

Perceptions of ‘Just Culture’ – The Case of Aircraft Maintenance

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This research seeks to explore perceptions of a ‘just culture’ within the aviation maintenance sector. The focus is not on the individual or error but rather the systems and processes in place ensure any errors or occurrences are accurately captured. Historically, the focus in aviation has been on attributing blame for individual human error, whereas in modern times there is increasing recognition of the systems-based approach, which seeks to build a continuous improvement mentality by an inclusive culture that encourages open reporting of incidents without fear of personal reprisal.

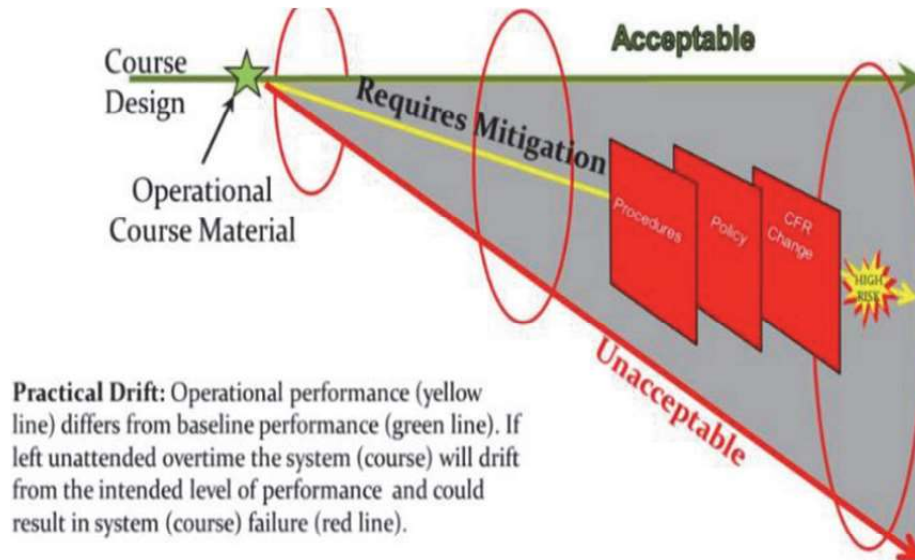
INTRODUCTION

With no hard shoulder at 38,000 feet there is little room for human error. Since inception, aviation safety landscape focused on technological improvements, which developed to understanding the human interaction and human limitations. More recently, the focus has shifted away from the individual towards the organisation system and factors that influence the human factor. It is generally accepted that a combination of improved airliner technology with better organisational and regulator understanding coupled with the management of the human, specifically its interaction with the technology within a techno-social context, has resulted in the significant reduction in the world accident rate.

Headlines frequently refer to ‘pilot error’, however error issues exist in a typical maintenance environment with 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 (Hobbs, 2008). Between 2011 to 2015 there was 1318 maintenance occurrences on commercial air transport, while 45% of fatal accidents in the past ten years related to a technical issue (EASA, 2016). From 1959 to 1983 maintenance and inspection were factors in 12% of 93 worldwide accidents (Sears, 1986). A Boeing study reported that 15% of commercial accidents from 1982 to 1991 had maintenance as a contributing factor (Civil Aviation Authority, 2003) and research by Gregory (1993) showed that improper maintenance caused 50% percent of engine related flight delays and cancellations. This demonstrates a maintenance environment that is not fully error free. Despite statistics, errors in themselves do not automatically result in a fatality as demonstrated by the Irish Aviation Authority (IAA) receiving 7,530 non-fatal occurrence reports (IAA, 2017). This reporting figure shows a deviation from the acceptable baseline. As illustrated in figure 1, it is a deviation or ‘practical drift’ as a contributing factor of human error (Snook, 2000). Knowing human error is present provides opportunities to place mitigation measures

in place, however where error drifts further towards unacceptable or defences fail or are bypassed the result can be catastrophic.

**FIGURE 1
PRACTICAL DRIFT**



Source: FEDERAL AVIATION ADMINISTRATION, 2017

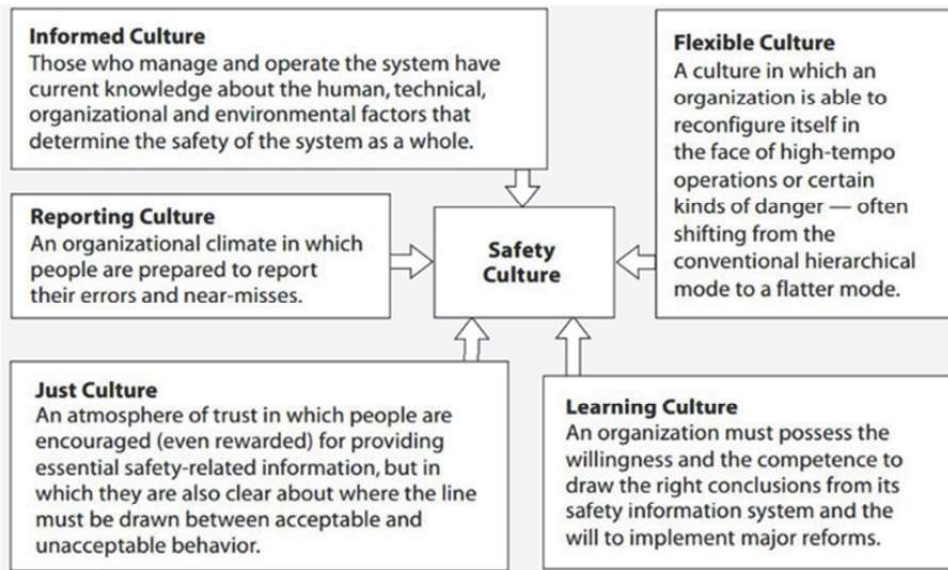
To place modern day accident figures in context, the drift leading to an accident in 2016 figures was 1.6 per one million flights, making aviation the safest long-distance travel mode (International Air Transport Association (IATA), 2017). According to Ascend Flightglobal (2009), in the twelve months to July 2009 there were 667 passenger and 56 crew fatalities in jet airliner occurrences with a cost of \$2,630 million. Flightglobal figures in 2012 show 21 accidents leaving 425 fatalities. Figures for 2016 show 65 accidents (10 fatal) leaving 268 fatalities, set against 3.8 billion passengers flying on 40.4 million flights. While there is no suggestion that 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 errors can remain undetected for months, even years and potentially go unreported (Marx and Graeber, 1994). Maintenance staff should understand that the safety reporting outcome of a just culture is not essentially a personal benefit (e.g. from blame) but principally a reduction or elimination of drift and accidents for aviation in general.

While the flight deck was receiving most research attention given that errors there have had an active impact, the maintenance environment is a significant source of latent and active errors, mistakes, events, incidents and accidents. Maintenance staff are front-line – core set staff because they are in daily contact with safety-critical processes associated with complex systems (Vaughan, 1996). This human interaction with complex safety-critical aviation technology driven systems can result in human maintenance error. Naturally, if aviation maintenance staff can eliminate error at best or reduce its occurrence and consequence, safety improves, and occurrence rates drop. A driver of safety improvement and rate reduction is continuous improvement, which in the context of this research involves reporting near misses and occurrences in order to make necessary changes. For effective safety reporting system to exist, a ‘just culture’ must be established (Reason, 1997).

JUST CULTURE IN AVIATION MAINTENANCE

Research into safety culture by Reason (1997, p. 195) identifies a number of related elements (see figure 2) which are required in order to develop and maintain a safety culture, of which a just culture is but one.

FIGURE 2
JUST CULTURE CONCEPT WITHIN THE SAFETY CULTURE (SOURCE: REASON, 1997)



Research in this area did not go unnoticed by the European Commission and European Aviation Safety Agency (EASA) who first incorporated the concept into the European aircraft maintenance requirement 145.A.60 (b) which states, “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” (Source: EASA, 2003).

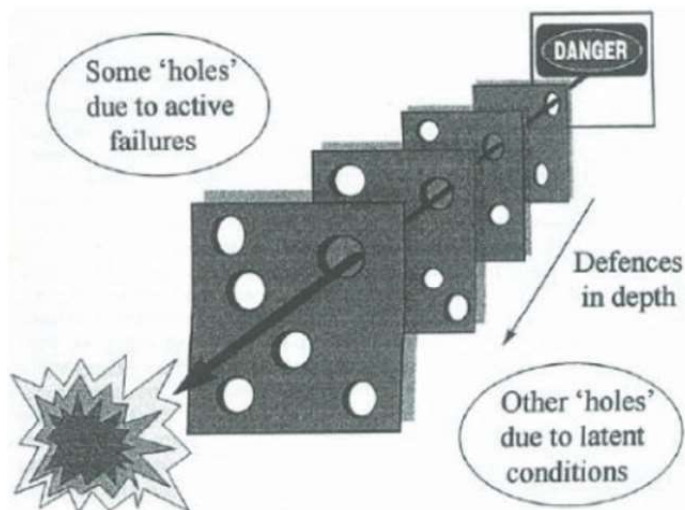
The overall intent of a just culture is to encourage staff to report safety information, near misses and occurrences for the singular purposes of maintaining or improving aviation safety. It is not a ‘blame culture’ nor a ‘no blame culture’, as it does not absolve staff of their normal responsibilities. A just culture must hold an atmosphere of trust to facilitate the reporting of safety-related information according to Reason (1997) which serves the common good by not punishing the reporter and judging him or her fairly (Dekker 2007). Importantly the Regulation has formalised legal requirements on individuals and organisations to use a just culture lens when investigating reports. Just culture now offers staff a high level of confidence of no consequences, while vitally affording the opportunity to contribute towards making a difference in their profession and aviation. As maintenance staff have been working under the just culture concept since 2003, they are an appropriate group for this research.

Maintenance Error and Just Culture

Human 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). It is generally classified as a cause of failure (old view - Woods, Johannesen, Cook, Sarter, 1994) or as a symptom of failure (systems view - Cook, Render & Woods, 2000; Reason, 2000). The old view tends to judge a human whereas the new view seeks to explain the error. 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's (1997) 'Swiss Cheese' model, is an example of a (linear) defence system for 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 it does not permit adaptation in the field; and it does not capture what the holes (gaps) are in the defences. Subsequent models, Human Factors Analysis and Classification System (HFACS) (Wiegmann and Shappell, 2003) is helpful in identifying which gap (active or latent) in the Reason model. Others argue to focus on reducing the consequence of error (Senders and Moray, 1991) such that the system should be error tolerant (Hollnagel, 1990; Rasmussen and Vicente (1989) and therefore design in an element of human variance to a particular system defence. In adapting his thinking, 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.

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. Healthcare just culture studies are relevant because both the medical and aviation domains hold similarities in so far as both are 'high reliability and safety critical dependant' (von Thaden and Hoppes 2005, p. 2). Table 1 provides an overview of some just culture studies. It is noticeable that the majority of these are quantitative based highlighting an absence or dearth of qualitative studies in this area to date.

TABLE 1
PREVIOUS JUST CULTURE STUDIES

	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. Study describes the development and validation of a survey to assess safety culture in US airline maintenance operations.	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	Healthcare setting. Development and test of a just culture assessment tool (JCAT) to measure the level of perception of just culture in a healthcare setting.
Measure	These indicators formed the basis for a self-evaluation tool to utilize as a staff survey to measure patient safety.	The study was adapted from their Commercial Aviation Safety Survey (CASS) to describe behaviour directly relevant to maintenance professionals.	Study employed a two-part self-assessment survey quantitative algorithm for evaluating the three aspects.	Survey used the 27 question JCAT tool arranged under each six-dimension into a just culture higher-order
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 and suggest work remains in achieving a just culture. 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	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 indication of the level of perception for just

RESEARCH PURPOSE AND OBJECTIVE

Given humans make errors and maintenance is a hazardous environment, it is reasonable to expect that incidents occur which ideally staff would report in order to improve aviation safety. Consequently, the understanding of staff perception of just culture as a formal protection free from blame or prejudice is important in designing and managing a functioning reporting system. The compelling purpose of this study is to understand an individual's perception of just culture leading to their motivation to submit an occurrence report. Using a pre-validated Just Culture Assessment Tool (JCAT) combined with interviews, to aid further the understanding of participant shared beliefs and their propensity to submit a safety report.

RESEARCH METHODS

Research Instrumentation

The Just Culture Assessment Tool (JCAT) allows for the measurement of perception of the higher order construct of just culture through the individual measurement of 6 conceptually related dimensions, see table 2. This research sought and was granted permission to use the JCAT (Petschonek, 2011), with minor modifications to reflect the specifics of the aviation maintenance environment. The JCAT adopts a 7-point Likert scale to measure participant perception results, ranging between agree strongly (1) to

disagree strongly (7). A score below or above 4 indicates a positive or negative perception respectively towards that dimension.

TABLE 2
JCAT DIMENSIONS AND DEFINITIONS

Dimension	Definition
Feedback and Communication About Events	One's beliefs regarding whether the organisation does an effective job of sharing event information about the events and the outcome of evaluating events.
Openness of Communication	The willingness of individuals to communicate event information upwards to supervisors and management e.g., willingness to reveal events, share events information, and to make suggestions for improvement within the unit or the organisation.
Balance	One's perceptions of fair treatment within the organisation as it relates to errors, error reporting, and its systems approach to medical error.
Quality of the Event Reporting Process	One's perceived quality of the event reporting system (which includes the process of entering reports and the ability to follow up on these reports), whether employees are given time to report, and to what extent the employees believe the reporting system is monitored and maintained.
Overall Goal of Continuous Improvement	One's belief that the organisation as a whole demonstrates a goal of continuous improvement, characterized by a willingness to learn from events and make improvements to the aviation system.
Trust	The extent to which individuals trust the organisation, their supervisors, and their co-workers.

SOURCE: PETSCHONEK ET. AL., 2013

An email link to a dedicated survey tool was provided via group email to all 326 maintenance staff. Participants were required to formally consent to participation prior to commencing the survey. The survey remained open for three weeks and preceded the semi-structured interviews that followed shortly thereafter.

Sample Population

The participants form part of a convenience sample due to their accessibility to the researcher. All 326 professional aviation maintenance survey recipients were exclusively from the maintenance

department of a commercial international licence air carrier. Participant responses were organised into 3 job-roles; 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; Engineers: who are technically qualified to perform and certify repairs, modifications, inspections and replacement of parts on aircraft and on engines, and Other Staff: who work predominantly in an office setting in areas such as quality assurance, planning, training, technical services, logistics, stores and technical records.

The 3 job roles meet the just culture definition of ‘front-line operators or other persons’ because all roles are active in a day to day setting in planning, organising and maintaining aircraft in a live commercial operational environment. Table 3 shows participant data and table 4 shows participant maintenance experience.

**TABLE 3
PARTICIPANT STATISTICS**

Sample Population Data	N	N %	% CR
Total email address survey sent to	326	100%	
Total responses	69	21.16%	
Incomplete responses	10	3.06%	
Complete responses (CR)	59	18.09%	
Management only	11	3.37%	18.64%
Engineers	34	10.42%	57.63%
Other Staff	14	4.29%	23.73%
Volunteers for Interview	12	3.68%	20.33%
Actual Interviewed	7	2.14%	11.86%

**TABLE 4
SUREVEY EXPERIENCE YEARS FREQUENCY FOR STAFF ROLE**

Experience (Y)	Management	Engineers	Other Staff	Total
<2	0	0	0	0
3 to 5	0	3	2	5
6 to 10	0	4	4	8
11 to 15	1	2	0	3
16 to 20	2	9	1	12
21 to 25	1	1	1	3
26 to 30	3	8	3	14
30+	4	7	3	14
Average (Y)	25	20	18.5	59

Interview Method

Survey participants were invited in the survey to participate in face-to-face semi-structured interviews. All those who wish to participate were contacted, with some subsequently not available. The interviews were undertaken to offer staff the opportunity to state what they thought of just culture, what it meant to them personally, (if any) and what they thought of just culture at an organisation level. The attempt triangulates the survey findings and to provide an opportunity for the staff to talk freely about their experiences and motivation of submitting an occurrence report. As noted, the majority of just culture research is quantitative in nature and so adopting qualitative approach was deemed novel. It is worth reflecting on Rubin and Rubin's (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*'. The interviews allowed a three-dimensional picture to emerge, beyond the survey, of what the individuals believed and perceive a just culture to mean. The data 'richness' holds tremendous added value as it was gained under a real-life situation which, has the ability to generate insights that otherwise may not be evident by other means (Yin, 2014).

The interviews were set-up by telephone, at a time and place convenient to the participant, which in some cases was during or after working hours. All interviews followed the same format, with permission signed and interviews recorded for later transcription. Thematic analysis, using the JCAT dimension definitions permitted the data to be ordered and constructed around the survey structure, with one additional theme, motivation, analysed. The use of the dimension as the basis of the thematic analysis was to match the interview data with the respective survey measurement, to aid in linking the surveys and interview. According to Saunders, Lewis and Thornhill 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*" (Saunders et. al., 2016, p. 568).

RESULTS

Survey Finding Descriptive Statistics

The Cronbach's Alpha, for the survey was $\alpha = .946$, indicating a strong measure of consistency of the concept. The mean score was 3.41 indicating a positive perception of just culture. In descending order of positive to negative perception, 5 dimensions hold a positive perception; quality of event reporting process ($m = 2.97$), continuous improvement ($m = 2.67$), balance ($m = 3.47$), feedback and communication ($m = 3.62$) and trust ($m = 3.54$), with only openness to communication ($m = 4.12$) recording a negative perception.

Survey Means and Cronbach's Alpha Scores for Just Culture Dimensions

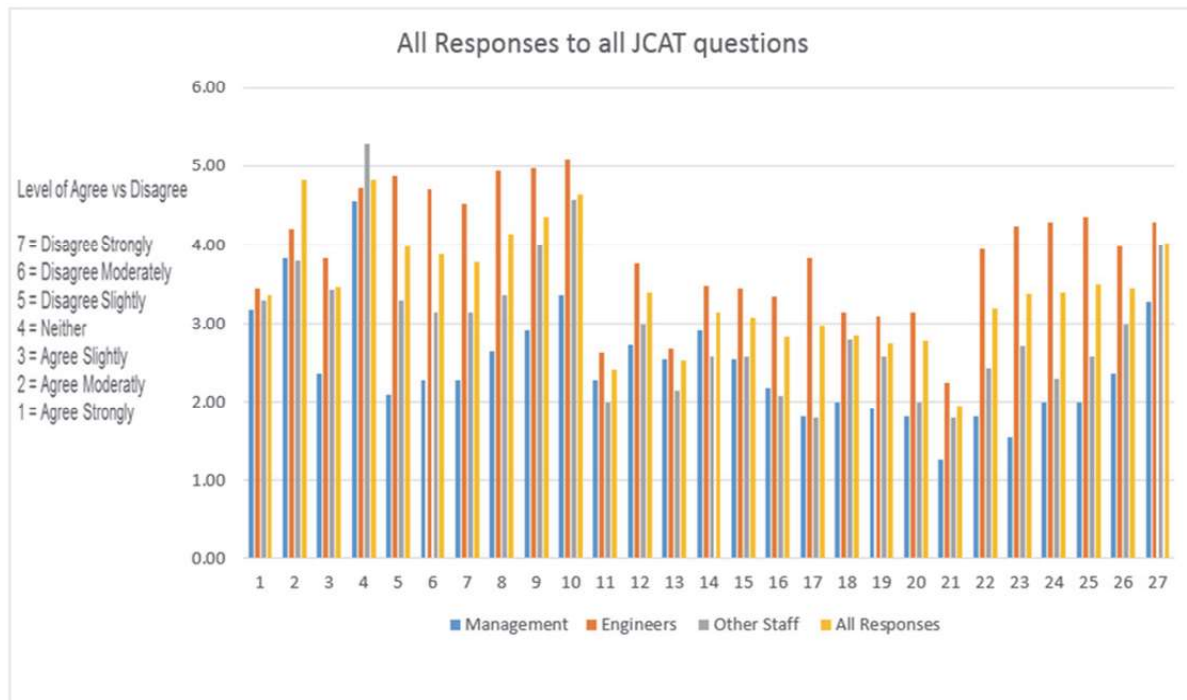
Results, as shown in table 5, are grouped by job role showed management ($m = 2.48$) and 'other roles' ($m = 2.96$) hold a positive perception in all dimensions, whereas engineers hold a positive perception in all but 2 dimensions, namely openness of communication ($m = 4.76$) and trust ($m = 4.23$). Overall, results revealed management hold the strongest perception of a just culture ($m = 2.48$).

TABLE 5
SURVEY MEANS FOR JUST CULTURE DIMENSIONS BY STAFF ROLE

	Dimension	Management	Engineers	Other Roles	Number of items
1	Feedback and communication	3.12	3.82	3.50	3
2	Openness of communication	2.76	4.76	3.64	5
3	Balance	2.76	3.82	3.14	5
4	Quality of event reporting process	2.29	3.45	2.36	5
5	Continuous Improvement	1.71	3.17	2.20	4
6	Trust	2.24	4.23	2.91	5
	Average	2.48	3.88	2.96	

Table 6 provides an overview of the score for each individual questions against each job role permitting comparisons. A score below four indicates a positive perception towards that question and just culture. Six negatively worded question were reverse coded to permit cross score comparison. As is shown below, the vast majority of scores depicted are positive. The clear indication below depicts engineers have a somewhat negative perception grouped around the openness of communication (Q4-8) and trust (Q23- Q27) dimensions.

TABLE 6
RESULTS OF ALL QUESTIONS BY INDIVIDUAL JOB ROLES



RESULTS DISCUSSION

Feedback and Communication

This dimension contained 3 items regarding one's belief whether the organisation does an effective job of sharing event information and the outcome of evaluating events. The survey showed all roles agreed slightly that the management does a good job of sharing information about events and they often hear about event conclusions and outcomes. The interviews supported this where participants stated they did receive information in particular through training sessions. Individual role analysis revealed most, but not all, managers agreed they do a good job of sharing information, whereas the majority of engineers disagreed. While overall this dimension scored well the fact that some managers, engineers and 'other roles' believe managers could do a better job of sharing information indicates a certain level of dissatisfaction with the status quo which could potentially act as an influencer against safety reporting.

Question 2, was negatively worded and reverse coded, revealed engineers don't know about events that happen in their area which is in contrast to the two other roles. The interviews revealed there was a lack of feedback after a submission which resulted in information not being made available to engineers about events in their area. In addition, the engineers did not have access to the conclusions or event outcomes resulting in an information void. All interview participants stated that where an individual submits a report, they are obviously aware that an event has occurred and have an expectation to hear back. Others who have not made the report will be oblivious unless provided with information, whether formally or locally. Hence, it is understandable there are mixed results particularly where managers receive regular reports.

Given that the 'other job' roles by virtue of both being predominantly office based, are more likely to be positioned in close proximity to management, they too would be more likely to hear about event outcomes. Engineers, in contrast, work typically outside or in a hangar, multi shift, at night, which can mean their only source is at yearly training sessions. Several participants cited examples that they never got feedback while others indicated a limitation with the system is that once a report is submitted, only the reporter can view any updates. This is designed to protect reporter confidentiality, however some participants said that even an acknowledgement email was helpful to them. Most participants expressed frustration about the lack of information. Some participants admitted feedback was not universally shared where only managers received daily status reports to be reviewed at weekly meetings.

This dimension shows there is strong recognition and acceptance that managers do a reasonable job of sharing information. While there was a mix of knowledge of events, the actual awareness of conclusions and outcomes by all staff was strong. An occurrence or event is to an actual moment in time. Information flow takes time and is historical in nature when shared. Therefore, it is vital that management instigate immediate action and not have to wait for the next training session to share. The delay in sharing information can delay the learning and thus potentially delay making the aviation system safer. There can be mitigating reasons, but the Regulation does impose obligations on organisations to ensure appropriate action for improving aviation safety in a timely manner.

Openness of Communication

Five items sought to understand the willingness of individuals to communicate event information upwards to supervisors and company managers e.g., willingness to reveal events, share events information, and to make suggestions for improvement within the organisation. The overall survey results showed this dimension holds the highest negative score. Engineers represented the highest negative perception with all response results above 4. The quantitative data showed in question 4 only, all job roles believe staff feel uncomfortable discussing events with managers. This commonality was not in the other responses where management and 'other roles' scored positive perception in questions 5 to 8. All interviews participants stated that supervisors, and not managers, were the key enablers in discussing events because they were closer to the staff. The highest negative score for the engineers was for question 8, where they did not trust managers to do the right thing.

Communication in the Regulation requires organisations to share and communicate information, staff also hold the obligation to share and report. While not universally shared, one participant admitted that not all occurrences were reported. However, the general interview consensus revealed participants were happy to report because they understood it was necessary to prevent reoccurrences, gets to the root cause and identify a trend.

This dimension revealed that open communication and the ability to share the information with management was an issue for engineers, in particular. 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. 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. One participant stated openness of communication is 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".

Balance

5 questions sought to understand one's perceptions of fair treatment within the company as it relates to errors, error reporting, and its systems approach to error. Mixed results revealed all job roles except for management have a negative perception that staff were usually blamed when involved in an event, and equally all except management have a negative perception that they feared disciplinary action when involved in an event. These two areas showed a clear gap between management and non-management. Interviews revealed the organisation was fair, principally due to a decision-making aid culpability matrix or a blame tree. All participants agreed any investigative follow up team do look to determine what happened and the reporting process was not used to 'tattle' on each other. The interviews were particularly strong in showing staff held respect for the process and what it was trying to achieve.

While there was general agreement that the process was fair one example came to light where an individual was known to be 'playing the system' through reporting an apparent 'mistake' in the knowledge it would not lead to a punitive action. This led to a perception of unfairness amongst some participants in the reporting system. A significant aspect of fairness relies not only on the process but also on the outcome of the occurrence investigation. The outcome was viewed as predicated on circumstances and participants stated any process must take into account all circumstances, even extenuating ones, such as personal circumstances, when deciding culpability.

Participants were clear that fairness is part of the department culture and climate and is advocated from the top down. Overall, participants stated they were not aware of anyone being sacked for reporting an occurrence, however one participant stated a person was disciplined for the act of not reporting.

Quality of Event Reporting Process

This dimension contained 5 questions on one's perception of the quality of the event reporting system. The survey results showed all job roles held a positive perception with management holding the most positive perception scores. Interview participants stated they believed reports were evaluated and reviewed, and a high reporting rate was an indication of a strong just culture. All participants said they were given time to enter a report, the process was generally easy to use, however one participant regarded the reporting process as remote, being on-line and cumbersome. The survey showed staff did not discourage each other from reporting however one interviewee stated an event was not reported as the individual viewed the process as an 'admin hassle'. This frank admission of not reporting when clearly the person should have, and knows he should have, goes against what the Regulation is attempting to achieve which is to maintain or improve aviation safety. Despite management intent, the main barrier identified to reporting was 'hassle'.

All participants described the quality of the investigation as high because independent investigators were imbedded within their department and would understand the circumstances under which the event occurred. Participants identified confidentiality in the reporting process as strong and managed well within the organisation. Originators were not exposed. The system design means only the sender and

recipient can see the report and any feedback but prevents an anonymous reporter receiving feedback. It is noteworthy that not one score was negative with this dimension holding some of the lowest (i.e. most positive) of all dimensions being ranked the second strongest dimension toward a positive perception for just culture.

Continuous Improvement

Four items measured this dimension and recorded the strongest positive perception of a just culture. The lowest scores (strongest perception) for the entire survey were recorded for each job role where they unanimously agreed that by entering reports, they are making the company a safer place for passengers. Similarly strong, was the belief that there were improvements because of event reporting. Not only did participants believe the company views events as improving opportunities, but also critically, they devote resources to make the necessary improvements.

The interviews revealed their early basic training was the primary influencer in deciding to submit a safety report and several participants stated prescriptive rules and regulation was secondary to their motivation. All participants agreed the reporting occurrences supported learning and improvement and the best outcome of a safety report was the ability to learn from its findings, essentially not to make the same mistake twice.

Trust

Five items measured this construct with this dimension demonstrating that engineers had a slightly negative perception of trust towards the organisation, their supervisors, and their co-workers in all but one question. Question 26 showed the engineers slightly agree they felt comfortable entering reports where others were involved whereas managers were slightly uncomfortable. Other staff recorded a neutral score for this question.

The engineers slightly disagree that the company does not use a fair and balanced system when evaluating staff involvement in events while in contrast, managers strongly agree and other staff moderately agree they do. Interview participants stated they considered the system fair, citing the existence of a transparent culpability matrix or flow chart as the key aspect of trust for managing events fairly.

The highest negative score for engineers in this dimension showed they do not believe the company adheres to its own rules and policies while the other two job roles do. This aspect of adherence to rules came across in the interviews. Participants stated that because investigation were not conducted by managers, staff were treated fairly. However, despite this, there was an element of leniency shown which influenced their perception because they considered some staff were treated differently depending on who they were or the position they held. While the nature of safety investigation is one of treating each event as unique, participants did recognise that each event holds unique extenuating circumstances but nevertheless leniency was perceived to exist.

This is a very important dimension because it is the extent to which individuals trust the organisation, their supervisors, and their co-workers. Overall, the engineer trust perception is slight negative with scores just above 4. Combined scores placed all staff just below a score of 4 indicating slightly agree except for the question 27, where a combined answer of 4 (neutral) showed the participants were neither comfortable or uncomfortable of others reporting of events they were involved in.

Motivation

Motivation was not measured in the quantitative data collection but featured strongly in the interviews. Participants were not motivated to report for personal gain or benefit but primarily for passenger safety improvements. Motivation is a central tenant to an effective reporting process. As stated earlier, staff reported based on the influence of their early training and not arguably due to the existence of a just culture in an organisation. Not one participant explicitly stated their motivation was due exclusively to the existence of a just culture despite company training on the subject. What came across principally as a motivator was a professional attitude to doing the right thing and ultimately making the

work place safer. All participants echoed the strong sentiment that by submitting a safety report, it would reduce or stop the chances of it happening again.

Reflecting the general participant interview viewpoint, one stated, "...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".

During the interviews, not all participants expressed a positive experience where one thought his job was in jeopardy if he did not report. Another highlighted being 'motivated' by a request to report so others could use the reporting system to act as a tracker of a recurring item on aircraft. The sharing information for others to learn was a principle motivator in the interviews, as one stated "let everyone know about it, people can see the issue and share the knowledge". In contrast, another participant stated their motivation first depended on what was discussed amongst their co-workers.

While the Regulation affords protection to persons who submit a report, participants introduced the aspect 'playing the system' and being 'off the hook' by virtue of making a report, while recognising its overall benefit of making people aware of mistakes. This is important because while just culture is there to offer protections to genuine errors, it is not a 'get off the hook' tool and if it is used as such it can bring discredit to the process. Thankfully, and as is clear from the participants cited reasons, this is the exception. In essence, one participant best sums up the motivation 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".

SUMMARY

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 quantitative findings suggest that the organisation does have a positive perception of just culture. There are differences between job roles and differences between dimensions. The primary differences by job role is between management and engineers. Management and 'other staff' had similar survey results. Where there was a negative perception score in many cases it was 'just' above the neutral score of 4, being in the slightly disagree category. The organisation management can view the differences and scores to better target their resources and training. This can lead to improvements in climate, culture and the report process. Management can also consider slightly agree scores, being close to neither or a negative score. In addition, management can look at why some staff, especially managers agree and others disagree on certain questions. It is easy to use high level figures to view the organisation as overall positive or negative perception of just culture, but the organisation score of 3.14 is in the slightly agree perception area. Therefore, they should take this research and use it to analyse what is required to move towards or into the strongly agree area. The staff have demonstrated they are engaged and willing to participate and to adhere to the organisation rules and principles. Improvements are needed in increasing trust and fairness perception especially with the engineers. Despite fairness in the survey having negative perceptions, the interviews did show that the culpability matrix was a key fair tool and taking in all circumstances even extenuating circumstances (Cromie et. al., 2016) was important for staff positive perception.

All job roles took part in the interviews which was important not to bias towards one job role to get a balanced perception as far as possible. Maintenance staff, by profession, hold a mindset towards safety, and therefore learning comes naturally to them. It is this mindset, which seeks to improve by never knowingly repeat a mistake. Participants were self-motivated taking comfort that the safety report was beneficial to passenger safety and organisational improvement. The interviews show participants have an overall positive perception of just culture. They have submitted a report and will do so as required in the future. They are motivated by an inner professionalism with a high regard for safety considerations identifying is at the career entry point of basic training (typically when young) that individuals are most influenced showing that if the safety of persons and aircraft is instilled positively and strongly at this stage, it remains. Hence a strong initial sense of responsibility for safety if key at the start. Participants

regard feedback as an important aspect of the process and consider the company manages a fair reporting process despite some misgivings such as with trust. All consider the reporting process as benefiting passenger safety through continuous improvements. The interviews found the participants understanding and knowledge of just culture is based on organisational internal training.

The interview research showed 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.

Isambard Kingdom Brunel recognised the only way to reduce danger and risk is to attain as close to perfection as can be attained by small gradual improvements until they do not occur; and equally we cannot make the human perfect and because the human will remain the same (Parliamentary Papers, 1841). Fast-forward 177 years, today this means practical drift will always occur and the company and staff must continually strive to return any human deviation back to the ideal baseline. This is the very reason we introduce control measures. This is where the concept of just culture enters the aviation concept of the safety dilemma equation through reporting errors it can be prevented occurring again. 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 stated the system, while there were some deficiencies, was overall fair. It is through this understanding that a company can target and approach its policies to ensure maximum benefit for all. This involves an atmosphere of trust between all parties, staff, management, passengers and regulators. Trust in the literature 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.

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” ((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 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 and especially a distributed concern for safety (Pidgeon and O’Leary, 1994). 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.

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APPENDIX

The JCAT survey as administered via the group email are listed below with the former healthcare replaced word in brackets beside the inserted word for this research. This was considered acceptable, as the minor changes hold the same overall meaning for a just culture irrespective of environment.

Feedback and Communication

1. The management does a good job of sharing information about events.
2. We don't know about events that happen in our area (unit)
3. I often hear about event conclusions and outcomes.

Openness of Communication

4. Staff feel uncomfortable discussing events with managers (supervisors).
5. Managers (supervisors) respect suggestions from staff members
6. Staff can easily approach managers (supervisors) with ideas and concerns.
7. If I had a good idea for making an improvement, I believe my suggestion would be carefully evaluated and taken seriously.
8. I trust managers (supervisors) to do the right thing.

Balance

9. Staff members are usually blamed when involved in an event.
10. Staff members fear disciplinary action when involved in an event.
11. When an event occurs, the follow up team looks at each step in the process to determine how the event happened.
12. I feel comfortable entering reports about events in which I was involved.
13. Staff members use event reporting to “tattle” on each other.

Quality of event reporting process

14. Coworkers discourage each other from reporting events.
15. The event reporting system is easy to use.
16. Reports are being evaluated and reviewed after they're entered.
17. I'm given time to enter event reports during work hours.
18. My manager (supervisor) encourage me to report.

Continuous Improvement

19. There are improvements because of event reporting.
20. The company (hospital) devotes [time/energy/resources] toward making safety improvements.
21. By entering reports, I'm making the company (hospital) a safer place for the passengers (patients).
22. The company (hospital) sees events as opportunities for improvement.

Trust

23. The company (hospital) uses a fair and balanced system when evaluating staff involvement in events.
24. I trust that the company (hospital) will handle events fairly.
25. The company (hospital) adheres to its own rules and policies.
26. I feel comfortable entering report where others were involved.
27. I am uncomfortable with others entering reports about events in which I was involved.

FIGURE 7
MEAN AND CRONBACH'S ALPHA RESULT BY DIMENSION

	Dimension	M	α	Number of items
1	Continuous Improvement	2.67	0.859	4
2	Quality of event reporting process	2.97	0.804	5
3	Balance	3.47	0.699	5
4	Trust	3.54	0.790	5
5	Feedback and communication	3.62	0.807	3
6	Openness of communication	4.12	0.857	5
	Overall Result All Dimensions	3.41	0.946	27