Safety Science 102 (2018) 251–262

Contents lists available at ScienceDirect

Safety Science

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

Regulation or criminalisation: What determines legal standards of safety culture in commercial aviation?

Anthony J. Lawrenson*, Graham R. Braithwaite

Safety and Accident Investigation Centre, Cranfield University, UK

ARTICLE INFO

Keywords:
Safety culture
Safety management
Criminalization of aircraft accidents
Aviation safety
Risk management
Corporate manslaughter

ABSTRACT

This paper highlights that further development of safety culture as a quantifiable standard presents a considerable dilemma to policy makers. The imposition of legal standards in any area of human endeavour is generally predicated on the assumption that the affected parties are aware of their causal role and therefore legal responsibilities. An intuitive response to this expectation would be to provide a well-defined, measurable and manageable structure of safety culture. However, we will consider whether that by presenting an effective safety culture as an achievable final goal, safety performance could be compromised in the long-term. Identified in numerous case studies (presented in two tables), the contrary approach of leaving safety culture as a loosely defined and adaptable concept, allows the criminal justice systems the opportunity to criminalise those safety cultures perceived as being inadequate, in the aftermath of a fatal accident. This approach encourages hindsight bias and potentially inhibits the development of reporting cultures within organisations. Should fear of exposure to retrospective analysis by the criminal justice system inhibit the free flow of information, organisational learning would be inhibited. Restrictions to the rate and quality of safety reporting remains one of the greatest challenges to the effectiveness of SMS across commercial aviation at operator, national and international level.

1. Introduction

Society protects itself through its legal policies and like all policies, those governing safety and risk management must demonstrate effectiveness to be credible. These standards reflect levels of societal tolerance, traditionally of individual behaviour but increasingly of organisational or corporate behaviour. Contemporary theories in safety science increasingly focus on a systems approach to explaining accidents, not only in the recognition of the organisational accident but by taking a system thinking approach to safety management. Whilst an aircraft accident is formally defined within international convention, (ICAO, 2010), the concept of an organisational accident originates within a system thinking approach; the approach recognises the influence of organisational culture on risk perception and therefore individual behaviours, (Cooper, 1997; Reason, 1997; HSE, 2007; Woods et al., 2010; Leveson et al., 2009, Leveson, 2011a). Similarly, legal theories of corporate crime and organisational failure identify a shift away from the traditional view of the corporation, described by Jensen and Meckling (1976) as a 'nexus of contracts', towards a more holistic or organic concept of corporate functionality, (Johnson, 2008; Kirk, 2012; Forlin and Smail, 2014). This emerging perspective of the corporation as an entity, allows, or even encourages the imposition of broader social responsibilities. The recognition of these social responsibilities can result in corporate criminal liability in the aftermath of a fatal accident, (Wells, 1996, 2001; Donaldson and Watters, 2008; Almond, 2013; Forlin and Smail, 2014; Hopkins, 2015).

1.1. A legal standard

A legal standard might broadly be defined as a standard of conduct which (in the context of corporate liability) is the norm for its industrial sector. A breach of this standard might include reducing costs by compromising regulatory compliance (Zhang et al., 2008). It may also include organisations which achieve regulatory minimum, but in the aftermath of a fatal accident are found to fall below the standards of reasonable expectation of society or the criminal justice system because of a tendency to manage a spread, rather than manage a reduction of risk (Wells, 1996; Gobert and Punch, 2003; Hopkins, 2005; Pinto and Evans, 2008; Almond, 2013). In the face of global corporatisation, and a hardening of social attitudes towards corporate malfeasance, legal systems have adapted concepts of corporate fault to meet public expectation, (Slapper, 2010; Almond, 2013; Forlin and Smail, 2014; Hopkins, 2015). Set against the background of these changes in the international socio-legal landscape, this paper focuses on the

* Corresponding author.
E-mail address: a.j.lawrenson@cranfield.ac.uk (A.J. Lawrenson).

http://dx.doi.org/10.1016/j.ssci.2017.09.024
Received 20 July 2016; Received in revised form 14 February 2017; Accepted 26 September 2017
Available online 06 November 2017
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Table 1
Possible strategies of regulating safety culture.

Strategy	Description	Advantages/disadvantages
Inter-national regulatory standard of safety culture	Regulator defines an industry standard (or a standard set of attributes) of safety culture; one international standard.	This approach would provide clarity as to the nature of industry safety culture and the required standard of safety culture possibly benchmarked against other operators. It would provide a measurable international standard. Unless adapted (Noort et al., 2016) the approach could ignore leading indicators of safety behaviours associated with national culture, Hudson (2007). It could also inhibit continual improvement, as note by Grote (2007).
National standards of safety culture	National aviation authorities assess their own safety culture that adapts to the particular characteristics of the nation and its cultural and legal environment.	As the regulator can co-ordinate development within a singular jurisdiction then national cultural behaviours are adapted into the regulatory structure by providing a benchmark within national standards (Kim and Choi, 2016). However, the very nature of international commercial aviation means multi-cultural interaction is inevitable and needs to be considered, Reader et al. (2015). Experience in the nuclear and petro-chemical industries suggest strong tendencies for the regulator and the operator to have very different interpretations on what effective safety culture looks like, Kringen (2013).
Organisation defined safety culture (Broad purposive)	Basing a safety culture definition adapted to each organisation allows a more purposive and flexible approach tailored to each organisation.	As each organisation effectively develops its own cultural traits, trying to adapt to a generic model might be ineffective. This approach could produce models of safety cultures rather than one specific definition. This approach may lack a degree of objectivity and could be rather descriptive, Grote and Weichbrodt (2013). Organisational self-awareness may not develop as no benchmarking facility would develop, Dempsey (2010). The organisation may develop standards that fall below common industry or broader socially acceptable standards of safety and risk management, Hopkins (2006).
No specified regulatory standard or definition of safety culture	The regulator provides nothing more than guidance as to best practice. Operators are merely compelled to assess and record their safety culture as part of their SMS.	Differences in national and cultural norms are partially offset as the organisation determines its own acceptable standard of safety culture. Enforcement is not a regulatory strategy as the low level of fines and minimal impact of enforcement orders do not induce the long term process of safety culture development. The incentive to develop safety culture is derived from the significant financial and public relation impact of prosecution by the criminal justice system.

emergence of a legal standard of safety culture within commercial aviation.

1.2. Defining safety culture

The International Nuclear Safety Advisory Group defines safety culture as "that assembly of characteristics and attitudes in organisations [sic] and individuals, which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance"[1]. The Confederation of British Industry (CBI, 1990) refers to safety culture as "…the way we do things around here". However, despite the various definitions, many accident investigation bodies such as the NTSB[2] are reticent about describing 'safety culture' as a 'probable cause' of accidents. "Investigators should be particularly cautious about attempting to assess safety culture after an organisation [sic] has experienced an accident or incident". Czech et al. (2014:5), assert that the inability of safety academics and practitioners to provide a useable definition of what safety culture is, lies at the foundation of this unease with safety culture as an accident cause.

1.3. The rising profile of safety culture

The established source of internationally recognised standards regarding safety management in commercial aviation is the ICAO[3] Safety Management Manual (ICAO, 2013a). Now into its third edition, the document describes three eras of safety management based on contemporary knowledge; from the early 1900s to the late 1960s – the technical era; from the early 1970s to the mid 1990s – the human factors era; and latterly, from the mid 1990s to the present day – the organisational era. Improvements in aviation safety performance attributed to the first two eras, technical and human factors, have seen an associated development of regulatory regimes, which specify minimum standards of compliance. The influence of organisational culture and policies on the effectiveness of safety and risk controls is acknowledged and defined within the opening pages of ICAO's SMM, 'Culture is characterized [sic] by the beliefs, values, biases and their resultant behaviour that are shared among members of a society, group or organization [sic]', (ICAO, 2013a:21). Within the sphere of formal accident investigation, safety culture first achieved formal recognition during the IAEA, (International Atomic Energy Agency), investigation into the explosion at the Chernobyl nuclear power plant, in Ukraine in 1986, (see Table 2). From an academic perspective, safety culture is generally recognised as a derived component of organisational culture, relating to an organisations safety and risk management practices, (Schein, 1996; Cooper, 1997, 2000; Guldenmund, 2000). In recognising the significant influence that organisational culture has on risk related behaviours, number of contemporary safety science commentators have implored operators and regulators to develop and improve organisational safety culture, in order to improve safety performance, (Cooper, 1997, 2000; Guldenmund, 2000; Hopkins, 2002; Bell and Healey, 2006; Morley and Harris, 2006; von Thaden and Gibbons, 2008; Leveson, 2011b).

2. Regulating safety culture in aviation

Whilst its influence on organisational behaviours has been generally accepted, implementing a regulatory standard of safety culture presents

[1] "Safety Culture" – A report by the International Nuclear Safety Advisory Group (Safety Series No.75-INSAG-4).

[2] The National Transportation Safety Board (NTSB) is an independent United States federal government agency charged with determining the probable cause of transportation accidents and promoting transportation safety, and assisting victims of transportation accidents and their families.

[3] The International Civil Aviation Organisation, a division of the United Nations sets and maintains common standards and best practice procedures for global commercial aviation.

a considerable challenge. A number of regulatory programmes are developing; Table 1 describes four generic strategies to regulating safety culture at international, national and organisational level. Eurocontrol is the organisation responsible for Air Traffic Control Management Europe. Since 2012 it has introduced a safety culture assessment following Regulation EU390/2013; safety culture is identified as a key performance indicator. Similarly, the Swiss Federal Office of Civil Aviation (FOCA) and the United Kingdom's (UK) Civil Aviation Authority (CAA) have embarked on the development of a safety culture assessment programme based on the work of Piers et al. (2009). In an effort to try to quantify the essential elements of safety culture and provide an acceptable regulatory definition of safety culture for these initiatives, six phenomenological indicators have been identified, based on the work of Piers et al.: management *commitment* to safety, safety *behaviours*, flow of safety related *information*, organisational *adaptability*, employee *awareness* of safety issues and finally, *justness* i.e. how 'just' is the organisation's culture[4].

The only commercial aviation accident investigation body, we are aware of, which even approaches a formal post-accident assessment of safety culture attributes, is the Transport Safety Board (TSB) of Canada. TSB Canada, the country's multi-modal accident investigation body, have developed a common framework for its staff to investigate organisational and management factors. The stated aim of this TSB Canada policy is to address systemic issues that shape human performance, (Morley and Stuart, 2014).

2.1. Challenges to regulating safety culture

A consistent criticism of many safety culture models is their predominant basis in Western cultural norms and value sets, (Hudson, 2007). However, recent research by Reader et al. (2015), has utilised the national characteristics identified by Hofstede (2001), to adjust safety culture indicators to accommodate national characteristics. Reader et al. and subsequent work by Noort et al. (2016), have made an important contribution by recognising significant differences in national attitudes to critical attributes of safety culture. In establishing a link between Hofstede's 'uncertainty avoidance' (UA) and 'power distance' (PD) indices, to significant safety values and beliefs, such as rule compliance, risk appetite, blame, adaptability and reporting behaviours, their work provides further insight to our understanding of the causal influence of safety culture. However, the establishment of a universal regulatory defined standard of safety culture has more fundamental obstacles to overcome.

A number of academics have challenged the idea that safety culture can actually be measured and therefore managed or regulated in any conventional sense. Grote (2007) suggests the utilisation of safety culture to achieve broad consensus across an organisation through 'loose coupling', is key to enabling organisational adaptability in the face of uncertain outcomes. Accordingly, Grote and Weichbrodt (2013), suggest that the 'abstract concept' of safety culture itself is an inappropriate regulatory objective and focus, should instead, be directed at rule adaptation and interpretation by the workforce by which the quality of safety culture can then be inferred. Le Coze and Wiig (2013), note that when a generic programme of improving health and safety culture was introduced to the Norwegian petroleum industry, variable interpretations from the regulator, management and the workforce resulted in significant disparities in the programmes output. This component approach to safety performance is challenged by a group of safety researchers who have taken a holistic or system thinking approach alternatively referred to as Cognitive System Engineering (CSE)[5]. "Safety is a system property, not a component property, and must be controlled at the system level rather than the component level", (Leveson et al., 2009:235).

2.2. The risk of certainty

An intuitive response to academic and industry ambiguity concerning definitions of safety culture, might be to provide a regulatory definition and enforce through threat of sanction. Wahlstrom and Rollenhagen (2009), considered such a strategy of certainty. They concluded that in providing operators with an approved definition or standard by which they can compare their own safety culture with other industry operators, the regulator creates an achievable minimum acceptable level of safety culture. However, the self-determined achievement of this goal, would ultimately be counterproductive to long-term safety performance.

In considering the effectiveness of sanction, Simpson et al. (2014), challenged the belief that deterrence is an effective regulatory strategy to influence corporate behaviour. Their *meta*-study suggested that regulatory strategies should not assume logical or proportionate responses by corporate actors. Organisations may similarly adopt the position that non-compliance, shrouded in the veil of 'equivalent' or 'alternative' means of compliance, will suffice. Simple cost benefit analysis would lead in the direction of Fischel's argument that the "optimal level of violations of law…is not zero" (1982:1271). Fischel (1982) suggests that relatively small fines and penalties are simply an acceptable cost to corporations; a necessary cost of maintaining an optimum market strategy in the face of regulatory hurdles.

Almond (2013), makes a similar point. He argues that as regulation is primarily concerned with managing rather than prohibiting certain conduct, enforcement action is rare. The net effect is that regulatory policy provides limited threat of reputational or penalty loss. According to Faure (2014), the effect of deterrence is further curtailed through the extensive use by corporations of comprehensive insurance products which mitigate the risk of asset loss.

2.3. The risk of ambiguity

Hopkins (2014) considered the alternative perspective. He warns that an inadequate definition of safety culture could lead to investigators imputing operators' thoughts rather than focussing on what has actually been done. But whilst there are difficulties in constructing a definition of the concept of safety culture for regulatory purposes, avoiding the pursuit of a definition creates other issues. Ambiguity could encourage the promotion of 'corporately palatable' versions of the concept of safety culture, or politically convenient interpretations of accident causation, Dempsey (2010).

The concept of safety culture remains something of an *inconveniently* abstract term with which safety performance can be engineered towards improvement. In contrast it is perhaps a little too *convenient* a quasi-legal term, used *post hoc*, to explain why organisations fail. As an example, Grote and Weichbrodt (2013) refer to the BP Texas City accident, (see Table 2), which describes many organisational problems, but with little detailed analysis. The report concludes that inadequate safety culture was the major cause of the accident as a blanket assessment of a failed organisation. A similar criticism could be made of the findings of the public inquiry into the high mortality rates of patients under the care of the Mid-Staffordshire National Health Service Foundation Trust, in the United Kingdom. The failures of the Trust were loosely defined concept of culture; cultures of 'fear', 'bullying' and 'secrecy', Francis (2013:16). Francis avoided imputing individual liability on the governing board by explaining the failures under the broad definition of 'cultural' causes. This leaves the suggestion that the malleable terminology of safety culture could be utilised to offset the increasingly unpalatable process of criminalising individual operators in the aftermath of an aircraft accident and instead focussing on the safety

[4] The *italic* emphasis is added to illustrate the title of each assessed characteristic of safety culture.

[5] This group would include *inter alia*: Rasmussen (1997), Woods and Cook (2002), Hollnagel (2004), Leveson (2004) and Dekker (2005) noted at Leveson et al. (2009:241), Marais et al. (2004).

Table 2
The causal role of safety culture in a number of high profile accidents.

Incident, year & fatalities	Inquiry	Synoptic of the causal role of safety culture	Individual criminal prosecution/conviction	Corporate criminal prosecution/conviction
Chernobyl Nuclear Reactor Meltdown 1986: Approximately 60 initial deaths.	IAEA (International Atomic Energy Agency), Safety Series INSAG-7 (1992)	'…safety culture was lacking in the operating regime at Chernobyl', (IAEA, 1992:21)	Six site managers & supervisors were convicted & sentenced under the Criminal Code of Ukraine, with terms of between 2 & 10 years on labour camps, Marples (2014).	None
Challenger Space Shuttle Launch Accident, 1986: 7 Fatalities.	Report by the PresidentialCommission, chaired by William P. Rogers, (NASA, 1986)	Commissioner Richard Fenyman described NASA's organisational decision making as 'a kind of Russian Roulette', (NASA, 1986:148)	None	None
Sinking of the Herald of Free Enterprise, 1987: 193 Fatalities.	Department of Transport (1987). Inquiry headed by Mr. Justice Sheen.	'From top to bottom the body corporate was infected with the disease of sloppiness', (Dept. of Transport, 1987:14).	The Crown, on the grounds of insufficient evidence, dropped five individual prosecutions for manslaughter. *R v P & O European Ferries (Dover) Ltd.* (1991).	The case against the company failed when Turner LJ directed the jury not to convict. *R v P & O European Ferries (Dover) Ltd.* (1991).
Kings Cross Underground Fire, 1987: 31 Fatalities	Department of Transport (1988). Inquiry headed by Mr. Desmond Fennel QC.	'…London Underground at its highest levels may not have given as high a priority to passenger safety in stations as it should have done', (Dept. of Transport, 1988:116).	None	None
Explosion of the Piper Alpha Oil Rig, 1988: 167 Fatalities.	Public Inquiry into the Piper Alpha Disaster, 1990. Inquiry Headed by Lord William Cullen.	'Senior management were too easily satisfied that the (permit to work) system was being operated correctly, relying on the absence of any feedback of problems as indicating that all was well.' (Cullen and Douglas, 1990:238).	None	None
Clapham Rail Crash, 1988: 35 Fatalities.	Investigation into the Clapham Junction Railway Accident 1989.Inquiry headed by Anthony Hidden QC	'There were obvious weaknesses both in the adequate training of staff and communicating to them, the force, relevance, and the importance of Departmental Instructions. Though they should have been obvious, the weakness were neither monitored nor corrected', (Hidden 1989:100).	None	British Rail pleaded guilty to two breaches of Health & Safety offences and fined £250,000. *R v British Rail Board* (1991), unreported, Central Criminal Court.
The Westray Mining Explosion, Novia Scotia, 1992: 26 Fatalities	'The Westray Story: A Predictable Path to Disaster: Report of the Westray Mine Public Inquiry', Richards (1996).	'The unsafe use of torches underground was a common practice at Westray. Management was aware of the practice, condoned the practice, and reprimanded those who condemned it. In so doing, management sent a clear message to the underground workers. Management's unsafe mentality was, in effect, filtering down to the Westray workforce', Richard (1997:149)	Two charges of manslaughter were imposed on two of the mines managers, Gerald Phillips and Roger Parry, but were stayed by the crown due to lack of evidence. Richards (1996).	Public pressure following the disaster resulted an amendment to the Canadian Criminal Code 467.3 §0.2(c). The amendment facilitates the prosecution of Board members, senior managers & the corporate body itself. Canadian Government (1994).
Ladbroke Grove Rail Crash, 1999: 31 Fatalities.	The Ladbroke Grove Rail Inquiry.Rt Hon Lord Cullen, 2001.	"The culture of the place had gone seriously adrift over many years", Railtrack's incoming Zone Director, (Cullen, 2001:4).	None	Network Rail pleaded guilty to breaches of Health & Safety offences and fined £4 million. *R v Network Rail (2007)*, unreported, Blackfriars Crown Court.
Hatfield Rail Crash, 2000: 4 Fatalities.	Office of Rail Regulator (ORR), 2006.	'At the time of the derailment and over the previous two years, the culture within Railtrack which conditioned decision making on safety and performance issues, was biased towards performance-driven decisions.' (ORR, 2006:8.105)	Fifty-five suspects were initially interviewed under caution. Six individuals were prosecuted for manslaughter and a further six under Health & Safety legislation. All manslaughter and Health & Safety charges were subsequently dropped against company executives. *R v Network Rail, Balfour Beatty Rail Infrastructure Services Ltd and others,* Old Bailey, 2005.	For Health & Safety Offences Balfour Beatty were fined £10 million (reduced to £7.5 million on appeal) & Network Rail (now taken over by Railtrack) fined £3.5 million. *R v Balfour Beatty Rail Infrastructure Services Ltd.* [2007] 1 Bus LR 77.
Columbia Space Shuttle in-flight break-up, 2003: 7 Fatalities.	Columbia Accident Investigation Board (CAIB) 2003. National Aeronautic & Space Administration (NASA).	'The Shuttle Program's complex structure erected barriers to effective communication and its safety culture no longer asks enough hard questions about risk.' (CAIB:185).	None	None

(*continued on next page*)

Table 2 (*continued*)

Incident, year & fatalities	Inquiry	Synoptic of the causal role of safety culture	Individual criminal prosecution/conviction	Corporate criminal prosecution/conviction
Loss of Nimrod XV230 in Afghanistan, 2006: 14 Fatalities	The Nimrod Review, Charles Haddon-Cave,2009.	'…a safety culture that has allowed 'business' to eclipse Airworthiness', (Haddon-Cave, 2009:445).	None	None
Explosion of the BP Deepwater Horizon Oil Rig, 2010: 11 Fatalities.	'Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling', National Commission, 2011.	BPs own investigation report, does not mention the term 'safety culture' but focuses on the technical and human failings of the BP and Transocean rig teams. The National Commissions report mentions BPs poor 'safety culture' 25 times.'BP's safety culture failed on the night of April 20, 2010, as reflected in the actions ofBP personnel on and offshore and in the actions of BP's contractors', National Commission, 2011:223).	Two of the most senior managers on board the Deepwater Horizon at the time of the explosion, Donald Vadrine and Robert Kaluza, faced 11 counts of involuntary manslaughter, The charges were dropped in 2015, (Department of Justice, 2015).	In January 2013, BP accepted a guilty plea under §1115 of the US Criminal Code for *inter alia* Felony Manslaughter and fined $4 Billion. Further litigation costs of $18 Billion may mean the total cost of litigation could rise to $46 Billion. (Department of Justice, 2015).
Meltdown of the Fukushima Nuclear Reactor, 2011: 0 Fatalities from immediate and direct radiation exposure.	The Official Report of the National Diet of Japan, 'Fukishima Nuclear Accident Independent Investigation Commission, (Executive Summary), 2012. Inquiry headed by Dr. Kiyoshi Kurokawa.	'Muto (Advisor and senior executive of the Tokyo Electric Power Company – TEPCO), implied that the cause of the accident was due to the unexpected tsunami, but the possibility of a tsunami was estimated in 2002—so TEPCO must have recognised the risks. Muto, however, claimed to have been unaware of such studies. This obviously was a failure of the safety culture within TEPCO', (Kurokawa, 2012:74).	Initially, the Fukushima Prosecutors Office had refused to prosecute thirty-three individuals under the offence of 'Professional Negligence resulting in bodily harm or death', (Japanese Criminal Code art. 211 (1), punishable by up to 5 years' imprisonment, or a fine of less than ¥1.000,000). The ex-Chairman of TEPCO and 2 senior executives face criminal charges. An investigation will determine whether the case will proceed to trial, Herber (2014).	There is no general Corporate liability under the Japanese Criminal Code, although under the doctrine of Ryobatsu-Kitei (double punishment) a corporation could face charges for the act of an associated individual. (Donaldson and Watters; 2008; Forlin and Smail; 2014).

culture of the relevant organisation.

2.4. Attributes of safety culture

Without consensus of what constitutes a legal standard of safety culture, in the event of a high profile accident with *prima facie* evidence of organisational failure, prosecutors and accident investigators, will search for a causal explanation. Dekker and Nyce (2011), in exploring the influence of 'folk-models' of causation within accident causation, point to the basic human need for causal explanation, described by Nietzsche (1889) as 'caused or aroused' by a fear of the unknown[6]. To describe this causal evolution, the case studies in Table 2 were collated as examples of high-profile accidents which prompted subsequent public inquiries and some criminal investigations. Table 2, is by no means exhaustive and is included to provide a chronology of some of the higher-profile accidents and associated attributes of safety culture that have been recognised as a contributory cause. High-profile accidents will often attract more investigative resources and can hold considerable political currency, (Hopkins, 2006; Hollnagel, 2014). As such these investigations often look deeper into the organisational influences behind the proximate causes. Table 2 highlights the attributes, i.e. the 'values and attitudes' highlighted by Piers et al. (2009), of safety culture, as identified by the accident investigation report or the subsequent criminal investigation.

The examples would suggest that despite the lack of a specific regulatory standard, the descriptive use of the attributes of safety culture has become more common within the spheres of both accident investigation and corporate criminal justice.

2.5. Attributes of corporate criminalisation

In Table 2, the accident report or subsequent criminal investigation, has identified one or more attributes of safety culture as a causal factor[7]. Many of the reports, (IAEA, 1992; Cullen, 2001; ORR, 2006; CAIB, 2003; Haddon-Cave, 2009; National Commission, 2011; Kurokawa, 2012), made specific references to *operating, company, organisational* and *safety culture*. Other reports described the 'values and attitudes' similar to the broader definition of safety culture used by Piers et al. (2009). These include '*organisational decision-making*', (NASA, 1986), the '*low priority of safety issues*', (Department of Transport, 1988), '*inadequate training'*, (Hidden, 1989), '*lack of reporting or feedback*', (Cullen, 1992), and management knowledge or condoning of '*unsafe practice*', (Richards, 1996).

Similar to the characteristics identified by Piers et al. (2009), the reports and inquiries use contextual phrases or attributes of the relevant organisations safety culture, rather than a generic or all-embracing definition. Using these collated attributes of safety culture, a further search was applied to examples of aviation examples of criminalisation, initially to cases identified by Michaelides-Mateou and Mateou (2010), and then subsequently to a broader search of examples of criminalisation identified in other studies, post-2009, (Dekker, 2011; Trögeler, 2011; Nemsick and Passeri, 2012). The aim of the research was to identify examples where the criminalisation of aircraft accidents had included corporate liability and significantly, what role safety culture played in imputing this liability. The results of the search are listed in Table 3. The physical and temporal proximity of operators and their

[6] "First principle: any explanation is better than none. Because it is fundamentally just our desire to be rid of an unpleasant uncertainty, we are not very particular about how we get rid of it: the first interpretation that explains the unknown in familiar terms feels so good that one 'accepts it as true'. We use the feeling of pleasure ('of strength') as our criterion for truth. A causal explanation is thus contingent on (and aroused by) a feeling of fear", Nietzsche (1889:5).

[7] For non-English reports, Google Translate was used to provide an appropriate search phrase and minor alterations were made to accommodate differences between English and American English spelling.

Table 3
Attributes of safety culture in commercial aviation accidents.

Incident, year & fatalities	Inquiry	The causal role of safety culture	Individual criminal prosecution/conviction	Corporate criminal prosecution/conviction
Air Inter Flight 148, Strasbourg, 1992: 87 fatalities.	Rapport de la commission d'enquête sur l'accident survenu le 20 janvier 1992 près du Mont Sainte-Odile (Bas Rhin) à l'Airbus A 320 immatriculé F-GGED exploité par la compagnie Air Inter, BEA (1993).	'The Commission therefore considers that the company culture is an important component of understanding the negative position taken by the company in respect of the GPWS'. BEA (1993:23.113).	Six individual defendants from Airbus, air traffic control, the airline, and the French Aviation Authority, DGAC were prosecuted then acquitted of manslaughter charges, Pearson and Riley (2015).	Airbus and Air France (parent of Air Inter) liable for damages and ordered Air France and Airbus to pay compensation to the relatives of the deceased', Tribunal de Grande Instance de Colmar, (2006).
ValuJet Flight 562, Florida 1996, 110 Fatalities.	'Aircraft Accident Report NTSB/AAR-97/06(PB97-910406), In Flight Fire and impact with Terrain, ValuJet Airlines Flight 592, DC-9-32, N904VJ Everglades, near Miami, Florida, May 11, 1996', NTSB (1997).	In a letter from ValuJet's Federal Aviation Authority inspectors: 'It appears that ValuJet does not have a structure in place to handle your rapid growth, and that you may have an organisational culture that is in conflict with operating to the highest possible degree of safety.' NTSB (1997:77).	Sabre Tech vice president of maintenance & two mechanics were charged with recklessness and numerous regulatory breaches. In 1999 all individuals were acquitted. US v Sabre Tech (2001).	Sabre Tech was found guilty of several regulatory & safety breaches. The convictions were eventually over-turned by the Federal Appeals Court. The company was also charged by Florida state prosecutors with 110 counts of 3rd degree murder & 110 counts of manslaughter. All but one of the charges were dropped under a plea agreement, Pearson and Riley (2015).
Alaska Airlines Flight 261, California, 2000: 88 Fatalities	'Loss of Control and Impact with Pacific Ocean Alaska Airlines Flight 261 McDonnell Douglas MD-83, N963AS About 2.7 Miles North of Anacapa Island, California January 31, 2000' NTSB (2000)	An NTSB Safety Assessment carried out earlier in 2000 made 170 recommendations it stated were intended to "guide both strategic planning and tactical action by Alaska Airlines as they move to strengthen the foundation of an effective safety culture that anticipates the potential for problems and acts swiftly and effectively to mitigate such threats." NTSB (2002)	None	Following the NTSB report into the crash, the US Attorney's Office announced a criminal investigation into the conduct of Alaska Air Group Inc. The case was dropped due to lack of evidence in 2003. US Attorney's Office (2003)
Air France, AFR 4590, Concorde F-BTSC, Paris, 2000: 113 Fatalities.	'Accident on 25 July 2000 at La Patte d'Oie in Gonesse (95) to the Concorde registered F-BTSC operated by Air France', Bureau d'Enquêtes et d'Analyses Pour la sécurité de l'aviation civile, BEA (2002).	The report mentions 57 incidents of tyre damage to Concorde aircraft. After implementing Airworthiness Directives during 1981–1982, no further modifications were made, suggesting the aircraft type was operated for over 17 years with a known risk to safety. The fleet incurred further incidents but the major design requirement, the strengthening of the fuel tanks was only undertaken after the fatal accident. BEA (2002:94-97).	Two former Concorde engineers, a former French civil aviation official and two Continental Airlines employees were charged with various offences including manslaughter. Initially only one employee of Continental was found guilty but in 2012 his sentence was overturned. Pearson and Riley (2015).	Continental Airlines were initially charged and convicted of corporate manslaughter. The company was fined €200,000. This verdict was overturned in 2012, absolving Continental of any criminal responsibility. Pearson and Riley (2015)
Collision of Scandinavian Airlines System Flight 686 with a Cessna Citation at the Linate Airport in Milan, 2001. 118 Fatalities	Agenzia Nationale Per La Sicurrezza Del Volo (ANSV): Accident involved aircraft Boeing MD-87, registration SE-DMA & Cessna 525-A, registration D-IEVX, Milano Linate airport, October 8, 2001, ANSV (2004).	Commenting on the lack of compliance of aerodrome management to Annex 14, the ICAO guide to aerodrome safety management: 'The reason for this may be many; complex aerodrome management organisation, lack of safety management system, unclear responsibility structure, weak safety culture, high traffic flow/intensity and physical expansion of aerodromes, etc. ANSV (2004:152).	In 2004, a court convicted four defendants, including one air traffic controller and the former director of the Italian air traffic control agency (ENAV) of manslaughter and negligence and sentenced them to prison terms ranging from six and a half to eight years. Pearson and Riley (2015).	Corporate criminal liability was not recognised in Italian law until 2001, namely Legislative Decrees 231/2001. This statutory liability does not extend to public bodies. Gobert and Mugnai (2002).
Crossair Flight LX 3597 Crossair Avro RJ100, Zurich, 2001: 10 Fatalities.	'Final Report No.1793 by the AAIB concerning the accident to the aircraft AVRO 146-RJ100, HB-IXM, operated by Crossair, Flight Number CRX 3597, 24th November 2001, Basserdorf, Zurich'. AAIB (2003).	'In summary, the flight safety officer described the activity of the flight safety department as reactive.' AAIB (2003:1.17.1.3). 'The individual fleets differed greatly in terms of their operation and operating cultures', AAIB (2003:1.17.14) Described as a 'culture of fear' by prosecutors, Michaelides-Mateou and Mateou (2010:74).	Six Crossair Chief Exeecutive, Dose, Chairman Maurice Sauter, four other airlines executives and the Chief of FOCA (Swiss Aviation Regulator), Andre Auer, faced criminal charges for negligent homicide. Their cases were eventually stayed in 2008. Pearson and Riley (2015).	Corporate criminal liability can be invoked under Article 102 of the Swiss Penal Code; the wording of the article would suggest this is only as an alternative where individual liability cannot be imputed. (Donaldson and Watters; 2008; Forlin and Smail; 2014).
DHL B757 collision with Bashkrian Airlines Tu154,	Investigation Report: (AX001-1–2/02). Accident, 1 July 2002, (near) Uberlingen/Lake of Constance/	'Organisational processes to create such a safety culture were also still under way. Being	Eight middle managers of the Swiss air traffic company, Skyguide, were prosecuted. Four	See above relating to Swiss corporate criminal law.

(*continued on next page*)

Table 3 (*continued*)

Incident, year & fatalities	Inquiry	The causal role of safety culture	Individual criminal prosecution/conviction	Corporate criminal prosecution/conviction
Uberlingen, 2002, 71 Fatalities	Germany.Type of Aircraft: Transport Aircraft: Boeing 757–200, Tupolev TU154M. BFU (2004).	new the safety and risk management systems were still at the development stage. Their introduction was basically accepted by all management levels but adequate resources had not been provided.' BFU (2004:93).	were convicted under negligent homicide. Three were given suspended prison sentences and one was fined. Michaelides-Mateou and Mateou (2010).	
Platinum Jet, Challenger CL-600, Teterboro Airport in New Jersey, 2005. 0 Fatalities	'Accident Report on Runway Overrun and Collision Platinum Jet Management, LLC Bombardier Challenger CL-600-1A11, N370V, Teterboro, New Jersey, Feb. 5, 2005', NTSB (2006).	'Because neither Darby Aviation nor Platinum Jet Management (PJM) was rigorous about enforcing the Federal requirement for operational control, PJM pilots operated in an environment in which pilot errors and/or omissions during pre-flight preparations were less likely to be detected before departure.' NTSB (2006:63).	Michael & Paul Brassington, the owners of Platinum Jet were sentenced to 30 & 18 months respectively for falsifying FAA 'Part 135 certification' and aircraft load and balance paperwork. US Attorney's Office, District of New Jersey (2011).	None.
Helios Airways Flight HCY 522, Boeing 737-31S, near Athens: 2005. 121 Fatalities	Air Accident Investigation & Aviation Safety Board (AAIASB) Aircraft Accident Report, Helios Airways Flight HCY522, Boeing 737-31S, at Grammatiko, Hellas on 14th August 2005. AAIASB (2006)	'The inexplicable inconsistences in the actions that were or were not performed, the actions recorded, and the actions described as having been performed by Ground Engineer No. 1 on the morning of 14 August 2005 were considered by the Board to confirm the idea that the Operator was not effectively promoting and maintaining basic elements of safety in its culture.' AAIASB (2006:199).	Four Helios Airways senior executives faced manslaughter charges in Cyprus and Greece. The Cypriot Court found the defendants not guilty but the subsequent Athens High Court case dismissed the defendants appeal and upheld their sentence of 10 years imprisonment with an option to buy out their sentence for €80,000. Dempsey (2010)	Helios Airways, (later re-named 'ajet'), was charged by Cypriot prosecutors with manslaughter along with its senior executives however the company was dissolved in 2006. Michaelides-Mateou and Mateou (2010:89).
Mid-air collision of a EMB-135 Legacy business jet and a GOL Airlines B737 8EH in Brazil: 2006. 154 Fatalities	Final Report A-OOX/CENIPA/2008, Occurrence: Aeronautical Accident, Aircraft Registration: PR-GTD & N600XL, 17th July 2007. Centro de Investgacåo e Prevencåo de Acidentes Aeronåuticos, CENIPA (2008).	'The performance of the N600XL crew had a direct relationship with the decisions and organisational processes adopted by the operator, on account of culture and attitudes of informality.' CENIPA (2008:265)	The Legacy pilots and three Brazilian air traffic controllers were charged with negligence and involuntary manslaughter. The pilots were acquitted in 2008, but that was overturned in 2010. In 2011 the pilots were sentenced to 4 years and 4 months but commuted the sentences to community service to be served in the U.S. Pearson and Riley (2015).	Brazilian Law currently restricts corporate criminal liability to environmental and economic crimes. Almond (2013:52).

supervisors has traditionally provided the obvious target for retributively driven prosecution, however the examples cited in the tables would suggest that that the prosecutorial target is moving from individuals towards an association with corporate culture.

3. The criminalisation of aircraft accidents

Throughout the international agreements[8] and national procedures[9], which describe the purpose of air accident investigation, a single theme prevails; The purpose of an investigation into an aircraft accident is to prevent re-occurrence and preserve life. "The sole objective of the investigation of an accident or a serious incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability", (ICAO, 2013a). In contrast to air accident investigation, criminal standards are generally determined by society's collective intolerance of certain acts or omissions; these are judged by society to be unacceptable and some form of punishment is often imposed as a deterrent, sometimes to invoke justice or occasionally as simple retribution (Michalowski, 1985). It is inevitable that the industry will have to address changes in societal expectations, articulated by law, when multiple deaths occur. Dekker succinctly describes this change in social expectation, "Accidents are no longer accidents at all. They are failures of risk management", (Dekker, 2007:x).

3.1. Frequency of the criminalisation of aircraft accidents

The criminalisation of aircraft accidents describes the use of the criminal justice system against frontline operatives in aviation such as pilots, air traffic controllers, maintenance personnel and increasingly the companies that employ them (Michaelides-Mateou and Mateou, 2010; Dekker, 2011; Trögeler, 2011). It has grown to an annual global average of slightly over three cases per year between 2000 and 2010[10]. With such low sample data, there can be considerable variation in annual figures and as the criminal process takes place under sovereign authority, there is no official record of the number of incidents at international level.

The difficulty in measuring the precise current growth trends in the number of events is further compounded by the invariably long periods of gestation that case investigation and compilation can take. For example, following the crash of the Air France Concorde near Paris' Charles de Gaulle Airport in July 2000, the various prosecutions of individual and corporate manslaughter took over a decade to process through the French legal system. Following the crash of Air France 447 (see Table 3), after six and a half years, both Air France and Airbus have been indicted, however a judicial decision whether to charge the companies is still pending at the time of writing. What can be determined from recorded observations of criminalisation compared with accident frequencies, is that whilst the numbers of aviation operators being involved in a fatal accident in the first decade of the twenty-first century has marginally decreased since the 1990's, the number of operators, or their employees then subsequently being subjected to criminal prosecution, during that period, had at least doubled[11].

3.2. Explaining criminalisation in aviation

Commentators on criminalisation in aviation such as Michaelides-Mateou and Mateou (2010), Dekker (2011) and Hudson (2014) have successfully highlighted the potential damage that criminalisation causes to safety reporting. They have adopted an interpretive[12] view of the function of law, having highlighted a series of unconscionable prosecutions without any apparent *mens rea* of the defendant operator accused of criminal activity after an accident. In effect, an interpretive perspective of the law of regulating safety culture would demand a clear and optimal definition, designed to maximise safety performance. Anything less would be unconscionable as interpretative legal standards are driven by moral standards concerning the potential loss of human life.

An alternative analysis, from the perspective of legal positivism[13], suggests that focussing criticism on the sometimes, amoral nature of the legal system, fails to recognise the essential but broader social policy function that is demanded of it. Legal positivism might well embrace the ambiguity of the current legal state of safety culture. The uncertainty around the legal standards of safety culture would compel organisations to self-assess their vulnerability to post-accident prosecution, rather than rely on the proscribed standards of regulation.

3.3. The impact of criminalisation on aviation safety

Dunn et al. (2009), describe two primary effects of criminalisation. The first, is the physical restriction placed around an aircraft crash site, restricting timely air crash investigation activity. Secondly is the more insidious and long term effect on open reporting of safety information. It is the fear of sanction, which criminalisation promotes, that impacts on reporting behaviours and the effectiveness of safety management systems, (Dekker, 2003, 2007, 2011; Thomas, 2002, 2007; Dunn et al., 2009; Michaelides-Mateou and Mateou, 2010; Trögeler, 2011; Townsend, 2013).

The promotion of SMS, (Safety Management Systems, now formalised as international Standard and Recommended Practice through *Annex 19* to the Chicago Convention published in 2013 (ICAO, 2013b)) and its related output of documented descriptions of how safety and risks are actually managed, will provide a rapidly expanding evidential database of corporate policy, process and decision-making. Should corporate fear of exposure to retrospective analysis by the criminal justice system, inhibit open reporting or the effective dissemination by companies of safety intelligence gathered through SMS, then organisational learning would be inhibited. This remains one of the greatest challenges to the effectiveness of SMS across commercial aviation and other industries at operator, national and international level, (GAO, 1997; FSF, 2010). This is particularly pertinent to corporate mind-sets given the adoption by multiple jurisdictions of various forms of corporate manslaughter. A summary of generic models of corporate criminal liability is provided at Table 4.

4. Corporate manslaughter in the UK

In what is arguably the most significant statutory response to social intolerance of corporate involvement in unlawful deaths, the Government of the UK introduced the Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA). The Act came into effect after a long debate as to how to best address corporate killing particularly following successive accidents in the UK. Examples such as those collated in Table 2, such as the capsize of the ferry *Herald of Free Enterprise*,

[8] ICAO (2010), Annex 13 of the Convention on International Civil Aviation (adopted 7 December 1944, commonly referred to as the 'Chicago Convention'), 10th Edn. Amendment 14, 14 November 2013, hereafter referred to as 'Annex 13'.

[9] National Authorities adopt ICAO's international standards and recommended practices then add their own additional elements to their statutory powers of air accident investigators. In the UK these are primarily the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996. Within the membership of the European Union; EU Regulation 996/2010 governs the investigation and prevention of aviation accidents and incidents.

[10] The number of incidents of criminalisation recorded by Michaelides-Mateou and Mateou (2010).

[11] From Michaelides-Mateou and Mateou (2010): 12 recorded incidents of criminalisation 1990–1999 (163.5 million global departures) and 31 recorded incidents between 2000 and 2010 (204.9 million global departures): Global Accident Statistics 1959–2015, UK CAA, CAP 1036 & CAP 701.

[12] An interpretative perspective on jurisprudence partly concludes that there is no difference between law and morality. It is most recently expressed by Richard Dworkin's seminal work 'Laws Empire', (1986).

[13] Legal Positivism would suggest whatever ethical justification of laws are offered, they have to reflect societies' normative sense of morality, (Hart, 2012).

Table 4
Generic models of corporate criminal liability.

Strategy	Description	Advantages/disadvantages	Examples cases	Example jurisdictions
Individual criminal liability	No specific corporate criminal liability offences exist. Where executives engage in egregious conduct they can face individual criminal liability. Companies may face administrative fines for wrongdoing.	The main advantage is that in principle individuals bear responsibility for their own sphere of responsibility; more senior management carry more responsibility. In reality this can encourage blame transference from the corporate body to an individual; 'scapegoating'.	Meltdown of the Fukushima Nuclear Reactor, 2011. TAM Airlines Flight 3054, Sao Paolo, Congonhas Airport, 2007	Brazil, Bulgaria, Germany, Greece, Luxembourg, Hungary, Japan, Mexico, Slovak Republic, Sweden.
Identification principle	The criminal liability of the corporation is derived from identifying a sufficiently senior 'controlling mind', that had sufficient authority and association within the company. In some jurisdictions it can expand to the mere lack of supervision of lower-level employees.	The offence links the behaviour of significant individuals within the corporate body to the organisation at large, in theory providing deterrence against inappropriate activity. In some jurisdictions, the necessity to identify the sufficiently senior executive is too narrow to be effective. Also, the nature and complexity of modern companies blur the causal link between executive decisions and corporate fault.	The Westray Mining Explosion, Novia Scotia, 1992. Crash of the Helios Airways Flight,Boeing 737, near Athens: 2005	Canada, China, Cyprus, India, Ireland, New Zealand.
Vicarious liability	Based on the dictum of '*respondeat superior*', organisational liability is based on the non-delegable responsibility of an employer for the acts of employees. The offending act may have to be negligent or to benefit the organisation.	The flexibility of this doctrine has allowed successful convictions against corporate bodies but it has been consistently criticised as being too broad in its applicability. For example as under Danish law the defendant company's sometimes considerable efforts to maintain the compliance of employees is effectively ignored.	Explosion of the BP Deepwater Horizon Oil Rig, 2010. Crash of Air France, AFR 4590, Concorde, F-BTSC, Paris, 2000	Bulgaria, Denmark, France, Norway, Russia, United States of America.
Specific corporate liability	The corporation is recognised as having its own legal personality and can embark in illegal activity. Under UK law, CMCHA, rather than focussing on the acts of individuals, focusses on the aggregate performance of the organisation as a whole.	The aggregate performance of a corporate body is considered a more representative assessment of an organisation's safety culture.To date there have been no convictions of large, multi-national corporations which would provide the acid test of this strategy's effectiveness to deal with the causal complexities of modern commerce.	*R v Cotswold Geotechnical Holding Ltd* [2012]: first case under UK's CMCHA. *Rechtbank Leeuwarden* [1987]: first case of corporate criminal liability under Dutch law.	Australia, Romania, The Netherlands, United Kingdom.

the Kings Cross Underground fire, the explosion of the Piper Alpha oil rig and the Clapham, Ladbroke and Hatfield rail crashes, were highly influential events, which accelerated the UK government's adoption of the CMCHA, (Pinto and Evans, 2008; Johnson, 2008; Almond and Colover, 2010).

No longer restrained by the almost impossible requirement to identify the 'controlling mind' at senior management level, the CMCHA assesses the aggregate[14] performance of the company, in effect its safety culture[15]. To date, all the successful convictions under the CMCHA have been of relatively small organisation; the largest company to have been convicted at the time of writing, Lion Steel Ltd. had 150 employees with a turnover of £10 million, (Woodley, 2013).

4.1. Global trends in corporate manslaughter

Initially reluctant to impose criminal liability on the corporate body, the civil systems of Europe have now started to adopt various statutes and rule amendments to bolster the law's deterrent impact against corporate manslaughter. Since the early 1990s, constitutional amendments in Austria, Finland, Switzerland, Denmark, Iceland and Norway, now facilitate various species of corporate criminal liability, (Donaldson and Watters; 2008; Forlin and Smail; 2014). Almond (2013), describes this trend as a 'quiet revolution', implicating the growing influence of the European Union, the United Nations, and the OECD[16] conventions (See Table 4).

Established on the legal principle of *respondeat superior*, the United States, corporate liability is based on the company's vicarious liability of its agents. Providing the agent reasonably believes that in their malfeasant act, they are acting in the company's interests, the responsible company may be found criminally liable. Although there is no statutory corporate manslaughter offence at Federal level, a 'model penal code' does include the concept and has been adopted by some States, (Gobert & Punch, 2003; Weissman and Newman, 2007).

The Canadian model of corporate liability is based on the acts or omissions of senior management. Following the Westray mining disaster in 1992, (see Table 2 & 4), the Canadian government embarked on a path of constitutional reform. The resultant Bill, C-45, 'The Westray Bill', was brought into effect in 2004, although not as far reaching as the UK's CMCHA, it introduced corporate criminal liability, including corporate homicide.

The Australian authorities introduced the concept of aggregation to their criminal justice system, where the company has 'expressly, tacitly, impliedly authorized [sic] or permitted'[17] the offence by its agents or its corporate culture, Sarre (2010:4). The Australian authorities in the enactment of the Work, Health and Safety Act 2011 imposes on an officer of the company, a duty to uphold six elements of due diligence[18]. In summary, commentators have identified a global trend, that has begun to address public concern over corporate deaths by assessing the

[14] 'A theory of aggregation arguably better captures the nature of corporate fault than a theory, which imputes to the company a crime of a particular individual. There are times when, as a result of employee negligence, victims are seriously injured. Negligence, however, is generally not deemed sufficient to warrant imposing criminal liability on an individual and therefore also insufficient … to hold a company liable for the agent's acts', Gobert and Punch (2003:84).

[15] S.8.3(a) of the CMCHA invites a jury to 'consider the extent to which the evidence shows that there were attitudes, policies, systems or accepted practices within the organisation that were likely to have encouraged any such failure…. or to have produced tolerance of it'.

[16] The Organisation for Economic Co-Operation and Development is an international organisation of 34 countries which aims, through co-operation to advance ideas and review progress in specific policy areas, such as economics, trade, science, employment, education or financial markets.

[17] Criminal Code Act 1995 (Cth), Section 12.3(6).

[18] The nominated officer must uphold, knowledge of health and safety, their understanding of the hazards created by their business, resources and processes, risk reporting, legal compliance and verification of resource and process application, Work & Safety Act 2011(Cth), s.27 (5).

quality of corporate safety culture and utilising it to impute criminal liability, (Almond, 2013; Forlin & Smail, 2014).

5. Conclusion

This article has highlighted the potency of safety culture as a legal concept. This legal potency is perhaps accentuated by the lack of a clear definition or cohesive strategy that would facilitate conventional regulatory techniques. Despite the considerable body of research linking effective safety cultures to positive safety performance, regulatory progress has been limited. In contrast, the global trend in corporate criminalisation has embraced safety culture as a malleable descriptor of organisational culpability. International safety bodies need to recognise these phenomena before committing to the implementation of a homogenous concept of regulated safety culture. The experiences of progressive efforts in the Norwegian oil and gas industry, (Le Coze and Wiig, 2013) and the nuclear industry, (Wahlstrom and Rollenhagen, 2009), suggest that pushing forward well-meaning regulatory efforts to promote safety culture may be counter-productive to safety performance. However, procrastination or deliberate inactivity by regulatory bodies would leave commercial aviation open to the continual onset of corporate criminalisation. The impact of the latter is uncertain but it is unlikely to promote the necessary open reporting systems that lie at the heart of successful safety management.

In complex systems, such as commercial aviation, cause and effect are neither proportionate nor intuitive, (Hollnagel, 2014). In contrast, there are deep socio-psychological needs which continually try to make them appear so. The struggle between these perspectives, essentially map the fundamentals of social policy discussions on concerning acceptable levels of safety and risk management. Jurisprudence, cannot simply be taken singularly from an interpretative view of law and dismissed as illogical or irrelevant to safety. At least some elements of legal positivism have to be considered insofar as they are predominantly deliberate strategies that have to accommodate conflicting priorities and limited resources. The net effect of this on commercial aviation, is that the massive impact of fatal accidents, cannot be exempt from the influence of criminal justice systems.

As the criminal justice system has to continually evolve to represent the values and attitudes of society, it has to absorb emerging causational concepts that explain individual and corporate behaviours. Safety culture would appear to be developing not just as a mechanism to manage safety related values and attitudes within organisations, but also as a legal concept that associates accidents with corporate criminal liability. Designers of future regulatory strategies of implementing safety culture, may question the necessity of enforcing homogenous models of safety culture within jurisdictions that have existing and explicit policies of corporate criminal liability. Operating organisations could be compelled by their own enterprise risk strategy to assess whether their particular safety culture is sufficiently aligned with the cultural values, norms and acceptable levels of risk that are enshrined within their own legal system. The development of leading indicators of the attributes of safety culture, that could impute corporate criminal liability, are worthy of further research. Identifying and managing them could be an effective strategy to avoid the more damaging effects of criminalisation and a powerful incentive towards the building of resilient safety cultures within commercial aviation.

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Lawrenson, Anthony J.; Braithwaite, Graham R.

2017-11-06
Elsevier
https://doi.org/10.1016/j.ssci.2017.09.024
Lawrenson AJ, Braithwaite GR. (2018) Regulation or criminalisation: What determines legal standards of safety culture in commercial aviation? Safety Science, Volume 102, February 2018, pp. 251-262

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