CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 REVIEW OF THE RESEARCH

The final chapter of this study contains an integrated analysis and discussion of the research findings. The aims, assumptions, opinions of experts in the field and the research methods that were dealt with in the previous chapters are revisited in order to compare findings. Conclusions are drawn and recommendations are made after the discussion of the research findings.

The purpose of this study was to identify and categorise the attitudes, stereotypes and prejudices that may exist towards female pilots in the modern aviation industry and to compare these differences/similarities in a cross-cultural study.

The objectives of the study were

- to examine and summarise the literature, historical data, selected legislation and current world trends in aviation to formulate a comprehensive literature and research study.

- to develop a valid and reliable instrument to assess the attitudes of female and male pilots regarding gender-based issues in aviation. Constructs originally explored included:
  - Learning Ability and Learning Speed;
  - General Piloting Skills;
  - Leadership; and
  - General Prejudices and Stereotypes.

- to obtain empirical data about the gender attitudes of aviators by means of a cross-cultural survey;

- to identify areas in which female and male pilots agree (converge) or disagree (diverge) regarding gender attitudes;

- to determine whether the average gender attitude score of aviators differs as a function of different pilot-related variables (biographical profile, age, total flying hours, type of license, position, and so on); and

- to use the research results to increase crew members' understanding of gender-related bias in order to enhance flight safety and efficiency.

8.2 CONCLUSIONS

8.2.1 The Aviation Gender Attitude Questionnaire (AGAQ)

Aviation Psychology specifies that the management of gender issues is critical to sustaining and improving aviation safety and ensuring effective performance. This study has been aimed at the development of a questionnaire that assesses aviators' perceptions about gender-related pilot behaviour.

The results obtained from the factor analysis and item analysis indicated that the Aviation Gender Attitude Questionnaire (AGAQ) has acceptable psychometric properties, and that aviation human factor specialists can use the instrument to gather valid and reliable data about gender-related attitudes held by pilots, specifically on the topics of Flying Proficiency and Safety Orientation. Furthermore, this data can be used to

- make pilots conscious of their perceptions with regard to gender differences as well as the way in which such perceptions may promote compatibility or discord within the cockpit;
- improve and promote better understanding and communication between female and male pilots, both in regular and irregular operations;
- improve and advance gender sensitivity and diversity training in CRM programmes; and
- develop strategies to address gender bias, prejudice and discrimination in aviation.

8.2.2 Legislative considerations

The literature review indicates that there is no evidence to suggest that women are not as capable of piloting as men are. Even though women are physiologically and anthropometrically different from men, modern aircraft technology and cockpit design

have overcome many of the problems that may once have been considered as limiting to a woman's ability to fly.

Notwithstanding these facts, some countries, such as South Africa, have been slow in changing legislation to allow women to fly in the military as combat pilots. In the commercial sector, however, South African Airways has instituted an affirmative action policy that promotes the training of women as pilots. With a limited pool of female aviators to draw from, more experienced and skilled male pilots often view these endorsements and affirmative action policies negatively and thus also believe that the skills and abilities of the female pilots promoted to these positions are inferior.

8.2.3 Flying Proficiency and Safety Orientation

Although the AGAQ was originally intended to consider four constructs (Learning Ability and Learning Speed, General Piloting Skills, Leadership, and Prejudices and Stereotypes), factor analysis concluded that only two constructs could be reliably considered: Flying Proficiency and Safety Orientation. As noted in Chapter Seven, Flying Proficiency refers to the aptitude towards flying that a person may or may not be seen to have. It relates to how proficient a pilot is deemed to be at the task of pilotage. The principal elements relate to learning ability and the speed at which concepts related to flying are understood, decision-making in flying, general piloting skills, and comfort levels with regard to stick and rudder controls. Safety Orientation relates to the level of risk-taking amongst pilots, safety consciousness, and attention to detail.

8.2.4 Cross-cultural conclusions

Principal Axis Factor Analysis and Tucker's coefficient of congruence indicate that there is little difference in the factor structures for the South African and the United States respondents. This suggests that respondents from both countries share similar beliefs regarding the abilities of female aviators. This may be due in large part to the fact that pilot training requires very specific technical education that seems to be fairly consistent, regardless of the country in which the pilot is instructed. This may be further explained by the fact that English is spoken in both South Africa and the United States. Although English may not be the first language of some flight students in South Africa, it is widely spoken and taught in the South African education system. Other Western cultural factors such as shared television programmes and music may also influence this phenomenon.

8.2.5 Item bias

Analysis of item bias was carried out on the items of the AGAQ. Bias was examined for each item and for both factors separately. In this examination, it was found that the means of the South African and United States respondents did not differ in a systematic way. The items of the two factors did not show uniform or non-uniform differences. Therefore, it was deemed acceptable to utilise the AGAQ to measure the perceptions of pilots from different geographical areas, and therefore different cultures.

8.2.6 Demographic differences

Although a cross-cultural analysis was deemed valid, it is important to note that an analysis of the demographic profiles shows that the sample population in South Africa did not match that in the United States. In short, the majority of pilots sampled from South Africa were professional (airline, transport or similar) male pilots, while the sample from the United States consisted mainly of female pilots and consisted of pilots in a recreational capacity. While the absence of professional female pilot respondents in South Africa can be accounted for by a general lack of such a demographic, the lack of professional male respondents in the United States cannot be fully explained or justified.

The Air Line Pilots Association (ALPA), a pilot union, is very dominant in the United States and it declined the invitation to participate in this research. Hence, sampling pilots from this demographic grouping was particularly challenging.

8.2.7 Flying with the opposite gender

Another significant difference ascribed to the biographical and demographic profile is that the majority of female aviators had flown with members of the opposite gender, while male pilots generally had not.

As noted above, this may once again be due to the fact that the majority of respondents from South Africa were professional male pilots. With the general absence of female pilots in the South African aviation industry, male pilots have generally not had the opportunity to fly with female pilots. Even with affirmative action programmes and an increase in the popularity of aviation amongst women, it is unlikely that this phenomenon will change in the near future.

By contrast, female pilots in the United States have frequently had the opportunity to fly with male pilots. This is generally to be expected, as pilots in the United States are predominantly male. By the end of 1996, only three per cent of all airline pilots in the United States were female (Helmreich & Merritt, 1998). Female pilots will therefore often fly with male pilots in one capacity or another (for example, with a male flight instructor).

8.2.8 The impact of gender

This study considered a variety of factors as the potential basis for the occurrence of attitudes (positive or negative), stereotypes and prejudices with regard to the Flying Proficiency and Safety Orientation of female pilots.

Factors that were investigated included gender, level of education, pilot certification, age, total flying time, position of the pilot and opportunity to fly with the opposite gender *After extensive analysis, it was found that the only variable that has significant impact on these gender-related attitudes is gender itself.*

Interpretation of this phenomenon therefore implies that female aviators generally hold positive perceptions of their own and other female pilots' abilities, skills and aptitude, while male pilots do not hold their abilities in the same regard. Furthermore, this suggests that male aviators see themselves in a more positive light than their female counterparts see them. This may be due to the innate sense of skill that all pilots must appropriate in order to take to the sky in the first place.

These results complement those of Helmreich and Merrit (1998). Their research was aimed at determining whether attitudes about stress, personal vulnerability and cockpit management differed as a function of gender. The results revealed that women's attitudes were strikingly similar to those of men in that they held equally unrealistic appraisals of their capabilities under stress and comparable attitudes about command. It may be further exacerbated by the air of élitism that still surrounds the aviation industry. The perception of one's own piloting skills as superior may be forged in the intense technical and recurrent training and skills practice.

8.3 RECOMMENDATIONS

- CRM is particularly strongly influenced by the beliefs and attitudes of pilots. For this reason, it is suggested that this study be extended to other countries in order to

determine whether there are cultural differences amongst aviators with regard to their opinions in respect of Flying Proficiency and Safety Orientation. Furthermore, such a study would either support or refute the above finding that gender is the only factor that influences the attitudes, stereotypes or prejudices of aviators as suggested by the responses given by the participants in this gender-related study.

It would be of particular interest to examine these findings in countries that do not share the Western alphabet or languages. In a study by Merritt and Helmreich (1995), where Anglophone pilots were compared to non-Anglophone pilots, it was found that significant cultural differences were observed in the areas of command structure and communications flow. This suggests that differences may occur in the perceptions of the abilities of female pilots.

- In future studies, structural equation modelling (SEM) methods, as implemented by AMOS (Arbuckle, 1997), can be utilised in order to test the two-factorial model of the AGAQ. Unlike with Exploratory Factor Analysis, one of the advantages of structural equation modelling is that it enables the researcher to postulate relations between the observed measures and the latent variables *in priori*. This in *priori* relationship between the observed variables and the latent variables would then be evaluated statistically to determine its goodness of fit to the data (Jöreskog, 1993).

- Additional research with regard to gender-related attitudes is required. Longitudinal studies could prove valuable in explaining the negative perceptions about women within aviation.

  At the time when these conclusions were being written, the study was being broadened to Norway with the assistance of Professor Monica Martinussen and the University of Tromsø, as well as to Australia with the assistance of Dr Jim Mitchell and the University of Western Sydney. The findings from this wider study and from those of future research will be included in several scientific aviation-related journals.

- It would be highly desirable to expand the number of professional male pilots in the United States who respond to the questionnaire in order to obtain a more accurate representation of the population. Several efforts are being undertaken to this end.

- The research findings above are of particular interest in the field of CRM for pilots and specifically in the field of 'Hazardous Attitudes' training. It is significant that

pilots generally hold their own skills in higher regard than of their counterparts. This is especially so in the case of counterparts of the opposite gender.

Furthermore, the research findings may improve and promote better understanding and communication between male and female pilots by leading to greater comprehension of the differences in the attitudes, stereotypes and prejudices that exist with regard to Flying Proficiency and Safety Orientation. To this end CRM training should include tuition regarding styles and attitudes aimed at an increasingly diversified population.

- Although this kind of exploratory research is expensive in terms of time (both for researchers and respondents) and publishing and materials costs, perhaps the biggest cost lies in application training. Understanding perceptions and attitudes as they relate to gender-based issues within aviation may be categorized under already existing sensitivity training. While sensitivity training was designed to facilitate the chances of an individual's values, beliefs or religious convictions, it has steadily begun to have negative connotations, especially within the aviation industry, where sensitivity training is seen, for example, to be 'used to overcome resistance to the lowering of standards in naval aviation to enable females to join the air combat arms of our military' (Atkinson, 1999:1). Addressing and understanding such prevailing or alleged attitudes, stereotypes and prejudices and how they manifest in pilot behaviour, especially in the cockpit, may take extensive research, effort and time.

  Understanding key concepts and fundamentals associated with attitudes, stereotypes and prejudices that exist with regard to gender-based issues holds a significant advantage for Aviation Psychology. Firstly, understanding the impact of and how attitudes affect pilot behaviour can do much to advance positive interactions amongst diverse flight crews. Positive interactions promote productivity and safety, especially in irregular operations. Secondly, understanding how these attitudes are formed with application to the aviation industry may allow for conceptual modelling. This has both an academic and a real-world benefit for the field of Aviation Psychology in that it allows a better understanding of how our opinions are formed in the first place, especially with regard to members of the opposite gender and their perceived abilities (Spertus, 1991).

  In encouraging women to take up flying as a professional career, the aviation industry needs to address many of the underlying issues that discourage women

from becoming pilots. These issues include recognising both the differences and similarities between males and females in terms of initial training, crew resources, command training and human factors data.

The aviation industry has a responsibility beyond awareness and skills training. It should proactively address how to develop, recruit and evaluate female aviators. In doing so, the aviation industry can add to its ranks equally qualified and valued pilots who possess different competencies and strengths.

In conclusion, the disciplines of CRM and Human Factors in Aviation are dynamic. They are always searching for ways in which to improve the operation of flight crews and overall safety in the aviation industry. No universal CRM programme exists and the Federal Aviation Administration (FAA) in the United States allows for air carriers to customise their training programmes to a certain extent. What is important, however, is that research such as the above be incorporated into training in one form or another. It is all very well to say that people learn from their mistakes, but in the aviation industry such lessons can be costly, not only in terms of economics, but also in terms of human lives. It is therefore of paramount importance that the industry attempts to address the way in which aviators interact with one another and their aircraft in a proactive rather than a reactive manner.