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Assessing Safety Culture within a Flight Training Organization

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ABSTRACT

This study was prompted by a string of aircraft hull losses experienced by a multinational, multi-campus flight training organization. A mixed methods study was conducted to study the attitudes and perceptions of the operations and management staff at this flight training organization through the use of a survey instrument previously existing and adapted, in order to ensure validity, and interviews with key staff members. Confirmatory factor analysis was performed to identify underlying constructs in the perceptions and attitudes of the staff in order to identify beliefs that may signify a flight training organization is at risk. An analysis was conducted using these constructs, along with the interviews obtained from key individuals, to further understand the beliefs, attitudes, and perceptions that may place similar flight training organizations at risk. The research study identifies a lack of a safety culture throughout the organization. The current system is substantially reliant on the necessity of flight instructors and their students to maintain a clean record in order to be viable for future employment and is seen by this operator as the primary system for ensuring accountable action by agents within the system. The implementation of a Safety Management System is recommended as a result of this study.

Assessing Safety Culture within a Flight Training Organization

In 2011, the two United States campuses of a multinational flight training organization experienced a high number of operational aircraft accidents and incidents, including four fatalities in two separate accidents and a net loss of five airframes. In a fifteen-month period between April of 2010 and July of 2011, 25,696 hours were flown while the company suffered two fatal accidents, a total of five hull losses, four engine fires, and twenty-seven pilot-induced incidents that required unscheduled maintenance (G. Austin, personal communication, November 4, 2011). All of the accidents involved students on solo flights or rentals. During the same period, the United Kingdom campuses of the same organization did not have any accidents or incidents. At present the organization does not employ a Safety Management System (SMS) or any other proactive system beyond a nominal quality assurance program.

Even in the dynamic environment of high-tempo flight training this rate of occurrence is notable. More importantly, this rate of occurrence is both economically and socially unsustainable and requires intervention (Strauch, 2004). Because these events appear to occur in serial isolation to each other, there is no systemic analysis as to the root cause or causes that may underlie the events. In a flight training organization it is the instructors who are not only the means of production but also tasked with inculcating values, particularly safety values, into their students. It is a peculiar aspect of aviation instruction in the United States

that the majority of instructors are not seasoned careerists but are often a year or less removed from the experience level of their new students (Aircraft Owners and Pilots Association, 2010). Many often see instructional careers as a stepping-stone to an airline cockpit, and economic forces further affect this with an inverse relationship between instructor experience and economic conditions. This yields a condition where accession to the airlines is relatively quick, and the greatest numbers of young pilots are being taught by likely the most inexperienced instructor cadre relative to other times.

During periods of high turnover, it is expected to see an increase in the number of accidents occurring. This phenomenon is well documented in the literature. What makes this scenario under investigation so troubling is that it is occurring during a period of economic and industry stagnation; there has been very little turnover in the firm's instructional staff in the past two years while the accident and incident rates have steadily increased. What must be considered is that these events, previously considered only in isolation, are indicative of systemic shortcomings when taken collectively, and could possibly be an indication of the lack of an effective safety culture.

Literature Review

Research studies involving mixed research methods related to safety are often found in the medical arena, and a number of these studies draw parallels to lessons learned in aviation, often pointing out how reporting systems have greatly

evolved in the aviation industry. Johnson and Terrence (2008) examined the corporate culture of an aviation organization and how that culture and individual intuition influences flight crew safety decision-making in a less-than-optimal, high-workload environment. A quantitative methodology utilizing content analysis and two qualitative approaches, focused and individual interviews, as well as observation was employed in this study. The company utilized for the study was Acme Community Air Service (ACAS), Inc., which provides humanitarian assistance in over 35 different countries. ACAS's operations are most often conducted in foreign nations where crews and staff personnel fly and maintain the aircraft, while living and working in environmentally harsh conditions. To accomplish its mission, ACAS owns, operates, and maintains a number of smaller single and multi-engine aircraft, permitting access to remote areas less conducive to operating larger turbojet aircraft. ACAS has long recognized the need for a strong aviation safety program, and in 1977 began assigning trained safety personnel at the corporate level.

The quantitative portion of the Johnson and Terrence study concentrated on analyzing the safety reports submitted primarily by pilots and maintenance personnel. The study concluded that conflicting safety and mission expectations resulted in conducting flight operations in less-than-optimal conditions. Practices, such as requiring its flight staff to perform additional organizational duties, also contributed in varying degrees to individual stress and fatigue. Both stress and fatigue were implicated in poor in-flight decision-making, incidents, and

accidents. Pilot error was most often the conclusion of ACAS aircraft accident investigators, ignoring the effect of corporate expectations placed on flight crews. ACAS expectations seemed to prioritize production over safety. When ACAS flight crews were faced with decisions surrounding these expectations, ACAS could have anticipated most of its crewmembers would have made choices that placed mission ahead of safety.

Biarman, Paletz, Orasanu, and Brooks (2009) examined the direct and indirect pressures that can be exerted on pilots by Alaskan operators. In addition, the paper examined ways in which organizations and individuals manage the effects of pressure. The study built on previous research that utilized a survey instrument that revealed companies with an elevated accident rate are more likely to stress on-time delivery of mail as important to their financial success, and to be less concerned about the effect of scheduling practices on the fatigue levels of their pilots. Twenty-eight pilots who flew in Alaska were recruited, via advertisements, and were interviewed in Anchorage and Fairbanks. Interviewers trained in the critical decision method, and with backgrounds in aviation, conducted interviews to explore weather-related incidents that had challenged the participants' skills as a pilot. Based on transcripts of the taped interviews, a set of bottom-up categories was created by identifying types of pressures. This initial scheme was generated in a data-driven fashion. The detailed categories were then clustered into themes based on conceptual similarity.

The Biarman et al. study concluded that pilots in Alaska encountered both

implicit and explicit norms and expectations to fly in marginal conditions. Pressure also arose from pilots' awareness of the need for their company to make money and perceived job competition. Some Alaskan operators were able to mitigate the effects of pressure on their pilots; some pilots reported mitigating pressure to fly by managing their employer's expectations and re-emphasizing safety.

The traditional aviation safety program has matured into what is now known industry-wide as an SMS. According to Brown (2008), the shortcomings of the traditional programs are their cumbersome focus on the individual components of safety instead of a holistic, big-picture perspective. Traditional programs have focused on "reporting and investigating events that have already occurred" (Brown, 2008). The new SMS approach involves an entire flight operation (pilots, maintenance, and support personnel) working together to increase aviation safety using a comprehensive systems perspective (Brown, 2008). Brown describes safety as freedom from harm, or the minimization and management of operational risk. Since there will always be hazards and risks involved with aviation, proactive safety management (an SMS) is required to identify and control those hazards, minimizing those risks to effectively manage aviation safety.

In his 2001 report, Dutcher looked at the attitudes towards flight safety using the Royal Canadian Air Cadet Gliding Program (RCACGP) as his subject base. He collected 69 returned surveys measuring attitudes towards safety and

human factors training from instructors and cadets alike. His results showed no statistical difference on those attitudes between instructors and cadets, men and women, or low and high flight time. Not surprisingly, Dutcher's (2001) data showed that the previous involvement in an aviation incident leads to a more positive attitude towards safety training. He drew the conclusion that neither frequency of exposure to human factors training nor the accumulation of flight hours statistically changed participants' attitudes about this training for the better (Dutcher, 2001). Dutcher did find that the possession of more advanced pilot licenses did improve the participants' perception of the relevancy of the safety training.

Dutcher, Carrick, and Smith (2003, p. 4) makes a new realization, "measuring personnel attitudes may be a better measure of true flight safety than occurrence rates." His further research on this same subject data led him to recommend simulator training, even low-cost, low-tech simulator types, as a method to further human factor safety techniques. He also finds that "personnel errors and attitudes are symptoms that can only be ameliorated by treating the underlying causes" (Dutcher et al., 2003, p. 4). According to Dutcher et al., "organizations must provide an environment conducive to the development and maintenance of aviation safety" (2003, p. 4). They suggest: "incidents should be of more concern, viewed as ideal learning opportunities" (2003, p. 4). Dutcher et al.'s methods involved a questionnaire containing 30 Likert-scale questions on flight safety attitudes, three open-ended questions on satisfaction and general

perceptions of safety, and a demographic section. He also sent two identical surveys to about ten percent of the participants, who were instructed to return them at least one week apart. Dutcher used this to establish reliability for his test.

Dillman, Voges, and Robertson (2007) prepared an 18-question Likert survey to determine the perceptions of aviation students towards voluntary reporting and the potential reasons for failing to file safety occurrence reports at Purdue University and Southern Illinois University Carbondale. Dillman et al. (2007, p. 1) thought that the "key ingredient to the success of any safety culture is the need for information about unsafe events, activities, or potentially hazardous operations. On occasion, participants in or witnesses to unsafe or potentially unsafe circumstances fail to communicate the information that is vital to maintaining the continuity of the safety culture" (Dillman et al., 2007, p. 1). They found that the primary reasons for not submitting safety occurrence reports were "a lack of time, ridicule from others, and embarrassment from peers" (Dillman et al., 2007, p. 1). Dillman notices possible reasons for failure to report: fear of punishment, lack of management support, lack of feedback, lack of a safety priority, or a different perception of what is considered safe or unsafe. The survey included Likert-type data as well as open-ended essay responses, but he expressed a desire to go back and obtain qualitative data from interviews with students and instructors to further analyze his research question. Unfortunately, the Likert-data resulted in bell curve data with nothing statistically significant or conclusive. The authors noted that the most interesting responses were from the open-ended

questions which expressly detailed specific problems that the Likert-questions could not: need for better access to safety reports, a lack of time to fill them out, and potential embarrassment from student peers and instructors. "The psychology that impacts a person's desire to learn quietly from their own mistakes is understandable" (Dillman et al., 2007, p. 10). Unfortunately, these private moments of self-reflection and maturation do not necessarily contribute to the growth of a flight school in an organizational sense.

Research Questions

The three research questions that this study investigated were:

1. In a flight training organization with operational deficiencies that have resulted in several accidents, what is the composition of underlying constructs of safety attitudes?
2. How do key individuals within the organization describe the underlying elements?
3. Based on the results, what could be proposed in regards to implementation of a Safety Management System?

Method

Research Design

A mixed methods research design was selected for this study that included quantitative and qualitative data collection and analysis. The research design was an explanatory mixed-methods design (Creswell and Plano Clark, 2010). In this

mixed methods design, the qualitative data is intended to enhance the understanding of the quantitative data. This type of design was selected to assess trends and relationships with quantitative data and also explain the reasons and constructs behind the resultant trends.

This mixed methods study was designed to analyze the safety culture of a flight training organization that had multiple events leading to incidents and accidents. An explanatory sequential mixed methods design was utilized, and it involved collecting quantitative data first and then explaining the quantitative results with in-depth qualitative data. In the quantitative phase of the study, participants completed a survey. Explanatory factor analysis and multiple regression was utilized to analyze and find the constructs that could be important to understand the safety culture of the organization. The qualitative phase was conducted by interviewing participants that are members of the organization. The results of the qualitative part of the study were utilized to explain and confirm the results of the quantitative study.

Participants and Sampling Procedures

The study participants were drawn from the current employees of the United States and the United Kingdom training locations of the organization being studied. The recruitment of the survey participants was accomplished using convenience sampling of volunteer employees currently employed and able to

receive email at their company address. The participants were also purposively recruited in an attempt to obtain a minimum of ten in each of three categories: flight instructor, management personnel, and support personnel. These participants were then segmented into categorical groups for subsequent analyses by gender, profession, and facility. Responses that were missing data for profession and facility were excluded from further analysis.

Instrumentation

Quantitative instrumentation.

The quantitative portion of the study utilized the Commercial Aviation Safety Survey (CASS) by Wiegmann, Zhang, von Thaden, Sharma, and Mitchell (2002), with only nominal adaptations for a flight-training environment. The CASS was created as a means of measuring the overall safety culture within an airline. Admittedly, the use of survey methods do not yield an equivalent level of detail as other more rigorous strategies, such as individual interviews or direct observation, but they do yield the comparative advantage of allowing a larger amount of the target population to be measured and to do so anonymously and without fear of negative repercussions, particularly given the questions about the nature of the organization.

The CASS was designed to measure five organizational indicators of safety culture, previously defined by Wiegmann, von Thaden, Mitchell, Sharma, and Zhang (2003) from reviews of the literature. These indicators from their

work were synthesized from common themes in safety culture research across multiple fields, inclusive of aviation, and are listed below.

Organizational Commitment to Safety: The degree to which upper management promotes safety, as evidenced by safety-related policies and the commitment of resources to maintain and improve safe operations.

Managerial Involvement in Safety: The degree to which middle and lower-level managers are personally involved in safety activities and in promoting safety among their employees.

Employee Empowerment: The degree to which employees are invited to participate in safety-related activities and decisions, and encouraged to take personal responsibility for safety.

Accountability System: The degree to which the organization rewards safe behavior and dispenses consequences for unsafe behavior.

Reporting System: The degree to which the organization possesses an effective, accessible means of reporting safety information those employees are willing to use.

As with Wiegmann et al.'s original work (2002), the safety culture survey is comprised of eighty-four items that are grouped as follows: measures of accountability systems (n = 10), measures of managerial involvement (n = 17), measures of organizational commitment (n = 30), measures of pilot empowerment

(n = 14), and measurement of evidence of effective reporting systems (n = 13), occurring in random order throughout the instrument. Participants responded using a five-point Likert-type scale ranging from 1 (strongly disagree), 3 (neither agree nor disagree), to 5 (strongly agree), where only those three scores are labeled. A seven-point scale was pre-tested but rejected due to negative participant response given the relatively high number of items in the instrument. In addition to the quantitative data sought, participants are asked to indicate their position, tenure with the company, tenure in their present position, and age. The instrument is attached in Appendix A. The Institutional Review Board of Embry-Riddle Aeronautical University reviewed the instrument and determined the research to be exempt under 45 CFR 46.101(b)(2)(i).

Qualitative instrumentation.

An interview case analysis was conducted to explore the five common themes from the survey instrument. The interviews were recorded using a digital recorder and transcribed using software with manual verification. The transcripts were then thematically analyzed for qualitative content using Nvivo 9. The scripted questions are attached in Appendix B.

Data Collection

Survey data were collected electronically over a five-day workweek. Notification was given one week in advance by email and again when the survey became available. Supervisory and management personnel were asked to remind

employees and encourage them to participate. Interview data was collected in person and over the phone as necessary on the fifth day of survey data collection after a preliminary quantitative data analysis was conducted by the researchers.

Data Analysis

The authors conducted confirmatory factor analyses (CFA) using the SPSS and AMOS software packages to test the structure of the survey items. An overall CFA for the five-factor model was conducted and then single-factor models for each of the five dimension scales were tested individually, following the same technique as in the original design (Wiegmann et al., Models are usually considered to fit well when the chi-square value is nonsignificant compared to the degrees of freedom; the RMSEA is below .10; and the NFI, TLI, and RNI are above .90 (McDonald & Ho, 2002). In preparation for the CFA, the raw correlations among items were examined. The results of the CFA, as well as examination, were consistent with those of the original author.

Following validation of the instrument through CFA, multiple regression analysis was performed with stepwise entry on the items and the constructs against the demographic information. Errors in the model as well as influential cases were studied as a guide to refinement and implementation of the qualitative instrument.

Quantitative Phase

Descriptive Statistics

There were 63 returned quantitative surveys collected on 83 five-point Likert scale items. The response rate was 36.4% from the 173 surveys distributed. Although most sources prefer between 5 and 10 responses per scale item (Hair must include all authors in first citation et al, 2010), this study was limited in that it reached only 63 respondents. A future study would gather data from at least ten times this amount by expanding the survey distribution to more than just one flight school company. Over two-thirds (68.3%) of the returns were from the two Florida based flight schools while the other 20 were split fairly evenly from the remaining four British flight schools. Fifty-three of the respondents were males (84%), and 46 of the total were instructor pilots (73%); the other 17 were either management (7), support (6), or maintenance personnel (4). Fortunately, there were no missing data in the entirety of the 63 returned surveys. Cronbach's Alpha showed strong indications of reliability for Organizational Commitment (.79), Managerial Involvement (.74), and Reporting System (.67), but was weak in Accountability System (.58) and Pilot Empowerment (.53).

Table 1

Descriptive Statistics by Facility

	Frequency	Percent	Valid Percent	Cumulative Percent

Campus 1 (U.S.)	29	46.0	46.0	46.0
Campus 2 (U.S.)	14	22.2	22.2	68.3
Campus 3 (U.K.)	7	11.1	11.1	79.4
Campus 4 (U.K.)	4	6.3	6.3	85.7
Campus 5 (U.K.)	6	9.5	9.5	95.2
Campus 6 (U.K.)	3	4.8	4.8	100.0
Total	63	100.0	100.0	

Table 2

Descriptive Statistics by Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	53	84.1	84.1	84.1
Female	10	15.9	15.9	100.0
Total	63	100.0	100.0	

Table 3

Descriptive Statistics by Employment Position

	Frequency	Percent	Valid Percent	Cumulative Percent
Instructor	46	73.0	73.0	73.0
Manager	7	11.1	11.1	84.1
Maintenance	4	6.3	6.3	90.5

Support	6	9.5	9.5	100.0
Total	63	100.0	100.0	

Factor Analysis Results

Principal components analysis with varimax rotation was conducted to assess the underlying structure for the 83 items of the survey instrument. The assumption of independent sampling was met. The assumptions of normality, linear relationships between pairs of variables, and the variables being correlated at a moderate level were checked and some variables did not meet the assumptions. The determinant was zero, so a factor analytic solution cannot be obtained. Thus the results should be viewed with caution. Five factors were requested corresponding to the five scales in the instrument: accountability system, managerial involvement, organizational commitment, pilot empowerment, and reporting system. The items associated with each scale are detailed in Appendix C. After rotation, the first factor, Accountability, accounted for 11.3% of the variance, the second factor, Managerial Involvement, accounted for 6.0%, the third factor, Organizational Commitment, accounted for 5.6%, the fourth factor, Pilot Empowerment, accounted for 5.4%, and the fifth factor, Reporting System, accounted for 5.3%; the combined variance for the five factors was 38.1%. Factor loadings for the rotated factors are shown in Table 4.

Table 4

Factor Loadings for the Rotated Factors

Item	Factor Loading					Communality
	1	2	3	4	5	
56	.70					.62
74	.69					.57
24	.67					.66
6	.63					.53
78	.62					.43
58	.59					.40
41	.58					.47
42	.55					.40
10	.55					.42
15	.54					.47
7	.54					.32
54	.53					.48
23	.51					.52
14	.50					.37
26	.50					.44
47	.47					.48
39	.45	.44				.59
81	.45				-.44	.42
28	.43					.34
51	.42					.23
2	.40					.20
11	.40					.28
29		.81				.70
59		.77				.66
66		.74				.58
36		.67				.50
69	.40	.58				.64
76		.47				.38
62			.78			.69
57			.73			.73
18			.66			.44
32			.62			.51
46	.42		.51			.47
27			.49			.45
61			.48			.33

31			.45			.28
75			.45			.38
20			.42			.42
16			.40			.34
4			.40			.17
77				.73		.61
63				.66		.58
60				-.64		.48
33				.58		.41
25				.52		.40
30				-.44		.42
21				.42		.36
72				.42		.39
55				.40		.28
37					.62	.61
82					.54	.33
64					-.54	.40
17					-.53	.52
34				.42	-.52	.30
68					.48	.31
53				-.44	.47	.53
67					.41	.51
52					.40	.28
38					.40	.21
Eigenvalues	9.40	6.00	5.76	5.60	4.84	
% variance	11.32	7.23	6.94	6.75	5.84	

Note. Loadings < .40 are omitted.

MANOVA Results

A multivariate analysis of variance was conducted to evaluate differences between facility location, gender, and employee position on a linear combination of 83 items from the survey instrument and whether there was an interaction between facility, gender, and employee position. The assumptions of independence of observations and homogeneity of variance/covariance were

checked and met. The interaction of gender and position was significant, Wilks' $\Lambda = .002$, $F\ (40,2) = 31.95$, $p = .031$, multivariate $\eta^2 = .99$. This indicates that the linear composite of all 83 survey items differs on the combination of gender and employee position. The interaction of facility and gender was significant, Wilks' $\Lambda = .000$, $F\ (80,4) = 5.98$, $p = .046$, multivariate $\eta^2 = .99$. This indicates that the linear composite of all 83 survey items differs on the combination of gender and facility location. The interaction of facility and position was not significant, Wilks' $\Lambda = .000$, $F\ (320,33.5) = 1.32$, $p = .164$, multivariate $\eta^2 = .92$. The main effect for facility was significant, Wilks' $\Lambda = .000$, $F\ (200,15.3) = 2.16$, $p = .042$, multivariate $\eta^2 = .97$. This indicates that the linear composite of all 83 survey items differs for flight school location. The main effect for gender was not significant, Wilks' $\Lambda = .008$, $F\ (40,2) = 6.09$, $p = .151$, multivariate $\eta^2 = .99$. The main effect for position was not significant, Wilks' $\Lambda = .000$, $F\ (120,6.9) = 1.97$, $p = .176$, multivariate $\eta^2 = .97$.

Quantitative Inferences

A significant statistical difference occurred in regards to flight school location on the 83 item safety survey. The significant interaction of gender and employee position probably occurs because of some skew in the demographic distribution. The ten females in the survey were comprised of four instructors, four support personnel, and two managers. The same can be said of the

significant interaction between gender and facility location with eight located in the United States, and two at a single U.K. location. Given that the sample size of females is so low it is not possible to make meaningful statements on the basis of gender however this was not expected to be relevant to the investigation at hand.

QUALITATIVE PHASE

The analysis of each interview and across all six interviews was conducted to provide additional insight into the five themes identified in the quantitative instrument design: accountability systems, managerial involvement, organizational commitment, instructor empowerment, and reporting systems. Because the implementation of a safety management system requires the full and unconditional commitment of leadership the responses of the chief executive and the chief flight instructor are examined in depth in addition to the cross-case analysis.

Chief Executive

The chief executive was 53 years old and in his thirteenth year as head of the training organization. Previously he had been involved in aviation as an airline pilot as well as having other financial investments in aviation including aircraft servicing and brokerage in both the United States and the United Kingdom. The chief executive is not involved in daily operations but is intimately involved with all aspects of operational finance and has been involved with the resolution of all major accidents. The chief executive is also the nominal

head of the company's quality program.

Accountability system elements.

As chief executive and principal owner of the organization the interviewee sees himself as ultimately accountable for all of the activities that take place in the organization. While most chief executives would see financial obligations as their highest priority the interviewee reports that safety is his overwhelming primary concern. This priority is assigned not only because of moral obligations to ensure a safe flight environment for staff and students but also out of economic self-interest. Because there are inherent risks in a flight training organization over the years, the executive confided he has been personally exposed to great financial loss as a result of the unsafe activity of others. The only way to combat this risk is to ensure that management and staff are fully accountable for their actions and to provide the background for a strong safety culture.

Indeed, the chief executive is proud that he does not maintain a "one strike and you are out" policy with regards to accidents and incidents. There are both students and instructors still operating aircraft who have been involved in serious incidents. The chief executive believes that there is a strong benefit to be gained from rehabilitation and the evangelism that can be offered by these individuals to other members of the staff and the flight training community. Accountability is defined and maintained by having these individuals continue with the organization so that others may learn from the incident as well as from the

individual. Dismissing the individual in question and passing them down the line to another organization does not improve safety either locally or globally. Only individuals who have demonstrated willful negligence or dishonesty in the post-incident or accident investigation are involuntarily separated from the organization. The corrective and instructive value of these individuals is simply too great to dismiss.

Managerial involvement elements.

To date, management has not been as involved as he would have liked in promoting the safety culture that he would like to see. He personally takes full responsibility for this, being distracted by financial aspects of the business over the past 12 months. As chief executive the interviewee believes that he possesses sufficient operational knowledge to be involved in the day-to-day affairs of flight operations and training but that the actual management and decisions are best carried out by individuals he has hired to fill those leadership roles. That said, he believes that the individuals in their key positions are doing all that is necessary to ensure a safe operation. He believes that other changes may be necessary to achieve the level of safety desired by himself, the staff, and the investors. Management desires a zero event safety record.

Organizational commitment elements.

The key to management's commitment to a true and effective safety culture is the recent hiring of a senior level employee tasked with the creation and

implementation of a fully European Aviation Safety Administration (EASA) compliant safety management system. Very strong exception was taken with the idea that management would place any objective over safety, particularly given the financial consequences directly borne by the chief executive as the majority shareholder. When asked to discuss retrospective rather than prospective organizational actions the chief executive declined to elaborate citing the pending litigation of a fatal accident in the fall of 2010.

Instructor empowerment elements.

No one in the entire organization is more empowered to impact safety then the individual instructors, according to the chief executive. As pilots-in-command of their respective training aircraft, pilots may be dozens to hundreds of miles from the school at any given time. Because there is little to no oversight or accountability of the instructors when they are flying training missions they necessarily must be empowered to take the actions necessary to promote a safe flying culture. What management must do, and needs to do better perhaps, is to make sure that the instructors have the right knowledge and backgrounds to implement the safety culture that is, according to the chief executive, desired by all parties. The chief executive strongly disagrees that there is an issue of any kind with instructor empowerment. If anything, he suggests that there may be too much empowerment and not enough guidance of the individual instructors.

Reporting system elements.

According to the chief executive there is a fully compliant Joint Aviation Authorities (JAA), U.K. Civil Aviation Authority, and EASA quality safety system that includes provisions for safety reporting from all members of the community. This includes students, staff, instructors, and management. This system is reviewed quarterly as part of the current quality audit system. The chief executive indicated that all concerns were capable of being dealt with anonymously and promptly in accordance with the procedures outlined in the existing quality manual. When asked if this involved the chief executive in reviewing these issues he stated that normally, no, he did not. These concerns are normally addressed by the appropriate level of operational management and expected to be resolved there.

Chief Flight Instructor

The chief instructor was 32 years old and had been in the position for eleven months. Prior to assuming the position he had been an instructor with the organization for two years. His aviation background involves an additional six years as an instructor and eighteen months as a regional airline first officer. The chief instructor position is his first management or leadership role.

Accountability system elements.

The accountability system is primarily based upon the individual's own self-interest, according to the chief instructor. The necessity of flight instructors and their students to maintain a clean record in order to be viable for future

employment is seen as the primary system for ensuring accountable action by agents within the system.

Being involved in or seeing students involved in any type of accident or incident would be sufficient to encourage most instructors to operate in the safest manner possible. When asked if this reliance on self-interest program was sufficient to ensure the highest level of safety possible in-flight operations chief instructor responded that he believed it was, in fact, the most effective method that he knew. Without self-accountability there is unlikely to be a change in behavior.

Managerial involvement elements.

Management has a strong involvement in all aspects of safety promotion, according to the chief instructor. Because of the high turnover involving both students and staff such an approach is necessary. New initiatives, including the reformulation of the existing quality system, are seen as the principle method of dealing with safety challenges that are expected to arise with the projected increase in flight training over the next six months and the transition to an independent operation.

Organizational commitment elements.

The company has a very strong commitment to maintaining a safe and effective flight operation. Because of the nature of the operation it is very unlikely that physiological needs such as sleep or nutrition should come into play

in causing an unsafe situation for most instructors or their students during normal operations. Under no circumstances will management tolerate unsafe activity. Multiple individuals have been terminated upon the first offense when management has learned of unsafe conduct of operations that violate either the letter or the spirit of regulations.

The chief instructor is unwilling and/or unable to comment on the state of the aircraft fleet, its maintenance, or the level of technology available to both students and instructors when operating company aircraft. In the chief instructor's opinion, and from his own experience, there are no significant or otherwise noteworthy issues regarding the aircraft's maintenance, airworthiness, or general safety.

Out-of-the-box type thinking particularly as it regards to safety or company procedures are also not tolerated. At the same time, instructors, students, and staff are encouraged to self-implement actions and activities that can increase safety in the flight operations environment. Management will never seek revenue over safety.

Instructor empowerment elements.

As with the chief executive, the chief instructor maintained a very strong belief that instructors were empowered to promote and act upon safety concerns. Feedback from the instructor staff is solicited through weekly staff meetings and an open door policy is maintained. As noted above, staff is fully expected to

engage in this empowerment and implement safety initiatives as they are appropriate. These initiatives for actions should be brought promptly to management's attention for adoption and incorporation across the system.

Reporting system elements.

According to the chief instructor, a formalized reporting system does not exist beyond a standing order to "see something, say something" related to safety concerns. He stated that there was a collection box for anonymous safety reports but that he did not know where it was located after the transition to the new hangar that occurred thirteen months prior to the interview. Internal safety reporting forms are supposed to be located behind the dispatcher's desk in operations but neither the chief instructor nor the dispatcher on duty was able to locate them. Later the dispatcher told the interviewer that she had never seen such forms in her five months of employment.

Cross-Case Analysis

A total of six individual interviews were conducted with members of management and staff. In addition to the two previously detailed interviews the chief ground instructor, the vice president of business development, the deputy chief ground instructor, and the current caretaker of the existing quality program were interviewed. By design, the five themes that were defined in the quantitative analysis were purposefully explored to explain the results. Overall there are more similarities between the participants then there were differences. Factors deemed

important for each individual tended to relate to their specific job position and differed according to perceived responsibility for safety.

Accountability system elements.

Without exception, all of those interviewed felt that self-accountability and specifically self-interest were the key elements of systemic safety accountability. In short, because it is in any individual's best long-term interest to be safe, it is expected that they will conduct themselves in a safe manner. As noted in the table, there were differences of opinion as to how management provided structure and support for this perceived system of self-accountability. Again, without exception, all of the six members of management who were interviewed saw personal responsibility and accountability as the key to safety. It was thought that the individuals themselves needed to conduct themselves in a safe manner rather than management creating an over-arching and intrusive structure. Both the chief ground instructor and the deputy chief ground instructor were of the opinion that at this level the instructors should be fully competent agents for safety and therefore fully accountable.

Managerial involvement elements.

When queried about the level of management involvement there was some variation between interviewees. Those who felt that management's current level of involvement was correct vary inversely with their position in the corporate

hierarchy. That is to say that the further the individual was from the top the more he or she believed that management could do more to promote safety and be involved with a safety culture.

Organizational commitment elements.

The sub-themes shown in the table were developed through the organizational commitment elements that varied markedly between participants. There was a divergence of opinions about the role that management currently plays in their commitment to safety as well as a divergence of opinions in what role is appropriate for management to play. The opinions expressed by each individual interviewee showed a similar divergence in this category to the responses regarding managerial involvement.

Instructor empowerment elements.

In this theme there was little variance in responses among those interviewed. Respondents universally believed that the instructors were sufficiently, if not overly, empowered to involve themselves in safety related activities, submit safety-related suggestions, and to intervene to prevent unsafe actions. Two individuals cited the fact that the current chief instructor was promoted from the ranks of existing instructors as evidence that the upward flow of values and safety information is taking place and working well.

Reporting system elements.

Just as this theme saw a divergence between the chief instructor and the

chief executive in terms of opinions and knowledge of the current system status so to were responses differing among the others interviewed. The only commonality between individual responses was the fact that none of the respondents accurately detailed the current state of the company's existing reporting system. All of the individuals believed that it was an important component of both a quality and a safety management system but none of them recall ever participating in the reporting process themselves. Of the four interviewed individuals not explored in depth previously, three of them believed that reporting safety concerns to their direct superior was the most appropriate and effective method of resolution. Only the chief ground instructor, who has served as chief operating officer on occasion in the past, felt it would be appropriate to act independently on some safety issues if necessary.

Discussion

The qualitative analysis corroborated and helped further explain the quantitative analysis. The findings of the qualitative analysis converged with the findings of the quantitative analysis and five main factors were analyzed. An integrated analysis of the quantitative and the qualitative results was utilized to address the research questions.

Research Question One

The first research question aimed to find the composition of underlying constructs of safety attitudes in a flight training organization with operational

deficiencies that have resulted in several accidents.

The survey instrument utilized for the quantitative analysis, CASS, was designed to measure five organizational indicators of safety culture. An interview case analysis was conducted to explore these five common themes from the survey instrument. The five factors studied were: Organizational Commitment to Safety, Managerial Involvement in Safety, Employee Empowerment, Accountability System, and Reporting System. Principal component analysis confirmed the existence of five main factors. After rotation, Accountability accounted for 11.3% of the variance, Managerial Involvement accounted for 6.0%, Organizational Commitment accounted for 5.6%, Pilot Empowerment accounted for 5.4%, and Reporting System accounted for 5.3%; the combined variance for the five factors was 38.1%. Even though these factors did not account for even half of the variance, the qualitative analysis appears to corroborate the results of the quantitative analysis. Without exception all of the six members of management who were interviewed saw personal responsibility and accountability as the key to safety.

Research Question Two

The second research question's goal was to find how key individuals within the organization described the underlying elements. Six interviews were conducted with members of management including the Chief Executive, the Chief Flight Instructor and the Chief Ground Instructor that also acts as the Chief

Operating Officer, Deputy Chief Instructor, VP of Business Development and Flight Administrator.

With regards to accountability, without exception, all of the six members of management who were interviewed saw personal responsibility and accountability as the key to safety. There were differences of opinion as to how management provided structure and support for this perceived system of self-accountability. It was believed by management that the individuals themselves needed to conduct themselves in a safe manner rather than the organization creating an over-arching and intrusive structure.

When queried about the level of management involvement there was some variation between interviewees. Those who felt that management's current level of involvement was correct vary inversely with their position in the corporate hierarchy. Individuals with lower positions believed that management could do more to promote safety and promote a safety culture.

The opinions about the role that management currently plays in their commitment to safety varied among respondents as well as the opinions of what role is appropriate for management to play. Individual interviewee's expressed opinions were similar for this category as were their responses regarding instructor empowerment.

In regards to instructor empowerment, all of the respondents believed that the instructors were sufficiently if not overly empowered to involve themselves in

safety related activities, submit safety related suggestions, and to intervene to prevent unsafe actions. Two individuals cited the fact that the current chief instructor was promoted from the ranks of existing instructors as evidence that the upward flow of values and safety information is taking place and working well.

The responses regarding the safety reporting system varied, however none of the respondents accurately detailed the current state of the company's existing reporting system. Only one respondent believed that the safety reporting system should be independent from the operations department, all others believed that the most effective way to express safety concerns was to report them to their immediate supervisor.

Research Question Three

The third research question attempted to provide recommendations for the implementation of a Safety Management System based on the results. One of the main findings of the study is that the organization lacks an effective, strong safety culture and it is relying on the individuals' values and mostly fear of having an accident on their record that could ruin their career, and trust that the individuals will act in a safe manner. The first step to creating a Safety Management System is to start by creating safety culture in which everyone from management to the line instructors to students are part of and in which they believe (Stolzer, Halford, & Goglia, 2008).

Implications and Recommendations

Certainly the strongest finding of this research study is that the organization as a whole is lacking a strong system of accountability by relying on individual interests. The perception that pilots will avoid hazards and consequentially not be involved in accidents because it is in their best interest can hardly be held as an exemplar or even an effective model of safety culture. Some of the members of the organization preferred having individuals act alone instead of instituting a safety culture throughout the organization. The members of the management team also believed that the individuals themselves needed to conduct themselves in a safe manner rather than management creating an over-arching and intrusive structure. All of the respondents agreed that a safety reporting system was important; however none of the respondents have participated in the company's reporting system, nor are familiar with the current status of the reporting system. In a further study, flight students should be included since they are an instrumental part of the safety of the organization since they have to fly by themselves as a requirement of many flight courses; in addition they are also allowed to rent the aircraft. Some students could also become instructors and help maintain the safety culture of the organization if it at all exists. In addition all of the accidents involved students on solo flights or rental flights and an instructor was not on board the aircraft. Therefore, the assumption that an individual-level program is sufficient to ensure safety in flight operations is clearly not valid and immediate attention is required. The implementation of a safety culture and a

Safety Management System is highly encouraged. Further studies should include the addition of members of the student body to the process. The proven survey instrument from Wiegmann et al. (2003) utilized in the study aids in claims about construct validity. The reliability and generalization of the results could be affected by the sample size. Additionally, the lack of normality violates assumptions of parametric analysis and limits the statistical power of any inferential methods to be used as a measurement of change following the application of a safety management system. A mixed methods approach is recommended for additional evaluations of so small a population.

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APPENDIX A

Quantitative Items Sorted by Scales

Accountability System

34. Being involved in an accident or incident, even if it was not your fault, would have an adverse effect on your career with this company.
39. Company management shows favoritism to certain pilots.
43. Pilots who cause accidents or incidents are not consistently held accountable for their actions.
46. Standards of accountability are consistently applied to all pilots in this company.
48. Pilots are consistently held accountable for acting unsafely, even if their actions saved time or money.
54. Being the cause of an accident or incident would have an adverse effect on your reputation with fellow pilots.
57. Action is consistently taken against pilots who violate safety procedures or rules.
64. Pilots get little recognition for new safety ideas.
71. Being involved in an accident or incident, even if it was not your fault, has an adverse effect on your reputation with fellow pilots.
81. When pilots make a mistake or do something wrong, they are dealt with fairly by the company.

Managerial Involvement

1. Management involvement in safety issues has a high priority at my company.
5. Chief pilots do not hesitate to contact pilots to discuss safety issues.
6. Flight management closely monitors proficiency and currency standards to ensure pilots are qualified to fly their assigned flights.
12. Management stops unsafe operations or activities.
19. My company's safety department is doing a good job.
26. Safety standards are seldom discussed openly.
29. Upper level management gets personally involved in safety activities.
33. My company only keeps track of major safety problems and overlooks routine ones.
47. Management is receptive to learning about safety concerns.
56. Management has a clear understanding of risks associated with flight operations.
59. Management often fails to recognize when pilots are flying unsafely.

66. Results of FAA safety inspections are made available to pilots for review and information.
69. Safety issues are assigned high priority in meetings at this company.
74. Pilots are kept informed of any changes that affect safety.
79. Chief pilots are unavailable when pilots need help.
82. There are good communications here about safety.
83. As long as there is no accident, management doesn't care how the flight operations are performed.

Organization Commitment

4. Following safety procedures is consistently expected.
7. It is hard for pilots here to maintain a consistent sleep schedule.
8. Management expects pilots to push the weather.
9. Management is committed to equipping aircraft with up-to-date technology.
10. Management is willing to invest money and effort to improve safety.
11. Management tries to get around safety requirements whenever they get a chance.
13. Management views FARs as a hindrance.
14. Management's view is that not all accidents are preventable.
15. My company does all it can to prevent accidents or incidents.
16. My company does not cut corners where safety is concerned.
17. My company inappropriately uses the MEL or deferral of inoperative equipment (e.g. illegally, use when it would be better to fix aircraft).
18. Personnel responsible for safety have authority to implement changes.
21. Personnel responsible for safety hold a high status in my company.
22. Pilots who are not feeling well or are tired are encouraged not to fly.
24. Safety is emphasized by my company during the interview and orientation process.
25. Safety works until we are busy.
27. Some safety procedures/rules are not really practical.
28. When it comes down to it, people in this company would rather take a chance with safety than cancel a flight.
30. I am confident that maintenance on aircraft is adequately performed and that aircraft are safe to operate.
31. Training focuses more on minimum requirements for a check ride than on safety.
32. Management doesn't show much concern for safety until there is an accident or incident.
37. Checklists and procedures are easy to understand.
38. Safety is identified as a core value in my company.
42. My company's manuals are up to date.
50. My company is more concerned with making money than being safe.

52. Training practices at my company are centered on safety.
55. Management views regulation violations very seriously, even when they don't result in any serious damage.
65. Safety is always discussed during training at my company.
75. When an accident occurs, management always blames the pilot.
78. Management expects pilots to push for on time performance, even if it means compromising safety.

Pilot Empowerment

3. Pilots are seldom asked for input when company procedures are developed or changed.
20. Peer influence is effective at discouraging violations of operating procedures and flying regulations.
23. Pilots try to get around safety requirements whenever they get a chance.
35. Pilots are actively involved in identifying and resolving safety concerns.
40. The best pilots in the group expect other pilots to behave safely.
44. Management ensures that all pilots are responsible and accountable for safe flight operations.
49. Pilots are given sufficient opportunities to make suggestions regarding safety issues.
53. Pilots do all they can to prevent accidents.
58. Pilots look at the company's safety record as their own and take pride in it.
60. My company rarely questions a pilot's decision to turn around due to weather.
62. Pilots who violate safety regulations upset other pilots even when no harm has resulted.
68. I am encouraged to stop flight-related activities that are unsafe.
76. It is important to fly safely if I am to keep the respect of other pilots in my company.
80. Pilots often encourage one another to work safely.

Reporting System

2. I am familiar with the system for formally reporting safety issues with my company.
36. Pilots are willing to report information regarding safety violations, marginal aviator performance, and other unsafe behavior.
41. Safety issues raised by pilots are communicated regularly to all pilots in the company.
45. This company's safety program includes mechanisms for me to report safety deficiencies.
51. Pilots do not report their own mistakes when they are not obvious.

61. Pilots often cover up a hard landing or a close call if they feel they can get away with it.
63. It is best to remain anonymous when reporting an unsafe condition or incident.
67. When a pilot reports a safety problem, management acts quickly to correct safety issues.
70. Pilots who raise safety concerns are seen as troublemakers.
72. Pilots can report safety discrepancies without the fear of negative repercussions.
73. Pilots who admit errors make a big mistake.
77. There is no point in reporting a near miss.

APPENDIX B

Qualitative Interview Instrument

1. Would you mind telling me about your background, and how you came to work here?
2. Would you describe what you do and how it relates to the organization?
3. I'd be interested to hear what your most challenging safety related event has been.
4. What do you think are the biggest misperceptions that employees have about safety?
5. What safety problem(s) need to be solved?
6. What are all the possible options? What are the pros/cons of each option?
7. What patterns emerge from the current safety environment and what are the perceived needs for change?
8. What patterns are revealed from historical safety records?
9. Was there any change in the perceived needs related to the recent fatal accidents?
10. What managerial issues arise from the rapid turnover of students and staff and how important have those issues become to the organization?

11. Since student enrollment and staff turnover are projected to increase, what economic impact will that have on the planning of the organization?
12. Since student enrollment and staff turnover are projected to increase, what impact will that have on the safety planning of the organization?
13. What is the level of managerial commitment to safety?
14. What is the level of staff commitment to safety?
15. What resources are or will be needed for conversion to a safety management system?
16. How are safety resources allocated?
17. How are safety resources financed?
18. How will the institution balance the need for safety changes with the need to continue the accomplishment of routine tasks?