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VALIDATING THE COMMERCIAL AVIATION SAFETY SURVEY IN THE CHINESE CONTEXT

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December 2006

Technical Report HFD-06-09

Prepared for

Federal Aviation Administration
Atlantic City International Airport, NJ
Contract DTFA 01-G-015

ABSTRACT

Organizational safety culture has been a focus of research in sociotechnical systems, such as civil aviation, as organizational factors have been increasingly noted as contributory to accidents. The aim of the present study was to validate the Commercial Aviation Safety Survey (CASS), developed at the University of Illinois, in the context of Chinese flight operations. Two specific goals of this study included translating and developing a Chinese version of CASS based on the English version, and exploring the specific cultural and safety contexts of the Chinese version of the CASS. A particular focus of the study examined confidential reporting systems. A translation-back translation technique was used to convert the CASS into Chinese while maintaining the integrity in the meaning of the concepts. The survey was modified to adapt to the current Chinese civil aviation system regulation (CAAC), which included adding localized demographics and investigation of attitudes toward developing a confidential reporting system.

The elementary confirmative factor analysis demonstrated that the CASS could be applied in the Chinese context. The general results from the two airlines surveyed demonstrated relatively low perceptions of organizational safety culture, with the exception of the instructor/trainer subscale. A comparison among the airlines' current reporting system, the pilots' attitude toward a possible confidential reporting system which would be controlled by the airlines they serve, or by a third party illustrated that pilots' attitude toward their current reporting system were significantly lower than other proposed reporting system options. The effect of Chinese current macro- and micro- environments on pilots' attitude will be discussed. This data represents a preliminary study. Future steps involve further collection of data for comparison between different cultures and airlines. In conclusion The CASS can be successfully applied in the Chinese context, but attention should be paid to further developing measurement equivalence before the Chinese version is widely used.

BACKGROUND

Research interest in "safety culture" was generally believed to have begun with the Chernobyl nuclear disaster in 1986, when both the International Atomic Energy Agency and the Organization for Economic Cooperation and Development cited "poor safety culture" as a contributing factor in the accident (Cox & Flin, 1998; Mearns & Flin, 1999; Pidgeon, 1998). The commercial aviation industry has displayed a strong interest in organizational safety culture, in part precipitated by the role attributed to a lack of corporate safety culture in the crash of Continental Express Flight 2574 in 1991 (NTSB, 1992).

The resulting interest in organizational safety culture has given rise to widespread definitions and measures of the construct. Wiegmann, Zhang, von Thaden, Sharma, & Mitchell (2002) reviewed numerous definitions of safety culture to identify the commonalities among them. They concluded that safety culture can be defined as "the enduring value and priority placed on worker and public safety by everyone in every group at every level of an organization" (p. 9). They noted that safety culture was typically defined as a group-level construct, based on shared values; safety culture was especially related to management and supervisory systems, but everyone in the organization was a part of the culture; safety culture was expected to influence the behavior of members of the organization; perceived contingencies or rewards for safe or unsafe behavior were critical components of safety culture; safety culture and learning culture were closely connected; and safety culture endures and persists over time.

After the definition of safety culture, investigating the construct of safety culture was a precondition to study the effect of safety culture on safety performance. Indeed, numerous organizational indicators that reflect an organizational safety culture have been proposed, with some estimates ranging from as few as two to as many as 19 (Flin et al., 2000). Wiegmann, von Thaden, Mitchell, Sharma, and Zhang, (2002, 2003) reviewed the organizational safety culture literature across a number of industries and originally identified five core indicators of an organization's safety culture to include: organizational commitment; managerial involvement, employee empowerment, accountability, and reporting system. The initial validation of the five indicators found that there were high correlations between two of the five dimensions indicated the subscales might measure the same construct (Wiegmann et al., 2003). After further testing, Gibbons, von Thaden and Wiegmann (2004) validated the correlation structure of the safety survey resulting in an improved version of Commercial Aviation Safety Survey (CASS), which including Formal Safety Program (Reporting Systems, Response and Feedback, Safety Personnel), Informal Aspects of Safety (Accountability, Pilots' Authority, Professionalism), Operations Personnel (Chief Pilots, Dispatchers, Instructors/Trainers), Organizational Commitment (Safety Values, Safety Fundamentals, Beyond Compliance) (Gibbons, von Thaden and Wiegmann, 2005). The reliability and validity of CASS has already been tested at US airlines. Our interest here was to learn if the CASS could be applied in a completely different national culture, such as China.

1.0. Method

1.1. Translation work

The first aim of this study was to develop the Chinese version of the Commercial Aviation Safety Survey (CASS) based on the English version developed by the University of Illinois. To confirm that Chinese version would express precisely the same meaning as the English version, we took two steps to convert and finalize the translation of the Chinese version. The basic procedures were as follows:

Step One: Translation/Back-Translation

1) A bilingual researcher, who is a Chinese-native speaker, who is also familiar with safety culture research, translated the English version of the CASS into Chinese. Two other Chinese researchers reviewed and refined the translation.
2) A third bilingual native Chinese speaker, who had not seen the original English version of the survey, translated the Chinese version (back) into English. After this translation from Chinese into English, another researcher reviewed and refined the English version.
3) Two members of the research group, one native English speaker, and the other native Chinese speaker, compared the original English version of the CASS to the back-translated English version of the CASS (from the Chinese), identifying problem or idiomatic phraseology.
4) The first reviewers refined the Chinese version remedying the problems identified by the procedure in Step 3.

Step Two: Aviation Terminology Transformation

Since some of the key aviation terms in the original study were not the same expressions used by the local Chinese aviation practitioners, we transformed the academic terms in the translated survey to reflect the vernacular used in Chinese aviation. The process included:

1) Ten native Chinese (local to China) pilots filled out the survey critically pointing out terms that they didn't understand very well or didn't recognize as aviation terms.
2) The researcher in charge of the English translation modified the terms identified as ambiguous or non-typical Chinese aviation expressions.
3) Back-translation (into English) of the refined survey revealed the problematic translation issues had been solved, subsequently finalizing the Chinese version of CASS (CASSCN) and completing the conversion.

1.2. Research Process

The research process included three parts: Firstly, translating the CASS into the Chinese version of CASSCN was a critical part of the research. Next, according to the reality that Chinese commercial aviation does not have a formal confidential reporting system (CRS), we added two parts to the survey to determine the pilots' attitude to a possible CRS developed and charged by the airlines they serve, and to a possible CRS developed and charged by a third party (e.g. Civil Aviation Association of China, or Institute of Psychology, Chinese Academy of Sciences). Items contained in the original English version of the CASS relating to a confidential reporting system at the airline were deleted since there is no formal confidential reporting system at the Chinese airlines. We used the items usually tested in the

reporting system category to evaluate the current real reporting system, which is not anonymous and confidential. Lastly, the demographic questions were established according to the Chinese aviation system.

1.3. Procedure

Participation in the survey was voluntary and no monies were paid to participants. Paper surveys were distributed randomly to airline employees who attend a routine administrative meeting (once a week). An envelope that could be sealed was distributed together with the survey. An empty box for collecting the surveys was placed in the lobby of the airline's building. Those who finished the survey could deposit the sealed, anonymous survey into the box. After a period of four weeks, the surveys were collected.

We chose this method to complete the surveys as the Chinese culture responds differently than the US culture. Normally in the US, we distribute a web-based survey. This practice would not work in China as there is no face value placed on a survey distributed without a person attached to it (Hwang, 1987). According to the cultural norms, if a person hands you a paper-based survey, then since you have agreed to take it, you will feel a stronger obligation to fill out and return the survey.

1.4. Sample

A total of 630 surveys were distributed: 430 surveys to employees of Airline A and 200 surveys to employees of Airline B. 190 of the Airline A surveys and 106 of the Airline B surveys were returned, for response rate of 44% and 53% respectively. Some of the surveys returned were unusable (based on the criterion of the amount of unanswered questions), resulting in a valid response rate of 43% and 32% respectively.

At Airline A, the titles of respondents include Trainee (8.6%), Co-pilot (38.4%), Captain (32.4%), Instructor (9.7%), Inspector (1.1%), and Manager not flying (1.1%), with 8.6% (Other) missing information (see Table 1 below).

Age distribution of the respondents was as follows: 20-30 years old (33.5%), 31-40 years (44.3%), 41-50 years (8.6%), 51-60 years (2.7%), 60+ years (.5%), with 10.3% missing information (see Table 2 below).

The distribution of respondents by years serving the current airline was as follows: <1 year (7%), 1-5 years (15.7%), 6-10 years (38.9%), 11-15 years (18.4%), 16-20 years (2.7%), 20+ years (4.9%), with 12.4% missing information (see Table 3 below).

At Airline B, the respondents include Trainee (4.7%), Co-pilot (31.3%), Captain (45.3%), Instructor (12.5%), Inspector (4.7%), and 1.6% (other) missing information (Table 1).

Table 1. Job description of respondents at two Chinese airlines.

Job Description	Airline A	Airline B
Captain	32.4%	45.3%
Co-Pilot	38.4%	31.3%
Trainee	8.6%	4.7%
Instructor	9.7%	12.5%
Inspector	1.1%	4.7%

The age distribution of the respondents was as follows: 20-30 years (35.9%), 31-40 years (53.1%), 41-50 years (7.8%), 51-60 years (3.1%) (Table 2).

Table 2. Age distribution of respondents in Airline A and Airline B.

Age Bracket	Airline A	Airline B
20-30 years	33.5%	35.9%
31-40 years	44.3%	53.1%
41-50 years	7.8%	8.6%
51- 60 years	2.7%	3.1%
60+ years	0.5%	

Years serving the current airline distribution of the respondents was as follows: <1 year (3.1%), 1-5 years (26.6%), 6-10 years (42.2%), 11-15 years (15.6%), 16-20 years (3.1%), 20+ years (9.4%) (Table 3).

Table 3. Distribution of employee's years at airline at two Chinese airlines.

Years at Airline	Airline A	Airline B
<1 year	7%	3.1%
1-5 years	15.7%	26.6%
6-10 years	38.9%	42.2%
11-15 years	18.4%	15.6%
16-20 years	2.7%	3.1%
20+ years	4.9%	9.4%

2.0. Results

2.1. Subscale reliability

The reliability results of the four dimensions are shown in Table 4. The CASSCN displayed suitable reliability results for the four dimensions calculated, measuring above the minimum criteria of 0.70 in all dimensions. However, we still needed to validate the model of safety culture in the Chinese context.

Table 4. Four-dimension reliability scale of CASSCN.

Subscale	# of Items	Airline A ALPHA	Airline B ALPHA
Formal Safety System	10	.84	.74
Informal Aspects of Safety	14	.81	.70
Operational Personnel	8	.84	.84
Organizational Commitment	14	.80	.76

2.2. Factor analysis of CASS

Since the model has already been validated using data from US airlines, we needed to perform a confirmative factor analysis only, which was carried out using Amos 4.0 (Arbuckle & Wothke, 1999). Evaluation of the models was based on the following statistics commonly used in prior research: The Normed Fit Index (NFI), Comparative Fit Index (CFI) and the Tucker-Lewis index (TLI), with values greater than .95 indicating good fit and values less than .95 but greater than .90 indicating adequate fit; the Root Mean Square Error of Approximation (RMSEA) and its 90% Confidence Interval (CI), with values of RMSEA smaller than .05 indicating good fit and values greater than .05 but less than .08 indicating adequate fit. For each model, the chi-square statistic (χ^2) and its degrees of freedom (*df*) were conventionally reported but were not considered for evaluation of individual models, due to its sensitivity to sample size.

According to the criteria above, we tested the subscales using Amos 4.0 first. The corresponding results of the subscale evaluation appear in Table 5. Due to a printing error, two subscales (Response and Feedback, and Chief Pilots) were accidentally missed in the distributed surveys, thus the CFA contains results for only 10 subscales. The results show that only one subscale, Instructors/Trainers, didn't appear to fit the model very well. The item "Instructors/Trainers teach shortcuts and ways to get around safety requirements" had low or negative correlation with the other three questions in the subscale. The test result with the problem item deleted is shown in Table 5.

Table 5. Results of CFA at Airline A.

Subscale	χ^2	P	NFI	TLI	CFI	RMSEA
Reporting system	39.03	.000	.982	.952	.984	.192
Safety Personnel	24.48	.000	.988	.970	.990	.146
Accountability	5.30	.071	.996	.988	.998	.095
Authority	12.59	.028	.993	.987	.996	.068
Professionalism	19.13	.002	.991	.980	.993	.124
Dispatchers	25.40	.000	.983	.923	.985	.252
Instructors	*0*		*1.00*		*1.000*	*1.323*
Safety Values	22.36	.000	.989	.974	.991	.138
Safety Fundamentals	22.01	.009	.991	.979	.993	.136
Beyond Compliance	8.30	.016	.995	.980	.996	.131

The four factor model fit the data from Airline A to some extent: χ^2 (29, N = 185) = 50.23, p=.01, NFI = .99, TLI = .99, CFI = .99, RMSEA = .06. The four factor model without the item in the instructors/ trainers subscale also fit the data: χ^2 (29, N = 185) = 62.55, p=.00, NFI=.99, TLI=.99, CFI = .99, RMSEA = .08. The three factor model without the operation personnel dimension also fit the data: χ^2 (17, N = 185) = 19.75, p=.29, NFI=.99, TLI=.99, CFI = .99, RMSEA = .03. According to the CFA results, the model fit the data adequately, so we can indeed determine that the CASSCN structure is adequately applied in the Chinese context at Airline A.

We attempted a CFA test with data from Airline B, but we can only use the results as a reference due to the small sample size of Airline B. At airline B, the single factor model of the subscales Accountability and Going Beyond Compliance didn't fit the subscale very well.

In the subscale Accountability, the item "When pilots make a mistake or do something wrong, they are dealt with fairly by the airline" has high correlations with other items. The CFA result with the item deleted is shown in Table 6. In the subscale Going Beyond Compliance, the item, "Management goes above and beyond regulatory minimums when it comes to issues of flight safety" has high correlations with other items. The CFA result with the item deleted is shown in table 6.

Table 6. Results of CFA at Airline B.

Subscale	χ^2	P	NFI	TLI	CFI	RMSEA
Reporting System	5.49	.359	.992	.998	.999	.039
Safety Personnel	20.77	.001	.971	.933	.978	.224
Accountability	*0.00*		*1.000*		*1.000*	*.916*
Authority	9.62	.087	.983	.975	.992	.121
Professionalism	5.26	.385	.993	.999	1.000	.029
Dispatchers	4.31	.116	.992	.978	.996	.135
Instructors	3.07	.215	.996	.993	.999	.092
Safety Values	5.86	.320	.993	.997	.999	.052
Safety Fundamentals	43.21	.000	.945	.852	.951	.348
Beyond Compliance	*0.00*		*1.000*		*1.000*	*1.034*

The four factor model fit the data from Airline B to some extent: χ^2 (29, N = 64) = 78.75 p=.000, NFI = .961, TLI = .952, CFI = .975, RMSEA = .165. The four factor model without the subscale Accountability also fit the data: χ^2 (21, N = 64) = 59.00, p=.000, NFI=.968, TLI=.995, CFI = .979, RMSEA = .169. The four factor model without the subscale Going Beyond Compliance also fit the data: χ^2 (21, N = 64) = 39.53, p=.008, NFI=.978, TLI=.977, CFI = .989, RMSEA = .118. According to the CFA results of both Airlines A and B, the model fit the data adequately, so we may indeed say that the CASSCN structure is appropriately applied to the Chinese context. The following data analysis was conducted according to the dimensions and subscales tested.

2.3. Descriptive Results

Performance scores for each airline on each of the four major factors of safety culture (Organizational Commitment, Operational Personnel, Formal Safety System, and Informal Safety System) were determined by calculating the mean of the participants' responses to all relevant items for that factor; that is, the overall mean of all items in all subscales for each factor. Overall scale means for each major factor appear in Figure 1. Responses were given on a seven-point Likert scale, ranging from 1-"strongly disagree," to 7-"strongly agree," with 4 representing "neither agree nor disagree." Negatively worded items (such as "My airline is more concerned with making money than being safe.") were recoded before averaging so that higher scores on all items reflected a positive response. The possible range of values for each scale, then, ranged from 1 (indicating an extremely negative view of the factor) to 7 (indicating an extremely positive view of the factor). A mean score of 4 may reflect either

mixed views (an equal number of positive and negative responses) or neutrality (neither agreeing nor disagreeing with any item).

Overall Scores:

The mean score for both airlines on all four major factors was generally slightly above the neutral point in all scales except for the Informal Safety System. This indicates that respondents in both airlines hold a positive opinion of the airline's safety culture overall in regard to each factor (Figure 1), with the exception of the Informal Safety System. Even so, considerable variability exists within most scales suggesting that not all employees view the airlines' safety culture exactly the same way. While some employees indicate a very positive view of their airline's performance on the various dimensions, other employees indicated a more negative view of some aspects of the existing safety culture. Comparatively, the airlines studied appear to have similar indications of safety culture, with no measurable significant differences.

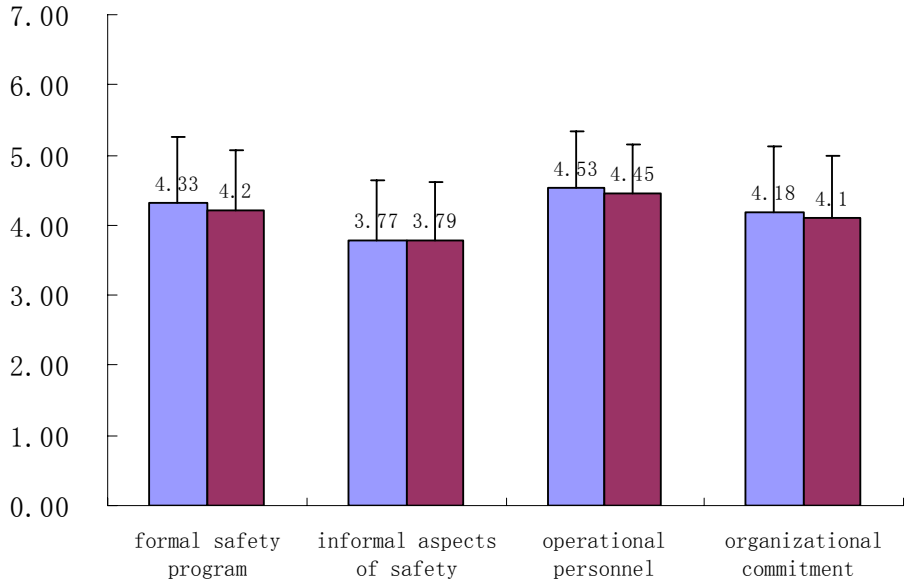

Figure 1. Overall dimension scores for 2 Chinese airlines tested using CASSCN. Airline A= blue (left), Airline B = red (right).

Figure 2 shows the comparative results between Airline A and Airline B for each of the subscales tested. Comparatively the airlines appear to be aligned in regard to their individual safety cultures, with no significant differences in their scores. The subfactor Instructors/Trainers received the highest scale scores at both airlines, while Accountability, Authority, and Dispatch received the lowest scores. .

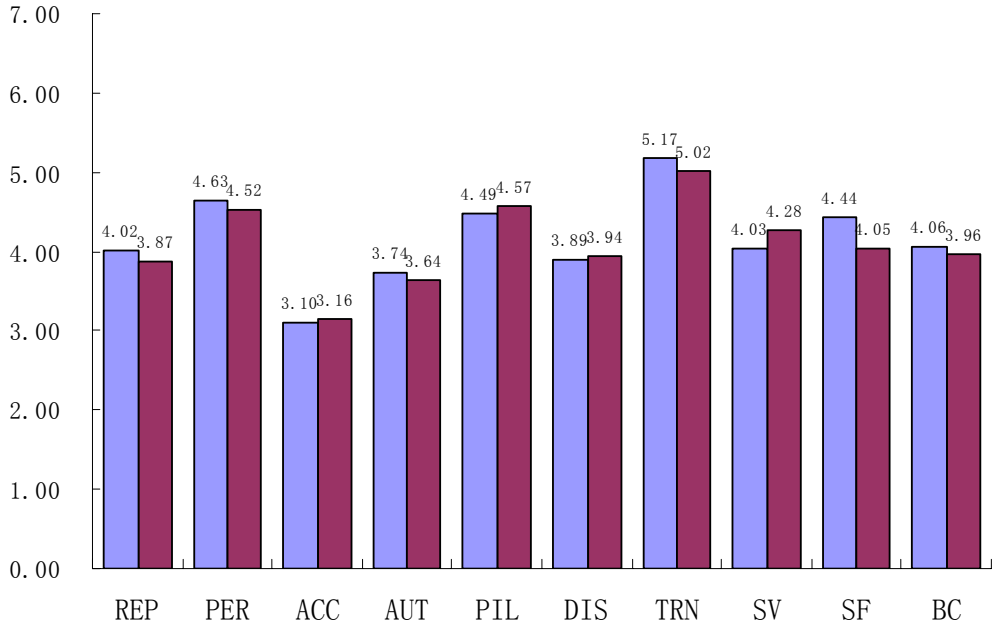

Figure 2. Subscale scores for 2 Chinese airlines tested using CASSCN. Airline A= blue (left), Airline B = red (right).

Formal Safety System

As noted previously, due to a printing error, a page of the survey containing the scales Chief Pilot and Response and Feedback were missing from the surveys. The Response and Feedback scale is part of the Formal Safety System Scale and as a result, only the items Reporting System and Safety Personnel were tested in this category.

Reporting System. The overall mean score for the Reporting System scale was 4.02 at Airline A and 3.87 at Airline B (Figure 3), indicating moderately positive to negative perceptions of the reporting system. Analysis of individual items suggests that the system itself is perceived as problematic (Table 7), and pilots may be reluctant to use it, particularly when the unsafe behavior of others is concerned. Reporting systems will be discussed in depth later in this report.

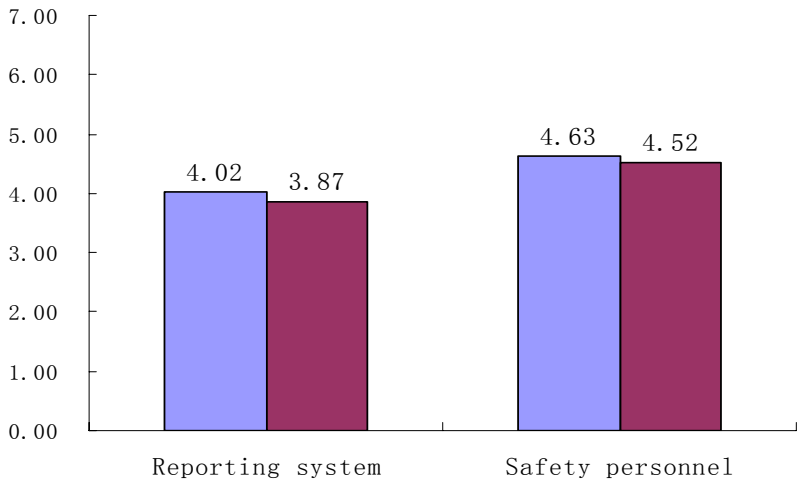

Figure 3. Formal Safety System scores 2 Chinese airlines tested using CASSCN. Airline A= blue (left), Airline B = red (right).

Table 7. Reporting System mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	S.D.	Mean	S.D.
The safety reporting system is convenient and easy to use.	4.18	1.70	3.98	1.54
Pilots can report safety discrepancies without fear of negative repercussions.	3.52	1.87	3.31	1.82
Pilots are willing to report information regarding marginal performance or unsafe actions of other pilots.	3.74	1.61	3.20	1.44
*Pilots don't bother reporting near misses or close calls since these events don't cause real damage.	4.14	1.62	4.50	1.57
Pilots are willing to file reports about unsafe situations, even if the even was caused by their own actions.	4.47	1.74	4.33	1.85

* = item reverse coded, so that higher scores always indicate positive safety culture.

Bloxplot Analysis

A boxplot (also known as a box-and-whisker diagram) is a convenient way of graphically depicting summary information, which consists of the smallest observation, lower quartile (Q1), median, upper quartile (Q3), and largest observation; in addition, a boxplot indicates which observations, if any, are considered unusual, or outliers. Boxplots are able to visually depict different types of populations, without any assumptions of the statistical distribution. The spacing between the different parts of the box helps to indicate variance and skew and to identify outliers. The box itself contains the middle 50% of the data. The upper edge (hinge) of the box indicates the 75th percentile of the data set, and the lower hinge of the box indicates the 25th percentile. The line in the box indicates the median value of the data. If the median line within the

box is not equidistant from the hinges, then the data is skewed. The ends of the vertical lines or "whiskers" indicate the minimum and maximum data values, unless outliers are present in which case the whiskers extend to a maximum of 1.5 times the inter-quartile range. The points outside the ends of the whiskers are outliers or suspected outliers. Due to the limited data from Airline B, the following results are from Airline A only. Figure 4 shows the boxplot distribution of the data for the Formal Safety System at Airline A.

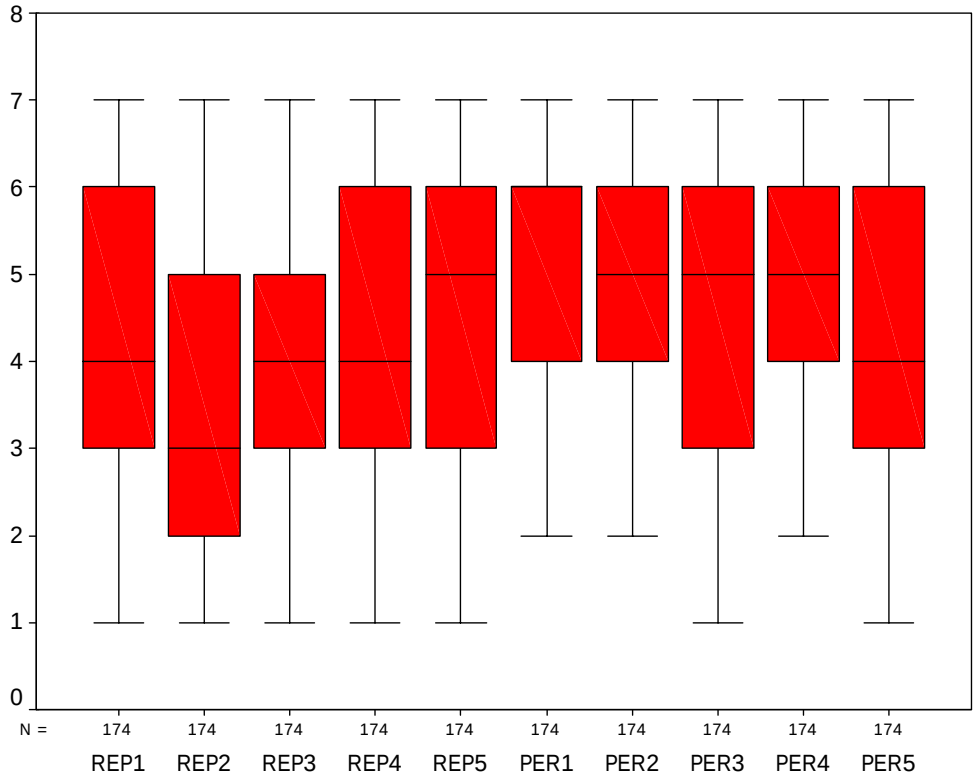

Figure 4. Boxplot for the Formal Safety System at Airline A.

Each scale contained a blank area at the end for the respondents to express their comments.

At airline A, five respondents made comments on the Reporting System:

- Good.
- There is no healthy safety culture, so it's hard to say safety management, and those reporting system like fake, which don't make any real sense.
- Don't know too much of the reporting system.
- The reporting system could reflect the real reason of the accident.
- The current reporting system hasn't standard procedure, and the dealing to the accident is too severe, leading to a very deep negative effect.

At airline B, five respondents made extra comments on the Reporting System:

- Not adequate, lack of staff and institute.
- To the information possibly affecting myself, I will report half.
- The pilots will be in fear of the negative repercussion due to the historical experience.
- Safety is the most emphasized issue, and I'm satisfied with the reporting system.
- The reporting doesn't play the role that it should play.

Safety Personnel. Safety Personnel received relatively high scale scores at each airline (Airline A = 4.63, Airline B = 4.52). Table 8 shows the individual item scores. Safety personnel are viewed as serious about safety and appear to be respected within the airline, though consistency may be questionable at Airline B.

Table 8. Safety Personnel mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
Personnel responsible for safety hold a high status in the airline.	4.89	1.62	5.23	1.27
Personnel responsible for safety have the power to make changes.	4.83	1.56	4.89	1.46
Personnel responsible for safety have a clear understanding of the risks involved in flying the line.	4.51	1.73	4.52	1.74
*Safety personnel have little or no authority compared to operations personnel.	4.80	1.48	4.64	1.94
Safety personnel demonstrate a consistent commitment to safety.	4.11	1.86	3.33	1.91

* = item reverse coded, so that higher scores always indicate positive safety culture.

At Airline A, 9 respondents made comments regarding Safety Personnel:

- Safety personnel should fulfill their tasks seriously and completely.
- Safety personnel should be familiar with professional techniques, knowing safety code very well, having the good personality, while the supervisors were nominated by the leader, and what they concern are their official career.
- The change of procedure should be finished by expert as it's very serious.
- It's difficult to evaluate some of the safety personnel although the survey is confidential.
- It's easy to escape the responsibility which should be taken as employees' income and the responsibility they should take is not equivalent.
- Everything should not be stopped at the surface, while some don't know even a few questions. They lack safety knowledge themselves.
- They consider the safety issues only focusing on the different effects, ignoring the feeling of participant himself.
- Couldn't treat the safety issues without discrimination when dealing with safety incident.
- They key is doing the real work rather than flubdub.

At airline B, there are only four extra comments, which are as follows:

- Need understand the relative regulation and execute it well, which could help to set a good compliance atmosphere.
- If the safety personnel could be a professional instead of an administrative staff, it will be helpful to safety.
- The safety personnel are doing well but the airline doesn't emphasize this part.

Informal Safety System

The Informal Safety System contains items categorized into the three subfactors of Accountability, Authority, and Professionalism. Mean scores for individual items are presented and respondents' comments are summarized.

Figure 4 demonstrates that Accountability received the lowest score at both airlines (3.10 Airline A, 3.16 Airline B) of the Informal Safety System scales and the lowest score of all subscales in the survey. Pilot's Authority received a similarly low score in the Informal Safety System scale, and the second lowest score of all subscales in the survey (3.74 Airline A, 3.64 Airline B). Pilot's Professionalism received adequate positive scale scores (4.49 Airline A, 4.57 Airline B).

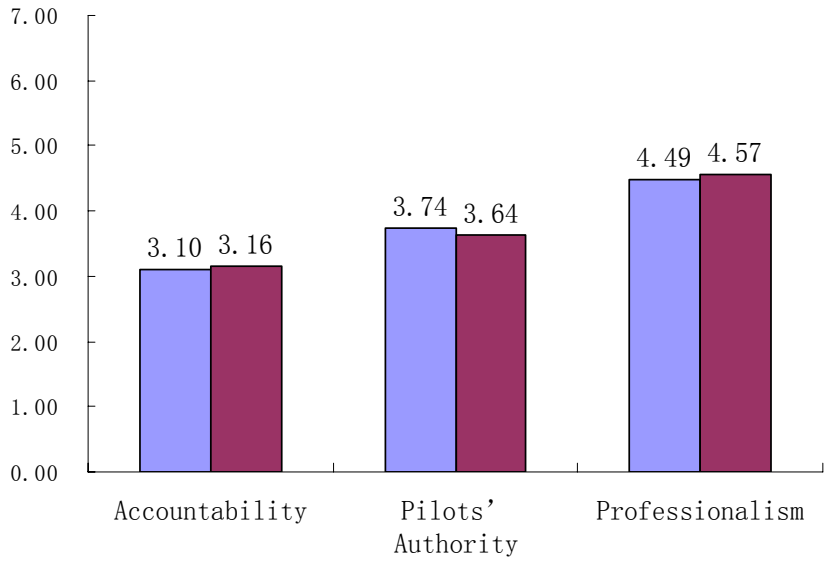

Figure 5. Informal Aspects of Safety scores for 2 Chinese airlines. Airline A= blue (left), Airline B = red (right).

Figure 6 shows a breakdown of the distribution of responses to the Informal Aspects of Safety scale at Airline A.

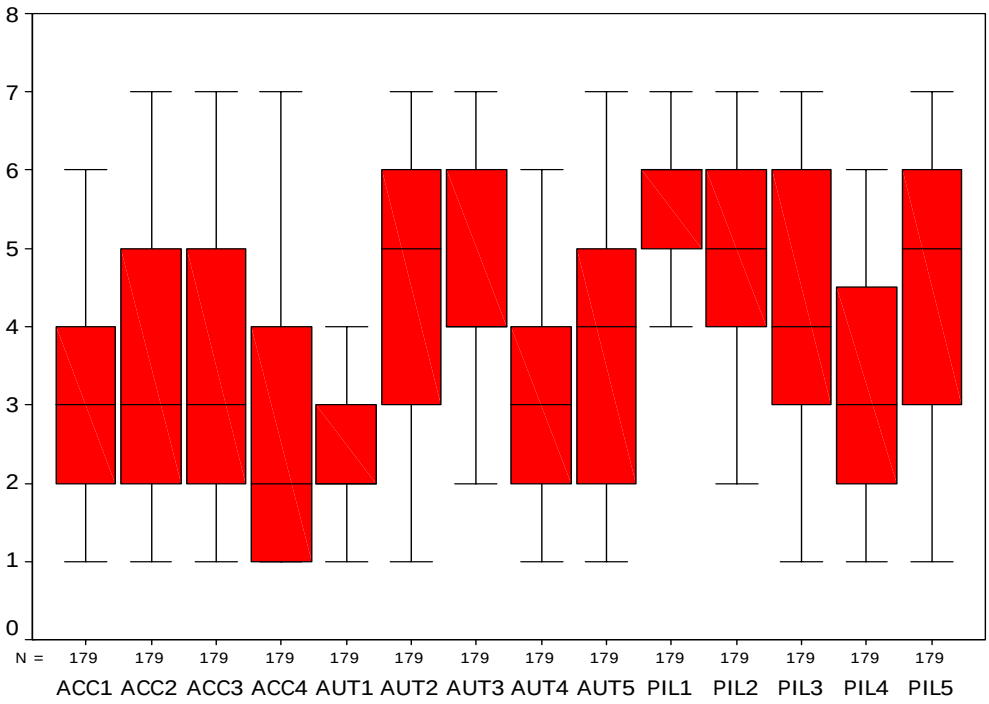

Figure 6. Boxplot for the Informal Aspects of Safety at Airline A.

Accountability. Table 9 shows the mean scores for each item in the Accountability scale. It appears pilots in both airlines perceive favoritism and inconsistent standards, along with the perception that they are first to be blamed when there is an accident or incident.

Table 9. Accountability mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
*Airline management shows favoritism to certain pilots.	2.92	1.43	3.22	1.75
Standards of accountability are consistently applied to all pilots in this organization.	3.46	1.81	3.25	1.91
When pilots make a mistake or do something wrong, they are dealt with fairly by the airline.	3.33	1.81	3.06	1.82
*When an accident or incident happens, management always blames the pilot.	2.71	1.77	2.75	1.57

* = item reverse coded, so that higher scores always indicate positive safety culture.

Respondent comments for the Accountability items included, Airline A:

- The management should create good objective environment when they emphasize the flight personnel.
- Professional, technique, safety…accident---responsibility will be different because of different person, which seems like a joke, but the reality is after accidents, some

participants could be promoted to a leader, some would be under the shade of accident their whole life.
- Everything is not by chance; there must some reasons for pilots to have made mistakes.
- Which model the flight manager flies determines the different dealing result with the same accidents at different model of airplane (e.g. The same burnt point, in A model was attributed to be accident by chance, in model B was attributed to thunder strike which belonging to mistake just because the leader flies model A).
- There is no clear responsibility. The right of captain is weakened, which makes accident analysis unclear.
- Actually, the captain has no right to determine something.

At Airline B, there were only three extra comments, which were as follows:

- The standard of responsibility should be consistent.
- The airlines always try to attribute the problems to pilots.
- The management should be responsible the majority of safety issues while the exception also exists.

Pilot's Authority. Pilots' Authority received the second lowest score of all subfactors at each airline. Table 10 shows the mean scores for each item in the Pilot's Authority scale. Pilots feel they have no authority to make critical safety decisions regarding their flights, or airline procedures. Although it appears they are trusted to assess their own fitness to fly.

Table 10. Pilots' Authority mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
*Pilots are seldom asked for input when airline procedures are developed or changed.	2.85	1.61	2.54	1.60
Pilots are actively involved in identifying and resolving safety concerns.	4.36	1.67	4.00	1.57
*Pilots who call in sick or fatigued are scrutinized by the chief pilot or other management personnel.	4.46	1.50	4.48	1.61
*Pilots have little real authority to make decisions that affect the safety of normal flight operations.	3.17	1.73	3.51	1.71
Management rarely questions a pilot's decision to delay a flight for a safety issue.	3.80	1.78	3.68	1.85

* = item reverse coded, so that higher scores always indicate positive safety culture.

Comments regarding Pilots' Authority are as follows. At Airline A, there were 8 comments:

- Our pilots (referring to the general captain without administrative job) haven't any authority. Please investigate how many pilots have administrative jobs, which is too abnormal.
- I heard that the high authority rests with the captain when I started to learn flying, but what is the fact?
- Compared to the determination of AOC, pilots have not any authority.

- Pilots are only executor and being inspected.
- Couldn't treat the accident itself very well, weakening the voice from the basic level.
- The determination of pilots is generally from AOC, which is not good to the flight.
- Safety is the life of pilot, the chance of living, so emphasize it of course.

At Airline B, only two extra comments:

- Must respect the pilots, as the most accidents have reason, and the safety couldn't be guaranteed except that every one cares about it.
- Airline may ignore some of the safety requirements because of pursuing performance.

Professionalism. The Professionalism scale received a moderately positive score (Airline A = 4.49, Airline B = 4.57). Table 11 contains the means scores for items in the Professionalism scale. Consistent with most pilots in the industry, the Chinese pilots appear to view safety as a matter of personal and professional pride. However, personal commitment to safety does not always override pressure from other sources, such as operations management or more senior pilots (which may be influenced by the Chinese cultural phenomenon).

Table 11. Professionalism mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
Pilots view the airline's safety record as their own and take pride in it.	5.40	1.45	5.05	1.35
Pilots who don't fly safely quickly develop a negative reputation among other pilots.	4.75	1.47	4.97	1.25
Pilots with less seniority are willing to speak up regarding flight safety issues.	4.09	1.74	4.61	1.28
*Decisions made by senior pilots are difficult to challenge.	3.32	1.47	3.29	1.29
Pilots never cut corners or compromise safety regardless of the operational pressures to do so.	4.90	1.63	4.94	1.63

* = item reverse coded, so that higher scores always indicate positive safety culture.

There were no extra comments from respondents at either airline regarding Professionalism.

Operational Personnel

The Operational Personnel factor contains items in the four subfactors of Chief Pilots, Dispatch, Ground Handling, and Instructors/Trainers. Mean scores for individual items are presented, and respondents' comments are summarized. Figure 5 represents the scores on the Operational Personnel scale. As noted earlier, due to a printing error, the Chief Pilot subfactor is missing from this data set.

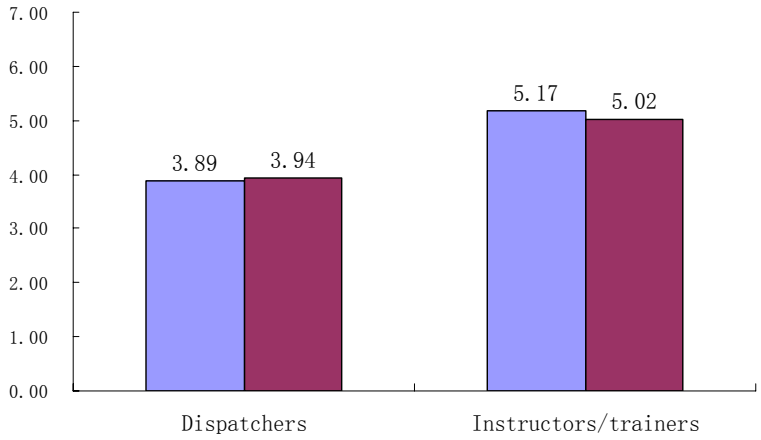

Figure 7. Operational Personnel scores for 2 Chinese airlines.
Airline A= blue (left), Airline B = red (right).

Figure 8 shows a breakdown of the distribution of responses to the Operational Personnel scale at Airline A.

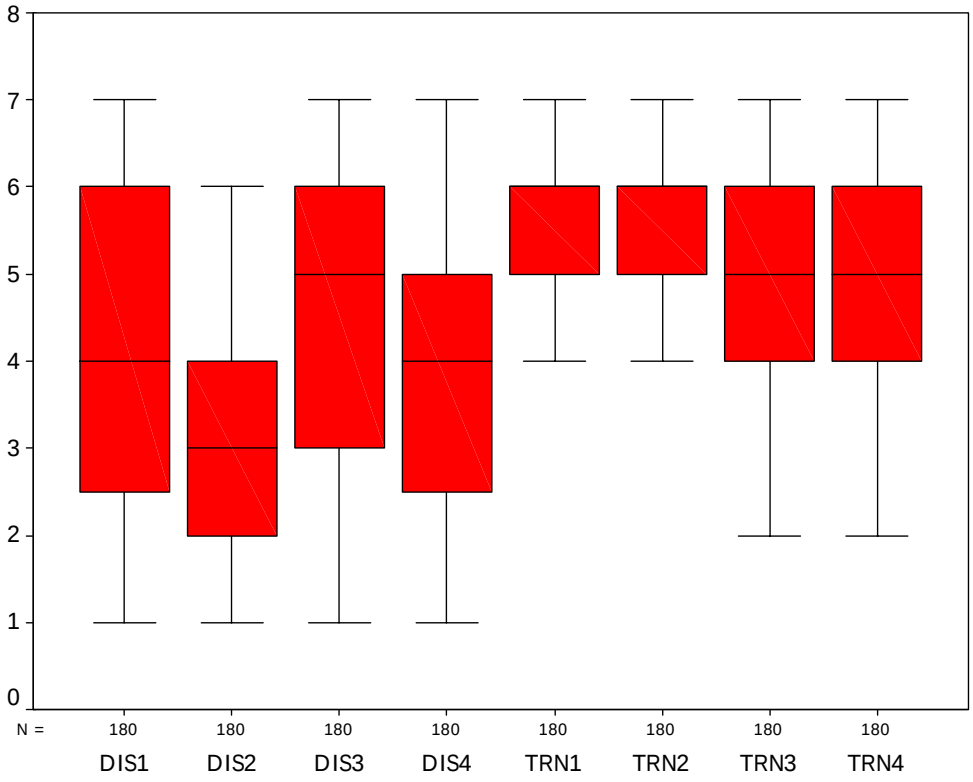

Figure 8. Boxplot for Operational Personnel at Airline A.

Dispatch. The Dispatch scale received low scores, just below the neutral point (Airline A = 3.89, Airline B= 3.94). Negative responses illustrate concerns among the pilots that dispatch does not appropriately use the MEL and that dispatch prioritizes the schedule over safety. Table 12 contains the breakdown of the subscale scores per their corresponding item.

Table 12. Dispatch mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
Dispatch consistently emphasizes information or details (e.g., weather requirements, NOTAMs) that affect flight safety.	4.04	1.72	4.22	1.61
*Dispatch inappropriately uses the MEL (e.g., use when it would be better to fix equipment).	3.39	1.53	3.49	1.61
Dispatch is responsive to pilots' concerns about safety.	4.30	1.57	4.30	1.63
*Dispatch would rather take a chance with safety than cancel a flight.	3.83	1.67	3.73	1.58

- * = item reverse coded, so that higher scores always indicate positive safety culture.

Respondent comments for the Dispatch items included, Airline A (7 comments):

- Dispatchers should improve their professional skill and coordination with flight crews.
- The on-time flight is judged as part of the leaders' performance, so they seek, to the best of their abilities, to preserve this schedule. Although this kind of phenomena doesn't happen everyday, it's the general situation.
- Some problems are not dealt with very well due to dispatchers' low sense of responsibility, or weak professional skill, or lack of the right to deal with problems.
- Not only dispatch, too many departments try to eliminate their responsibility for abnormal (accident) flights. (Not all departments, not all accidents.)
- Lack real experience in regard to flight; some even don't understand it at all. The pilots need to declare safety issues, such as overtime flight and technical failures, themselves, or dispatch will not be concerned or will not ask at all.
- Most of the time, dispatch can not cope with an abnormal situation or accident very well.
- Lack of professional skill and some even violate regulations, such as below-standard weather conditions, asking the pilots to try to land.

At Airline B, only 3 extra comments were received regarding dispatchers:

- The job dispatchers are performing now is different from the dispatch profession.
- It's difficult for the dispatchers to arrange a flight completely due to the airline's pursuit of schedule performance.
- The professionalism of dispatchers are good, but is limited by their leaders.

Instructors/Trainers. Instructors/Trainers received the highest score (Airline A = 5.17, Airline B = 5.02) among the Operations Personnel scales and the second highest score of all

scales in the survey. Table 13 shows the breakdown of each item in the subscale. Instructors' commitment to safety is very highly regarded, though there is possible room for improvement in the applicable knowledge of the instructors.

Table13. Instructors/Trainers mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	S.D.	Mean	S.D.
Instructors/trainers have a clear understanding of risks associated with flight operations.	5.51	1.04	5.49	0.98
Safety is consistently emphasized during training at my airline.	5.60	0.97	5.44	1.04
*Instructors/trainers teach shortcuts and ways to get around safety requirements.	4.60	1.49	4.32	1.64
Instructors/trainers prepare pilots for various safety situations, even uncommon or unlikely ones.	4.98	1.29	4.84	1.27

* = item reverse coded, so that higher scores always indicate positive safety culture.

At Airline A, there were 7 extra comments regarding Instructors/Trainers:

- The selection of instructors have severe problems. I'm worried that our working team could be developed healthily, rather than the lack of instructors, as the strong "GUAN XI" is important to be an instructor/pilot.
- Some instructors can not execute SOP strictly, which could mislead and harm the young pilots.
- Basically, they do their duty.
- Absolute professional instructors, working hard and consistently, to insure safety.
- Instructors have relatively high theoretical knowledge and flight experience to keep the flight normally.
- Some instructors' competence is just so so.
- Simulation tests are creating difficulty to pilots.

At Airline B, there were 2 extra comments regarding Instructors/Trainers:

- Lack of training time.
- The competence of the instructors determines the teaching competence of the instructors, so they need to be trained too.

Organizational Commitment

The following section breaks down the Organizational Commitment items into the three subfactors of Safety Values, Safety Fundamentals, and Going Beyond Compliance. Mean scores for individual items are also presented and respondents' comments are summarized. Table 6 illustrates the scale scores for the Organizational Commitment subfactor.

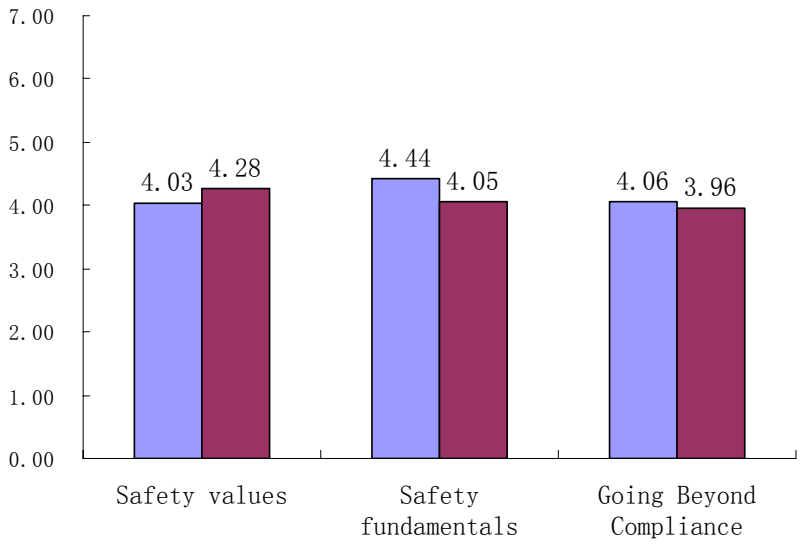

Figure 9. Organizational Commitment scores for 2 Chinese airlines. Airline A= blue (left), Airline B = red (right).

Figure 10 shows a breakdown of the distribution of responses to the Organizational Commitment scale at Airline A.

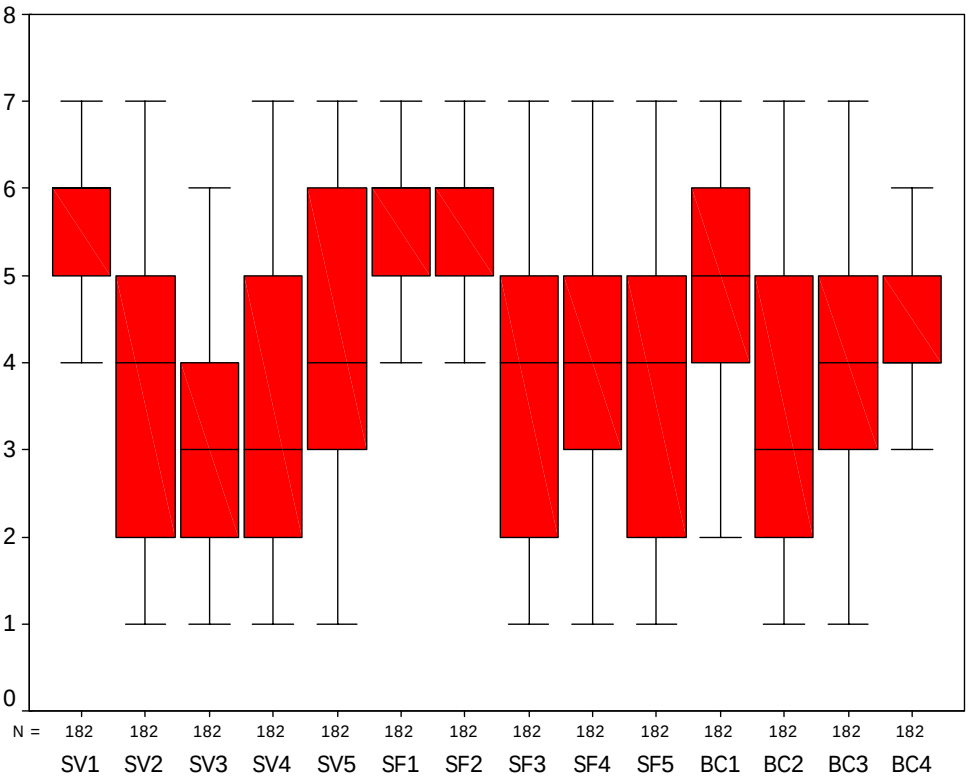

Figure 10. Boxplot for Organizational Commitment at Airline A.

Safety Values. The Safety Values scale received moderately positive scores (Airline A = 4.03, Airline B =4.28). Most participants gave strong positive to safety as a core value at their respective airlines. However, pilots perceive that airline management places their greatest emphasis on scheduling and making money. Table 14 contains the scores for each item in the Safety Values subfactor scale.

Table 14. Safety Values mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
Safety is a core value in my airline.	5.39	1.45	5.48	1.18
*Management is more concerned with making money than being safe.	3.84	1.74	4.24	1.69
*Management expects pilots to push for on time performance, even if it means compromising safety.	3.24	1.70	3.65	1.46
*Management doesn't show much concern for safety until there is an accident or incident.	3.41	1.81	3.62	1.94
Management does not cut corners where safety is concerned.	4.25	1.58	4.41	1.51

* = item reverse coded, so that higher scores always indicate positive safety culture.

At Airline A, there were 5 extra comments on management Safety Values:

- Management continues to insist on the first place of safety.
- The management hasn't good virtue; they emphasize the money instead of safety.
- The opinion and training mechanism will lead to a vicious circle, which are the debt owed, so I agree that "management does not show much concern for safety until there is an accident or incident."
- Managers will emphasize more much on safety instead of making money, but their concern is making money much more so than safety.
- Safety issues are not taken as management issues at all.
- Management is overstaffed but they still can't finish work efficiently.

At Airline B, there were 2 extra comments regarding Safety Values:

- The details in safety management and process management need to be executed and improved.
- Managers seldom know the real flight.

Safety Fundamentals. The Safety Fundamentals scale also a marginally positive scale score (Airline A = 4.44, Airline B = 4.05). Items in this scale deal with the airline's willingness to invest resources in keeping aircraft, equipment, procedures, and other critical items up-to-date and in good condition. There is some disparity between the airlines measured, but generally pilots perceive the airline positively in this regard, although there appears to be room to improve maintenance and safety at both airlines. Table 15 contains the scores for each item in the Safety Fundamentals subfactor scale.

Table 15. Safety Fundamentals mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	**S.D.**	**Mean**	**S.D.**
Checklists and procedures are easy to understand.	5.46	0.98	4.47	1.81
My airline's manuals are carefully kept up to date.	4.94	1.55	4.27	1.68
My airline is willing to invest money and effort to improve safety.	3.83	1.63	3.73	1.35
My airline is committed to equipping aircraft with up-to-date technology.	4.08	1.65	3.77	1.33
My airline ensures that maintenance on aircraft is adequately performed and that aircraft are safe to operate.	3.87	1.80	4.00	1.80

At Airline A, there were 8 extra comments regarding Safety Fundaments:

- Good.
- In the high tech age, all the airplanes are advanced, so the key is how to make good use of human resources, salary system and safety culture, etc.
- In the operations manual, the same pages could include all airplane models, which is not convenient to use.
- Some aspects are not so good.
- The extreme unfairness in the salary structure leads many maintenance technicians to quit. There are only a few people working in the front line, and the work is very hard, so the lack of personnel results in the necessity for flights to depart according to the MEL.
- We should emphasize the maintenance to the airline completely, which is a severe problem.
- The advanced airplanes and the behindhand maintenance are clear contrast.
- The failures are kept, and the maintenance is behind.

At Airline B, there were 2 extra comments on safety fundamentals:

- Not satisfied with the updating of materials and the training.
- The redundant materials are not adequate.

Going Beyond Compliance. The Going Beyond Compliance scale received a slightly positive to negative overall score (Airline A = 4.06, Airline B = 3.96). In general, the pilots perceive airline leadership as following the spirit as well as the letter of safety regulations. However, a critical exception to this pattern appears in the area of scheduling. The negative mean score at both airlines for this item (Airline A = 3.30, Airline B = 2.74) suggests that this is an area of significant concern. Table 16 contains the breakdown of the respondents' Going Beyond Compliance scale scores.

Table 16. Beyond Compliance mean scores for Airline A and Airline B.

Item	Airline A		Airline B	
	Mean	S.D.	Mean	S.D.
Management goes above and beyond regulatory minimums when it comes to issues of flight safety.	4.63	1.45	4.75	1.61
*Management schedules pilots as much as legally possible, with little concern for pilots' sleep schedule or fatigue.	3.30	1.71	2.56	1.37
*Management tries to get around safety requirements whenever they get a chance.	3.95	1.53	4.06	1.37
Management views regulation violations very seriously, even when they don't result in any serious damage.	4.36	1.35	4.49	1.47

* = item reverse coded, so that higher scores always indicate positive safety culture.

At Airline A, there were 3 extra comments regarding Going Beyond Compliance:

- Management is strict regarding the work of pilots, should care more about the life of pilots.
- If accident doesn't happen, everything is ok, but if accident happens, the regulation that the participant should be responsible to the accident will be changed to if the participant could have strong "GUANXI" to help him to escape from the responsibility of the accident he should take.
- To some extend, the requirement to the pilots is higher than standard

There were no comments at Airline B.

3.0. Comparison analysis (Airline A) of Reporting Systems (RS)

Dissimilar to US civil aviation, China airlines only have a non-confidential Reporting System (RS), though currently the Chinese Civil Aviation Safety Research Institute and the Safety Office of the Regulatory Commission (CAAC) are attempting to set up a local Confidential Reporting System (CRS) like that of the US' Aviation Safety Reporting System (ASRS). Given that China has no CRS we were interested to learn if it is possible and acceptable to the potential users of the system to develop a CRS in China, and which party could possibly run a successful CRS. Based on these considerations, we added two parts to the items in the Reporting System section, in addition to the items already contained in the CASS. In the following results, RS1 refers to the airline's current reporting systems, RS2 refers to a possible CRS which would be controlled by the airline the pilots' serve, and RS3 refers to a CRS controlled by a third party. Results illustrate that pilots' attitude to RS1 were significantly lower than the other two reporting system options (Table 17). With RS2, Captains showed more reservation using the system than Co-pilots; with RS3, Captains and Co-pilots alike were in agreement that they would report information regarding their own performance and that of other pilots.

Table 17. Comparison mean results of different Reporting Systems at Airline A* (N=171).

Reporting System	M.	S.D.
RS1	3.97	1.10
RS2	4.38	1.05
RS3	4.51	1.02

*RS1 refers to the airline's current reporting systems.
RS2 refers to a possible CRS controlled by the pilot's airline.
RS3 refers to a CRS controlled by a third party.

The repeated one-factorial F test showed that $F(2,342) = 23.48$, $p<.001$, revealing significant difference among pilots' perception of the different reporting systems. Post-Hoc tests demonstrated that the pilots' perception of the CRS was directly associated with whomever was in charge of the system. (Table 18).

Table 18. Post - Hoc comparison among different suggested reporting systems Airline A (N=171).

Reporting System**		M.	S.E.
RS1	RS2	-0.40*	0.07
RS1	RS3	-0.51*	0.09
RS2	RS3	-0.11	0.08

*The mean difference is significant at the .05 level.
**RS1 refers to the airline's current reporting systems.
RS2 refers to a possible CRS controlled by the pilot's airline.
RS3 refers to a CRS controlled by a third party.

Comparison between the attitude to report self-information and others' information

Two items in the survey expressed the extent to which pilots would most likely report their own information (mistakes) and others' information. The results of the three Reporting System choices are shown in Table 19.

Table 19. Comparison between the attitude to report self and others' information at Airline A (N=168).

Reporting System*	Item	M.	S.D
RS1	Reporting others	3.74	1.61
	Reporting Self	4.47	1.74
RS2	Reporting others	4.18	1.59
	Reporting Self	4.73	1.61
RS3	Reporting others	4.60	1.49
	Reporting Self	4.68	1.58

*RS1 refers to the airline's current reporting systems.
RS2 refers to a possible CRS controlled by the pilot's airline.
RS3 refers to a CRS controlled by a third party.

Two-factors in the repeated F test showed significance. Factor 1 related to the different reporting system: RS1, RS2, and RS3; and Factor 2 related to the perception of reporting

information on self vs. others. The main effect of Factor1 revealed significance, $F(2,342) = 12.90$, $P<.001$; the main effect of Factor 2 also revealed significance, $F(1,171) = 25.06$, $p<.001$; with the interaction effect revealing significance, $F(2,342) = 12.74$, $P<.001$. The simple effect showed that with RS1, the pilots' interest in reporting others is significantly lower than self-reporting, $F(1,171) = 31.80$, $P<.001$. With RS2, pilots' indicating they would report others, is significantly lower than self-reporting, $F(1,171) = 18.81$, $P<.001$. There was no significant difference in the pilots' will to report others and self with RS3, $F(1,171) = 0.46$, $P= 0.501$.

Comparison among different Positions

We compared the results to identify any significant difference between Co-pilots (n=71) and Captains (n=60) at Airline A. The results are shown in Table 20. The two-factor mixed F test showed significant main effects for job title, $F(1,122) = 6.73$, $p= 0.01$. The interactive effect between the two factors was marginally significant, $F(2, 244) = 2.78$, $p= 0.06$. Simple effect analysis demonstrated that with RS1, the Co-pilots' evaluation was significantly more positive than the Captains' evaluation, $F(1,122) = 6.38$, $p= 0.01$. With RS2, the Co-pilots' attitude was also significantly more positive than the Captains' attitude, $F(1,122) = 7.99$, $p= 0.05$. With RS3, there were no significant differences between the Co-pilots and the Captains, $F(1,122) = 0.50$, $p= 0.483$.

Table 20. Difference between Co-pilot and Captain at Airline A.

Reporting system	Title	M.	S.D.
RS1	Co-pilot	4.16	1.02
	Captain	3.61	1.06
RS2	Co-pilot	4.54	0.93
	Captain	4.01	1.11
RS3	Co-pilot	4.58	0.84
	Captain	4.39	1.04

*RS1 refers to the airline's current reporting systems.
RS2 refers to a possible CRS controlled by the pilot's airline.
RS3 refers to a CRS controlled by a third party.

We also tested the possible difference among the pilots' of different age brackets attitude to the different reporting systems; specifically the attitude of those who have reported unsafe information and those who have not had this experience. There were no significant differences in regard to the reporting systems items revealed among the pilots according to age or history with reporting.

3.1. Comparison analysis (Airline A) in different dimensions

The Co-pilots' attitude to all items were more positive than the attitudes of the Captains in absolute value. The results indicate that, statistically, the Co-pilots' have a more positive attitude than the Captains in some dimensions. The one-way ANOVA analysis demonstrated that the age and reporting history had no effect on the attitude of any scale.

Table21. F test between different job positions at Airline A (major factor scales).

		Sum of Squares	df	Mean Square	F	Sig.
Formal Safety System	Between Groups	5.670	1	5.670	8.134	.005
	Within Groups	85.049	122	.697		
	Total	90.720	123			
Informal Safety System	Between Groups	4.391	1	4.391	5.791	.018
	Within Groups	94.778	125	.758		
	Total	99.169	126			
Operational Personnel	Between Groups	3.619	1	3.619	5.916	.016
	Within Groups	77.699	127	.612		
	Total	81.318	128			
Organizational Commitment	Between Groups	1.774	1	1.774	2.084	.151
	Within Groups	108.109	127	.851		
	Total	109.883	128			

Table 22. F test between the different job positions at Airline A (subfactor scales).

		Sum of Squares	df	Mean Square	F	Sig.
Reporting System	Between Groups	7.112	1	7.112	6.467	.012
	Within Groups	138.573	126	1.100		
	Total	145.685	127			
Accountability	Between Groups	7.123	1	7.123	3.875	.051
	Within Groups	233.407	127	1.838		
	Total	240.530	128			
Authority	Between Groups	2.985	1	2.985	2.790	.097
	Within Groups	134.810	126	1.070		
	Total	137.795	127			
Professionalism	Between Groups	4.001	1	4.001	4.736	.031
	Within Groups	108.122	128	.845		
	Total	112.123	129			
Instructors/ Trainers	Between Groups	5.150	1	5.150	8.709	.004
	Within Groups	75.103	127	.591		
	Total	80.254	128			

4.0. Discussion

4.1. Validation of the CASS in the Chinese Context

The CFA demonstrated that most of the subscale indicators adequately fit the data, revealing that the CASS model could be applied in the Chinese context; however there are still some aspects in need of refinement. One subfactor, relating to Instructors/Trainers didn't appear fit the data well at Airline A, whereas Accountability and Going Beyond Compliance did not appear to fit the data well at Airline B. Due to the fact that the sample size was relatively small at Airline B, the CFA results could only be used as a reference. The CFA

results at Airline A were relatively better, especially in the four-model test. Another aspect in need of attention and further exploration is the measurement equivalence across cultures (Drasgow & Kanfer, 1985). The CASS model was developed and validated according to US cultural norms, so care should be exercised in regard to its application to another culture before the measurement equivalence can be tested. This is the next step for us.

4.2. Basic Results

Generally, the scores of the two Chinese airlines were moderate to low. The pilots evaluated their own Professionalism and their Instructor/Trainers highly. Scores relating to Safety Fundamentals and Safety Personnel were also above neutral. Pilots evaluated Management (Accountability, Safety Values, and Going Beyond Compliance) and Operational Personnel (Dispatchers), as well as the participation of pilots regarding safety issues (Reporting System and Authority) relatively low.

Chinese civil aviation has rapidly developed in recent years, and has experienced typical representations of Chinese Reformation, changing from a central economy to a market orientation in the past 20 years[1] (Egri, Kaicheng, Ralston, Stewart, & Terpstra, 1999). Communist Party control, in effect since the 1940s, has gradually ceded as reform has taken effect (Laaksonen, 1988; Warner, 1992; Child, 1994; Child & Tse, 2001). Under the Communist system, the importance is on the value of the relationship, emphasizing cooperation (Laaksonen, 1988). Powerful obligatory norms of reciprocity (*bao*) and hierarchically structured social relationships (*guanxi*) have been embedded into the Communist system of management (Hwang, 1987; Warner, 1992; Warner, 1995). Under the Communist system, management held the key position in the superior-subordinate relationship keeping a great divide between the superior's knowledge and the knowledge deficiencies and high illiteracy among the workforce, thus resulting in the workforce's reliance upon personal relationships (nepotism and *guanxi*) (Warner, 1992; Warner, 1995).

Under the Communist system, Chairman Mao's mission was to feed and shelter the people and stabilize the society, while business success was secondary. Personnel management (*renshi guanli*) simply processed paperwork rather than purposefully situate people, which made it hard for companies to find suitable managerial candidates after the Chinese Civil War. According to Laaksonen (1988), Communists employed former business managers, Communist Party members, university graduates, and members of the People's Liberation Army (PLA). According to Yan and Warner (2001) former business managers may have been competent but might not have shared the socialist ideology making them incongruous candidates. Communist Party members, while ideologically compatible, were more often than not, inexperienced managerially, yet became the first generation of managers, receiving minimal training. The proportion of university-educated people in China has been historically low and their philosophy is not considered in concert with Communist Party ideology. The PLA, was considered competent and ideologically compatible given their military experience and their decision-making skills under various stressful situations. Therefore, many Army officers received management positions.

Cultural practices, such as *bao* and *guanxi*, have been monopolized by powerful leaders in Communist China before the Reform (Hwang, 1987). Yet even with the reform, some patterns remain regardless of political or economic pressure to change (Luo & Chen, 1996).

[1] http://finance.sina.com.cn/g/20021012/0844265300.html

Historically in China, employment has been a cradle-to-grave system (Warner, 1995). Once given a job, the person may hold this position for life. Each employee has a personal file (*dangan*) kept in his home office (*danwei*) which is controlled by the manager. Managers could keep a person's *dangan* under lock-and-key to keep them from moving. Likewise, this lack of movement in the workforce, kept suitable, perhaps better-educated candidates, from the ability to join the job market (Luo & Chen, 1996).

The State-owned companies began reformation at the beginning of the 21st century. During this time, the three large airlines merged with some of the local airlines. Privately owned airlines have been permitted to arrange operations in the past few years, and foreign-investment airlines will enter China in the near future. The macro- and micro-environment has been turbulent, to say the least, at the Chinese airlines, especially the traditional State-owned airlines. Due to the above, for a period of time during the cultural Reform in China, there was high punishment and an authority system wherein decisions were slow-moving (Wall, 1990; Warner, 1992; 1995). In the course of the Reform, performance shifted to dependence on factors like individual personalities, administrative style and management philosophy.

The public media frequently features news stories about the conflict between pilots and management, between passengers and airlines, and the competition among older airlines and newer start-up airlines for pricing and recruits (the start-up airlines frequently headhunt from the older airlines), et al[2]. These major change upheavals increase the potential risks to flight safety. On the one hand, management at most Chinese airlines understands that training programs offered in China are not as high-quality as programs offered elsewhere, so Chinese pilots are sent outside the country to receive their advanced technical training or recurrent training from all over the globe. While management takes positive steps to correct one weakness, on the other hand, they still must contend with the relatively slow changes in organizational cultural morals and the supporting systems in the "real" world Chinese aviation system. This may lead to an imbalance in their personal consciousness. According to Egri, Kaicheng, Ralston, Stewart & Terpstra (1999), the new generation of Chinese managers (ages between 41-51 years), while demonstrating a shift in work values, still holds traditional Confucian values, yet they appear to be more westernized than their older generation counterparts (managers of ages 52 years or above). Bu and Xu (2000) found similar results in a study of work-related attitudes among Chinese employees, noting that the shift is not yet complete, but the former mentality is in retreat.

It has long been recognized that Chinese culture emphasizes a harmonious society and the traditional Confucian values that emphasize the class system, obedience, the doctrine of mean, and *renqing* (kindness/reciprocity) still influence contemporary Chinese behaviors (Tsui, Wang, Xin, Zhang, Fu, 2004). Yet the requirements of flight safety: cooperation, coordination, communication, cross-supervision, et al., challenge the traditional cultural values of the pilots and management to some extent (Bu & Xu, 2000; Lau, Tse, & Zhou, 2002). These factors must be considered in regard to their effect on safety culture.

[2] http://news.sina.com.cn/c/2006-10-25/011311322674.shtml

4.3. Reporting System

Due to the difference between US airlines and Chinese airlines, we analyzed Reporting System (RS) separately. Two items in RS had negative values. One item, "Pilots can report safety discrepancies without fear of negative repercussions," may make sense if we consider the score in relation to the penalty system in Chinese aviation. Comments revealed that the current penalty system was the reason pilots hesitate to report events. The other low scoring item, "Pilots are willing to report information regarding marginal performance or unsafe actions of other pilots," also makes sense in the context that Chinese civil aviation does not have a systematic confidential reporting system. If a pilot reports another, the participant and other peers could easily know this information, which adds extra burdens on the reporter. On the other hand, the Confucian value of *renqing* and keeping the in-group harmony is also an important value in China (Oyserman, Coon, & Kemmelmeier, 2002). Nisbett, Peng, Choi, & Norenzanan (2001) has similarly described Eastern ontologies and epistemologies in terms of holism, in which greater attention is paid to the entire field, the situational context, and relationships among objects and events in the environment rather than the rule itself. Conversely, Western epistemologies, rooted in Aristotelian formal logic (Peng & Nisbett, 1999), emphasize order and constancy in the world, immutable laws and truths, and decontextualized facts and ideas. Given this, it may explain why Chinese pilots may be reticent to report others' information relating to safety. There was no significant difference between the two potential CRSs generally although the mean of RS3 was a little bit higher than the RS2.

The results also indicate an interesting finding arising from the significant difference between self-reporting and reporting others in RS2. While it appears the pilots welcomed the development of the confidential reporting system, the results reflect that pilots are apprehensive giving event report information to an airline CRS system. The difference ceases when the CRS is potentially charged by a third party, which may be explained by deindividuation. It appears that third-party confidence could motivate pilots to offer more information, especially in the absence of post-report pressure, without the cultural concern that the report may break airline group harmony. Comparing the different positions reveals that the younger generation of pilots prefers, and is open to, the reporting system and will express their attitude directly. This also reflects the transition and reformation of Chinese culture (Bu & Xu, 2000; Lau, Tse, & Zhou, 2002).

CONCLUSION

Results of this study indicate the CASS can be applied in the Chinese context. Results reveal that pilots at the test airline have a negative perception of management, supporting departments and staff, while perceptions of their own professionalism and that of their instructors/trainers is positive. The typical professional culture of pilots is pride in their job and themselves (Helmreich, 1997). A confidential reporting system controlled by a third party could greatly aid pilots to report safety issues without fear of negative repercussions and moral trouble. Our study to explore the structure of Chinese aviation's safety culture and the measurement equivalent requires more research. We have taken steps to understand the pilots' perception of safety culture, which is only part of our overall research goal. Further investigation is needed regarding the perception of those in other positions to arrive at a more general conclusion.

Limitation

This reflects a preliminary result of the aviation safety culture structure and partial results in Chinese context due to the limited data. Appropriate measurement equivalence still needs to be followed up. This study reflects partial results of the indicators of safety culture in the Chinese civil aviation context. Typically pilots represent a proud professional culture (their job and themselves) (Merritt, 2000), so we need further investigation regarding the indicators of safety culture among other positions to get a more general conclusion. The relationship between safety culture and safety performance should be further explored.

ACKNOWLEDGEMENT

This work was supported in part by a grant from the Federal Aviation Administration under Award No. DTFA 01-G-015, jennelle Derrickson, technical monitor, and in part by a grant from National Natural Science Foundation of China (NSFC, 70401018). Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the FAA or the NSFC.

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