CHAPTER 6
A STUDY OF AMT NORMS AND WORK HABITS

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6.1 INTRODUCTION

Awareness of maintenance-related factors in aircraft mishaps has expanded considerably over the past ten years. Similarly, the application of human factors research to aviation maintenance technicians (AMTs) has risen as well.1 Once reserved for flight crews, attention is now given to personality and organizational factors that may influence the safety and quality of work performed by AMTs. Maintenance resource management (MRM) addresses these issues.2 Little attention, however, has been given to social factors at the workgroup level, which may also contribute to human error. Indeed, a great deal of anecdotal evidence exists suggesting that a workgroup may apply social pressure on an AMT to ensure conformity to locally established procedures, even if those procedures contradict those officially established by the organization.3 These workgroup pressures emanating from one's peers are called norms.4 Despite the preponderance of anecdotal evidence, few have attempted to quantify the extent to which norms may negatively impact the quality of maintenance work. The purpose of this study is to gauge, quantitatively, the extent to which norms may exist in the AMT workplace. Because of the lack of previous research, this study remains largely exploratory in nature.

6.2 NORMS

Norms are omnipresent in society. Norms dictate fundamental rules of dress, speech, and basic interaction. In this way, norms can be defined as expected, yet implicit rules for behavior.4 Because these rules for behavior define others' expectations, norms facilitate interaction by reducing the number of surprises one may encounter in a social context. On the other hand, a violation of norms can prove distressing. Dressing inappropriately, for example, may be not only a source of concern for the norm "breaker," but may also elicit negative reactions from those who conform.5 In this case, the norm breaker may be sanctioned by others in the surrounding group.

Norms usually develop as a answers to problems that have ambiguous solutions.6 When faced with an ambiguous situation, an individual may use others' behavior as a frame of reference around which to form his or her own reactions. As this process continues, group norms develop and stabilize. Newcomers into the situation are then socialized into the group norms. Very rarely do newcomers initiate change into a group with established norms.

In the context of the present study, norms are also defined as expected rules of behavior. Norms, particularly the extent to which norms may impact compliance with standard operating procedure (SOP) remain the focus for this study.

6.3 POLICY AND PROCEDURE

Degani and Wiener[7] described a model for understanding deviations from established procedure. Despite the uniformity SOPs dictate, pilots tended to deviate from them in actual practice. Degani and Wiener attempted to isolate factors that might encourage such seemingly reckless behavior. The result was a hierarchical model in which an organization's "philosophy" -- as driven by or perhaps in spite of other external forces such as economics, technology, etc., dictates the policies that specify operations in that organization. Finally, these policies influence the procedures that govern the actual behavior of employees.

However, as Degani and Wiener[7] note, employees can (and do) deviate from procedure when put into practice. They identify four specific reasons why a pilot deviates from SOP: individualism, complacency, humor, and frustration. Each of these reasons may also impact the AMT. This study, however, contends that norms may also play a role in deviation from SOP. The next section explores this contention more fully in the context of on-the-job training (OJT).

6.4 OJT AS NORMATIVE INFLUENCE

Zohar[8] showed that a reciprocal relationship exists between an organization's culture (or climate) and its employees' perceptions regarding safety. Specifically, he found that an individual formulates his or her perceptions of an organization's safety commitment based on how that organization functions and the expression of safety-related programs, rules and regulations. Therefore, as common sense would dictate, an employee's personal regard for safety is based directly on the priority the organization places on it. However, Zohar specifically measured attitudes regarding employee safety. An organization's safety culture may also be expanded to include those of the customer as well.

What factors should a culture that promotes customer safety encompass? First, a change in organizational culture should favor one that reflects continuous operational reliability. Weick[9] differentiates an "operationally reliable" organization from others in that it requires a culture dedicated towards error-free performance. Thus, a major learning strategy, trial-and-error, is unavailable to organizational newcomers. According to Weick, a newcomer in an "operationally reliable" organization must be incorporated and socialized into its culture quickly and without error. This socialization is accomplished by creating a culture that substitutes trial-and-error learning with stories, imagination, and symbolism. By socializing newcomers in this way, the underlying attitudes of organizational members are manipulated and the errors that might occur while learning essential job skills are minimized.

Weick and Roberts[10] expand on this theory by asserting that as a culture which encourages safety in this way develops, it becomes reminiscent of a "collective mind." This "collective mind" is characterized by interdependence and coordination. Maintaining the "collective mind" is required to maintain a truly safe and "reliable" environment, such as can be found on flight decks. The components of the collective mind, interdependence and coordination, show up in other research in which the level-of-analysis focuses more on the work group or team than on the organization.[11]

However, a highly interdependent organization intensifies the effects of the actions of all of those within the organization. In other words, high interdependence between team members makes the consequences of decisions made by those at even the lowest level of an organization more far-reaching than the consequences of those decisions made in a *low* interdependent environment.[12] Therefore, in an organization characterized by *high* interdependence, it would be necessary for all members of the organization to possess good decision-making skills. In order for a structured environment such as a flight line to exist where interdependence is maintained and yet remains "operationally reliable," coordination and considerable decision-making skills among groundcrew personnel are necessary.

Roberts[13] documents such a situation in an extensive study of U.S. Navy aircraft carrier operations. In Roberts' study, three researchers went to sea intermittently for up to ten days on two aircraft carriers. During this time, they observed and collected data on the operations that most likely contribute to "reliability." Among the safety strategies observed by Roberts is the "buddy." In the buddy system, an experienced deck hand is assigned to closely monitor another. By doing so, a form of redundancy is built into the system, a redundancy that is assumed to ensure operational reliability.

Despite the relative reliability of these operations, accidents do happen. In fact, a review of deck operations from 1977 to 1991 traces 91% of deck mishaps involving aircraft to "human causal factors."14 In addition, the mishap rate for Naval operations seems to have stabilized over the past few years.15 These two studies suggest that current strategies for safety have reached their potential.

Anecdotal evidence supports this assumption. Interviews with officers familiar with Naval line operations showed that the training of behaviors that may encourage safety and a minimization of error are implied at best.16 Indeed, the current buddy system relies solely on the skill of the experienced "mentor." If the mentor does not display behaviors that contribute to crew safety, then the "buddy" will be equally lacking. In addition, even if mentors are skillful in their jobs, they may lack the communication skills necessary to maximize a "buddy's" learning. And even if the mentor is capable in both the job and communication skills, it may not be possible to slow the pace of the job, appraise performance and provide feedback in an environment where performance is the criterion for success.17

As was described by Wieck and Roberts,10 reliance on the "collective mind" is greatest in an environment in which OJT remains the most salient training tool for newcomers. This is the case with Naval Air maintenance operations.18 Accordingly, previous needs analyses suggest that commercial air groundcrew operate in much the same way as the military by relying heavily on OJT.19 OJT, in most cases, was used to "refine" technical training obtained elsewhere. In describing training in a commercial environment, Walters19 identified five separate ways in which current systems may degenerate. They are as follows:

- Experienced workers are not always knowledgeable.
- Without an outline to follow, valuable skills get left out.
- Mistakes are perpetuated.
- There is no consistency from employee to employee.
- Shortcuts develop due to lack of understanding.

Walters19 continues by proposing a training system that addresses the concerns identified by the needs analysis. This study's primary purpose is to assess the extent to which group-related problems such as norms are perpetuated in industry. It is not the contention of this study that AMTs consciously violate SOP. Instead, we examine the extent to which norms may be perceived by AMTs as well as assess possible reasons why negative norms may be accepted by individuals.

As stated previously, the structure of this study is driven primarily by its exploratory nature. Therefore, it is difficult to make specific hypotheses regarding the data. However, certain assumptions did drive the creation of the survey instrument. First, norms exist and are a function of the incongruity between procedures and the "real world." Second, the creation of norms is also guided by an AMT's ability to access and/or understand SOP. In addition to these two assumptions, instances of a specific, well-documented norm is measured: the use of a "black book" or personal references to complete one's work. This was done to assess the prevalence of a well-recognized norm that does not follow SOP. Furthermore, measuring individuals' reactions toward a specific (and well-documented) norm allows for a frame of reference to be developed regarding attitudes towards norms themselves. In addition, certain demographic data were also collected. This was done to assess how experience and job type might affect one's acceptance and use of norms.

6.5 DATA COLLECTION

6.5.1 Test Site

Data collection occurred during a human factors workshop conducted at an aviation maintenance engineer (AME) conference held in Canada. The purpose of the workshop was to introduce and familiarize AMEs with norms and their promulgation. The test site was far from ideal for data collection. Participants had great difficulty in completing their surveys due to lack of tables and writing surfaces, and discussion occurring during the actual data collection itself. These factors could have been a factor in the quality of the data collected.

6.5.2 Test Subjects/Data Collection

One hundred forty-five people completed and returned surveys to the experimenters. The majority of these respondents were Canadian; American respondents were sought, but data collection on a second group within the allotted timeframe proved impossible. Data were missing from some of the returned surveys, though not in a systematic fashion. Because cases were deleted when missing data, sample sizes in certain analyses are not equal. In all, 138 individuals fully completed their surveys.

Subjects varied greatly in age and experience. Ages of those who provided the data (*N*=144) ranged from a minimum of 16 years to a maximum of 70 years (*M*=40.5 years). Experience (*N*=141) varied as well, though not to as great a degree (min=0 years, max=50 years, *M*=18.3). Table 6.1 displays these data clearly.

Table 6.1. Descriptive Statistics of Age and Experience

	MIN.	MAX.	MEAN	SD
AGE in years (N=144)	16	70	40.5	13.2
EXPERIENCE in years (N=141)	0	50	18.3	13.1

Data indicating “type of work performed” were also collected. The majority of respondents checked more than one category demonstrating that they were not limited to one specific area of aircraft maintenance. In order to facilitate analysis, worktype data were recoded to reflect a ranking order. That ranking included, in this order, students, light check personnel, heavy check personnel, and then management. In doing this, a basic assumption was made: participants who listed themselves in a “higher” rank had experience in the “lower” ranks, while the reverse would most likely not be true. For example, an AMT who indicated “management” or “upper management” was coded simply as management, despite also having included himself in another group such as “hanger maintenance.” Though this remains a generalization done only for the purposes of data analysis, correlations between worktype, experience and age bear this assumption out. Both work and experience are significantly correlated to worktype (1=“manager,” 2=“heavy check,” 3=“light check,” 4=“student”). See Table 6.2 for the correlation matrix.

Table 6.2. Correlation Matrix of Age, Experience, and Worktype, *p<.05

	AGE	EXPERIENCE	WORKTYPE
AGE	--	.92*	-.49*
EXPERIENCE	--	--	-.50*
WORKTYPE	--	--	--

Worktype was restricted mainly to two groups, management (*n*=57) and "Light check" (*n*=55). The remaining individuals were divided between heavy check personnel (*n*=16) and students/"Other" (*n*=14). Aircraft inspectors/regulators (ASIs) were coded as "others," though their low numbers (*n*=3) made it prudent to collapse them in with another category.

Data collection occurred during a safety seminar. Prior to survey distribution, participants were given a brief, 20 minute primer on "norms," so as to ensure a standard definition among respondents. During this time, participant anonymity was also ensured. Subjects were given a total of 20 minutes to complete the survey, after which all responses were collected for later analysis. The norms survey is presented in Appendix A.

The Survey

The norms measure was created using an *a priori* scale structure, i.e., specific questions were created based on past research and subject matter input. Questions were then grouped together accordingly to create *a priori* subscales.

The survey was divided into five subscales. Each scale was intended to reflect a facet of workplace norms. However, subsequent calculation of Cronbach's alpha indicated unreliability in two of the scales, Scales II and III. Cronbach's alpha is a statistical calculation performed on a survey to test the extent to which its observations are consistent both among the respondents and within the survey itself. A low alpha score, <.50, indicates that the scale factors are not consistent among respondents. See Table 6.3 for a list of each scale and their associated reliability coefficients.

Table 6.3. Listing of Subscales and Associated Reliability Coefficients

Subscale	Subscale Name	Cronbach's Alpha
Scale I (n=144)	**"Procedures Are Not 'Real World'"**	**.52**
Scale II (n=138)	"There is a great Degree of Pressure to conform to the workgroup"	.38
Scale III (n=138)	"Norms Positively Impact Safety"	-.18
Scale IV (n=142)	SOP is accessible and easily understood."	.69
Scale V (n=139)	"I use a Black Book or Private References"	.69

Subscales were created to assess the degree to which norms factored into an employee's work environment. A score of 5 indicates highest agreement with each subscale. A score of 1 indicates highest amount of disagreement with a statement.

In addition to the attitude survey, a second measure was included to gather critical incidents of "positive," "negative," and "neutral" norms. Because of the qualitative nature of these data as well as the lack of standardization among participants, these critical incidents were not analyzed systematically. They were, however, collected for future presentation and to guide further research.

6.6 RESULTS

Because of the exploratory nature of this study, analysis of the data was driven primarily by the *a priori* scale structure. Comparisons were made among respondents in terms of worktype and experience.

Descriptive statistics revealed interesting trends within the data. Overall, the sample (*N*=138) demonstrated greatest agreement with Scale III ("Norms impact on safety") with a mean=3.4 (*SD*= .68); note that a score of 5 indicates "greatest agreement." Scale V ("Use of blackbook") showed the least amount of agreement (n=139, *M*=1.9, *SD*=.64). Most interestingly, however, was the general lack of agreement in the sample with all of the subscale items. In other words, respondents did not generally agree with any of the subscale factors, demonstrating that the norms identified in the survey may not be perceived by AMTs as impacting work performance. These results are explored more fully in the discussion section of the report. Table 6.4 lists the means and standard deviations of each scale for the entire sample.

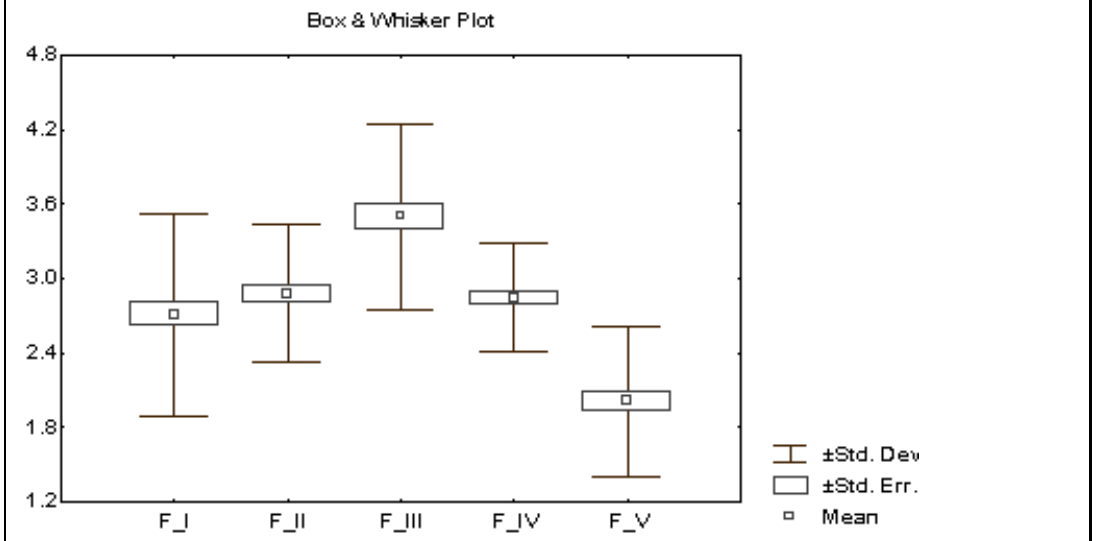
Table 6.4. Descriptive Statistics of Subscales I-V

Scale	Valid N	Min.	Max.	Mean	SD
Scale I	144	1.0	4.67	2.72	.80
Scale II	138	1.2	4.4	2.85	.60
Scale III	138	1.0	5.0	3.4	.68
Scale IV	142	1.8	4.2	2.8	.44
Scale V	139	.67	3.3	1.9	.64

Two multivariate analyses of variance (MANOVA) were conducted. The first MANOVA showed significant differences at the .05 alpha level among worktype categories for Factor II ($F(3,126)=2.71$, $p<.05$). Specifically, Student Newman-Kuels *post hoc* analysis showed that shop/component personnel scored significantly lower than any of the other worktype groups. These were the only significant results obtained through MANOVA.

Closer examination of each worktype reveals that, in general, managers were more apt than the other worktypes to show agreement with all factors, particularly Scale III ("Norms impact on safety") (*n*=55, *M*= 3.5, *SD*= .76). Other types of personnel did not demonstrate any systematic deviation from the overall mean for any scales. For example, students and light check employees agreed less with Scale V ("Use of blackbook") than managers and heavy check personnel. However, students and heavy check personnel agreed less with Scale I ("Procedures are real-world") than did managers and light check employees. Figures 6.1-6.4 provide a summary of each worktype's data.

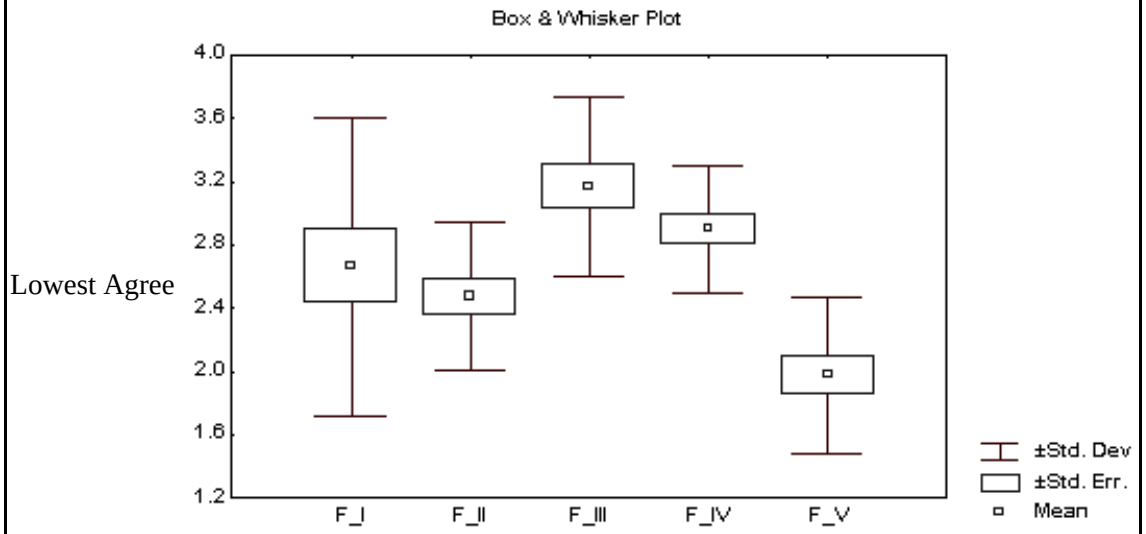
Highest Agree



Lowest Agree

Figure 6.1. Means and Standard Deviations of Manager Scale Scores

Highest Agree



Lowest Agree

Figure 6.2. Means and Standard Deviations of Heavy Check Personnel Scale Scores

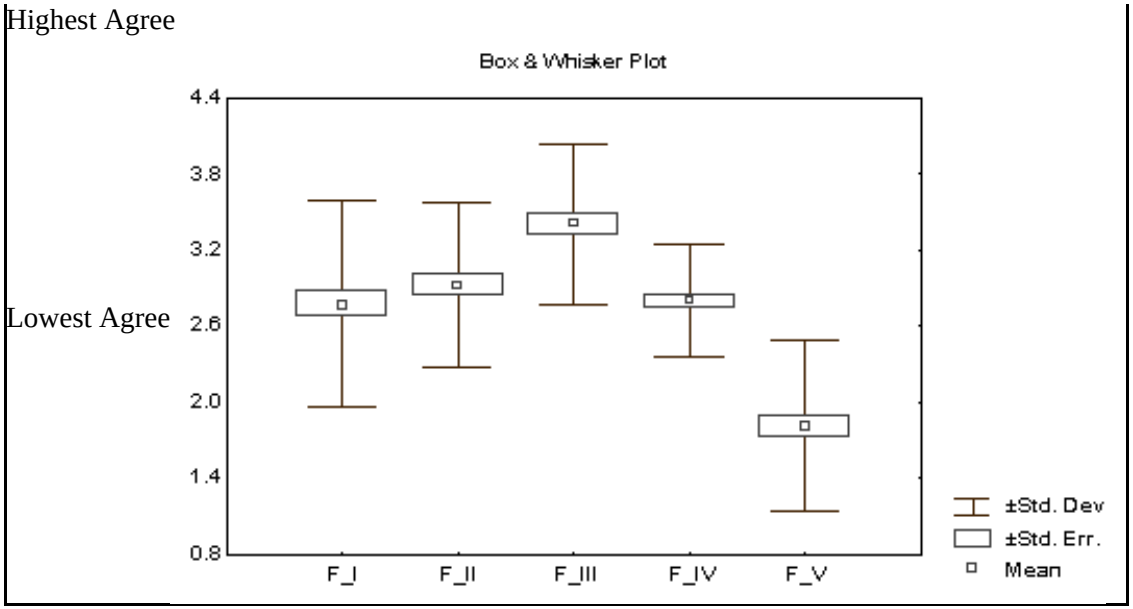


Figure 6.3. Means and Standard Deviations of Light Check Personnel Scale Scores

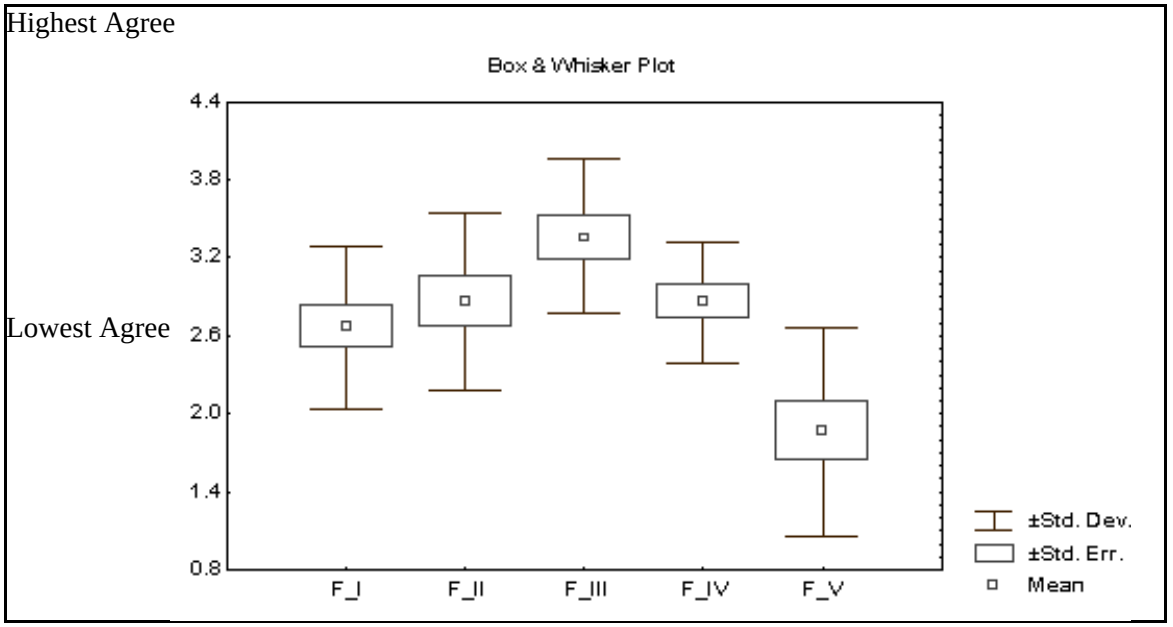


Figure 6.4. Means and Standard Deviations of Students' Scale Scores

Effect of work experience was also investigated using a second MANOVA. Because work experience was listed by subjects in terms of years, it was recoded and divided into quartiles. These quartiles are as follows: *n*=37 "<8 years," *n*=33 "8><18 years," *n*=37 "18><27 years," *n*=38 ">27 years of experience." MANOVA was conducted using the recoded work experience as the independent variable. Results indicate that differences due to work experience exist at the .05 alpha level for Scale V($F(3,129)=2.70$, $p<.05$). Student Newman-Kuels *post hoc* analysis indicated that those employees with the most experience scored significantly greater than the second most experienced employees for Scale V ("Use of blackbook"). However, this difference is only at the .1 alpha level ($p=.07$).

6.7 DISCUSSION

Overall, with one exception, the results indicate no significant differences among worktype. Similarly, with one exception, there were no significant differences attributed to experience level. Interpretation of the lone significant difference due to worktype leads one to conclude that shop/component personnel are affected by workgroup pressures to a lesser degree than other personnel. One may theorize that a "slower" pace, relative to line or hanger work, may buffer component personnel from the effects of workgroup pressure. Similarly, managers also seem more vulnerable to workgroup pressure than component personnel, due to the "buck stops here" nature of their position. In other words, managers are accountable to many different organizational members, creating more pressure to conform. However, it must be noted that examination of the means shows that all worktype groups indicated some level of disagreement to being pressured by their peers. These data do not support the notion of workgroup pressure factoring into one's job.

The results derived from the "experience" MANOVA are more difficult to interpret. The mean of the most experienced employees (Group 4) is significantly greater than the mean for the second most experienced group of employees (Group 3), implying that the most experienced employees were more apt to use personal references. Perhaps as one gains more work experience, certain habits, such as consulting a "blackbook," become more ingrained. Curiously, distribution of the means across all four is bimodal. The lack of systematic increases or decreases makes data interpretation difficult at best. However, as was the case with the worktype group data, means of all experience groups indicate overall disagreement for Scale V ("Use of blackbook"); respondents did not rely on personal references to as great a degree as anecdotal evidence seemed to indicate.

Examination of the means themselves showed low agreement with all scales, with the notable exception of Scale III ("Norms impact on safety"). In other words, as a group, respondents felt that norms positively impact safety. However, as a group, respondents felt that SOP do reflect the "real world" (Scale I), are easily accessible and understood (Scale IV), and do not require the use of personal references (Scale V). In addition, respondents did not feel that they were negatively pressured by existing norms (Scale II).

When categorized by worktype groups, managers seemed the most inclined to show agreement with any of the factors, scoring greater than the means for the entire sample. However, they also showed greater variation in their answers, as a group, than did most of the other worktypes, demonstrating a lack of overall agreement in the factors. In addition to this result, students and light check personnel indicated more understanding and accessibility to SOP than other more experienced personnel. This could be due to the relative "newness," compared to older, more experienced workers, of the training on SOP for this population. Accessibility, especially when computer-based, may also contribute to this. No other systematic trends seem to be apparent with regards to worktype.

However, interpretation of the means must be performed with a caveat. Because MANOVA indicated few, if any, significant differences among the factors, all groups gave equivalent answers, in a statistical sense. But does the lack of any significant findings have a value? Possibly. If these results were borne out through repeated testing, these data could prove encouraging. For example, the sample's overall disagreement with all factors may indicate that norms may not be as great a problem as once believed. The lack of significant differences shows that these feelings are widespread and are not dependent on experience or type of work.

Once again, however, one must be careful when interpreting a lack of statistical significance. The lack of significant differences may be due to effects separate from the independent variables. For example, it is equally likely that sample characteristics may have driven the results. The sample surveyed for this study were all attending a safety seminar; therefore, respondents' work habits may not reflect those of the AMT population as a whole. In addition, difficulties occurred in data collection, such as lack of adequate time to complete the survey, which may also have affected individual's responses.

Due to the exploratory nature of the study, the survey's subscales could not be fully defined before data collection; this may have affected some of the resulting data. The scales themselves possessed only moderate reliability. This calls into question their statistical validity, especially Scales II ("Degree of workgroup pressure") and III ("Norms impact on safety"). Barring the general disagreement with the factors among the sample, the lack of systematic results, even among the means, supports this conclusion.

How could further research into maintainer norms benefit from the current study? First, because this research project was an initial, exploratory effort into a field that lacked previous research, this survey amounted to a pilot effort. Pilot testing rarely reveals "good" data. Instead, it identifies areas for survey modification should data be collected in the future. Second, other demographic information could have been collected. The present study's independent variables may not have been sensitive to differences among the scales. In addition, the recoding of the worktypes, though necessary for analysis, may have introduced an artifact not present before the data transformation. Finally, the researchers may have overestimated the extent to which norms are identified and accepted in the general population. In such a case, the pre-survey primer as it was designed may not have addressed some of the specific conceptualizations of norms individual respondents may have possessed.

Research into norms, especially potentially destructive ones, may require behavioral observation in the field. Collecting critical incidents, for example, may provide more detailed and valid data that attitudinal research could not. However, attitudinal research is a legitimate and cost-effective first strategy for initial data collection.

6.8 CONCLUSIONS

It is difficult to make conclusions from these data. At best, they represent directions of research that need further study. For example, are norms omnipresent, as anecdotal evidence indicates, or are they not, as the survey results show? Examination of the qualitative data collected from the participants show that norms are present in the maintenance environment. Many of the norms cited are identical across respondents. A sample of them are listed below:

"Keeping schedule, even though [the] aircraft is not ready."
"We don't have it, so don't worry about it."
"Using shortcuts to stay in [the] time limit."
"Fill out paperwork days after work is carried [out]."
"Using the wrong tools for job."
"Non-critical items signed off without checking."

Because of the contrast between the quantitative data and the qualitative data, it is difficult to reconcile the two. One possible explanation could be that the quantitative data created demand characteristics that elicited responses contrary to the critical incidents. Participants could be trying to "put on a good show" for experimenters. Another likely explanation could be that the critical incidents are the result of the 20 minute norms primer given prior to data collection. Many of the responses are similar to the examples given in the primer. Respondents could be "parroting" the norm examples provided to them minutes earlier. Finally, the identification of these norms could be an example of the "Not Me" syndrome (i.e., everyone else, other than the respondent, conforms to workgroup pressure). This is likely as well. Could future surveys be structured to compensate for this?

On the other hand, the results of the survey are extremely encouraging. The universal lack of agreement with the factors, for example, may indeed be evidence of safe work habits. In this we can take some comfort. Also, according to these data, procedures were accessible and understandable, which implies organizational support for the AMT. This is also encouraging. Even the listing of negative norms emphasizes that critical components and tasks are not taken lightly. The following sample of positive norms listed by the respondents demonstrates also an undercurrent of safety present in the AMT environment:

"Independent checks required on maintenance actions."
"Two people working together all of the time regardless of task."
"We would do a final walk-around just before the aircraft was pushed back."
"After doors closed, do a final walk-around with nothing else in mind."

Some of the data made intuitive sense. It might be expected that less experienced personnel might be more familiar and willing to use SOP than more experienced employees who may not consult written SOPs to an equal degree. This would be especially true of managers who may not consult written SOP as often as those on the line. Indeed, the data bear this out. Other results are more perplexing. The lack of use of personal references was surprising. Would a broader, more representative sample respond the same way? One could only guess.

To conclude, though the authors were constrained by the exploratory nature of the research, it has provided an interesting first look into a previously unexplored area. This study has laid the groundwork for additional research into the difficult field of attitudes and employee norms. However, the data as it currently stands not only provide some evidence of the need for maintaining a safety culture, but they provide those tasked with such endeavors with a "gameplan" to guide them through it.

6.9 REFERENCES

1. Marx, D.A. & Graeber, R.C. (1994). Human error in aircraft maintenance. In N. McDonald & R. Fuller (Eds.) *Aviation psychology in practice* (pp. 87-104). Brookfield, VT: Ashgate.

2. Roberston, M. (In press). Maintenance Resource Managment. *Human Factors Guide for Aviation Maintenance.*

3. Dupont, G. (1997). The Dirty Dozen in maintenance. In *The Proceedings of the 11th Meeting on Human Factors Issues in Aviation Maintenance and Inspections* (pp. 45-49), Federal Air Administration Office of Aviation Medicine, Washington D.C.

4. Myers, D. (1990) *Social psychology (3rd ed.)*. New York: McGraw-Hill.

5. Forsyth, D. (1990). *Group dynamics (2nd ed.)*. Pacific Grove, CA: Brooks/Cole Publishing.

6. Sherif, M. (1936). *The psychology of social norms.* New York: Harper & Row.

7. Degani & Wiener (1994). Philosophy, policies, procedures, and practice: The four "p's" of flight deck operations. In N. McDonald & R. Fuller (Eds.) *Aviation psychology in practice* (pp. 87-104). Brookfield, VT: Ashgate.

8. Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology*, 63(1), 96-102.

9. Weick, K.E. (1987). Organizational culture as a source of high reliability. *California Management Review*, 29(2), 112-127.

10. Weick, K.E. & Roberts, K.H. (1993). Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly*, 38, 357-381.

11. Cannon-Bowers J.A., Tannenbaum, S.I., Salas, E. & Volpe, C.E. (1995). Defining competencies and establishing team training requirements. In R.A. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 333-380). San Francisco: Jossey-Bass.

12. Roberts, K.H., Stout, S.K., & Halpern, J.J. (1994). Decision dynamics in two high reliability military organizations. *Management Science, 40*(5), 614-624.

13. Roberts, K.H. (1990). Some characteristics of one type of high reliability organization. *Organization Science*, 1(2), 160-176.

14. Shappell, S.A. (1995). Naval flight deck injuries: A review of naval safety center data, 1977-1991. *Aviation, Space and Environmental Medicine*, 66(6), 590-595.

15. Schmidt, J.K. (1996). Crew coordination training: It isn't just for aircrew anymore. In *Meeting Proceedings Tenth Federal Aviation Administration Meeting on Human Factors Issues in Aircraft Maintenance and Inspection: Maintenance performance enhancement and technician resource management* (pp. 65-70). Washington, DC: Federal Aviation Administration/Office of Aviation Medicine.

16. Sian, I.B. (1997). *Groundcrew coordination training: An application of team training skills to aviation ramp activities.* Unpublished Master's thesis, Old Dominion University.

17. Goldstein, I. (1993). *Training in organizations (3rd ed.)* Pacific Grove, CA: Brooks/Cole.

18. Qurollo, J. (1990). U.S. Navy training for aircraft maintenance. In *Meeting Proceedings Third Federal Aviation Administration Meeting on Human Factors Issues in Aircraft Maintenance and Inspection: Training issues* (pp. 29-36). Washington, DC: Federal Aviation Administration/Office of Aviation Medicine.

19. Walter, D. (1990). An innovative approach NDT inspector training at Boeing. In *Meeting Proceedings Third Federal Aviation Administration Meeting on Human Factors Issues in Aircraft Maintenance and Inspection:* Training issues (pp. 52-71). Washington, DC: Federal Aviation Administration/Office of Aviation Medicine.

6.10 APPENDIX A

Norms Survey

Dear Fellow Aircraft Maintainer:

Thank you for taking the time to answer a few questions. Your answers will be strictly confidential and anonymous. This worksheet will only take a few minutes to complete. Your candid answers may help prevent an aircraft accident by aiding us in understanding one of the leading causes of maintenance error: *norms*.

Norms are unwritten rules followed by the majority of a group. (In other words, "the way we do things around here . . .") Norms can be positive, negative, or neutral as they relate to safety/compliance standards.

Examples of norms:

- How fast people in the group usually work (Can be positive, neutral or negative)
- Number of coffee/smoke breaks taken per day (positive, neutral or negative)
- Doing the "extra" inspection to insure quality work (positive)
- Number of casual conversations during work time (neutral or negative)
- Use of private reference lists (the "little black book") rather than using manuals (Likely negative)
- Usual quitting time for the day (Likely neutral)
- Making sure that work areas are cleaned up before leaving (positive)

Thank you in advance for your valuable time.

Demographics (Your answers are strictly anonymous)

Age:	_____
Years as AME/AMT or in aviation work:	_____
Area of Maintenance:	¨ Line Maintenance ¨ Hangar Maintenance ¨ Component/Support Shop ¨ Management ¨ Upper Management

Please indicate your agreement with the following questions using the following scale.

1 = Strongly Disagree	2 = Disagree	3 = Moderately Agree	4 = Agree	5 = Strongly Agree

1.	My workgroup would not get work completed on time if all written procedures were followed exactly.	1 2 3 4 5
2.	There is pressure from my workgroup to take shortcuts from the formal procedures.	1 2 3 4 5
3.	Norms that contradict written policy usually compromise safety.	1 2 3 4 5
4.	Most norms in my workgroup are aligned with my company's goals and policies.	1 2 3 4 5
5.	Most norms in my workgroup have a positive impact on safety.	1 2 3 4 5
6.	I usually follow the norms of my workgroup.	1 2 3 4 5
7.	Others in my workgroup have made negative comments when I don't follow workgroup norms.	1 2 3 4 5
8.	I am rewarded for following my workgroup's norms.	1 2 3 4 5
9.	I value the opinions of my fellow workers more than the opinions of senior supervisors.	1 2 3 4 5

10.	The formal procedures of my company do not reflect what happens in the “real world.”	1 2 3 4 5
11.	Many formal procedures are outdated.	1 2 3 4 5
12.	I have difficulty accessing written policies and procedures.	1 2 3 4 5
13.	The formal standards and procedures of my company are difficult to understand.	1 2 3 4 5
14.	I am very familiar with the standards, policies, and procedures that apply to my job.	1 2 3 4 5
15.	The formal procedures that apply to my work are communicated adequately.	1 2 3 4 5
16.	I have difficulty getting the information I need to do my job.	1 2 3 4 5
17.	I have kept a personal reference list to help me in my job.	1 2 3 4 5
18.	I need to use private references to keep up with my workload.	1 2 3 4 5
	Has your company ever provided you with any training to recognize norms?	Yes No

Please describe three norms that exist in your work environment now or at some time in your past. Describe a positive, a neutral, and a negative norm. If you need more room, please use the reverse side.

Positive Norm

Description of the norm:

How did you learn the norm?

What happens if you don’t follow the norm?

Neutral Norm

Description of the norm:

How did you learn the norm?

What happens if you don't follow the norm?

Negative Norm

Description of the norm:

How did you learn the norm?

What happens if you don't follow the norm?

Thank you for helping to make our industry safer.