Safety Science xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Review

Merchant shipping's reliance on learning from incidents – A habit that needs to change for a challenging future

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ARTICLE INFO

Article history:
Received 28 June 2016
Received in revised form 7 January 2017
Accepted 27 January 2017
Available online xxxx

Keywords:
Maritime transport
Safety regulation
Technology change
Learning from incidents
Novel technology

ABSTRACT

The safety record of the international merchant shipping industry has shown a continual improvement for a prolonged period due to its ability to learn from incidents and prevent recurrence; through training, education, technology development and regulatory change. However, the annual rate of ship losses has remained relatively unchanged in recent years. The industry has become accustomed to a safety regulatory regime based heavily on embedding lessons from incidents. That regime has served it well for more than a century but the industry is experiencing rapid change, which presents a challenge to this approach.

This paper reviews the development of the maritime safety regulatory regime and the 'proof of need' attitude to new regulations that has been created. Regulators face challenges with changes in both technology and the operational model and the paper discusses these in the context of the desire to prevent future casualties without waiting for incidents. As future societal demands lead to the introduction of novel technology in order to solve massive challenges such as climate change the risks of incidents are likely to increase. The conclusion reached is that the industry has a strong culture based on a backward-facing approach to learning from incidents but to maintain a continual improvement in safety it has to adopt a forward-facing approach of similar rigour, using some form of 'learning without the incidents'. A way forward is postulated where 'synthetic lessons' from simulated incidents that have not actually happened are 'learned' and accepted as justification within the safety regulatory regime.

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http://dx.doi.org/10.1016/j.ssci.2017.01.014
0925-7535/

1. Introduction

With the demise of long distance oceanic transportation of people, the carriage of passengers is restricted to ferries and cruise ships. Combined with the reduction in the number of seafarers and the change in the nations supplying seafarers, this disengagement of the general public from shipping has resulted in societal failure to comprehend the importance of the maritime freight 'pipeline'. Societal familiarity with the benefits brought by shipping (see the following section on context) has been largely replaced by a focus on the unacceptability of maritime incidents, particularly those involving highly visible, widespread pollution.

In earlier times the primary concern was for the loss of life associated with maritime incidents, both passengers and seafarers. That societal concern was inevitably incident-driven with a call for regulation to ensure that 'this can never happen again'. Over time this pressure has resulted in the development of a unique safety regulatory regime, which reflects the international nature of shipping but retains national legislative structures for enforcement. The international and national statutory regulation is supported by a form of self-regulation carried out by classification societies, as independent standards-setting and enforcement bodies. The classification societies hold a unique position whose contribution is recognized by, and indeed mandated by, the National Administrations and enshrined in the regulations developed by the International Maritime Organisation (IMO, the London-based United Nations specialized agency that is the global standards-setting agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships). The duplex arrangement is referred to in this paper as a single entity, the maritime safety regulatory regime, reflecting the fact that the two elements each require, and depend on, compliance with the other.

The responsibility for safety cannot simply be shouldered by the regulators. Whilst there is often a presumption that some form of regulatory intervention is necessary to ensure that safety is properly maintained, as exemplified by the campaign of Plimsoll (1873) and Everard (2003) clearly made the case that ultimately *'it is the owner who is responsible'*. In exploring whether a ship owner is faced with a dilemma when confronted with matters of profit and safety Everard, from an established ship owning family, concluded that '*It has to be a team effort with many institutions and authorities involved, it is the only way to improve. The most important person, as always, is the ship owner. The owner is the one who chooses the flag, the insurer, classification society and to a degree the method of operation... The buck finally stops at the owner*.' This conclusion becomes especially relevant when considering the move towards incorporating safety management systems within the maritime safety regulatory regime. Although there are many other procedures and codes of good practice available the ship owner does rely, to some extent, on compliance with the maritime safety regulatory regime as an indicator of adequate safety. This paper focuses on the safety regulatory regime, but the discussion and conclusions can also be related to other safety contributors.

The paper sets out the context, describes how the maritime safety regulatory regime has developed and how that development has created a strongly held view that any new regulation must be justified by irrefutable evidence of necessity. Against that background the paper discusses the impact of changing technology on maritime safety and the contribution of human performance on both incidents and incident prevention. Looking forward to increasingly rapid technology change the paper suggests possible routes to creating a proactive maritime safety regulatory regime that can be built on synthetic evidence or through transfer of experience from other applications.

2. Context

Merchant shipping is a global critical infrastructure which has become absolutely essential to modern existence. World trade relies on shipping with 80% of international trade by volume, and 70% by value, generally being quoted as being transported by sea. The former Secretary-General of the IMO, Efthimios Mitropoulis, characterized this dependence by stating that '*without ships and seafarers, one half of the world would freeze whilst the other half would starve*'.

The volumes of maritime cargo are very large – the review of maritime transport by UNCTAD (2014) identifies the volume of seaborne trade carried in 2014 as

- Oil and gas 13,447 billion ton-miles
- Bulk cargo 30,505 billion ton-miles
- Containers 8466 billion ton-miles

Clearly, the safe, efficient and reliable transportation of these large volumes of cargo requires a correspondingly large fleet of ships. Moreover, Everard (2003) observed that *'shipping safety has become increasingly inseparable from commercial efficiency'*. The merchant shipping fleet, at the beginning of 2015, comprised 50,422 ships (Barnes, 2015), with an individual gross tonnage greater than 300 (note: Gross tonnage is a measure of volume, used to represent the earning capacity of a ship and used predominantly for the calculation of fees and taxes), with a combined cargo carrying capacity of 1600 million tons. The fleet includes 13,647 tankers with a cargo carrying capacity of 580 million tons and 5097 container vessels with a cargo carrying capacity of 228 million tons. The largest cargo ships currently in operation can each load more than 400,000 tons of cargo.

In terms of governance whilst some ship owners and ship managers operate very large fleets the average number of ships in a fleet is about seven. The world fleet is registered under the jurisdiction of many nations. The IMO has 171 members. Some national administrations still retain considerable expertise whilst others are little more that registries, relying totally on the organizations that they recognize, usually the classification societies, to carry out the supervision of their registered ships.

This very short overview demonstrates the breadth of the merchant maritime sector. The maritime safety regulatory regime must be capable of effective application across this diverse industry, across cultures and scales and technologies.

3. The safety record

By learning from incidents the marine safety record has shown continual improvement throughout recorded history. The recent history is shown in Fig. 1, based on the annual World Casualty Statistics published by IHS Fairplay (2015). The annual loss rate is based on actual and constructive total losses, where constructive total losses of ships are those where repair or recovery might be practicable but is prohibitively expensive. The trend is indicated by a fitted exponential curve which illustrates the slowing rate of improvement over the thirty-five year period. The inclusion of constructive total losses explains some of the year on year variation as factors such as the price of scrap steel and freight rates affect decisions on the repair of badly damaged ships. Further peaks are attributable to years with extreme storms and similar maritime hazards. The effectively flat line between 2002 and 2010 caused considerable concern. More recently the loss rate has fallen again, although the severe changes in the industry following the financial crisis of 2008 might have been expected to lead to reduced maintenance and fleet renewal, thereby increasing risk of incidents.

Please cite this article in press as: Pomeroy, R.V., Earthy, J.V. Merchant shipping's reliance on learning from incidents – A habit that needs to change for a challenging future. Safety Sci. (2017), http://dx.doi.org/10.1016/j.ssci.2017.01.014