Royal Aeronautical Society
Montreal Branch

MANAGEMENT COMMITMENT: CORNERSTONE OF AVIATION SAFETY CULTURE

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Abstract

Knowledge of cultural influences can be leveraged to mitigate risk, to contain costs and to improve corporate effectiveness. Surprisingly, these aspects of organizational behaviour are often overlooked or their effect underestimated. Management commitment may be the single most important determinant of airline safety. Although further research linking measured management commitment and safety performance is warranted, it is clear, at least implicitly, that such a relationship exists. Safety culture, internalising the principles of strategic risk management, allows executives to become more entrepreneurial by encouraging them to think more systematically about the future and helping them to profit from emerging opportunities. It is concluded that commitment is not merely a benign management obligation to safety culture. It should also be earned and driven by the very groups falling under its protection. Management commitment to establishing a thriving and pervasive safety culture will determine, in large part, whether an organization achieves its corporate goals.

Management Commitment: Cornerstone of Aviation Safety Culture

The air transport industry serves many masters in a universe of shifting markets, unending competition and complex rules where - citing the late Arthur Ashe - "success is a journey, not a destination". Each goal reached is the reward of thorough preparation, appropriate investment and meticulous execution, reflecting the cultures of the airline and its environment.

Cultures have extraordinary capacity to create cohesiveness, to nurture growth and to give identity. Some cultures have survived for thousands of years; others emerge with each new day. Cultures provide norms that allow the diversity of mankind to coexist but they can also restrain flexibility, narrow scope and obstruct necessary change. At the margins, they have also been roots of disagreement, intolerance and conflict.

All organizations have cultures and those of international airlines are cultivated to traverse political, ethnic and social boundaries while offering products and services of uniform quality regardless of market setting.

Knowledge of cultural influences can be leveraged to mitigate risk, contain costs and improve corporate effectiveness. Surprisingly, these noteworthy aspects of organizational behaviour are often overlooked or their effect underestimated.

Background and purpose

Increasingly, studies conclude that safety culture is a critical component of safety health. Other studies verify the importance of visible engagement by high-level management in encouraging all organization members to adopt the safety culture.

This paper reviews these investigations to better understand linkages between safety culture and management commitment and identifies opportunities to apply this understanding in new ways.

Contents and scope

An air transport industry overview will establish the strategic need for safety culture and associated management commitment. Topics presented include:

- High reliability organizations and culture;
- Safety culture and related concepts;
- Governance and management commitment;
- Safety culture benefits, culture change, and avoidable pitfalls; and
- Conclusions.

The paper is prepared principally for executives and senior managers to evaluate the benefits of an active safety culture, to become aware of their role in shaping its character and to encourage their commitment to its further development.

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Industry overview

Sluggish markets, fierce competition, shrinking margins, personnel turnover, unusual operating demands and adverse economic reality are selected but persistent characteristics of air transport industry volatility which divert management focus away from safety matters.

However, from at least two perspectives, the current state of the industry gives cause for guarded satisfaction: solid business growth and admired safety achievement.

From the first perspective, data presented in Table 1 shows passenger traffic growth of 6.2 percent and cargo traffic growth of 5.3 percent (IATA, 2006, February).

Table 1

Passenger/cargo traffic growth, capacity growth, and load factor by region

	Year to Date 2006 over 2005				
Region	Passenger Traffic Growth	Passenger Capacity Growth	Load Factor %	Cargo Traffic Growth	Cargo Capacity Growth
Africa	7.6%	10.4%	69.3%	2.4%	7.1%
Asia/Pacific	6.6%	3.9%	74.5%	6.3%	5.1%
Europe	5.6%	4.2%	72.9%	0.8%	3.7%
Latin America	3.1%	3.0%	73.7%	9.8%	5.0%
Middle East	17.0%	13.8%	74.3%	14.4%	13.8%
North America	3.7%	3.6%	76.2%	3.7%	4.6%
Industry	6.4%	4.8%	73.9%	5.3%	5.2%

Despite growth in passenger and cargo traffic, the airline industry lost an estimated US$6 billion in 2005 and expects to lose a further US$2.2 billion in 2006 (IATA, 2006). This results from several factors converging to apply upward pressure on capacity while continuing to weaken already thin margins. The extraordinarily high price of fuel, estimated to have cost the industry US$83 billion in 2005, represents a particularly challenging barrier to profitability.

The industry-wide response has been to remove as much cost as possible from the value chain and to simplify business processes.

The second perspective, airline safety performance, shows a significantly downward trend in the hull loss rate of Western-built jet aircraft (IATA, 2003, 2005a, 2006), as illustrated in Figure 1. This is the result of collaborative effort on the part of government and industry worldwide.

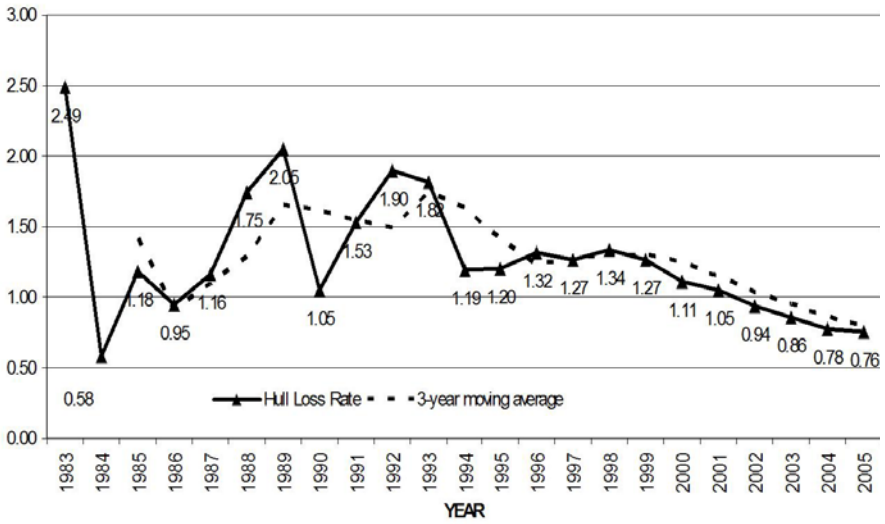

Figure 1. Western-built Jet Hull Loss Rate 1992 - 2005 and three-year moving average. *Note.* Hull loss rate expressed per million sectors.

However, while the downward trend is encouraging, the current hull loss rate is similar to a level reached in 1984, suggesting that global mitigation efforts cannot be relaxed.

There is considerable scope for improving other facets of airline safety, especially on realising that total recordable injuries/illnesses among scheduled airlines are just under four times the average for the group of industries indicated. As shown in Figure 2, the rate of lost workday cases among scheduled airlines is 2.5 times the industry group average.

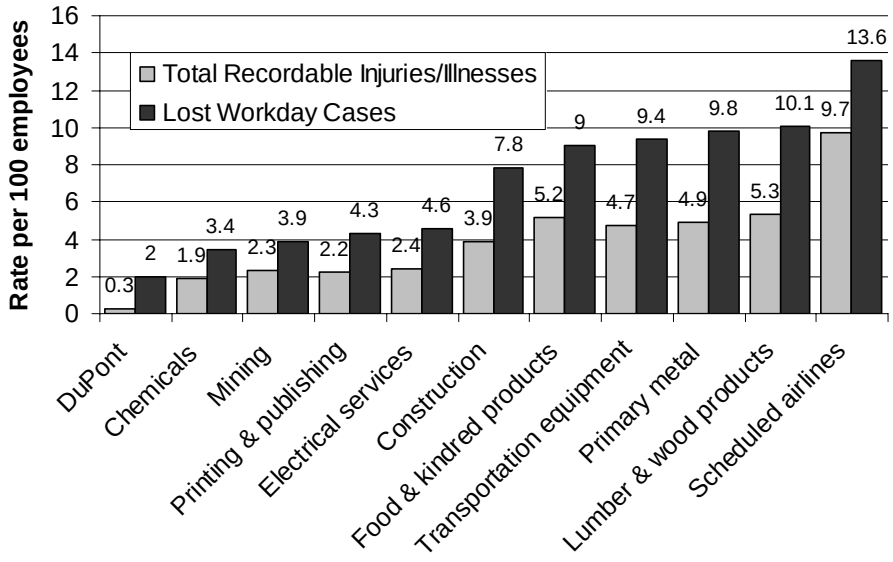

Figure 2. Total recordable injuries/illnesses and lost workday cases shown as rates per 100 employees. Across these industries, the lost workday case average was 2.6 and the recordable injuries/illnesses average total was 5.4. *Note.* U.S. Department of Labor 2001 data as cited in Grubbe (2004).

While the historic volatility of air commerce may have been magnified by post-9/11 consequences, the airline industry faces further challenges including:

- A global economy whose recovery is halting and discontinuous;
- On-going, probably permanent, resistance to historic pricing practices;
- High fuel prices showing little likelihood of significant abatement;
- Risk of further terrorist events diminishing traffic or escalating security costs;
- The traffic-eroding effects of traveller inconvenience; and
- Perception by the money markets as doubtful investment opportunities.

Strategies to meet these challenges, including restructuring, changing business models and industry shakeouts, are not unprecedented. What is unprecedented is the level of management exposure in terms of transparency, liability and accountability. During such turbulent times, the call is for diligence in identifying novel means for achieving safety goals and for executives to apply resulting knowledge to new corporate challenges.

High reliability organizations and culture

Recognising their potential for catastrophic consequences, high-risk organizations (HROs) are characterised by their demand for high reliability and categorised according to complexity, interdependencies and proximity to hazard (Aase and Nybø, 2002). Examples include nuclear power plants, transportation systems (air, maritime, rail, etc.), chemical processing plants, power distribution centres, multinational manufacturing, offshore installations and large construction projects. HROs are expected to handle demanding technologies under hazardous conditions without major accidents.

An aircraft carrier probably represents *the edge of the envelope*, operating under extreme conditions in an unstable environment and with twin goals of attaining maximum operational efficiency and preserving safety and reliability. This is achieved with self-design, authority overlays and redundancy (Rochlin, La Porte and Roberts, 1987).

For commercial airlines, the objective is to create a fail-safe experience of socio-technical perfection with precise timing, environmental sensitivity and sustained profits. This is achieved through prescription, surveillance and failsafe designs.

Aviation has always been an important symbol of mankind's pioneering vigour. Catastrophic failures, such as the loss of an airliner, define the boundaries between our civilisation and its technological legacy (Batteau, 2001). Although rare among HROs, when accidents do occur, organizational, managerial and human factors, rather than purely technical failures, are usually identified as the prime causes. By their very nature, these factors touch on cultural issues.

Safety culture and related concepts

Widespread study of corporate culture was triggered in the early 1980s by four popular books (Ouchi, 1981; Pascale and Athos, 1982; Deal and Kennedy, 1982; and Peters and Waterman, 1982). Over time, top managers realized that the cultures of organizations define limits, explain both success and failure, and point to opportunity (Stricoff, 2005a). The first to be identified was ***corporate*** (or ***organizational***) culture, accepted by many to be *a collection of beliefs, expectations, symbols and values learned and shared by a corporation's members and succeeding generations of its employees*.

Historical perspective

The origin of the phrase *safety culture* can be traced to 1986 when the concept of *poor safety culture* was identified by the International Atomic Energy Agency (IAEA) as a factor contributing to the nuclear accident at Chernobyl, Ukraine (Meshkati, 1997; Cox and Flin, 1998; Cooper, 2000; Zhang, Wiegmann, von Thaden, Sharma, and Mitchell, 2002).

The most dramatic turning point for safety culture in the United States was when NTSB member John Lauber filed a dissenting statement concerning probable causes of a fatal airliner accident near Eagle Lake, Texas in 1991 (Meshkati, 1997). In it, he contended that failure of management to establish "a corporate culture which encouraged and enforced adherence to approved maintenance and quality assurance procedures" be included among probable causes.

Recognizing a need to better understand the concept and its influences, the U.S. National Transportation Safety Board (NTSB) hosted the Symposium on Corporate Culture and Transportation Safety in 1997. It is noteworthy that more papers were presented on safety culture than were on corporate culture.

Then-Chairman Jim Hall noted in his address that although the NTSB did not describe corporate culture *per se* in its reports, it did investigate how culture may have set the stage for accidents by looking at management practices, policies and attitudes. He acknowledged that the best management in the world cannot overcome the influences of a corporate culture that insists on emphasising other attributes over safety (Hall, 1997).

The Columbia Accident Investigation Board (CAIB) Report on the 2003 space shuttle disaster recorded that "… NASA's organizational culture and structure had as much to do with this accident as the External Tank foam" and introduced the concept of a *broken safety culture* as a contributory organizational shortcoming (NASA, 2003).

Safety culture

Reason (1997, April) concluded that "few phrases occur more frequently in discussions about hazardous technologies than safety culture. Few things are so sought after and yet so little understood." Yet, the number of formally documented efforts to assess safety culture within the aviation industry remains limited (Wiegmann, Zhang, von Thaden, Sharma, and Gibbons, 2004).

While safety culture continues to elude formal definition, it is agreed to be more than merely avoiding, or even reducing, the number of accidents, although these are likely to be the most apparent measures of success. It is regarded as a component of corporate culture.

Safety culture may be taken as "the enduring value and priority placed on worker and public safety by everyone in every group at every level of the organization" (Zhang et al, 2002). Primarily, it could also mean to do the right thing at the right time in response to normal and non-normal situations.

The International Maritime Organization (IMO) contends that an organization having a safety culture gives appropriate priority to safety and manages it like other areas of the business (IMO, 2002). Safety culture must take root in the professionalism of its employees through:

- Recognising that accidents are preventable by adhering to published procedures and established best practice;
- Constantly thinking safety; and
- Actively seeking continuous improvement.

To assist understanding, the model presented in Figure 3 shows the evolutionary development of safety culture along dimensions of informedness and trust (Hudson, 2003).

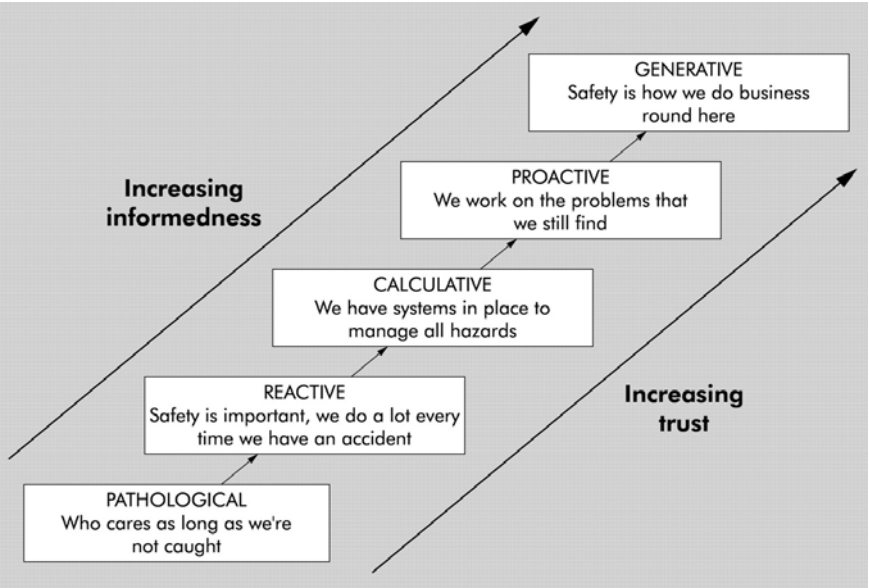

Figure 3. Evolutionary model showing range of safety cultures from the pathological through the reactive to the calculative. Later the proactive culture can evolve toward the generative. *Note.* From Hudson (2003).

Operations at early stages tend to be driven by management and principally with a focus on economic returns. Safety is accommodated reactively or not at all; when it is discussed, the

tendency is to emphasise the fault of those involved. On the other hand, organizations operating at these levels are more open to arguments about the financial benefits of safety.

At the calculative level, the main danger stems from the comfort of complacency, overdependence on statistics, or a "if it isn't broken, don't fix it" mentality.

Above this level, safety culture is progressively more internalised and driven by the workforce, the safety management system and data. The generative level is an alternative description of HROs, a level more likely to be reached by small groups than larger ones. At this level, complacency is countered with chronic unease. In such advanced organizations, there may be a feeling that the safety culture battle has been won and they will seek non-financial justifications for further investment.

Paraphrasing Pidgeon and O'Leary (1994), attributes and elements of a desirable safety culture include:

- Responsibility for safety accepted at strategic management level;
- Attitudes of care and concern permeates the organization;
- Appropriate norms and rules for managing hazards established; and
- On-going reflection upon safety practice.

Building on the work of others (Reason, 1998 later modified by Hudson, 2003), an organization is encouraged to be:

- Informed, ensuring that managers know what is going on and that staff are willing to report their own errors and near misses;
- Vigilant and alert, evidenced by all constituents being alert for the unexpected;
- Just and trusted with a culture that normally includes qualified non-punitive processes, although certain actions may be unacceptable, meriting some retribution;
- Flexible and adaptable, capable of accommodating changes in demand and circumstances, in both routine and non-routine modes of operation;
- Inquisitive, intellectually curious, eager to change, ready to learn and to improve; and
- Uncompromising regarding the relaxation of agreed standards.

Safety climate

Since its introduction by Zohar (1980), the literature has not presented a generally accepted definition of *safety climate* (Zhang et al, 2002). Conceptually, safety climate can be regarded as "…the surface features of the safety culture discerned from the workforce's attitudes and perceptions at a given point in time. It is a snapshot of the state of safety, providing an indicator of the underlying safety culture…" (Cox and Flin, 1998; Flin, Mearns, O'Connor, and Bryden, 2000; Gaba, Singer, Sinaiko, Bowen, and Ciavarelli, 2003). In other words, climate is context.

Safety performance and indicators

Links between safety climate and safety performance are implied, even if not stated explicitly (Zohar, 2000).

Commonly, safety performance is measured in terms of fatalities, lost time accidents and incidents, self-reported events and observations of safety behaviours. These measures, while useful, are substantially archival in nature.

There is a movement away from traditional measures of safety performance based purely on such *lagging indicators* towards *leading indicators* such as safety audits or measurements of safety climate (Flin et al, 2000, Australian Transport Safety Bureau, 2004). This shift of focus is driven by awareness that organizational, managerial and human factors, rather than purely technical failures, are prime causes of accidents in HROs (Weick, Sutcliffe, and Obstfield, 1999).

If this trend can be accelerated, it may avoid the need to await system failure in order to identify weaknesses and to take remedial actions. This can be conceptualised as a switch from *feedback* to *feedforward* strategy (Falbruch and Wilpert, 1999).

Safety management systems

A safety management system (SMS) is regarded as the systematic application of management processes to the hazards faced by an organization (Hudson, 2003).

An SMS defines reliable, robust systems, practices, and procedures and systematically applies safety management principles to formally assure that goals can and are being achieved. An SMS ensures that authority and accountability co-exist.

Although an SMS can significantly help to achieve high levels of safety, such systems are by their very nature paper-based, prescriptive and bureaucratic. They tend to set minimum standards and can easily result in no more than the achievement of such standards, especially when competition for managerial attention and resources is intense.

An SMS is never enough if practised mechanically; it requires an effective safety culture to flourish (Hudson, 2001). Safety culture enables individuals to fill in the gaps and exercise initiative while retaining high levels of safety performance.

Governance and management commitment

A corporate approach to safety requires a robust Board-level safety policy, maintenance of high safety standards and top-management commitment to safety (Overall, 1998).

Management commitment is one of only two factors (the other being workforce involvement) well-measured and repeatedly cited in studies which assessed the role of management in safety climate (Flin et al, 2000; Yule, 2003).

Senior management responsibility and accountability

Management responsibility and accountability for airline safety is largely rooted in the Convention on International Civil Aviation, Standards articulated in Annex 6 to the Convention and corresponding implementation by International Civil Aviation Organization (ICAO) Contracting States.

Broadly, these include (Overall, 1998; Byron, 2001):

- Setting overall policy for implementation by functional operational managers;
- Satisfying air operator certificate (AOC) requirements;
- Being available to the safety system;
- Setting and specifying company safety standards;
- Verifying that standards are known and accepted by everyone; and
- Ensuring that deviations from standards are recognised, reported and corrected.

To this list could be added a management responsibility to challenge consensus. Organizations with strong safety cultures generally acknowledge that a leader's best response to unanimous consent is to take an opposing view to encourage exhaustive debate (NASA, 2003).

Ultimate responsibility, authority and accountability for safety management rests with the Chairman, President and Chief Executive Officer (CEO), preferably documented in the SMS, usually in the form of a safety policy (Overall, 1998).

The importance of management commitment

Management commitment to safety was studied before the term safety climate was coined and was later identified as prerequisite to successful initiatives to improve the state of safety in industrial organizations (Zohar, 1980).

A number of authors have argued that top management commitment is an essential ingredient, as well as a key indicator, of a safety culture (Cohen, 1977; Zohar, 1980; Pidgeon, 1991; Flin et al, 2000; Flin and O'Dea, 2003). Management commitment may be regarded as:

- The most important determinant of workforce satisfaction with safety and related contingency measures (Rundmo, 1994);
- A factor explaining the highest variance in safety climate scores (Alexander, Cox, and Cheyne, 1995);
- The most important factor differentiating organizations with differing levels of safety (Diaz and Cabrera, 1997); and
- The single most important determinant of airline safety (FSF, 1989).

However, despite its apparent importance and desirability, there is little empirical research surrounding actual management commitment to safety in general (Cooper, 2000).

Employee perceptions of management commitment

Workforce *perceptions of management commitment* were related to low accident rates in a cross-section of 42 US industrial plants (Smith, Cohen, Cohen, and Cleveland, 1978).

Employee perceptions of company safety policy (including management commitment) were deemed to be the most important dimension of safety climate, with perceptions of the organizational philosophy regarding the relative priorities of productivity versus safety, second (Diaz and Cabrera, 1997). Perceptions in turn affected actual performance (Marsh, Davies, Phillips, Duff, Robertson, Weyman, and Cooper, 1998).

Perceptions are particularly important since attempts to promote enduring organizational change are unlikely to succeed if senior management involvement and commitment is not in evidence. Employees will quickly sense true management priorities (e.g. optimising production, etc.), and may conform to these tacit norms even when they conflict with explicit policy statements (e.g. always running a safe aeroplane fleet, etc.).

The perceived status within the organization of personnel directly dealing with safety is indirect evidence of management commitment (Zohar, 1980). Subsequent studies, confirming the initial work in this area, point to perceived management commitment as critical to shaping staff attitudes towards safety and risk as well as the trust relationship between workers and management (Pidgeon, 2001).

Motivating and earning management commitment

Management commitment to safety may either be driven by corporate imperatives, by the promise of enhanced organizational capability, or by combinations thereof.

The *legal imperative* obligates the employer to comply with safety and health regulations. When this is the primary motivation, safety is regarded as just another cost of doing business. The employer may only meet legal minima, possibly not much more. The main goals will be to comply with standards, to avoid conflict with the regulator and to avoid penalties.

The *fiscal imperative* requires executives to operate in the best interests of the business and with financial prudence. In the private sector, this means operating at a profit; in the public sector, operating within the budget. A short-term focus may reactively emphasise safety only to reduce safety event costs. If long-term benefits of an effective safety culture are understood, safety may be thought of as *process-quality* and given equal priority with production.

The *social imperative* drives the organization to feel a strong obligation to support and protect the welfare of each member of its *corporate family*, including employees, the community in which it operates and society in general. Safety, in this case, is accepted as a core corporate value, not open to negotiation.

McKinsey (2005, January) concluded that "Risk plays a role in all businesses, but they rarely manage it as well as they could. Management must better understand where companies and business units are vulnerable by assessing their exposure to each type of risk."

Since safety and business share common risk management principles, high-reliability safety culture can also *earn* management commitment with the promise of helping the airline to navigate hazard-laden opportunities (e.g. restructuring, mergers, acquisitions, growth, management attrition, outsourcing, partnerships, liquidity erosion, etc.). Greater competencies permit greater challenges to be safely accepted, the result being greater potential profit.

Whatever the driver, motivation for management commitment needs to be framed in a solid business case, articulating its strategic fit and associated returns in the same convincing terms as any other business opportunity, including establishing safety as a profit centre. This should also include a capital management or financing plan, linked to airline objectives and strategy, complete with risk assessment, gap/sensitivity analysis, timelines and performance measures.

Measuring management commitment

Management commitment must be measured against safety plans and results. Studies confirm that companies with strong top management commitment to safety and health exhibit tough-caring leadership, marked by a number of critical indicators including:

Policies, plans and procedures

- There is a published safety policy.
- Safety objectives are clearly stated.
- Strategies and plans for achieving safety objectives are written.
- Accident investigation procedures ensure timely identification and implementation of corrective actions.

Allocated resources

- Managers provide budgets, staffing and facilities for safety meetings.
- Management representatives are members of the safety committee.

Management behaviour

- Managers are driven by an unending desire to improve company safety culture.
- Managers attend safety meetings.
- Managers adopt good safety practices (e.g., wearing personal protective equipment).
- Managers participate in executing safety plans.
- Managers monitor and periodically evaluate the safety programme.
- Managers personally conduct safety audits and inspections.

Management accountability

- Managers are held accountable for safety performance, e.g., pay/promotions are partially dependent on safety.
- Top managers receive and respond to safety committee recommendations.

Management training

- Managers regularly attend safety activities outside the company.

Discussion

There is a demonstrated linkage between safety culture, management commitment, safety performance and strategic risk management. The success of a corporate safety and health programme requires top management to demonstrate not only an interest but also a long-term commitment to protect against injury and illness.

Every management action should exhibit an element of safety leadership and send a message about the corresponding level of commitment to safety and health. This will underscore the relative importance of perceived management attitudes and behaviours within the safety climate, in relation to other functions such as production, selection, discipline, planning, etc.

Benefits of safety culture

Management commitment to establishing, maintaining and developing a robust safety culture will yield significant financial, operational, prognostic and strategic planning benefits, enabling the organization to both contain costs and exploit new opportunities with greater effectiveness. These benefits include enhanced:

Profitability. There is considerable evidence that the most safety-minded companies are also amongst the most profitable (Hudson, 2001).

Efficiency. Safety improvement as an outcome of safety culture allows a company to deploy its resources more effectively.

Flexibility. An organization, which uses its safety culture to manage risks, is able to safely take risks that others dare not run.

Adaptability. Companies, which capitalise on the learning part of their safety culture, are able to reconfigure themselves in the face of risk-bearing challenges. Evidence shows that high-reliability organizations have the ability to reconfigure themselves in the face of high-tempo operations or certain kinds of danger (LaPorte and Consolini, 1991 as cited in Reason, 1997, April).

Continuity. Three ingredients are vital for driving a company's safety engine, all of them the purview of top managers: commitment, competence and cognizance - the three Cs (Reason, 1997). But management turnover is a fact of life. So how does a company maintain a commitment to safety in the face of personnel turnover, volatile market forces and economic reality? Reason suggests that this is where safety culture comes in to play! He states that "A good safety culture is something that endures and so provides the necessary driving force."

Durability. Redundant, fail-safe systems allow greater tolerance for failure and, in turn, permit and promote entrepreneurship and safe risk-taking.

Predictability. A safety culture with mature feedforward systems, focussed on solutions rather than mistakes and on the future rather than the past, will transform the unknown into the known and thus reveal to top management the way ahead to new opportunities.

Culture change and management commitment

Organizational climate often changes very quickly in the aftermath of a significant incident but the underlying corporate culture may not change sufficiently to prevent further incidents. In such cases, management will act to implement change, generally by establishing additional controls (such as total quality management, etc.).

However, management initiatives are never guaranteed success and those likely to be affected may question whether the idea is worthwhile or simply a fad that will pass soon enough. There is strong anecdotal evidence that the primary cause of ineffective change management was the failure to successfully change underlying organizational culture.

Cultures are deep-seated and their values may be so resistant to change, especially among airlines with strong brand identity, that modification is unlikely with exhortation, edict, or generic training programmes. For this reason, "corporate culture may be more difficult to change than policies or processes; but a concerted change management programme that taps into personal motivations can have dramatic effects in a relatively short time" (McKinsey, 2005, April).

Committed leadership is the key to changing culture. Leaders influence safety through what they do and what they don't do. Behaviour, which is definable and measurable, is the most practical and effective way to transform culture (Stricoff, 2005b).

Avoidable managerial pitfalls

Some researchers have found that management consistently underestimates workplace risks (Cooper, 2000 as cited in Hall, 2005). This finding, when accounting for the extent of senior executive authority, could lead to the conclusion that the greatest danger may come from a CEO who over-delegates his safety responsibilities. Management commitment and active involvement in safety affairs would obviate this possibility.

Culture change may become necessary during evolution of the company or the industry in which it operates. Since culture change projects have the potential for corporate-wide consequences, executive managers should be aware of and avoid common pitfalls, including:

- Using a team for work better done by individuals;
- Labelling the performing unit a team but managing members as individuals;
- Falling off the authority balance-beam (task- versus people-orientation);
- Dismantling existing structures so that teams will be "empowered" to work;
- Setting challenging objectives but skimping on organizational supports; and
- Assuming that team members have all the skills they need to collaborate.

Conclusions

Culture seems far more important in determining who we are and why we behave in certain ways, whereas climate can be seen as more of a reflection of what we are and what we do (Yule, 2003).

This paper concludes that:

- More research is needed to assess safety culture within aviation;
- Definitions for safety culture and safety climate must be agreed; and
- Actual management commitment to safety must be empirically researched.

In order to survive, airlines must grow in response to market demands, intensified competition and accelerating technological change. But the pursuit of growth requires companies to take risks, to place bets on specific products, channels, customer segments, and new business models (Slywotzky and Drzik, 2005).

When focused on the perils of risk, typical managerial response is to seek ways to minimise attendant exposure. Safety culture, internalising the principles of strategic risk management, allows executives to become more entrepreneurial by encouraging them to think more systematically about the future and helping them to profit from emerging opportunities.

Finally, it is concluded that commitment is not merely a benign management obligation to safety culture. It should also be earned and driven by the very groups falling under its protection. Management commitment to establishing a thriving and pervasive safety culture will determine, in large part, whether an organization achieves its corporate goals.

Note: This paper is based on a chapter to appear in a forthcoming book: Donald L. Van Dyke. *Fundamentals of Airline Management*. Aldershot: Ashgate.

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Appendix A. Definitions

Common definitions facilitate the formulation of a systematic methodology for measuring dimensions, develop standards for benchmarking superior cultures, and share related information and strategies both within and across industries (Zhang et al, 2002).

Accountability

Accountability is defined as the quality or state of being accountable; especially, an obligation or willingness to accept responsibility or to account for one's actions. Loosely, it has been described as "having to answer for what one has done, or has not done, either good or bad" (Wall Street Journal, 1952 as cited in US Air Force ROTC, 2004). A condition of accountability exists when an individual has the authority to do something, performance is evaluated and there are consequential results.

Accountability is the aspect of responsibility involving the giving of a statistical or judicial explanation for events. Judgement may follow.

Accountability constrains the extent to which office-holders or representatives can willfully deviate from their theoretical responsibilities. The goal of accountability is at times in tension with the goal of leadership. A constituency may have short-term desires which are at odds with long-term interests.

Accountability for safety

The principle of corporate *accountability for safety* is increasingly becoming a feature of national law and of regulatory requirements. At times, these provisions are focussed on the corporate body having a legal personality and at other times on the individual(s) having corporate authority to ensure that the operation can be financed and performed to the standards required by the regulatory authority.

Prime executive responsibility for safety management should rest with the person fulfilling the role of chief executive officer (CEO).

Broken safety culture

A *broken safety culture* is one in which safety standards are habitually relaxed to meet financial or time constraints, often characterised as reactive, complacent and dominated by unwarranted optimism.

Corporate climate

Corporate climate may be regarded as the surface features of the corporate culture discerned from workforce attitudes and perceptions at a given point in time. Organizational climate is a function of both the corporate culture and the members' liking for their jobs (Helmreich, 2000).

Corporate culture

Moorhead and Griffen (1989) identified a number of definitions for *corporate* (or organizational) *culture*. Taken together, corporate culture may be defined as "a collection of beliefs, expectations, symbols and values learned and shared by current and succeeding generations of a corporation's members.

Rather than being solely concerned with shared perceptions, meanings, values and beliefs as many writers propose, it can also be cogently argued that organizational culture is the product of multiple goal-directed interactions between people (psychological), jobs (behavioural) and the organization (situational) (Cooper, 2000).

The terms "organizational culture" and "corporate culture" are used interchangeably. Between Deal and Kennedy (1982) and Reason (1997, April), we have a workable definition for organizational culture being "shared values (what is important) and beliefs (how things work) that interact with an organization's structures and control systems to produce behavioural norms (the way we do things around here)."

High reliability organization

The term *high reliability organization* has been coined to describe organizations with exemplary track records of safety: aviation, chemical manufacturing, shipping, nuclear power production, and the military. This concept is rooted in the analyses of errors that reveal organizational failures, along with technical failures (related to system performance) and human limitations (related to human behavior) (Pizzi, Nash and Goldfarb, 2005).

Informedness

Informedness denotes the self-assessed level of understanding of a particular issue area.

Management commitment

Management commitment, in the present context, refers to the extent to which senior management time and resources is dedicated to the requirements, development and promotion of corporate safety and health programmes.

Responsibility

The etymology of the word *responsibility* ultimately relates to Latin "respondere" (to reply). It has at least two related meanings.

The first is an obligation to answer for actions. Often this means answering to some specified authority.

The second is the recognition that in order to achieve one's purposes, one must act oneself ("take" responsibility) rather than expecting others to do something.

Safety

Although the concept of *safety* is central to the study of all high-reliability organizations, it continues to elude internationally agreed definition, particularly since it is a dynamic non-event. However, in the present context, it is taken basically as freedom from risk of significant harm.

Safety climate

Zohar (1980) introduced the term *safety climate* in his seminal study and identified two dimensions as being most influential in determining safety climate level. The first was relevance of safety to job behaviour; the second was workforce perceptions of management attitudes to safety.

Safety climate can be considered as a subset of organizational climate and defined as "the temporal state measure of safety culture, subject to commonalities among individuals perceptions of the organization" (ATSB, 2004; Zhang et al, 2002).

It can also be regarded as "the surface features of the safety culture discerned from the workforce's attitudes and perceptions at a given point in time" (Flin et al, 2000; Gaba et al, 2003).

Safety culture

Considerable disagreement remains as to how *safety culture* should be defined and whether or not it is inherently different from the concept of safety climate (Zhang et al, 2002).

Paraphrasing Zhang et al (2002), there are currently at least a half-dozen definitions having the following commonalities which evidence that safety culture:

- Involves shared values at group level or higher;
- Concerns formal safety issues in organizations;
- Is closely related to management and supervisory systems;
- Emphasises the safety contribution of all organizational stakeholders;
- Has an effect on employee behaviour;
- Involves some sort of reward system; and
- Exhibits endurance, stability and resistance to change

Paraphrasing the International Atomic Energy Agency (IAEA, 1991), safety culture might be described as that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance.

Safety culture has also been defined as "the product of individual and group values, attitudes and beliefs, competencies and patterns of behaviour that determine the commitment to,

and the style and proficiency of, an organization's health and safety management" (Health and Safety Commission, 1993). Shell Aircraft has successfully applied this definition.

In the view of the U.S. National Aeronautics and Space Administration (NASA), safety culture "refers to the collection of characteristics and attitudes in an organization – promoted by its leaders and internalized by its members – that makes safety an overriding priority" (NASA, 2003).

Safety management systems

For Transport Canada, a *safety management system* (SMS) means a systematic, explicitly, comprehensive and proactive process for managing risks that integrates operations and technical systems with financial and human resource management to achieve safe operations and compliance with the *Canadian Aviation Regulations*.

According to the US Federal Aviation Administration (FAA), an SMS is defined as the systematic management of risk associated with flight operations, related ground operations, and aircraft engineering and maintenance activities to achieve high levels of safety performance.

Sweden defines SMS as a system requiring all parts in the aviation industry to take part in the safety work.

The position of the United Kingdom Civil Aviation Authority (CAA) is that there is no recognised standard in aviation for defining a typical SMS. The CAA has adapted best practice from other industries in order to provide guidelines for those parts of the aviation industry that wish to implement a formal SMS.

Annex 14 to the Convention on International Civil Aviation defines an SMS as "a system for the management of safety at aerodromes, including the organizational structure, responsibilities, procedures, processes and provisions for the implementation of aerodrome safety policies by an aerodrome operator, which provides for control of safety at, and the safe use of, the aerodrome".

According to Hudson (2003), an SMS comprises a register of known hazards and a clear understanding of the nature of defences applied to manage those hazards. Risk assessments are regarded as normal, but there is a feeling in many quarters that the numbers should not be taken too seriously as it is the structure and magnitude of the risks that is important. The system is documented, with specified accountabilities and required competence to perform duties critical to safety. Finally, there are a number of levels of audit and review required, given the assumption that, unlike quality management systems, safety will never actually achieve perfection and processes and knowledge can always be improved. The demonstration that an SMS is in place and that it is operational and effective is called a safety case.

A substantial body of knowledge and required processes is embodied in the ICAO Standards and Recommended Practices (SARPs). ICAO SARPs serve to support many of the requirements of an SMS but as Hudson (2001a) noted, were not constructed with a management

system, as such, in mind. As a result they are, literally, unsystematic and are not collected together with the requirement to demonstrate an assurance, as with a safety case. They have, nevertheless, served aviation well and form a repository of good practice and safe design.

Safety performance

Griffin and Neal (2000) suggested that *safety performance* should be distinguished from safety climate: that the former is a product of behaviour while the latter is the product of safety perceptions. They successfully demonstrated a direct positive relationship between safety performance, measured as safety compliance and safety participation behaviours, and a higher order safety climate factor consisting of perceptions of management values, safety inspections, personnel training and safety communications.

Senior management

According to Hackman (1997), *senior management* comprises individuals authorised to structure work for performance by other organizational members. IATA Operational Safety Audit (IOSA) Guidance Material defines senior management as "the highest level of management within an organization that has the authority and responsibility for setting policy, demonstrating commitment, meeting requirements, approving allocation of resources, setting objectives, implementing processes and achieving desired outcomes" (IATA, 2005b).

Appendix B

International Standards and Recommended Practices

Implementation of International Civil Aviation Organization (ICAO) Standards is mandatory for Contracting States under international law (subject to any notified differences) while the implementation of Recommended Practices is directory (in effect, simply encouraged).

The actual task of implementing either is left to the individual Contracting States through their domestic legal systems. Over the high seas, operations are governed under Annex 2 to the Convention. Otherwise, the rules with which operators must comply will not be directly those articulated in the Convention or its Annexes but rather the national laws of the individual sovereign States.

Convention on International Civil Aviation

The Convention on International Civil Aviation (1944), otherwise known as the Chicago Convention, is the pre-eminent source of aviation law. Being a treaty between contracting States, the Convention and the 18 Annexes form part of public international law. Thus, at the international level, the Convention and the Annexes establish the structure, principles and (in many cases) the minimum standards that Contracting States are expected to apply in their own domestic aviation laws.

Part II of the Chicago Convention regards the formation of ICAO and, inter alia, Article 44 sets out the Organization's safety objectives, excerpted in Figure 4.

Convention on International Civil Aviation
Chicago, 7 December 1944

Part II - The International Civil Aviation Organization

Chapter VII - The Organization

Article 44

Objectives

The aims and objectives of the Organization are to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport so as to:

a) Insure the safe and orderly growth of international civil aviation throughout the world;

…

h) Promote safety of flight in international air navigation;

Figure 4. ICAO safety objectives provided in the Convention on International Civil Aviation.

Annex 6 to the Convention on International Civil Aviation

Annex 6 Part I to the Chicago Convention particularly regards operation of transport category aeroplanes. ICAO Contracting States were requested to implement the following Standards in their national law, as noted in Figure 5:

Annex 6
to the Convention on International Civil Aviation

Operation of Aircraft

Part I International Commercial Air Transport - Aeroplanes

CHAPTER 3. GENERAL

3.2 Accident prevention and flight safety programme

3.2.1 An operator shall establish and maintain an accident prevention and flight safety programme.

Note.— Guidance on accident prevention is contained in the Accident Prevention Manual *(Doc 9422) and in the* Preparation of an Operations Manual *(Doc 9376).*

3.2.2 **Recommendation.—** *From 1 January 2002, an operator of an aeroplane of a certificated take-off mass in excess of 20 000 kg should establish and maintain a flight data analysis programme as part of its accident prevention and flight safety programme.*

3.2.3 From 1 January 2005, an operator of an aeroplane of a maximum certificated take-off mass in excess of 27 000 kg shall establish and maintain a flight data analysis programme as part of its accident prevention and flight safety programme.

Note.— An operator may contract the operation of a flight data analysis programme to another party while retaining overall responsibility for the maintenance of such a programme.

3.2.4 A flight data analysis programme shall be nonpunitive and contain adequate safeguards to protect the source(s) of the data.

Note.— Guidance on flight data analysis programmes is contained in the Accident Prevention Manual (*Doc 9422*).

Figure 5. Annex 6 Standard regarding Accident prevention and flight programme. *Note*: Differences to one or more of these provisions have been notified by Australia, France, Papua New Guinea, United Kingdom, United States and Uruguay.