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Assessing Institutional Resilience: A useful guide for airline safety managers?

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Abstract

Significant attention has been given in the literature to aviation safety, with emphasis on the importance of developing and maintaining resilience to accidents. To date, this attention has remained at the conceptual level, with comparatively little empirical research undertaken to test the validity of concepts put forward in the literature. This report presents the findings of a qualitative study, investigating the factors perceived to facilitate safety culture and institutional resilience within airlines. Thirty-two senior managers, drawn from Safety Departments and Flight Operations Divisions, participated in the research, representing 12 airlines operating in the Asian and Pacific regions. Data was obtained through semi-structured interviews with participants, based on questions relating to terms contained in James Reason's Checklist for Assessing Institutional Resilience.

The checklist provided a useful framework for obtaining data; however, some terms reflected exclusivity in identifying factors that impact on organisational resilience, and others significantly overlapped in their application to the airline industry. Themes emerging from the findings include the importance of leadership roles undertaken by the board, senior management, chief pilots and safety departments, and the influence of both formal and informal performance management systems. Analysis of the findings addresses the implications for Reason's checklist, and identifies those factors that are not on the checklist but perhaps ought to be. The emergence of a model which may be empirically tested through quantitative design is considered, along with other recommendations for future research. In conclusion, strategies are presented, drawn from the data, which support the presence or absence of safety cultures within the airline industry and impact on ability to assess institutional resilience.

ACKNOWLEDGEMENTS

ABBREVIATIONS

ATC	Air Traffic Control
ATSB	Australian Transport Safety Bureau
AOC	Air Operator Certificate
CAIR	Checklist for Assessing Institutional Resilience
CEO	Chief Executive Officer
CRM	Crew Resource Management (training)
FOQA	Flight Operational Quality Assurance
HRO	High-Reliability Organisations
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IOSA	IATA Operational Safety Audit
LOSA	Line Operations Safety Audit
OHS	Occupational Health and Safety
QAR	Quick Access Recorder
SMS	Safety Management System
TEM	Threat and Error Management

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EXECUTIVE SUMMARY

History shows that some organisations operating in hazardous environments or using hazardous processes appear to 'forget' to be afraid of the hazards they face. The outcome is that accidents, seemingly preventable, sometimes occur and reoccur. Reason (1997) proposes that organisations move within a 'safety space', alternating between states of increasing resistance to accidents and increasing vulnerability to accidents. Reason discusses the need for 'navigation aids' and the use of 'regular health checks to determine an organisation's position in 'safety space'. One such navigation aid might be an assessment of 'institutional resilience' – a concept introduced by Reason in his 'Checklist for Assessing Institutional Resilience' (CAIR).

This report is the second part of a study on the contribution to safety made by the Flight Operations Divisions and Safety Departments of major airlines. It presents the results of a qualitative analysis of 28 interviews conducted with 32 senior managers in 11 major airlines in the Australasian region. The objective of this part of the study is to consider institutional resilience within the airline industry. A secondary objective is to assess the usefulness of the measure of 'institutional resilience', or the CAIR checklist, published in the magazine *Flight Safety Australia* (Reason, 2001a).

The CAIR checklist was shown to present considerable overlap in the use of the terms given in the twenty checklist items. Analysis of the information given by interviewees showed that most of the concepts did not present as mutually exclusive. Other terms receive little or no attention by the interviewees and thus contribute little to a measure of institutional resilience.

Use of language is an interesting issue to emerge from this research. For example, the term '*mindful of danger*' was not used by any of the 32 interviewees. Complementary terms such as 'vigilance' and 'complacency' were instead used to explain the phenomena associated with human and organisational factors endangering flight operations It is suggested, therefore, that a 'checklist' for a particular industry would benefit from review to ensue use of appropriate language and shared meaning.

Two key findings were identified by participants as contributing to airline safety and institutional resilience. The first was the role of leadership, incorporating the concepts of corporate governance, and the tension between production and safety. The second was performance management and its inherent formal and informal systems of communication that support safety culture.

Several important concepts appeared to be missing from the CAIR checklist. The concepts, which became apparent during analysis of the interviews, are 'maintenance of standards', 'networking', 'benchmarking', 'risk assessment' and 'self introduced safety measures'.

Overall, it is concluded that the CAIR checklist is of limited value to airlines as a means of assessing institutional resilience. However, while the terms in Reason's checklist are not mutually exclusive, they may give rise to the emergence of a model that serves to explain the relationships between them. The model may present trust, safety culture, and mindfulness of danger as dependant variables impacted by the independent variables of, for example, (management) commitment, meetings (quality and content), data, encouragement of reporting, non-technical skills training, and performance management. The concept of 'production versus safety' may also be tested as a moderating variable between the independent and dependent variables.

1 INTRODUCTION

1.1 Background to the study

History shows that some organisations operating in hazardous environments or using hazardous processes appear to 'forget' to be afraid of the hazards they face. The outcome is that accidents, seemingly preventable, sometimes occur and reoccur. Documented examples in Australia are the Moura mine disasters and the Longford gas explosion (Hopkins, 1999 & 2000) and the former airline, Ansett (ATSB, 2001).

Reason (1997, 115) proposes that organisations move within a 'safety space', alternating between states of increasing resistance to accidents and increasing vulnerability to accidents. Reason discusses the need for 'navigation aids' and the use of 'regular health checks to determine an organisation's position in 'safety space'.

The characteristics of organisations that successfully manage their hazardous environments while at the same time produce reliable services and products is described in theory on High Reliability Organisations (Weick, 1987; LaPorte, 1996; Weick, Sutcliffe & Obstfeld, 1999; Roberts & Bea, 2001). Associated with the concept of high reliability is that of resilience or the ability to 'bounce back' from setbacks. The terms 'organisational resilience' and 'institutional resilience' are often used in discussion on the ability of organisations to either 'bounce back' from unexpected problems or to resist the effects of hazards (Dannatt, Marshall & Wood, 2006).

Reason (2001a) has developed a checklist for assessing institutional resilience. The application has been directed principally towards the health care industry (Carthey, 2001) and the air transport industry (Reason, 2001b). The checklist adapts theory developed by Reason (1997) and Weick (cited by Reason, personal correspondence 2004) together with management theory developed by Mintzberg (cited in Reason 1997, 113) and Weiner (cited in Degani & Weiner, 1994). While the health care industry appears to have adopted the checklist and found it useful as a tool for assessing 'institutional resilience', to date it has not similarly resonated with the safety initiatives adopted in aviation.

1.2 The research questions

Following on from the preceding discussion, the major purpose of this study is to explore the following question:

> What factors are perceived to facilitate institutional resilience within the airline industry?

This leads to the following specific sub-questions regarding the understanding of institutional resilience within the airline industry:

1. What are the key factors identified by participants as contributing to airline safety and institutional resilience?

2. To what extent are the factors contained within Reason's Checklist for Assessing Institutional Resilience (CAIR) perceived to be relevant to the airline industry?

3. Do additional factors exist which are not encompassed within Reason's CAIR?

This report is the second part of a study on the contribution to safety made by the Flight Operations Divisions and Safety Departments of major airlines, covering the results of a qualitative analysis of 28 interviews conducted with 32 senior managers. The objective of this part of the study is to consider institutional resilience within the airline industry. A secondary objective is to assess the usefulness of the measure of 'institutional resilience' published in the magazine *Flight Safety Australia* (Reason, 2001a).

In exploring these questions, this study utilised a modified case study approach, incorporating both qualitative and quantitative data, however the primary research focus was on the in-depth exploration of the qualitative data. The research design and methods sections are presented below and they provide further overview.

1.3   Significance of the study

Whilst the literature regarding aviation safety and institutional resilience identifies the importance of fostering and maintaining 'increasing resistance to accidents' (Reason, 1997), it fails to spell out exactly how this is accomplished within the airline industry. Despite the paucity of research in this area, various approaches to increasing resilience continue to be applied in making critical decisions regarding aviation safety. The absence of a sound theoretical basis underscored by strong empirical evidence supports the importance of this study. It considers the choices organisations make and their perceived levels of commitment to undertake courses of action that may affect not only those participating in the decision process, but also stakeholder groups such as customers, employees, shareholders and the wider community. In addressing the apparent gap in the literature, this study seeks to provide guidance for the way evaluation of airline institutional resilience is generated and evaluated.

In summary, this study makes a number of significant contributions to both the specific area of concern, i.e., airline institutional resilience, and the research methodology by which the data was analysed. Specifically:

- a contribution to the literature on institutional resilience within the airline industry by providing empirical evidence in relation to the identification and measurement of resilience;

- contribution towards the development of a revised model of institutional resilience with implications for theory and practice;

- potential application to the wider group safety field. While this stage of the study has focused on Reason's checklist for institutional resilience within the airline industry, the concepts and corresponding measures may apply to other management areas and processes and these ideas and results may therefore have wider applicability; and

- discussion of findings and implications drawn from qualitative data and analysed by cognitive mapping software. The findings inform further research development utilising the quantitative design and methodology.

1.4   Definitions

Following is a definition of the key terms employed in this report.

1.4.1   Institutional resilience

Institutional resilience is a term used in titles of checklists intended to indicate characteristics of aviation and healthcare organisations (Carthy, de Leval, & Reason, 2001; Reason, 2001a). In the case of aviation, it is related to the safety of flight operations; while in healthcare, it is related to 'preventable medical errors'. In personal correspondence, Reason advised that development of the checklists was influenced by Karl Weick and others in the development of High Reliability Theory (HRT) (Weick, Sutcliffe & Obstfeld, 1999; La Porte, 1996).

Reason's concept of 'institutional resilience' may imply a quality or characteristic of an organisation that provides resistance to the hazards that it faces. However, this appears to differ somewhat from the common understanding of 'resilience' used in relation to HRT, implying an ability to 'bounce back' from surprises or persist (act reliably) in the face of continued change. This consideration of the term 'resilience' is also used in the literature on High Reliability Organisations (HRO), where a resilient organisation is described as one that copes with unexpected surprises, reflecting:

> …capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back (Wildavsky, 1997, 77).

This latter definition is further supported by the Concise Oxford Dictionary, considering the concept to mean:

> (Of elastic bodies) recoil, rebound, resume shape and size after stretching or compression; have or show elasticity or buoyancy or recuperative power.

Reason (2001b) describes the processes that contribute to such resilience. He talks about "a system's intrinsic resistance to its operational hazards", introduces the concept of 'safety culture', and further discusses the taxonomy of 'safety culture' (pathological, calculative, and generative). Reason refers to Mintzberg's (1989) framework of three main driving forces in an organisation or department responsible for driving safety (the safety engine). These are: commitment, competence and cognisance. Reason then discusses the application of the 'drivers of safety' to 'four P's of Management', namely: Principles (Philosophy), Policies, Procedures, and Practice. The conclusion of Reason's paper provides a matrix of the interaction of the 'three C's' and the 'four P's'.

Reason's concept of 'resilience' seems to be associated with his proposition of an organisation's position in 'safety space'. At one end of the space, there is increasing resistance to accidents, and at the other end, increasing vulnerability. Organisations can 'navigate' through safety space using the matrix described in the previous paragraph.

Accuracy in use of the terms 'resilience', 'institutional resilience', or 'organisational resilience' might be supported by reference to Reason's theory on accident causation (commonly referred to as the 'Reason Model'), as well as work undertaken on 'threat and error' by Helmreich and colleagues at the University of Texas. In this context, threats are any unexpected event that threatens continued safe operation. Such threats could be mechanical failures, unexpected bad weather, air traffic control (ATC) failures, or hijacking. Errors refer to human errors, which are well represented in the literature.

In conclusion, for the purpose of this research, we define 'institutional resilience' in regard to airline operations as being:

> The capacity of the airline to continue safe operations in the face of unexpected threats or hazards including the occurrence of human errors and violations.

1.4.2 Safety health

'Safety Health' is a term coined by Reason (2001b), who commonly uses metaphors from the health industry to describe safety issues in other industries. Safety health is a characteristic of an airline associated with its freedom from 'pathogens' which are likely to result in an operational accident. The concept may be closely linked to Reason's concept of 'institutional resilience'.

Reason goes on to describe ways to measure 'safety health'; and proposes,

> …there is no single comprehensive measure of 'safety health'. It involves sampling a subset of a potentially larger collection of indices reflecting the current state of organizational processes. The number of such diagnostic checks ranges typically from around eight to 16 and will vary from one type of system to another and their purpose is to identify those two or three processes that are in most urgent need of attention.

1.4.3 Operational accidents

An operational accident is an accident involving an aircraft during the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked. It includes when the aircraft is preparing to become airborne, is airborne, or is taxiing to or from the terminal. Accident, as defined for this study, is an event that threatens the safety of the aircraft's occupants. This definition includes the terms 'serious incident' and 'incident' as defined in Annex 13[1] by the International Civil Aviation Organization (ICAO) and 'immediately reportable matters' and 'routine reportable matters' as defined by the Australian *Transport Safety Investigation Act 2003 and Regulations*. An incident is an event other than an accident associated with the operation of an aircraft, which affects or could affect the safety of operation.

It should be noted that 'operational accidents' are different in concept from personal and 'occupational health and safety' accidents.

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[1] *ICAO Annex 13 Standards and Recommended Practices* Chapter 1 and Attachment C (ICAO, 2001).

1.4.4 Airline industry

For the purposes of our research, 'airline industry' is the industry composed of organisations that transport persons and freight by air for hire or reward in accordance with fixed schedules or timetables. This distinguishes it from the 'charter industry', corporate or private aviation, sport aviation and military aviation.

The geographic area considered in our research is Australia, New Zealand and East Asia.

1.5 Outline of this report

This report consists of five sections (including the Introduction), each with its own focus in terms of the research questions. This section presents a brief summary of each section.

Section one: **Introduction**

Introduction outlining the background of the study, research questions, and significance of the research. Definitions of concepts relating to the study are also provided in this Section.

Section two: Research method and design

Section two reviews the central research question and presents the case for the design and methods adopted. Having addressed the conceptual foundations for this study, an outline of the research design is presented, placing the research in context.

The rationale behind the choice of cases and individual participants is discussed, followed by a description of the data collection and analytical procedures presented. The chapter closes with a set of guiding principles suggested for the evaluation of this study, reviews possible limitations to the approach chosen and addresses relevant ethical issues.

Section three: Findings

This section presents an overview of the key findings drawn from the qualitative data, a detailed overview of the analysis and associated findings drawn from the in-depth interviews conducted with participants. This includes the presentation of key concepts and themes that emerge from the data. The section focuses directly on the findings as they relate to the research questions and closes with a summary of the topic as described by participants within this study.

Section four: Discussion and implications

Section four addresses the research questions and the implications of the study outcomes. Strategies that respondents consider support the checklist are provided and summarised, followed by a discussion of their application to the airline industry in Australasia.

Section five: Conclusion, limitations and future research

This final section concludes with a summary of key points, examines the limitations of the study, presents an overview of the contribution of this research, and highlights further research directions.

2 RESEARCH DESIGN AND METHOD

2.1 Research design and method

The following is a brief overview of the methodological approach adopted in this study. Given the nature of the research problem, the absence of previous research in this particular area and the need to explore this issue with regard to real organisations with real and relevant issues to address, it became clear that an investigative field study was required, involving a number of locations throughout the Asia and Pacific regions.

Driven by the need to explore in depth the assumptions made in the literature regarding organisational resilience and the absence of empirical evidence, this study therefore utilised a modified case study approach, incorporating both qualitative and quantitative data. However, given the exploratory nature of the study, the research focus was on the in-depth exploration of the qualitative data. It is this data that is addressed within this report. Data was drawn from 12 airlines throughout the Asia and Pacific regions. The airlines included eight international carriers, three domestic carriers, and two airlines covering both national and international routes. Thirty-two interviewees, holding positions in Safety Departments or Operations Divisions or a combination of both functions, participated in 28 interviews.

2.1.1 Qualitative data collection and analysis

In terms of analysis, and with regard to the qualitative data, it was considered important to apply a consistent analytical approach across the case data to facilitate understanding and enable comparisons where possible. Consequently, while acknowledging there were many possible routes to take, a systematic procedure was developed for this study. In summary, interviews were transcribed, coded into categories in NVivo™ (software designed to facilitate the storing and analysis of qualitative data), then mapped using the cognitive mapping software, Decision Explorer™.

Identification of concepts was followed by detailed analysis of each of the interviews; examination of links between concepts followed a structured process prior to building a composite map of interviewees' experiences regarding the research topic. Finally, the composite map and NVivo codes were analysed in relation to Reason's Checklist for Institutional Resilience (CAIR) and key issues and themes identified and findings written up.

2.1.2 Quantitative data collection and analysis

Designed as an adjunct to the qualitative research, the quantitative survey instrument was completed by a total of 11 respondents, all drawn from airlines that participated in the qualitative study. Outcomes from the quantitative data collection may be found in the paper entitled, *Organising for Flight Safety*, (Dannatt, Marshall & Wood, 2006).

2.2   Delimitations of scope

As indicated above, this study utilised a modified case study approach, incorporating both qualitative and quantitative data, however the research focus was on the in-depth exploration of the qualitative data. Each case was made up of two or three people from a particular airline. Issues regarding scope are highlighted here.

Use of the case study approach

While findings from case studies can be valuable, the method has limitations. One of the major criticisms is that of its limitations in terms of representativeness and generalisability. However, as this is the first study of its kind there were few existing benchmarks on which to base a more comprehensive, generalisable quantitative study. The focus of the study was therefore necessarily exploratory.

Sample limited to airlines in the Asia and Pacific regions

The study is limited to airlines within the Asia and Pacific regions. This was a deliberate choice given the paradigm guiding this study and importance of focusing on actual organisations within our region with real issues to address. The common background of the various groups involved in the study was advantageous, in that it ensured some degree of commonality between the groups in terms of factors such as nature of the organisation, geographic region and the nature of the issue to be addressed. This enhanced opportunities for making comparisons between the various group's perceptions of the organisational resilience.

Small sample size for the quantitative study

The small sample size was a result of the exploratory nature of the study and the fact that the quantitative study was a secondary focus and conducted in order to add a further layer of meaning. In addition, accessing sufficient numbers of participants is difficult due to the often highly confidential nature of the data.

3   RESULTS

3.1   Perceptions relating to Reason's Checklist for Assessing Institutional Resilience (CAIR)

Following is a discussion of the comments to emerge from the guided interviews which are seen as possibly relating to each of the terms contained in Reason's CAIR (checklist). Each of the following categories draws its title from Reason's checklist, presents Reason's definition for that concept, then discusses the findings regarding this concept as drawn from the interview transcripts.

3.1.1   Mindful of danger

The term, 'mindful of danger', is defined by Reason as follows:

> Top managers are ever mindful of the human and organisational factors
> that can endanger their operations (Reason, 2001a, 40).

This particular concept is central to Reason's notion of institutional resilience. Whilst the term 'mindfulness' was not one expressed by interviewees, evidence of being 'mindful' was apparent in the interviews and in their responses to questions on this issue. Their replies also consistently indicated that their notion of mindfulness was actually wider than that of senior managers in that it encompassed the level of vigilance apparent within the overall organisation. Some also likened it to the development of a sense of 'chronic unease' i.e.:

> …what we try to do is … basically keeping people on their toes, a
> chronic unease… So we try to tell people that it isn't as good as it
> seems and that things are more fragile than they appear (Hii, 8).

The concept of mindfulness as perceived by interviewees is a multifaceted one, made up of many related concepts and largely driven by many of the other items within Reason's checklist as well as additional factors not catered for by this instrument.

The consequences of being 'mindful of danger' are seen as significant, in that interviewees saw a 'mindful organisation' as one that takes action to improve either the individual or system, making changes and creating additional defences against 'nasty surprises' (Ai, 16). For interviewees this meant that accidents are 'true accidents', or chance events, rather than incidents resulting from human error or faults inherent in the system. Interviewees generally perceived that the final outcome of this is achievement of the higher goal of a 'good safety record' which may arguably be translated into positive brand image, resultant achievement of overall organisational objectives and subsequent long-term viability of the organisation.

Delving further into what drives the development of mindfulness, interviewees presented a number of different contributing factors. A preliminary analysis of the data reveals that the most dominant concepts influencing the degree of mindfulness include:

- The role of the Chief Executive Officer (CEO) and the Board (refer Section 3.1.3); including the importance of a shared vision and the development of a culture which supports this.

- The level of commitment evidenced by senior management (Section 3.1.3).

- The balance of production (money) versus protection (safety) (e.g. refer Section 3.1.12)

- The degree of reliance on systems and hard data (Section 3.1.13).

- Enhancement of safety awareness and training with an emphasis on non-technical skills (Section 3.1.17).

- Dealing with complacency (discussed below).

- The importance of communication and effective feedback systems (Section 3.1.18)

- The role of safety data and reporting in highlighting areas requiring attention (e.g. Sections 3.1.4, 3.1.6, 3.1.8)

Other points distinguished as influencing the degree of mindfulness by smaller numbers of interviewees included an awareness of customers and the link between safety, brand image and profitability; the identification of organisational change as a potential threat to safety processes and effectiveness, especially where risk management approaches were not used as part of the change management process and personal professionalism. About a third of the interviewees specifically mentioned the importance of adhering to risk management principles in order to proactively maintain vigilance.

The converse side of mindfulness or vigilance is represented by the notion of complacency, i.e:

> Just because it's going OK today doesn't mean it's going to be OK tomorrow (Miii, 17).

Combating complacency is an ever present issue for the majority of the airlines represented in this research. While incidents can sometimes act as 'wake up' calls and are therefore welcomed as such, many felt that this is a reactive stance to take. Nor is it enough to rely on systems and processes to maintain vigilance. In fact, half of the interviewees indicated that at times, an over reliance on sophisticated systems and processes to highlight potential problems can in fact reinforce a tendency towards complacency. Written systems and policies do not guarantee safety, as stated by one interviewee:

> Where I think aviation is strange, we've written all these rules. Lots of rules on safety compliance and those rules are going to be safe, but it costs you a lot of money (and) doesn't always result in safety (Ciii, 186).

With very few exceptions, interviewees were mindful of needing to keep a vigilant edge amongst their management and staff. Approaches varied, including both formal and informal means. For example:

> We measure it (complacency) by guys fronting in with shirts that aren't ironed their best, shoes aren't as polished as they normally are, fluorescent backpacks, not black backpacks, things that then might indicate 'She'll be right'… If your professionalism is dropping so is your protection against things like complacency (Fi, 32).

Some of the stated measures of addressing complacency necessitated strategies to ensure reports were acted on, which at least half of the airlines indicated as being linked in with performance management issues. Crew resource management (CRM) training and audits were also identified as useful tools in highlighting weaknesses.

In terms of mindfulness and complacency, the role of people related issues was highlighted further with comments relating to the importance of effective induction and the inherent challenges of over-coming the lack of experience regarding major incidents or accidents, i.e.:

> …there is no-one, now, working in the company that was around when we had our last accident. So in terms of organisational history, or corporate memory, those people are gone. So really the entire staff…have got no experience in what it is like to have a major accident. And that is probably one of my biggest challenges (Hii, p26).

3.1.2   Accept setbacks

Reason's definition of 'accept setbacks' is as follows:

> Top management accepts occasional setbacks and nasty surprises as inevitable. It anticipates that staff will make errors and train them to detect and recover from them (Reason, 2001a, 40).

The majority agreed that setbacks were inevitable, with many seeing them as part of 'a game of statistics':

> Look, these things happen, you can't run a big airline 24 hours a day operating at every place on that map without having problems (Ci, 147).

Many of the airlines provided examples of incidents where fleets of aircraft were grounded for considerable time in the interests of safety.

In many ways this issue links back to the concept of complacency; while the surprises might be nasty ones, in hindsight many felt that there should not have been surprises, i.e., "…if we'd known what we know now we would have seen it evolving over two months or so ago" (Fi, 35).

Two of the interviewees also questioned the assertion by Reason that 'occasional setbacks and nasty surprises are inevitable', e.g.,

> I don't think we're accepting of setbacks; I'd probably call them problems rather than setbacks (Giii, 36).

> I would say that if you get a surprise it's possibly nasty, but if you have a culture within the organisation which communicates … you never have surprises (Fii, 20).

Overall, however, the feeling was that despite the rhetoric around zero tolerance and zero incidents, and all of the efforts to record information, conduct audits and establish robust hazard reporting systems, occasional setbacks or problems are inevitable. The real point was to learn from them, minimise opportunity for reoccurrence, make adjustments where required, and move on.

> I guess that as long as they remain nasty surprises and not accidents, and as long as we pay attention to these surprises, I think that, that is plugging the gap to a great extent (Mii, 8).

3.1.3 Top management commitment

The concept of 'committed' is described by Reason as:

> Top managers are genuinely committed to the aviation safety and provide adequate resources to serve this end (Reason, 2001a, 40).

As noted in other areas of this Report, the critical importance of the leadership role evidenced by the CEO/chief pilot and the Board were evident across the study. The majority of those interviewed expressed the view that safety was seen as a high priority within their respective organisations and that the CEO and the organisational leadership were genuinely committed to aviation safety. However, further analysis revealed that the level of commitment to safety was not consistent across all airlines.

A small number of interviewees raised the notion of corporate governance with regard to both senior management and the Boards' role in achieving a high level of aviation safety. One example given is the responsibility of the chief pilot in terms of good governance in bringing safety issues to the Board's attention.

Further analysis of the interviews demonstrated that, should the Board not see safety as a high priority, then the possible flow-on consequences was felt throughout the organisation. For example, where the Board was not seen to be actively talking about safety, this was seen to create more pressure for the CEO to be more focused on the commercial return. For example:

> …I don't think they're (the Board) that way inclined (i.e. focused on safety)…they're not in aviation because they're keen on aviation, they're in aviation because they are keen to make money and it's just another business (Giii, 28).

This emphasis on the financial imperatives of the business was seen as possibly leading to issues such as lower levels of commitment from senior managers to safety, an overall less 'mindful' organisation, a possible increase in incidents, more systemic faults and resultant impact on the safety record of the airline. It was suggested by a small number of interviewees that the organisation may then become more reactive in its approach. Even where interviewees felt that sufficient focus was paid by the CEO and the Board to safety, a few observed that it would be good if 'they talked about it more'. This again relates to the symbolic significance of the leadership team and how this translates into stakeholder perceptions of priorities.

Nonetheless, it is important to bear in mind that these effects could also result from a perceived, rather than actual, inattention to aviation safety by the Board and top level management.

Assigning safety to a senior management role

In some instances the appointment of an individual to a senior safety-related role is seen as evidence of strong commitment to safety by the airline. This is in fact Reason's argument in including this item on the CAIR. However, interviewees presented three perspectives of this story.

On the one hand, at least a third of interviewees felt that the combination of a senior level position and direct reporting to the CEO and Board was an important symbolic and operational representation of the airline's commitment to aviation safety. This influenced the overall perceived level of senior management commitment to safety, thus in turn working to create a sound safety culture. This again linked to the more global concepts of constant vigilance and mindfulness. Downstream effects included improvements to systems and processes, influences on individual behaviour, and again, an overall positive influence on the safety record and perceived long-term prospects for the airlines concerned.

Nevertheless, the downside of this delegation of responsibility was the danger that at times this was perceived to be a means of shifting responsibility. For example, evident in this study was the presence of either a positive feedback loop or 'vicious cycle' related to the degree of mindfulness reflected by the CEO, and the impact this had on the organisation.

In this instance, while it initially appears positive that safety is assigned to a senior level position with direct reporting to the CEO, and indicative of the CEO's commitment to safety, it also has the potential to produce a negative perception of the CEO/chief pilot attempting to reduce their own level of responsibility for safety by delegating it elsewhere. The loop is then reinforced; as increased responsibility falls on the senior safety person, it is perceived that less falls within the gambit of the CEO, thus decreasing the level of mindfulness of the CEO and so on. The existence of feedback loops such as these is extremely significant, indicating areas requiring attention to determine whether reinforcement is a positive or negative consequence for the airline.

The third stance taken on this issue sat between the two extremes, recognising that there was a degree of removal by the CEO from immediate responsibility, but that this had to do with areas of expertise and role responsibility necessary for the safety role, rather than degree of support for overall aviation safety within the organisation i.e.:

> …we've got all the good words from the CEO about you know, safety is everyone's responsibility, blady blah (sic), I wouldn't say that the CEO is actively involved…. But having said that he's not unsupportive either…I think frankly it's a question of time, expertise, knowledge and so on. ..he relies on me and other so-called experts to brief him as required... (Giii, 14).

The above quotation reflects a common observation from those assigned to senior safety roles.

All of the airlines in this study had created senior management positions where safety was either the only responsibility of that position or it was assigned a high priority within the job description. Again, while largely seen as a positive, there were some possible negative associations with this arrangement for some interviewees. For example, while there was much talk of shared responsibility, at times there was a perceptual undercurrent that as safety had been assigned to a senior safety position or to a specific department, there was not as much emphasis placed on shared responsibility.

3.1.4   Events reviewed

The concept of 'events reviewed' is defined by Reason as:

> Past events are thoroughly reviewed at top-level meetings and the lessons learned are implemented as global rather then local repairs (Reason, 2001a, 40).

All of the participating airlines had in place systems which enabled the reporting of events occurring during line operations. These reports go to various mangers in the safety or operations departments and summaries are passed further up the line to higher levels of management. Generally, most subjects referred to some system of follow-up being in place to ensure that 'safety fixes' are implemented.

Evidence of 'follow-up' systems, from many interviewees' perspectives include attendance by executive and senior management at safety meetings and procedure reviews, ongoing communication with aircraft manufacturers, provision of briefings to keep staff informed and enable opportunity for questions to be asked and answered, ongoing education of crew and staff at all levels of the organisation, and strategies for continued dissemination of information. Examples of strategies put forward include: access by crew to videos developed from computer data depicting actual events; distribution of safety magazines to staff summarising events; and corporate safety personnel continually talking to staff and stakeholders:

> …by putting this sort of information out to people, we are not hiding it from them, and we're also giving them reinforcement, because it is the old story, you think it wont happen to me…but then you think, he's pretty experienced; he did it, it might happen to me… (Hi, 15).

The majority of interviewees stated that it was imperative that if a safety recommendation resulted from an investigation, all stakeholders had to be informed. In doing so, all parties (e.g., crew, engineering, flight operations, ground staff) are made aware of the implications for their work processes, and the interrelationship with those of other parties. Interviewees also agreed that the level of understanding had to move from the 'shop floor' back up to executive management levels, and only transparency in reviews and communication would allow this to happen on an operational (day-to-day), as well as strategic, basis.

A final, and significant, indication of events being effectively reviewed is the unstinting authorisation by management of costs associated with follow-up initiatives to optimise levels of safety in the airline.

3.1.5   Improved defences

Reason refers to 'improved defences' to mean:

> After some mishap, the primary aim of top management is to identify the failed system defenses and improve them, rather than to seek to divert responsibility to particular individuals (Reason, 2001a, 40).

The subjects generally responded that their answer would be dependent on the situation. For example, an isolated incident seemingly initiated by an individual's error of skill, lack of knowledge, or violation of standard procedures, might be due to a failing on the part of the individual. Alternatively, it could be the outcome of failures in training programs, staff selection processes, or failure of the company to divest itself of individuals who are not capable of performing to the required standard. Some respondents gave examples where system failure had been the focus of attention:

> …about three or four altitudes busts. Not in very close succession but over a period of about, oh I don't know, a year or fifteen months or so. Now this was a little while ago, so we actually went back and looked at all our procedures for the setting of altitudes… (Giii, 196).

The majority of interviewees confirmed that the most effective course of action after a mishap is to engage a team of investigators to search for the facts pertinent to the actual event. An even larger number of interviewees stated that the focus is on both people and the technical systems. No mention was made of focus being placed on management systems.

The process described by those interviewees includes the staff and crew being approached first to gain their version of the event or events. A report is then produced as a starting point for ongoing analysis:

> The upshot of it is that we sit down and say, 'Well, OK, what are the issues that we need to address?' (Dii, 3).

In addressing the issues, policies, manuals and procedures are reviewed, along with their implications for training in the simulator and CRM seminar room. Interviewees stated that ongoing briefings for all staff concerned provided reassurance that appropriate review processes are in place.

A few interviewees stated that senior management would most likely jump to the conclusion that an accident was the fault of 'young' pilots, due to their lack of experience. Other interviewees perceived that the focus was more likely to be on the captains, and follow-up simulator training was intended to change their mindsets, rather than merely practice new or revised procedures.

A few interviewees referred to the presence of a whole-of-airline action group in their organisation, for example, a security committee taskforce. In relation to mishaps, other interviewees referred to mainly two separate committees for ongoing action. That is, performance issues are dealt with by a disciplinary review board, and matters relating to flying standards are referred to a standards review board (or technical review board).

Interviewees' perceptions of the effectiveness of such activities, however, are summarised succinctly by one respondent:

> I think whatever you do, you will not be able to cover all the angles… as long as they [mishaps] remain nasty surprises and not accidents, and as long as we pay attention to these surprises, I think that is plugging the gap to a great extent (Mii, 8).

3.1.6   Health checks

The concept of 'health checks' is defined by Reason as:

> Top management adopts a proactive stance towards safety. That is, is does some or all of the following steps to identify recurrent error traps and remove them ; strives to eliminate the workplace and organisational factors likely to provoke errors; 'brainstorms' new scenarios for failure; and conducts regular health checks on the organisational processes known to contribute to mishaps (Reason, 2001a, 40).

Indications of ongoing 'health checks', from the interviewees' perspective, are regular communication with crews, presence of safety managers and senior pilot managers on observation flights, along with other strategies such as a managerial role dedicated to managing crews' personal needs (e.g., roster bids, leave without pay) and problems (e.g., sickness, ongoing training). Interviewees also stated that a sound infrastructure of meetings between the Executive, Safety Committee and stakeholders is important. As one interviewee explained,

> [T]here is a report to Executive Committee monthly, and the Board Safety Committee quarterly, where we work on systemic issues for the business – not what we think are the 2 or 3 major events that we needed to talk about – there's plenty of those… run an airline here and those things happen all the time (Dii, 42).

An example of an effective meeting provided by some interviewees is one held between executive, senior line pilots, safety department personnel and checking and training captains. This meeting is held on a regular basis, at least every two months. During the meeting the checking and training captains are asked to present their 'view of the world' and what should be happening to crew training and assessment. It was agreed by the interviewees that this meeting's agenda provided the opportunity to obtain a 'snapshot' of operations on a regular basis.

A further indication of effective 'health checks' put forward by interviewees is the presence of a confidential report system. Confidentiality is supported by the data being collated and analysed by one person and presented to fleet managers in statistical or narrative content only, without reference to easily identifiable groups or individuals. Follow-up action resulting from the briefings was perceived by interviewees to motivate crews towards ongoing contribution of data.

All interviewees reported that a line operations safety audit (LOSA[2]) exercise had been conducted. This is commonly supplemented by programs included as part of CRM training (or replacing the traditional CRM program), and is intended to raise awareness of crews to the avoidance, entrapment and mitigation of human error.

While several interviewees indicated that they were confident in being able to identify risks, it was not clear from the interviews whether formal risk assessment was in common practice among the airlines. One airline commented that the practice was in place if:

> …it is of significant nature, then a formal risk assessment is done, and there are a couple of people who are approved to facilitate them (Cii, 209).

The risk assessment process does appear to be used for major projects; the following providing such indication:

> We're certainly doing a huge risk assessment of the introduction of the 777s this year and they've identified all of the errors where we were vulnerable and making sure we got all those covered. However, the process is not universal. We're still developing that [risk assessment process], I think it is probably fair to say. We are aware of the fact that we have got to go down that path because people now want to see bits of paper (Ei, 20).

On the contrary, a few interviewees responded to the concept of 'health checks' as a process remaining in the domain of the Safety Department, rather than Flight Operations, or being delegated to 'authorities'. While these interviewees agree that they obtain data on a regular (usually monthly) basis, and review them to identify trends, they concede that they get to know and expect such trends:

> …initially you react to them, but now you realise they are still operating aeroplanes the same way and to the same level of safety (Cii, 321).

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2   LOSA is an organisational tool used to observe flight crew behaviour and situational factors. The audits rely on expert observers gathering information throughout a flight regarding potential threats to safety, how the threats were addressed, the errors such threats generated, how the flight crew managed the errors, and the behaviours that have been known to be associated with accidents and incidents (ICAO, 2002).

In relation to perceived need by many interviewees to keep a close eye on the 'management dashboard', other interviewees expressed less concern, with one stating:

> …when people say morale is low that's interesting but nobody failed to extend, no aircraft has ever gone out unscrewed… I think the word morale is not understood. It's a throwaway for 'I'm pissed off' (Bi, 391).

3.1.7 Institutional factors recognised

Reason defines 'institutional factors recognised' as evident when:

> Top management recognises that error-provoking institutional factors (like under-manning, inadequate equipment, inexperience, patchy training, bad human interfaces, etc.,) are easier to manage and correct than fleeting psychological states such as distraction, inattention and forgetfulness (Reason, 2001a, 40).

Responses from interviewees indicate that emphasis in their airlines is moving from fixing the individual to fixing the system. Many interviewees agreed that learning from an event required asking the questions: Why did it happen? What caused it to happen? What are the factors..? The next stage of enquiry was seen by many interviewees to focus on the person accountable for the event, and assessing whether any rules were broken, unacceptable risks taken, as well as the absence or presence of alternative action. In examining the individual's responsibility in 'what happened', interviewees considered a full circle of the enquiry resulted with further questions needing to be asked: Were our rules clear? Were our processes clearly known to the pilots? Is our documentation well designed? If the information was there for the pilot to know, did we make it easy for him to be aware of it? Acknowledgement of the interrelationship between individuals and systems was expressed by the majority of interviewees, and summarised in the following comment:

> …when I joined the company the emphasis was definitely on fixing the individual…this was the ethic. In six years that I've been here, actually seen the movement. It's quite encouraging…recognizing that it's the system that has to be fixed. Not saying that the individuals aren't part of the system of course, but the answer has to be systemic (Mi, 23).

3.1.8 Data

Acknowledged by Reason to occur when:

> It is understood that effective management of safety, just like any other management process, depends critically on the collection, analysis and dissemination of relevant information (Reason, 2001a, 40).

Nearly all interviewees considered data collection and dissemination as a 'given' in the airline context, possibly due to such processes supporting the essential element of required Safety Management Systems, commonly prescribed by safety regulators. The concept is inherent throughout interview data, and receives a significant amount of attention in findings relating to all other concepts within Reason's checklist.

3.1.9   Vital signs

The concept of 'vital signs' is considered by Reason to be present when:

> Management recognises the necessity of combining reactive outcome data (i.e., the near miss and accident incident reporting system) with active process information. The latter entails much more than occasional audits. It involves the regular sampling of a variety of institutional parameters (scheduling, budgeting, rostering procedures, defenses, training, and the like), identifying which of these "vital signs" are most in need of attention, and then carrying out remedial actions (Reason, 2001a, 40).

A question asked during the interviews related to the use each airline made of their recorded flight data and results of pilots' training programs. Many interviewees stated that such data was of paramount importance in addressing operational issues (e.g. fuel compliance) and non-operational issues (e.g. pilot fatigue). The majority of interviewees stated that they review all air safety reports, data occurrence reports, as well as confidential safety reports (for those airlines which had them in place). A few interviewees confirmed that their airline undertook flight data analysis several years before they were legally required to do so. Other interviewees acknowledged that the monitoring of data was essentially passive:

> Clearly a lot of what we do is reactive to a problem that's happened… I mean I don't think you can never get away from the reactive… if we'd solved all the problems we wouldn't need safety departments anymore (Giii, 11).

It was confirmed by numerous interviewees that the safety departments kept records of all incidents (e.g., system failure, bird strikes, missed-approaches), compiling the data in yearly average statistics for reporting to management and pilots. Incidents may be reported as 'serious', 'less serious' or 'snapshots'. Some airlines put the average scores on excel spreadsheets, and provided feedback through graphs for visual representation of fleet averages; one interviewee referred to a 'management dashboard' through which the airline could be viewed in terms of safety as well as the stock market.

> A number of airlines confirmed the use of the LOSA program; others stated that their airlines were considering that program's implementation but were yet to do so, but would '…sooner rather than later' (Giii, 239).

The flight operational quality assurance (FOQA[3]) program was also used as a primary tool for analysing data and identifying trends in relation to issues such as pilot technique and airport information. Some interviewees stated that this program was not available throughout the fleets, but predominantly the Boeing 777s.

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3 FOQA involves collecting and analysing flight data to determine if flight crews, aircraft systems, or the aircraft itself deviated from normal operating limits; identifying trends; and taking action to correct potential problems. Airlines typically use a quick access recorder to capture flight data onto a removable optical disk. The data is then analysed using by a computer system that evaluates deviations from specified tolerance thresholds (GAO, 1997).

Some interviewees answered that there was no systematic analysis of the results of these programs. However, they acknowledged the usefulness of some reliable means of assessing their airline's safety levels.

> …if there was a ready sort of yardstick if you like or mechanism or process that someone else was using that we could perhaps learn from, then fine. But I suppose this may be a function of our stage of growth… it almost comes down to gut feeling type stuff (Giii, 231).

While a relationship between safety and pilot performance level was acknowledged by some interviewees, others stated there was no need to create a system that proactively checks to see whether pilots are complying with regulatory requirement or standard operating procedures. These were said to be monitored through the process of license renewals, audit checks, line checks, and feedback from crew.

Nonetheless, the majority of interviewees shared the same objective: to have fewer incidents, no serious incidents, and no accidents, and the gathering, analysing and monitoring of trends was vital:

> We believe that after x number of incidents you have a major incident (Lii, 29).

3.1.10   Staff attend safety meetings

Reason describes this item as:

> Meetings relating to flight safety are attended by staff from a wide variety of departments and levels (Reason, 2001a, 40).

All of the organisations had some kind of system of meetings in place in relation to safety. For the majority it was a formalised process moving from (for example) weekly departmental meetings, through various committees up to board reporting.

In general, the emphasis was on sharing information, highlighting threats and attempting to raise awareness. As one interviewee stated:

> What we are trying to do, I think is taking it from the troops in the trenches to the generals on the hill, to make sure that we all have the same perspective on the threat (Hi, 26).

Many interviewees described the existence of 'off-shoot' meetings, not all of which were attended by the Safety Department. Much of this depended on the structure of the organisation and the role of the Safety Department; for example, whether there was also a separate Corporate Safety area which covered a broader range of OHS issues.

Outcomes of the meeting are generally documented and distributed, mostly through the use of organisational websites or intranets.

Lower level meetings are held more frequently (sometimes twice a week) and tend to be a little less formal. As the information flows up the chain the process gradually becomes more formalised and data filters more extensively prior to being passed on. As a consequence, only those issues seen as high risk or of critical importance are addressed at the CEO and Board level.

The majority of the airlines have formal committee structures in place, which are charged with the review of all safety aspects of the airline. For example, one of the airlines has developed an Airline Safety Review Committee that reviews all of the safety aspects of the airline, encompassing issues that are collected through reports such as air safety records, cabin safety reports, incidents, injuries and so on. Critical information is passed on to the Board safety meeting that meets biannually. Similar to other organisations within the study, this airline has also developed specific safety sub-committees to deal with particular areas such as engineering, ground cabin, etc.

As mentioned above, much of this is about the flow of information, with the majority of interviewees emphasising the importance of making sure that information is distributed effectively throughout the organisation and that a notion of shared responsibility is developed. For a few, this also entails the development of an embedded safety system, rather than a highly centralised safety operation.

It was common for a cross section of people to attend these various meetings and committees. At times it is a mixed group of representatives across the airline and at other times it also includes key external stakeholders depending on the airline and the issues to be addressed.

All of the above is supplemented with informal networks, which constantly run in parallel to formal meeting structures within the airlines.

> We'd (pilots) go hammer and tong with management until we closed the meeting and then we'd go and have a beer but there is a lot of trust, mutual respect… (Aii, 228).

3.1.11 Career boost

Little mention was made of 'career boost' in the transcripts, a concept defined by Reason to be in evidence when:

> Assignment to a safety-related function (quality or risk management) is seen as a fast-track appointment, not a dead end. Such functions are accorded appropriate status and salary (Reason, 2001a, 40).

Only one comment within the 28 transcripts related directly to a career path in airlines' safety-related functions, and this related to the creation of a new appointment at senior level in one airline. Nonetheless, as stated above in the Research design and methods section, the participants in this research were all drawn from senior management ranks, responsible either for the standards of line operations or for safety management. They occupied positions with titles such as General Manger Operations, Fleet Manager, Chief Pilot, General Manager Flight Safety, or Head of Group Safety, among others. It is unknown whether the salaries commanded by these positions are greater or less than earned by line pilots. However, it may reasonable to contend that very few of the participants found themselves in such positions 'by accident'; many were 'hand-picked' for their positions, and an even greater number expressed deep and long-held interest in their role functions. It is reasonable to contend that occupation of such positions, and their position in the company structure, indicates status attributed to both expert and technical knowledge bases. This contention will be considered further in the Discussion section.

3.1.12 Money versus safety

Reason highlights the issue of money vs safety (production vs protection) as follows:

> It is appreciated that commercial goals and safety issues can come into conflict. Measures are in place to recognise and resolve such conflicts in an effective and transparent manner (Reason, 2001a, 41).

As noted in the earlier discussion concerning *mindfulness*, the perceived balance between the issues of money (production) and safety (protection) is seen as a critical factor in pursuing high safety standards within the industry.

Whether this balance is perceived to be reached is largely a function of the level of commitment to safety evidenced by senior management , which in turn is heavily influenced by the role of the CEO, chief pilot and the Board.

As indicated earlier, influencing factors on senior management and CEO commitment includes the perceived role of the Board, an understanding of customer expectations regarding safety, stakeholder pressures, and shareholders as well as regulatory and legislative requirements. Underlying all of this is the importance of a shared vision for the airline.

On occasion, interviewees observe that the commercial imperative may outweigh the safety related concern, depending on the perception of the overall degree of risk; for example:

> …sometimes airlines including us would be under pressure to fulfill the commercial requirements… and (the question is) shall we take this risk? But that risk has to be a calculated risk …when we have certain defects we have to ask ourselves…safety, legality, feasibility…So if the answer is yes to that, then we are willing to take that risk to fulfill that commercial requirement (Lii, 37-43).

However, the number of airlines that indicate that the commercial imperative will sometimes over-ride some of the safety related considerations is small, with most answering along the following lines:

> Lets not get away from the fact that we're a commercial venture and sometimes there is a perception out there that commercial will take precedence. (However) I'll put my hand on my heart and say that the executive team will never run a commercial venture that compromises safety. They're certainly not in the business of doing that….I'd like to see them probably talk a little bit more (about safety) and that's probably the only let down (Ai, 35).

Thus, it appears from the interviewees that the conflict between production and protection is clear; the balance is generally thought to be on the safety side, but at times the means of resolving such conflicts are not always visible to others within the organisation.

3.1.13   Reporting encouraged

The encouragement of reporting is described by Reason as:

> Policies are in place to encourage everyone to raise safety-related issues. (One of the defining characteristics of a pathological culture is that messengers are 'shot' and whistle-blowers dismissed or discredited) (Reason, 2001a, 41).

A large number of interviewees agree that the concept of an 'open-culture' is only as strong as the ongoing reporting that supports it. They same number agree that it is important to make sure that all cultural aspects of safety, ranging from operational flight safety and security to occupational health and safety issues, is regularly reported and acted upon. The same majority of interviewees consider that success in reporting lies in placing people in an environment where they can see reporting being accepted as a proactive process.

> We're not out there to screw anyone because of their supplying of information. Sure, we are going to investigate and some of the questions we hit them with are going to be pretty tough but that's just the nature of the game. It's not supposed to be personal (Ai, p172).

What does such an environment look like? Many interviewees state that reports should be treated confidentially, particularly as a similar number consider that some 'older' pilots (or those from the 'old school') remained guarded with their information and willingness to share it. Other interviewees also stipulate that an environment of encouraged reporting is one where pilots know they can report without fear of recrimination, and that the information will be analysed, fed back to decision-making meetings, and acted on. Further, pilots receive feedback and closure on reports they have passed on to the Safety Department or line management, and see the information being utilised in follow-up organisational learning processes. Another indication is pilots being requested to increase their reporting by line managers, when the number of reports is found to be decreasing.

Methods of reporting in a positive environment range from formal (e.g., flight data analysis programs and fleet forums) to informal, such as telephone calls, letters, or emails to the company personnel who need to hear what they know. Websites were also instigated in some companies; but these were found to be comparatively unsuccessful in obtaining information. Interviewees attribute the lack of success of website usage to 'IT function overload'. In return, reporting is encouraged through the Safety Department and management providing feedback in turn. Fleet forums again provide such opportunity, along with letters of appreciation sent to staff on their performance, and newsletters being published for staff at regular intervals.

A final factor considered significant in indicating an encouraging reporting environment is the opportunity for ongoing education and communication amongst all staff. Strategies within these training sessions, perceived to underline encouragement of reporting, include the presence of Safety Department personnel at inductions, technical training sessions and flight forums. Such opportunities get 'the message across' after the technical components of training are completed, and enable Safety Department personnel to meet and get to know individual pilots.

The presence of senior management at 'question and answer' forums further reinforce the acceptability of reporting and the respect with which such information will be treated.

Encouragement to report is noted by some interviewees to need little encouragement. While some pilots are seen to put in the minimum, others may over-elaborate:

> ..then you get 2 volumes and 3 chapters on a minor incident (Aii, 218).

Nonetheless, many interviewees concede that all feedback is positive, even if it relates to a negative aspect of company or individual performance:

> It is not in our interests to have a bloke whose eyeballs are hanging out of his head operating an aeroplane because that will lead to other issues (Cii, 281).

Some interviewees note that emphasis is placed on management to be open, but pilots may not always act in a similar manner themselves. Reasons given by interviewees for this reluctance include potential status barriers in communication between captains and first officers, and reluctance on the part of pilots to 'dob in their mates' and possibly jeopardise their colleagues' careers.

However, in reverse, a number of interviewees consider that the 'generation gap' between captains and their crew is reducing, rather than widening. In the words of one respondent:

> Previously it was a macho think to come in and land [the aircraft at all costs]… now people actually congratulate each other for doing a go around… Recently, the captain brought the co-pilot in and told me, this guy did a great job, he told me to around (Lii2, 163).

However, the majority of interviewees state that they believe pilots will report a colleague, including a captain, if that person is not doing the 'right thing'. This will most likely happen, in the interviewees' perceptions, when the issue is a regulatory requirement (e.g., drinking within eight hours of flying) and therefore critical to safety. Perhaps a further inducement is found in the statement of one interviewee:

> Anybody who reports an incident will not be subject to disciplinary action…anyone who fails to report an incident most certainly will be… (Gi2, 363).

Environments where reporting is not encouraged are seen by some interviewees to exist in companies that are conscious of adverse information reaching the public, and consequent appearance of suppressing discussion at every level. Conversely, some airlines experience government pressure to release safety reports to the public; this in turn negatively impacts on crews' willingness to report.

Interviewees from smaller airlines consider that they have to work harder to encourage reporting amongst crews, stating that in such environments, everyone appears to know everybody's 'business' and the informal networking overrides perceived need or desire to report in writing. It is also pointed out by a few interviewees that in some small airline companies, the term 'confidential' does not guarantee confidentiality per se, but merely a commitment not to make copies of reports.

For the majority of interviewees, the only perceived choice pilots have in relation to reporting is that they can do so willingly or unwillingly. Responses indicate that the former occurs because of the high degree of professionalism amongst pilots; and the latter because:

> …they know it's going to appear on the recorder" (Eii, 83).

3.1.14 Trust

The concept of trust is defined by Reason as:

> recognition by the organisation of the critical dependence of a safety system on the trust of the workforce, particularly in regard to reporting systems. A safe, or informal culture, is the product of a reporting culture that, in turn, can only arise from a just culture (Reason, 2001a, 41).

Analysis of the transcripts reveals numerous indications, in the perception of interviewees, of a just culture supported by the presence of trust within the companies. Indications relate primarily to management style and leadership, the standing of Safety Departments, and pilots' perceptions of consequences in participating in a reporting culture in partnership with these two parties.

First, in relation to management style and leadership, trust is seen to be present in the organisational culture when chief pilots are seen to lead with action, as well as words. Leading with action includes being willing to undertake the flying required of line pilots, to take a share in flying hours on days popularly requested for leave, and being able to communicate with pilots as a peer as well as line manager.

Trust in the organisation is also perceived to exist when line managers, including chief pilots, are able to make their own determinations regarding the best way to act on reports and other sources of information. Their flexibility in dealing with information which may be adverse, but nonetheless presenting a range of reaction, is considered indicative of trust by senior managers in allowing that range to be fully utilised. Examples of reactions that inspire trust include chief pilots or line managers choosing to deal with particular reports by discussing their content on the telephone with relevant parties, asking pilots to visit them informally over a cup of coffee, or formal investigation if the situation requires. The use of a process by chief pilots to determine whether incidents should be treated as a human error, slight lapse or wilful violation of procedures are seen by interviewees to reflect open-mindedness, rather than immediate reliance on disciplinary strategies. In contrast, trust in management is said to be given when line managers 'stick to the rules' and are consistent and reliable in their decision-making. In the words of other interviewees, trust encompasses predictability in the reaction of chief pilots and line managers to reports of incidences.

Trust is also seen to be evident when senior management supports the decisions of chief pilots, and in doing so go beyond talking about trust to enabling the development of procedures and processes in response to analysis of data provided by pilots and their line managers. Further, interviewees state that trust is felt when pilots believe that senior and line managers are interested in them as individual performers, rather than facilitators of flight schedules.

The level of trust attributed to auditors or observers (e.g., LOSA) is also seen to reflect the level of trust held in management by pilots. Associated with these relationships is the respect with which pilots' reported information is treated. Respect is considered to be present when chief pilots, line managers and auditors are willing to listen, maintain the confidentiality of their listening when gathering information, and are consistently willing to give a 'fair hearing'. The use of data for positive outcomes, such as learning and evaluation, rather than support for 'political agendas' is seen by interviewees to be a motivating factor in encouraging pilots to voluntarily line up to do flight data reporting and analysis.

Some interviewees note different levels of trust within sectors of the airline. For example, the operational side of the airline is considered less political than line management, with one respondent saying:

> …by the nature of the animal we [pilots] probably have a high level of trust (Hiii, 303).

Varying levels of trust translate, for some interviewees, into associated levels of tension. The presence or absence of trust is seen to impact on resultant tension between line managers and the Safety Department; such tension can be deemed healthy or unhealthy.

A healthy, trustworthy Safety Department is identified by interviewees as a major factor in promoting trust within the airline. 'Healthy' is attributed to a Safety Department which is independent of line management, and staffed by personnel who have and share their expert knowledge. Similar to line managers, trust is said to be given to Safety Department personnel when those members in turn treat pilots fairly, and practise what they preach. Evidence of practise is seen when the Safety Department ask for feedback in turn from pilots, for example relating to standards of instruction, and are seen to act on that feedback. Inherent in all of the above is a willingness to be 'out there' with the pilots and available:

> …the Safety Department guys are quite prepared to take a phone call, or even if need be to jump on an airplane… if somebody's got a problem (Aii, 37).

Interviewees also put forward indications of when trust is *not* in evidence in an airline. Several interviewees state that the absence of trust is most discernable in times of industrial action. Such action is often the result of company policies towards retrenchments during periods of economic setback. Trust is said to be dependent on management implementing strategies on agreed criteria (e.g., retrenching pilots on a 'last in – first out' basis). When criteria are not seen to be adhered to, levels of distrust are felt to increase.

The level of trust may also be challenged when pilots do not receive feedback on the information and data they provide to management and/or the Safety Department. This may be due to the confidential nature of the data, but more often is perceived to signify no action on the part of management, and consequent waste of time in continuing to provide information. Further, as acknowledged above in 'Reporting encouraged', some interviewees feel that a number of pilots remain cynical about possible hidden agendas in relation to the use of data by managers. Cynicism appears to be supported when managers are perceived to act inconsistently in response to data received through reporting systems.

It was also stated by one interviewee that it is harder to maintain a level of trust between pilots and managers when dealing with personal performance issues, than it is when dealing with operational matters.

Lack of trust is also seen to be more evident in companies where divisions exist between pilots who come up through the ranks within the commercial environment of general aviation, and those recruited from defence forces. The latter are perceived by some interviewees to promote an overly bureaucratic approach to aviation. However, they are seen by others to provide realistic behaviours in dealing with performance problems. This will be considered further in providing findings for 'Qualified Indemnity' (s 3.1.15) and 'Blame' (s 3.1.16).

Lastly, there appears to be a fine balance in the view of several interviewees between a strong, independent Safety Department, and a Safety Department that is seen to promote role conflict and ambiguity in accountability between pilots and line managers. In such instances, interviewees claim that trust is extinguished in the resultant highly-charged political environment.

3.1.15 Qualified indemnity

The concept of 'qualified indemnity' is described by Reason as:

> Policies relating to near miss and incident reporting systems make clear the organisation's stance regarding qualified indemnity against sanctions, confidentiality and the organisational separation of the data-collecting department from those involved in disciplinary proceedings (Reason, 2001a, 41).

The majority of interviewees confirm that pilots understand they are not immune from disciplinary action. As stated by some interviewees, if a pilot has intentionally violated to a significant extent, they will be 'shown the door'.

> If it's trainable, we'll train it. If it's a persistent problem, we'll try and fix it, and if it's just one of those things, we'll put out a notice (Gi2, 7).

Numerous interviewees state that the normal process in dealing with pilot non-performance (reflecting negative attitudes and persistently violating) is for (frequently) the Safety Department or Union representative to counsel the pilot in the first instance, giving feedback to senior management who will then decide what action needs to be taken. Alternatively, a pilot manager or chief pilot, will fly with the pilot concerned and arrange for the latter's roster to be scheduled to allow time to be spent together for communication and observation of performance. Assessment will then be taken on the need for further counselling, training, or whatever strategy is seen to be required. Interviewees agree that termination is considered a last or drastic resort; rehabilitation to an acceptable level of performance is the preferred strategy.

Nonetheless, the quest for rehabilitation is not interminable,

> We accept the fact that people make errors – come and tell us; turn up to work drunk – violation – then you're going to be sacked (Ai, 211).

The number of interviewees who stated there is, or is not, a written policy on qualified indemnity appear to be equal. Several airlines provide employees with books, brochures and, in one instance, a CD for distribution amongst new recruits and staff on a continual basis. Those who advise that no such written policy exists, were nonetheless adamant that pilots know where the company stands in relation to qualified indemnity. The absence of written policy is seen by several interviewees to be compensated for in the written contract of employment:

> If I sign my contract to say that I will turn up to work in a fit and proper state, I will conduct my activities in a professional manner and in the best endeavours of the organisation, that's all written into our contracts (Ai, 213).

Several interviewees stated that in the event of an incident if a pilot is uncomfortable with the process of going to a company manager directly, and possibly compromising their confidentiality, they can go to a pilot safety committee member instead. The majority of interviewees further stated that their Safety Departments are generally known to be interested in the facts ("what happened") – rather than "who did it…"

It was also stated by some interviewees that unions within their airlines insist on all matters relating to qualified indemnity be kept confidential. However, the system of confidentiality in relation to qualified indemnity is considered by some interviewees to be of concern. As summarised by one interviewee:

> Perhaps the protocol [of keeping data and names confidential and anonymous to management] is a weakness. It's like the difference having an assessment written about you, and being shown that assessment, as opposed to having an assessment written about you and not even being shown it (Mii, 20).

The issues surrounding qualified indemnity lead easily into the following concept of 'blame'. For many of the interviewees' responses, the two concepts appear to significantly overlap.

3.1.16   Blame

> Disciplinary policies are based on an agreed (i.e., negotiated) distinction between acceptable and unacceptable behaviour. It is recognised by all staff that a small proportion of unsafe acts are indeed reckless and warrant sanctions, but that the large majority of such acts should not attract punishment. The key determinant of blameworthiness is not so much the act itself – error or violation – as the nature of the behaviour in which it was embedded. Did this behaviour involved deliberate unwarranted risk-taking, or a course of action likely to produce avoidable errors? If so, then the act would be culpable regardless of whether it was an error or a violation (Reason, 2001a, 40).

Most of the 32 interviewees state that the intention behind policies and procedures in relation to safety is to establish the 'facts'. The majority of respondents reiterate that there is always more to learn about 'what happened' than is written in reports, and pilots need the opportunity to tell their 'side of the story' as they occur.

Further agreement among interviewees is based on the perception of pilots as professionals, who will not knowingly do anything to disadvantage the company.

> They are harder on themselves than anybody… you don't have to do anything with them because they've beaten themselves up so much they'll never do that again (Ciii, 163).

Again, the Safety Department is considered by many interviewees as the area interested only in finding out the facts, and acting on them in a non-judgemental manner. It is believed that the Safety Department acts on this information to establish if the issue is with an individual, and if so, identify the counselling and coaching required to alleviate that problem. If the issue is seen to be present across a group of pilots, the Safety Department is seen to look for learning mechanisms for direction-setting along with provision of skills training. If there is an error in process, change the process.

A large number of interviewees also state that investigations undertaken by line managers are not driven by a need to distribute blame, punishment or discipline. They contend that if a pilot is laid off after an incident, there is usually more involved in the situation than just that incident. A similar number of responses, however, indicate that the line manager (Chief Pilot, Fleet Manager) fulfils the role of enforcer or disciplinarian, and further believe that many line managers are under pressure from senior management to 'hang' pilots if necessary. However, several interviewees present a different slant, stating that punishment by line managers towards pilots is never intended, but rather establishment and affirmation of management as the 'boss' in the company.

In view of the above, the perceived division between pilots from military backgrounds and commercial aviation backgrounds emerged again in the context of 'blame'. Some interviewees contend that while ex-military pilots are considered overly-bureaucratic and inflexible, their behaviour exhibits a more open culture; that is, if a pilot needs a 'kick' (figuratively speaking), the line manager from a military background will oblige and consider the matter dealt with. Conversely, a line manager from commercial background may be seen to 'beat around the bush' to a greater extent, and have their hands tied in relation to managing pilot non-performance due to the requirement for confidential reporting in many airlines. Similarly, in a less 'blame-oriented' situation, some interviewees state that unlike captains (pilot in command) from a military background, commercial aviation captains appear to be more reticent about debriefing first officers at the end of a trip, perhaps not wanting to appear over-bearing to their crew.

In summary, many interviewees express that the Safety Department should undertake investigations and follow-up reports. As one respondent states:

> Flight ops management shouldn't be doing the investigation of incident reports… they actually do the investigation and then they are involved in the determination of the level of retribution, so there is conflict of interest (Miii, 120).

There is agreement amongst interviewees on the importance of assessing pilot competence and suitability for command to substantiate the required high standard of performance and minimise opportunity for 'blame'. Further agreement is also given to the consideration that whoever assesses an incident, and renders a judgement, will need to be well-informed:

> …it's funny, with pilots particularly, they won't tolerate criticism from someone they don't respect from the point of view of that person's performance (Ei, p141).

3.1.17   Non-technical skills

This concept was described by Reason to mean:

> Line management encourages their staff to acquire the mental (or non-technical) as well as the technical skills necessary to achieve safe and effective performance. Mental skills include anticipating possible errors and rehearsing the appropriate recoveries. Such mental preparation at both the individual and organisational level is one of the hallmarks of high reliability systems, and goes beyond routine simulator checks (Reason, 2001a, 41).

The majority of airline interviewees confirmed that the transfer of non-technical skills most often took place in the training room, usually within CRM or threat and error management (TEM[4]) courses. The majority of interviewees state that their airlines have dedicated CRM staff, frequently led by a CRM Manager. Content of CRM courses vary within airlines, with the most comprehensive (4-day) program covering teamwork, decision-making, communication, information processing, errors of violation, leadership, key cockpit skills, workload management, situational awareness and stress. Several interviewees express the importance of non-technical training in airlines that employ a diverse group of people from different cultures, nationalities and languages.

For many airlines, participation by crew in CRM is a mandatory training requirement, provided as part of induction of new staff into the company and refresher courses held annually or perhaps two-yearly. Attendance at a CRM is also required in a number of airlines if crew are involved in an incident, or instances where staff are confronted with non-technical, but significant work issues (e.g., a captain's perceived inability to relate to crew; lack of teamwork between cockpit and cabin crew). Most often, such situations are referred to CRM staff by Safety Department personnel. The CRM staff may initiate counselling with the crew or crewmember; in at least two airlines, the content of counselling sessions is recorded in writing and placed on personal files.

It is also agreed by numerous interviewees that the need for training in non-technical skills creates a bridge of common interest and concern between the Safety Department and Flight Operations. In a number of airlines, CRM Staff attend meetings with the Safety Department to discuss safety issues or participate with Safety Department staff at meetings held at divisional or whole-of-company level.

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4   A threat refers to anything external to the flight crew that increases operational complexity and, if not managed, results in errors. TEM is the recognition and management of such threats and errors by the flight crew (ATSB, 2006).

In some instances, the work of the CRM Staff is supported by human factors working groups throughout the company, which enables a broader understanding of issues relating to human factors. This level of understanding is increased for numerous airlines, with movement towards increased integration of other company sectors (e.g., engineering, ground staff, and cabin crew) with pilot CRM training. Interviewees, who report combined CRM courses, or plans for such courses, agree that combined CRM courses increase awareness of roles between all parties. However, caution is added from some respondents in relation to content reverting back to technical skills (rather than non-technical) and possible irrelevance to non-pilot groups.

While it is conceded that many CRM courses are initiated by senior management as a result of legislative requirement, the provision of dedicated staff, adequate resources and facilities, and presence of senior managers at the courses creates the impression that airlines are committed to training in non-technical areas. Some interviewees note a tendency for CRM courses to turn into corporate resource management courses or platforms for management to communicate with staff on matters other than non-technical skills.

Other positive signs in support of non-technical skills training include CRM staff being financially supported by the airlines to attend conferences or seminars external to the organisation, and possibly in other countries. The usefulness of attendance at conferences is generally agreed upon by interviewees, on the proviso that staff is required to present a report and/or seminar on their return.

Many interviewees report that the development of CRM courses is ongoing. In some airlines, non-technical training is addressed in CRM; in others, CRM has been replaced by TEM courses; in some airlines, both CRM and TEM are provided to crew. A concern is expressed by one interviewee that CRM staff need to be vigilant in ensuring that so-called development of CRM material into TEM courses did not result in providing the same content 'boxed in a different cover', and thereby increasing the risk of redundancy. The majority of interviewees, however, perceive the development of CRM and TEM course content to be indicative of airlines' vigilance against complacency.

3.1.18   Feedback

Described by Reason as when:

> The organisation has in place rapid, useful and intelligible feedback channels to communicate the lessons learned from both the reactive and proactive safety information systems. Throughout, the emphasis is upon generalising these lessons to the system at large (Reason, 2001a, 41).

Similar to the term 'data', feedback is largely addressed in other terms throughout Reason's checklist; for example, 'events reviewed' (s 3.1.4), 'vital signs' (s 3.1.9), 'staff attend safety meetings' (s 3.1.10), to name a few.

The role of management in Flight Operations is seen as crucial in providing on- the-ground indications and reminders of safety issues:

> …this work we call 'lesson learned, action taken and closure' (Li2, 178)

Interviewees give examples of auditors sitting and talking with engineers, cargo and cabin crew, as well as staff in other airport departments, reinforcing that they are 'out there'.

Over-riding all else in terms of maintaining constant vigilance and influencing aviation safety, is the notion of communication. This relates to both the formal communication processes such as meetings, intranets, staff memos and so on, as well as encompassing the significance of people just talking and telling stories. This last point is especially critical in transference of culture and reinforcing the message regarding 'the way we do things around here'. Indeed, at times the more informal channels are seen to be the most effective.

Another factor put forward by several interviewees is that when the airline is small, feedback through communication is more easily accessed, without reliance on formal channels.

Also refer to Section 3.1.13 'Reporting encouraged' for additional observations regarding the notion of open culture. As stated above, it appears that feedback is integral to all terms in Reason's checklist; indications of its presence or absence in airline operations is likely one of the most powerful factors contributing to safety culture and institutional resilience.

3.1.19 Acknowledge error

This concept is defined by Reason as:

> The organisation has the will and resources to acknowledge its errors, to apologise for them, and reassure the victim (or their relatives) that the lessons learned from such accidents will help to prevent their recurrence (Reason, 2001a, 41).

There are few direct responses to the concept of acknowledging error from interviewees. One that is put forward, however, is the perception of maturity of management leadership when senior managers are seen to take responsibility for their part in pilots' non-performance. A pertinent statement to this effect is:

> …the problem is not in the sky, the problem is here (Eii, 12).

As stated above, when prompted to discuss the company's willingness to acknowledge error, interviewees did not provide thoughts or opinions in relation to companies' reaction to accidents and incidents in public. Accidents that were mentioned by some interviewees were considered from a learning perspective, rather than implications for public liability and restitution. For example, almost all of the interviewees spoke of incidents that they could recall from their time at their respective airline or of a story they heard regarding another airline. Their stories varied widely and included tales of turbulence resulting in injuries, unsecured cargo doors, issues with airspace separation, tail strikes, taxiing errors, runway incursions, parts falling off aircraft, incidents related to windshear and discussion of more serious accidents – one involving a fatality - which triggered fairly major changes both in terms of process, policies and organisational culture.

However, despite the evident occurrence of incidents and accidents, stories of which were scattered throughout the interviews, the emphasis was very much on learning and moving on rather than attributing blame, apologising and reassuring the victims as per Reason's definition. This does not mean that such acknowledgements were not made, only that within this study, people preferred to discuss them as opportunities to learn and change, rather than acknowledge responsibility for them – perhaps believing that such acknowledgement would be better placed at senior executive level.

Given the above, it is likely that the concept of 'acknowledge error' is represented in responses given to other items in Reason's checklist such as 'events reviewed' and 'improved defence'. The validity of the concept's inclusion in the checklist as a separate criterion will be discussed below (s 4.1.1).

3.2   Summary

The above represents the main findings in relation to interviewees' responses to semi-structured interviews, utilising Reason's checklist as a framework for questioning. This Section reports and summarises the themes emerging from the interviews' content, supported by appropriate comments reported verbatim (and confidentially) provided by interviewees. Further points are raised which, though not widely held, may nonetheless be significant in discussing the factors that contribute to airline safety and institutional resilience.

The following Section seeks to step back from the findings, and discuss their interpretation and implications.

4   DISCUSSION

4.1   Overview

The following discussion outlines a general overview of both the exclusivity and, in some cases, mutual dependence of the concepts in Reason's CAIR (checklist). Points of interest that emerge from the findings will be addressed, in particular: the leadership roles reflected by senior managers and pilots, and evidence of resultant formal and informal performance management systems. Consideration is given to factors currently missing from the checklist, which may benefit from their inclusion. This is followed by a discussion on the emergence of a model based on Reason's checklist, which may provide a useful basis for ongoing quantitative research. This Section concludes with acknowledgement of the limitations of the study, and recommendations for future research.

4.1.1   Implications for Reason's checklist

As a framework for the semi-structured interviews, Reason's checklist formed a useful basis for in-depth discussion and gathering of data from 12 airlines, represented by 32 participants in 28 interviews.

As a 'checklist', however, there is considerable overlap in the use of terms, and the information given to demonstrate their application by interviewees; most of the concepts did not present as mutually exclusive. For example, the information interviewees provided when considering ***accept setbacks*** was similar to that provided for ***improved defence*** and ***institutional factors recognised***. Similarly, many interviewees repeated their responses when considering ***events reviewed*** and ***vital signs***, as with ***qualified indemnity*** and ***blame***, possibly signifying that these concepts refer to similar rather than different factors.

There also appeared to be a close association, from interviewees' perspectives, between the term ***events reviewed*** and ***regular meetings***. This may be due to a premise that regular meetings are held to review events and decide on action against reoccurrence. The notion of '***staff attend safety meetings'*** was closely associated with interviewees' responses to ***regular meetings*** at which ***events*** [are] ***reviewed***. The presence of senior management at these meetings may in turn signify that the airlines' executives are ***committed*** to the safety culture.

In relation to ***improved defence***, it may be that some individuals initiate safety incidents because they lack the skill or knowledge they might reasonably be expected to hold. When the issue is identified as a systems failure, the item is closely associated with the term, ***events reviewed***. This latter term also has close association with ***regular meetings***; one might presume that the subject of regular meetings is to review events and decide on actions to defend against reoccurrence.

Some terms received little or no attention. The term which received least attention was ***career boost***. Very few comments were raised by interviewees regarding the notion that assignment to a safety-relate function was seen as a 'fast-track appointment', with associated remuneration. As stated previously, interviewees were drawn from Flight Operations Divisions (Chief Pilots, Fleet Managers) and Safety Departments (Managers, Senior Officers).

Although not directly referred to, the writers gained the impression that the interviewees may have self-selected for their positions. This impression was based on the interviewees' extensive knowledge and/or experience of aviation and, most impressively, their obvious enthusiasm for and intrinsic motivation to perform their roles. It is possible that the presence or lack of opportunity to gain status within the corporate structure has less interest than the opportunity to work towards optimal safety and aviation skill within their airline.

The above observation in relation to **career boost** may also be considered from the perspective of 'career anchors' (Schein, 1996; Marhsall & Bonner, 2003). The career anchor of 'technical/functional competence', with resultant achievement of expert status among peers is likely to be enjoyed by many of the interviewees. Likewise, the career anchor of 'autonomy and independence', allowing personal freedom in the job context, may positively influence pilots in their choice of careers in aviation. While assignment to a safety-related function may not necessarily mean increased salary and status, many respondents indicated that neither did these roles result in decreased salary or being perceived as 'put out to pasture'. Indeed, the impression given was that any perceived disadvantage in terms of salary was more than compensated by the 'lifestyle' career anchor, providing position-holders with a stronger balance between work commitments and personal needs (e.g., more nights spent at home).

There were few direct responses relating to the term '**acknowledge error**' in the 28 interviews. This may have been due to the legal ramifications of acknowledging error as an organisation to victims and their relatives, and therefore inappropriate to comment on without official sanction. However, this lack of direct response did not necessarily mean that there had been no accidents or incidents from which lessons were learnt. As can be seen from the previous section of this report, almost all of the interviewees spoke of incidents that they could recall from their time at their respective airline or of a story they heard regarding another airline. However, the overall emphasis was very much on learning, instituting appropriate changes to policy and practice and moving on, rather than attributing blame, apologising and reassuring the victims as per Reason's definition. The focus of interviewees' responses were the avoidance of such an outcome, where the need to 'acknowledge error' arose. This term, therefore, may be of more relevance to the Health Industry (to which Reason's checklist is also applied in research), where the risk of litigation may be encountered more frequently and accountability more easily established.

Aviation is a highly regulated industry, with prescriptive specification of required outcomes. Issues such as staffing levels, training, pilot experience, etc. implied in the term, Institutional factors recognised, are likely to have been assessed by the regulator before an Air Operators Certificate is issued to the airline. This term is perhaps also more relevant to the Health Industry.

Language is an interesting issue to emerge from this research. For example, the term '**mindful of danger**' was not used by any of the 32 interviewees. Complementary terms such as 'vigilance' and 'complacency' were instead used to explain the phenomena associated with human and organisational factors endangering flight operations It is suggested, therefore, that a 'checklist' for a particular industry would benefit from review to ensue use of appropriate language and shared meaning.

Key findings were identified by participants as contributing to airline safety and institutional resilience. The first was the role of leadership, incorporating the concepts of corporate governance, and the tension between production and safety. The second was performance management, and its inherent formal and informal systems of communication that support safety culture. These are presented below.

4.1.2   The role of leadership

The importance of 'leadership' roles was emphasised by most of the interviewees in relation to many of the checklist terms.[5] The roles of, and interrelationships between, the Board, CEO and chief pilots are seen as critical, as is the presence of a strong Safety Department (which also received significant attention in discussions relating to many terms in the checklist[6]). The Board's endorsement of safety as priority and ongoing focus on that outcome is symbolic; if safety is seen as important, production (or money) will be seen as less important. If the Board is not seen to be overly focussed on safety, stakeholders perceive production to be the higher prerogative.

Assigning the safety function to a senior management role may present a 'double-edged sword' in regard to corporate governance. For many interviewees, this strategy signifies senior management's commitment to safety. For others, it reflects a shift in responsibility away from management to a specialised area and, in some cases, a consequent 'wiping of hands' by management who feel they have dealt with safety by delegating that function. Most interviewees acknowledge that a strong safety culture emerges when responsibility for safety is shared by everyone, and is embedded within the whole-of-organisation, rather than delegated to a centralised safety operation.

Leadership is also seen when Safety Departments forward both positive and negative data to the Board, who in turn communicate the findings to stakeholders, endorse subsequent plans of action, and providing funding for their implementation and ongoing evaluation. This again strengthens the relationship, from the interviewees' perspectives, between strong leadership and balance between production and safety within the airline.

Strength of leadership is also seen when there are clear lines of accountability. That is, Safety Departments utilise their advisory authority, focussing on the 'facts' and 'what happened', as opposed to 'who did it'. The closeness of the Safety Department Manager and personnel to flight crews is seen to be important in airlines where this occurs. This may result from the Safety Department representing a point of contact for contact for crew, where consequent disciplinary action is not an issue. Such advisory authority supplements, but does not substitute for the line of authority between pilots and their Chief Pilots or Fleet Managers. That is, the Safety Department provides the facts and recommendations; pilot managers provide direction and command in support of their implementation. In summary, safety culture is seen to be enhanced when the alliance between the Safety Department and Flight Operations is strong, but non-competitive.

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5   Mindful of danger; acceptance of setbacks; committed; health checks; staff attend safety meetings; trust; blame; non-technical skills; and feedback.

6   Events reviewed; improved defense; health checks; trust; qualified indemnity; blame; non-technical skills; and feedback.

4.1.3 Performance management

The concept of performance management was also inherent in many of the terms used in Reason's checklist.[7] While formal performance management systems are in place for assessment of pilots' technical skills (e.g., through simulators, line checks, audits, etc.), it appears that informal performance management strategies are utilised for feedback on operational performance on a day-to-day basis. Many interviewees stated that there may be a need to 'kick arse'; those from ex-military backgrounds perceive they do so more openly than their counterparts from commercial aviation. However, whether 'kicking arse' willingly or unwillingly, the majority of interviewees state that it is usually undertaken privately, without written record. Interviewees' responses indicate the perception that such informal feedback is more effective than formal performance management.

As mentioned above, formal assessment is undertaken in relation to pilots' technical skills. While the need for development of non-technical skills through CRM and TEM was frequently acknowledged by interviewees, the writers note little evidence in the findings of formal assessment of non-technical skills taking place.

Organisational Behaviour literature (c.f., Howell, Dorfman & Kerr, 1986; Howard & Joyce, 1982; Howell & Dorfman, 1981; Kerr & Jermier, 1978) suggests that in the perceived absence of leadership or formal performance management systems, employees will substitute these elements with a strong culture of professionalism. This is even more likely to happen when employees exhibit a high level of self-efficacy (Bandura, 1986; Marshall, 2000; Marshall & Wood, 2000); that is, the confidence and self-trust to effectively undertake a task or role. The majority of interviewees referred to the high level of professionalism amongst pilots, most of whom rate their own performance far more harshly than those given by managers. Interviewees also stated that pilots are more likely to debrief on incidents with peers, in private. This may provide some explanation as to why performance feedback is more likely to occur between pilots and their line managers privately, without written record, than publicly.

On those occasions when written documentation regarding performance does exist, its content may be known within a wider public arena, and the performance in question more likely to be relating to disciplinary action for violation. From the data gathered in this research, formal performance feedback is less likely to happen as frequently as the more informal appraisals of performance. It is also believed that pilots, being highly self-efficacious, are likely to embrace informal feedback and move on to the next challenge in reaching required levels of performance.

4.1.4 What appears to be missing from Reason's checklist?

Several concepts became indirectly apparent in this research, although not directly considered through any of the terms listed in Reason's checklist. These are presented below.

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[7] Mindful of danger; improved defence; institutional factors; vital signs; reporting encouraged; trust; qualified indemnity; blame; non-technical skills; and feedback.

4.1.4.1 Maintenance of standards

The importance of airlines maintaining their standards, and the extent to which exemptions are given against airline- or pilot-established safety rules was an issue that emerged from this research. An example of the above is a company rule on minimum experience required for pilots flying particular aircraft types. What happens when flight operations need to take place, but there is a staff and/or skill shortage? The inquiry behind this concept focuses on how airlines set their standards, and what policies and strategies are implemented in support of their implementation.

4.1.4.2 Networking

Informal networks are considered to be critical by the majority of interviewees in this research. While not a formal component of safety management systems, networking is nonetheless identified as a key factor in gaining essential knowledge and driving performance-related behaviour. An underlying theme that emerged from analysis of data is that pilots are 'story-tellers'; for many it is their debriefing strategy. The role of stories and narrative in communication may be highly significant in reinforcing or changing behavioural norms and creating a safety culture.

4.1.4.3 Benchmarking

It is proposed that the term, networking, is closely related to benchmarking. Interviewees' responses indicate that benchmarking formally occurs in some airlines, usually with alliance partners. More frequently, however, benchmarking is undertaken informally, sharing and utilising knowledge gained from former colleagues and long-term 'contacts'. The impact of this variable on safety culture invites further investigation.

4.1.4.4 Risk assessment

The concept of risk assessment was referred to by only a few interviewees, and was in fact more noticeable by its absence rather than presence in the data. This may point to a need for further enquiry as to whether airlines undertake formal risk assessment practices, and if they do, what do these practices look like, and for what reasons are they undertaken?

4.1.4.5 Safety measures

It would be useful to identify the safety measures adopted by airlines that are not currently required by regulation. For example, airlines reporting in this study that have introduced FOQA also report marked improvement in 'stable approaches[8]' (reduced risk of landing accidents).

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[8] An aircraft is deemed to be on a 'stable approach' when it has been positioned on the glidepath at the correct airspeed, correctly configured, and all the paperwork and checklists have been completed by the flight crew (Gunston, 2004).

Other airlines report implementation of runway alignment guidance systems, LOSA programs and International Air Transport Association (IATA) operational safety audits (IOSA[9]). Identification and quantification of such systems would lead on to obtaining data regarding their perceived effectiveness, or otherwise.

4.1.5 Emergence of a model based on Reason's checklist?

As previously stated, the terms in Reason's checklist are not mutually exclusive, but may give rise to the emergence of a model which serves to explain the relationships between them. The model may present trust, safety culture, and mindfulness of danger as dependant variables impacted by the independent variables of, for example, (management) commitment, meetings (quality and content), data, encouragement of reporting, non-technical skills training, and performance management. The concept of 'production versus safety' may also be tested as a moderating variable between the independent and dependent variables. This model may form the basis on ongoing quantitative research, which the writers consider worthy of undertaking, and is also discussed in Section 4.1.7.

4.1.6 Limitations of the research

The necessity for economy of effort and resources meant that the study concentrated in the geographic area adjacent to the researcher's country of domicile. It is possible that outcomes could differ if the study focussed on countries where aviation is less developed or where accident rates are recorded to be higher.

The same considerations meant that the study could not be expanded to include a comparison between 'legend' and 'budget' airlines. This would be a fruitful area for future research, particularly in those airlines where the 'production vs. protection' equation attracts more scrutiny by managers and company directors.

A further limitation was that of communication with participants and other constraints imposed by differences in language and culture. A major difficulty encountered in setting up the study was in making contact with critical decision makers who could agree to participate. As anticipated, this was more difficult with the overseas airlines than it was with the local airlines. From a sample of thirteen overseas airlines, seven agreed to participate.

Confidentiality is an issue influencing the successful interface between researchers and airlines. While airlines do not generally compete on the basis of safety (Rose 1992), their reputation is important, if not critical, to ongoing customer support and financial success (Rogerson 1983). Furthermore, the news media commonly over-report items on aviation safety (Barnett 1990). If this report referred to an airline by name, in a manner that the media inferred as criticism of safety standards, the result might be unnecessary publicity and public concern, which, in turn, could affect the airline's reputation and financial performance. For these reasons, none of the airlines participating in this study is identified. The issue of confidentiality, however, did not affect the level of cooperation extended by each of the participating airlines.

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9   IOSA is an internationally recognised and accepted evaluation system designed to assess the operational management and control systems of an airline (IATA, n.d.).

Limitations associated with the research design are covered in section 2.2 'Delimitations of scope'.

4.1.7 Recommendations for future research

This research lends itself to a quantitative design in order to examine the relationships between the key terms in Reason's checklist, and their impact on trust and safety culture. Development of the terms into measurable items will allow the testing of a model to further examine the factors that impact on institutional resilience within the airline industry. The potential independent variables that may be drawn from the terms in Reason's checklist are numerous, and would likely lend themselves to integration into key variables. It is suggested that distinct constructs or variables, and the items that load onto them, may be identified through exploratory factor analysis.

Distribution of the questionnaire to staff at all levels of airline companies will enable representative data to be gathered and analysed from numerous stakeholders' perspectives.

Research and development of other quantitative measures would also inform the study on assessing institutional resilience. Examples of longitudinal data that may be useful to collate include numbers of: safety initiatives implemented by airlines; success and failure rates in training and checking programs; terminations or demotions resulting from failure to meet technical standards or violations; exemptions granted against company standards; percentage of dedicated Safety Department personnel against full-time equivalent of Flight Operations personnel; missed approaches as a percentage of total flights; pilot turnover (and stated reasons for leaving the company); violation reports from external sources; regulatory action; on-time departures; and size of airline and length of time in operation.

A further area of research could be the investigation of formal risk assessment practices. What is indicative of a sound risk assessment system? Are risk assessments undertaken within airlines, and if so, how often and what strategies are utilised? Such research would seek to examine the impact of formal risk assessment systems on airline decision making and resultant safety culture and institutional resilience.

5   CONCLUSION

The research question underlying this report is: what factors are perceived to facilitate institutional resilience within the airline industry? To answer this question, it is necessary to ask another. That is, if management is committed to facilitating institutional resilience, what does this *look like*? The term 'committed' is included in Reason's checklist, and while overlapping with some terms, appears to be the 'driving force' behind others. Analysing data from 32 interviewees, a list of strategies emerges, which participants in this research identified as important for commitment in action, and resultant safety culture. They are as follows:

- Executive and senior management attend safety meetings, CRM seminars and make themselves available for information forums with crew.

- Regular meetings are held between Executive, senior line pilots, Safety Department personnel and checking and training captains.

- The presence of a Safety Department, showing strength through being well-resourced, independent of Flight Operations, and directly accountable to senior management.

- Regular briefings are held within the company to keep staff informed.

- Data is collected, analysed and reported to the Board and Executive.

- Recommendations for safety initiatives are endorsed and financially supported by the Board and Executive.

- The Board and Executive give priority to the funding of systems for data collection.

- The Safety Department Manager and personnel are 'out there': talking, flying, enjoying refreshments, training, and debriefing with crew.

- There is a confidential system for reporting, or at least a system where crew can report without fear of recrimination.

- Data is acted upon, and discussed openly, without negative reference to individuals or groups.

- Recommendations arising from analysis of data and reports are implemented and evaluated, with resultant feedback given to pilots.

- Non-technical skills training are seen to be as important as training in technical skills.

- The content of non-technical skills training (e.g., CRM, TEM) is updated and developed on a continual basis.

- A variety of strategies are utilised to disseminate information throughout the organisation: magazines, websites, intranets, videos.

It is suggested that the presence, or otherwise, of the above processes, procedures and inherent strategies will significantly impact on safety cultures within airlines, and contribute to their institutional resilience.

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7   APPENDIX

7.1   Appendix 1: Checklist for Assessing Institutional Resilience against Accidents (CAIR) –Aviation Version (Reason, 2001a)

COMPANY CHARACTERISTIC	YES	?	NO
1. Mindful of Danger Top managers are ever mindful of the human and organisational factors that can endanger their operations.			
2. Accept Setbacks Top management accepts occasional setbacks and nasty surprises as inevitable. It anticipates that staff will make errors and train them to detect and recover from them.			
3. Commitment Top managers are genuinely committed to the aviation safety and provide adequate resources to serve this end.			
4. Regular Meetings Safety-related issues are considered at high-level meetings on a regular basis, not just after some bad event.			
5. Events Reviewed Past events are thoroughly reviewed at top-level meetings and the lessons learned are implemented as global reforms rather then local repairs.			
6. Improved Defence After some mishap, the primary aim of top management is to identify the failed system defences and improve them, rather than to divert responsibility to particular individuals.			
7. Health Checks Top management adopts a pro-active stance towards flight safety. That is it does some or all of the following: • takes steps to identify recurrent error traps and remove them; • strives to eliminate the workplace and organisation factors likely to provoke errors, • 'brainstorms' new scenarios of failure, and • conducts regular 'health checks' on the organisational processes known to contribute to mishaps.			
8. Institutional Factors Recognised Top management recognises that error-provoking institutional factors (like under-manning, inadequate equipment, inexperience, patchy training, bad human-machine interfaces, etc.) are easier to manage and correct than fleeting psychological states such as distraction, inattention and forgetfulness.			
9. Data It is understood that the effective management of safety, just like any other management processes, depends critically on the collection, analysis and dissemination of relevant information.			

COMPANY CHARACTERISTIC	YES	?	NO
10. Sampling of 'Vital Signs' Management recognises the necessity of combining reactive outcome data (i.e., near miss and incident reporting) with active process information. The latter entails far more than occasional audits. It involves the regular sampling of a variety of institutional parameters (e.g., scheduling, budgeting, rostering, procedures, defences, training and the like), identifying which 'vital sign' is most in need of attention, and then carrying out remedial action.			
11. Staff Attend Safety Meetings Meetings relating to flight safety are attended by staff from a wide variety of departments and levels.			
12. Career Boost Assignment to a safety related function (quality or risk management) is seen as a fast-track appointment, not a dead end. Such functions are accorded appropriate status and salary.			
13. Money vs. Safety It is appreciated that commercial goals and safety issues can come into conflict. Measures are in place to recognise and resolve such conflicts in an effective and transparent manner.			
14. Reporting Encouraged Policies are in place to encourage everyone to raise safety-related issues. (One of the defining characteristics of a pathological culture is that messengers are 'shot' and whistleblowers dismissed or discredited.			
15. Trust The company recognises the critical dependence of a safety management system on the trust of the workforce – particularly in regard to reporting systems. (*A safe culture – that is, an informed culture – is the product of a reporting culture that, in turn, can only arise from a just culture*)			
16. Qualified Indemnity Policies relating to near miss and incident reporting systems make clear that the organisation's stance regarding qualified indemnity against sanctions, confidentiality, and the organisational separation of the data-collecting department from those involved in disciplinary proceedings.			
17. Blame Disciplinary policies are predicated on an agreed (i.e., negotiated) distinction between acceptable and unacceptable behaviour. It is recognised by all staff that a small proportion of unsafe acts are indeed reckless and warrant sanctions, but the large majority of such acts should not attract punishment. (*The key determinate of blameworthiness is not so much as the act itself – error or violation – as the nature of the behaviour in which it is embedded. Did this behaviour involve deliberate and unwarranted risk-taking, or a course of action likely to produce avoidable errors? If so, then the act would be culpable regardless of whether it was an error or a violation.*)			
18. Non-technical Skills Line management encourages their staff to acquire the mental (or non-technical) as well as the technical skills necessary to achieve safe and effective performance. Mental skills include anticipating possible errors and rehearsing the appropriate recoveries. Such mental preparation at both the individual and organisational level is one of the hallmarks of high-reliability systems, and goes beyond routine simulator checks.			

COMPANY CHARACTERISTIC	YES	?	NO
19. Feedback The institution has in place rapid, useful and intelligible feedback channels to communicate the lessons learned from both the reactive and proactive safety information systems. Throughout, the emphasis is upon generalisation these lessons to the system at large.			
20. Acknowledgement of Error The institution has the will and the resources to acknowledge its errors, to apologise for them, and to reassure the victims that the lessons learned from such mishaps will help to prevent their recurrence.			

SCORE :   YES = This is definitely the case in this company -   **score 1**

   ?   = Don't know, Maybe or Could be partially true –   **score 0.5**

   NO = This is definitely NOT the case in this company - **score 0**

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INTERPRETING THE SCORE

16 – 20	So healthy as to be barely credible!
11 – 15	You're in good shape, but don't forget to be uneasy.
6 – 10	Not at all bad, but there is still a long way to go.
1 – 5	The organisation is very vulnerable
0	Jurassic Park

CAUTION

High scores on this checklist provide no guarantee of immunity from flight safety mishaps.

Even the 'healthiest' organisations can still have bad events. But a moderate to good score (8 – 15) suggests that you are still striving to achieve a high degree of flight safety while still meeting your other production objectives. The Price of flight safety is chronic unease: complacency is the worst enemy.

There are no final victories in the struggle for safety!!!!!