

**A Study into the Perception and Motivation of
Just Culture in Aviation Maintenance**

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Submitted to the National College of Ireland, August 2017

Abstract

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Within the highly technical and skilled aircraft maintenance environment, errors and mistakes can occur. An important aspect of error management is to first identify the error and then mitigate against the error from happening again. Within the European occurrence reporting regulation a concept of just culture exists to encourage reporting of errors and safety-related information. Its aim is for the prevention of accidents and incidents while critically not attributing blame or liability towards any one individual.

The aim of this research study was to understand the perception and motivation of aircraft maintenance individuals to submit a report in a just culture setting. The study was set within the maintenance department of an Irish international airline which operates such a just culture policy. To achieve this aim, aircraft maintenance professionals participated in semi-structured interviews, and through thematic analysis, a rich data set resulted in findings of their perception and motivation. The study identified the participants are highly motivated to report being influenced by a professional ethos, peers and organisational climate. While it found some issues of perception towards the just culture construct, overall it identified a strong level of perception for a just culture exists among the participants.

With limited aviation academic research on just culture in aviation maintenance, this study aims to contribute to the general discussion on just culture and provide a source of feedback to the participant organisation to assist in their just culture policy development.

Declaration

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Acknowledgements

I would like to thank several people without whose assistance the completion of this research study would not have been possible.

A special thank you my wife Susan and my son Adam for their love, permission, encouragement, tolerance, patience, and advice, which supported me throughout the degree course.

My sincere thanks to Dominic Ryan for his assistance and belief in the concept of just culture and to Olivia Edge for her incandescent counsel and encouragement throughout.

A debt of gratitude to Dr Collette Darcy who supervised the dissertation bringing tremendous advice and immense experience and guidance.

To the lecturers, who are indubitable legends in their own fields, for providing some of the more memorable presentations of my third level career.

Finally, thank you to all my classmates who made the journey all the more enjoyable and interesting which enhanced the overall learning experience.

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List of Abbreviations

CAA: Civil Aviation Authority

EASA: European Aviation Safety Agency

FAA: Federal Aviation Administration

IAA: Irish Aviation Authority

ICAO: International Civil Aviation Organisation

SMS: Safety Management System

1. Introduction to the Study

From the outset, it is important to understand, the aviation airline industry today is a commercial operation dominated by companies listed on major stock markets around the world. In addition, and despite the de-regulation of significant aviation markets such as the United States of America in 1978 and the European Community in 1997, numerous bi-laterals and open skies agreements, the aviation industry remains a highly regulated safety environment. The airline industry holds dual core business aims, to operate safely and to return value to shareholders. This requires executives to manage the balance between safety management and financial management. Such a balance requires the understanding of the concept of safety, which is understood as,

“the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management”

(International Civil Aviation Organisation (ICAO) 2013, p. 2-1).

To achieve “...an acceptable level...” of safety between protection and production is a difficult management dilemma potentially resulting in bankruptcy or catastrophe. The balance is to achieve an acceptable level between the two, which is the safety space.

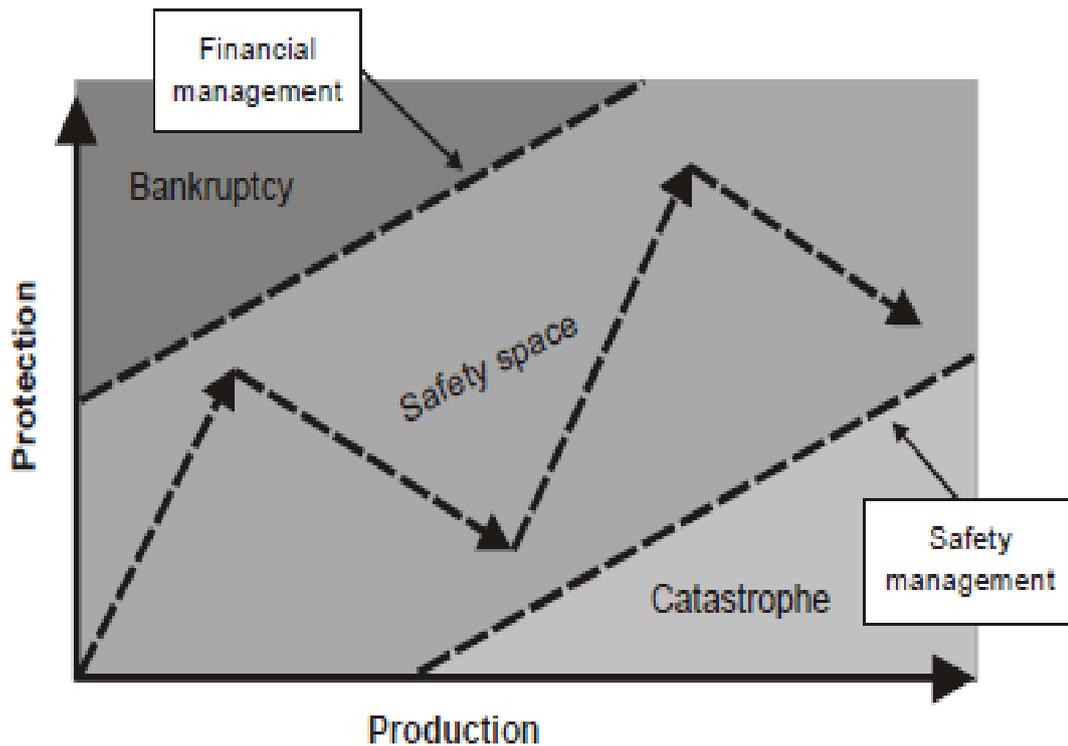


Figure 1: Aviation Safety Space

(Source: ICAO, 2013)

To facilitate this European aviation regulators mandate the implementation of a safety management system (SMS), which is defined as a “*systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures*” (ICAO, 2016, p. 1-2). The approach involves a process of hazard identification and risk management requiring all airline staff to adhere to regulatory requirements including reporting occurrences. For the system to function effectively, the organisational culture and specifically safety culture is an important component which has a strong influence on staff. Safety culture is regarded as “*the engine that continues to propel the system towards the goal of maximum safety health*” (Reason 1997, p. 195). Specifically, as a component of safety culture, and the primary focus of this study exists the ‘Just Culture’ concept which is defined in this study to mean,

“a culture in which front-line operators or other persons are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but in which gross negligence, wilful violations and destructive acts are not tolerated”

(European Regulation 376/2014, Article 2)

The objective of an organisation implementing a just culture is to set rules and principles that encourage front-line operators to report safety-related information. Front-line operators or others in this study are ‘core-set’ aircraft maintenance staff, meaning those persons in contact with safety-critical processes that are most closely associated with complex systems (Vaughan, 1996). In order to work Reason (1997) insightfully notes, a just culture must hold an atmosphere of trust to facilitate the reporting of safety-related information which Dekker (2007) contends, serves the common good by not punishing the reporter and judging him or her fairly. In setting such rules and principles, an airline must establish a system to manage occurrence reports. Under European Regulation (EU) 376/2014, (occurrence reporting requirements) the objective of using the information is to contribute towards the prevention of accidents and incidents.

This research study is set within a commercial airline focussing specifically on the aircraft maintenance department. The maintenance department is a technical-social environment that can benefit from a just culture because the maintenance environment is known to be a significant source of human error, mistakes, events, incidents and accidents (Hobbs, 2008). While SMS hazard identification and risk management introduce mitigating measures such as prescriptive procedures, the human that deviates from the standards is a source

of error. Hobbs (2008) identified the maintenance environment to be “...*more hazardous than most jobs in the labour force*” (p. 2) with stress levels that maintenance staff “...*have more in common with doctors than pilots*” (p. 2). Consequently, through reporting, even self-reporting errors and other safety-related information, the safety management system receives analyses and can act on the report with the aim of hazard identification and error reduction.

The concept of human error with aviation technology is not new having been identified in earnest during the 1940's and 1950's (e.g. Roscoe, 1997; Fitts 1951; Chapanis, Garner and Morgan, 1949; Fitts 1947). Human error is “*an error is the failure of planned actions to achieve their desired goal, where this occurs without some unforeseeable or chance intervention*” (Reason and Hobbs 2003, p. 39). As such, deviating from a planned action or standard can lead to an occurrence, however small, which is what SMS seeks to address. This is enabled by a strong just culture environment. It would be naïve to consider a dearth of reporting before the occurrence reporting requirements came into force because the just culture concept (alongside existing reporting requirements) was first introduced into the European maintenance requirements in 2003. Consequently, maintenance staff have been working under this concept longer than others and therefore should hold a strong perception of its benefits both for themselves and for their organisation, passengers and the industry at large.

The majority of studies on just culture perception among individuals are predominantly in the healthcare sector (e.g. Ireland, 2015; Petschonek, Burlison, Cross, Martin, Laver, Landis and Hoffman, 2013; Petschonek, 2011; Barger,

Marella and Charney, 2011; Von Thaden, Hoppes, Li, Johnson, Schriver, 2006; Von Thaden and Hoppes, 2005). While, in aviation, some dedicated writing on just culture in aviation exists (e.g. Dekker, 2012), in general, there is a lack of evidence on specific just culture aviation studies, because they are typically subsumed within safety culture work (e.g. Gibbons, von Thaden and Wiegmann, 2005; Reason, 1997). One noticeable problem is a lack of qualitative research, instead previous studies focus is on the quantitative survey approach to score a just culture perception. While surveys can produce useful data (e.g. Petschonek 2011; Von Thaden and Hoppes 2005), they lack the ability to adequately deliver an in-depth rich meaningful understanding of an individual's just culture perception that is gained by talking to individuals. Therefore, a gap in methodology exists and as such, this study methodology will be to use the qualitative interview method to answer the research questions.

This brings to the fore the crux of a just culture. Based on a review of the literature there is a scarcity of research in the area of understanding just culture perception in aviation and a gap exists in understanding if a just culture motivates an individual to submit an occurrence report, as envisioned in the Regulation. While there is some literature on this (e.g. Dekker, 2012, Reason, 1997), the problem extends to a lack of formal models to convert the intangible just culture concept into a tangible set of just culture rules and principles.

The formal positioning of a just culture definition within a Regulation has changed the occurrence-reporting paradigm. As such, it is not verifiably clear if a just culture concept works. The problem extends to a lack of understanding of an

individual's perceptions and motivation for reporting. Therefore, the purpose of this study is to understand an individual's just culture perception and motivation within the aircraft maintenance organisational setting by using semi-structured interviews. The value for the organisation and the industry is this study adds to the pool of just culture information to enhance management decision-making process. The study also provides an alternative to the traditional quantitative methods, by establishing a qualitative baseline for future just culture research.

This research study structure continues with the following: chapter two, next, will review the literature that surrounds just culture and its position within the safety system, to include human error and its relationship with safety culture. This is followed by a review of the maintenance working environment and management intent before finally considering previous just culture studies. In chapter three the purpose of the research and the research questions are stated before chapter four discusses the methodology and presents the instrumentation techniques and procedure for data collection and analysis. Chapter five presents the study findings which will be discussed in chapter six. Finally, chapter seven will draw conclusions and provide several recommendations.

2. Literature review

2.1 Introduction

Just culture is relevant in a high-reliability organisation because errors can occur in this environment and as a direct result, real concern exists where people are afraid to self-report and report their colleagues. That of course is an exception and not the rule due to the plethora of reports submitted to the regulatory authorities. The following just culture literature review section will discuss its origins before discussing related safety culture, human error, the maintenance environment and cultural aspects that all combine within the aviation system.

2.2 Origins of a Just Culture

Professor Reason (1997) substantial writings on just culture and its relationship as a subcomponent of a safety culture, considered it to mean,

“an atmosphere of trust where people are encouraged, even rewarded, for providing essential safety-related information – but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour” (p. 195).

This started in earnest the just culture conversation, eventually leading to the European Aviation Safety Agency (EASA) first adopting the concept within the aircraft maintenance (Part-145) requirements by stating,

“An occurrence reporting system should enable and encourage free and frank reporting of any (potentially) safety related occurrence. The establishment of a just culture will facilitate this. An organisation should

ensure that personnel are not inappropriately punished for reporting or co-operating with occurrence investigations”

(EASA 2003, 145.A.60 (b)).

This concept was required to be integrated into the maintenance system and procedures, however it was not until (EU) No 691/2010 (air navigation) that a formal definition of just culture was enacted before being transferred into (EU) No 376/2014 (occurrence reporting). It is specifically this latter Regulation that has provided the platform to extend not only the conversation but also places just culture on a legal setting within European civil aviation. A just culture intent is to offer individuals confidence through fairness, trust and confidentiality to submit occurrence reports on events that they have found or caused. Just culture aims to establish a balance between non-punitive measures for genuine errors of mistakes while equally addressing individuals who perform wilful misconduct or have serious disregard of professional responsibility. The objective is to encourage or motivate individuals to submit an occurrence report so it can contribute to the prevention of accidents and incidents and not to attribute blame or liability. The importance and relevance to this study is, given that a just culture has existed for considerable time in a maintenance setting, it bodes well that individuals can share their understanding, experience and opinions on just culture through interviews. However, despite its virtues, just culture does hold some limitations that are considered in the next section.

2.3 Constraints to a Just Culture

The just culture concept is not without some limitations because it relies on individuals to accept it first and then trust what protections and benefits it offers at face value, prior to submitting the report. The participant, who has experience of submitting a report understands this, but crucially, it is the observer, having never submitted a report that has to be convinced of its virtues. Consequently, it is relevant to understand constraints during the research because it affects management intent and the individual's perception and motivation of a just culture.

The placing of the word 'just' in just culture as an adjective infers fairness, indicating being equitable and open-minded but is also a constraint because a just culture is not a blame free culture and therefore an organisation must be *"clear about where the line must be drawn between acceptable and unacceptable behaviour"* (Gain 2003, p. 3). Dekker (2009) recognises fairness as a constraint because *"its problem lies in the false assumption that acceptable or unacceptable behaviour form stable categories with immutable features that are independent of context, language or interpretation"* (p. 179). In effect, to be fair and equitable it has to regard each person and events on equal merits, which in reality, in the researcher's twenty-five years' experience, is not possible. The difficulty in attaining fairness rests in determining culpability, being uniquely intrinsic to context and interpretation. This means that to be fair, each person and event should be considered individually and not collectively. Significant research in an aviation maintenance setting by Cromie and Bott (2016) confirms that until all factors are considered, a decision cannot be reasonably attained because

extenuating circumstances are vital to being open-minded and to providing a strong perception of fairness. To assist organisations in this aspect they can use a culpability decision tree or a decision flow matrix (e.g. Baines Simmons Limited, 2011 and Reason, 1997), which offers a level of objectivity and transparency that are designed to mitigate against fairness being regarded or perceived as a constraint.

If the process is not fair, it can also be perceived to be not trustworthy. This can result in a constraint of personal fear, especially if individuals base their fear on being punished for reporting (Dekker, 2011). Trust is an important element of relationship establishment and building, of which a lack of trust can result in individuals not reporting as a constraint. Reason (1997) proposes important factors to establish trust, including indemnity against disciplinary proceedings, confidentiality or de-identification and the separation of report reviewing with those who hold authority over disciplinary matters. Dekker (2012) argues trust is just one aspect, it is the retention that is key to keep reports coming in, however this can be extremely difficult if non-related trust issues (e.g. working hours) “...*spill over into safety issues*” (p. 142). Trust hampered by fear impacts safety-related information flow, which prevents learning and continuous improvement Reason (1997). However, GAIN (2004) recognises other constraints citing examples of where people who may wish to report but simply forget or they do not want the trouble to report.

However, despite the existence of just culture in aviation, and its principles of fairness, national judicial law has yet to embrace the concept resulting in court

cases destroying “*the willingness of people to voluntarily report errors and violations*” (Dekker, 2011, p. 123) or even to not report errors, or hide any record of one-off errors (Chapman, 2009). Although the exception, one groundbreaking aviation accident investigation addressed blame when counsel asked Lord Cohen (1954) about liability during the de Havilland Comet crash, he stated, “*the accident was not due to the wrongful act or default or to the negligence of any party or of any person in the employment for the party*” (p.32). While the national Courts come to full terms with just culture, it is poignant to recall the words of Dame Helena Kennedy (2004) when referring to justice, “*is a process not a result and the truth is not the only goal of a trial, we want privacy, fairness, equality and finality. Every time we play the rules to make it easier to convict the guilty we make it easier to convict the innocent*” (p. 30). In other words, justice and fairness can be mutually exclusive, while potentially the law may not always be just. Such constraints are real in the live maintenance environment; they hold genuine concerns and relate to this study as part of the interview themes and analysis. Just culture does not operate in a vacuum but part of the broader safety culture and system, which the next section will review.

2.4 Just Culture as part of a Safety Culture and System

Uniquely ‘safety culture’, while commonly discussed and referred to, is a relatively modern concept. Its origins lie within the concept of safety climate (Zohar, 1980), before emerging to the fore in the aftermath of the 1986 Chernobyl nuclear disaster. The linking of safety with culture was not a traditional link previously made (Roberts, 1989; Weick, 1987). Importantly Turner, Pidgeon, Blockley and Toft, (1989) questioned the use of the word culture in the Chernobyl

report against the social science understanding where the report referred to the 'notion of safety culture' to mean a safety culture in the context of reducing it to functional procedures and employee attitudes. This is not far from what it is understood to mean today. For Reason (1997), safety culture is *"the engine that continues to propel the system towards the goal of maximum safety health"* (p. 195). Just culture and safety culture are not mutually exclusive both sharing aspects *"characterised by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventative measure"* (Reason 1997 p. 194, citing Booth 1993). Figure 2 demonstrates a link between just culture and safety culture. What is evident from this figure is an emerging picture of interrelatedness; each sub-component plays an important part in the overall aviation safety system.

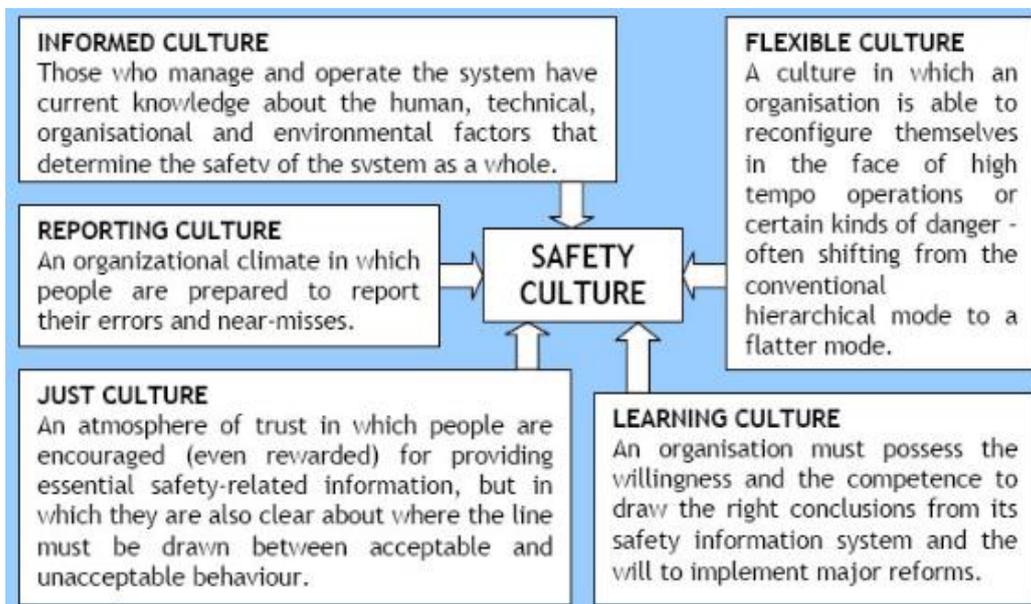


Figure 2: Safety Culture

(Source: Reason (1997))

Safety culture is central for a functioning safety management system (SMS) as its aim is to manage hazards and risks to an acceptable level of safety. Pidgeon and O'Leary (1994) view of safety culture holds four sub-components, 'strategic

management', where safety is advocated top down; 'distributed *attitude of care and concern*' for all roles must endorse and support a care for safety; '*norms and rules*' guidelines that shape perceptions of staff, and 'on-going *reflection*' to continually understand meaning, adapt and learn.

It is noteworthy that Professor Reason is articulating high-level concepts of climate and culture, which do hold strong relevance, whereas Pidgeon and O'Leary are recognising a more practical reality that an organisation faces on an ongoing basis. For this reason and based on actual field experience, this researcher concurs more in favour towards the Pidgeon and O'Leary concept of safety culture. These four factors combined are indicative of a just culture and management intent, which are important to this study because perception of staff can be influenced by management, organisational norms and rules, values and learning.

2.5 Human Error and its relevance for a Just Culture

Human error is generally classified into human error as a cause of failure or as a symptom of failure (Woods, Johannesen, Cook, Sarter, (1994) which are old views and new views respectively (Cook, Render & Woods, 2000; Reason, 2000). The old view tends to judge a human whereas the new view tends to explain error. However Dekker (2001) is critical, the new view has a tendency to be judgemental but accepts progress can be made only with the new view. The systems view of error recognises that error is part of a larger problem. The system itself is the cause and not the human. Therefore, defences must be in place to protect not only the system but also the human. If there is a human error,

the system defence (e.g. checklist, procedures) captures it. Reason (1997) 'Swiss Cheese Model', is a linear defence system against active and latent failures and is the antithesis of the old view, see figure 3.

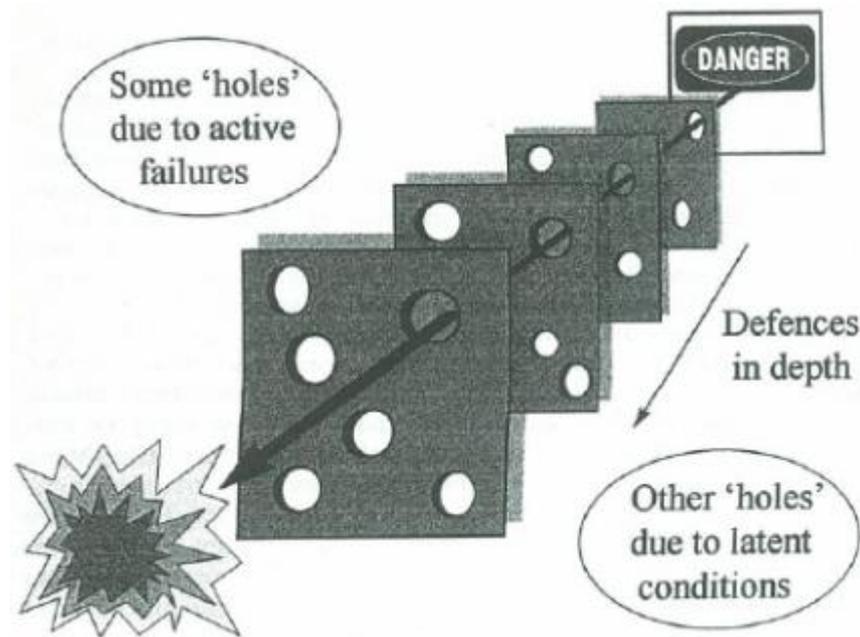


Figure 3: 'Swiss Cheese Model'

(Source: Reason, 1997)

The problem with this model is twofold, the linear aspect does not account for the human unpredictability or external influences. It assumes humans follow procedures rigidly and does not permit adaptation in the field; and it does not capture what the holes (gaps) are in the defences. Wiegmann and Shappell (2003) answered this by developing a Human Factors Analysis and Classification System (HFACS) to use as a tool in identifying which gap (active or latent) in the Reason (1997) model. Given that human error is always going to be present Senders and Moray (1991), argue to focus instead on reducing the consequence of error. The system should be error tolerant (Hollnagel, 1990) when we know humans are limited and therefore design in an element of human variance to a

particular system defence. Others like Rasmussen and Vicente (1989) have also argued for tolerant error systems. However, despite the 'Swiss Cheese' model for system protection, Reason (1990) contends that to negate errors any system design must allow for changes in the organisational culture (i.e. the effect – learning and training) and individual beliefs and values.

While headline news frequently refer to 'pilot error', regrettably similar human error issues have been identified in the maintenance environment. The unique maintenance environment as depicted by Hobbs (2008) paints a hazardous picture of maintenance engineers working at heights, in all weathers, holding clerical levels of attention to detail all while ensuring good communication and coordination in a noisy environment. From 2011 to 2015, the total number of maintenance occurrences calculated by EASA on commercial air transport was 1318 while 45% of fatal accidents in the past ten years are related to a technical issue, meaning the area of maintenance has become under increasing focus (EASA, 2016). To go back thirty years, research by Sears (1986) showed between 1959 to 1983 maintenance and inspection were factors in 12% of 93 worldwide accidents. A Boeing study reported that 15% of commercial accidents from 1982 to 1991 had maintenance as a contributing factor (Civil Aviation Authority, 2003). A study by Gregory (1993) showed that improper maintenance caused 50% percent of engine related flight delays and cancellations. This demonstrates that the maintenance environment is far from perfect. Despite the statistics, errors in themselves do not automatically result in a fatality. During 2016, the Irish Aviation Authority (IAA) received 7,530 non-fatal occurrence reports from Irish airlines (IAA, 2017). This infers at some level, there was a

deviation from the acceptable baseline. As illustrated in figure four, it is this deviation or 'practical drift' (Snook, 2000) that is a starting point of human error. This is somewhat understandable because humans are imperfect, they tend to take shortcuts or compromise to suit local conditions. Knowing this means employing mitigation measures (defences), however where this drifts towards unacceptable, the results can be catastrophic.

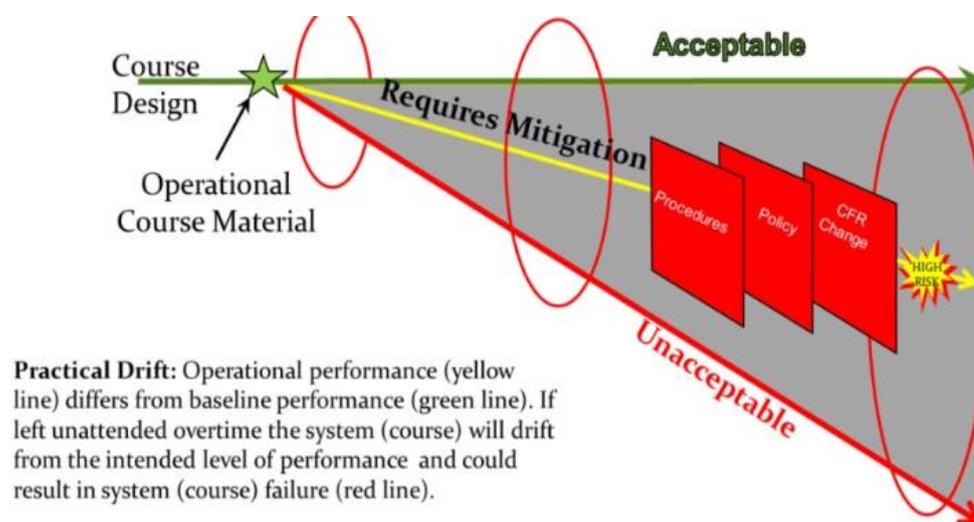


Figure 4: Practical Drift (Source: Federal Aviation Administration (FAA), 2017)

In context, based on international figures, the drift leading to an accident in 2016 figures was 1.6 per one million flights making aviation the safest long distance travel mode (International Air Transport Association (IATA), 2017). However, where incidents and accidents occur they have a significant cost both in lives and in money. According to Ascend Flightglobal (2009), there were 667 passenger and 56 crew fatalities in jet airliner occurrences in the twelve months to July 2009, the cost of all hull losses and liability was \$2,630 million. Flightglobal figures in 2012 show 21 accidents leaving 425 fatalities. In 2011, this figure was higher at 32 accidents and 514 fatalities. IATA (2017) figures for 2016 show 65 accidents (10 fatal) leaving 268 fatalities, set against 3.8 billion passengers flying on 40.4

million flights which is an increase from 2015 which had 4 fatal air crashes leaving 137 fatalities. While it is not suggested all of the above are exclusive to maintenance error, it simply serves to demonstrate the negative outcome of any drift. Real time errors by pilots in flight are identified immediately; in contrast, maintenance staff errors can remain undetected for months, even years and potentially go unreported (Marx and Graeber, 1994). Maintenance staff should understand that the beneficial outcome of their occurrence reports is not so much a personal benefit (e.g. from blame) but principally a reduction or elimination of drift and accidents. This is the crux benefit for maintenance environment needing a just culture.

These are significant statistics and it is clear that maintenance error prevention plays a key role in seeking to maintain or improve aviation safety. Front-line operators (i.e. maintenance staff) role and actions are best placed to effect a strong reporting culture and thus an informed culture. Through demonstrating how prevalent human nature error and deviation is in aviation, and by considering its consequences can potentially motivate individuals to submit a report. This is the real value of a just culture and relevant to this study.

2.6 Organisational Culture or Climate – an influence on Just Culture

Culture is such a broad concept that it can lead to fundamental confusion (Wallerstein, 1990), and the understanding of organisational culture and organisational climate differences is relevant for this study. Organisational culture and climate are essential attributes of managerial intent when seeking to devise, construct and implement a just culture. Organisational climate is “*the*

shared meaning organisational members attach to the events, policies, practices, and procedures they experience..." (Ehrhart, Schneider and Macey 2014, p. 69).

This definition infers that it relates closely to the person more so than the organisation. Schwartz and Davis (1981) view of organisational climate is similar, being a measure of an individual's expectations which is why climate, as a motivator, can instil values for reporting which is central to understand in this study.

In contrast, Schein (2010) contends organisational culture is more than the individual. It is the organisation culture that solves problems caused by external and internal issues that has worked before and can act to influence others in how to *"...perceive, think and feel in relation to those problems"* (p. 18). O'Reilly (1989) strongly argues that it is culture, rather than prescriptive rules that influences behaviour outcome and therefore is a *"potential social control system"* (p. 12). What Schein and O'Reilly are articulating is that culture is a powerful group and organisational influencer on how individuals act towards problems that an occurrence report may identify. This is important because culture has values, beliefs and assumptions that are deep rooted in most aspects of the organisational life (Ehrhart and Schneider, 2016).

Denison (1996) review of climate and culture notes the difference between the two is based on the perspective taken for the phenomenon of culture. Climate is temporary, *"subject to direct control... limited to those aspects of the social environment that are consciously perceived"* (Denison 1996 p. 634). The relevance for individuals is that should the organisational climate change this

could affect the staff perception of the just culture system. Zohar and Hoffman (2012) consider climate enacted values influence perceptions as to what the priorities are in the organisation. This is important to acknowledge during the study interviews because management set the tone and intent of a viable just culture. In effect and of relevance to the understanding in this study, climate, being individual focused, acts to influence the prospective reporter, whereas culture being group or organisational focused, acts to influence the implementation of improvements and changes resulting from a report. Management, being a sub-component of safety culture and related to just culture, is reviewed further in the next section.

2.7 Management Intent on Just Culture

Management is a key component of a commitment to a just culture. The relevance for a successful just culture is that management hold a guiding vision of how things ought to be done while lower level see things how they actually are (O'Reilly, 1989). As recognised by some, (e.g. Wallerstein, 1990) the management perspective is an ontological assumption about their nature of reality and how they see the world. This is fundamental to this study, as it is management's intent of how they see a just culture that defines the rules and principles under which it operates, which affects how staff perceive the constraints of fairness and trust. Importantly Dowling and Pfeffer (1975) highlighted that management are critical to provide clear advocacy of the importance of cultural values because as argued by Jacobsen and Hillkirk (1986), only through their actions, repeated advocating, and backed by resources can they reinforce its importance to ensure it permeates throughout

the organisation. Research by Lautman and Gallimore (1987) found that management commitment, at the top levels, with a strong emphasis on safety is essential for it to permeate the organisation. Clearly this is important because any attempt to *“promote enduring organisational change are unlikely to succeed if senior management are not seen to be closely involved and committed to the initiative”* (Pidgeon and O’Leary 1994, p. 33).

The importance of managerial intent cannot be overstated because as O’Reilly (1989) contends, the fallout of a lack of clear managerial direction is that staff *“can take their cues”* (p. 22), from other staff. If those other staff are not committed to occurrence reporting even in a just culture environment, then this can influence staff who may be uncertain of what to do. Irrespective of procedures or managerial direction, culture as a normative social control system is an enabler for staff buy-in and acceptance of occurrence reporting. The management relevance is clear, top-level commitment under a just culture is required to successfully promote occurrence reporting. Despite commitment and just culture assurances, management should be aware that just culture is not tangible, it is a concept that organisations and regulators seek to position in the mind of the individual, not unlike in marketing. Once imbedded its aim is to influence the person to submit a report without the fear of blame or punishment. Fear acts as a barrier such that persons may fear potential consequences and thus be discouraged from reporting. The positioning (of a just culture) acts to counter the ‘flight’ aspect of the ‘fight-or-flight’ condition (Cannon, 1929) which is a physiological reaction that occurs to a perceived harmful event (Cannon, 1932). The analogy with just culture intent is to ‘fight’, that is to stand up and report

rather than 'flight' and not report. While each person can react differently to a 'fight-or-flight' situation, with strong legal protection associated with a just culture, it potentially can reduce the level of fear towards reporting. Significantly, fear also relates to the report analyst especially with hindsight bias affecting the investigation team and management. Lord Hidden (1989) best summed up this bias by stating,

"There is almost no human action or decision than cannot be made to look flawed and less sensible in the misleading light of hindsight. It is essential that the critic should keep himself aware of that fact" (p. 147).

In support of in-house managerial good intent researchers have provided a wealth of information to aid decision makers and the following section provides an overview of some salient studies.

2.8 Previous just culture studies

There are numerous studies relating to culture and its measurement (e.g. Fletcher and Jones (1992) but the lack of just culture studies in aviation is noticeable. The following are a number of just culture healthcare studies and their inclusion in this study is relevant because both the medical and aviation domains hold similarities that are "... *high reliability and safety critical dependant*" (von Thaden and Hoppes 2005, p. 2). The following are a review of some just culture quantitative studies which is in contrast to a lack of qualitative studies. The survey method provides merely a score indication leading to calculator tables and conjecture, which is in contrast to the rich data obtained from interviews that are used for this study.

	Von Thaden and Hoppes, (2005).	Gibbons, von Thaden and Wiegmann, (2005).	Barger, Marella and Charney (2011).	Petschonek (2011) and Petschonek et al. (2013).
Context	Healthcare setting. Data set divided into four indicators to measure for a just culture; Reporting systems, Response and feedback, Accountability and, Basic safety.	Aviation setting. Research describes the development and validation of a safety culture survey in maintenance operations of two U.S. licence air carriers. The study was based on five dimensions, Organisational commitment, Managerial involvement, Employee empowerment, Accountability system and, Reporting system.	Healthcare setting. Just culture in a hospital setting to examine; An organisations commitment to a just culture, To assess the degree to which a just culture was implemented, and To assess the hospitals adherence to just culture essential tenets.	Healthcare setting. Development of a just culture assessment tool (JCAT) to measure the level of perception of just culture. The tool consisted of six dimensions; Feedback and Communication, Openness to communication, Balance, Quality of reporting, Continuous improvement and, Trust.
Measures	These indicators formed the basis for a self-evaluation tool to utilise as a staff survey to measure patient safety.	The survey was adapted from their Commercial Aviation Safety Survey to describe behaviour directly relevant to maintenance professionals	Study employed a two-part self-assessment survey quantitative algorithm for evaluating the three just culture aspects.	A 27 question JCAT survey arranged under each of the six-dimension combined to form a just culture higher-order concept.
Outcome	Through surveys response the results allowed the researchers to generalise on perceptions of a just culture.	Study found the CASS maintenance version did not provide solid support for the five-factor model of safety culture.	Their conclusion showed that the respondents typically overstated the degree to which they believed they were aligned with just culture' principles revealing significant gaps in many areas. Critically the conclusion showed that there was a need to improve staff awareness on the value of reporting, need to focus on system process and the nature and cause of human error.	Benefits identified the JCAT model encompasses all six dimensions into distinct elements and the six dimensions enable interpretation of varying aspects of just culture and how professionals might react to each dimension. Outcome was a score giving an indication as to the level of perception.

Figure 5: Previous Studies

2.9 Literature Summary

Just culture when first applied in a maintenance setting found a welcome natural home because the environment is error inducing. The focus of error mitigation has shifted over the decades from technology related, to the human as the cause to the system approach today. SMS is a system approach, which mandated occurrence reporting and with the just culture concept, they combine as key faucets of aviation safety. Organisational climate, despite culture being more widely referred to, holds applicability to a just culture as it influences reporting and organisational culture influences improvements. Intertwined are management and their intent who crucially provide direction on how the process is managed which directly influences the individual's perception of fairness and trust. In conclusion, the concept of just culture is twenty years old and while there is a sea of material on the subject, there is a narrow base of significant writers on the subject and an even narrower base of academically robust studies. Consequently, in addition to the purpose of the study as presented in the next section, an aim of this study is to provide a contribution to this growing literature base.

3. Research purpose, objective and questions

The compelling purpose of this study is to garner an individual's perception and motivation within a live organisational setting on the concept of just culture, through sharing their understanding and experiences. The just culture concept introduced into a maintenance setting in 2003 resulted in the researcher deliberately deciding to use the maintenance environment as the focus of this study. The appropriateness of the maintenance environment, as the literature shows, is a source of known error resulting in incidents and accidents. This study, in contrast to previous studies that seek a quantitative score as an indication of perception, creates a qualitative research platform for meaningful rich understanding based on interviews to answer the research questions. As such, the objective of this study is to understand the aircraft maintenance individual's perception of just culture, and are aircraft maintenance individuals motivated by just culture to submit an occurrence report.

Research Questions,

1. What is an individual's perception of a just culture in an aircraft maintenance organisation setting?
2. What motivates an individual to submit an occurrence report in a just culture maintenance organisation setting?

4. Research Methodology

4.1 Introduction

The following chapter describes the research philosophy and the methodology for the seven interviews of the aircraft maintenance professionals. The techniques and procedures show how thematic analyses resulted in organising the rich data into just culture themes, centred on the JCAT model (Petschonek *et al.* 2013).

4.2 Research Philosophy

A Research philosophy is about beliefs and assumptions held by an individual and in particular, the viewpoint a researcher holds towards their research, which normally focuses on three primary areas epistemological assumptions, ontological assumptions and axiology assumptions. This study is a reflection of the researcher's values, area of interest and assumptions, which are reflective due to the level of human interaction required to answer the research questions. Having carefully reviewed and considered each of the major research philosophies, positivism, postmodernism and pragmatism, interpretivism was concluded to be more aligned with the researcher philosophy and therefore the most suitable. Interpretivism best matches the subjective nature of this study given the subjective nature of the study as it seeks to gather and interpret qualitative data while regarding humans as individuals who hold a voice and opinion.

As the research objective is to understand a just culture, the methodology selected aims to capture non-logic and free flowing meaningful thought, relevant

to the participants, through semi-structured interviews. The result is to achieve an individual's rather than an organisational perspective. However, collectively, it may indicate an overall organisational trend and perspective. Individual's behaviour towards submitting an occurrence report is what potentially leads to improvements in aviation safety. It is interpretivism specifically and through its key sub strands of phenomenologists, hermeneuticists and symbolic interactionists that are relative to this study and discussed next.

Phenomenologists study the lived experience of participant recollections and interpretations. Within a just culture environment there can exist the 'observer' and 'participant'. The observer perceives an experience having no experience of reporting or an investigation. In contrast, the participant, having submitted an occurrence report, has such an experience. The relevance to this study is where possible to ascertain both experiences. Hermeneuticists relate to cultural artefacts and as such are not explicitly relevant to this study. Symbolic interactionists holds some significance to a just culture study as it relates to the meaning of interactions between people (e.g. self-incrimination reports, investigations). The symbolic meaning requires a high level of trust, which is of paramount importance to a successful just culture. The symbolism a just culture environment represents, being fair and equitable can hold powerful representative meaning to a person or the organisation. Just culture as a symbolic representation is potential evidence of leadership, commitment and fairness. Symbolism can permeate throughout, even to the occurrence investigation or 'learning teams' (Clonklyn, 2016), potentially to influencing fairness and reasonable actions.

Given the research objective, these do not support a deductive logical approach, which identified a non-logical premise within the research aim and questions as well as the theory. As such, a judgement had to be determined from the research data as to the outcome (Ketokivi and Mantere, 2010). This outcome judgement is significantly subjective with the researchers adopted approach was along the inductive reasoning as this was the best fit for the research objective and permitted multiple explanations that most closely align with the research interpretive philosophy.

4.3 Methodological Choice

A range of qualitative methods were given some consideration with documentation review found not appropriate given its inflexible means, as was observation due to the inability to interpret and contextualise. Focus groups was not viable due to the lack of available staff in a dynamic maintenance organisation setting and the case study method lacked breadth of information, which is required for this study. Finally, the quantitative interview method was considered the only viable method as it suitably aligned with the interpretive philosophical approach permitting better contextualisation and understanding of a just culture. Despite an alternative quantitative survey approach available (e.g. Petschonek, 2011, Petschonek *et al.* 2013), the researcher believed interviews would provide the rich data that best addressed the research questions. This study research philosophy is interpretive in nature and as noted by Saunders *et al.* (2016) a criteria of reliability and validity cannot be applied rigidly given that qualitative research is “*regarded as socially construct and multifaceted*” (p. 205).

As such, the notion of using reliability and validity for this paper in the whole is not appropriate, as this paper is interpretative focused. Denzin and Lincoln (2011) note that a qualitative study relates predominantly with interpretive philosophy, which reinforces this view.

Despite the challenges of the interview method such as, being time consuming, difficult to analyse and potential interviewer bias, the interview method did permit the researcher the ability to make sense of the data collected. The research data, through interpretivism, is explicitly subjective in nature, non-standard, which aligns with the research approach and the research objective. Therefore, the element of subjectivity has a common thread linking the research philosophy through to the research question and research method. It is noteworthy to recognise the difficulty of replicating this qualitative research due to its interpretivism and being reflective of the research environment at this time.

Qualitative methods approach requires a suitable analysis tool, however when reviewing the options grounded theory (Glaser and Strauss, 1967) was identified as unsuitable because this study was not seeking to discover or develop theory. Content analysis (Smith, Lasswell and Casey, 1946) was also not viable given the nature of quantifying themes and the adaptation to micro analyse which is not part of this study. Discourse analysis (Harris, 1952), did hold some relevance, but with its significance on semiotic and sign language was not used as it relates to creating discourses based on social reality. Narrative analysis was not appropriate as these used stories, journals, family conversations as its main research unit while interpretative phenomenological analysis (IPA) has ridged

guidelines and is therefore limited. Case study was a possibility but there is not the depth of interviews to make this analysis practical, within the timeframe. Therefore, thematic analysis, despite reliability concerns and heavy reliance on themes and quotes was suitable as it offers a flexible analytical approach to breaking down the data into codes. This coding then enables the research findings data to be organised towards developing the finding discussion. Finally, the next section introduces the implementation strategy for the research design.

4.4 Strategy

A research strategy is “*a plan of how a researcher will go about answering her or his research question*” (Saunders *et al.*, 2016, p. 177). It is in effect, the link between the chosen method and the philosophical approach right through to the preferred means of analysis (Denzel and Lincoln, 2011). Above all, there is no point in having a strategy without implementation because as a leading business executive once stated a, “*strategy without execution is hallucination!*” (Moore 2012, p. 1).

The implementation commenced with approaching the Technical Director to discuss the research proposal. The Director agreed to facilitate the research permitting access to the maintenance department. Following a further meeting, the Director agreed to introduce the research, by email, to the department. The email advocated participation and included an outline of the research. Following this, the researcher sent an email providing additional information on the study. Volunteers came forward by email to the researcher. The interviews commenced and concluded over the subsequent three weeks and were analysed into finding themes and discussion sections.

4.5 The Instrumentation

This study instrument undertook the semi-structured interview method and as interviews are time-consuming researchers can be less inclined to undertake this method. However, it is worth reflecting on Myers and Newman (2007) citing Rubin and Rubin (2005) observation that interviews are like night goggles, *“permitting us to see that which is not ordinarily on view and examine that which is looked at but seldom seen”* (p. 2). The interviews enabled a three-dimensional picture to emerge, beyond survey numbers, of what the individuals believed and perceive a just culture to mean. The value of this ‘richness’ holds tremendous added value as it was gained under a real-life situation which, according to Yin (2014), has the ability to generate insights that otherwise may not be evident by other means. The interviews linked directly with the interpretivism philosophical approval of the research study, because the research is subjective, holds many interpretations and the individual participants hold a voice and opinion. As stated by Stake (2005), it is the intention to link back to the theory while recognising that the data collected and analysed for the paper relates to the researcher’s philosophical stance. Therefore, another researcher could interpret the data differently.

4.6 Ethics

Strict ethical factors were applied based on the University ‘code of ethics’. This was first established prior to commencing this study and identified there was no ethical issues. Ethics according to Berry (2004) and Thomas (1996) comes down to deontological (following rules) and teleological views (benefits versus

consequences of action) which they argue is challenging to adhere stringently to one or another.

Ethics in this research relates to pre-study commencement but also right through to post study interview data disposal. At the organisational level, the Technical Director received a full briefing on the research before granting permission in writing. The Director introduced the study to his department. As interviews involve a unique level of personal interaction, they were both professional and consistent throughout the process. All participants received identical briefing of the research and prior permission to record the interview was granted. All recordings and transcripts will be deleted/destroyed post study completion. All interview participants were volunteers and signed participant consent forms. The key aspect throughout was to treat participants with fairness, dignity and respect. Where participants stated identifying information (e.g. a name or company), this was not recorded in the transcript or study; instead, a generic '[x]' or '[*identifying information deleted*]' was used.

4.7 Techniques and Procedures

This section describes the organisation, participants and the process undertaken to gather and analyse the data.

4.7.1 Participant aircraft maintenance organisation

The study involved a commercial airline (licence air carrier) headquartered in the Republic of Ireland. This study focused exclusively on its aircraft maintenance environment which Ward, McDonald, Morrison, Gaynor and Nugent, (2010) described as "*a highly regulated, safety critical, complex and competitive*

industry" (p. 247). The maintenance department contains several sub-sections (e.g. quality assurance, technical planning, engineering, reliability, logistics, stores control, technical records, flight line, and base maintenance) which combine as a specialised socio-technical environment. The Irish Aviation Authority approve the organisation to maintain and perform continuing airworthiness management activities on large commercial transport aircraft.

4.7.2 Maintenance department participants

Participation in the study was available to all staff resulting in the study participants represented the following two job roles,

1. *Management*: who hold the responsibility and accountability to ensure the resources are in available and in place, and maintain overall control of the maintenance and training activities.
2. *Engineers*: who are technically qualified to maintain an aircraft and issue a Certificate of Release to Service (CRS), post all maintenance activities. These activities include, repair, modification, inspection and replacement of parts and systems in aircraft and engines. The engineers are the only staff suitably qualified and appropriately authorised to release an aircraft into operational service.

The job roles meet the just culture definition requirement of 'front-line operators or other persons'. The interviews involved convenience sampling, which assisted in the study timeframe; however, convenience sampling is limited by selection bias that can involve sampling error and affect credibility.

4.7.3 The Interview sample size

The potential interview population was three hundred and twenty-six and it was never practical to interview each one had they all volunteered. There is some debate on a suitable sample size; however, Saunders (2012) provides guidance of between five and twenty-five. This study interviewed seven, which is within the recommendation to provide a useful, credible data set within the resources (Patton, 2002). By convenience sampling there was easy access to the department members, and they all volunteered to participate as such there was no need to engage in purposive sampling.

4.7.4 Data collection

The interview data was collected, post introduction, by digital recorder and hand notes by the researcher. Each interview lasted approximately forty-five minutes and was on a one-to-one basis. All interviews, except one were away from the work environment in an office meeting room, close to the participant's workplace. The participants were positive, knowledgeable and demonstrated a willingness to contribute to the just culture research process. Each interview commenced with identical questions based on just culture themes (i.e. feedback, blame) and depending on responses, subsequent questions order altered with additional non pre-planned questions asked. There were no questions added to interviews based on responses from earlier interviews.

Questions were clear and probe meaning and responses considered from differing angles (Saunders *et al.*, 2016). Any negative responses were considered equally valid and only served to add to the rich data for analysis.

Overall, the interview was deemed a suitable data gathering technique as it permitted participants to confer their experiences past and present (Maykut and Morehouse, 1994). Trust between the interviewer and interviewee was paramount to enable a free and frank communication, this element of trust according to Myers and Newman (2007) is often a challenge in an interview setting. Therefore, in setting the interview, the researcher was prepared with a relevant question schedule, appropriate meeting location, suitable office facilities, convenient and accurate timing, respectful demeanour, absolute confidentiality and honesty of the voluntary nature of the process.

The interview as a data collection method is appropriate to this study as it affords the participant an opportunity to tell their story by their own words. This is an established phenomenon within academia. According to Myers and Newman (2007) "*the qualitative interview is the most common and one of the most important data gathering tools in qualitative research*" (p. 3). Delamont (2004) notes it has been involved in the majority of qualitative research over the past twenty years. However, despite its popularity Helfferich (2009) states the importance of technical, interactive attention, communication competences are critical in conjunction with understanding personal bias for interviewing.

4.7.5 Data analysis

Each participant interview was accurately transcribed for the first step of the thematic analysis to commence. As noted, the thematic analysis method is flexible enough to provide the best interpretation of the data. According to Saunders *et al.*, (2016) the key aspects of qualitative analysis lies in the

“...interaction between the data collection and data analysis to allow meanings to be explored and clarified” (p. 568). The study approach deemed the best fit was an inductive approach. However, as suggested by Corbin and Strauss, (2008) this is heavily time consuming to the point that it can take months. Considering this and acknowledging those that have gone before the analysis invariably took a combination of deductive and inductive means Saunders *et al.*, (2016).

Thematic analysis code methodology used the six-step process by initially placing the data under suitable headings, which according to Braun and Clarke (2006) is a flexible approach within the qualitative research. In step, one the researcher became familiar with the data by listening and transcribing the data. Step two involved initial coding of the dataset, applying the same codes to each interview as applicable. Step three arranged the data into general themes and step four identified the coded data/themes under distinguishable grouped headings. Step five grouped data analysed towards the literature and step six located the final output for inclusion into the findings report. The importance of coding cannot be understated because as noted by Lincoln and Guba (1985), the key aspect is to capture all respondents own experiences and world view.

The six-step theory in practice resulted in each interview being transcribed and printed. On each transcription, a code number represented the respective themed response (i.e. feedback = 4). Each coded interview was posted into Microsoft Excel format with the question on left, participant response immediately across to the right followed by the code number. Within each interview, a sort filter ordered the responses by their respective code numbers leading to grouping

of similar coded responses. The resulting categorised interview data was organised together under a particular theme (i.e. motivation).

The absence of a specific qualitative analysis-computing tool in this study does not diminish the analysis effectiveness, but to infer a tool could have augmented better time management. To demonstrate an audit trail, for which a computer package would provide, the researcher has retained all hard and soft copy evidence of the interview coding process. In reflecting on qualitative data analysis tools and their use, the researcher was mindful of Fielding and Lee (1998) citing Cordingley (1991) statement that, the qualitative researcher is continually seeking *“tools which support analysis, but leave the analyst firmly in charge”* (p. 167). In essence, while undertaking such a time consuming process, the researcher is believed to be best positioned to make sense of and integrate the qualitative data while manual thematic sorting can lead to greater insight in itself (Bazeley, 2009).

5. Research Findings and Analysis

5.1 Introduction

This chapter presents the findings from the interviews that are organised into the six JCAT themes and an additional theme of motivation. The structure is set with the aim of answering the research questions. In general, the findings show participants have a strong sense and perception of just culture. They are highly motivated by inner professionalism and outward safety considerations. They seek constant feedback from their submitted reports and consider the company manage a fair process even if there are some misgivings with trust, however critically they consider the reporting process as benefiting passenger safety and continuous improvements. The study received twelve responses leading to seven interviews. Two declined and three were unavailable. Management (n = 3) and engineers (n = 4) participated in the interviews. The following figure six two lists the population data of the participants.

Population Data	N	N %
Total Staff	326	100%
Volunteers for Interview	12	3.68%
Actual Interviewed	7	2.14%

Figure 6: Participant data

The research purpose was to understand participant's perception of a just culture and their motivation to submit an occurrence report. The following are the findings that support the answer to the research questions. There is no

expectation that everyone understands just culture to the same degree. Consequently, the seven interviews enabled the researcher to ask questions that explored what each participant understood of a just culture. That coded rich data was organised under the following just culture themes; feedback, communication, fairness, reporting process, improvements and trust themes as they were shown to collectively combine to provide a higher order construct of just culture (Petschonek, 2011), and they provide a clear manner to answer the research question. From the onset, it is important to establish what the participant understood a just culture to mean because it establishes a background to aid the study understanding on which their perception and subsequently their responses to the questions are based on. Their understanding of a just culture is a clear indication of their pre-disposition, which is presented in the next section.

Note: the participant number identifier *does not* relate to the order of interview. This is deliberate to protect participant responses from identification to any one individual.

5.2 Just Culture and participant understanding

The participants showed they held a strong understanding of just culture that was in keeping with the Regulation despite the majority of participants stating they had not read the Regulation. They revealed that in nearly all cases their knowledge of just culture is based on internal company documents and training. The following participant summed up the consensus of a just culture for all participants,

“Really it means that if a mistake is made, we want to create an atmosphere where the person that made the mistake is comfortable standing up and

saying he made a mistake and reporting it rather than trying to brush it under the carpet or covering it up, so he feels that if he stands up and lets everyone know about the mistake he made, he won't be penalised for it and that if you're making a report against someone else that they won't be penalised for it either" (Participant 3).

What the above represents is participants share a positive understanding commensurate with what the Regulation espouses in line with this study definition of just culture. It shows that during the interviews the researcher and participant hold the same understanding. This is important to avoid any misinterpretation during the interviews and during subsequent analysis.

5.3 Feedback and Communication

Both feedback and communication are central to a just culture as evident in several studies identified in the literature review. The interviews showed all participants had submitted a report however, but a number did not receive any feedback while several stated they did not hear about all conclusions or event outcomes. Several participants cited examples that they never got feedback while others indicated that they have yet to receive feedback believing this may be due to it being currently under review. One participant singled communication in particular as an issue, which may influence the perception of poor feedback, "no I just find that communication is one biggest I find is a problem in the organisation, lack of and communication..." (Participant 7). Another participant stated the communication of feedback must be directly to the originator, "it has to come back to the instigator, it has to otherwise it's a waste of time" (Participant 4).

A fundamental problem several participants identified with feedback was the system they use to report is not fully utilised to provide feedback and communication. That means once submitted only the reporter can view potential updates which is an issue,

“ah you see there’s the problem with it, you only see what you submitted and only the individual who submitted it sees it which in my mind is a flaw, everyone in the organisation should see it because nobody knows what’s going on until the final report is submitted which could be months or it could be up to a year later so no one knows what’s going on. Currently I’ve one going through the process at the moment and only for I’m talking about it, no one would know what’s going on. I go onto the system, [identifying information removed], I go on there but only I can see what I’ve submitted, no one else can log on and see it, that’s a flaw in my mind” (Participant 4).

While the process is to protect reporter confidentiality and rumours from developing, it was articulated by some participants that feedback to some degree would be beneficial. One participant summed up the participants sentiment by stating,

“well an acknowledgement would be nice that it has been received would be something and then it would at least it would prompt you every now and again to go in and have a look or some sort of email system” (Participant 7).

There was no consensus if report visibility prior to a conclusion or outcome would help aviation; however, there one participant believed it would,

“in my mind without a doubt, absolutely because we get so many emails about so many different things, a report is issued from the [identifying information removed], and people just say delete but if they were reading it and knew something was going on long before the report was issued, they might start reading it” (Participant 4).

Most participants expressed a concern at the lack of information about events with one participant stating,

“it’s frustrating, it’s frustrating not knowing what’s going on, it’s submitted and it’s lying there, it’s like it’s just lying there in the cloud and you don’t know what’s going on, it is a bit frustrating and it gets you wondering, and it gets others wondering whether, I use the word, cover up is taking place” (Participant 4).

This was not universally shared as one participant acknowledged they received feedback through training stating,

“the yearly communications that we do and it does go through previous occurrences and reports, that’s brilliant because it’s feedback from our point of view” (Interview 6).

Several participant discussed communicating through a system called ‘event tracker’, which is separate from the occurrence reporting process. Its intent and function is to record a live emerging event such as an aircraft delayed or grounded for technical reasons (e.g. birdstrike). In virtually all cases, the situation will not end in an occurrence report. This information remains in the system as a point of further reference and communication between shifts, through open access in the maintenance department. The participant described its use as,

“yes, it’s basically our way of communicating, anything really, whether it be damage abroad to an aircraft, what’s going on, everybody, whoever’s involved can go in and add the step or this person’s going to...” (Participant 6).

The significance is one of internal department communication. The department has ‘event tracker’, an existing system, available to all staff, to create and update technical events. Its use is in addition to occurrence reporting which one participant stating, *“if you were going to put in an occurrence report, you’d do that as well and you can, as far as I know, link the...or you can put in the occurrence report...”* (Interview 6). Unlike occurrence reports the ‘event tracker’ affords full visibility of all technical events, *“... that there’s a note there for everybody to see, whether everybody goes in and reads them or looks up, we have an event tracking module that you can, basically tracks everything”* (Participant 6).

What emerged from the interviews is that the company has invested in an excellent ‘event tracker’ communication system. However, for occurrence report communication, the feedback and communication is a source of mixed feelings from “frustration” to “brilliant”. To say occurrence reporting information lacks communication would be naïve as several participants stated, regular reports are issued, *“there’s a weekly meeting in the [deleted] office. On a daily basis, we get a list of incidents that have been raised unless it’s confidential. If it’s confidential we don’t see it, it doesn’t come out of the [deleted] office”* (Participant 1).

Participants considered an appropriate timeframe to get feedback ranged from immediate (i.e. an acknowledgement) to understanding it may take months

because the company may have to go to the aircraft manufacture for information. However, several participants stated they did want feedback as soon as possible and in no case should it be closed without the originator getting feedback. Timeframes included a short “*within 3 working days*” (Participant 5), to a longer one depending if the aircraft manufacture has to be contacted.

Several participants found a lack of feedback frustrating but when present it is brilliant. Feedback is a vital element in occurrence reporting as indicated in the legislation and in previous studies. One participant even suggested an email alert to improve communication. During the interviews it became apparent that a certain group i.e. management, receive daily reports. The production of daily reports exclusively to management may explain certain frustrations among some staff.

5.4 Openness of Communication

Open communication is a two way process and while the Regulation requires organisations to share and communicate information, the staff also hold the obligation to report. One participant admitted that not all occurrences were reported, “*Not really, I think that the, that probably a lot more, a lot might not be a good word but there’s definitely more occurrences there that aren’t reported*” (Interview 6). This view was not universal, with another participant stating he does share, “*to prevent reoccurrence ... happy to report. Gets to the root cause, identifies the trend to address it*” (Interview 2). One participant described the situation where the report was submitted with basic details, as happens in cases

however, the follow up investigation was not, in their view, entirely robust. The participant felt that other factors should have been taken into account,

“one or two cases I can remember I know they weren’t. It was left as that the report, this is the finding, the finding is probably basically right but there were just a few other factors that could have been added into it but they weren’t” (Participant 3).

Open communication and the ability to share the information with management was of concern. It became evident in some of the interviews, that submitting a report often involved a local discussion amongst staff first as opposed to individuals automatically acting unilaterally,

“it’s a combination of both, so sometimes you have the local chat and from the local chat you decide to put in a report or sometimes you have the local chat and it doesn’t go any further or sometimes the report goes in and there’s no local chat, it’s a mixture of all” (Participant 3).

Other participants stated they would have no issue submitting a report because that is what they believe is the right thing to do, it came across clearly that most submit without fear due to their personal character makeup rather than prescriptive requirements. Another participant highlighted a reason for openness of communication,

“Basically you’d submit a report yourself if you made a mistake and you think others would make the same mistake so it’s about highlighting the mistake you’d made and the whole intent of doing it is hopefully that it might prevent others from making the same mistake, ...that’s the real goal” (Participant 3).

This is significant as it shows that when communication lines open it can also motivate individuals to report to prevent mistakes happening again. This interview data highlights important aspects of open communication and it needs to be a two way process, the reporter needs to report initially as much as possible, and those involved in the event should freely contribute to an investigation. In all situations, the outcome is then a reflection of all the pertinent facts.

5.5 Balance (Fairness)

Fairness is both in its application and in perception. If it is perceived fair, it will encourage reporting. There was general agreement that the process was fair, one participant stated,

“it’s a fair system, every single report that’s made is treated in the same manner, it might be investigated by different parts of the business, different people in the business depending on who the report is for or from but absolutely a fair system exists in how it’s followed up” (Participant 1).

Agreeing, another participant said, *“I suppose yes, I suppose you would have to say yes, I suppose so yes”* (Participant 4), however this was further clarified by,

“I’ll use the word fair in inverted commas, and however to get to the fair was very stressful for the people involved. We had very close to a serious incident and that individual had to go through a lot of stress” (Participant 4).

More than one participant referred to the lack of fairness in the system by referring to an example where an individual was known to be ‘playing the system’. Here, he was reporting a ‘mistake’ in the knowledge it was not what would be

normally be understood to be a mistake. This led to a perception of unfairness amongst some participants in the reporting system, *“...it’s a simple word but it’s brilliant, that is brilliant, playing the system and it’s having a negative effect on others big time, big time” (Participant 4).*

A significant aspect of fairness relies on the outcome of the occurrence investigation, which should take into account all circumstances, even extenuating ones. Overall participants believe personal circumstances should be considered when deciding the outcome or culpability,

“Personal circumstances because looking at the individuals overall performance to date is a huge factor in determining factor if it is an isolated situation, whether he was influenced by stress, so his personal circumstances” (Participant 7).

In occurrence reporting there are two general types of individual, the participant and the observer. Some interviews revealed negative experiences which one participant described as dreadful,

“this whole incident dragged out over weeks and eventually I got called up to a meeting..., they said tell your story, so I told the story, told them I didn’t eat or sleep.... wasn’t sleeping or eating... you know what I mean, so I went into the meeting and I was I didn’t eat or sleep” (Participant 5).

Another participant’s experience was that once the interview was over, he heard nothing further *“No further info, no feedback. Asked for input but when left room no further interaction” (Participant 7).* This experience was not throughout all the interviews. Indeed one participant inferred that just culture has been operating for some considerable time and that before just culture became commonplace,

he had been involved in an event for which he was interviewed. He felt that the organisation always had a sense of just culture: *“there was never a sense the organisation was trying to be unfair”* and when asked was he treated fairly and was the outcome was fair *“absolutely... yes I believe it was”* (Participant 1).

This would tend to support that the organisation always held a strong culture of fairness when dealing with occurrences. He went on to state he has seen the company move from a place where just culture was not in vogue but practiced, to today where it is in vogue and it is still practiced. He continued that fairness is part of the department culture and climate from the top down the organisation is committed to supporting a strong safety culture. It is advocating from the top down that provides a strong positive message and it reinforces it to all staff, especially those who may be unsure, *“...the organisation does absolutely support the just culture from the CEO down. I see in him a guy that is trying to make the business work, etc. etc. but very much behind just culture”* (Participant 1). The cultural aspect is significant as a means to drive norms and a control measure to influence people to report. One participant compared maintenance department culture to the flight operations department culture, who are universally regarded to hold a strong reporting culture,

“we seem to be behind flight ops side of the house, for example and if you talk to people who are in the business 25/30 years ago, the thoughts of reporting someone else is not actually something they would have done, they would have tended not to do it, they would have always have said “no hold on you can’t do that” and that whole culture has changed and I’ve seen that change over the last number of years to a point where now I see in [identifying organisation name removed] a healthy culture of reporting, of

people reporting themselves and people reporting colleagues” (Participant 1).

Interestingly, another participant, simply summed up the maintenance reporting culture as a ‘macho culture’ in the context that reporting everything is not the norm in maintenance,

“I think it’s because it’s not macho. In maintenance and engineering it’s all men, ah sure I cut my finger, who cares, your finger could be hanging off but I’m not reporting that whereas the pilots or the cabin crew section if they cut their finger, they’ll report it and no-one bats an eyelid” (Participant 5).

However, this is where the macho culture distinction ended, he went on to state that the reporting was for serious items like aircraft damage.

One participant stated that an agitated staff member contacted him believing he would be sacked post an event, but found himself reassuring him,

“...I told him was we operate a just culture, as part of that just culture there absolutely will be an investigation, people will talk to you and will want to talk to you about what happened but it’s just culture” (Participant 1).

Overall, participants stated they were not aware of anyone being sacked for reporting an occurrence, *“no, I’m not aware of that and I think I would be but I’m not” (Participant 4).* Another participant, noted that he was aware of another employee being concerned for his job but he had attributed this to a former employer, *“it probably was a little bit, and it could be from a previous organisation that he came from but he knew he had made a mistake, he had reported it and in his view the outcome was that “I’ll be sacked” (Participant 3).*

In contrast one participant stated he had come across a person who was disciplined, this was for an act that was not reported, *“eh, no, not directly, they didn't report it but they were caught out so that was why they were disciplined”* (Participant 5). The discipline was for not reporting rather than over the wilful act. Attributing the discipline to the 'not reporting aspect', would send a message to all others that it is the lack of a report that is the most significant issue,

“yes, again they were pointing the blame at him because it was blatantly obvious that he did it. They were blaming him and he couldn't say it wasn't me because he [word deleted] it and that is just culture going was it accidental, was it sabotage? He punched it cos it wasn't working” (Participant 5).

This is important for the perception that just culture works as intended. Had the person who was wilful not been punished, just and fairness perception could have been tainted.

5.6 Quality of Event Reporting Process

To aid the reporting process, a suitably designed, transparent and workable reporting process must be in place. Without this, reports cannot be submitted, logged, tracked, analysed for feedback and improvements. The interviews showed overall, that the organisation has an easy to use system which one participant described as: *“seamless, if you can go onto a computer and look up the Irish Independent you can go on to the [identifying information deleted], there's no issues, there's no bother doing it...”* (Participant 4), however one

participant did not agree stating *“the reporting process is remote, it is on-line, it is more cumbersome than the old system”* (Participant 2).

One participant revealed that the process was not always easy. Post one event, an individual pleaded to his colleague not to submit an occurrence report citing the hassle and administration reasons. The participant stated,

“so when we came in, we said we have to do an occurrence report, [x] begged, he pleaded with me not to and I didn’t. “I’ve known [x] for a long time and he didn’t want to go through the hassle, he didn’t want to go through the hassle of it...” (Participant 4).

Despite the colleague offering to submit the report in his own name the individual still insisted, *“he didn’t want to go through all of that. It’s not that he didn’t buy into it, into the just culture, he didn’t want to go through it”* (Participant 4). This frank admission of not reporting when clearly the person should have and knows he should have is startling. Despite the management intent, the system process, the lack of punitive demonstrable measures, the main barrier identified to reporting was ‘hassle’. The participant clearly could and should have shared this occurrence for the betterment of the organisation but deliberately chose not to.

Throughout the interviews it became evident that participants generally considered the reporting process fair, citing the existence of a culpability matrix or flow chart. Culpability is a difficult aspect of any process and to facilitate this,

“ there’s an index or a flow chart that they follow, did you do this, did you not do this and depending on where it ends up, it either goes to the left or the right, to the left it’s ok, if it goes to the right, then you’re in trouble” (Participant 4).

Despite it being somewhat prescriptive, it is transparent in how a decision was reached, i.e. an outcome. Another participant referred to it as,

“I suppose, it is a very mechanical system that you can actually see, that he satisfied all of this and it shifts it, it looks at where, it asks certain questions and based on the answers it arrives at [an output]” Participant 7).

Participants were clear that they believed reports were being evaluated and reviewed because they see the output through training or via the on-line reporting system. A participant stated there was visibility at monthly safety meetings,

“All these events then, so the process is we raise an incident, the incident then from an [identifying information deleted] prospective is reviewed at our monthly safety meeting and then we go back to where is the root cause” (Participant 1).

The outcome of reports is sent to the training section or for improvements but this is based on a report churn; the frequency of data inputted and the output of the investigation. This is evident where participants agreed they were given time to enter reports during work hours. Participants agreed a high reporting rate was an indication of a strong just culture. One participant summed this, *“a strong culture would be by the number of incidents reported, we are way ahead of others in reporting within our group” (Participant 2).*

While the participants indicated they considered reports were evaluated and reviewed, one participants own experience showed that the thoroughness of the investigation process could influence people’s perception of the quality of the reporting process. The participant stated,

“...the investigation happened and the conclusion was came to very quickly and the final report was finished but the conclusion the investigator came to probably didn't have the full details, didn't get the full investigation” (Participant 3).

The interviews showed that despite managers encouraging, it was in-fact supervisors who were the most effective. One participant, when asked about encouraging staff to report, stated,

“...I think at the ground level that comes from the supervisors, the supervisors are the closest to their teams so where you have a supervisor that encourages reporting” (Participant 1).

Another respondent echoed this sentiment by stating, “...all promote just culture, it is imbedded, the supervisors are the key level” (Participant 2). One participant highlighted he felt that his training placed him in a position where he could influence a strong reporting character towards younger staff, *“I agree with that, it's characters like me in a supervisory role who are trying to impart, what we have up through to the younger generation” (Participant 4).*

5.7 Continuous Improvement

The participants agreed that reporting occurrences supported learning and improvement. One participant stated,

“I can see the benefits of reporting and because I can see that as an organisation, the organisation takes it as a learning opportunity and so they take the incident, they review it, they review it in a fair manner, and

everybody benefits as a result...and here's the lesson learnt and here's what we've taken or implemented as steps to prevent it" (Participant 1).

The participants all agreed the best outcome of a report was the ability to learn from its findings. The key was not to make the same mistake twice. Maintenance staff, by profession, hold a mindset to maintain, to make good damaged parts and systems and therefore learning comes naturally to them. It is this mindset, which seeks to improve by never knowingly repeat a mistake. One participant stated, "...it's a learning curve. I think it's a learning curve for the whole company, you know, from years gone by, the more and more things being reported it does get safer..." (Participant 5). However, to make improvements the company needs to garner, analyse and disseminate all information however small, but the interviews identified not all issues are reported. One participant noted, not all event are reported, particularly small things, "... *the major things are reported and we do all learn because they bring it up in human factors but I think a lot of minor things in [maintenance] aren't reported*" (Participant 5).

Participants agreed that improvements go towards keeping the company and passengers safe is what mattered, "...*keeping us safe, keeping [company name] safe, keeping the individuals safe and learning from mistakes to the benefit of the industry as a whole*" (Participant 4). One participant noted the company uses training as the vehicle to share occurrences with the aim that staff actions can improve,

"here are the incidents...here are the issues that happened within the line maintenance environment or within the maintenance environment and here's the reasons why and here's the lesson learnt and here's what we've

taken or implemented as steps to prevent it happening again” (Participant 1).

5.8 Trust

Trust is about the extent to which individuals trust the organisation, their supervisors, and their co-workers. Not only does trust have to exist it must have the perception it exists. A key aspect of this theme is for the perception of trust by handling events fairly. The interviews revealed a mixed level of perception that can go towards explaining this. One element is the concept of leniency, where staff members can be treated differently from others.

One participant stated in the interviews that all staff were treated fairly, and another participant stated managers cannot be accused of leniency in the process because, *“they’re less likely to be involved in an issue because their roles don’t actually lend themselves to be involved” (Participant 1)*. Another stated, *“No, all treated equally” (Participant 2)*. One participant provided a caveat around the issue stating,

“no I wouldn’t say there’s a difference in how people are treated, there possibly will be a difference in how people react to it... from a company point of view they are treated similar but different people will pick it up differently” (Participant 3).

However, in contrast another participant believed some staff were treated with leniency depending on who they were. One participant made the distinction between being treated individually and the outcome by stating,

“everybody is treated individually definitely everybody is treated individually, there’s no doubts about that but some will be looked on more

favourably than others because of their position in the company” (Participant 2).

Another participant believed leniency is alive and well “yes, absolutely”, adding he believing he would get a harder time: “I’d get a harder time, I’d definitely get a harder time. It’s like they’re nearly letting them away with it” (Participant 5).

Of course, being treated individually or differently is to be expected given each occurrence is a unique item, hold unique extenuating circumstances. However, one participant did refer to investigator bias, where investigators know those being interviewed and hence treat them differently,

“... in our case the guys doing the investigation work for the company so if the individual involved knows those people, on a personal level as well, the conversation would probably go a little bit different whereas if they don’t know them, it will be, not that it will be different, the person being interviewed might see it in a different outcome” (Participant 3).

This view was not shared by all participants, with one maintaining it is a fair system,

“it’s a fair system, every single report that’s made is treated in the same manner, it might be investigated by different parts of the business, different people in the business depending on who the report is for or from but absolutely a fair system exists in how it’s followed up. It is fair” (Participant 1).

All participants described the same process of how the report is handled, stating that the report is first sent to a central location office where it is reviewed and for maintenance originated reports, sent to one of the trained dedicated investigators

embedded within the maintenance department. This was considered fair by most because they stated that these investigators would understand the circumstances under which the event occurred rather than if a person outside the maintenance department conducted the investigation. In contrast, one participant took another view, instead preferring investigators to be,

“...totally independent and they didn’t know them. I think you’d get a more balanced outcome...I would prefer them to be outside, not knowing and just have rigid indexes to follow” (Participant 4).

One of the key aspects of a just culture in the Regulation is confidentiality. This they believed to be the case,

“absolutely, and actually any of our reports, I don’t think I’ve ever seen a report with a name on it” (Participant 1).

The process of reporting is to send in under your own name under your own login or you can send anonymously which one participant regarded as: “...having confidentiality like that encourages people to report...Yes” (Participant 3). The system design means only the sender and recipient can see the report and any feedback but restricts the anonymous reporter receiving feedback.

All participants agreed that bringing a colleague or union representative to an investigation meeting, was helpful in establishing trust between the individual and company. Participants also said this was encouraged and permitted and where one was present they would not be turned away.

5.9 Motivation

Motivation to report featured strongly during the interviews. Motivation can come in different guises however safety reporting does not endear itself to personal gain or benefit. Motivation is a central tenet of an open occurrence reporting process. Arguably it is the existence of the just culture concept that is itself a motivator.

No one participant explicitly stated their motivation was due exclusively to the existence of a just culture. What came across very clearly was a professional attitude of doing the right thing and ultimately making the work place safer from further mistakes. All participants echoed the strong sentiment that to report, *“it might stop it from happening again. I think just to get them out there”* (Participant 6). Participants expressed their motivation being summarised as follows,

“make sure that we capture all the issues... and we put processes in place where how to prevent them from happening again, to find the root cause” (Participant 1).

“...that it might prevent others from making the same mistake, maybe a little bit of investigating into it,...maybe it’ll change the way we do the job but it’s to try to prevent others from making the same mistake that’s the real goal” (Participant 3).

However, while the above give glowing benediction of occurrence reporting, not all participants expressed a positive motivation (or experience) to reporting, stating, *“...then was like my job in is jeopardy so I reported it...so it was the fact that I thought I’d be in trouble for not reporting it”* (Participant 5). One participant

highlighted an unusual reason being 'motivated' by an engineering request which was to use the reporting system to act as a tracker of a recurring item on aircraft,

"...so it was a bit of a way of tracking where they were going missing or trying to pin down where this was happening or where it wasn't happening and the other was as a means to assist engineering to track an issue" (Participant 6).

If you consider the item missing a safety issue, then this is reportable, however this method for tracking on behalf of engineering is not its intent. It can also skew the SMS indicator metrics.

Another aspect of motivation, the aspect of sharing and learning emerged, one participants reason was to, *"let everyone know about it, people can see the issue and share the knowledge"* (Participant 2). Another participant stated their motivation first depended on what was discussed amongst their co-workers, where one participant stated,

"so if [name deleted] made a mistake and I realise that you've made a mistake and I could come to [name deleted] and say you did something wrong, you made a mistake, this is what you should have done and depending on the response I get will determine whether I make a report or not" (Participant 3).

The Regulation affords protection to reporters and one participant highlighted this fact when referring to being 'off the hook' by virtue of making a report,

"The first one is the legal obligation that you have to it, the second one is that if you do make a mistake and you report it, you're kind of off the hook as such whereas if you make a mistake and you don't report it, you put

yourself at more risk and then there's the whole philosophy that it does help safety, it makes other people more aware of mistakes, it probably highlights flaws in procedures" (Participant 3).

This statement is important because while just culture is there to offer protections to genuine errors, it is not a 'get off the hook' tool otherwise it can bring discredit to the process. Thankfully, and as is clear from the participants cited reasons, this is the exception not the rule. In essence, one participant best sums up the consensus, *"It's really just about highlighting mistakes. When a mistake is made, others are made aware of the mistake so that they don't make it and it also allows management to change processes and procedures to try and prevent, say, you get a lot of repeat incidents that are minor from eventually becoming a major incident"* (Participant 3).

5.10 Summary

The preceding sections were organised under six subscales of the higher-order just culture construct (Petschonek, 2011 and Petschonek *et al.* 2013) plus an additional motivation theme. It showed issues with feedback and communication while fairness and the process was highly regarded. Participants were self-motivated taking comfort from the report being beneficial to aviation. As such, the organising of the finding data into logical existing themes assists in the research discussion in the next section.

6. Research Discussion

6.1 Introduction

The purpose of the study was to understand the perception of just culture from aircraft maintenance staff and what motivation they held to submit an occurrence report. The two job roles, which took part in the interview, were reflective of the maintenance department providing a source of data that represented individuals who performed the variety of front-line maintenance activities. This was important not to bias towards one job role or age profile and to get a balanced perception as far as possible. The interviews showed that the department holds a wealth of experience that act to guide younger staff who can take their cues from (O' Reilly, 1989) as a means for a safe organisational culture and personal attitude. The seven interviews were acceptable because this aligned with the research literature recommended numbers (Saunders et al. 2016).

6.2 Discussion

It is not without its faults that aviation exists today. The sense of adventure, freedom and allure amongst the clouds has inspired men, women and children throughout the generations. Today, from humble beginnings, we fly faster, higher, and carry more passengers safely than ever before. Yet despite technical advances, accidents do happen. National and international statistics (e.g. IAA, 2017; IATA, 2017) demonstrate year on year fatalities, and investigations reveal how and why they happened. Invariably the causes are a result of a multiple of reasons, i.e. human, weather or technology (Woods, Johannesen, Cook, Sarter, 1994). Recognising causes means mitigation such as defences (Reason, 1997),

as human interaction is renowned as a cause, resulting in procedures, rules, training and legislation to manage and control this interaction. However, despite mitigations humans will be humans and continually revert to type. It is because we cannot make the human perfect and because the human will remain the same is the very reason we introduce control measures.

Isambard Kingdom Brunel was centuries ahead of his time, and arguably the first, when he articulated what we now call the systems approach to managing safety in a high-reliability organisation. In Brunel's time it was the technically advanced railway system where he saw significant hazards that he considered required a risk reduction management approach. Today the aviation system is a modern equivalent, which has recently come to embrace the systems approach towards hazard/risk management through SMS. In evidence to a select committee on railways, Brunel recognised that the system is complicated and the human cannot and will never change and the only way to reduce danger and risk is by small gradual improvements until they do not occur which is as close to perfection that can be attained (House of Commons, 1841). This was an early concept of the system approach as SMS and occurrence reporting is all about managing hazards and risk. The crux is to make the improvement and change, no matter how small, before an accident that will lead to maintaining or improving (railway) aviation safety.

More recent system literature refers to the difference between human error and system error resulting in much debate on making error tolerant systems (Hollnagel, 1990, Rasmussen and Vicente, 1989). This debate is largely over with today, aviation safety thinking approach is evident and arguably it has just caught up with Brunel, with its SMS system approach after decades spent focused on

the technological (1900's to 1960's) and the human (1970's to mid-1990's) (ICAO, 2013). We only have to look to the past to see the future.

Brunel in his committee evidence summed up why we need occurrence reporting, because the nature of accidents change which means we must keep up with understanding why and apace with mitigating measures. The SMS concept encapsulates such an approach but relies heavily on receiving reports. This was evident in the interviews where participants recognised an occurrence is any safety-related event, which endangers aircraft and people. The participant's personal safety attitude was clear as a motivator towards the safety side of what constituted an acceptable means between financial and safety management. Nowhere did any participant consider financial pressure in their decision making for maintenance actions. This is where the concept of just culture enters the aviation concept of safety dilemma equation (ICAO, 2013). A just culture is a balanced approach to determining blame. It is not a blame free concept but seeks, at a system level, to provide reassurance that for genuine errors, commensurate with experience, there will be no punishment provided it was not a wilful violation or gross negligence. The participants understood this and felt the system, while there was a few issues, was overall fair and trustworthy. It is through this understanding that a company can target and approach its policies to ensure maximum benefit for all.

The literature is clear on an error being a planned deviation from the expected (Reason and Hobbs 2003), but in any system or process there is always an element of practical drift (Snook, 2000). In Brunel's evidence he said humans will not change, this means practical drift will always occur and the company and

staff must continually strive to return the deviation back to the ideal baseline. This involves an atmosphere of trust (Reason, 1997) between all parties, staff, management, passengers and regulators and in particular the perception of trust. If passengers do not trust an airline, then even at a zero price point people will not fly. Trust in the literature (e.g. Dekker, 2012; Reason, 1997) is a key ingredient in a just culture and when it is present enables opinions (even negative ones) to surface which is a positive reflection of open communications. To be opinionated is a reflection that individuals care and are passionate leading to potential changes. The participants did trust the process with all citing the use of culpability trees (Baines Simmons Ltd, 2011) and in particular the participants were adamant that extenuating circumstances must be taken into account (Cromie and Bott, 2016).

Even by listening can provide encouragement and motivation towards their propensity to report. Fortunately, maintenance staff hold a particular mindset towards maintaining. This mindset is conducive, before prescriptive rules, to ensuring the work place and system are as safe as possible. However issues do arise and the just culture concept is a mitigation towards impeding individuals to report. The participants reflected exactly what the Regulation envisioned, that they were motivated to prevent the error occurring again, to learn from the event, to put in place measures ultimately leading to maintaining or improving the aviation system. This goes towards answering the study research question of what motivates the individuals to report. Motivation is not finite and should not be taken for granted. Knowing where you stand provides a positive level of comfort, which requires feedback, both from management and peers. This feedback concept provides the bedrock for aviation safety as stated in the Regulation and

it is vital that feedback is timely and directly to the reporter. As some participants noted, to have no feedback can leave an individual isolated and potentially suspicious.

Finally we are reminded that reporting occurrences acts to improve aviation and indeed the Regulation is explicit in this by stating, “*the civil aviation safety system is established on the basis of feedback and lessons learned from accidents and incidents*” (Regulation (EU) 376/2014, para. 33). Therefore, it was no surprise that the participants expressed continuous improvement as a leading motivator. This view is not by chance, because it is ingrained in the maintenance professional mindset from basic training through to staff selection, that safety is first and last, above all else, even commercial. This may not sit well with some, given the ICAO (2013) concept of safety resides within the ‘acceptable level’ zone between financial management and safety management. The literature supports communication, as an important aspect of reporting with buy-in from the top down was an important component of safety culture, (e.g. Pidgeon and O’Leary, 1994). For all participants this was central and they identified that in their organisation there was top-level commitment. It is safety culture with its sub-components, which mean that just culture cannot be a stand-alone concept if it is to be successful. Just culture must act in tandem and parallel with other sub-components, the organisation climate and culture. The message from the literature and from the participants is one of interrelatedness as aviation is a system, from the point of entering the departure terminal to the point of departing the arrival terminal. Just culture is merely one important part of ensuring the

system holds a high level of safety as safe as possible towards the prevention of accidents and incidents.

6.3 Study Implications

6.3.1 Theory implications

The study adds to already existing data that shows that the participant's perception of just culture aligns with safety and just culture theory (Dekker 2012; Reason 1997). It shows participants understand just culture as part of a wider systems approach such as SMS but specifically within the framework of a safety culture (Gibbons, von Thaden and Wiegmann, 2005; Dekker, 2001). Participants were clear that just culture needs champions such as supervisors and advocating from the top down, which is in keeping with Pidgeon and O'Leary (1994) work.

This study identifies a gap in perception between different job roles of management and engineers, in relation to communication and trust, which was identified in other studies (e.g. Petschonek et al. 2013; Von Thaden and Hoppes, 2005). It identifies a gap in the theory for safety culture assessment methods given the experience of the CASS adoption in the maintenance domain (Gibbons, von Thaden and Wiegmann, 2005). The theory to date is peppered with safety analysis of accidents (e.g. Strauch, 2017; Dekker, 2012; Wiegmann and Shappell, 2003; Reason, 1997; Turner *et al*, 1989). While beneficial, this is a historic perspective and therefore the safety and just culture discussion requires contemporary refreshing and updating such as by Cromie and Bott (2016). This study adds to the current just culture conversation by being current, topical and it holds European wide relevance. Unlike previous studies

predominantly using quantitative means, this study uniquely used a qualitative method being a new departure and important contribution to the safety and just culture discussion.

6.3.2 Practical Implications

This study was conducted in a live organisational environment and the individual's perceptions enables the organisation to make better decisions with a view to make appropriate changes. It was also the first occasion that interviews were performed to understand just culture perception, which is in contrast to the abundant use of survey methods. This study approach adds a new rich alternative dimension to view just culture.

This study was conducted in a single maintenance department of a licenced air carrier and should it be repeated for other similar environments including, stand-alone maintenance repair organisations (MRO), it could permit cross organisation comparisons. Maintenance organisation activities are identical and although some job titles may differ between them, the activity is the same. Where such data is pooled, it could permit greater generalisation of maintenance staff. However, airlines are dynamic commercial environments, designed to run efficiently leaving little room for 'time off' for involvement in academic research and notwithstanding management good intent, the live working environment may make time and cost allocation difficult. A study of this nature could be organised at a national level to provide a national indication of perception of a just culture.

6.3.3 Future Implications

The area of just culture research is relatively new and interviews can permit the study to be replicated and tested further. The use of interviews as a method of research, while time consuming should be repeated as it adds a colourful mix of experiences, attitudes and data that is not forthcoming from a survey. Additionally, a study may use the mixed methods approach of qualitative and quantitative so that the blended data will provide, yet again, another alternative important view. While time consuming, future research should consider studying the participants experience in real time from reporting the event, through investigation and outcome.

6.4 Study limitations

This study, based on the researcher literature review, is the first to use interviews only to understand just culture in an aviation setting. As such, it has been to date untested in an aviation setting. The participant sample was a relatively small convenient sample and therefore is not generally to be regarded as representative of the full population. The participant's size did not lend it to make strong assumptions about the department in general. As the researcher has worked in aviation for over twenty-five years, researcher bias is present given the researchers pre-conceived view of just culture that must be recognised as a limitation.

It is a known issue that researcher can inadvertently influence the interview situation where the interviewee may react to this. (Fontana and Frey, 1994). This Hawthorne effect needs careful management through standard procedures

universally applied to all interviews and must be stated as a limitation. Like any academic study, time management and word count are natural limitations. While researchers seek to express their work as comprehensively as possible, the limitation resulted in certain applicable material not residing in the final study. The researcher has limited experience in studies of this nature being a part-time student with limited knowledge, skills and experience. As such, another researcher may have interpreted the findings in a different manner.

7. Conclusions and Recommendations

7.1 Conclusions

The study identified that aviation maintenance staff were willing to engage and talk freely on their experiences of a just culture. This was evident from the frank and open, even sometimes incriminating, information provided. This makes for a direct means to answer the first research questions, 'what is an individual's perception of a just culture in an aircraft maintenance organisation setting', showed that for feedback and communication, there was a gap of poor individual reporter feedback and weak communication in general. However, it was shown that the communication was not a fluid, two way process. Some participants were reluctant to report, even refusing to report. Fairness was evident in all the interviews as strong, however there was a level of perceived unfairness depending on who the reporter was or if known personally to the investigators. The process was easy to use, even if a previous system was regarded as better and individuals were encouraged to report with the supervisory level identified as the most important to make this happen. All participants recognised that improvements were a vital aim while trust was an issue for some however, this was minimised with transparent process such as the culpability matrix. When combined, the perception was strong, and regardless of any reservations, all participants would report in the future.

In respect to the second research question, 'what motivates an individual to submit an occurrence report', the findings were very clear. The findings showed that participants were motivated out of a professional duty of care, to prevent a re-occurrence, to share information for others to learn and for organisational and

aviation improvements, with the aim, that when combined, results in maintaining or improving aviation safety. The underlying bedrock of their motivation that became evident from the participants was their propensity to submit an occurrence report was already within their own personal character. In other words, irrespective of the Regulation they were pre-dispositioned, as maintenance professionals, to maintain or improve safety in spite of any prescriptive Regulation. This observation aligns with Isambard Kingdom Brunel's evidence to the railway select committee that it is wishful to trust to regulations to fix accidents because each one is unique and even futile to expect humans to obey them (House of Commons, 1841). This infers that the best means to make a change involves training and importantly as noted in the literature by setting a suitable organisational climate and the use of culture as a control force.

Finally, the purpose of the study was to understand the perception and motivation of aircraft maintenance staff within a live organisational setting. This was achieved. The participants showed they have an excellent understanding of what a just culture is and should be, their experience, by in large, is a positive one and they are highly motivated to report for its many safety benefits while recognising the organisational commitment to making just culture work.

7.2 Recommendations

7.2.1 The organisation should provide a mechanism for timely two-way visibility on occurrences, such like a live register and updated regularly for visibility of status.

7.2.2 The organisations should place a member of non-management staff on any investigation panel on rotating basis. This is to provide a greater level of transparency and independence to all staff. By having non-management, it is hoped that other staff will take comments as impartial when building their perception of the process.

7.2.3 The national aviation regulator should run a just culture study at a national level. It should be organised in conjunction and coordination with, all aviation companies once every two years. It should be mandatory. Non-identifying results should be published.

7.2.4 Where a report passes a certain severity threshold, the Member State air accident investigation section, should conduct the investigation. The aviation regulator performs the initial receipt and analyses however, as the air accident authorities have a wealth of experience of serious investigations they should do this investigation.

7.2.5 The European Commission should develop a digital European forum where individual organisations, regulators and related parties can upload their occurrences to make available for industry access. This is so that

occurrences are 'de-siloed', being held normally within the organisation setting. Typically only statistics are published, however where the actual report data is available cross community, this can permit organisations to learn from other organisations. The system of sharing report information exists under the SAFA program and that type of existing Community digital platform could be adapted. Alternatively, the system could be organised similar to the EASA airworthiness directive database. The key benefit is that the knowledge pool is larger; occurrences that happen in one country are preventable in another. This information sharing is in keeping with the intent of a European occurrence reporting Regulation.

7.2.6 The company should issue monthly bulletins to all staff advising them of issues that could or can have an effect on safety and work performance. Feedback from experience and incidents should be included. Also near misses, what was prevented and how it was prevented is useful to share. In addition, weekly stand up meetings to provide feedback performed by managers/supervisors shift by shift.

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Appendix 1: Interview Consent



ACADEMIC ETHICS CONSENT FORM

'Just Culture in Aviation Maintenance'

I, the undersigned, declare that I am willing to take part in research for the project entitled 'Just Culture in Aviation Maintenance'.

- a) I declare that I have been fully briefed on the nature of this study and my role in it and have given the opportunity to ask questions before agreeing to participate.
- b) The nature of my participation has been explained to me and I have full knowledge of how the information will be used.
- c) I fully understand that there is no obligation on me to participate in this study.
- d) I fully understand that I am free to withdraw my participation at any time without having to explain or give a reason.
- e) I am also entitled to full confidentiality in terms of my participation and personal details.

Signature of Participant _____

Date _____

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