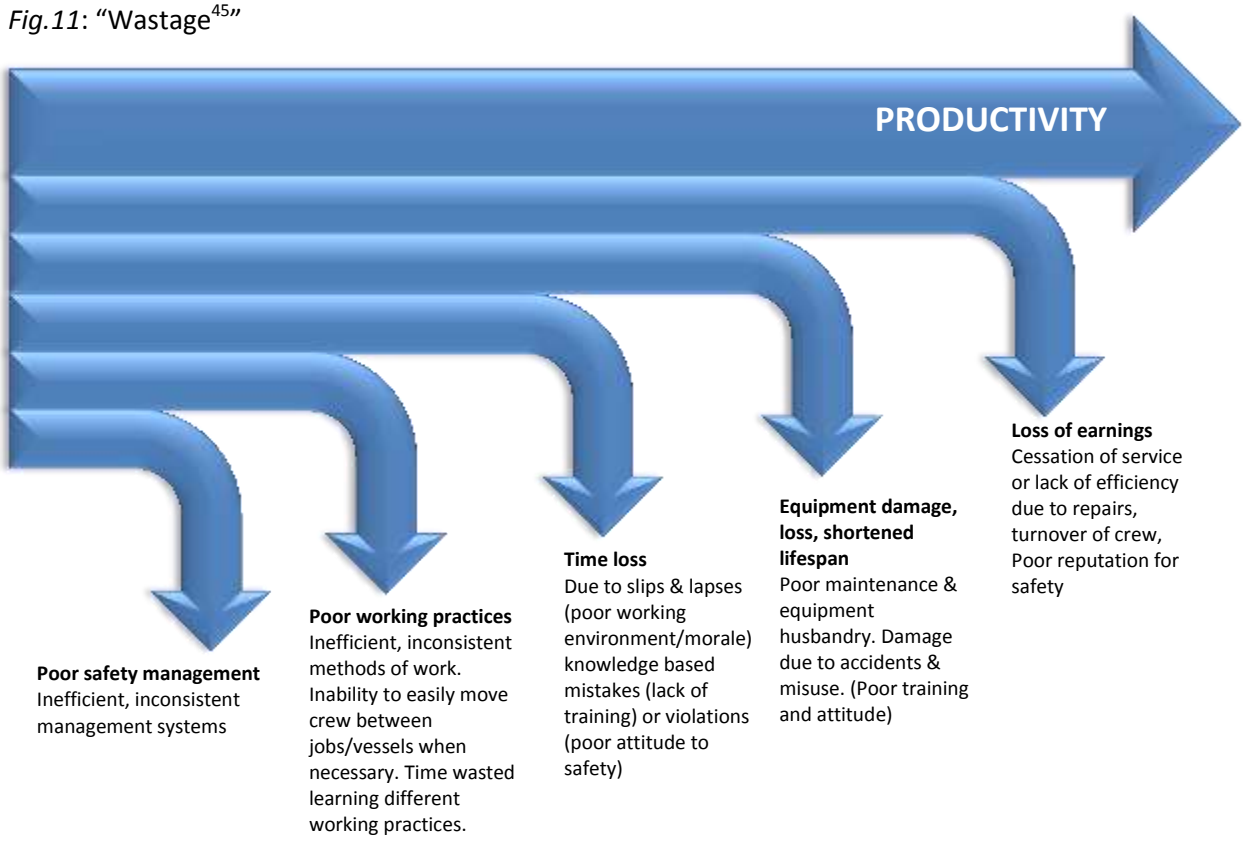
It is vital for everybody within the organisation, both at sea and in back-office supporting roles, to have an understanding of the concept of safety as a culture[43]. Again, this must come down to training (and the right kind of training) that will inculcate the necessary ethos and mind-set into the crew and management. In short, it includes the values and practices that are shared within the company, at all levels, in order to ensure that risks are always minimised as far as reasonable practicable[44] and that everybody truly believes and understands the underlying purpose of established procedures.

To develop this further, it must be demonstrated to senior management (through independent research, training or discussion and argument) that Safety is not in conflict with productivity and efficiency, but forms an integral part of it. It provides a secure foundation to sustainable and stable financial performance by introducing cost-savings and helping to inoculate the company against wastage, routine loss, inefficiency and delay, and against one-off, potentially crippling costs.

> *If you think safety is expensive, try having an accident!*
>
> **Anon**

Health and safety related wastage is an unmeasured, invisible loss incurred continuously due to poor health and safety management.

Fig.11: "Wastage[45]"

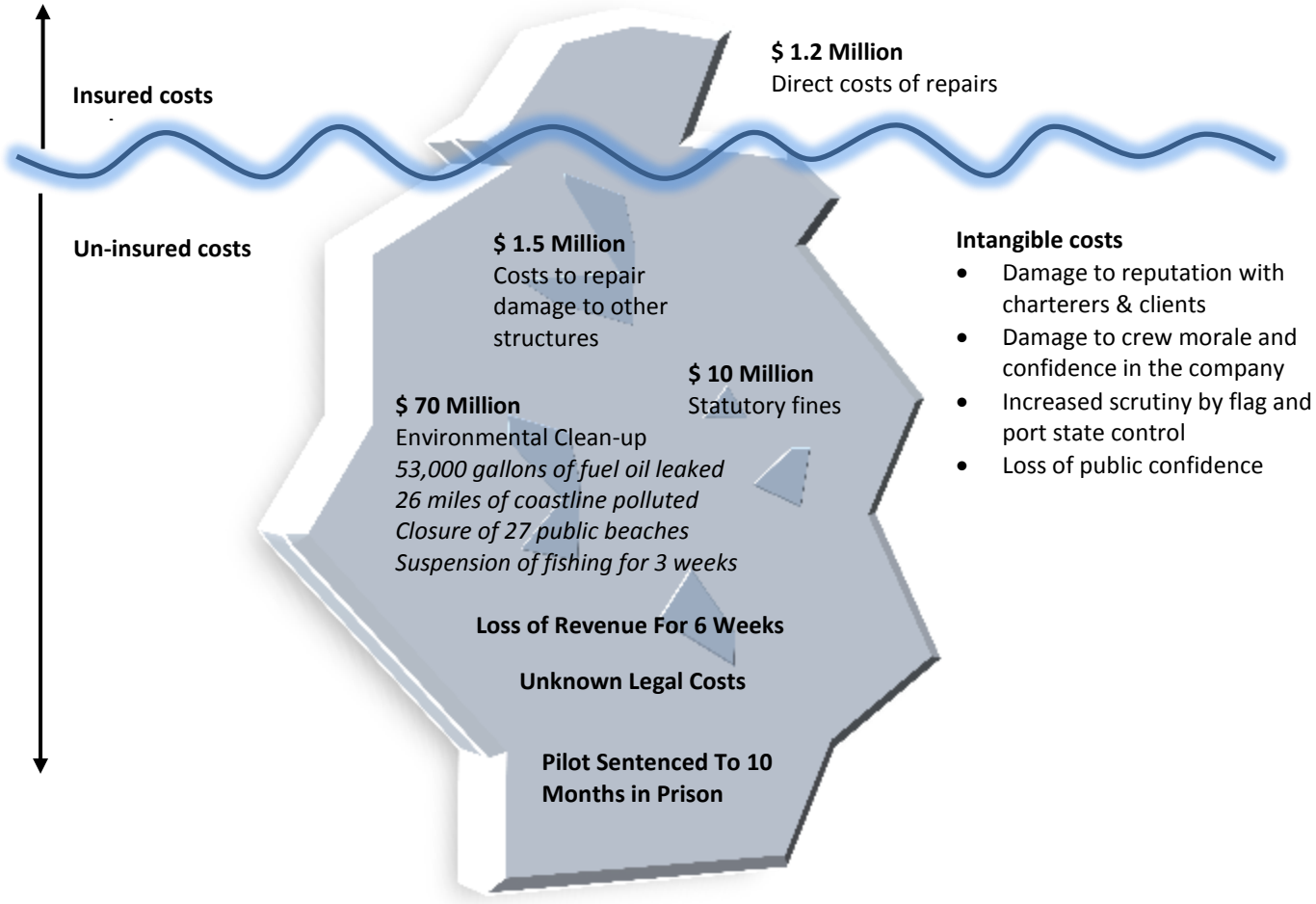


[43] ICS, *Implementing An Effective Safety Culture*, (2013)
[44] HSE, "ALARP At A Glance", (2015)
[45] Author's interpretation

Picture 1: MV Cosco Busan: (Woods Hole Oceanographic Institution)

To consider large scale accidents and significant one-time losses we can see that the potential unforeseen circumstances are even worse. It is imperative that management understands the true costs of accidents in human, legal, environmental and financial terms.
In order to examine the financial costs, we will use the MV Cosco Busan as a case study[46]. In doing so, we can see that (relatively) minor initial and direct impact of an accident can rapidly be overshadowed by spiralling associated costs.

Fig.12: "One-off costs: The Tip of The Iceberg"



The one off costs of an accident can be considerable, even terminal for a company and their operations. Commitment from senior management (armed with knowledge and training) is vital in order to foster a culture of "enlightened self-interest" in seeking to most effectively avoid financial loss, while also satisfying their moral and legal responsibilities.

[46] MCA, (2010)

5.6. Enlightened Self-Interest": The Crew's Perspective

The case for management's commitment to health and safety is easy to make – however, this management-centric view is only part of the overall issue, and fails to address in sufficient detail the commitment (or lack thereof) of the crew/employees and what can be done about it. A good management system will be a positive start, but the behaviour of the crew/employees must also be addressed by the changing of attitudes as well as procedures – this requires careful management, support, training and patience.

The crew's/employees relationship with health and safety is more problematic than that of senior management. Post-accident reporting from many serious incidents suggests that most of the personnel involved have been adequately trained, competent, and with sufficient (or high levels of) experience, but that one of the causal factors of the accident has been a failure to follow established procedures[47].

To develop this statement further; the question must be asked: "Why?"

The workforce/crew suffered more than senior management under the "Blame Culture" and Culture of Compliance" than management (or at levels 1 and 2 of the IOGP's safety culture ladder) and continue to suffer under companies and organisations that still operate at those levels. Therefore, the attitude towards "Health and Safety" and "Compliance" as concepts is tarnished.

Health and Safety is seen as a threat: A threat to accepted and long held working practices ("we always used to do it like this"); A threat to productivity and professional fulfilment ("we used to be allowed to do this much faster"); A threat to convenience and efficiency ("all these new rules have made this too complicated"); And a threat to employment, as dangerous tasks are increasingly mechanised. It can also be seen as intrusive, bureaucratic and over-prescriptive – engendering resistance from seafarers[48].

This negative attitude poses a threat to the link between management policy and procedures, and what is actually occurring on-board – as the crew seek, erroneously, and for a variety of reasons, to resist health and safety policies in favour of other ways of working. This barrier can only be broken by convincing the seafarer that Health and safety is in their best interests: that it safeguards them from injury, loss and exploitation; that it safeguards jobs by increasing productivity and stopping losses; and that it can be achieved in an unobtrusive and co-operative manner – whereby senior management involve the workforce in the development, testing, monitoring and review of safety management systems, which are user-friendly and time-efficient enough to be practicable to implement.

Therefore, a good safety management system, adhering to the principles of self-regulation, the "just-culture" and the "generative" level of safety culture, is essential. Training (both in technical aspects and in more generalised health and safety culture and awareness) is also a sound investment at all levels: it arms senior management with the skill and knowledge required to develop a practical and proportionate safety management system, and gives the crew the perspective and attitude to *want* to follow it. (see 8.2 "Training").

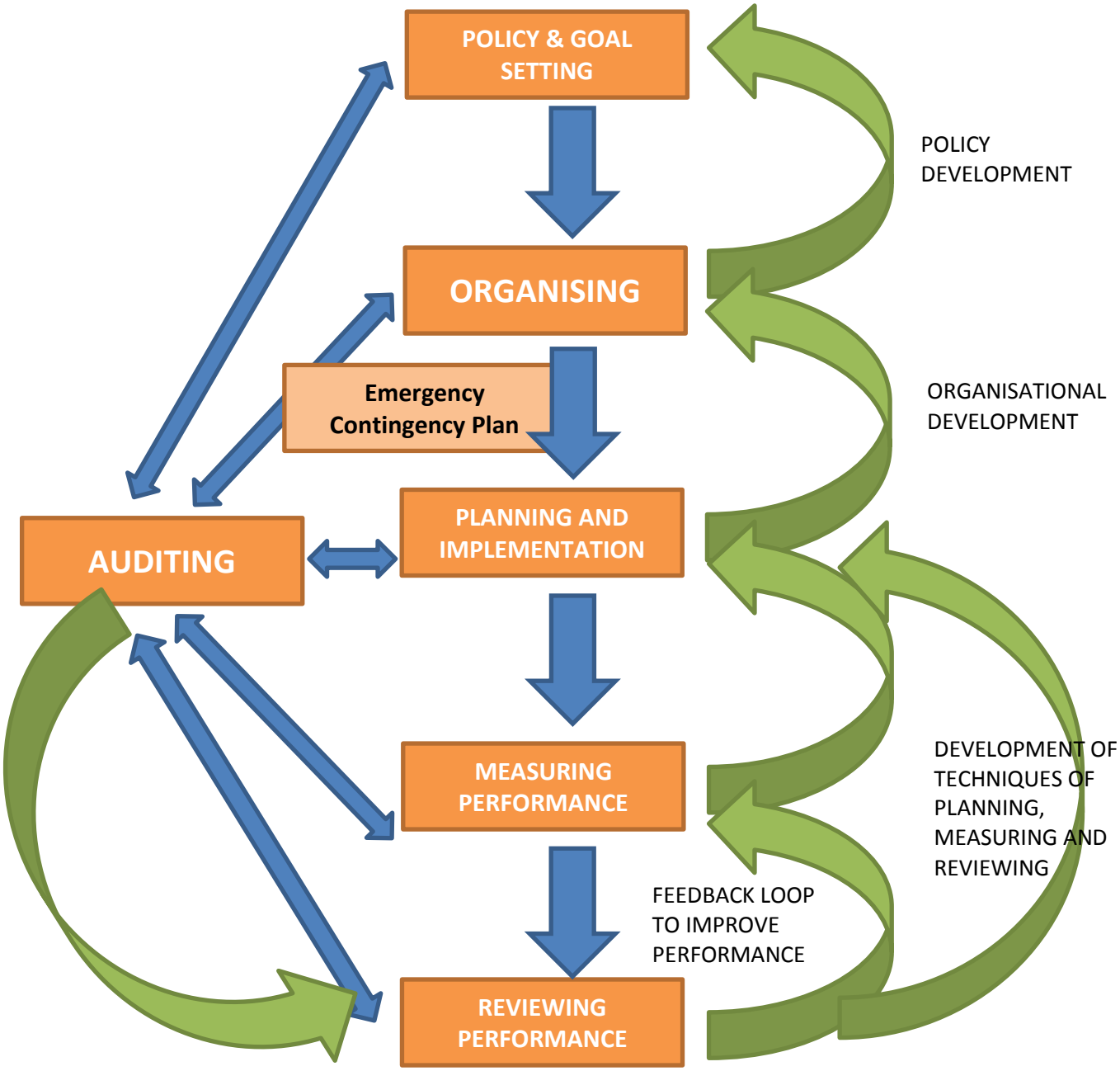
[47] ICS, *Implementing An Effective Safety Culture*, (2013). p.5

[48] Antonsen, et al., "Reducing The Gap Between Procedures And Practice", *Safety Science Monitor*, (2008)

6. Safety Management Systems[49]

The ICS notes, “Implementing An Effective Safety Culture”, explain that having a suitable safety management system is a key component to achieving an effective safety culture. Whereas this is correct, insofar as a good safety management system is a *symptom* of an effective safety culture, it cannot be counted on in isolation. It is the implementation and acceptance of the safety management system, and the understanding of why it is in place, that drives how crew/employees behave. (see 8.2 Training)
The ISM sets out a standard Safety Management System template, though there is little in the way of detailed guidance. This can be compared to the UK Health And Safety Executive’s “HSG-65” which includes explanatory notes on how to develop and implement it. While the two are very similar, the ISM Code makes explicit provision for the inclusion of an Emergency Contingency Plan[50] (though, again, it offers no guidance on its contents, development, management or implementation)

Fig.13: “HSG-65: A Safety Management System And the ISM Code”



[49] HSE, “HSG-65”
[50] ISM Code

6.1. Policy & Goal Setting

Effective health and safety policies set a clear direction for the organisation to follow. They contribute to all aspects of business performance as part of a demonstrable commitment to continuous improvement. Responsibilities to people and the environment are met in ways which fulfil the spirit and letter of the law. Stakeholders' expectations in the activity (whether they are shareholders, employees, or their representatives, customers or society at large) are satisfied. There are cost-effective approaches to preserving and developing physical and human resources, which reduce financial losses and liabilities.

The ICC, in the introductory paragraph of it's "Implementing An Effective safety Culture" brochure, cites the "shipping Industry's goal of Zero accidents and zero lives lost at sea[51]". This statement, while laudable in intent is worthy of further analysis and thought if we are to truly appreciate the value of an effective safety culture at all levels.

The argument as to whether a "Goal Zero" policy is useful, achievable or even counter-productive rages on. It can be convincingly argued that "Goal Zero" is the ONLY ethical and practical goal to set, as to aspire to anything less implies a negligent, even immoral, acceptance of workplace casualties, and that some "minimum" is a fair sacrifice in pursuit of productivity[5253]. Indeed, many shipping companies have published "Goal Zero" as their Health and Safety policy target[54].

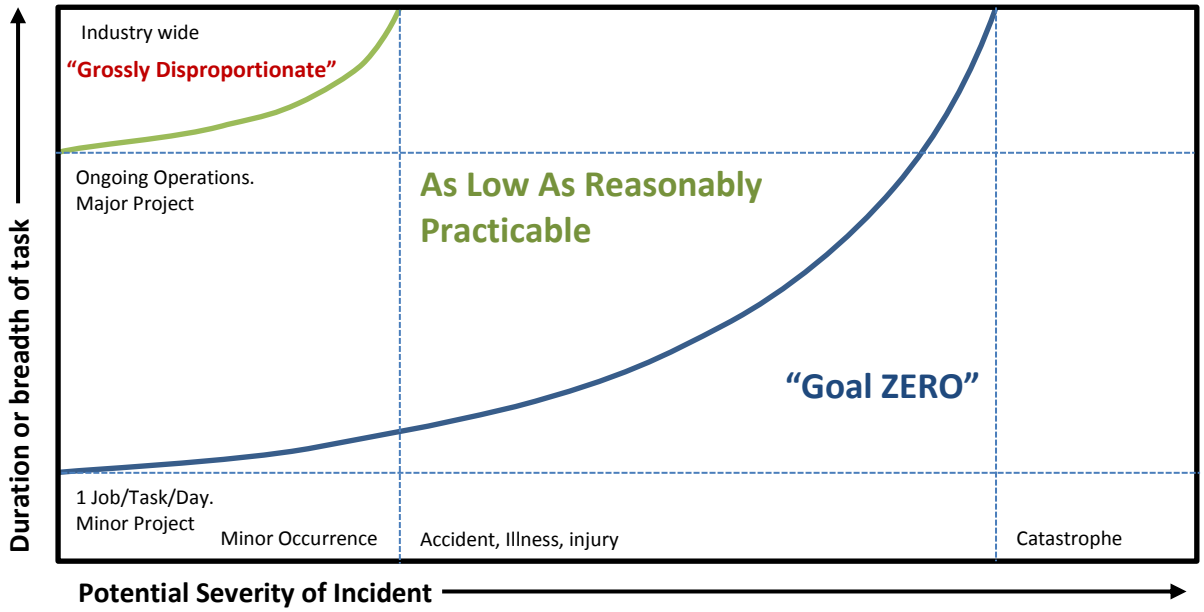
Conversely, many (including a host of Health and Safety professionals/academics) argue that "Goal Zero" is not-only impossible on scientific and semantic grounds[55], but also counterproductive, as unrealistic goals damage morale, overshadow real achievement, and camouflage unsafe acts by encouraging under-reporting[56].

"Goal Zero", then, is best regarded not as a long term Goal, but as a cultural trait better described as "striving for excellence" than aiming for zero accidents. The real goal (as defined) should be measured positively, not negatively: linked to % training competencies, completion and implementation of a Safety Management System, attendance at safety meetings, % PPE compliance or the number of near misses reported or safety improvements/commendations submitted, for example. (see 7.1.3 "Behaviour Based Reporting Programmes"). The measuring of positives is more likely to change behaviour for the better, as people strive to "look good" rather than avoid "looking bad"[5758].

[51] ICS, *Implementing an Effective Safety Culture*, (2013)
[52] Nylund, Atkin, *The Goal Of Zero Accidents* (2011)
[53] The Facilities Society, *Towards Zero Accidents*, (2014)
[54] Shell Oil, *Strengthening Our Safety Culture*, (2015)
[55] Quilley, *The Emperor Has No Hard Hat*, (2012)
[56] Norder, *Identifying Measurable Safety Goals*, (2011)
[57] Cooper, *The Safety & Health Practitioner*, "Goal Setting For Safety", (Nov 1993)
[58] Norder, (2011)

The concept of “Zero Accidents” can be applicable for short projects, small teams or in terms of averting catastrophe. The more tightly defined the goal of “zero” is, the more achievable (and therefore useful) it is. The goal of “No accidents today/on this job/vessel”, for the duration of a project or voyage, can be a useful (and motivational) short-term ambition as it focusses the mind on the task in hand[59]. Similarly, when considering a catastrophe (sinking/explosion/mass-casualty event), a “zero” goal can be applicable due to the severity of the potential consequences and the societal aversion to large scale incidents[60]. The assumption being that, the greater the severity of the incident, the more complex the system, the more people involved the more safeguards there will be and so (in theory) a catastrophe would be less likely to occur than a minor injury with only a few causal factors (see 4.0 “accident causation”).

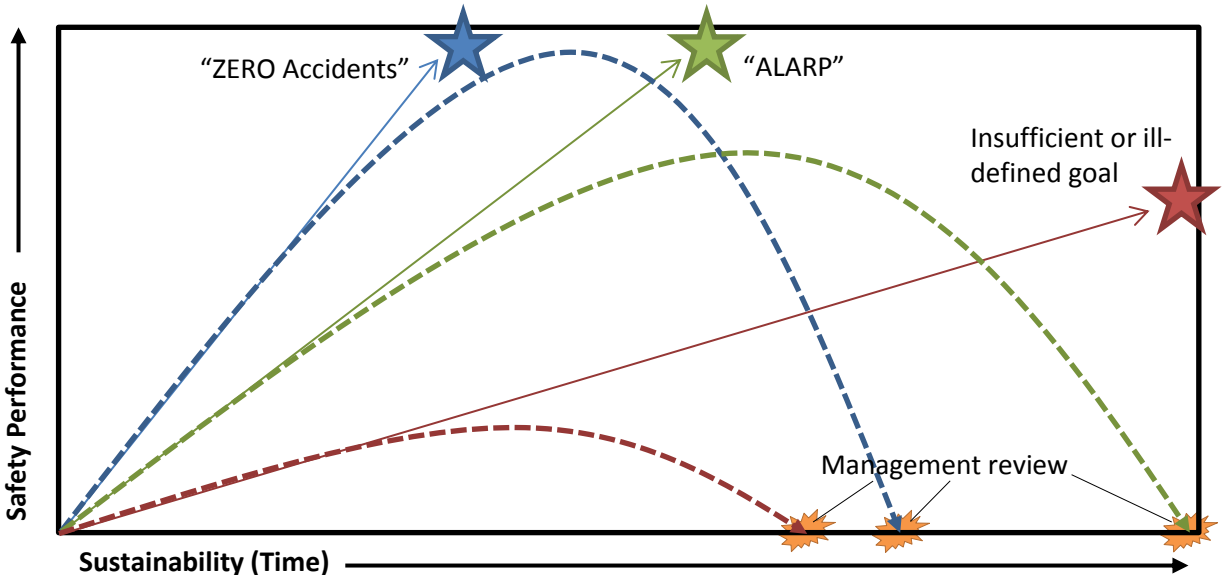
Fig.14: Goal Setting: Realistic Targets 1[61]



For long term, ongoing, operations, whole industries or for less severe occurrences the concept of “As Low As Reasonably Practicable” can be more useful in furthering the pursuit of excellence[62]. As it allows for the effective measurement and management of health and safety in a way that does not punish failure or encourage covering-up and under-reporting. By accepting that there will always be a certain level of unmitigated risk, but then striving to minimise it, better results can be achieved than by an ill-managed and unrealistic target[63].

[59] HSE, *Worker Engagement Case Study*, "Channel Tunnel Rail Link", (2005)
[60] HSE, "Cost Benefit Analysis" (2015)
[61] Author’s interpretation
[62] HSE, "ALARP At A Glance", (2015)
[63] Quiley, (2012)

Fig.15: Goal Setting: Realistic Targets 2: "The Safety Cannonball"[64]



A short term, well defined goal of "zero accidents" can be a useful tool if correctly managed. However, this position cannot be maintained indefinitely, as individuals learn how to "play" the system and are tempted to cover-up incidents and under-report in pursuit of the "goal". Similarly, a blanket "Goal Zero", undefined by time, space or nature of the occurrence, is also not conducive to the intelligent management of health and safety and, fails to do justice to the seafarer.

In the case where the goal has not been correctly considered in the context of a workable safety management system (or, indeed, there *is* no goal, or one that is ill-conceived or ambiguously defined) performance will rapidly deteriorate as there is no framework to work to. In the long term, the most sustainable goal that will allow the greatest long-term improvement in health and safety performance, is the intelligent application of ALARP as a principle – within the framework of a "just" culture of self-regulation, managed by a Safety Management System, built on-top-of (and superseding) attentive compliance with rules and regulations, backed up (when necessary) with appropriate punishment/reward for unacceptable, or creditable activity.

6.2. Organising for Health and Safety

An effective management structure and arrangements are in place for delivering the policy. All staff are motivated and empowered to work safely and to protect their long-term health, not simply to avoid accidents. The arrangements are:

- Underpinned by effective staff involvement and participation; and
- Sustained by effective communication and the promotion of competence which allows all employees and their representatives to make a responsible and informed contribution to the health and safety effort.

There is a shared common understanding of the organisation's vision, values and beliefs. A positive health and safety culture is fostered by the visible and active leadership of senior managers.

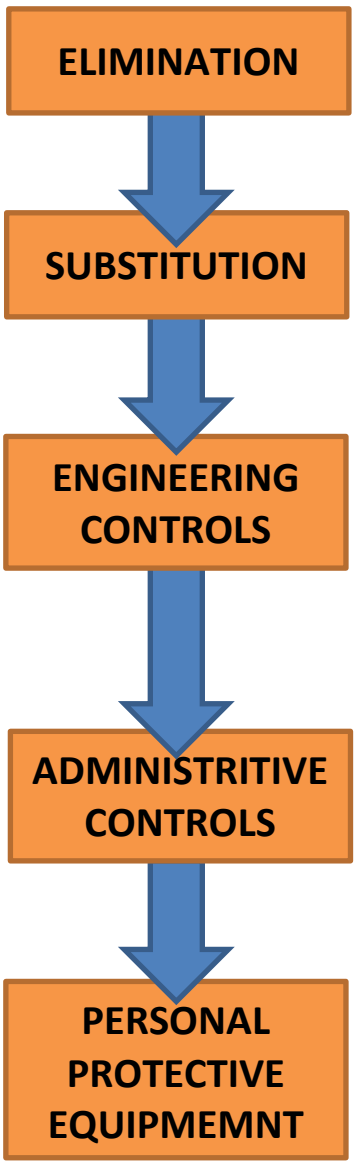
[64] Author's interpretation

6.3. Planning and Implementation

There is a planned and systematic approach to implementing the health and safety policy through an effective health and safety management system. The aim is to minimise risks. Risk assessment methods are used to decide on priorities and to set objectives for eliminating hazards and reducing risks. Wherever possible, risks are eliminated through selection and design of facilities, equipment and processes. If risks cannot be eliminated, they are minimised by the use of physical controls or, as a last resort, through systems of work and personal protective equipment. Performance standards are established and used for measuring achievement. Specific actions to promote a positive health and safety culture are identified.

Risks should be reduced to the lowest reasonably practicable level by taking preventative measures, in order of priority. The table below sets out an ideal order to follow when planning to reduce risk from construction activities. Consider the headings in the order shown, do not simply jump to the easiest control measure to implement.

Fig.16: The Hierarchy of Controls[65]



ELIMINATION	Redesign the job or substitute a substance so that the hazard is removed or eliminated. For example, crew must avoid working at height where they can.
SUBSTITUTION	Replace the material or process with a less hazardous one. For example, use a small Mobile Elevated Work Platform to access work at height instead of step ladders. Care should be taken to ensure the alternative is safer than the original.
ENGINEERING CONTROLS	Use work equipment or other measures to prevent falls where you cannot avoid working at height. Install or use additional machinery such as local exhaust ventilation to control risks from dust or fume. Separate the hazard from operators by methods such as enclosing or guarding dangerous items of machinery/equipment. Give priority to measures which protect collectively over individual measures.
ADMINISTRITIVE CONTROLS	identifying and implementing the procedures you need to work safely. For example: reducing the time workers are exposed to hazards (eg by job rotation); prohibiting use of mobile phones in hazardous areas; increasing safety signage, ***and performing risk assessments.***
PERSONAL PROTECTIVE EQUIPMEMNT	Only after all the previous measures have been tried and found ineffective in controlling risks to a reasonably practicable level, must personal protective equipment (PPE) be used. For example, where you cannot eliminate the risk of a fall, use work equipment or other measures to minimise the distance and consequences of a fall (should one occur). If chosen, PPE should be selected and fitted by the person who uses it. Workers must be trained in the function and limitation of each item of PPE. ***PPE is a LAST line of defence!***

[65] Health and safety Executive, "The Hierarchy of Controls" (Authors emphasis additional)

6.4. Emergency Contingency Planning

The company shall establish, implement and maintain appropriate plans and procedures to identify the potential for, and responses to, security incidents and emergency situations, and for preventing and mitigating the likely consequences that can be associated with them. The plans and procedures shall include information on the provision and maintenance of any identified equipment, facilities or services that can be required during or after incidents or emergency situations.

6.5. Measuring

Performance is measured against agreed standards to reveal when and where improvement is needed. Active self-monitoring reveals how effectively the health and safety management system is functioning. This looks at both hardware (premises, plant and substances) and software (people, procedures and systems) including individual behaviour and performance. If controls fail, reactive monitoring discovers why by investigating accidents, ill health or incidents which could cause harm or loss. The objectives of active and reactive monitoring are:

- To determine the immediate causes of sub-standard performance; and
- To identify the underlying causes and the implications for the design and operation of the health and safety management system.

Longer-term objectives are also monitored.

6.6. Audit and Review

The organisation learns from all relevant experience and applies the lessons. There is a systematic review of performance based on data from monitoring and from independent audits of the whole health and safety management system. These form the basis of self-regulation and of complying with sections 2 to 6 of the Health and Safety at Work etc Act 1974 (HSW Act) and other relevant statutory provisions. There is a strong commitment to continuous improvement involving the constant development of policies, systems and techniques of risk control. Performance is assessed by:

- Internal reference to key performance indicators; and
- External comparison with the performance of business competitors and best practice, irrespective of employment sector.

Performance is also often recorded in annual reports.

7. Measuring Behaviour

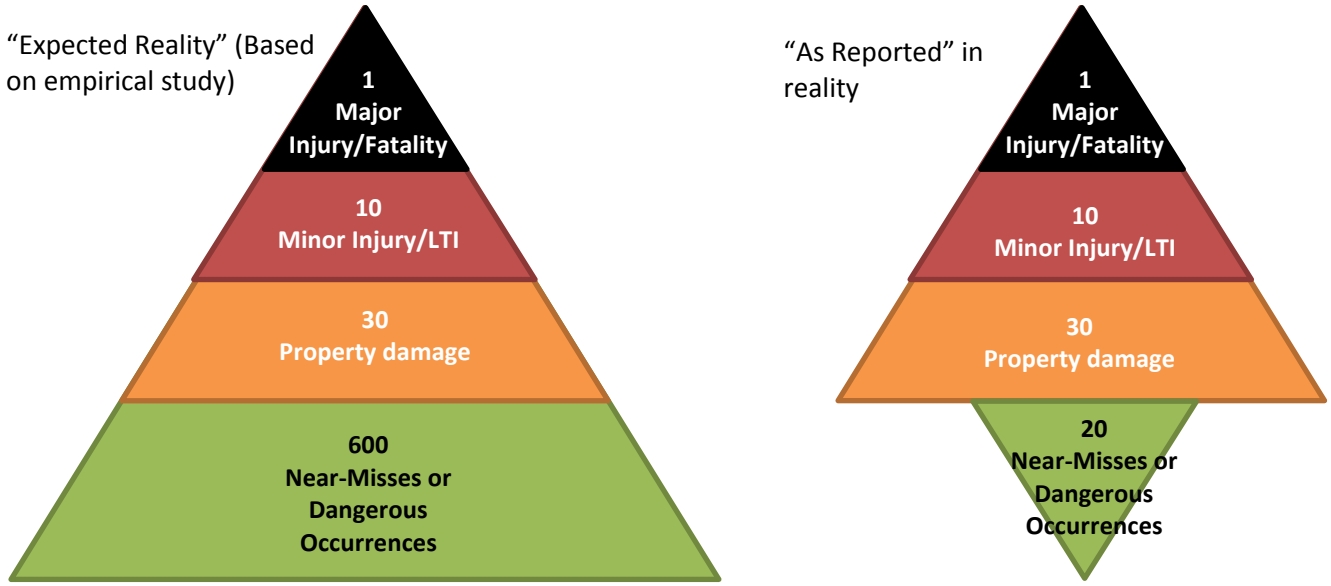
There are two key (and linked) components of effective measuring of behaviour: an effective and robust accident & near-miss reporting system; and the ability to manage, interpret, investigate, prioritise and retrieve this data in support of a process of continual review and improvement.

There are numerous yardsticks by which measuring of performance can be conducted. The most common is measuring Lost Time Incidents (LTI's)[66]. However, this is not to fully explore the root of the problem. LTIs and other "consequential" occurrences are only the *result* of near misses or dangerous occurrences that have not been mitigated by control measures (see 4.0 "Accident Causation" above). To fully measure, understand and mitigate damage, LTI's, and major injuries/fatalities it is the near misses that should be the primary indicative factor (see *fig.17* and *fig.18* below).

Comparative reporting and collaboration can also be a useful exercise[67] (see 7.1.5. Collaborative Reporting Systems, below)

7.1. Reporting

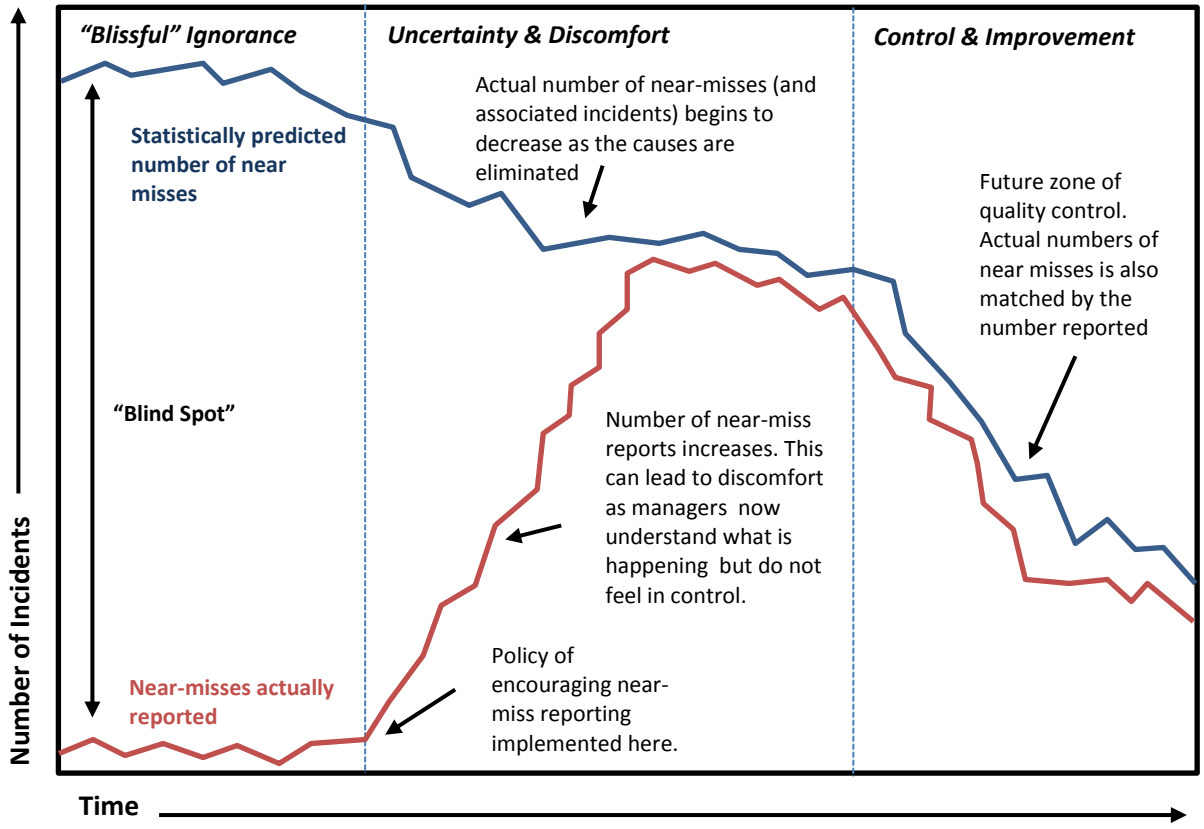
Fig.17: "The Importance Being Earnest": "The Safety Triangle" [686970] vs. the Safety Diamond[7172]



A traditional problem with previous or "lower" safety cultures is that they stifle an open and honest culture of accident and near miss reporting (See "Blame Culture" and "Culture of Compliance" in *Fig.8:* "Not Mazlow's Hierarchy of Safety" and "Levels" 1,2 & 3 in *Fig.9*: IOGP "Safety Culture ladder")

[66] ICS, *Implementing an Effective Safety Culture*, (2013)
[67] ICS, *Implementing an Effective Safety Culture*, (2013)
[68] ConcocoPhillips Marine (2003)
[69] Bird, Frank E., (1969)
[70] Heinrich, H.W., *Industrial Accident Prevention*, (1931)
[71] Concept from: Borg, B., Predictive Safety from Near Miss and Hazard Reporting, (2001).
[72] Statistics From: [A Red Ensign/"White" Flag Ship Registry], *Summary of Casualties, Accidents and Incidents on […] Registered Vessels*, (2014)

Fig.18: The Life Cycle of Near Miss Reporting[73]



7.1.1. Barriers to Reporting

Barriers to reporting can be caused by many factors, but all are characterised as poor health and safety management.

a) Caused by poor goal setting:
As previously discussed above (See 6.1: Policy & Goal Setting) an unrealistic goal can become a barrier to reporting. Crew will feel pressure to achieve goals (whether external or self-imposed) am may seek, whether consciously or unconsciously to under-report, understate or even cover-up hazardous occurrences and accidents, in order to improve their safety record. In such cases, this fixation on a numerical and negatively measured safety benchmark skews priorities; the tail wags the dog, and your "safety record" becomes more important that genuine safety.

b) Caused by unenlightened management:
Another barrier to reporting of incidents and hazardous occurrences is caused by management systems that still operate at the less developed "blame" (*fig.8*) or "pathological" (*fig.9*) end of the health and safety management spectrum[74].

- Crew may be in fear of being blamed, disciplined, embarrassed or found legally liable if they raise awareness of hazardous occurrences.
- They may feel that it is futile to report accidents and occurrences if they believe (rightly or wrongly) that the company will remain indifferent and not address the issues anyway – the management is perceived as complacent.
- Crew may try and avoid the extra workload, particularly if there is to be no time allocated for accident investigation – and that the extra work would be done in the crew's own time.

[73] Borg, B., Predictive Safety from Near Miss and Hazard Reporting, (2001).
[74] IMO, *MSC-MPEC.7/Circ.7*, "Guidance on Near Miss Reporting" (2008)

c) Caused by ineffectual data management/capture/retrieval:
It may be that, to report an accident or near miss is too complicated and time consuming, particularly if there is a lack of a simple, standardised reporting format. Even when incidents are reported, this information must be suitably stored, categorised and managed if any meaningful conclusions are to be drawn

7.1.2. Overcoming Barriers to Reporting[75]

A few suggested measures to overcome these barriers may include:

a) Encouraging a "just" or "generative" culture that explicitly encourages incident and near-miss reporting.

b) Having clearly defined and promulgated policy detailing under what circumstances a seafarer reporting an accident will be guaranteed a non-punitive response (in all circumstances apart form an illegal act or malicious/unacceptable behaviour)

c) Assuring confidentiality in incident/near miss reporting (perhaps by "sanitizing" reporting documentation to remove personal data).

d) Assuring that accident and near miss investigation is adequately resourced[76] in time and (qualified/knowledgeable) personnel to avoid putting extra time pressure on the crew (which runs the risk of breaking work/rest hours legislation[77] and/or discouraging reporting in the first instance.) For major occurrences consider using a specialist or 3rd party expert in order to conduct impartial investigations in support of the crew.

e) Consider resourcing an accident/near miss investigation cell at company level (in-house or 3rd party), in order that the data is suitably investigated, manages and interpreted in order to adequately discern meaning and generate recommendations for improvement (see 8.1 continuous development)

f) Investigations should be conducted in a timely manner and with a degree of consistency. Once complete, recommendations should be made, and decisions made on how/whether these recommendations are to be acted upon. This should be an open process, exposed to internal scrutiny. The accident investigation and eventual outcome (including implementation of mitigating measures or any changes to policy/procedures) should then be published and disseminated to all crew within the company: a timely and a favourable outcome will encourage further reporting in the future.

7.1.3. Behaviour Based Reporting Systems

Behaviour Based Reporting Systems are a facet in a wider safety management regime called "Behaviour Based Safety" (BBS). BBS, itself is the "application of [the] science of behaviour change to real world problems"[78], incorporating "A process that creates a safety partnership between management and employees that continually focuses people's attentions and actions on theirs, and others, daily safety behaviour[79]".

BBS "focuses on what people do, analyses why they do it, and then applies a research-supported intervention strategy to improve what people do[80]".

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[75] IMO, *MSC-MPEC.7/Circ.7, "*Guidance on Near Miss Reporting" (2008)
[76] IMO, *MSC-MPEC.7/Circ.7, "*Guidance on Near Miss Reporting" (2008). 4.3
[77] IMO, *Maritime Labour Convention*, As amended (2010)
[78] *Cambridge Centre For Behavioural Studies*, "What Is Behavioural Safety" (2015)
[79] Cooper MD., *Behavioural Safety: A framework For Success* (2009)
[80] Geller, E. Scott (2004). "Behaviour-based safety: a solution to injury prevention", *Risk & Insurance*. 15 (12, 01 Oct) p. 66

It is (ostensibly) a scientifically derived system, based on organisational behavioural studies[81], empirical evidence, and academically peer-reviewed research (rather than anecdotal or "common-sense" "evidence").
One part of a BBS system will be some form of documented, methodical reporting system designed to encourage fault-finding and resolution at the lowest possible (crew/employee) level as a "peer-to-peer" exercise. In most cases, a worker or supervisor will identify a hazard or unsafe act and immediately intervene to stop the job, discuss the unsafe act with the "perpetrator" on-scene, agree on an immediate resolution and fill-in and submit a simple report form (generally a small pocket-sized "card".

The original behaviour based reporting system was the STOP® safety program developed by DuPont™ for use within the Oil and Gas industry[82]; It (or various non-proprietary versions of it) are widely used and regarded as best practice within the Oil and gas industry[83].

It is intended to prevent injuries and occupational illnesses in the workplace by training, supervision, peer-observation and discussion about safe and unsafe practices. By considering *why* workers engage in unsafe behaviour, the actual cause of the unsafe behaviour can be addressed (rather than merely curing the immediately obvious symptom) which, in turn, will eliminate obstacles to working safely. In this respect it mirrors and compliments the "culture of self-regulation" and the "Generative" culture discussed above (see 5.3 "Culture Of Self-Regulation")

Advantages

a) As well as determining the reasons behind worker actions during audits, supervisors reinforce safe actions by acknowledging, thanking, praising, or otherwise recognizing the worker(s) for working safely.

b) Unsafe practices will be discouraged and corrected in a non-confrontational and collaborative manner. Instead the supervisor (or fellow crewmember) should try to get the worker to recognize the hazard for themselves, usually by asking, "What could happen if ..." Allowing the worker to recognise the hazard independently will make it more likely that the worker will identify and recognise similar unsafe situations in the future and not repeat them. The supervisor should also get an agreement from the worker to work safely in the future. This, "peer/self-assessment" is more likely to change long term behaviour patterns as people understand WHY they should be working safely, rather than unthinkingly complying with orders/regulations under threat of punishment.

c) A BBS reporting program will help identify why workers engage in both safe and unsafe practices. It will also assist in identifying trends. Once these trends have been identified (following careful analysis) safety management can become pro-active and begin to address hazards/unsafe practices *before* any harm in incurred

d) It should allow personnel to submit (anonymously if desired) any safety improvements and/or other hazards identified.

e) The system should also be used to identify and commend good safety behaviours and practice.

f) Ideally, it is an open, honest, involving, proactive system of communication to assist in the elimination of dangerous or potentially dangerous situations and hazards.

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[81] Matthews GA., "Behavioural Safety from the Consumer's Perspective", *Cambridge Centre For Behavioural Studies*, (2015)
[82] DuPont™, "Welcome to DuPont™ STOP®"
[83] Flemming & Lardner, "Behaviour modification programmes establishing best practice", *Offshore Technology report 2000/048*, The Keil Centre, for The Health And Safety Executive (Crown Copyright, 2001)

Disadvantages

a) In a safety management system based upon the hierarchy of hazard control (see *Fig.16* Above) a BBS reporting system may only identify hazards and non-conformances further down the chain (not wearing PPE, a missing machine-tool guard, for example) as these are physical deficiencies and easier to identify. It is less likely that crew will identify more conceptual deficiencies higher up the hierarchy (such as poor procedures, a missed opportunity to substitute for a safer method or to eliminate the task altogether) as these may become obscured in the day-to-day interests of getting on with the job.

b) In such circumstances (where physical deficiencies are disproportionately reported over administrative and systematic deficiencies) any interpretation and conclusions drawn are likely to be biased. "False positives" are generated, whereby a lack of reporting (or unbalanced reporting) is taken to mean that there are no hazards or deficiencies.

> *Absence of evidence is not evidence of absence*
>
> **Carl Sagan**

c) Similarly, any recommendations made are likely to focus on the physical, easily visible measures at the lower tiers of the hierarchy and should not be used in preference to the implementation of reasonably practicable safety measures further up the hierarchy.

d) To be successful a BBS program must include all employees, from the CEO to the front line workers/crew (including contractors and sub-contractors) to achieve meaningful changes in behaviour, policy, procedures and/or systems. Those changes cannot be done without buy-in and support from all involved in making those decisions.

e) Such programmes run the risk of becoming a "numbers game", where quantity becomes more important than quality. It may become competitive, with different units, departments, vessels competing to submit the highest *volume* of reports without due regard for their quality (having forgotten their original purpose).

f) Staff and crew may become jaded with the system, as "reporting fatigue" sets in (particularly in organisation who demand a quota of such reports per man, backed up with administrative action for "non-producers". The system becomes open to abuse, cynicism and ridicule[84].

In principle, behaviour based reporting systems are progressive, proactive and forward thinking mechanism of safety management (and particularly incident/near miss reporting). However, the must be carefully managed if an organisation is to get the best out of them:

a) Managers and crews should be adequately trained in health and safety management, and in hazard identification, risk perception and assessment if they are to correctly identify and report hazards and deficiencies (particularly the more conceptual, thus harder to spot, deficiencies) (see 8.2 "Training") this will allow managers (with correct training aptitude and experience) to draw more logical conclusions and recommendations from higher quality reporting.

[84] LinkedIn, *Behavioural Safety Research*, "Observation/Intervention Card Quotas", (initiated by Strother T., 2012)

b) Training and instruction is needed to educate (or remind) managers and crew as to the “point” of such reporting programmes – what they are designed to do and WHY, if they are not to become considered a burden. Examples of where such reporting has led to positive change will be crucial in winning over hearts and minds of the crew.

c) Careful consideration should be undertaken as to whether this is to be a voluntary or mandatory system (i.e. with a quota). Both models have pros and cons; careful management, training and inculcation of a positive culture should serve to increase the usefulness and value of the system (and the safety management system as a whole)

7.1.4. Confidential Reporting Systems

A confidential incident reporting system is a mechanism which allows problems in safety-critical fields to be reported in confidence. The concept was generated in the Aviation industry and in healthcare.

Confidential reporting systems aim to protect the identity of the reporting person. Often this is a means to ensure that the voluntary reporting systems are non-punitive. Confidentiality is usually achieved by de-identification, often by not recording any identifying information of the occurrence. Such a system returns to the user the identifying part of the reporting form, and no record is kept of these details. Confidential incident reporting systems facilitate the disclosure of human errors, without fear of retribution or embarrassment, and enable others to learn from previous mistakes.[85]

This allows events to be reported which otherwise might not be reported through fear of blame or reprisals against the reporter. Analysis of the reported incidents can provide insight into how those events occurred, which can spur the development of measures to make the system safer[8687]

Some Examples include:

a) The Aviation Safety Reporting System, created by the US aviation industry in 1976, was one of the earliest confidential reporting systems. The International Confidential Aviation Safety Systems Group is an umbrella organization for confidential reporting systems in the airline industry[88].

b) CIRAS, (Confidential Incident Reporting and Analysis System), the confidential reporting system for the UK railway industry[89].

c) CHIRP, (Confidential Human Factors Incident Reporting Programme / Confidential Hazardous Incident Reporting Programme) a confidential reporting system for the British aviation and maritime industries.

d) CROSS (Confidential Reporting on Structural Safety), a confidential reporting system for the structural and civil engineering industry[90].

[85] International Civil Aviation Organization, "Safety Management Manual", (Doc 9859 AN/474 v.3 2013)
[86] O'Leary, M; Chappell, S. L., "Confidential incident reporting systems create vital awareness of safety problems". ICAO journal 51 (8, 1996): 11–3, 27.
[87] National Aeronautics And Space Administration (NASA), "ASRS: The Case for Confidential Incident Reporting Systems", NASA ASRS (Pub. 60)
[88] National Aeronautics And Space Administration, "ASRS - Aviation Safety Reporting System: International"
[89] Davies, John (University of Strathclyde), "Improved railway safety through the implementation of a confidential incident reporting and analysis system (CIRAS)"
[90] UK Environment Agency, "learning From Experience: Post-incident Reporting for UK Dams" (2008)

Advantages[91]

a) When organizations and industries want to learn more about safety incidents and why people did what they did, the best approach seems to be to simply ask the participants.

b) People are generally willing to share their knowledge if they are assured their identities will remain confidential, and ultimately, anonymous and the information they provide will be protected from disciplinary and legal consequences.

c) A properly structured confidential, voluntary, non-punitive incident reporting system can be used by any person to share this information.

d) Such a system has the means to ask, and frequently answer, the question of why. There is no substitute for knowing why a system failed or why a human erred.

e) A voluntary incident reporting system cannot succeed without the cooperation, oversight, and guidance of the community that will use it. It must be viewed as a safety information resource accessible and responsive to all.

f) A voluntary reporting system usually must exclude from its protections some types of incidents, such as criminal acts and intentional unsafe acts. In certain systems, such as the ASRS, this exclusion extends to legally defined accidents.

g) The safety data gathered from incident reporting can be used to identify system vulnerabilities and gain a better understanding of the root causes of human error. Incident reporting data is complementary to the data generated by mandatory, statistical, and monitoring systems.

h) The ultimate achievement of an incident reporting system is that it can prevent accidents and fatalities.

Disadvantages

a) Lack of accountability leading to risk of abuse

b) Difficulty in conducting a “follow-up” when seeking further information, clarification or detailed analysis (particularly in the case of anonymous reporting (as opposed to confidential reporting))

c) Some states freedom of information laws make it difficult to guarantee anonymity.

d) Lack of legal and/or commercial authority of the reporting agency to impose change upon the commercial entity (in the case that the reporting agency is a separate entity and not within the company reported on) – unless there has been a criminal act, it relies on the company reading, understanding and implementing the feedback (which they may not even realise pertains to them)

[91] National Aeronautics And Space Administration (NASA), "ASRS: The Case for Confidential Incident Reporting Systems", NASA ASRS (Pub. 60)

7.1.5. Collaborative Reporting Systems

The primary objective of accident and near-miss reporting must be to identify areas of concern, implement appropriate corrective action and avoid future loss. However, In order to do so it is vital that reports are not only generated and acted upon, but shared and read as widely as possible[92].

It may take years, and thousands of incidences of reports in order to discern meaning and conduct suitable trend analysis on this data[93]. This is, however, often impractical:

- Serious incidents are discrete (and thankfully rare) events. In small organisations there may be few (or no) incidences of particular types of event to study, until incidents or near misses actually happen – clearly a far from ideal situation.
- Similarly, even for relatively minor incidents or near misses, there may be few recorded events to study, analyse and learn from.
- Often there is no agreement on the "sensitivity" and categorisation of reporting, with many identification methods, "taxonomies" (categories) of causes, different reporting requirements, nonstandard language and nomenclature and disagreement on the level of investigation for different types of incident.
- Differing safety cultures cause some industries/companies/vessels/activities to generate more reports than others – this imbalance has little or nothing to do with the *actual* frequency of accidents and is, instead, a symptom of a positive and mature safety culture.

Therefore, as implicitly recommended by the IMO[94], there has recently been an emergence of joint, collaborative accident, incident and near-miss reporting systems. Some examples include:

1. Insjo (Sweden)[95]
2. ForeSea (Finland)[96]
3. Nearmiss.dk (Denmark)[97]
4. Oil Companies' International Marine Forum (OCIMF)[98]
5. Informal tanker Operators safety Forum (ITOSF)[99]
6. International Support Vessel Owners' Association (ISOA)[100]

Advantages

1. By gathering information from a wider base, there is more data to assess (a larger "n" in scientific, statistical terms) which allows more robust and logical conclusions to be drawn.
2. A large stock of data allows even very rare occurrences to be captured and learned from.
3. The data is stored and retrieved in a manner that allows long term trend analysis[101]
4. The data is characterised and categorised consistently[102]
5. It allows organisations to learn lessons from the mistakes of others, before any further harm is done if the situation were to occur again to somebody else.

[92] IMO, *MSC-MPEC.7/Circ.7*, "Guidance on Near Miss Reporting" (2008). 5.2
[93] IMO, *MSC-MPEC.7/Circ.7*, "Guidance on Near Miss Reporting" (2008). 5.3
[94] IMO, MSC-MPEC.7/Circ.7, "Guidance on Near Miss Reporting" (2008). 5
[95] Injso, "Experience Data Bank"
[96] ForeSea, "Reports"
[97] Nearmiss.dk, "Previous Safety Alerts"
[98] www.ocimf.org
[99] www.iotsf.org
[100] marinetalk.com, "ISOA - International Support Vessel Owners' Association"
[101] IMO, MSC-MPEC.7/Circ.7, "Guidance on Near Miss Reporting" (2008). 5.1
[102] IMO, MSC-MPEC.7/Circ.7, "Guidance on Near Miss Reporting" (2008). 5.3

Disadvantages

1. There is more than one of them! – while inter-company co-operation at a national level is a step in the right direction, international collaboration (initially by combining the three examples above, and then by broadening the breadth and depth of penetration and uptake of the system) would further increase its usefulness and value.

2. Lack of accountability leading to risk of abuse

3. Difficulty in conducting a “follow-up” when seeking further information, clarification or detailed analysis (particularly in the case of anonymous reporting (as opposed to confidential reporting))

4. Some States’ freedom of information laws make it difficult to guarantee anonymity.

5. Lack of legal and/or commercial authority of the reporting agency to impose change upon the commercial entity (in the case that the reporting agency is a separate entity and not within the company reported on) – unless there has been a criminal act, it relies on the company reading, understanding and implementing the feedback (which they may not even realise pertains to them)

Table 2: Accident/Near Miss Reporting Platforms & Sources	
Body	**Source**
Health and Safety Executive	Operations Notices
	Offshore Safety Alerts & Notices
	Health and Safety Bulletins
	Enforcement Notices < 5 Years
	Enforcement Notices > 5 Years
	Register of Convictions < 5 Years
	Register of Convictions > 5 Years
Flag Administration	Annual Casualty Summary
International Association of Drilling Contractors	Safety Alerts
International Marine Contractors Association	Safety Flashes
Maritime and Coastguard Agency	Marine Safety Alerts
	Technical Safety Alerts
Step Change in Safety	Safety Alerts
US Coastguard	Safety Alerts & Lessons Learned
	Marine Casualty Reports
Marine Safety Forum	Safety Alerts
Isle of Man Shipping Registry	Casualty Reports
gCaptain	News
Insjo	Experience Data Bank
ForeSea	Reports
Nearmiss.dk	Previous Safety Alerts
London P&I Club	StopLoss Bulletins
Alert!	Issues
Mariners Alerting & reporting Scheme	Reports
Confidential Hazardous Incident Reporting Programme	Feedback Publications
Oil Companies' International Marine Forum (OCIMF)	www.ocimf.org
Informal tanker Operators safety Forum (ITOSF)	www.iotsf.org

7.2. Investigating

Once accident/near-miss data is reported and collected, it must also be analysed in order to discern its meaning and redeem its value as an information investment[103].

1. Gathering near-miss/incident/accident information

    a. Who and what was involved?
    b. What happened, where and in what sequence?
    c. What were the potential losses and their potential severity?
    d. What was the likelihood of a loss being realised?
    e. What is the likelihood of a re-occurrence of the chain of events and/or conditions that lead to the near miss/incident/accident?

2. Analysing Information

3. Identifying causal factors

4. Developing and implementing recommendations

5. Completing the investigation

[103] IMO, MSC-MPEC.7/Circ.7, "Guidance on Near Miss Reporting" (2008). 4, 5.1

Fig.19: Example Incident Report & Investigation (See ANNEX A for full text)

Allmode Health And Safety Department

Date: 17/09/14
Source: Marine Safety Forum

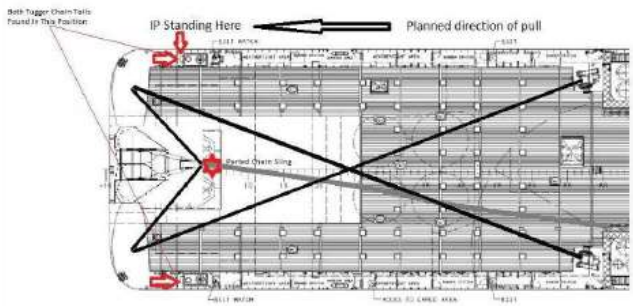
Advisory Notice: 001

Injured Party Struck By Tugger Wire Assembly

Vessel was deploying 15t anchor during a pre-lay operation. Deck personnel were using tugger wires with an endless chain sling connected through the anchor D-Shackle to move the anchor along the deck and over the stern roller. During the operation, the rigging assembly (endless chain) parted and both tugger wires recoiled around the cargo barrier. The injured person (IP) was struck on the head (from behind) on the right hand side just below the ear. The IP suffered a fractured skull, fractured jaw and laceration to neck. IP was provided with medical treatment on board the vessel and transferred to hospital for surgery.

Key Findings

- Snapback zones were not adequately identified during the job planning.
- The safe haven was not adequately assessed.
- Procedures did not incorporate calculation of expected loads, sizing/selection and use of rigging and its limitations.
- The industry has 'normalised' into accepting that small wires and loose rigging equipment fail on the deck of an Anchor Handling Tug & Support vessel.



Immediate Actions

1. Chain slings are not to be used in configurations highlighted above, due to known reductions in MBL as a result of a non-linear pull and rigging around sharp edges, where it is possible to have a reduction in MBL by up to 50%.
2. No personnel aft of a line extending between the most forward tugger winches on both sides of the cargo rail when wires and equipment are under tension, with the exception being to take control of anchor handling safety systems; (e.g. check of shark jaws).
3. Remove reference to 'Safe Haven' from Company SMS until this position can be further defined.

Recommendations

1. The following technology solutions to be evaluated to improve the factor of safety (FoS) during operations with both tugger and capstan winches and associated loose rigging gear:
   - Use of a higher grade of chain (120), designed specifically for extreme conditions.
   - Reduction in winch line pull, providing an additional increase in safety on deck when greater calculated loads are not being moved on deck.

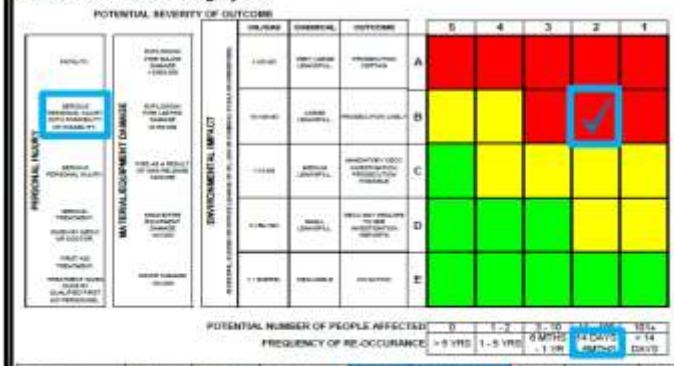
2. Review procedure to determine the best mechanism for incorporating greater detail into pre-job planning including but not limited to calculation of expected loads, sizing/selection and use of rigging, rigging failure modes and associated risks including snap-back zones and applicable safe working areas.

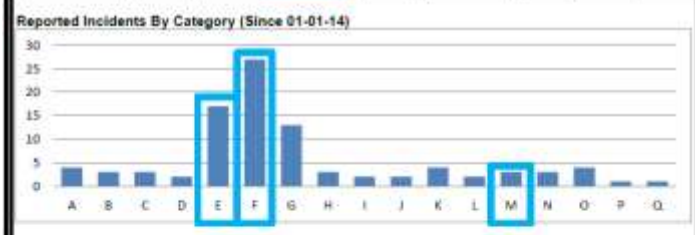
3. Safe haven is re-defined to mean a place of refuge whereby a person/s cannot be struck, caught between or exposed to any hazard, taking into account the event of any unforeseen failure. If possible, the safest place for a person/s to be stationed may not necessarily be in a position on the upper deck.

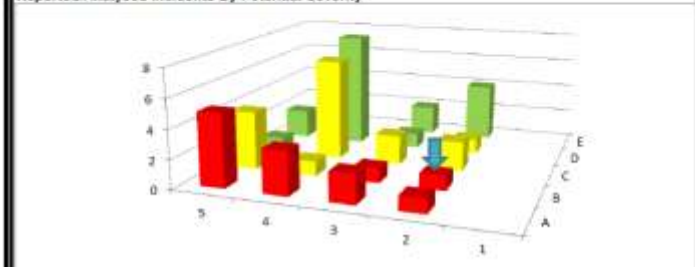
Allmode Comment

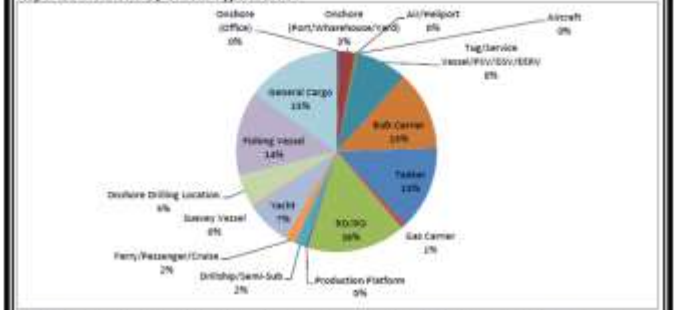
Although this particular incident is specific to Anchor Handling Tug & Support Vessels, there are many common hazards associated with any kind of lifting, mooring or tugging operations conduced on any kind of vessel. The high mechanical stresses involved make equipment failure a distinct possibility which much be mitigated against by means other than engineering controls. The correct planning and management of such tasks, the procurement and correct use of suitable equipment, the calculation and designation of snap-back zones and safe havens, and suitable supervision all have a part to play for the avoidance of injury, even if there is a case of equipment failure (which MUST be assumed in the planning process). All vessels are advised to compare their own procurement, inspection and handling of lifting/winching tackle and safety management procedures to the example above. See below for the root cause analysis for this specific event.

Allmode Comment - Category: B2









This incident is categorised as a B2 due to the serious nature of the injury sustained ("Serious with possibility of disability") and the high potential for re-occurrence due to the routine nature of this task on this type of vessel ("14 days > X > 6 months").
It is one of a high proportion of such incidents that occur on Tug/Service vessels due to the nature of their work.

Root Cause Analysis

As demonstrated above, although the causal-factor of the incident was the incorrectly configured chain sling which led to equipment failure, poor planning, management and safety attitude were the root causes. The incorrect selection and procurement of lifting equipment, the lack of detailed calculations and job planning, and the expectation and acceptance of equipment failure, all conspired to make such an incident likely (or inevitable) over a period of time. The injury sustained, while serious, can be seen as a lucky escape due to the heavy loads and equipment involved.

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8. Modifying Behaviour

8.1. Continuous Development

The goal of implementing an effective safety culture must be to modify the attitude and behaviour of company personnel at every level, from senior executives to front-line crew, so as they "believe in safety, think safety and are committed to safety[104]" not because they fear punishment, or are required to by rules and regulations, but because they *want* to – as they understand it is in their best interests, financially and morally.

This is a long term process, that must be centred upon the development and earnest implementation of a *meaningful* safety management policy – one that is structured to encourage (and when necessary enforce) self-assessment, reporting and the ambition to continually develop and improve procedures and attitudes beyond what is required by international regulations.

Some companies may wish to utilise outside consultants to advise on the assessment and development of their safety management procedures and oversee changes to their safety culture[105] in order to gain perspective and achieve cost-effective "non-destructive testing[106]" of their policies, procedures and attitudes.

8.2. Training

In order to achieve this turnaround in culture and approach, and to arm leaders, managers and supervisors with the sufficient knowledge, skill and aptitude to ensure it is effective, training is essential.

A level of health and safety management knowledge commensurate with the employees' job specification and seniority will ensure that they fully understand:

a) **How** to write and develop effective safety management policies;
b) **What** international and national rules and regulations must be adhered to;
c) **When** to implement, enforce and improve the policy, and;
d) **Why** it is important to manage and implement safety measures effectively

See below for a matrix of available, accredited and desirable Health and Safety training, the relevant awarding bodies, and how the different sectors within the maritime industry compare with each other:

[104] ICS, *Implementing an Effective Safety Culture*, (2013)
[105] ICS, Implementing an Effective Safety Culture, (2013)
[106] "non-destructive testing" in the sense that lessons can be learned in a "reputationally safe" environment, out of sight of clients, contractors and external auditors and (more importantly) before incurring physical, financial and legal harm due to incurring accidents.

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Table 3: Formal Health and Safety Training by Industry: Current Status and Potential for Improvement							
Body	**Course**	**Dur.**	**Oil & Gas**	**Passenger/Ro-Ro/Cruise**	**Commercial Maritime**	**Commercial Yacht**	**Private Yacht**
nebosh	NEBOSH Diploma	40 day	HSEQ Director	HSEQ Director	HSEQ Director		
nebosh	NEBOSH General Certificate	20 day	**On-Board Safety Officer** / **HSEQ Director**	**HSEQ Director**	**HSEQ Director**		
iosh	IOSH Safety for Senior Executives	1 day	Senior Management	Senior Management	Senior Management	Senior Management	Senior Management
iosh	IOSH Directing Safely	1 day	Middle Management	Middle Management	Middle Management	Middle Management	Middle management
iosh	IOSH Managing Safely	4 day	Heads & deputies of department / OIM	Master, Officers	Master, Officers	Master, Officers	Master, Officers
IMO	Master's ISM Training	3 day	**Offshore Installation Manager**	**Master**	**Master**	**Master**	
mca	Safety Officer's Course	3 day		**On Board Safety Officer (Red Ensign only)**	**On Board Safety Officer (Red Ensign only)**		
OPITO	OPITO (I) MIST	2 day	**All Crew**				
IMO	Superintendent's Course	1 day		**Superintendent**	**Superintendent**		
iosh	IOSH Working Safely	1 day		All Crew	All Crew	All Crew	All Crew
Vessel Specific	Vessel induction	1 day		**All Crew**	**All Crew**	**All Crew**	
IMO	STCW-95 basic modules	1 day	Marine Crew Only	**All Crew**	**All Crew**	**All Crew**	**All Crew**

Table 4: Available Health and Safety Training			
Course	**Audience (Maritime Sector)**	**Contents**	**Explanation**
NEBOSH Diploma	HSEQ Director or Senior HSEQ consultants	The management of Health And Safety	
		Hazardous Agents in the Workplace	
		Workplace and Work Equipment	
		Application of Health and Safety Theory & Practice	
NEBOSH General Certificate	HSEQ Managers or Senior HSEQ consultants	The management of health and safety	
		Controlling Workplace Hazards	
		Practical application of workplace Health and Safety	
IOSH Safety for Senior Executives	Directors, Vice Presidents, Senior Executives and other senior managers who have the responsibility for policy making and strategic planning for health and safety within larger organisations of 250 or more employees.	Introducing Safety for Senior Executives	Basic principles of health and safety – the cost of accidents to the business.
		Safety Management Systems	Concept of safety management – policies, procedures and systems of work.
		Goal Setting	Importance of health and safety plans and objectives.
		Risk Management	Management of occupational risk.
		The Legal framework	Criminal and civil, corporate manslaughter. Corporate and personal liabilities.
		Compliance and Enforcement	Enforcement arrangements.
		The “just Culture”	Safety leadership – key actions a senior manager can take. Developing a positive safety culture.
		Monitoring, Review and Continual improvement	Reviewing your health and safety performance and risk management arrangements.
IOSH Directing Safely	IOSH Directing Safely is intended for people with strategic responsibility for determining and implementing effective health and safety management within small to medium sized organisations. (under 250 People)	Introducing Directing Safely	Understand the importance of strategic health and safety management and its integration into other business management systems Appreciate the consequences of failing to manage health and safety effectively (Moral, Legal & Financial). The consequences of poor health and safety management
		The Legal Framework and Potential Penalties	Understand directors' and employees' statutory duties
		The Causes of Accidents	Identify accident causes and plan for prevention through hazard identification
		Risk Assessment, Control and Management	Risk assessment and control strategies. Safety Management Systems.
		The Human Element: Working Together, the “Just Culture”	Understand the importance of employee selection and the effect of human factors on health and safety Recognise the importance of consultation and communication with employees on health and safety issues
		Monitoring, Review and Continual improvement	Appreciate the significance of performance monitoring for continual improvement of health and safety management
IOSH Managing Safely	Managing safely is a flexible course for managers and supervisors in any sector, and any organisation. It brings managers up to speed on the practical actions they need to take to handle health and safety in their teams.	Why Manage Safely	
		Assessing risks	
		Controlling risks	
		Understanding your responsibilities	
		Identifying hazards	
		Protecting our environment	
		Investigating accidents and incidents	
		Measuring performance	
IOSH Working Safely	Working safely is a one-day course for people at any level, in any sector, needing a grounding of health and safety. It focuses on why health and safety is important, and how you can make a real difference to the wellbeing of yourself and others through changing your behaviour.	Why Work Safely	
		Defining hazard and risk	
		Identifying common hazards	
		Protecting our environment	
		Improving safety performance	

9. Summary & What Next?

The case for the implementation of an effective safety culture, and the inculcation of a mature and proactive attitude to safety had been made.

The legal requirements of managing a shipping company, ship or department can seem tortuously complex, particularly because certificate structure/college phases and other training often does not cover aspect of shipping in sufficient detail. While there is broad awareness of certification for crew and vessel, it is the finer details such as survey windows and MLC requirements, and Hours of Rest requirements about which there may be training and knowledge gaps. Depending on company structure and industry, there may also be a lack of understanding regarding the implementation of Permits to Work, Risk Assessments and dealing with Port State Control.

Further guidance can be sought as to how to develop and implement a viable Safety Management System, and training in order to arm crew and managers at all levels with the knowledge, skill and (crucially) attitude necessary to develop, implement and benefit from these systems in a compliant, profitable and morally sound manner.

These “Best Management Practice” guidelines are available as a workshop, seminar and training package, alongside the accredited and internationally recognised training packages as outlined above (Table 3 and 4 above).

For advice, and to discuss further options, please contact us for a bespoke, free consultation of your needs and aspirations.

For Further Information On:

- Training
- ISM / Health & Safety Services
- Consultancy and focal point services

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Working Safely

Aim:
Everybody at work must have an understand of why they must "Work Safely"

5 Interactive Modules:

- Introducing Working Safely
- Defining Hazzard And Risk
- Identifying Common Hazards
- Improving Safety Performance
- Protecting Our Environment

Working safely is a one-day course for people at any level, in any sector, needing a grounding of health and safety. It focuses on why health and safety is important, and how you can make a real difference to the wellbeing of yourself and others through changing your behaviour.

It focuses on best practice rather than legislation, it's suitable for delegates from around the world, and not just those from highly regulated countries such as the UK.

The course is a 100% match to the Health and Safety Executive's 'Passport' syllabus.

Working safely is recognised as an equivalent to a level 1 award in health and safety in a construction environment. This means that delegates who successfully complete it can apply for a Construction Skills Certification Scheme (CSCS) green Labourer card once they've passed the CITB Health, Safety and Environment Operatives Test.

Allmode will tailor training to suit your operational needs and business type. Offering competitive rates with a worldwide capability.

Make Allmode your first point of contact when it comes to your training and security.

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iosh ICoC SAMI ISO 9001 PYA APSA InterManager Isle of Man Ship Registry

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Managing Safely

Aim:
Every manager should have an understanding of their responsibilities when it comes to health and safety

8 Interactive Modules:

- Introducing Managing Safely
- Assessing Risks
- Controlling Risks
- Understanding Your Responsibilities
- Identifying Hazards
- Investigating Accidents And incidents
- Measuring Performance
- Protecting Our Environment

Managing safely is a flexible course for managers and supervisors in any sector, and any organisation. It brings managers up to speed on the practical actions they need to take to handle health and safety in their teams.

Managing safely won't turn learners into health and safety experts – but it will give them the knowledge and tools to tackle the health and safety issues they're responsible for. Importantly – it brings home why health and safety is such an essential part of their job.

Allmode will tailor training to suit your operational needs and business type. Offering competitive rates with a worldwide capability.

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Compliance Health-Check

The compliance requirements for a modern vessel/owner can be a heavy burden to bear. Regulations mount up and the consequences of non-compliance can be harsh, leading to heavy fines, detention of the vessel causing loss of time and business, and even (where safety or pollution control is compromised) imprisonment. Where measures are not mandatory (such as cyber security) the burden can be onerous.

In an environment where time is increasingly precious, and the complexity and workload involved in remaining compliant is ever increasing, Allmode are pleased to offer a "one-stop-shop" solution for fault-finding, pre-audit, management reviews and policy/procedure writing to assist in success with external auditors and inspections, and to help avoid the negative impact of being found non-compliant.

This will allow you to concentrate on your core competencies, while we provide you with ours - contributing to a time-and-cost-efficient solution to maintain your operational capability, efficiency, stop-loss and safeguard your bottom line in all safety and security related matters.

Allmode Delivers:

- In-office and on-scene audits, conducted worldwide, at short notice by experts in the field.
- ISPS (SSA/SSP), ISM, MLC, SOLAS Class pre-audits and management reports
- Pre-Client's Audit inspection to satisfy client's/charterer's due-diligence requirements
- Due diligence investigation and reporting on clients and contractors
- Assistance with rectifying of identified non-conformances
- Assistance with implementing ISPS code requirements including record-keeping and development, conduct and supervision of 18-monthy large scale security exercises.
- On-scene health-and-safety survey, management review and risk assessments conducted by health and safety professionals with "Technical Practitioner" membership of the Institute of Occupational Safety and Health
- Pre-Port State Inspection Audits
- Free Insurance Health-Check
- IT/Cyber Security Health-Check (Including Vulnerability Assessment and Penetration Testing)
- Regular reviews and updates.

Case Study: MOL Precision Detained Due to Multiple Safety Violations and Poor Security Management

The U.S. Coast Guard has detained an MOL containership in Seattle over multiple significant violations discovered during port state control inspections.

The violations were discovered by Port State Control officers from Coast Guard Sector Puget Sound aboard the Panama-flagged MOL Precision. Violations included defective oil bilge line filtering equipment, missing security training records, and not sending required ballast tank information to the National Ballast Information Clearinghouse (NBIC) prior to entering a U.S. port.

According to the Coast Guard, the oil bilge line filtering equipment, required to be maintained so that the ship will not discharge bilge oil overboard, was found to have a non-functional alarm and intermittently operating meter.

As far as the missing security training records, the Coast Guard said that the records of the security drills could not be provided for an eight month period in 2014.

Finally, the required information for any vessel equipped with ballast water tanks and bound for ports or places in the U.S. was not sent to the NBIC, the Coast Guard reported. The NBIC collects analyses and interprets ballast water management data to reduce the likelihood of exotic species invasions.

The vessel will remain in Sector Puget Sound's Captain of the Port zone until the violations are corrected.

Allmode's proactive and preventative pre-audits could and can prevent this eventuality.

Fig.20: "Stepping Stones to an Effective Safety Culture: Barriers and Solutions" (Author's Interpretation)