The Effects of Joint Flight Attendant and Flight Crew CRM Training Programmes on Intergroup Teamwork and Communication

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Abstract

The aim of this research is to assess and evaluate the effectiveness of Crew Resource Management (CRM) training programmes for enhancing teamwork and cooperation between flight attendants and pilots. CRM programmes have been defined as the use of all available resources to achieve a safe flight (Helmreich, Merritt & Wilhelm, 1999). CRM programmes were developed for pilots following a series of accidents in the United States in the 1970s which were attributed to ineffective (or non-existent) communication within the flight decks. CRM programmes were extended to flight attendants in the 1990s after accident investigations had determined that some crashes could have been averted if flight attendants had passed on safety critical information to the pilots (e.g., the 1989 British Midlands crash at Kegworth). Human error is attributed to 60-80% of air accidents (Shappell and Wiegmann, 2004; von Thaden, 2008).

Studies 1 and 2 involved a 36-item questionnaire for flight attendants which was administered before and after the introduction of the new CRM training programme for flight attendants at a South Pacific airline. The participating airline is a major air carrier so it was possible to obtain large samples (500+) for each of these quantitative studies. The results showed that there had been a significant attitude change in the positive direction. Multivariate analyses also revealed that there were significant differences between fleet type flown, crew position flown and length of service (seniority). As predicted crews with a greater length of service displayed safer attitudes as measured by the FSAQ (Flight Attendants) Crews on the narrow-bodied A320 and B737 showed safer attitudes than their colleagues on the wide-bodied long-haul aircraft. Flight attendants in senior positions (ISD, ISC, and Purser) also displayed safer attitudes. Study 3 followed up on the significant positive attitude changes through a series of seventeen focus groups which involved 100 flight attendants. The purpose was to obtain high quality qualitative data on perceived barriers (and solutions) to communication between pilots and flight attendants. The major barrier identified was the locked flight deck door which meant that flight attendants could not see periods of high workload on the flight deck and there was difficulty in communicating safety critical information over the interphone due to noise and the lack of face-to face contact. Flight attendants suggested that one possible solution would be to install CCVT cameras so that the pilots could see that it was safe to unlock the door.
or see the flight attendants face. Another barrier was seen to be the lack of a whole pre-flight briefing on long-haul aircraft as flight attendants rarely had the opportunity to even see the pilots on the large B747 aircraft. A solution would be to have the whole team assemble in the area nearest to the flight deck for a quick two-minute briefing. The full briefing would still be between the Captain and the lead flight attendant who would then brief the flight attendant team. These data were then used to develop Study 4 which consisted of a 14-item questionnaire (FSAQ-Pilots) which provided data on the ways pilots viewed the barriers (and solutions) to intergroup communication. The results from this study showed that pilots safety attitudes varied according to fleet type flown, length of service, and crew position flown. Captains, pilots on narrow-bodied aircraft and pilots with a greater length of service all displayed safer attitudes than their colleagues. The qualitative data displayed the same solutions to barriers as the flight attendants had shown. The major barrier was once more the locked flight deck door and the installation of CCTV cameras was recommended. A whole team pre-flight briefing was also recommended. Study 5 followed up on these data by developing a CD Rom which contained five scenarios presented in video clip format. These short video clips involved a landing gear malfunction, drunken passengers, a medical emergency and an explosive decompression followed by an emergency landing. All these provided opportunities for both pilots and flight attendants to identify how they would show intergroup communication and cooperative teamwork. Pilots and flight attendants identified very similar patterns of communication which showed effective intergroup teamwork. Pilots and flight attendants with seven or more years experience; those in leadership roles (Captains, lead flight attendants); and crews on B737, B767, and A320 fleets showed significantly lower perceived ratings of danger, volatility, complexity, the role of the captain, flight attendants and communication in the majority of the five video clips (as described in Chapter 7). Study 6 was an experimental intervention based on the social identity and social categorization theories which formed the theoretical framework for this thesis. According to these theories flight attendants would be more willing to engage in cooperative teamwork behaviours when their social (as opposed to personal) identities had been primed. Three subscales were identified through factor analysis. The subscale labeled intergroup cooperation showed significant differences between the
groups when social (as opposed to personal) had been primed. Flight attendants in the social priming condition indicated that they would be more willing to engage in intergroup teamwork. The results supported the main hypothesis. Social identity theory has not been applied to flight crew teamwork previously. These data showed that joint CRM training is valued by both flight attendants and pilots, especially when joint training sessions enabled both groups to meet and hence break down barriers to communication; a major aim of CRM programmes.
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CHAPTER ONE

INTRODUCTION

A statement of the research topic and outline of the proposed research

The present research will investigate how Crew Resource Management (CRM) training programmes can be developed, evaluated and refined in order to optimise communication, coordination and teamwork between the flight deck crew and flight attendants. Most research in this area to date has focused on how CRM programmes could enhance CRM skills within the flight deck, examining ways to optimise communication and coordination patterns between the pilots. The present research will focus on effective teamwork between the pilots and flight attendants and explore methodologies that would bring two groups of crew together to show effective team skills.

The unifying research theme is that while modern aircraft are rostered to operate with one crew there are two subcultures on the aircraft as the crew are neither separate individuals nor a single homogenous group. Since the early to mid 1990s it has been suggested that ‘crew’ consist of two separate sub-groups or two distinctive cultures represented by pilot and flight attendant sub-groups (Chidester, 1993; Kayten, 1993; Chute & Wiener, 1995, 1996; Wiener & Kanki, 1993). Incidents and accidents (e.g. Kegworth, 1989; Dryden, 1989) which highlighted failed teamwork and communication between the two sub-groups led the aviation industry to examine joint CRM training as a way to improve teamwork and communication.

The present study will investigate one sub-groups’ (the flight attendants) attitudes and perceptions to safety critical behaviours and events. Questionnaires and focus groups will be used to address
the question of whether joint CRM appears to have any positive effects and whether any significant barriers to effective teamwork and communication remain. The other sub-group (the pilots) attitudes and perceptions to communication and team work will be studied using questionnaires to provide a point of comparison. Finally an experimental manipulation is planned that will investigate whether an emphasis on social/organizational identity rather than personal identity would create an increased willingness by flight attendants to engage in positive intergroup behaviours.

Instigating Events leading to the development of CRM training

Aircraft Accidents and Incidents

During the 1970s a series of aviation accidents occurred which were attributed to pilot error. The aviation industry acknowledged the need for a new type of training for pilots which would include psychosocial factors related to communication and interaction on flight decks. Four of the main instigating accidents were at the Everglades, Florida; Tenerife in the Canary Islands; Portland, Oregon; and Dryden, Ontario. These four accidents all had components in which a lack of team work and intergroup communication had been identified. Each accident was used by the aviation industry and researchers to advocate for a new type of team training.

CASE 1: EASTERN AIRLINES

On 29 December 1972 Eastern Airlines Flight 401, a Lockheed L-1011 Tri-Star jet, crashed into the Florida Everglades while on final approach to Miami International Airport. The crew had problems with the landing gear and Air Traffic Control (ATC) had asked the crew to remain in a holding pattern near the airport while the crew worked on the problem. The crew had also been asked to hold at an altitude of 2,000 feet. The crew had not noticed that the aircraft’s auto pilot had become disconnected. The height above ground was only noticed immediately prior to impact leaving crew with little time to correct the problem and the aircraft crashed. The flight crew’s
preoccupation with the landing gear had allowed the aircraft below 2,000 feet as no one was monitoring the instruments. The flight crew also had an experienced maintenance specialist from the airline on board who had come forward to help with the landing gear problem. The accident report stated that the probable cause was the failure of the flight deck crew to monitor instruments focused on problems with the aircraft’s landing gear (NSTB/AAR-73-14). This type of accident is described as Controlled Flight into Terrain (CFIT). This accident was noteworthy as it was the first wide bodied aircraft crash in the United States. Pilot error was a cause due to the fact that no one was designated to fly the plane and all crew were distracted by a relatively minor problem. The need for a new type of specialized cockpit training for flight crews was identified which led to the origins of CRM training.

**CASE 2: TENERIFE**

Another accident occurred in Tenerife, Canary Islands in May 1977 when a KLM B747 Flight 4805 started to take off in heavy fog without ensuring the runway was clear. It crashed into a Pan American B747 already on the runway. There was confusion over whether Air Traffic Control (ATC) had cleared the aircraft for take off as there was other talk happening at the same time. This included the Pan American flight reporting that they were still on the runway. Unfortunately this transmission was not heard by the KLM B747 crew who reported that they were now at takeoff. There was a brief discussion on the KLM flight deck as to whether the Pan American aircraft had turned off the runway. This accident was an example of the need for training which recognized that crew performance involves group performance rather than an individual working without listening to the opinions of other crew members (O’Hare and Roscoe, 1990).

The Dutch Aircraft Accident Report stated that the direct cause of the accident occurred due to the Captain’s decision to take off without ensuring the runway was clear (Kayten, 1993). Additional possible contributory factors were commercial pressure to take off as delays had meant that a new crew would need to be dispatched due to crew flight time limitations. Poor
visibility on the runway would have made it difficult to see that the Pan Am flight had not left the third runway intersection. A third factor could have been poor reception which meant that the crews had difficulty hearing Air Traffic Control (ATC) instructions clearly (O’Hare, St George & Isaac (1993).

**CASE 3: PORTLAND**

An example of lack of situational awareness and crew communication was observed when United Airlines flight 173 crashed into woods near Portland, Oregon on 28 December 1978. The flight crew had reported a landing gear malfunction warning which had diverted the crew’s attention from other vital factors for safe flight. Hence the fuel state was not monitored correctly and communicated successfully to the Captain and the plane crashed when the fuel ran out.

One reason for the failure of the crew to communicate the fuel status successfully to the Captain was the difference in rank and the failure of the crew to use a clear and direct communication tones. (O’Hare and Roscoe, 1990, p.218)

Ginnett (1993) stated that the First Officer and Flight Engineer had warned the Captain on at least four occasions that they were running out of fuel and that they should stop circling in the holding pattern and make a decision to land. Kayten (1993) stated that the crash of United Airlines flight 173 was the first time that the National Transport Safety Board (NTSB) recognized the need for CRM training. She noted the recommendation from the NTSB accident report for “flight deck resource management indoctrination”. (Kayten, 1993, p. 289)

**CASE 4: DRYDEN**

The crash on takeoff of a Fokker F-28 from Dryden, Ontario on March 10 1989 is another example of the many factors that work together in aircraft crashes. Air Ontario Flight 1363 had taken off with snow on the wings and crashed because the aircraft did not gain enough lift to
enable it to fly. Helmreich and Foushee (1993) discussed environmental, regulatory, organizational, individual and group factors all interacting together in this crash. Under group factors they discussed the actions of the flight attendants in this accident. An experienced pilot was seated in the passenger cabin and had voiced his concern over the need for de-icing to the lead flight attendant. Several passengers had also noticed build up of ice on the aircraft’s wings and had also voiced their concern to the flight attendants. This vital information was never conveyed to the flight deck by the flight attendants.

Helmreich and Foushee believed that:

“This failure in communication is understandable in the light of organizational norms regarding cabin-cockpit communication on safety issues. One of the managers of flight attendant training testified that flight attendants were trained not to question flightcrews’ judgements regarding safety issues.” (p.15)

The Canadian Civil Aviation Safety Board (2004) published an Aviation Safety Letter (1/2004) that stated that the lessons learnt from the Dryden accident were still applicable for the aviation industry today. The term “Professional Courtesy” and how this applied in an aviation safety context was discussed. The accident at Dryden was used to illustrate how professional courtesy was a contributing factor for the accident. As has been outlined in the preceding paragraphs an experienced pilot and passengers in the cabin and had voiced their concerns over snow on the aircraft’s wings to the flight attendant. The pilot was influenced by professional courtesy in not going to report his concerns to the Captain. There was also the assumption that the aircraft was going to be de-iced. The flight attendant had also noticed the snow and stated to the Commission of Inquiry led by Justice Moshansky that as she had been snubbed by pilots in the past over a similar situation she decided not to convey this information to the pilots.
**Aviation Research in the 1970s**

Research in the 1970s included the seminal study by Ruffell Smith (1979) which was conducted in a B747 flight simulator. In aviation research it is possible to use high fidelity flight simulators rather than be restricted to a laboratory setting. This produces high face validity and the participants (pilots in this discussion) see the relevance of the study to their flying duties. Laboratory studies cannot achieve this as it would be unethical to put research participants in dangerous situations and observe their reactions. This also applied to aviation before high fidelity simulators were produced as crews could not practice emergency situations in real aircraft. Therefore, the introduction of the simulator has provided a safe and ethical environment to practice otherwise dangerous situations.

In the Ruffell Smith study (1979) B747 crew faced a carefully developed scenario in which they were asked to fly a flight from New York to London in a flight simulator. During the flight one of the four engines needed to be shut down due to oil pressure problems. This meant that the flight to London could not continue on three engines and the crew had to decide an alternative airport for landing. During this decision-making process additional problems were developed. These included a hydraulic pressure failure, bad weather conditions and less than optimum communication with ATC. It is important to note that the pilots’ decision making skills were frequently disturbed by a flight attendant needing assistance. In 1979 there would have been very few examples of cabin crew being included in such research projects or Line Oriented Flight Training (LOFT) exercises.

The Ruffell Smith 1979 study showed that breakdowns in communication distinguished low performing crews from high performing crews. Errors were in the areas of communication, crew interaction and leadership rather than in technical flying skills. Errors occurred when a
crewmember was interrupted by other crewmembers, including cabin crew when they were occupied with performing a particular task (Ruffell Smith, 1979, cited in Foushee, 1984).

**An Historical Overview of the Development of CRM Training**

In June 1979 NASA sponsored an airline industry workshop on “Resource Management on the Flight Deck.” This encouraged dialogue between academia and the aviation industry. Helmreich and Foushee represented the academic world with representatives from the FAA and Airline Pilots Unions in attendance. Many United States and international airlines also sent workshop delegates (Lauber, 1993). United Airlines had developed the Command Leadership Resource Management programme while Northwest Airlines had the Line-oriented Flight Training (LOFT) by the 1970s (O’Hare and Roscoe, 1990). Human error and poor communication had been identified as major causes of air accidents. This workshop led to the application of the new label Cockpit Resource Management (CRM) which involved training flight deck crews to use all the available resources more effectively. This resulted in many of the airlines leaving the workshop to start developing programmes to improve communication and coordination issues on the flight deck (Helmreich, Merritt, & Wilhelm, 1999, p.1).

**The development of CRM programmes**

It is important to provide a definition of CRM before describing how the programme has developed. Helmreich, Klinect & Wilhelm (1999) used the following definition from an FAA CRM Advisory Circular. This stated that:

“CRM can broadly be defined as the utilization of all available human, informational, and equipment resources toward the effective performance of a safe and efficient flight. CRM is an active process by crewmembers to identify significant threats to an operation, communicate them to the PIC, and to develop, communicate, and carry out a plan to avoid or mitigate each threat.
CRM reflects the application of human factors knowledge to the special case of crews and their interaction” (p.667)

This section starts with an overview of the first five generations of CRM from Helmreich, Merritt and Wilhelm (1999) who described the changes in CRM over the two decades prior to 1999. Research by additional respected aviation specialists will also be discussed. Helmreich, Merritt and Wilhelm (1999) used the term “evolution” which described the process of growth and development. The word “generation” has been used to describe each of the new changes in CRM training which are outlined under the following headings.

**First Generation Cockpit Resource Management**

The first generation was based on both the literature and practice from psychology at that time. United Airlines in 1981 was the first to develop a detailed CRM programme which was based on the “Managerial Grid” developed by Blake and Mouton in 1964. The training was based in a seminar room where pilots were asked to identify their own managerial styles. It is important to note that these classroom activities did not relate to actual incidents from aviation and crew behaviour in the cockpit setting and therefore lacked face validity. Exercises were based on games and activities of a more general nature. Through this process it was hoped that pilots would realize areas that needed to be improved and work on ways to develop their managerial style in the cockpit. For example, one aim of this first generation course was to empower junior crewmembers to speak out with any concern and to continue to do so using decisive terms until the captain received the message being communicated. It was also a major aim that captains would be willing to listen to feedback from junior crew members without fear of the loss of their command authority. Accidents involving such factors were to be discussed (e.g. Portland, 1978).

At this stage it was recognized that CRM training should happen on a recurrent basis each year.
Helmreich, Merritt and Wilhelm (1999) described how the first generation courses expanded to include LOFT. This was when crews flew full mission flights in a simulator and were given the opportunity to practice the interpersonal skills that had been used in the classroom. Despite this realistic setting for CRM training some pilots resisted the concept and saw such courses as a way to influence their personalities. Wilhelm, Helmreich and Merritt (2001) believed that while CRM has evolved over the last twenty years it is important not to overlook the original goals which focused on the limits of human performance and the fact that human performance is fallible and errors will be made.

**Second Generation Crew Resource Management Training**

An important workshop was held by NASA in 1986 where it was hoped that CRM would become a natural part of pilot training (Helmreich, Merritt and Wilhelm, 1999). The term Cockpit Resource Training was changed to the more inclusive title of Crew Resource Management Training and a second generation of training started to become apparent. This included specific aviation concepts as well as modules that focused on team work, situational awareness, and effective pre-flight briefing strategies. Decision-making skills were taught and this included for the first time teaching on how to break the chain of errors that could result in an accident. Helmreich, Merritt and Wilhelm (1999) cited work by Brynes and Black (1993) from Delta Airlines which will also be discussed in detail under a separate heading on CRM course development in Chapter 2. The research by Brynes & Black (1993) was noteworthy as it described how a large United States airline which employed over 9,000 pilots could develop effective CRM training.

**Third Generation Cockpit Resource Management Training**

Helmreich, Merritt and Wilhelm (1999) discussed how this generation broadened the scope of CRM during the 1990s when CRM training evolved to include the organizational culture in which
the crews worked. Teaching included how the organizational culture within a particular airline determined the safety culture under which the crews operated. CRM also expanded to include technical skills along with behaviours that crew could use to operate more effectively. Flight automation was now being introduced on many flight decks and specific modules were planned to help crews adjust to the new challenges in this area. It is significant to note that human factors issues were now included in CRM programmes. CRM also addressed training issues for check pilots which included advanced CRM training. It was also decided at this time to evaluate both human factors and technical flying skills. New captains received modules that would help them adjust to their new leadership roles.

Third generation CRM training was now expanded to include other groups in aviation including flight attendants, dispatchers and maintenance workers. Joint training between pilots and flight attendants was also introduced. However, Helmreich, Merritt and Wilhelm (1999) warned that the reduction of human errors was no longer a major concept in some CRM programmes. This concern was addressed in fourth and fifth generation CRM training.

**Fourth Generation Crew Resource Management Training**

In 1990 the FAA made a major change to training flight crew with the introduction of the Advanced Qualification Programme (AQP). This was a positive move in that it allowed airlines to develop training to fit its own specific needs. Airlines that used this programme were required to provide CRM and LOFT training to all flight deck crews. Evaluation of CRM training became more important and necessary as airlines needed to identify their own specific training needs for each aircraft type and programmes were required to address human factor issues at every stage in their training modules. Special training was also required for check captains who were charged with evaluating crew in full mission simulation scenarios known as Line Operational Evaluation
(LOE). Checklists were developed by individual airlines to include CRM target behaviours. Such checklists will be described in detail in the section on the evaluation of CRM effectiveness.

**Fifth Generation Crew Resource Management Training**

Helmreich, Merritt and Wilhelm (1999) viewed fifth generation CRM as error management, citing the influence of work by Reason (1990, 1997). Error management is viewed as something that will occur and CRM should use a set of countermeasures to avoid and trap error. These countermeasures are summarized as:

- Avoidance of error
- Trapping incidents before they happen
- Mitigation of errors which occur and are not trapped

“The same sets of CRM errors apply to each situation, the difference being time for detection. For example, consider an advanced technology aircraft which experiences a controlled flight into terrain (CFIT) because an improper waypoint is entered into the Flight Management Computer (FMC). A careful briefing on approach procedures and possible pitfalls, combined with communication and the verification of FMC entries would probably avoid the error. Cross-checking entries before execution and monitoring of position should trap erroneous entries. Finally, as the last defence, inquiry and monitoring of the position should result in mitigating the consequences of an erroneously executed command before CFIT”. Helmreich et al. (1999, p. 26)

Helmreich (2000) noted the importance of the actions taken by a crew when an error occurred. The detection of errors was improved when crews took actions such as cross-checking, verifying actions and evaluating decisions. Programmes that included CRM training along with technical flying skills were viewed as a part of successful threat and error training.
Helmreich (2000) believed that there were three cultures operating in aviation which were national, organizational and professional. He further discussed the importance of the recognition of cultures operating in aviation through the world believing that early CRM programmes had merely concentrated on what had occurred in the cockpit without considering the importance of the influence of different cultures. Three cultures were identified and discussed:

1. National Culture
2. Organizational Culture
3. Professional Culture

Pilots with high scores in national culture believed that rules and orders should not be broken. These pilots came from many non-Anglo countries (Scandinavian, Germanic, South American and Asian countries) while pilots from Anglo countries (United States, United Kingdom, Ireland, British Hong Kong, Canada, Australia and New Zealand, (Helmreich & Merritt, 1993) showed a much lower regard for rules and written procedures. Junior pilots from non-Anglo countries were reluctant to question senior pilots’ actions and to inform the Captain of safety critical information. However, junior pilots from Anglo countries were more likely to speak out if they had concerns with the safety of the flight and to share information.

Organizational culture reflected the airline’s policies about error and following SOPs including what actions would be taken against errors ranging from minor to major error where the safety of the flight would be affected. A high level of trust and open communication between management and flight deck crew was essential. Senior management were also seen as enabling adequate safety resources to be allocated where needed.
Professional culture referred to the pilots attitudes to norms and professional pride. Helmreich’s previous research (Helmreich, 2000a) revealed that some pilots believed that their flying skills and decision making would not be affected by personal stress and that their decision making skills were as good in emergencies as in normal flying. While error management has been a major focus of fifth generation CRM other factors such as stress management also needed to be built into CRM programmes.

Helmreich and Merritt (2000) further added to this discussion on the roles of safety and error management as part of effective CRM training. Fifth generation CRM was viewed as an Error Management (EMCRM) model that emphasized the reduction of threats and errors. Some commentators had believed that CRM had failed whenever there was an aviation accident or incident that involved human factors. Helmreich and Merritt (2000) believed that the limitations of CRM should be acknowledged as not everyone accepts the training received. This has been known as the “boomerang” or “Drongo” effect. This is more likely when a foreign airline applies a CRM programme which had been designed for use in the United States. In such cases it is likely that the programme did not reflect the countries cultural norms and offered little relevance to the pilots’ flying duties which often would be highly rule bound with the belief that the captain’s decisions were not to be questioned. Helmreich (1996) had also acknowledged that CRM training does not reach everyone even when additional courses had been undertaken.

Helmreich (2000a) reviewed the lessons in error management that had been learnt during the previous twenty years of CRM in aviation. He outlined the need for a systematic approach that would collect reliable and valid data on standardized forms. These data would provide a sound basis for identifying areas which needed specific safety interventions. Helmreich (2000b) identified the need for the implementation of error management training citing research from the National Aeronautical Space Administration (NASA) that had identified that 70% of aviation
accidents were due to human error (Helmreich, 2000b; NASA, FAA, Aviation Safety Action Partnership, Washington DC; 1999; Advisory Circular 120-66A).

The importance of national culture was viewed as an essential part of the framework. In some cultures it is deemed inappropriate for another crew member to question the Captain’s actions. The recognition of different cultural norms was seen as an essential part of trapping error. Therefore, in countries where crew members thought that the Captain’s actions should not be questioned EMCRM could be taught as a way of empowering junior crew members to speak out in order to avoid and trap errors. The professional culture was also part of this framework with the recognition that some pilots did not recognize stress, fatigue and personal problems. Organizational culture was also viewed as important as it was senior management that would provide the funding and support to produce a positive safety environment.

Wilhelm, Helmreich and Merritt (1999) acknowledged that they were greatly influenced by the work of Reason (1990, 1997). Reason’s contribution to the development of models of accident causation in safety critical areas, including aviation has become a seminal piece of research. Reason’s research is discussed in detail in Chapter 2 as it has provided an important theoretical perspective underlying much of the work on threat and error in aviation.

In 2001 Wilhelm, Helmreich and Merritt developed the Threat and Error Model of CRM – (TEMCRM). This was viewed as an additional layer of protection for managing and trapping threats and errors which would happen due to limitations in human performance. Wilhelm, Helmreich and Merritt (2001) believed that the Threat and Error model is a simple concept that can direct and optimize all activities in the cockpit (and elsewhere throughout the airline). They believed that:
“Communication and coordination techniques which optimize situational awareness; decision-making strategies which acknowledge the effects of time pressure, fatigue, and tunnel vision; and command styles which clarify crewmembers respective roles – all these techniques are designed to avoid, trap or mitigate the consequences of error and manage the threats encountered in line operations” (p. 6)

In order to achieve this, airlines would need to have a non-jeopardy incident reporting system which would allow an airline to develop training to encounter identified problem areas and improve the airline’s safety culture. Support from management is seen as essential to the development of effective safety programmes. Pilots are encouraged to report errors and a timely response from management is seen to encourage more reporting as pilots and other aviation groups can see that action is being taken (Wilhelm, Merritt & Helmreich, 1999).

A good summary of the five generations of CRM was provided by Salas, Burke, Bowers and Wilson (2001) based on the framework provided above by Helmreich, Merritt and Wilhelm (1999). They summarized the five generations of CRM training as follows:

- First generation CRM training focused on psychosocial reasons with classroom exercises focusing on changing individual styles.
- Second generation CRM focused on cockpit managerial styles and dealt with modules on crew dynamics on the flight deck.
- Third generation was extended to cover teams outside of the cockpit, including the cabin crew. This was an important recognition of the role that other groups also play in aviation safety.
- Fourth generation involved the introduction of the Advanced Qualification Programme (AQP) programme which permitted airlines to develop their own programme which
would meet their own needs. However there was the provision under FAR 121 that such training included LOFT and CRM training. Federal Aviation Regulations (FARs) are designed to increase safety by making training requirements mandatory. FAR 121 applies to large air carriers which carry more than thirty passengers. All aircraft flying under FAR 121 need to have weather radar, FAA approved dispatchers, and strict crew rest breaks. This is where the mandatory requirement for crew-orientated training such as CRM and LOFT originated (Birnbach & Longridge, 1993).

• The fifth and latest generation of CRM training focused on threat and error management. This recognized that human error will occur and therefore ways to trap and mitigate error through training were essential.

The influence of culture in the cockpit was explored using data provided from both pilots and flight attendants from twenty airlines in fourteen countries (Merritt & Helmreich, 2002). National and organizational cultures were investigated to determine whether these factors influenced cockpit performance. Merritt and Helmreich (2002) defined culture as:

“the values, beliefs and behaviours that we share with others and help define us as a group, especially in relation to other groups” (p.1)

They sought to understand cross-cultural influences in command authority, communication, individual responsibility, and reactions to stress. CRM was seen to be at risk to cultural influences because of the importance placed on interaction between human beings. Successful CRM training viewed the pilot culture as part of an organizational culture set within a national culture. The measuring tool was the Flight Management Attitudes Questionnaire (FMAQ) which contained 82-items examining attitudes to:
• Leadership and command
• Crew interaction and communications
• Stress
• Work values
• Team behaviours
• Attitudes to cockpit automation

These attitudes, especially crew interaction and leadership and teamwork, are of particular interest for the present study. The results showed that the strongest differences were in command structures attitudes between Anglo and non-Anglo pilots. Anglo pilots believed that it was alright to question the Captains’ decisions and that First Officers should take command of the aircraft under certain circumstances. Pilots also preferred leaders who viewed them as equals and wanted direct and clear communications on the flight deck. Anglo pilots also scored highly on the Information Sharing scale as they were more willing to see the importance of pre-flight briefings and debriefing. Discussion before decisions were made was considered important. Coordination and communication between the flight deck and cabin were also viewed as important by pilots from both Anglo and non-Anglo countries.

Merritt and Helmreich (2002) concluded that the FMAQ was a useful measurement tool for both CRM skills and organizational and cultural climates. They emphasized the importance of many cultural influences on pilots’ behaviour as messages which were not communicated clearly represented a safety threat. These data on communication are of significance to the present study which is exploring communication and coordination patterns between the flight deck and cabin.
The Extension of CRM to Flight Attendants

It is important to note that training in crew coordination skills was not included for flight attendants until third generation CRM. The change in name from Cockpit Resource Management (CRM) to Crew Resource Management (CRM) by most airlines in the early 1990s was helpful in developing CRM training for flight attendants due to its more inclusive title. The importance of the inclusion of flight attendants in Crew Resource Management training was illustrated by an accident at Kegworth in the United Kingdom. The lack of communication between the flight deck and flight attendants was one of the key factors in this accident which is outlined below.

On January 8 1989 a British Midland B737-400 crashed at Kegworth in the United Kingdom killing 47 people and seriously injuring another 74. This included seven members of the flight crew. Both mechanical and human factors errors combined to cause this airline crash.

The Air Accident Report (1990) concluded that the cause of the accident was:

“that the operating crew shut down the No. 2 engine after a fan blade had fractured in the No.1 engine. This engine subsequently suffered a major thrust loss due to secondary fan damage after the power had been increasing due to the final approach to land”. (Air Accident Investigation Branch, (AAIB) 4/90, p. 35)

The flight deck crew faced a critical flight situation where the good engine had been shut down and the damaged engine had failed. In aviation accidents there is generally a chain of events that lead up to the accident and if these are not recognized and appropriate action taken there is a high possibility of an accident occurring. The Captain had ordered the No. 2 engine to be shut down after thinking that the smoke coming from the cabin was coming from a fire in the No. 2 engine. This action reduced both the smell and signs of smoke coming into the flight deck of smoke and
provided evidence to the flight deck crew that the correct action had been taken. However, both passenger and flight attendants were still aware of smoke in the cabin. Some of the passengers and flight attendants also observed fire in the No. 1 engine. The flight attendants did not convey this critical information to the flight deck.

The necessity for better whole crew communication was apparent in this tragedy. The air accident report also made note that the flight crew were not informed that flames were coming from the No. 1 engine by three cabin crew in the aft cabin (Air Accident Report Branch, 1990, p.35). The need for effective joint Crew Resource Management training is demonstrated in this accident. The reasons why the flight attendants failed to inform the flight deck can only be guessed. However they could include the assumption that the pilots knew what they were doing and that the pilots were also perceived as a group of people with higher status than flight attendants.

Figure 1: The Crash of a British Midland B737 at Kegworth, January 8 1989
The relationship between flight deck crews and flight attendants had been identified in the literature as an area of importance for research in the early 1990s; however, this has still remained an area in need of research (Chidester, 1993; Kayten, 1993; Helmreich, Wiener & Kanki, 1993). The present study has provided the opportunity to address this crucial research need with the collection of systematically collected data over a period of time focusing on communication and team work behaviours between the two groups.

One exception to the lack of research in the literature was the description of the development of a CRM training programme from an organizational perspective at one American airline. This had included flight attendants at a time when most of the American airlines were limiting CRM to flight deck crews (Vandermark, 1991). He noted that the programme was favourably received by both flight deck crew and flight attendants, and commented on the importance of corporate support for such programmes.

Chidester (1993) went as far as stating that the coordination between flight deck crew and flight attendants had been assumed in the operational community and largely unstudied by the research community. He suggested that future research should focus on the interaction between the flight deck crew and flight attendants. This viewpoint was further supported by Helmreich, Wiener and Kanki (1993) who believed that it would be essential to include both flight deck crew and flight attendants in CRM training programmes and that researchers should focus on the evaluation of such programmes.

Kayten (1993) also supported this perspective, stating that the need for training and reinforcement of effective communication skills between flight deck crew and flight attendants is an area in need of further investigation. She believed that there were two distinct cultures operating on board a commercial airliner, these being the flight deck crew and the flight attendants. The
present research will investigate factors associated with the development of these two distinct cultures and the implications/needs that have to be addressed in CRM programmes.

A more theoretical approach based on an organizational perspective examined the three distinct patterns of communication found in organizations within aviation; pathological, bureaucratic, and generative (Westrum, 1995). Westrum used a sociological perspective where a successful flow of information was seen as a crucial part of an organization. However, as such an informational flow was ineffective under pathological and bureaucratic communication styles it was seen as vital that an organization moved to a more generative style in which new ideas were welcomed. The generative model has been important in the extension of CRM training to flight attendants with Westrum (1995) providing the example of the Southwest Airlines in the United States. Southwest Airlines had introduced CRM training to all areas of its organization. Westrum (1995) had commented that while organizational structure was important, the key to effective communication was to recognize the importance of the organizational processes. This was especially significant as it was felt that no handbook/checklist could ever cover regulations and procedures for all the situations that might arise.

The extension of CRM to the flight attendants followed the recognition of the important safety role played by flight attendants (Hayward, 1995). This had received additional momentum following two major accidents in which vital information was held by the flight attendants but not conveyed to the flight deck. The accident reports into the accidents at Kegworth, Britain (Air Accident Investigation Branch, 1990) and Dryden, Canada (Moshansky, 1992) which have already been discussed in this chapter, have provided vital information regarding the importance of communication between the cabin and the cockpit and have been incorporated into CRM programmes. Dunn (1995a) also described the Dryden accident to illustrate the importance of teaching CRM skills to flight attendants.
Recognition of an individual crew member’s behavioural styles is important as people perceive things in different ways. Training should be provided that would acknowledge such differences in preferred styles of communication (Johnston and Sullivan, 1995). They believed that CRM programmes should be designed to overcome these barriers by helping crews to appreciate that individual crew members could have different behavioural working styles. It would be important to include practical opportunities to demonstrate that each crew member could hold a different perspective on the same event. The authors’ discussed the personal profile system developed based on the work of Marston. (1969)  Behaviour is divided into four categories; dominance, steadiness, influencing of others and conscientiousness. Crews are required to work through exercises in order to show how they are all different blends of the four styles. For example, crew high in dominance focus on the task at hand and want results while others who are more people orientated wanted to work in a predictable and harmonious working environment.

The extension of CRM training to flight attendants can also be viewed as an additional way to improve an airline’s safety culture (Helmreich, 1996). An example of this need for additional CRM training comes from a Canadian airline in the 1990s. Differences in behaviour patterns between flight attendants and pilots were described by MacLeod (2005). The aircraft type BAe 146 was in service around the world and in the 1990s both pilots and flight attendants noticed a problem with the air recycling system on this aircraft type. Cabin air drawn from the engine compressors and filtered into the cabin had contained contaminants such as engine oil and hydraulic fluids. The pilots did not notice such a strong and immediate effect on their health as flight deck air had lower levels of contaminants; however several pilots in Australia had reported in-flight incapacitation from breathing contaminated air. This was a serious problem and airlines should have recognized and insisted on the rectification of the poor quality of air being recirculated on the BAe aircraft. Court action supported by the unions led to a Senate Inquiry in
Australia, although there was no clear outcome as fume problems were still being reported after maintenance engineers had implemented solutions.

The flight attendant group suffered poorer health which resulted in a number of resignations. One airline in Canada decided that was cheaper to pay sickness compensation to cabin crew rather than change the filters to the air conditioning system on a more regular basis. This would have improved air quality but organizational factors were an important part of decision making by airline management with the cost factor playing an important part. MacLeod (2005) acknowledged that although the pilots were sympathetic to the flight attendants’ cause they were aware that a change of aircraft type back to the Dash-8 turbo-props would not be advantageous to the pilot group. Thus, the pilots were aware of issues such as social status, prestige and pay packets and decided not to officially back the flight attendants. Issues such as these influence how the pilots and flight attendants view each other and make it imperative that CRM programmes break down such barriers.

**Evaluation of the effectiveness of CRM training**

CRM programmes needed to be built and evaluated on reliable and valid data from the aviation community (Helmreich, Kline & Wilhelm (1999); Helmreich (2000)). Five sources were identified:

1. Formal evaluations of performance in training and on the line (Line/LOS Checklists, Line Oriented Flight Training LOFT)

2. Incident reports

3. Surveys of flight crew perceptions of safety and human factors (e.g. Cockpit Management Attitudes Questionnaire CMAQ; Flight Safety Attitude Questionnaire FSAQ; The Flight Management Attitudes Questionnaire FMAQ)

4. Flight Operations Quality Assurance (FOQA)
5. Line Operations Safety Audits (LOSA)

The evaluation of training effectiveness is not usually based on any one method; rather, combinations of methods are used. For example, Amundson (1995) described the development of CRM training at Northwest Airlines in the United States. She reported that the airline used a variety of methods to study the effectiveness of crew communication, including data collected from incident and crew reports. Data were also collected through the administration of the Cockpit Management Attitudes Questionnaire (CMAQ) (Helmreich & Wilhelm, 1991).

Information was collated about the attitudes of both the pilots and the flight attendants to communication and coordination issues. Data analysis revealed that both groups were open to the ideas of CRM training. The survey item that had the greatest endorsement from both groups was the idea that good communication and crew coordination were as important as technical proficiency to the safety of the flight. The data also showed a weakness in the area of the pre-flight briefings given by the pilots, specifically in the quality and frequency of such briefings.

The Cockpit Management Attitudes Questionnaire (CMAQ)

The Cockpit Management Questionnaire (CMAQ Helmreich, 1984; Helmreich, Wilhelm & Gregorich, 1988) had been developed to determine the effectiveness of CRM training at a time when there was only anecdotal evidence available. The CMAQ consisted of 25 items containing statements on crew coordination which had been successfully used in NASA research. Factor analyses had been applied to the items and three scales were identified. These were labelled as ‘Communication and Coordination’ (eleven items), ‘Command Responsibility’ (number of items not provided) and ‘Recognition of Stressor Effects’ (number of items not provided).

Further research conducted into the outcomes of CRM training using the CMAQ had shown that the programmes had been positively received (Helmreich and Wilhelm, 1991). Participants had
been asked to complete a five-point Likert attitude scale ranging from “strongly disagree” to “strongly agree” for each of the 25 items. The overall data showed that crews from both airlines valued the training, especially when its value to aviation safety was recognized. Attitude change was shown to be highly significant in a positive direction on the three scales mentioned above. Highly significant differences in attitudes were also discovered between pilots on different aircraft fleets. Helmreich and Wilhelm (1991) concluded that:

“these findings suggest that CRM training is achieving on one of its stated goals by increasing awareness and acceptance of the concepts of effective crew coordination”. (p.292)

**CMAQ and Line/LOS/LOFT evaluations**

The need for the evaluation of CRM training programmes had also been identified by Helmreich, Foushee, Benson & Russini (1986). This need was highlighted as airlines were implementing CRM courses, including the Command Leadership at United Airlines which focused on crew coordination skills and ways to manage resources in the cockpit. Evaluation methodologies often involve the collection of data using more than one evaluation technique. This was evident in research which focused on attitudes about cockpit management which was then linked to observable behaviours in line flying settings (Helmreich et al., 1986). By 1986 600 pilots had completed the CMAQ survey. Results showed that there were highly significant differences between Captains, First Officers and Second Officers as a function of their crew position flown and the organization they flew for.

Helmreich et al. (1986) then explored the safety attitudes of 163 pilots flying either B727 or B737 aircraft. Five check airman who had flown with the pilots were asked to rate the pilots on their skills in cockpit management on a five-point Likert scale. A one was given for “extremely poor” to a five as “outstanding”. Each pilot was rated by at least two different check airmen. Pilots rated
as “average” were not included in the study along with those who had not completed the CMAQ questionnaire. Pilots were assured of confidentiality and that the de-identified data would be stored in the University of Texas database. A major finding was that there was strong linkage between the CMAQ questionnaire responses and actual flight deck performance. Effective pilots were shown to demonstrate different skills and attitudes than average to poor pilots.

As these items are relevant to this present study fifteen of the most predictive items are shown in descending order with the most highly predictive items shown first. They are taken directly from the summary table from Helmreich et al (1986, p.1199.) They show items which differentiated between poor or average pilots and superior pilots:

1. My decision making ability is as good in emergencies as in routine flying situations. (Superior disagree)

2. Captains should encourage their First Officers to question procedures during normal flight operations and in emergencies. (Superior agree)

3. Pilots should be aware of and sensitive to the personal problems of fellow crewmembers. (Superior agree)

4. The Captain should take control and fly the aircraft in emergency and non-standard situations. (Superior agree)

5. There are no circumstances (except total incapacitation) where the First Officer should assume command of the aircraft. (Superior disagree)

6. First officers should not question the decisions or actions of the Captain except when they threaten the safety of the flight. (Superior disagree)

7. The pilot flying the aircraft should verbalize his plans for manoeuvres and should be sure that the information is understood and acknowledged by the other pilot. (Superior agree)
8. Pilots should feel obligated to mention their own psychosocial stress or physical problems to other flight crew personnel before or during a flight. (*Superior agree*)

9. Captains should employ the same style of management in all situations and with all crewmembers (*Superior disagree*)

10. Conversation in the cockpit should be kept to a minimum except for necessary operational matters. (*Superior agree*)

11. Instructions to other crewmembers should be general and non-specific so that each individual can practice self-management and can develop individual skills. (*Superior disagree*)

12. Training is one of the most important responsibilities of a Captain. (*Superior agree*)

13. A relaxed attitude is essential in maintaining a cooperative and harmonious flightdeck. (*Superior agree*)

14. The Captain’s responsibilities include coordination of cabin crew activities. (*Superior agree*)

15. The Captain should provide clear, direct orders concerning procedures to be followed in *all* situations. (*Superior disagree*)

Captains rated as superior were viewed as effective managers of people, who were ready to listen to advice and encourage other crew members to question decisions. The Captains were also aware of personal issues which could affect a crew member’s flying duties and viewed friendly attitudes on the flight deck as important to safe operations. The Captain was also seen as responsible for coordinating cabin crew actions.

Helmreich et al. (1986) concluded that measures of cockpit attitudes could be used to evaluate Cockpit Resource Management training. They believed that programmes could result in attitude
change although it was viewed as essential to link CRM training with LOFT exercises to enable the new skills and attitudes to be practised and reinforced in a real aviation setting. They concluded that it would be necessary to build a larger data base and evaluate training with pre-and post-training measures.

This finding was further supported by research by Helmreich, Wilhelm, Gregorich and Chidester (1990). An evaluation of CRM training for flight crews using performance ratings had been conducted by expert observers. This longitudinal study looked at cockpit attitudes and the evaluation of CRM training. One group of flight crew had received formal CRM training while the second group was yet to receive this training. The group which had received CRM training perceived it to be highly valuable. These perceptions were reinforced by hard data from the CMAQ where highly significant changes in attitudes were discovered. This research was the first work to examine attitudes and performance before or after CRM was introduced. The expert raters (check airmen and LOFT instructors from the airline) had been given formal training in each of the fifteen areas to be assessed. This included showing videotaped scenarios of crew performances. Crews were rated as below average, average, or above average.

Following CRM and LOFT training crews showed increased ratings in excellent performance along with a corresponding decrease in the number of inferior crew performances. Helmreich et al. (1990) believed that these data had shown that crew performance had been modified for the better. Observer bias was controlled for as the researchers used data only from a rater who had done more than three ratings. The four top causes of above average performance in the airline crews that had received CRM training were:

1. Inquiry – asking for more information
2. Technical skills
3. Advocacy – suggesting a plan of action
4. Decision Making Skills

In the second airline which at that time had not introduced CRM training the four skills associated with poor ratings were:
1. Briefings
2. Communications
3. Inquiry
4. Advocacy

A second major finding by Helmreich et al (1990) was that there were differences in attitudes due to the particular crew position flown. Captains, First Officers and Flight Engineers were found to hold significantly different attitudes. Differences in crew attitudes were also found between the different aircraft fleets. Differences as a function of crew position and aircraft flown had also been found in the research undertaken by Helmreich et al (1986). These findings will be discussed in more detail in subsequent chapters.

Line/LOS Evaluations

The development of checklists used to evaluate crew behaviours and performance in both on the line flying and in LOFT simulator scenarios was seen as an effective way to capture the transference of CRM skills to actual crew behaviours (Clothier, 1991). There had been three different versions developed by 1991. Clothier (1991) described how the first version was based on variables identified from 60 aviation accidents linked to human error (Cooper, White and Lauber, 1980). The second version was based on the CMAQ (Helmreich, 1984). This contained questions based on 14 behaviours scored on a five-point Likert scale. Such behaviours examined included communication and coordination, command responsibility, and recognition of the effects
of stress. The third version reduced 14 behaviours of the second version down to 10. Behaviours selected were considered essential to interaction on the flight deck (Clothier, 1991). The second version was used by Clothier (1991) to evaluate flight crew behaviours before and after initial and recurrent CRM training. The data showed that line flying and LOFT behaviours had shown significant improvements following training. Significant differences had also been discovered between fleet type and crew size with the smaller two person crew showing increased interaction.

**LOFT Training Programmes**

The development of the Line Oriented Flight Training (LOFT) provided the opportunity for flight deck crews to practice CRM skills within the safety of the simulator. Butler (1993) described the development of Line Oriented Flight Training (LOFT) for pilots. Pilots were required to fly a trip in the flight simulator that followed a carefully written scenario, which included the occurrence of non-routine events requiring the crew to problem solve as a team. Accident investigation reports as well as data from incident reporting schemes have indicated the importance of communication and coordination not only between the pilots on the flight deck but between the flight deck and flight attendants. Realistic scenarios have been developed from information in these reports. LOFT training although required by airlines is non-jeopardy which allows the crew to know that their performance would not cost them their jobs, although further training may be required in a small number of cases. The training in the cockpit simulator is videotaped for discussion and debriefing at the end of the exercise. This results in crews identifying good team skills shown and in some instances where communication and coordination skills could have been improved. The videos are then destroyed at the end of the debriefing.
The Flight Management Attitude Questionnaire (FMAQ)

The Flight Management Attitude Questionnaire (FMAQ) was designed to evaluate the training effectiveness of CRM programmes. One of the aims was to develop databases that would show areas where training had been effective and also to show areas that needed improvement. Another reason was to provide senior management with data that would show that their training budget was used effectively. The derivation of the Flight Management Attitude Questionnaire (FMAQ) was based on the work of prominent researchers and then further developed to examine flight safety attitudes as well as exploring how national culture influenced pilots responses (Helmreich, Merritt, Sherman, Gregorich & Wiener, 1993). The first step was to include the 25 item Cockpit Management Attitudes Questionnaire developed by Helmreich in 1984. The authors then obtained permission from Hofstede for the use of his 16-item work values survey module (1998). This was included to capture cross-cultural differences in flight attitudes. A section on attitudes to automation was then included. This resulted in an 82 item questionnaire based on a one to five Likert scale in which pilots were asked to circle responses to each item ranging from ‘strongly disagree’ to ‘strongly agree’. Attitudes were examined to:

- Command
- Communication
- Stress
- Rules
- Automation
- Organizational climate
- Work values
The FMAQ was used by Merritt (1996) to investigate patterns of communication and coordination between pilots and flight attendants. In order to do so the Flight Management Attitude Questionnaire (FMAQ) as described above was given to both pilots and flight attendants from a large commercial carrier. The sample size was not reported. The cockpit-cabin interactions were assessed by the following items:

Q1. Captains should encourage crew suggestions
Q2. I’ll speak up if I see a problem
Q3. Junior crew should not question senior’s decisions
Q4. Crew should not question the Captain
Q5. Subordinates are afraid to disagree

The 1(disagree) -5 (strongly agree) Likert scale showed that pilots strongly agreed with the item that the Captain should encourage crews suggestions (M = 4.5). Cabin crew also agreed with this statement (M = 4.0). For Question 2 the means were: pilots (M = 4.75); cabin crew (M = 4.0). Question 3 which asked for rating on the statement that a ‘junior crew member should not question a senior’s decisions’ reversed this trend: pilots (M = 1.0); cabin crew (M = 2.00). Question 4 which asked crew to rate ‘crew should not question the Captain’ showed a larger difference between the two groups’ means; pilots (M = 2.00); cabin crew (M = 3.50). Question 5 was the only item in which cabin crew gave a higher rating than the pilots; pilots (M = 2.50); cabin crew (M = 3.75).

The FMAQ had also asked crew to rate their preferred leadership styles. Nearly 80% of pilots preferred the consultative style while 45% of cabin crew preferred a directive style. In summary the data showed that pilots preferred a more consultative leadership style while the flight attendants preferred a more directive leadership style. The pilots believed more strongly than the
flight attendants that the Captain should encourage suggestions from the crew, and also felt that they would be more likely to speak up if they saw a problem. However, the flight attendants felt that they should not question the Captain’s or senior crew member’s decisions. They also felt that there were occasions when subordinates were afraid to disagree.

Merritt (1996) also discovered that the pilots were perceived to be of higher status than the flight attendants and that the “power distance” between the flight deck and cabin was viewed as higher than between the captain and the co-pilot. Power distance (PD) is a concept developed by Hofstede (1991) who defined power distance as “the extent to which the less powerful members of institutions within a country expect and accept that power is distributed unequally.” (p.28.) This concept will be discussed in more detail in the following chapter.

This empirical research by Merritt (1996) also showed that there was social unease or awkwardness between the flight deck and cabin. For example, Flight attendants with gaps in knowledge of aeronautical terms felt this unease when reporting technical problems to the flight deck as they did not wish to feel incompetent. This was also found to be influenced by age and gender differences and separation within the company with two different management groups. The physical separation of the flight deck door was another important factor. Pilots were seen to be more competent with their technical expertise. The data also showed that each group viewed the other as having a poor understanding of the tasks involved in each other’s jobs. It was found that 70% of pilots thought that they had a good understanding of the flight attendant’s role, while 70% of flight attendants thought that the pilots did not have a good understanding of the flight attendants’ job. Such information provided a good basis for the refinement of CRM programmes, which could focus on strategies to encourage clear communication in the cockpit-cabin interface.
While Merritt (1996) collected data from pilots and flight attendants from one airline; further research by Helmreich and Merritt (1996) focused only on the pilot population from nineteen airlines. Their research using the FMAQ found a significant agreement ranging from 85% - 100% from the pilots on the following items:

- Good communication and crew coordination are as important as technical proficiency for the safety of the flight
- The Captain’s responsibilities include coordination between cockpit and cabin crews
- The pre-flight safety briefing is important for safety and for effective crew management
- The pilot flying the aircraft should verbalize plans and be sure the information is understood and acknowledged
- I like my job

Wilhelm, Helmreich and Merritt (2001) continued with further research on the Flight Management Attitudes Questionnaire (FMAQ) and provided the reader with guidelines to use in developing their own FMAQ. It is important to note that a three-point Likert attitude scale was used instead of the usual five points. The three points were ‘Agree’, ‘Neutral’ and ‘Disagree’. Where the five point attitude scale has been used the authors suggested collapsing the data into three points. In order to achieve this, the writers provided a framework for data analyses and comparison norms. A report was written for a non-existent international airline named as airline XXX with both domestic pilots and those from another culture named Hobbit land. All the Hobbit pilots were Captains although none held management positions.
The report was entitled “A Generic Report for the Flight Management Attitudes Questionnaire (FMAQ) and its Variants”. It was written for:

- The Flight Management Attitudes Questionnaire 2.0 - (FMAQ) -International Version
- The Flight Management Attitudes Questionnaire 2.1 (US FMAQ)
- Flight Management and Safety Survey (FMASS) - a two-page short version

Coding master files were included for all three versions. Microsoft Chart objects were also embedded to assist in the presentation of results. They also suggested an outline for the presentation of results as follows:

- Who responded?
- Organizational Climate
- Safety Attitudes and Flight Operations Management
- Training and Checking
- Flight Management Attitudes (CRM)
- Automation Attitudes
- Crew Comments

**Aviation Safety Reporting Systems**

**Voluntary Incident Reporting Systems**

Incident reporting systems are confidential and independent of Governments and Regulators so that pilots (and flight attendants) can report safety violations and incidents without fear of recrimination and punitive consequences. However, it is important to note that while the Aviation Safety Reporting System (ASRS) is independent of the Federal Aviation Administration (FAA) it
is funded by the United States Government. The aim is to provide a mechanism to help ensure that such safety related occurrences will not happen again. The incorporation of these reports into training programmes is a key factor.

The voluntary incident reporting system used in the United States is known as the Aviation Safety Reporting System (ASRS). The confidential nature of the scheme means that although crew are not identified it was viewed as important that the aircraft manufacturers and airlines were given reports on the incidents and aircraft type involved in order that necessary safety action could be undertaken when necessary. There was no mandatory requirement to file a report in such voluntary systems (Helmreich & Merritt, 1998).

The Flight Safety Foundation Bulletin “Cabin Crew Safety” (1997) described how a special ASRS reporting form was developed for cabin crew. There had been a concern that very few reports had been received by cabin crew who were seen as a group who would have important safety information. Lack of awareness of the ASRS reporting scheme amongst cabin crew was identified as one possible reason for the low level of reporting. The original ASRS form had been designed for all crew although it was written using technical terminology for pilots that could have indicated that cabin crew reports were not welcomed. Cabin crew unions and airlines were invited for their input in the design of a user-friendly form for cabin crew. A large blank space was also included for additional comments. One such example quoted from the ASRS data base from cabin crew included the following:

“The problem was primarily due to the attitudes of the captain on this trip. It was a two-day trip, same crew both days, two crew in the cockpit and three in the cabin. The captain made some decisions and took some actions that we (the rest of the crew) felt compromised safety. This was an adversarial situation and it was obvious that this put more strain on the first officer also, which
could be a safety problem. The captain set this adversarial tone in his pre-flight briefing to the cabin crew. Most of it was to set up his rules for us, such as requiring us to knock on the door prior to entering the cockpit just in case they were reading the paper or something, so they could put it aside and the passengers would not see them reading during the flight… Apparently this captain got a passenger complaint about this at some time”. (p.5)

**Aviation Safety Action Partnership**

A proactive reporting system known as the Airline Safety Action Partnership (ASAP) was developed in cooperation with the FAA in 1997. Pilots are given immunity, within reason, to report problems within their own airline as well as their own mistakes. These valuable data are then analysed by a specialist team and ways to reduce errors are planned.

The ASAP reporting system was extended to flight attendants who also held valuable information on safety violations. Stewart and Palmer (2006) an experienced flight attendant and an experienced pilot respectively from American Airlines stated that the programme involved the FAA, the airline company and the union(s). The authors gave guidance as to how other airlines both within the United States and internationally could adopt this programme within their own cultural and organizational settings. They noted that it was important to encourage both pilots and flight attendants to report safety issues. The reporting system was designed on a voluntary basis with the aim getting employees to report safety violations with impunity. This would involve a level of trust between the company and employee so employees were notified that if a timely and accurate report was produced there would be no fear from FAA regulators or from company management (unless criminal activity was involved). This would enhance aviation safety through data from the reports which would help in the prevention of accidents and incidents. It was important to note that communication needed to be kept open between management and employees. The employees should realize that reporting an incident could help them and their
colleagues from facing the same threat. This would be reinforced if management published a regular summary of safety recommendations and corrective action taken.

Incident reports could contain both qualitative and quantitative data based on the different methodologies used (Harris, 1995). Confidential reporting systems were an important part of aviation safety but there were difficulties in the identification of longer term trends as the data were often recorded as an unstructured narrative. While incident reports could provide insight into occurrences, they did not provide all the necessary details needed to understand why the event happened. In-house reporting systems were starting to address this issue. Harris (1995) believed it would be important to code the written statements into a framework that would include examining the psychological processes at work.

Another strength of incidents reports is that they can contain data from a number of sources such as pilots, air traffic controllers and passengers (Shappell, 1994). Shappell viewed such reports as having a high ecological validity as they were based on real incidents occurring during line flying. These can then be used in the development of appropriate remedial training or used to highlight deficiencies in CRM type behaviours. However, a weakness in Shappell's (1994) paper was the lack of any mention of reports received from flight attendants. This goes against the unifying theme of this thesis which emphasises the presence of two sub-groups of crew operating on a modern commercial aircraft (the pilots and the flight attendants). This otherwise informative paper would have been enhanced by incidents reports received from flight attendants which would have certainly been available at that time.

**Reporting Systems within an Airline’s Organization**

The British Airways Confidential Human Factors Reporting Programme (CHIRP) required all staff to report safety related events. This information was recorded in a database to look for trends
over time (O’Leary, 1995). This type of trend analysis is often attempted through the use of a statistical software package which analyses data to search for a trend or pattern. For instance, the data could show that one particular aircraft fleet had been experiencing problems in communication between the flight deck and cabin.

Safety issues and failures within an organization need to be reported in order to learn from mistakes. Such reporting programmes are based on the trust that no punitive actions would be taken. The members of the organization need to know that management will treat them fairly and trust is an essential part of this process (Murphy, Crawley & Cross, 2005). They argued that:

“Safety behaviour is dependant upon safety culture, and trust plays a central role in the development and maintenance of safety culture… In order for an organization to learn from failure, the workforce must be willing to report safety incidents”. (p.23)

Trust also helps to develop cooperative behaviour and mutual cooperation. An airline which has a positive safety climate built on mutual trust helps to create a more positive attitude on the flight deck and in the cabin. It would also help crews who had not flown together before to form a team that would be more willing to share information and keep everyone in the loop.

**Flight Operations Quality Assurance (FOQA)**

Digital data from the flight data recorder (FDR) is collected and analysed with other data sources. This again emphasises that evaluation techniques frequently use more than one source. Such data can contain material on the parameters of the flight and whether SOPs have been followed. One example provided by MacLeod (2005) described examining the time taken from the selection of the first stage of flap to the recording of first weight on the wheels. He believed that if the time was short the crew did not have a well configured approach and that their CRM skills would have
been placed under pressure. One drawback to this method is that it is costly to obtain and analyse such data and only fragmentary evidence is provided from such an indirect method of assessment (MacLeod, 2005). Another drawback is that the FOQA does not contain voice data which would give a more rounded assessment. One possible way to overcome this would be to use transcripts from the Cockpit Voice Recorder (CVR) to complement the physical data from the FDR. However, the unions would be very likely to object to this on privacy grounds. Another reason for objection would be that punitive action could be taken against the flight deck crew.

**Line Orientated Safety Audit (LOSA)**

The Line Orientated Safety Audit (LOSA) has been conducted by Helmreich and his colleagues from the University of Texas since 1997. Helmreich, Klinect & Wilhelm (1999) used expert observers to collect data about crew behaviour on normal flights using the University of Texas Line/LOS checklist developed by Helmreich, Klinect, Wilhelm, & Jones in 1999. Data are collected on a non-jeopardy basis and are used to improve CRM training within particular airlines as it can be used to identify trends where safety could be compromised. Therefore data are proactive and can be used to prevent possible incidents and accidents. LOSA can also be used to identify excellent flying skills and used as examples in CRM training. Helmreich, Klinect and Wilhelm (1999) discovered differences in crew behaviour on different aircraft fleets as well as differences within the same organization. They emphasised that organizations needed to be aware that there was a high degree of variability between organizations and fleet types.

They noted that:

“The high degree of variability observed corresponds to differences in the operating environment and, most importantly, demonstrates the power of organizational cultures and subcultures (Reason 1997). Even in the same organization, fleets engaged in comparable operations can vary widely, manifesting their own subcultures.” (p.680)
LOSA has provided an effective measure to evaluate CRM training. In order to do such an evaluation Helmreich and his colleagues devised a classification system for error which resulted in a taxonomy developed specifically for the aviation context. Error was operationally defined as:

“crew error or inaction that leads to deviation from crew or organizational intentions or expectations.” (Helmreich, 2000 p. 6)

The taxonomy contained the following five categories:

- Intentional non-compliance - Violations
- Procedural – Followed procedures but wrong execution
- Communication – Missing information or misinterpretation
- Proficiency – Error due to lack of knowledge or skill
- Decision – Crew decision that unnecessarily increases risk

The following percentages of each error type were observed by Helmreich 2000, p.7 during LOSA line checks:

- Intentional non-compliance 54%
- Procedural 29%
- Communication 6%
- Proficiency 5%
- Decision 5%

Helmreich (2000) believed that LOSA reviews represented:

“a readily observable behaviour that can be assessed and reinforced by training and check personnel. One of the major venues for decision making should be the formulation and sharing of
error avoidance strategies in response to recognize threats. Similarly, detection and management
behaviours are usually observable and can be evaluated and reinforced”. (p.9)

Kirkpatrick’s four level hierarchal model for the evaluation of training effectiveness

Kirkpatrick’s (1976) model for evaluating training effectiveness was based on his MBA
dissertation and has become standard practice for the evaluation of training programmes within
industry and is particularly suited for use within the aviation environment with its unique safety
training needs. These include the necessity to provide effective value for money training in all
aspects of an airline’s operation in order to survive in today’s competitive market. The longevity
of this model provides credence for its use into the 21st century. The four hierarchical levels of
evaluation have not been changed in subsequent publications (Kirkpatrick, D.; & Kirkpatrick, J.;
2005). The four factors identified were: reactions, learning, behaviour, and organizational impact.
Reactions looked at how well the training had been received by the participants; learning
examined whether participants had changed their attitudes and beliefs; behaviour looked at
whether learning had transferred into the operational environment, while the organizational level
evaluated whether there had been positive (or negative) implications in terms of increased
efficiencies as well as the cost effectiveness of training (Kirkpatrick, D.; & Kirkpatrick, J.; 2005).

The validity of the application of the four factor model in the evaluation of CRM training
programmes has been described in the literature by Salas, Burke, Bowers and Wilson (2001);
O’Connor, Flin and Fletcher, (2002); O’Connor, Flin, Fletcher and Helmsley, (2002); and
MacLeod, (2005); Salas, Wilson, Burke and Wightman, 2006). Although these authors used
different methodologies ranging from meta analyses of the research literature, surveys and
interviews to descriptive accounts they are all based on the same four factor theoretical model.
Literature Reviews

Literature reviews have proven a popular way to evaluate the effectiveness of CRM training. A major reason for this popularity is that a number of different studies can be identified through a search of key words in aviation related electronic databases. The resultant review identifies a number of relevant studies already conducted by researchers and summarizes relevant findings. The reader is able to use the reference lists as an additional source in the location of relevant material for their own research topics. Literature reviews have an additional strength as they provide data analyses based on the results obtained from all of the studies reviewed. Such analyses can be time consuming; however, it would often take much more time to conduct longitudinal research within the training department of air carriers.

Salas et al (2001) evaluated the effectiveness of CRM training by evaluating 58 accounts of CRM training in military and civil aviation published between 1983 and 1999 using Kirkpatrick’s 1976 framework. Their definition of CRM for this research was:

“a way to train aircrew to use all available resources-equipment, people and information- by communicating and coordinating as a team.” (Salas, Burke, Bowers and Wilson, 2001, p. 2)

CRM was generally seen as effective and produced the desired behavioural changes and enhanced learning skills. Reaction assessment was seen as the easiest way to collect data. Analyses of these data showed that 46% of the training programmes used such assessment and evaluation strategies. Reaction assessment also included asking participants to rate their liking for the CRM course. The programmes were generally seen in a positive manner by the participants. Learning was frequently assessed through questionnaires on attitude change which demonstrated positive learning outcomes. The transfer of learning to the cockpit was difficult to assess as many studies did not address this level of evaluation. As the papers reviewed had been published from
1983 to 1999 and CRM training for cockpit crews in commercial airlines did not become mandatory until 1998 in the United States this outcome would not have been surprising. Salas et al (2001) believed there was a need for the implementation of a systematic multi-level examination of CRM programmes which would provide more rigorous evidence in its approach to the examination of the effectiveness of CRM programmes.

In 2006 Salas, Wilson, Burke and Wightman updated the literature review of CRM training evaluations conducted by Salas et al in 2001. Kirkpatrick’s (1976) four factor framework was also used in the classification of evaluation strategies. However this time the search was widened to include not only accounts of training from civil and military aviation but from medicine, the oil industry, shipping and nuclear power plants. This new search located 28 published studies which revealed that although data on positive reactions were found there were fewer publications which provided evidence that CRM training had a positive impact on learning and behaviour with only five studies identifying any impact at the organizational level. Evidence of multilevel evaluation (two or more levels from Kirkpatrick’s framework) was found in 12 of the 28 studies (43%) compared with 41% from the 2001 study by Salas et al, which represented only a very small percentage increase. However, when the levels were more closely examined the majority of studies had evaluated CRM training at the reaction and learning level, rather than all four levels of Kirkpatrick’s hierarchical framework. The importance of conducting evaluations at all levels was once again recommended by Salas et al in 2006. In order to do so it was suggested that the evaluation of CRM training should be mandated along with the provision of adequate funding and access to employees in high risk industries. While such a mandate is already in place in the aviation industry requiring CRM training to be evaluated by an approved methodology (European Joint Aviation Authority) this is not the case in the other research domains. (Salas et al, 2006).
A literature review of the effectiveness of CRM training showed that CRM training participants had displayed a positive reaction to training, positive attitude change and effective transference of safety related behaviours to on the line flying (O’Connor, Flin, & Fletcher; 2002). Evidence had been obtained from 40 studies of CRM evaluation techniques in aviation with an additional eight studies from other high risk industries. The strategies to evaluate CRM training effectiveness were then described providing a useful toolkit of ideas. Once again Kirkpatrick’s 1976 four factor model was used to classify each strategy.

Reaction Assessment

- paper and pencil questionnaires, course evaluation sheets

Learning Assessment

- CMAQ (Helmreich, 1984)

Behaviour Assessment

- Behavioural rating systems based on behavioural markers
- Line/LOS (LLC) checklists
- LOSA audits
- Line Operational Evaluations (LOE)
- LOFT
- Non-Technical Skills (NOTECHS)

Organizational Assessment

- Incident reporting
- Air carrier discrepancy reports
• Various equations used to calculate return on investment

A different approach was undertaken in the evaluation of the effectiveness of CRM training programmes (O’Connor, Flin, Fletcher, and Helmsley; 2002). This investigation was undertaken by three of the authors (O’Connor, Flin, & Fletcher) from the literature review discussed above and published in the same year. This study was based on the results of a survey which had been distributed to all aviation companies in the United Kingdom. Participants were first asked whether pilots received initial and recurrent CRM training and if so who had provided such training. Once again Kirkpatrick’s (1976) four factor framework was used to ask whether data had been collected on reactions, learning, behaviour and the organizational impact of CRM training. Participants who did not evaluate CRM training were asked to identify factors which hindered training evaluation. Following this first round of data collection twenty semi-structured interviews were conducted to further explore the survey information. Aviation companies were divided into groups of small, medium, and large operators.

As this thesis has been conducted within a large air carrier only the survey results from large aviation operators will be discussed. Large operators were defined as those who held a Part A Licence under CAA rules in the United Kingdom and who also carried 1% or greater of the available seat capacity per kilometre flown. Using this definition large operators represented 10% (or 11 air operators) of the 113 surveys which had been returned. Large air operators consistently evaluated initial and recurrent training from their own in-house training department as it was felt that evaluations could be designed specifically for the airline’s own operational needs and culture, and also met organizational needs as it was seen as cost-effective (O’Connor, Flin, Fletcher, & Helmsley, 2002). All large operators had carried out evaluations on reactions to training. However, this number dropped to only 18%, or two carriers, when it came to attitude assessment. Only one large operator had carried out any formal assessment of knowledge. This percentage
improved vastly when it came to assessments of CRM behaviours reaching 82% or 9 large operators. Organizational impact was assessed by 36% or four of the large operators.

Assessment methods used by large aviation operators

O’Connor, Flin, Fletcher, and Helmsley (2002) then analysed methods of assessment which have been summarized as follows:

Reaction assessments

- Paper/pencil reaction sheets

Learning and attitude assessments

- CMAQ (Helmreich, 1984)
- In-house attitude surveys

Behaviour assessments

- Behavioural markers
- LOFT
- Simulator checks
- On the line observations
- Informal feedback from check captains

Organizational impact assessments

- Safety performance data
- Incident reporting
• Confidential reporting
• Non-specific flight crew evaluations (e.g. company climate surveys)

Although many different methods used by large air operators have been described above the overall reason why CRM evaluations were not carried out by all air operators was the lack of availability of suitable, easy to use measurement tools. This was particularly noticeable in the medium to small air carriers who did not have in-house CRM training or could not afford the cost of independent aviation training contractors (O’Connor, Flin, Fletcher, and Helmsley, 2002).

The CMAQ (Helmreich, 1984) which has already been described earlier in this chapter was the most frequently used evaluation tool. Reasons for this could be that its use has been frequently discussed in the research literature (Helmreich, Foushee, Benson & Russini, 1986; Helmreich & Wilhelm, 1991). The CMAQ and its subsequent derivations would also have been familiar tools for CRM Managers within aviation; many of whom would have coordinated its distribution to pilots in order provide data for the University of Texas database. The shorter 25 item version would have also provided pilots with a questionnaire which would have taken a relatively short time to complete which could have contributed to a higher response rate.

Behavioural markers have been used frequently in the assessment and evaluation of pilots’ performance on the flight deck, as discussed in the preceding paragraphs. Such a methodology allows for the observation of whether CRM type behaviours taught in CRM training courses have transferred to the flight deck environments. This transfer of learning is at the third level of Kirkpatrick’s four factor model. The Group Interaction in High Risk Environments (GIHRE) project had been set up to investigate how discrete groups of highly skilled professional working in high risk environments managed high workload periods. The research was funded by Gottlieb Daimler and the Karl Benz Foundation which had been established in 1998. Expert practitioners
had met in Switzerland in July 2001 for a two-day workshop focusing on the use of behavioural markers in high risk environments. However, the use of behavioural markers has received mixed reviews as represented by the following statement from experienced CRM and Human Factors practitioners participating in this workshop (Klampfer, Flin, Helmreich, Häusler, Sexton, Fletcher, Field et al, 2001).

“There appear to be many misconceptions regarding the strengths and weaknesses of behavioural marker systems for the measurement of non-technical skills”. (p. 7)

The following discussion will focus on how behavioural markers can be used to evaluate non-technical CRM type behaviours in cockpit crews in aviation while acknowledging both the strengths and weakness of such systems. A set of clearly defined behavioural markers would be a strength as pilots conducting observations would know exactly which markers (usually written as a set or sub-set of categories) to focus on. Therefore, good behavioural markers should describe specific observable behaviours which are well defined and based on clear concepts (Klampfer et al 2001). However, a weakness in the system would occur with broadly written markers such as “displays good CRM skills” as these would be difficult for objective evaluation. Klampfer et al (2001) describe how effective markers should be written, comparing two systems used in aviation; the fourth version (LLC) of the University of Texas and the later NOTECHS system which had been developed in Europe and was based on the core elements from the LLC. Thus, under NOTECHS the category ‘cooperation’ had four elements; ‘team building and maintaining’, ‘considering others’, ‘supporting others’, and ‘conflict solving’ while the University of Texas category ‘cooperation’ contained one behavioural marker which was classified as the ‘communication environment’ (Klampfer et al 2001; p. 27).
Another weakness could occur when trainers had not been adequately briefed on how to use such markers when evaluating the non-technical aspects of pilots’ behaviour, whether in observations on the line, simulator observations (including LOFT) and in LOSA audits. Klampfer et al (2001) believe that experienced check captains should receive training over a two day period and that video segments of targeted behaviours be used to make training more realistic. In order to allow time for individual practice and questions group size should be limited to 8-12 persons. This training should make the use of behavioural markers more reliable and valid; reliable in that inter-rater reliability could be calculated and valid in that such observations are based on behaviours which occur during cockpit crew interactions and would therefore have high face validity. There is no doubt that markers will continue to evolve with the introduction of new technologies and systems must be updated to reflect this. This is an area where researchers and practitioners can work together to provide the best possible outcomes for the evaluation of CRM training and cockpit crew behaviours.

There is very little research on the development of behavioural markers for cabin crew. Qantas, an Australian based international air carrier funded research aimed at developing expected safety behaviours (ESBs) for the training and assessment of cabin crew (Simpson, Owens, & Edkins, 2004). Cabin crew markers were developed through what the authors described as the use of valid scientific methodology as they believed that previous behavioural marker systems had not been based on robust scientific research. However, Simpson et al, (2004) may have overlooked the research described above in the GIHRE project in 2001 in which behavioural markers had been developed through data obtained from a large number of cockpit crew observations undertaken by expert practitioners. In order to find the middle ground it is important to acknowledge that although systems may have been developed and validated using different methodologies it is the end product that is important. It is also possible that different target populations (cockpit crew or cabin crew) could require different methods to develop reliable and valid sets of behavioural
markers. The key question would be whether the marker set focuses on the observation of clear and observable safety targets.

Simpson, Owens, and Edkins (2004) discussed the methodology used to develop the set of ESBs to assess and evaluate cabin crew behaviours providing enough detail for this methodology to be replicated. The Critical Decision Method (CDM) uses the interview format where expert practitioners (in this study represented by experienced cabin crew) are presented with probes relating to non-normal events and asked to state what their behaviour would be. The responses are then collated and behavioural markers identified.

The CDM process is suited to evaluation of CRM training programmes for cabin crew. Simpson, Owens, and Edkins (2004) invited 80 lead flight attendants (Pursers, Customer Service Managers (CSM) or Cabin Supervisors) to attend these semi-structured interviews which were conducted on an individual basis by experience CSMs. The CSM was asked to recall a challenging non-routine incident which had occurred during the past 18 months. Then both the interviewer and participant create a time line relating to decision making events. The interviewer then identifies specific decisions that had been made and probes reasons behind such decisions, including the use of the probe “what if”. A set scenario based on a real Qantas incident which had involved smoke and fumes in the cabin was then presented and the participant was asked to identify decisions they would have made if they had been CSM on that aircraft. The Qantas team, including psychologists and senior cabin crew, analysed the critical incidents which had been identified and found that these had been grouped around situational awareness, operational understanding, passenger management issues, understanding of operational events negotiation skills and resource management (Simpson, Owens, and Edkins, 2004).
The use of such behavioural markers in a LOSA type evaluation for flight attendants carried out in line flying was discussed although the authors believe that they have only provided a first step in LOSA for flight attendants as they admit that the cabin environment (unlike the cockpit for pilots) is more problematic for such observations. My discussions with both flight attendants and pilots during this research would support this view, as even the mock-up aircraft used in training did not have direct lines of sight for reliable and valid observations. I would submit that the small upper deck of the B747 could provide a starting point as there are clearer lines of sight (with the exception of the large galley) and that it is also located near to the locked flight deck crew. The upper flight deck cabin crew would have to follow protocols to provide food and beverages to the flight deck crew.

**Barriers to effective communication between flight attendants and pilots**

The unifying research theme for this thesis is that while modern aircraft operate with one crew there are two subcultures on the aircraft as the crew are neither separate individuals nor a single homogenous group. Since the early to mid 1990s it has been suggested that ‘crew’ consist of two separate sub-groups or two distinctive cultures represented by pilot and flight attendant sub-groups (Chidester, 1993; Kayten, 1993; Chute & Wiener, 1995, 1996; Wiener & Kanki, 1993). Incidents and accidents (e.g. Kegworth, 1989; Dryden, 1989) which highlighted failed teamwork and communication between the two sub-groups led the aviation industry to examine joint CRM training as a way to improve team work and communication. A major reason for the creation of barriers to effective communication and teamwork on-board modern airliners is the existence of two sub-groups representing two different cultures.

Chute and Wiener (1995) have also suggested that pilots and flight attendants operating on commercial airlines represented two distinct cultures and that such a separation between the two crews could result in less than optimal teamwork. Literature reviews, incident and accident data
along with their own research data based on pilot and flight attendants perceptions of each others role and responsibilities provided the basis for this belief.

An attitude survey conducted with pilots and flight attendants from two United States airlines (pilots, n = 177, flight attendants, n =125) provided data which identified specific areas in which these two different cultures possessed different attitudes and perceptions (Chute & Wiener, 1995). Barriers to communication often occur in such instances. The following barriers were identified:

- Organizational separation
- Scheduling issues with different crew changes during the same tour of duty for flight attendants and pilots (different union conditions)
- Lack of time for full crew introductions and pre-flight briefings
- Physical separation of the flight deck door

**Organizational separation**

Data showed that both pilots and flight attendants had similar views on the benefits of operating under one company department rather than two separate departments (63% pilots, 68% flight attendants agreed with a ‘Yes’ response) It was seen important that communication would be clearer with less opportunity for errors when the same operational message was provided to both groups. Even when pilots and flight attendants did ‘not agree’, the importance of joint/coordinated training was acknowledged.

**Scheduling Changes**

Both flight attendants and pilots were asked the question “Do you notice work-related differences when crews are paired together for more than 1-2 leg?” (‘Yes/No’ response). Both groups strongly affirmed this question (pilots, 78%, flight attendants, 72%). Therefore, crew changes
were viewed as a barrier to crews getting to know the other group. Both crews noticed it was beneficial when they could operate together over an entire trip.

**Crew Introductions and Pre-flight Briefings**

The flight attendants thought that crew introductions initiated by the pilots was just not a courtesy, but an important way of setting the tone for the flight, especially as cabin-cockpit pre-flight briefings did not always happen due to time restraints. The pilots also agreed on the importance of introductions although it was thought that the flight attendants should take the initiative. However, the importance of a pre-flight briefing was recognized by both groups as extremely important in setting the tone for the flight even if airline schedules and different crew changes did not allow for this. Chute and Wiener (1995) explored this topic further by asking both pilots and flight attendants how often a pre-flight briefing did occur. Once again both groups held quite different perceptions of the frequency with pilots perceiving that briefings occurred far more often (between group statistical analyses not given due to different wording of questions).

**Physical separation of the flight deck door**

The lack of visual contact caused by the closed flight deck door resulted in both pilots and flight attendants being unable to see each other. This resulted in pilots wondering why their crew meal had not been delivered as they could not see the high-workload in the cabin. However, the flight attendants did not fully understand the high workload times on the flight deck and often delivered meals then, just as the pilots were fully occupied with descent and could not eat the meal. Flight attendants perceived that the closed flight deck door also meant that the pilots could not see the severity of turbulence at the rear of the aircraft; therefore, requests to the pilots to turn the seat belt sign on did not always happen. The question which asked flight attendants how often they encountered turbulence without prior notice from the pilots showed that 87% of flight attendants rated this 3 (sometimes) to 5 (frequently) on a five-point Likert scale.
Future Recommendations (Chute & Wiener, (1995))

The following solutions to barriers to communication and team work were made by Chute and Wiener (1995):

- Joint CRM training
- Jumpseat rides for flight attendants
- Participation of pilots in some cabin service training
- Reorganization of Flight Operations and In-flight Services into one department
- Time allowed for pre-flight briefing and introductions

The introduction of such measures was seen as a way to break down communication barriers between the two different cultures operating on an aircraft.

Chute and Wiener (1996) continued to expand on the importance of effective communication between the flight deck and cabin in another journal article published the following year. The dilemma facing flight attendants in situations in which it was necessary to decide whether to take safety critical information to the flight deck was discussed. Accident and incident reports along with attitude surveys conducted at two United States airlines showed that there was still confusion over what and how information should be passed onto the flight deck, especially under “sterile cockpit” procedures, and that pilots and flight attendants had different perceptions of the importance of flight related information. For example, results showed that over 60% of the pilots wished to be told of a catering problem while only 8% of the flight attendants surveyed said that they would tell the flight deck.
Results also showed imbalances in authority and in the chain of command. While the captain was clearly seen as in command of the aircraft it was found that there was some ambiguity over which flight attendant would be specifically responsible for communication with the pilots. The results showed that while the lead flight attendant would take this responsibility in theory, this did not always happen in practice. Chute and Wiener (1996) commented that the relationship between the lead flight attendant and other flight attendants was not as structured as that between the captain and flight deck crewmembers. This statement could have been further amplified; as flight attendant crew complements (up to fourteen flight attendants on a long-haul flight) are always larger than the complement of pilots there could be confusion over the lines of communication, both within the cabin and between the cabin and flight deck. This could be a barrier to communication as each flight attendant could assume that either the lead flight attendant or the flight attendant with the information had conveyed this on to the pilots.

Chute and Wiener (1996; 2000) identified five factors as barriers to effective communication between flight deck crew and flight attendants and put forward a theoretical model in which each of these five factors (Historical, Psychosocial, Physical, Regulatory and Organizational) works as a filter by which crewmembers make decisions on whether to pass information on to other crew. These five factors are outlined in more detail below.

**Historical Barriers**

This refers to as far back as the 1930s when the original flight attendants were viewed as nurses to look after airsick passengers and were required to salute the pilots. Under these circumstances there was little conversation or contact between the two groups.
Psychosocial Barriers

This refers to social factors such as age, gender, racial, and national differences which would hinder communication between pilots and flight attendants. They cited the crash at Dryden described earlier in which the flight attendants falsely assumed that the pilots knew what they were doing with regard to de-icing.

Physical Barriers

This refers to the closed flight deck door which restricts the flight attendants from recognizing high workload times on the flight deck. The opposite is also true in that the pilots can not see the high workload times in the cabin and often use the interphone to ask for a meal when the flight attendants are busy with meal service delivery to the passengers.

Regulatory Barriers

This refers to Federal Aviation Administration (FAA) or other relevant authority regulatory requirements. The flight attendants are for example aware of the “sterile cockpit rule” which requires no irrelevant communication with the flight deck below 10,000 feet. The flight attendants have faced a dilemma of deciding what essential information is and often err on the side of caution by not communicating vital information to the safety of the flight. This has been an implicating factor in accidents as previously discussed in this chapter.

Organizational Barriers

This refers to the difficulties encountered when pilots and flight attendants belong to two different departments in the airline. They each report to different senior managers which limits the opportunities to communicate. The two groups are also represented by different union bodies which emphasizes different contractual agreements.
Chute and Wiener (1996; 2000) outlined ways, again emphasising the importance of joint CRM training, clarification of the “sterile cockpit” rule, pre-flight briefings, crew introductions, and communication of an accurate and timely flow of information pilots and flight attendants, and flight attendants and pilots.

**Barriers to effective communication – lack of technical knowledge in the flight attendant sub-group**

**Lack of technical knowledge in the flight attendant group**

A significant barrier to effective teamwork and communication has been lack of sufficient technical knowledge provided in initial and recurrent flight attendant training. Accidents discussed at the beginning of this chapter (Kegworth, 1989; Dryden, 1989) demonstrated how flight attendants were aware of potential technical problems but falsely assumed that the pilots would also be aware of the situation and would be using their expert technical knowledge to solve the problem. Therefore, crucial information held by the flight attendants has not been passed onto to the flight deck crew. In aviation any assumption is a possible threat to the safety of the flight and barriers to effective transfer of information between flight attendants and pilots need to be explored.

Dunn (1995a) described the Dryden accident to illustrate the importance of teaching CRM skills to flight attendants. She believed that it was essential to include joint CRM training as part of a safety programme. It was also believed that it would be essential to provide some training for flight attendants in basic aerodynamics. This could include information involving technical terms such as flaps, ailerons and rudder. It was thought that this would enable flight attendants to have more confidence in reporting events to the flight deck as they would be able to provide more
accurate descriptions based on their increased knowledge of aircraft terminology. This would also potentially provide the pilots with more accurate information to deal effectively with the situation.

The need for such empirical research was identified by Dunbar, Chute, and Jordan (1997) who conducted an evaluation of cabin crew technical knowledge from the perspectives of both pilots and flight attendants. Flight attendants from two United States airlines were invited to complete a questionnaire measuring their technical knowledge. Two questionnaires had been designed using a five-point Likert scale; the technical questionnaire contained 13-items examining knowledge of basic aerodynamics, aircraft systems, and procedural issues. The first ten-items consisted of multiple choice questions followed by three short-answer questions. Pilots and a different group of flight attendants were then invited to complete the flight attendant and pilot expectation survey. This was based on perceptions of both sub-groups that flight attendants would be knowledgeable in a given technical area. In this case a five-point Likert scale was used for the first ten-items followed by three short answer questions on particular skill areas.

Barriers need to be identified in the first instance so targeted remedial action can be taken. The research by Dunbar et al (1997) provided data which identified gaps in flight attendants’ knowledge in technical areas. These specific areas could then be addressed in both initial and ongoing recurrent training for flight attendants. These barriers to teamwork and effective communication will be described in more detail.

**The “sterile cockpit”**

“Sterile cockpit” rules were unclear; flight attendants were unsure under which circumstances (if any) messages should be conveyed to the cockpit while the aircraft was below 10,000 feet. Flight attendants had been asked what they would do when presented with the following scenario “You
are sitting at an exit door. One minute after takeoff you hear an UNUSUAL whistling sound that appears to be located near the door. As lead flight attendant what action would you take?” It is a matter of concern that less than 50% of the flight attendant sample (n = 200+) would pass the information onto to the pilots.

**Smoke in the cabin**

It is important that flight attendants can identity the difference between the smoke from an electrical fire or from smoke from a heating system. Fire in the cabin is a serious situation and technical knowledge of the different types of smoke could save vital minutes if timely and correct information is conveyed to the pilots. Again the majority of flight attendants were either unaware or could not accurately identify such differences. The reader should note that the question was not focusing on the actual fire fighting skills of flight attendants but rather on knowledge of smoke detection. Flight attendants have annual recurrent training in fire fighting skills and it would be a logical step to emphasize the different types of smoke, especially as this would guide fire fighting approaches.

**The Auxiliary Power Unit (APU)**

The Auxiliary Power Unit (APU) start up procedure often has a flash of fire which is self-contained engine fire and not a problem; however, only 50% of flight attendants identified this as a common occurrence. This technical knowledge is important as flight attendant can immediately reassure passengers and ensure that passengers are not heading to the emergency exits. However, I have discussed this with a senior Captain from Airline ABC who believes that this is a rare occurrence and in such cases the Captain would elect to return to the gate for safety checks to be completed. The APU is also difficult to see from some parts of the cabin.
Knowledge about the theory of flight

Lack of knowledge about the theory of flight was identified as the most challenging area and largest gap in the flight attendants’ technical knowledge. The results showed that only 29% could identify lift, weight, thrust, and drag as the four counterbalancing forces involved in flight. Dunbar et al (1997).

Knowledge of the aircraft systems and procedures

Knowledge of the aircraft systems and procedures showed a more promising outcome with 86% of flight attendants able to identify the importance of the hydraulic system in providing power to the ailerons, elevators and rudders on large jet aircraft. The identification of the problems associated with ice and the importance of de-icing was recognized by 82% of flight attendants. In this instance it is difficult to judge the effect of training on the knowledge as flight attendants would be very aware of lack of adequate de-icing from the Dryden accident in 1989.

This could also be true in the recognition of the importance of hydraulics following the Sioux City crash in 1989. On July 19 1989 a DC-10 operating as United Airlines flight 232 crashed at Sioux Gateway Airport following a catastrophic failure of all three hydraulic systems after the No 2 engine had failed. Flight deck crew assisted by a positioning Check Captain had manipulate the throttles of the remaining No1 and 3 engines in order to keep the aircraft in the air, arrange an emergency descent and emergency landing at Sioux City.

Knowledge about aircraft components

Flight attendants were presented with a diagram of an aircraft and asked to match eight labels of parts to the correct position on the aircraft. It was found that only 11% of the sample could correctly match all components to the aircraft diagram (ailerons, elevators, horizontal stabilizer, leading edge flaps, rudder, spoilers, trailing edge flaps, and the vertical stabilizer). These
components are essential parts which enable an aircraft to take off, cruise and land safely so this is obviously an area in need of additional course content in training courses and training materials. Another concern was that only 17% of flight attendants had the technical knowledge that aircraft are labelled left to right (when facing forward in the aircraft). This lack of knowledge was one of the many factors which could have helped to prevent the Kegworth accident as flight attendants could have had more information on which to voice their concerns to the flight deck crew over which engine was actually on fire.

Dunbar et al (1997) then calculated the percentage correct answers to provide an overall score (M = 61%). They also explored whether these scores were influenced by years as a flight attendant or time since last recurrent training. The Pearson correlation coefficients showed that no significant relationship was found between years as a flight attendant or time since recurrent training. However, when the results were calculated using the overall scores from the 16% of flight attendants who had identified previous piloting experience this flight attendant group had significantly higher scores on the questions on basic aerodynamics, smoke and fire detection systems and knowledge of aircraft components.

The second measuring tool designed for use in this study was a survey on the expectations of flight attendants knowledge completed by both pilots and flight attendants. The 5-point Likert scale was anchored with 1 = not at all knowledgeable to 5 = very knowledgeable. The results showed that both pilots and flight attendants expected flight attendants to be knowledgeable about the “sterile cockpit” rule and safety procedures but less so with knowledge of the theory of flight and basic aerodynamics. Technical knowledge was identified as an important area to be addressed in future flight attendant training. It was thought that this would increase the flow of valuable safety information to the flight deck as flight attendants would feel more confident in reporting safety issues Dunbar et al (1997).
The Sioux City crash was very successful example of effective CRM skills and as such a more detailed account has been included earlier in this chapter. While Dunbar et al (1997) noted that a flight attendant had reported damage to the back wing to the flight deck; the Second Officer’s inspection noted that this was actually to the horizontal stabilizer. Dunbar et al (1997) commented that the accident report (NTSB, 1989) identified that lack of technical knowledge amongst flight attendants was a serious concern with potentially serious consequences. This was to be later demonstrated in the Dryden and Kegworth accidents which occurred in 1989.

While lack of technical knowledge was identified I would submit that the Captain would have sent a flight deck crew member to assess the damage anyway, as in this case even if flight attendants correctly named an aircraft part it would not be expected that they could supply the Captain with the exacting amount of technical information needed following such a catastrophic failure. Also, the two sub-groups did work effectively as a team as there was a flow of information between the flight deck and cabin and visa versa; one of the most crucial was that a flight attendant immediately passed information to the Captain that there was a DC-10 Check Captain in the passenger cabin who had volunteered to assist. This additional experienced pilot proved invaluable as he was able to contribute and execute some of the problem solving strategies the flight deck crew had discussed including the manipulation of the aircraft’s throttles to maintain differential control of engine power to manage the lateral and vertical flight path.

I was travelling on a DC-10 when the Captain did indeed send one of the two FOs back to check on the No2 engine. Earlier in the flight I had the privilege of being invited by the Captain to sit on the flight deck for a while during a long-haul flight operated by a DC-10 aircraft. This would have been in the 1970s well before the Sioux City crash. After I had returned to my seat in the passenger cabin I noticed that the FO was walking towards the back of the aircraft carrying a
torch. I had realized that there had been some teething problems with the No2 (tail engine) and immediately thought there could be a problem with the engine even though there had been no loud noise from the tail of the aircraft. I also thought a diversion would be announced. As it was the middle of the night the announcement about the diversion came just after the cabin lights were turned on for breakfast which was served earlier than usual. The diversion was announced due to technical problems (the No2 engine had indeed been shut down as a precautionary measure).

**Barriers: Lack of trust between senior management and aircrew**
A significant barrier to effective teamwork and communication occurs when there is a lack of trust towards senior management. Organizational management must develop trust between senior management and the pilots (and flight attendants) in order to encourage error reporting. Steps could then be taken to create new training methods to trap threats to flight safety. This would include an organizational culture which takes a non-punitive approach to errors expect when these were intentional violations. Aircrew also needs to see that management is addressing reported safety concerns (Helmreich, 1999).

The importance of trust is summarized by Helmreich (1999):

> “If there is not trust and a non-punitive policy toward inadvertent human error, the organization will not hear from its members and will not be in a position to take a proactive stance toward safety.” (p.3)

**Countermeasures to Barriers to Communication**
Evaluation methods used in the assessment of CRM training effectiveness should be able to identify barriers to communication and team work between the two sub-groups operating on an
aircraft (pilots and flight attendants). A Line Orientated Safety Audit (LOSA) was conducted for airline ABC in 1998 by staff from the University of Texas. It contained a question asking pilots to identify any barriers, which could hinder flight deck/cabin operations. The main issue identified was the absence of joint flight deck and cabin crew training. The pilots were strongly in favour of the introduction of joint training. The need for a joint flight deck and cabin crew reporting area was also seen to be important as it would help with pre-flight briefings. Training which involved the sharing of each other’s roles and responsibilities was also seen as important and it was felt that this could be addressed in the joint training sessions.

**Key areas in CRM training**

Kanki and Palmer (1993) referred to a NASA/CRM workshop outlined by Orlady and Foushee, (1987) where seven major CRM areas were identified.

These were:

1. Communication
2. Situational awareness
3. Problem-solving/Decision–making/Judgement
4. Leadership/Fellowship
5. Stress management
6. Critique
7. Interpersonal skills

Communication is the central platform on which all the above CRM skills are built upon. For example, good interpersonal skills are linked to effective communication amongst all the team. Communication and coordination skills for both pilots and flight attendants are a key theme in this thesis.
**Situational awareness**

Situational awareness is another major platform for CRM training.

Kanki and Palmer (1993) cite a comment made by Schwartz (1987), on situational awareness. This stated:

> “that the key to safety lies within the group’s level of situational awareness rather than the cumulative awareness of individual crewmember. The dynamics involved in “group situational awareness” hinge on cockpit management skills such as communication, managing people, command and leadership” (Kanki and Palmer, 1993, p. 130.)

The Human Factors Programme Manager at the ABC airline in this research (April 2007, personal communication), has also suggested that “situational awareness” (SA) is a key factor in the development of efficient aircrew communication and coordination training skills.

Durso et al. (2006) suggested a good definition of the complex construct of situational awareness (SA) believing it was based on a number of cognitive processes. They stated that when put in less complex terms it was how the operator, for example the pilot or flight attendant, understood a particular situation. This comprehension was seen to be based on cognitive mechanisms including working memory, long term memory and knowledge. SA was seen to also involve perception of the environment, understanding of information obtained through the senses, and putting that information into action in terms of safe and effective decision making. Good SA skills were seen as likely to result in safe performance. However the loss of SA has often been viewed as the cause of failure and crashes. The authors cited the example of loss of SA, where aircraft are involved in a controlled flight into terrain (CFIT).
Controlled flight into terrain (CFIT) has proven to be an important safety issue today with the Aviation Safety World Journal reporting five accidents on commercial jets attributed to CFIT in 2005. It was also reported that CFIT and loss of control (LOC) accidents accounted for 62% of airline fatalities for the ten year period from 1995-2004. This shows an important area that has continued to need CRM exercises, simulator training, and LOFT training exercises. Examples such as CFIT accidents could be used to emphasise the importance of good CRM skills in the cockpit. The captain is the team leader and is responsible for seeing that someone is actually flying the plane and monitoring instruments at all stages of the flight. When Airline ABC introduced the DC-10 aircraft to its fleet, the American training pilots emphasised that “someone must always be left minding the office”, (personal communication, May 5, 2009). Diffused responsibility is a psychological term which in essence means that everyone present assumes that someone else has, or will taken action. CRM training should also include this when it examines the link between the cockpit crew and Air Traffic Control (ATC) so that the flight deck crew do not assume that the ATC controllers will always notice if they are flying into terrain.

This means that the sum of the group’s efforts is greater than the same tasks completed on an individual basis. Each crew member may be delegated a specific task by the Captain and the outcome is dependent on the whole group working together as a team. For example, one individual may recognize that a problem exists and would communicate this to the team who work together to take action to find a solution. Thus, one key to develop effective situational awareness skills would be to provide opportunities for group training. This would include classroom exercises, simulator training and exercises in mock-up aircraft.

Sumwalt, Thomas and Dismukes (2002) believed that effective crew monitoring and cross checking was often the last line of defence in accident prevention. They cited the University of Texas LOSA line audit, (Helmreich 2001) which included data from 2000 flights that 64% of
“unintentional errors” could have been detected and trapped by more effective crew monitoring and cross checking. Sumwalt, Thomas and Dismukes (2002) concluded that CRM courses needed to emphasize the importance of crew monitoring. Such skills needed to be taught and they cited the experience of one United States airline that developed an “active monitoring concept”. Management had bought into the programme and new Standard Operating Procedures (SOPs) had been developed to reflect the need for behaviour change. The programme included four basic skills which were:

1. Developing well thought out SOPs
2. Training that focused on specific monitoring skills
3. Opportunities to practice the new skills
4. Ways to evaluate the effectiveness of the new programme (Sumwalt et al. 2002, p.3)

From the inception of the new monitoring and cross checking programme for flight deck crews it was recognized that safety initiatives needed to be evaluated to ascertain whether they were achieving their desired goal(s). In this case check pilots were asked to evaluate trainee pilots monitoring and cross checking skills from the first day of training. Fleet captains obtained advice on how the programme could be improved. Once all the pilots have been through the course such skills would be evaluated on check flights. In order to accommodate this additional requirement training forms were modified to include monitoring and cross checking skills. The authors also recognized the need to statistically evaluate pilots’ monitoring skills before and after participating in the new programme. The need for collaborative research with other airlines was also recognized.

Thomas (2003) described how LOSA type evaluations could be adapted in order to improve organizational safety. He identified ways in which airlines could identify safety deficiencies
before incidents or accidents occurred. He described two accidents which occurred following
deficiencies in training programmes. They both occurred on Australian registered aircraft.
The following descriptions are written in my own words from the knowledge gained through
reading the accident reports. Thomas has provided greater detail in his descriptions on pages 3 &
4 of his paper.

An Ansett B747 aircraft landed at Melbourne during the mid 1990s after confusion amongst the
flight deck crew over whether all landing gear had been locked down. The nose wheel had not
been locked down and the aircraft landed heavily without loss of life. The crew did not pick up
that there needed to be five green lights illuminated on the instruments, rather than the four that
had been showing. The crew was new to this aircraft type and would have needed further training
which had not been set in place by the airline (Personal communication, Airline ABC B747
Captain/ Simulator Instructor).

The second incident involved a Qantas B747 aircraft which aquaplaned off the runway during a
night landing at Bangkok. This incident will be described (along with photographic
documentation) at the end of this Chapter. Thomas (2003) identified these incidents as examples
of deficient crew training in effective coordination and communication skills as well as the failure
of the crews to identify possible threats. Thomas (2003) therefore recommended a pro-active
system (as opposed to a reactive system) so organizational performance evaluations would be
linked with the evaluation of the actual training systems.

Thomas (2004) conducted a study with crew from a Southeast Asian airline in order to identify
both threats and errors and the ways crews were able to mitigate these by trapping threats through
CRM training and effective communication skills. This study had a high level of face validity as
observations were conducted during scheduled flights. Such observations would be similar to
LOSA audits when skilled observers from the University of Texas observed flight deck behaviour in order to identify the strengths and weaknesses within the airlines’ fleets. Thomas also used this methodology to develop a predictive framework for threat and error management.

Thomas and Petrilli (2006) followed up on the previous studies by examining whether crew who had flown together before were more effective in identifying threats and errors than crews who had not meet before. Again, LOSA type observations were undertaken by trained observers on routine scheduled flights on a narrow-bodied aircraft fleet from the same airline. The sample size was large for this type of study with the voluntary participation of pilots which enabled observations of CRM and non-technical skills on 154 flight segments. The results indicated that there was no significant difference in crew familiarity for CRM type skills. However, differences were found between the ways familiar and unfamiliar crews coped with errors with unfamiliar crews demonstrating a higher rate of errors.

**Examples of CRM leading to successful outcomes**

**Sioux City, Iowa**

On July 19 1989 a DC-10 operating as United Airlines flight UA232 crashed at Sioux Gateway Airport. The National Transportation Board (NTSB) had the responsibility for the crash investigation and produced a 129 page report (NTSB, 1990). This accident report will be reviewed to illustrate excellent teamwork from both the flight deck and cabins crews. The aviation world has recognized this accident as a good example of effective CRM training applied under challenging and difficult circumstances (NTSB, 1990; Kayten, 1993).
Background Information

The No2 engine, which is located on the tail of the DC-10, underwent a catastrophic failure when fragments from the fan rotor blades engine separated from the engine. This resulted in the loss of the three hydraulic systems that controlled the aircraft’s flight. The flight deck crew had enormous difficulty in controlling the aircraft and declared a “Mayday” (the highest emergency condition). The nearest airport was Sioux Gateway airport in Sioux City. This airport was not equipped for large jets and there was a lack of airport rescue and fire fighting services. However, there were 295 National Guardsmen on their monthly training exercise at the airport who provided additional support in terms of first aid, organization and communication. The accident also occurred at a time when the two shifts were changing over at the local hospital so double the usual medical teams were available to treat the injured. The aircraft carried 285 passengers and eleven crew members. One flight attendant and 110 passengers died when the aircraft crashed on landing at Sioux City.

Effective CRM skills

It is important to look back and examine how the crew reacted when they faced enormous difficulties in controlling the plane. Effective CRM skills will be identified. Shortly after the engine failure the senior flight attendant was called to the flight deck to be briefed by the Captain to secure the cabin and prepare for an emergency evacuation. This showed that there was good communication between the flight deck and flight attendants despite the challenging conditions faced. She then returned to the cabin and briefed her flight attendant team on an individual basis. One flight attendant reported back to the flight deck that a United Airlines DC-10 Check Captain had come forward to offer his assistance. Good communication with the flight deck was observed as this was reported back to the Captain immediately. The Captain invited the off-duty check airman to the flight deck immediately.
Crew resource management focuses on using all the resources available and the check airman was asked by the Captain to go back into the cabin and observe the state of the engines and wings. He reported back that the ailerons were slightly raised and the spoilers were locked down. The Captain then asked the check airman to take control of the throttles. This meant that the Captain and First Officer were free to manipulate the controls. However, the check airman reported difficulty in controlling the throttles so he used problem solving skills and decided to use both hands to manipulate the throttles for engines No1 and No3. The whole reason this aircraft survived was the use of differential control of engine power to manage the lateral and vertical flight path (Personal Communication, senior airline Captain, September 2010).

Additional valuable information was communicated by a flight attendant who had observed damage to a wing. The Captain also used the Second Officer as an additional crew member to return to the cabin and assess any damage. After seeing the damage the Second Officer stopped and communicated to the senior flight attendant that the cabin briefing needed to be done quickly. He returned and reported back that there was damage to the right and left horizontal stabilizers. The senior flight attendant read from the “Short Notice Emergency Cabin Preparation” and cabin crew ensured that passengers knew the brace position.

Another example of using all the resources available was when the crew contacted United Airlines maintenance base at San Francisco advising that they were in a “Mayday” situation and requested any mechanical advice from the maintenance engineers. A “Mayday” is the call used to identify that the aircraft is at the highest level of danger. However the maintenance engineers were unable to provide any additional advice. United Airlines dispatchers were also involved and requested that all the emergency services available should be deployed. Shortly before the crash landing the Captain had asked the senior flight attendant if the cabin had been prepared stating that it would be a difficult landing and evacuation. He also notified that he would signal the
“brace, brace, brace” call over the public intercom to alert the flight attendants and passengers to prepare for landing. This was another example of effective communication when the flight deck was very busy with attempting to control the flight path of the damaged aircraft.

The crash landing
Fuel was jettisoned and the crew continued to face difficulty in lining up the aircraft for an emergency landing on the runway. The check airman continued to manipulate the throttles based on his experience with no slats/no flaps approaches and knowledge that power would be needed to control the descent and landing. The aircraft touched down with its right wing making contact with the runway and the aircraft was destroyed by fire despite the presence of fire fighting teams. All passengers and cabin crew were in the brace-for-impact position when the plane hit the ground. Flight attendants and other passengers helped in the evacuation.

Crew Background
In aircraft accidents investigations it is important look at the experience levels of the crew. The captain was highly experienced with nearly 30,000 hours flying with United Airlines. He also had nearly 8,000 hours on the DC-10 aircraft. The first officer was also highly experienced with 20,000 flying hours logged, including 665 hours on the DC-10. The second officer or flight engineer had logged over 20,000 hours, however only 33 hours were logged on the jet DC-10 aircraft. The check airman had logged over 23,000 hours with nearly 3,000 hours on the DC-10.

The Safety Board Report
Effective CRM skills were noted in the accident investigation report
• “The CVR recorded the flight crew’s discussion of procedures, possible solutions, and courses of actions in dealing with the loss of the hydraulic system flight controls, as well as methods of attempting an emergency landing. The captain’s acceptance of the check airman to assist in the cockpit was positive and appropriate. The Safety Board views that the interaction the pilots, including the check airman, during the emergency as indicative of the value of cockpit resource management training which and been in existence at UAL for a decade.” (p. 76).

• The Safety Board believes that under the circumstances the UAL flight crew was highly commendable and greatly exceeded expectations” (NSTB, 1990) p. 81

Helmreich and Foushee (1993) also noted that the crew was able to reduce the loss of life and that the crew acknowledged that CRM had helped them cope when facing an emergency situation. Ginnett (1993) also commented on how Captain Al Haynes in command of United 232 enlisted the support of an off-duty DC-10 Check Captain to assist on the flight deck. This newly increased crew worked together effectively as a team to problem solve in a short time frame and created new procedures to enable the aircraft to reach Sioux City airport.

Figure1.2: The crash landing of UA flight 232 at Sioux City Gateway Airport July 19 1989
United Airlines Flight 811

On 24 February 1989 a United Airlines B747 flight operating as flight UA 811 was enroute from Honolulu, Hawaii to Sydney, Australia when a catastrophic decompression occurred when a cargo door blew out and caused major damage to the body of the aircraft. Unfortunately several passengers died when they were sucked out of the cabin and passengers and cabin crew were injured. Kanki and Palmer (1993) noted the effectiveness of CRM training in how the crew worked efficiently as a team to problem solve options when faced with this major emergency. The Captain acknowledged the effectiveness of CRM training. The aircraft was able to make a successful emergency landing at Honolulu International Airport (NTSB, 1992).
Another example of good CRM skills

Airline ABC was enroute from DEF to XYZ when the Captain was notified of a fire in one of the galleys. He immediately sent back the First Officer (FO) who was on a rest period to give assistance and provide clear and concise technical updates. The Captain had declared a “Mayday” crew were preparing to descend to an airport over Europe that was nearby and could handle large jets.

The Captain delegated the Second Officer (SO) to fly the plane so he would be left free to manage the situation. The FO reported back that there was a fire and that the flight attendants were aggressively applying their fire fighting training. A senior flight attendant was wearing a fire fighting hood and had aimed two fires extinguishers into the galley oven before closing the doors. The team was prepared with additional fire extinguishers ready with their pins pulled if required. Containers above and below the galley were removed to check that the fire had not spread. After twenty minutes the fire was under control and after fifty minutes the Mayday was withdrawn. The FO had been providing reports to the Captain throughout. The FO also set up a
routine to check that the flight attendants monitored the closed-off galley for the remainder of the flight. (Human Factors Manager, Personal Communication, 2008)

The following summary from the Captain after the incident showed that there had been excellent team work skills and part of this was attributed to both CRM training and joint CRM emergency training with the flight attendants. This summary is used with the Captain’s permission.

“The regular concise information given to me throughout the process was invaluable. I was able to determine a course of action and make decisions as events unfolded. The plan of action was modified as more information became available and circumstances changed. The initial call from the FSM (the senior flight attendant) was clear and concise. I could determine from the tone of his voice and background noise that this was in fact a serious situation. When the FO arrived in the galley he made a short crisp call advising that an oven fire was being aggressively attacked by the flight attendants (FA’s) and that he would call back in two minutes. He then took on the role of communicating with me. He knew the type and amount information I required. His frequent calls were short and crisp, providing a factual update and an assessment if the situation was getting worse, remaining the same, or improving.”

“The FSM also kept in contact with me and we had a review of the situation later during the flight. I spoke with the FA’s who were directly involved in fighting the fire later in the flight. At the completion of the flight the FSM and I conducted an operational debrief with the crew. It is a credit to the FA’s, especially the FSM, that a number of passengers on leaving the flight, thanked and complimented the crew for their actions. I am not aware of any complaints or overly concerned passengers. The FA’s took prompt and aggressive action to fight the fire. The team achieved success from an operational and passenger handling perspective under very stressful conditions. The leadership of the FSM was outstanding. He had the respect of his team and displayed a professional set of skills that helped determine a successful outcome to a serious
situation. His closure and summarising of the event to the FA’s during the Operational Debrief was excellent.” (Flight’s Captain, Personal Communication conveyed through Human Factors Manager, 2008)

The airline has used this real life scenario as a part of both CRM training and joint CRM training with the flight attendants. This incident will be referred to from both a group and team perspective in Chapter 2.

Cockpit-Cabin Communication and security issues after September 11 2001

Countries have mandated that aircraft operating under FAR 121 have strengthened lockable flight deck doors which are to be kept locked during flight. In the United States the FAA issued a Special Federal Aviation Regulation (SFAR 92-2) on 15 January 2002. In Canada the Transportation Safety Board issued an Aviation Advisory Circular mandating reinforced lockable flight deck doors by 1 April 2003. ICAO adopted the policy of its members requiring reinforced locked doors. Since the access to flight decks with their locked doors prevents face-to-face communication between pilots and flight attendants ways of improving such training are of crucial safety importance. Protocols have been rewritten and training amended to adjust to the new requirements. There has been an increased reliance placed on interphone communication. Flight attendants are also trained in self defence skills during their Emergency Procedure (EP) training. They are also trained in observing passengers who display suspicious behaviours.

Chute and Wiener (1996) discussed the issue of cockpit-cabin communication. Their comments mainly addressed situations when the flight attendants physically entered the flight deck. However, they commented that it would be easier for a pilot to be dismissive of a message spoken over the interphone rather than spoken during a visit to the cockpit. They stated that it would be important to remember that elements of information conveyed in a face-to-face manner could be
lost in an auditory only mode. The use of the interphone could mean that the cabin crew would be unaware of particularly high periods of workload on the flight deck and could wonder why they were asked to call back. Therefore, it is even more important to focus on ways to communicate the perceived urgency or importance of the message. Protocols for the use of the interphone are currently being rewritten in airlines around the world, as is the case with the airline in this research.

Dunn (1995b) discussed the flight attendants’ perspective following accidents and incidents, stressing the importance of organizational support for staff following such incidents. It is important to note that she believed that flight attendants could also be under considerable stress following hijacking threats, medical emergencies during flight, and violent weather. In the aviation world after September 11, 2001 CRM programmes that provide training for such events are even more important.

Reliable and valid data are needed to improve safety training programmes; firstly to prevent a threat or error occurring and then how to take positive action when/if an emergency occurred. The use of “when” an emergency occurred has been carefully selected as accidents and incidents are still continuing to occur with several different airlines around the world. This makes it vital for aviation and human factor psychologists to further research human factors training in airlines. It is also important that airlines hire or contract out fully qualified human factor psychologists to further research specific problems which have been identified from their own incident reporting systems and LOSA reports. It is also important that an assessment and evaluation of safety training is summed up in the airline’s flight safety magazine and other relevant publications so that the knowledge is shared in the aviation community.
The introduction of giant commercial aircraft (e.g. Airbus A380) along with increasing numbers of commercial flights also emphasizes the importance of this research. The first commercial passenger flight of an A380 was made by Singapore Airlines from Singapore to Sydney on the 24 September 2007 with 471 passengers, 30 flight attendants and 4 pilots. (The New Zealand Herald, 25 October 2007, p.A1) It must be noted that this aircraft can be configured in an economy class mode for up to 853 passengers. The stakes are high in aviation as in any high risk operation but these stakes are even higher now as these giant commercial aircraft come into operation.

Shappell, Detwiler, Holcomb, Hackworth, Boquet & Wiegmann (2007) analysed commercial aviation accident data from the years 1990 to 2002 from the National Transportation Safety Board (NTSB) and the National Aviation Safety Data Analysis Centre (NASDAC) data bases. During this thirteen year period it was discovered that CRM failures were involved in nearly one out of five accidents. It was found that over 60% of the CRM failures involved in-flight crew coordination, communication and monitoring actions on the flight deck.

This research will gain in importance to the aviation community as larger aircraft capable of flying longer distances are added to airline fleets in the next ten years. This was emphasized at a recent symposium held by the New Zealand Royal Aeronautical Society at their Annual Conference on March 23 2007 in Auckland, New Zealand. Managers from the giant aircraft manufacturer Boeing demonstrated the longer range of the B787-8 Dreamliner aircraft. This will naturally have an influence on training programmes which will need to adapt to accommodate longer crew duty times and workload periods. The effectiveness of the new technology used in the engineering side estimated that maintenance needs would be reduced by an estimated 20%. New engineering and technology on the flight deck were predicted to mean more reliable on-time flight departures and less chance of engineering failures in the air. The opportunity for fewer engineering (technical) problems means that human factors training can focus more on the human
being in the safety chain. Human factors training programmes have been also extended to maintenance crews.

This has major implications for the human factors training in aviation, not only with flight crew but across the whole of airline training programmes. In other words effective new approaches to reduce aviation errors which lead to incidents and accidents must be developed by human factors aviation psychologists. This approach must include close cooperation with the human factors training managers throughout commercial airlines. This will be an area where theory from social psychology literature can be used to inform programme development. This is where theory and practice meet. The importance of research in obtaining hard data from reliable and valid methodologies to inform this development is essential. Helmreich (2000) viewed CRM training as an effective means to prevent and trap errors.

He stated:

“Effective CRM is data driven and curricula are built on knowledge about the cultures that surround the pilot force and the behavioural norms and practices in line operations.” (p.3)

The following examples illustrate the need for recurrent CRM joint training held on a regular basis. On August 2 2005 an Air France A340 crashed on landing at Pearson International Airport, Toronto. The aircraft had landed during severe weather and skidded on the wet runway ending up in a deep ravine. The aircraft burst into smoke and flames and emergency evacuations were carried out. It is interesting to note that the report stated that the flight attendants made the decision to evacuate. Four out of the eight emergency chutes were in a usable state and the flight attendants evacuated all the 297 passengers in just two minutes. No fatalities were reported. (Transportation Safety Board, Canada 14 November 2007). This is an example of the cabin crew working together as a team to evacuate 297 passengers in two minutes from an A340 aircraft.
The second example involved a B747 aircraft where there was an upstairs and downstairs level of passengers to evacuate. Communication systems, including the interphone had become inoperable, making it difficult for the flight attendants to know if the Captain had ordered an evacuation of the aircraft. There were also more passengers along with a corresponding greater number of flight attendants and the accident had occurred at night. The accident report described the situation in the following way. In September 1999 a Qantas B747-400 was attempting to land at Bangkok International Airport, Thailand at night and on a water-laden runway. The accident occurrence report (ATSB, 1999) concluded that the pilots had shown a reasonable standard of CRM skills but should have spent more time discussing what actions would be taken if a go-around procedure was needed. The Captain made the decision to cancel the go-around at the last moment and the aircraft aquaplaned off the runway. (p.42). The report also noted that pilots had
not been given sufficient training when landing in adverse weather conditions, although this was a technical, not a CRM, issue.

Six flight attendants and the lead flight attendant had realized that the aircraft’s landing was abnormal and adopted their brace positions. Some flight attendants also shouted out “Brace, brace, brace” or “heads down” to the passengers in their areas. The plane’s emergency lighting had been activated. In the following ten minutes the major CRM failures described in the report occurred.

The interphone was no longer working and the flight attendants manned their assigned doors waiting for the ‘evacuate” command. The Captain tried to contact the lead flight attendant on the interphone but was unable to do so. He then ordered the SO to go back into the cabin and assess the situation. The SO reported that there was no fire nor any known injuries. In the meantime the lead flight attendant decided to go to the flightdeck for instructions stating that his crew were manning their doors. In the meantime the Captain and FO continued to discuss the pros and cons of an emergency evacuation. This indecision did not assist the cabin crew waiting for instructions. Passengers had left their seats and were queuing up by the doors, despite instruction. The lead flight attendant then returned to the flight deck to get the situation clarified quickly. The report stated that the failure of the PA and interphone systems had a major effect on cabin cockpit communication. (p.55).
Figure 1.6: A Qantas B747 aquaplaned off the runway on landing at Bangkok International Airport 23 September, 1999

Figure 1.7: The Qantas B747 then crossed a road before coming to a stop.

Mandatory CRM Training Programmes
CRM training has been mandated and recognized as an essential component of training programmes by the Civil Aviation Authority (CAA) in New Zealand and the Federal Aviation Authority (FAA) in the United States. Other regulators in different countries include the CAA in Britain, the Civil Aviation Safety Authority (CASA) in Australia and the CAA in Canada. Birnbach and Longridge (1993) have provided a detailed description of regulatory requirements, specifically the Federal Aviation Regulations (FARs) Parts 121 and 135. They noted that all major and commuter airlines needed to have training programmes in place which have been approved by FAA inspectors.

**Federal Aviation Regulations (FARs)**

Federal Aviation Regulations were mentioned in the preceding paragraph but as they have such an important role in shaping United States aviation requirements they will be discussed in more detail. FARs are a prime example of how regulations influence airline behaviour. Part 121 refers to aircraft which carry more than 30 people and have a payload greater than 7500 pounds which means that they apply to the large aircraft of many commercial airlines. Part 135 refers to the smaller commuter airlines with less than 30 passengers and a payload of less than 7500 pounds. As this present research focuses on the larger jet aircraft from a major airline Part 121 will be the major focus of this section.

The FAA regulatory requirements for Part 121 are described in the Air Transportation Operator’s Handbook (1989) which was updated in 1996 (Federal Aviation Administration, 8400, FSAT Air Transportation Information Bulletin 96-02). Part 121 requires that pilots have both ground-based and air-based training, but allows for the use of high-fidelity flight simulators to meet these requirements. Pilots are also required to demonstrate competencies in certain manoeuvres and procedures which need to be overseen by a check airman. High-fidelity simulators are also used for CRM training requirements.
In 1990 the Advanced Qualification Programme (AQP) was introduced and represented a major change to training regulations for flight crew by the FAA. This was a positive move in that it allowed airlines to develop training to fit their own specific needs. Airlines that used this programme were required to provide CRM and LOFT training to all flight deck crews. The FAA has set out rules for CRM training in two publications, Line Orientated Simulations Advisory Circular 120-35B and Cockpit Resource Management Training Advisory Circular 120-51, (Birnbach and Longridge, 1993).

Civil Aviation Authority (United Kingdom) CRM Regulations

In the United Kingdom the Civil Aviation Authority is the government organization which is tasked with the regulation and oversight of aviation. This regulatory body has put out an advisory notice for CRM training, including advice for trainers. Regulation CAP 737, November 29 2006, (http://www.caa.uk/docs/33/cap.37) has collated all the requirements for CRM training and it is important to note that requirements for CRM training for cabin crew are also included along with guidelines for evaluating flight deck crew. The regulation also requires airlines to have developed programmes to evaluate CRM effectiveness.

Civil Aviation Authority (Canada) CRM Regulations

In 1997 the CAA (Canada) issued an Air Carrier Advisory (ACAC) to assist in the interpretation of CRM training regulations as outlined under 705.124 of the Canadian Air Regulations applicable to commercial carriers (http://www.tc.gc.ca/eng/civilaviation/standards/commerce-circulars-ac0117-1719.htm). This ACAC was written after the regulatory authority had noticed that the regulations could be subject to misinterpretation. As the airlines use the regulations to develop and write appropriate CRM training the potential for inconsistent or lack of appropriate CRM training objectives was apparent. While it is hoped that any lapses would have been
identified by CAA inspectors who sign off on CRM training courses it also would mean that airlines would have already spent both time and money in the development of courses which did not meet the CAA Rule requirements. Initial CRM training and annual training are mandated.

Annual training is required to include the importance of pre-flight crew introductions and has a special emphasis on the pre-flight briefing between the Pilot in Charge (PIC) and the in-charge flight attendant who then is responsible for briefing the cabin crew team. Training should include role plays of a situation which requires problem solving activities, such as an unruly passenger or hijacking attempt. Joint crew fire fighting exercises are to be held in which require both the pilots and flight attendants to work together. Pilot and flight attendants responsibilities should be clearly understood so crews can work together as a coordinated team. This should include a debriefing discussing the positive ways crews worked together and also ways in which coordination of the exercise could have been improved. The key point here is that both pilots and flight attendants are required to communicate and coordinate activities effectively. The ACAC also recommends that pilots and flight attendants participate in a joint emergency evacuation drill, again followed by a debriefing.

**The regulatory environment under which Airline ABC is governed**

Each airline that belongs to the International Civil Aviation Organization (ICAO) is required to have CRM/Human Factors training, including Threat and Error Management (TEM), as part of the certification process for all pilot licensing. This requirement is reflected in the Civil Aviation Authority (CAA) regulations of each member country. Airline ABC operates under a Civil Aviation Authority (CAA) which takes its powers from the Aviation Act established in 1990 in the country concerned. This act permits the government, through the Minister of Transport to establish the rules that all airlines and aircrew are required to follow. The CAA monitors compliance of these rules and has the authority to take action in cases of non-compliance. Airline
ABC is governed by the CAA Rule (CAR) Part 91—a general rules section and specific airline operator rules under CAR Part 121. CAR Part 61 refers specifically to pilot training and licensing and mandates CRM training.

**CAR Part 91 General Consolidation General Operating and Flight Rules**

CAR Part 91 contains the following rules and regulations which are also applicable to the importance of joint CRM training between pilots and cabin crew. Cabin crews are required to be familiar with the authority of the PIC and how this affects their role and responsibilities. The importance of communication is emphasized by the positioning of an interphone capable of cabin/cabin communication and pilot/cabin crew communication when cabin crews are seated on jump seats. Emergency training is also mandated and is particularly suited to joint training as intergroup communication and coordination is vital. Such emergencies could include, emergency evacuations on land and water, fire fighting exercises, and emergency descents. The cabin crew also has the responsibility to identify passengers under the influence of drugs and alcohol and subsequent timely notification to the PIC. The following CARs would apply to the situations described in the above paragraph. This is not an exhaustive list but is intended to illustrate how rule development and training are closely linked.

**CAR Part 91**

**“91.5 Compliance with crew instructions and commands**

A passenger shall comply with any commands given to them by the pilot-in-command pursuant to 91.203.

**91.115 Flight attendant requirements (c)**

(c) No person may operate an aircraft carrying flight attendants who are not—
(1) familiar with the necessary functions to be performed—

(i) in an emergency; and

(ii) in a situation requiring emergency evacuation; and

(2) capable of using the emergency equipment installed in that aircraft.

91.203 Authority of the pilot-in-command

Each pilot-in-command of an aircraft shall give any commands necessary for the safety of the aircraft and of persons and property carried on the aircraft, including disembarking or refusing the carriage of—

(1) any person who appears to be under the influence of alcohol or any drug where, in the opinion of the pilot-in-command, their carriage is likely to endanger the aircraft or its occupants; and

(2) any person, or any part of the cargo, which, in the opinion of the pilot-in-command, is likely to endanger the aircraft or its occupants.

CAR Part 121 - Air Operation Certification - Large Aeroplanes

These rules will be outlined in regard to the requirements for certification for large aeroplanes as all of the crews in the studies flew on jet aircraft able to carry more than 90 passengers.

CAR Part 121.917 specifically refers to CRM requirements stating that each airline operator needs to provide initial, competency, and recurrent training qualification curriculum.

Each airline operator is required to develop CRM training specifically designed for each crew members’ position. This includes training and evaluation of proficiency levels in applicable CRM skills along with a technical evaluation based on each flight crew member’s piloting. Technical piloting skills are required to be evaluated either in line flying or during a flight conducted in a
simulator. Specific CRM requirements for pilot training are set out in the following section under CAR Part 61.

**CAR Part 61 - Pilot Licensing and Ratings**

CAR Part 61.17 refers specifically to the licensing requirements for the Airline Transport Pilot License (ALTP); an employment prerequisite set by Airline ABC.

The following CRM/Human Factor tasks are part of the Flight Examiners Guidelines for the ALTP License and are covered in the following order in the index to these guidelines:

“Task: Crew self evaluation (*debriefing/operational review/critique*)

Task: Threat and error management (critical task)

Task: Communications process and decision making (*inquiry/advocacy/assertion*)

Task: Communications process and decision making (*communications/decisions*)

Task: Team building (*leadership/followership/concern for tasks*)

Task: Team building (*interpersonal relationships/group climate*)

Task: Workload management and situational awareness (*preparation/planning/vigilance*)

Task: Workload management and situational awareness (*workload distribution/distraction avoidance*)”

Assessment Criteria, Objective, Action (by the examiner) and evaluation criteria are included for each of the above tasks. As this thesis examines the teamwork between pilots and cabin crew the criteria for assessment and evaluation of pilots’ communication skills with cabin crew will be used to show how effective communication has been defined for rating in the Flight Examiners Guidelines.
“ASSESSMENT CRITERIA

Task: Communications with cabin crew, company and passengers

Objective:
To determine that the candidate:
(a) Communicates relevant information with cabin crew.
(b) Communicates relevant information with company.
(c) Makes passenger announcements when appropriate.

Action:
The examiner will:
(a) Role play the positions of cabin crew and company as required.
(b) Observe the candidate’s communication with cabin crew, company and
passengers, and determine that the performance meets the objectives.”

Communications with Cabin Crew Rating Scale

Not yet competent (Rating up to 70)
Does not communicate relevant information with cabin crew in a timely manner

COMPETENT (Rating 70-85)
Communicates adequately with cabin crew

COMPETENT (Rating 85-100)
Communicates relevant information with cabin crew in a timely and assertive manner

The CAA also issues Advisory Circulars (ACs) which provide additional material on standards
and compliance with a specific rule. The following AC has material on what would be considered
acceptable for meeting the mandatory CRM (Human Factors) components. This is closely linked
to CAR Part 61 and provides information on CRM syllabus material which would be deemed
acceptable to meeting the licensing requirements for an ALTPL license. Advisory Curricular (AC
61.7 Appendix111 ATLP Examination credits, Sub Topic Syllabus Item 46.2 and 46.4 sets out
the Human Factors requirements. Again, as each requirement is set out in clear and concise terms,
the Sub Topic will be taken directly from the AC to Part 61.
“Sub Topic Syllabus Item

Human Factors - General

46.2 Airmanship, Professionalism and Responsibility

46.2.2 Define professionalism.

46.2.4 Distinguish between piloting for personal reasons and for hire or reward.

46.2.6 Distinguish between safety, effectiveness and efficiency in terms of pilot responsibilities.

46.2.8 List the people to whom a pilot is responsible in carrying out his or her duties.

46.2.10 List the people to whom a co-pilot is responsible in carrying out his or her duties.

46.2.12 Describe key features of good and safe airmanship.

46.2.14 State the approximate proportion of aircraft accidents and incidents commonly attributed to human performance errors.

46.4 Human Factors Models and Programmes

46.4.2 Define human factors as used in a professional aviation context.

46.4.4 Describe the fundamentals of the SHEL Model in relation to the interaction of humans with other humans, hardware, information sources and the environment.

46.4.6 Explain the role of human factors programmes in promoting aviation safety in flight operations in commercial aviation.”

The CARs and ACs are used by airlines CRM/HF training departments to guide the development of appropriate CRM Course Booklets. These Booklets are then set to the relevant regulatory authority for approval. Once this has been signed off the airline is required to follow the training objectives contained in the Booklets; however, if one role play is replaced with an updated role
play which is still linked back to the relevant training objective additional approval is not required. A detailed description of Airline ABCs Course Booklets will be provided in the next section. It is essential to describe the actual CRM course content in order to be able to identify training effects in later empirical studies in the present research.

**CRM/Human Factor Training Course Development and Course Booklets**

**The Experience of Airline ABC**

*Training Requirements*
Annual recurrent training consists of a two day course for flight attendants (part Emergency Procedures (EPs) and part CRM. The CRM component includes a joint training session with the pilots in the classroom followed by a simulated exercise in the cabin simulators. Pilots are required to attend one day of EPs plus a joint CRM session with the flight attendants in the cabin simulators. Pilots also have an added CRM requirement in their Fleet Refresher training.

Attendance and participation in all rostered CRM courses was a requirement before aircrew could be signed of for duty. This can be viewed as a competency criterion. This criterion is based on the subjective assessments of both EP and CRM facilitators and it is possible for a crew member to fail. For instance, if one crew member speaks in a derogatory manner about another team member (even during breaks) this would show that team work skills have not been understood. In such cases remedial action would be taken which would sometimes involve the Human Factors Manager. The Human Factors Manager would have a range of options depending on the situation. One such option would involve meeting with the crew member and reviewing the CRM material to ensure that CRM objectives had been understood.

*CRM Course Booklets*
Airline ABC has developed and written many CRM/Course Booklets over the years since CRM training was first introduced for pilots in 1988. Booklets are provided for initial, competency, recurrent, and training for upgrade to supervisory positions (for both pilots and flight attendants). CRM training which have focused on the provision of relevant training objectives, course material and evaluation criteria for different groups (pilots, flight attendants and joint training). Training Objectives link back to the CAR rules Parts 121, Part 61, and Part 91.

Each Course Booklet has its own Course Facilitators Guide which contains detailed information on how the curricula is to be delivered listing key training objectives and training material. A useful list is provided containing all materials needed and where the relevant kit is to be collected (and returned). Course facilitators are selected from line pilots and flight attendants who have indicated a strong interest in CRM training. This provides credibility with the course participants as they realize that facilitators have shared similar experiences. A training course is also provided for the facilitators. Each booklet contains a timetable for the day(s) so everyone realizes that material has been designed to be covered within that timeframe. Each course has also been designed with pre-course material to be read by the participants before arriving for training. This would assist in building up some prior knowledge of the material which will be reinforced in the course and should facilitate better learning and retention.

As a teacher and teacher educator for over 25 years I have found these booklets to be based on best teaching practice and would liken the Training Objectives to Learning Outcomes used in the development of lesson plans. Trainee teachers also have to list in detail how they will provide relevant teaching material based on the students’ prior knowledge and learning which will assist students in meeting the learning outcomes. Just as a teacher should not provide learning material at an inappropriate level, a CRM Booklet based on upgrade training would not be provided for initial training. However, material covered in previous training (or teaching) would also review
prior learning and build upon this in new material that is introduced. An example would be the inclusion of “classic” aviation accidents which were used to advocate for CRM type training in consecutive booklets. These include the accidents at Tenerife, Portland, Kegworth and Dryden which have been fully described in Chapter One. A common thread in all these accidents was the lack of effective communication both within the cockpit and between the cabin crew and pilots. The accidents at Kegworth and Dryden both occurred in 1989 and were used in booklets for the initial flight attendant CRM training when it was introduced in 1998. Both these accidents provided real-life examples of what could occur when cabin crew did not communicate information to the flight deck crew (and also when the flight deck crew did not seek information from the cabin crew).

**Initial CRM Training Course Material for Pilots**

CRM training was commenced in 1988 for Airline ABC’s pilots. This consisted of a three day course held at a location approximately two hours drive away from the airline’s main base. The aim of holding the new training away from the usual training facilities at the main airline training centre was to provide a training environment away from distractions. Evening training sessions were also able to be scheduled as the pilots were living on-site. Pre-course readings had been sent out beforehand to enable participants to be prepared for some of the exercises and discussions. The course material was collated and placed (with appropriate topic dividers) in a ring binder folder. The course content was provided from a CRM Course developed for pilots in a neighbouring Anglo country and adapted for Airline ABCs pilots (Margerison, McCann & Davies, undated).

The material covers over 100 pages so a synopsis is provided for four modules which focused on teamwork and communication; training in which is a key focus of this thesis. However, the full list of course modules is provided below.
The CRM Training Modules covered were:

- Teamwork and Decision Making
- Conversational Control Model
- Self Management
- Communication Styles
- Linking Skills
- Cockpit Communication
- Team Decision Making
- Crosswind: Critique of a scripted scenario

**Teamwork and Decision Making**

The Teamwork and Decision Making module was the first to be covered and it is pertinent that teamwork and decision making were a key focus of this thesis. In this module pilots would practice effective teamwork skills in classroom group activities and view a specially prepared video showing what could happen when effective teamwork and decision making was not practiced in the cockpit. The video showed the cockpit crew of a B727 preparing for take-off on a short-haul domestic flight. Pre-flight preparation was rushed as they had arrived late on a connecting flight. However, despite this time pressured environment the Captain asked if the cabin crew had arrived as he wished to brief the Purser on turbulence. This showed the importance of a pre-flight briefing between the Captain and lead flight attendant was recognized in pre-flight preparation back in 1988. (More detailed course content covering effective pre-flight briefings would be included in training content in later courses). The rushed preparation for this B727 domestic flight resulted in the aircraft taking off with flaps 15° rather than flaps 20° due to the aircraft’s weight. The script continued with preparation for landing at their destination in wet
weather. The crew discovered that the antiskid on the aircraft was inoperable. They needed to decide whether to land or continue onto their alternate airport.

The SADIE model of team decision making was introduced. This model provides an excellent method for decision making and its acronym SADIE is easily remembered. It was to prove so useful that it was incorporated in the initial flight attendant CRM training introduced ten years later. This was very effective as it would have both the pilots and flight attendants familiar with the SADIE model. It is still being used by pilots and flight attendants as a means of effective teamwork and decision making to this day. The model involves:

S  Sharing Information
A  Analyzing Information
D  Developing Solutions
I  Implementing Decisions
E  Evaluating Performance

The pilots at the course then were asked to divide into groups to apply the SADIE model in analyzing the performance of the B727 crew. Such a discussion would assist in the identification of effective and ineffective skills; something which could then be expanded on in later years when joint pilot/flight attendant training commenced.

Communication Styles

Communication is another key CRM concept which is explored in this thesis so it is important to outline the course material covered within the Communication Styles Module. Communication
styles: Assertive, Aggressive, Supportive, and Submissive are outlined and discussed. Case Studies are used to identify communication styles based on studies from the business world rather than with a clear aviation focus. Pilots are a group of highly trained and focused individuals who must use clear and concise communication patterns. Training in these skills would have been helpful if an aviation scenario had been provided at the beginning of this module. Having said this, the group exercise was based on a communication scenario between a Base Captain and a B737 Captain.

**Cockpit Communication**

A scripted dialogue is provided for the B727 incident previously shown on the video and course participants share how well the crew managed the incidents which occurred. This is again linked back to the SADIE model. Another incident, this time based how the pilots on an A320 aircraft managed pre-flight checks. Again the cabin crew was scripted in; this time with cabin crew providing interruptions by asking questions such as how many meals were loaded, at a busy time when fuel load sheets were being checked. Once again the SADIE model is used to analyze the flight deck crew’s performance.

**Team Decision Making**

This section demonstrates how the performance of a team is more effective than an individual’s performance regardless of whether their crew rank is Captain, FO, SO, F/E (Flight Engineer) and regardless of the aircraft type flown. Maximizing team effectiveness is then discussed with crew being shown a number of ways to work as a team. Team solidarity is more successful when all team members feel that their input is valued and that there will be no put downs. In some accidents crew have stopped offering vital information after the message has been ignored. An example of this was the crash of the DC8 in Portland as the pilots did not listen to the increasing warnings from the F/E over fuel starvation as they were distracted with preparations for a
possible undercarriage collapse on landing as undercarriage indication switches on the gear leg had been destroyed.

A social hierarchy does (and has to) exist on the flight deck and while the Captain is the team leader it is up to him/her to set the tone for effective teamwork. The Captain is also given authority under CARs to act as aircraft commander and is ultimately responsible for the safety of the passengers, crew and aircraft. However, junior crew members are also expected to cross check the Captain’s action such as when entering information into the FMC. In fact, in a future undated course booklet for pilots the airline developed a phrase for junior crew members to use when they felt their concerns were not taken seriously by the Captain This phrase was “Captain, you must listen!” and this could be followed by “I am very concerned over our unstable approach and the crosswinds forecast over the runway.” The relevant SOP required for an Occurrence Report to be filed with Flight Operations if this phrase had been used. Focus has been originally on CRM training for pilots this has been important as this was first introduced for aircrew.

**Flight Attendant Upgrade Course Material (July 2008)**

This new Upgrade Course – Human Factors for Flight Service Managers, Pursers, Flight Service Managers, Pursers, In-Flight Service Managers, In-Flight Service Coordinators (July 2008) was written 20 years after the original CRM course for pilots. This superseded an upgrade course which had been used for 10 years. However, it follows the same format in terms of the provision of a Course Facilitators Guide, pre-course readings and a clear timetable and material written in Modules. These modules follow a review of key CRM material as well as introducing new work related to the participants’ new roles. The Course Modules in this training booklet are:

- Course Introduction
- Authority
- Threat and Error Management
Module on Authority

The beginning of this module starts with a discussion on the difference between leadership and authority with the PPT slide then shown which states that leadership is acquired while authority is assigned. These differences are more than semantic as can be seen by the next section on authority. It is very appropriate that this is covered early in the training curricula, as it describes relevant CARs and ACs setting out the legislation authorizing the Captain’s command authority. CARs Part 61, 91, and 121 are the key pieces of legislation, however the course booklet also details that additional relevant legislation under the Crimes Act, Civil Aviation Act, and Aviation Securities Act. The module also covers the chain of command on the aircraft and how the Captain can delegate all his/her legal authorities to the FO or SO if necessary as these pilots hold a Pilot License as set out under CAR Part 61.

These are essential pieces of knowledge and it is important that the Senior Flight Attendant (SFA) understands how the regulatory environment sets out the Captain’s authority while also showing how the Captain has the authority to also delegate appropriate tasks to the SFA. This legislation can be viewed by the SFAs as empowering them in their new roles as there are a range of situations which the Captain is able to delegate to the SFA. For example, the SFA is given
authority by the Captain to restrain drunk, abusive or any passenger that represents a danger to the safety of the flight. Before 9/11 the Captain was required to delegate authority to a crew member who would read the relevant legislation to the passenger before applying the restraints. However, after 9/11 pilots were told that they could not enter the cabin to assist with any passenger problems. Under the Crimes Act the Captain can authorize the SFA to search passengers and hand baggage regardless of whether the passengers have been through security checks prior to boarding. The relevant CAR is listed below.

“91.203 Authority of the pilot-in-command

Each pilot-in-command of an aircraft shall give any commands necessary for the safety of the aircraft and of persons and property carried on the aircraft, including disembarking or refusing the carriage of—

(1) any person who appears to be under the influence of alcohol or any drug where, in the opinion of the pilot-in-command, their carriage is likely to endanger the aircraft or its occupants; and

(2) any person, or any part of the cargo, which, in the opinion of the pilot-in-command, is likely to endanger the aircraft or its occupants.”

This thesis examines both pilots and flight attendants understandings of each others job roles and understanding. It is very appropriate that the Course Booklet dated in 2008 continues to reinforce this. The Course Manual to the SFA Upgrade Course puts this like this:

“A clear understanding of the legal responsibility and the roles of the Captain, First Officer, Second Officer, SFA ISC and FAPS/FAPC are critical to ensuring that a competent and effective team is managing the flight” (p.6)  (Airline ABC Flight Attendant Course Manual, July 2008)
This links in well with the Objectives which are aimed at ensuring participants:

- Understand the Captain’s authority
- Understand the roles and responsibilities of the Captain, FO, SO and SFA
- Understand the chain of command on the aircraft

**Introductory CRM training for flight attendants (1999)**

**Course Booklet – “Flight Attendant Crew Resource Management”**

The introduction to the booklet emphasizes that this course will be like no other training course that the participants had attended. It was to use “state of the art” educational training methodology which would require full participation from all the course attendees. Prior knowledge and experiences in aviation were recognized and participants were encouraged to share these in group discussions. This was important as it showed the flight attendants that their skills were recognized. Course participants were sent out pre-course work to be read beforehand.

Course Objectives were:

- Work on crew problems and assess different methods of tackling them
- Identify a systematic approach to team decision making
- Develop and practice the use of various communication techniques and styles and assess when they should be used
- Study and practice effective Team Decision making

It is always important to link course objectives to the course content to ensure that participants have relevant teaching material that will enable them to achieve the stated objectives.

The following material is a summary of the course content:
The importance of effective communication and teamwork

The Dryden accident (10 March 1989) is used to emphasize the importance of effective communication and teamwork. This accident is viewed on a video and then discussed. Participants are encouraged to identify instances when vital safety information is not conveyed to the flight deck crew. They are also asked to address reasons (or barriers) that might have hindered flight attendants from taking a more assertive approach to ensure information flowed smoothly between both sub-groups of aircrew.

High and low performing teams

Flight attendants were then asked to complete an exercise in which they identified characteristics of high and low performing teams that they had been involved with in their aviation careers. Pre-course material had already asked participants to be ready with some examples of such teams. Space was provided in the Course Booklet to write down these characteristics. Such characteristics were then shared. Another short video was then viewed based on a pre-flight briefing (lead flight attendant and Captain; lead flight attendant and cabin crew team) and finally pre-flight preparations prior to passenger boarding. This reinforced the previous material on characteristics of good and bad teams as participants were then asked to identify efficient and effective teamwork along with examples of ineffective teamwork.

The SADIE model of Problem Solving

The SADIE flow diagram consisting of a problem solving model is introduced (this has been fully discussed in the introductory course for pilots). The flow of information is seen as crucial with everyone in the flight attendant team seen as important contributors. A substantial section of the course booklet (pp.17-24) is devoted to this important model.

Communication Styles
Communication styles are then covered in another detailed section (pp.25-39). The model of communication styles (also in the pilots course work) is outlined. This includes four main styles of communicating information: assertive, aggressive, supportive, and submissive. The differences between Assertive and Aggressive behaviour are noted (“A”) category behaviours with the emphasis placed on assertive behaviour, which unlike aggressive behaviours, does not involve put-downs. Category “S” behaviours focus on skills in using supportive behaviours which focuses on helping others while not putting one down as in submissive behaviours. Examples of all four categories of communication styles are provided with two case studies. Case A focuses on comments made by one driver to another after their cars had collided at an intersection. Case B involves a performance appraisal with four different comments written to in the booklet to illustrate the different styles of communication. An Assertion Skills Exercise follows with participants asked to record assertive style comments below two very short scenarios. The second scenario is based on a situation on board on aircraft involving two flight attendants. The first flight attendant needs to use an assertive style message to ask a colleague to tone down the constant chatter.

**Barriers to Communication**

A section on Barriers to Communication based on material by Chute has already been discussed and is linked back to the pre-course work which had been provided. This includes research by Chute and her colleagues which have been fully discussed in this chapter. Flight attendants are acquainted with the five-factor model before examining an excellent chart listing the different characteristics of the pilots and flight attendants who represent two distinctive cultures.

**Understanding Other’s Roles and Teamwork**

Understanding each other’s roles and teamwork is the focus of the next section. The importance of forming an effective team quickly into each flight is recognized as an emergency could
happen in the first few minutes. The question “Do pilots and cabin crew really know any more than the bare bones of what the other group does?” is posed. Workload Differences are identified as one reason why communication problems occur (i.e. thus, presenting another barrier to communication between the two groups of aircrew). These often occur as each sub-group cannot see each other’s workload when the flight deck door is closed. An example, of this is provided from an occurrence on an Airline ABC aircraft. A toilet smoke detector had gone off during take-off and a flight attendant had pushed the “Alert” call button. However, the flight deck crew did not respond to the chime and cabin crew had wondered why. The answer that pilots will not respond to a chime during the take-off roll as all spare capacity is already engaged in attending to controlling the aircraft during take-off.

A diagram showing peak workload times for pilots is used to emphasize that these times occur during taxi, take-off and climb, lowers during cruise and then increases again during descent and landing. This is contrasted with another diagram which shows that cabin crew workload is highest during cruise often including a busy meal service.

**Teamwork in Emergency Situations**

The next heading is “Working Together in Emergencies” in which it is vital that each crew member is aware of their individual and team responsibilities. The question is asked as to whether cabin crews are aware of the flight deck crew’s responsibilities in the event of an oven fire. This booklet was written in 1998, many years before the example of successful CRM teamwork during an oven fire on an Airline ABC aircraft provided in the preceding section occurred. Course participants are then asked whether they feel that the flight deck crew realizes how long it would take to prepare the cabin for a crash landing. (However, even with this awareness from the pilots, the luxury of time is not always available which in itself emphasizes the importance of knowing each others’ roles and responsibilities).
Flight Attendant Technical Knowledge

This was also an appropriate part in the course to link back to the Dryden crash and discuss the importance of having some technical knowledge about how an aircraft flies. A diagram labelling where the aileron, spoilers, leading edge slats, and trailing edge flaps are located on the wings along with the positions of the fin, tail, rudder, and elevator in the tail section is provided in the course booklet. An aircraft model is also used by the course facilitators to locate these aircraft parts. The Dryden incident was referred to as it showed the importance of an uncontaminated wing surface to provide lift for the aircraft. The importance of covering technical terms in this introductory is acknowledged and links back well to the study on flight attendants’ technical knowledge undertaken by Dunbar et al. (1997) which had asked flight attendants to place several given technical names for aircraft parts onto a diagram of an aircraft. The reader is referred back to this study under an earlier section in this chapter on barriers to communication.

The Kegworth crash (again described at the beginning of this chapter) is then studied and participants asked to identify factors that influenced the pilots to shut down the wrong engine on this B737. Information that the cabin crew possessed was not passed onto the pilots. Reasons for this failure in teamwork and communication are discussed and also questioned.

These course objectives clearly recognize the importance of teamwork and effective decision making. This introductory course would focus on reinforcing the importance of such skills to the flight attendant sub-group and in doing so would cover new teaching material that had already been part of the CRM training material that had been used with the pilot sub-group. This would help bring both groups closer together as certain phrases and models used in effective teamwork
and communication were common to both groups were introduced in CRM training. An example of this is the SADIE model of team decision making.

**Joint CRM Training-The experience of Airline ABC**

While joint training is required by Airline ABC such training is not mandated by the regulatory authority. Therefore, the training requirement for joint CRM exceeds the minimum standard mandated by the regulatory body. Airline ABC’s Joint CRM Course provides the opportunity for both pilots and flight attendants to learn more about each other’s role through opportunities provided for discussion. Realistic scenarios involving actual aircraft accidents and incidents are used to develop this discussion. Both crews get to meet each other beforehand which assists both groups to work together to solve problems through effective communication, coordination and group situational awareness.

The accident reports into the accidents at Kegworth, Britain (Air Accident Investigation Branch, 1990) and Dryden, Canada (Moshansky, 1992) which have already been described in the present chapter, have provided vital information regarding the importance of communication between the cabin and the cockpit and have been incorporated into joint CRM programmes.

Hayward (1997) also stated that these accidents have been one of the reasons that Joint Training for pilots and flight attendants for Emergency Procedures (EP) has commenced. Australian Airlines started a joint two-day EP training course for all flight crew in 1991, which, although not designed specifically for the flight attendants, has provided the means for developing an understanding of role responsibilities for all crew members. The video produced from the Dryden accident has been used in the Australian Airlines joint training course (Hayward, 1997).
Accident Investigation

Mandatory Reporting Systems

The regulations of countries belonging to The International Airline Transport Association (IATA) require compulsory reporting of all aircraft accidents and incidents to the countries’ relevant Civil Aviation Authority. This is known as the Civil Aviation Safety Authority (CASA) in Australia. In the United States the Federal Aviation Administration (FAA) is the regulatory governing body, while in Canada this is known as the Transportation Safety Board of Canada (TSB). The Air Accident Investigation Branch (AAIB) in the United Kingdom has also sponsored a number of aviation research projects on topics such as crew fatigue and bird strike. The Safety Regulation Group has been set up as an aviation safety initiative which aims to identify potential risks in the United Kingdom.

Accident investigation authorities, established under legislation in the airline’s home country, investigate aviation accidents and incidents to find causal factors in order educate the aviation industry and to help stop these occurrences from happening again. All crew are encouraged to report safety related occurrences and investigators will work with the reporter to find out what happened in the chain of events and why. Even a small event could underline a potentially serious problem.

Airline ABC operates under a Civil Aviation Authority (CAA) which takes its powers from the Aviation Act established in 1990 in the country concerned. This act permits the government, through the Minister of Transport to establish the rules that all airlines and aircrew are required to follow. This act also establishes the regulatory authority for the CAA to investigate general and recreational aviation incidents and accidents. Another piece of legislation (1990) gives authority to a transport accident investigation body to investigate accidents and incidents occurring within the transport sector (aviation, rail, road, and maritime). The authority is required to investigate
commercial aviation accidents as well as “high profile” general and recreational accidents. The aim is to identify causes and events in order that such occurrences do not happen again. The focus is very much on what can be learnt rather than apportioning blame to any individual or organization. Safety recommendations are made in order to check that findings have been implemented. Reports containing safety recommendations that would be relevant beyond the country in which Airline ABC operates are also given to the relevant international body such as ICAO. Accident investigators and interested parties can also check on safety recommendations through an online database.

The accident investigation expertise within this authority is recognized with countries requesting assistance in the investigation of occurrences. For example, the Pacific Island nation of Vanuatu requested assistance in the investigation of a fatal aviation accident involving a general aviation aircraft on 19 December 2008. The request was approved and air accident inspectors, including an engineering expert were sent to assist in the investigation.

Air accident inspector’s reports are thorough and include publishing findings and, more importantly, safety recommendations. The main aim is prevention of further accidents and these are available on the worldwide internet and in published reports. Sometimes such reports can take a year to publish and the more recent accidents may not yet have reports published. The aircraft manufacturer involved (usually one of the two giant aircraft manufacturers Boeing or Airbus) send their own aircraft crash investigators to investigate aircraft engineering, design, and human factor issues.

Such authorities have teams of investigators skilled in specialized accident investigation areas that arrive as soon as possible at the accident/incident sites. For example, in Australia the
Australian Transport Safety Bureau (ATSB) is the government agency responsible for investigating accidents. The investigators would focus on identifying deficiencies in the aviation environment. It would then make any necessary recommendations to the airline with the focus on the airline making the necessary changes rather than having to use the regulatory powers of the Civil Aviation Safety Authority (CASA). The United Kingdom the Air Accident Investigation Branch (AAIB) is part of the Department for Transport. It is responsible for the investigation of all civil aircraft accidents and serious incidents in the United Kingdom. It is important to note that the country where the accident or incident occurred is on most occasions the one who conducts the investigation. However the airline/country involved will usually send its own crash investigators.

In the United States the National Transportation Safety Board (NTSB) was established in 1967 to investigate major accidents. It is independent of the government and FAA, although it has no regulatory powers to check whether its safety recommendations are reinforced. The NTSB has “Go Teams” consisting of experts in various types of aviation. These areas include:

- Operations
- Structure
- Power plants
- Systems Air Traffic Control
- Human Performance
- Survival Factors
The human performance investigation section examines crew performance and before accident factors that could be a factor in human error such as fatigue, drugs, and alcohol. Training and workload issues are also investigated (http://ntsb.gov/Abt_NTSB/invest.htm), (Kayten 1993).

The aim of accident investigations was to make sure that similar factors do not lead to additional accidents (Braithwaite, 1999). A major focus was on the communication of recommendations to the correct people so that safety actions could be implemented. Information needed to be based on statistically significant data and that preconceived opinions needed to be discarded during the fact gathering process. Braithwaite (1999) also believed that it was important to build upon existing research which was based on statistically significant data citing research by Helmreich, Merritt and Wilhelm (1999) as one such example. While Braithwaite (1999) believed it was important to recall the reasons why CRM training was needed he did not advocate starting programmes with first generation CRM. CRM programmes were to be built upon more recent knowledge.

An investigation of air accident investigations in Australia showed that air accident investigators examined the chain of events that led up to the accident (Hayward, 1997). Hayward (1997) then described the movement to look at systemic factors, including what had occurred before the accident as well as the context in which the accident occurred. Human factors and aviation psychologists were seen to play an important role in this development. Air accidents reports from the Australian Bureau of Air Safety Investigation (BASI) were examined. This included an example of an Ansett B747-200 series which landed without its nose wheel down at Sydney Airport in October 1994. There had been discussion in the cockpit beforehand over the landing gear visual instruments and the number of green lights that needed to be visible to indicate that the nose wheel was locked down (Bureau of Air Safety Investigation, 1996).
Air accident investigators use a number of different tools to help discover why accidents have occurred and to prevent future accidents from occurring. One such tool is the Human Factors Analysis and Classification System (HFACS). Wiegmann and Shappell (2001) assessed the usefulness of the HFACS as a measuring tool for investigating and analyzing the causes of aviation accidents outside military aviation for which the system had been specifically designed. They used accident reports obtained from the United States National Transportation Safety Board (NSTB) from 1990 to 1996. They discovered that this tool could reliably identify all the areas of human factors that were part of the chain leading up to commercial aviation accidents. Several safety critical areas were identified including the pilot’s fatigue and stress levels along with errors committed by managers. Wiegmann and Shappell (2001) acknowledged that the system was based on the work of Reason’s (1990) model of latent and active failures. Reason’s research will be discussed in detail in the following chapter.

Summary

It is clear from the literature that further research is needed to illustrate the effectiveness of CRM training programmes. On the basis of the literature review there is reason to believe that differences exist in human factor related attitudes between pilots and flight attendants. It is clear that further research is needed to clarify ways in which these two distinct cultures function on board commercial airliners and to explore ways in which barriers to communication can be reduced. There is also reason to believe that there are human factor related differences between junior and senior flight attendants in attitudes to command and communication. Senior flight attendants would have more authority, along with a higher level of experience and might be expected to feel more confident in communication with the flight deck.

It is essential for flight safety that flight attendants are included in CRM training and that effective means for bringing flight attendants into the communication loop are developed. The
present research will add to the body of knowledge on CRM training issues for pilots and flight attendants with an emphasis on the flight attendants’ perspective to such training programmes. The research will investigate ways to optimise intergroup contact between flight deck crews and flight attendants.

Conclusion

Crew Resource Management (CRM) has been described within the context of the application to help produce a safer aviation environment. The evolution of CRM concepts has been outlined to show how programmes have been adapted to suit the requirements of a rapidly changing aviation environment. CRM programmes had been initially designed for flight deck crew after a series of accidents in the 1970s. Overall these programmes were well accepted by the pilots and were specifically designed in order to be extended to flight attendants. Team work is an integral part of communication and coordination between pilots and flight attendants and needs be developed on a sound theoretical basis. Chapter 2 provides such a framework using social identity theories (Hogg & Abrams, 1988; Hewstone & Brown, 1996; Hogg & Terry, 2001) along with psychological theories of group formation as a way of understanding to explain how two distinctive groups of aircrew (pilots and flight attendants) can work effectively together in an applied aviation setting.
CHAPTER 2
THEORETICAL MODELS

Introduction

The unifying research theme is that while modern aircraft are allocated to operate with one crew there are two subcultures on the aircraft as the crew are neither separate individuals nor a single homogenous group. Since the early to mid 1990s it has been suggested that ‘crew’ consist of two separate sub-groups or two distinctive cultures represented by pilot and flight attendant sub-groups (Chidester, 1993; Kayten, 1993; Chute & Wiener, 1995, 1996; Wiener & Kanki, 1993). Incidents and accidents (e.g. Kegworth, 1989; Dryden, 1989) which highlighted failed teamwork and communication between the two sub-groups led the aviation industry to examine joint CRM training as a way to improve teamwork and communication.

This chapter will explore theoretical approaches based on models of social identity and social categorization; along with theories of group and team formation that have the potential to offer highly productive research avenues to pursue. Such theoretical frameworks that have the potential to explain how two different sub-groups can learn to understand each other’s perspectives through opportunities provided for positive intergroup teamwork. An understanding of such mutual interdependence is an important part in effective communication and teamwork while operating on modern aircraft.

The present research is based on a conceptual framework developed in social psychology that involves group behaviour and team performance. It is based on the social categorization and social identity frameworks. The social identity approach asserts that society is made up of social categories with each category linked to the other in terms of status and power. People are seen to obtain their identities through the social categories they belong to (Hewstone & Brown, 1986;
Hogg & Abrams, 1988; Pettigrew, 1988; Brown, 1995; 2000). This links in well with research by Kayten (1993) who believed that airline crews had clearly defined roles with the captain as the leader of the team. Status, like role, determined appropriate behaviour for all the members of a group, with the flight deck crew enjoying higher status than the flight attendants. As higher status members of a group generally have more power, lower status members of a group would frequently defer to higher status members.

The psychological literature on group formation links in well with the overriding research theme as described above. The importance of teamwork and communication skills by flight deck crews has been described by Foushee (1984); and Ginnett (1987, 1990). Models of organizational shells (Edwards (1972) & Ginnett (1987; 1990) have provided an additional perspective on ways teams form and work together in a rapidly changing aviation environment. Models of accident causation also suggested that it was important to investigate how individuals and groups functioned together as a team (Reason, 1990, 2004, Sasou & Reason, 1998). Research conducted by Hofstede (1991) showed that an individual’s perception of power and status was determined by both occupational group and home country. The relevance of Hofstede’s work within an aviation environment was replicated using a large sample of pilots from many countries where different cultural boundaries operated (Helmreich & Merritt, 1998).

Therefore, theoretical approaches based on models of social identity and social categorization; along with theories of group and team formation have the potential to offer highly productive research avenues to pursue. However, no introduction to a theoretical approach based on the social identity and social categorization approaches would be complete without a prior discussion and reference to seminal works by Hofstede (1991) and Reason (1990, 1997, 1998, 2004, 2006, 2008).
Research by Reason on the Development of a Strong Safety Culture

A strong safety culture and climate need to exist to help prevent errors and accidents. The importance of identifying how individual members had cooperated and communicated as a team in aviation accidents had been discussed in the literature by Sasou and Reason (1998) who went on to develop both a definition and taxonomy to help to categorize team errors. Sasou and Reason (1998) thought that while individual errors were one form of “human error” as defined by Reason (1990) “team error” considered how a group of people made human errors when they worked as a team or in a group.” (p.1). Such an approach fits in well with the unifying research theme in this thesis.

Reason (1990) had developed a model of accident causation which applies to the aviation sector as well as other safety critical organizations. This is often referred to as the ‘Swiss Cheese’ model as the failure of any one factor which has not been protected by safety measures in the chain could result in an accident. Swiss cheese consists of a number of holes in any given slice and if two slices are put together with holes that exactly match an error can slip through the system and has not been trapped. This could result in an accident and is an example of organizational failure. This model has been used by accident investigators as they seek to find the cause of aviation accidents. It consists of the following key points:

- Organizational deficiencies and latent failures
- Local Factors
- Unsafe Acts
- Inadequate or absent defences
Organizational defences and latent failures included management decisions, policies and actions and potentially unsafe organizational practices. Local factors included situations which contribute to active failures. In aviation this could include violations of Standard Operating Procedures (SOPs) or violation of Air Traffic Control (ATC) instructions. Environmental factors such as weather conditions are also included. Unsafe acts are viewed as having an immediate harmful effect on safe operations and are usually linked to the people involved. In aviation these unsafe acts could be related to failures in teamwork and communication between the two subgroups of aircrew (pilots and flight attendants) operating on an aircraft. Inadequate or absent defences included technical and human failures which were related to the previous three factors.

As Reason continued to expand on his model of accident causation he acknowledged different types of accidents (individual and organizational) which he discussed in the growing research literature that he and colleagues had published (Reason, 1990, 1997, 1998, 2004; Sasou & Reason, 1998). Once again the important distinction between individual errors and errors made when individuals were working as a team was emphasized. Individual accidents consisted of slips and lapses while noted for frequent occurrences the consequences were generally limited. Individual errors were viewed as mistakes, lapses or slips. Mistakes and lapses happened when people planned and thought about actions while slips occurred when the action was instigated. However while organizational failures were rare widespread consequences resulted. Such failures resulted from a number of causes including errors in judgment and poor decision making skills often made by individuals working as part of a team.

In 2008 Reason published work which further expanded on his theories of accident causation. Safe organizations were characterized by three main cultural drivers; commitment, cognisance, and competence that could be mapped onto the ‘4 P’s’ of management; principles, policies, procedures and practices. Reason then provided a new analogy (additional to the well-known
‘Swiss cheese’ model) which described what could happen when all factors involved in organizational safety had not been recognized. This model of a ‘knotted rubber band’ was used to describe the tension between productive and protective resources. The rubber band is viewed as limited resource, which when stretched has reduced ability for control as well as the ability to take protective actions.

Research on accident causation conducted within an aviation setting

The application of Reason’s accident causation model in an aviation setting was also supported by Helmreich and Merritt (1998, p.179) who also believed that when a strong safety culture had been established within an organization there was the opportunity for complacency to develop, especially when there had been no major incident or accident. Helmreich and Merritt (1998) cite this threat to safety directly from Reason himself:

‘Simply increasing production without the corresponding provision of new or extended defences will also erode the available safety margins. The consequence of both processes – neglecting existing defences and failing to provide new ones – is a much increased risk of a catastrophic and sometimes terminal accident.” (p. 6)

Additional research methodologies used to help understand factors involved in accident causation in aviation have included, confidential, non-punitive error reporting from within the industry, computer modelling, and literature reviews. The importance of a strong safety climate and safety culture, as first proposed by Reason (1990) provides a key linking factor between all methodologies. The additional research described below helps to add to the understanding of how a strong safety culture and climate is defined and adds to Reason’s seminal work in this area.
NASA places a strong emphasis on the development of a strong safety culture (Statler & Malouff (2003). The Aviation System Monitoring Modelling Project (ASMM) has provided computer modelling tools to assist in the identification of factors that could cause accidents. This proactive approach uses data from the National Aviation System to identify human error and put in place effective safety systems which would catch such errors. Again, more reliability is obtained by using a non-punitive approach to members of the aviation community who report such errors. Thus, computer modelling has also been identified as a productive methodology to use in the identification of factors which have the potential to cause accidents in aviation.

Literature reviews have also been useful in identifying key factors which would assist in the identification of useful methodologies to conduct safety assessments. For example, Wiegmann, Zhang, von Thaden, Sharma, Mitchell Gibbons (2004) conducted an extensive literature review on safety culture within the aviation industry and other safety critical environments with the aim of providing effective methods for conducting safety assessments within such organizations. In order to do so a safety climate needed to be defined. Wiegmann et al provided such a definition for the aviation environment from Eiff (1999):

“A safety culture exists within an organization in which each individual employee, regardless of their position, assumes an active role in error prevention, and that role is supported by the organization.” (p. 217)

The distinction between a safety culture and safety climate is also made with a safety culture being viewed as a lasting characteristic of an organization while a safety climate is subject to change due to operational demands. Wiegmann et al. (2003) suggested four major headings which could be used to conduct an assessment of the safety culture within an organization:
• Management involvement
• Employee empowerment
• Reward systems
• Reporting systems

Another relevant viewpoint on examining accident causation in aviation was suggested by Von Thaden (2008). He stated that human error had been responsible for 60%-80% of aviation accidents and these errors occurred when latent conditions existed within an organization. He suggests that aviation researchers and air accident investigators should look for coincidences, links and resonance when examining the system as a whole. Cultural influences would include the willingness of juniors to question their seniors, direct and indirect speech patterns, individuals’ perception of stress, and adherence to rules. Von Thaden’s research in 2008 linked back and also provided support for the research conducted by Wiegmann et al. (2004) as each individual is seen as having a role in speaking out on safety issues. Von Thaden also believed that it was important for top level management to be seen as supportive of a positive safety culture as this support would then flow down throughout the organization.

A methodology for assessing safety programmes in aviation using information from the NTSB accident investigation data base was put forward by Shappell and Wiegmann (2009). They suggested a framework called the Human Factors Intervention Matrix as a way of evaluating safety intervention programs. This HFIX model was designed in grid format with decision errors; skill-based errors; perceptual errors; and violations on the left hand side of the grid. The five factors which had been identified were: Organizational/Administrative; Human Errors; Technology/ Engineering; Task/Mission; and Organizational /Physical Environment. These
factors were written across the top of the grid. The aim of such a model was to prevent accidents due to human error which the authors believed accounted for 70%-80% of aviation accidents. This percentage rate would support the findings by Von Thaden (2008) where 60-80% of aviation accidents were attributed to human error.

**Organizations and Culture**

**Hofstede's research on power and status in intergroup relationships**

Research published by Hofstede (1991) is relevant to the underlying theme of this thesis as the effects of power and status in intergroup relationships will be explored in groups of employees who differ in status and power. The research reported on by Hofstede (1991) had been conducted from 1967-1973 with data collected from employees of IBM, a large multi-national corporation. This major empirical study analysed data from 117,000 questionnaires completed by 88,000 employees from 66 different countries. Hofstede surveyed seven categories of employees; managers from the head office in the particular country, branch managers, technical experts sales representatives, two types of technicians and administration employees. Each of these work position categories was considered to be of equal weight in the data analyses. Two rounds of data collection were conducted over four years (between 1967 and 1973) to test for stability over time. Hofstede (1991) derived four different cultural dimensions from the IBM data; power distance, uncertainty avoidance, masculinity-femininity, and individualism-collectivism.

The relevance of research conducted over 30 years previously to today’s modern aviation environment could at first glance be questioned. However, this seminal piece of research work by Hofstede has stood the test of time; one reason being the extremely large sample sizes collected over two different periods of time. Hofstede had also included different categories of workers
separated by a hierarchical power structure; this difference being similar in principal to the
differences in status experienced by two different subgroups of employees (pilots and flight
attendants) operating on a commercial jet aircraft.

**Power Distance**

Hofstede had defined power distance as:

> “the extent to which the less powerful members of institutions within a country expect and accept
> that power is distributed unequally.” (p.28.)

Therefore, high power distance cultures one would expect to find a high level of dependence on
those who are seen as superior, with subordinates unlikely to directly approach their superiors.
Conversely, in lower power distance cultures there would likely be some degree of consultation
between groups, with subordinates feeling able to question their superiors if/when necessary.
Hofstede calculated the power distance index (PDI) for 50 countries in the study, finding high
power distances values for Latin, African, and Asian countries and much lower distances for the
USA, Britain, Canada, South Africa, Australia, and New Zealand. Hofstede then stated that PDI
scores could be used to provide information about dependence relationships in a country.

Hofstede believed that when the emotional difference between the two groups was relatively
small, subordinates would more readily approach, and when necessary contradict their leaders.
Hofstede (1991) used the term “emotional difference” (which had first been written up in earlier
research by Mulder (1976, 1977) to describe the difference that separated people in a subordinate
role from those in positions of authority.

Power distance at the occupational level was also investigated by Hofstede (1991) with
comparisons made across 38 different occupations. He concluded that occupations with the lowest
status (and education) had the highest power distance scores. However, those occupations with high status and high education showed the lowest power distance scores. Hofstede then compared occupational differences across cultures and noted an interactive effect. In cultures with low power distance, different occupational groups showed clear differences, with low status positions showing higher power distance scores than higher status positions. It is important to note that in high power distance cultures occupational differences were much smaller as all occupations had high power distance scores. Hofstede stated that it was possible to calculate PDI scores by occupation, as the three questions used for the calculation of the PDI scores across countries were also suitable for comparison across occupations. This was because the three PDI questions measured social inequality across countries and differences in social status leading to inequality were also the prime criterion by which occupations could be distinguished. Therefore, the work environment in low power distance societies would be characterized as places where inequalities among peoples would be minimized and that there would be some degree of interdependence between less and more powerful people. These findings demonstrated that status and power played an important interactive role in the way in which groups of people worked together.

**The masculine-femininity index (MAS)**

Hofstede (1991) had described the work goal items in the questionnaire given to the IBM workers where participants were asked to rate the importance of the 14 items on a five-point Likert scale, ranging from of little or no importance to the utmost importance. Workers were instructed to think of factors which would be of importance in their ideal job, and to disregard their present work situation. The analysis of these 14 items revealed two underlying dimensions, individual versus collectivism and masculinity versus femininity.

Hofstede had listed the eight items associated with the masculinity-femininity (MAS) dimension, describing the first group of four items as masculine, with the second group of four described as
feminine. The masculine items examined the importance of high earnings, the recognition given when a job was well done, the opportunity for advancement to higher-level jobs, and having challenging work, which would give a personal sense of accomplishment. The four feminine items examined the importance of having a good relationship with a person’s direct superior, working with people who cooperate with one another, living in a desirable area, and employment security.

The MAS dimension became known as masculinity-femininity, and is of interest to this present research as it was one of the two of four dimensions which could be used across occupational groups; the other being power distance. It follows that it would be important to demonstrate the relevance of Hofstede’s (1991) findings in an aviation environment, specifically with the employee groups of pilots and flight attendants. The next step included searching the research literature for the existence and utility of a research instrument including some of Hofstede’s dimensions.

**The development of research instruments in aviation based on Hofstede’s indices**

This section will provide examples from empirical research demonstrating how the inclusion of particular survey questions was derived from Hofstede’s four cultural indices. The replication of Hofstede’s cultural indices in the aviation environment was shown by research undertaken by Helmreich and Merritt (1998). Pilots’ work-related attitudes and values were surveyed with data being collected from over 9000 pilots in 22 different countries. Their study confirmed that effects of national culture were observed over and above the professional culture of the pilots. Significant correlations were found for all of Hofstede’s indices. Helmreich and Merritt (1998) outlined the research instrument they developed (with Hofstede’s permission) to tap Hofstede’s four cultural dimensions. They added Hofstede’s Work Goal Values to the Flight Management
Attitudes Questionnaire (FMAQ) designed by Helmreich, Merritt, Sherman, Gregorich, and Wiener (1993). The present outline will focus on the dimensions of power distance and masculinity-femininity, as these were the only two dimensions in which the country index could be used for occupations.

**Item development and findings in the FMAQ (Helmreich & Merritt, 1998)**

*PDI items and data analyses*

The following three items were used by Helmreich and Merritt (1998) to calculate PDI scores. The pilot population surveyed were asked how frequently subordinates were afraid to express disagreement with their superiors on a five-point Likert scale ranging from very frequently to very seldom. They were also asked to state which of four leadership styles they would prefer to work under, as well as the style they were currently working under. The PDI was then calculated as the percentage who choose a consultative leadership as their ideal leadership style, the percentage who choose an autocratic or directive leadership as the typical leadership style and the mean response to the question asking how often subordinates were afraid to express disagreement.

*Research findings based on PDI items*

Helmreich and Merritt (1998) found that pilots from the airline ABC had low PDI scores. They reported the mean scores for the “command scale” for pilots across 22 countries. These scores ranged on a scale from zero to one hundred with a score of zero representing the lowest possible power distance and 100 representing the most hierarchal power structure. Helmreich and Merritt (1998) found that out of the 22 countries in their study, pilots from airline ABC scored the fifth lowest score, with a PDI of 21. When Hofstede calculated the scores for the IBM workers in this
country’s sample, it was found that it had one of the lowest PDI scores from among the 50 countries in the study, having a PDI score of 22.

MAS items and data analyses (Helmreich & Merritt, 1998)

Helmreich and Merritt (1998) then explored the MAS dimension with their large pilot population by developing items that related to the importance of opportunity for advancement to higher-level jobs, the security of employment, the opportunity for higher earnings, and the importance of working with people who cooperate with one another. Respondents were asked to rate these on a five-point Likert type attitude scale, ranging from of very little or no importance to of utmost importance.

Research findings based on MAS items (Helmreich and Merritt, 1998)

Attitudes on work values from pilots in the United States and foreign countries were collected by Helmreich and Merritt (1998, p.246). The following rankings for all the work value items for pilots from airline ABC’s country were reported. The 379 pilots ranked these work value items in the following order with the most important item ranked first:

1. Have sufficient time left for your personal or family life
2. Have security of employment.
3. Live in an area desirable to you and your family.
4. Maintain good interpersonal relationships with fellow workers.
5. Have opportunities for advancement to higher-level jobs.
6. Work with people who cooperate well with one another.
7. Have opportunity for high earnings.
8. Have challenging task to do, from which you get a personal sense of accomplishment.
9. Have a warm relationship with your direct superior.

10. Find the truth, the correct answer, the one solution.

11. Have a changing work routine, with new, unfamiliar tasks

12. Know everything about the job, to have no surprises

13. Observe strict time limits for work projects

These survey items both provided a model of the items used to tap the MAS dimension as well as showing the relative rankings of these items, which Helmreich and Merritt (1998) found in their study.

Additional research on the development of Hofstede’s cultural indices in an aviation environment

Additional information on the application of Hofstede’s four dimensional model to behaviour and attitudes on the flight deck was provided by Helmreich (2000). Helmreich (2000) referred back to how he and Merritt (1998) had adapted Hofstede’s four dimensions to apply to pilot populations across many different national cultures. This captured research data from 22 airlines.

Research Findings (Helmreich, 2000)

Three out of the four dimensions were found to be appropriate for use with pilots in a flight deck setting. These were:

1. Power Distance (PD)

2. Individualism- Collectivism

3. Uncertainty Avoidance (UA)

Pilots from countries such as Morocco, the Philippines, Taiwan and Brazil had the highest PD scores indicating that junior pilots believed that there was an unequal distribution of power which
showed they represented countries with a more autocratic culture. Countries including Ireland, Denmark and Norway and the United States showed low PD scores which indicated that they accepted a consultative leadership style which would be more willing to question senior crewmembers’ decisions.

Individualism- Collectivism represents differences in national cultures where people from individualist cultures examine the costs and benefits for themselves. In more collectivist cultures people believe in pleasant relationships in both work and family life. Teamwork and communication are important factors in aviation and pilots from collectivist cultures are more likely to achieve these goals. The United States and Australia scored the highest in individualism. However many Latin American and Asian countries scored highly on collectivism.

Uncertainty Avoidance (UA) as named by Hofstede was only replicated when Helmreich and Merritt (1998) renamed this dimension as ‘Rules and Order’. It centred on the viewpoint that an organization’s rules should never be broken and that written rules and procedures were needed for all situations. The pilots who rated highly on this index were from Taiwan, Korea, and the Philippines. Such pilots were seen as likely to follow rules and regulation to the letter but could find it more difficult to problem-solve as a team in situations outside of the rule book. While pilots from Anglo countries such as the United Kingdom, Ireland, the United States, Australia and New Zealand had low scores on this dimension they were more likely to overlook regulations such as always using checklists and following the airline’s SOPs in normal flying situations. However they were more likely to work as a team to problem-solve unusual and unique flying situations.
Additional research findings from the literature (Hofstede and Pederson, 2001)

Hofstede and Pederson (2001) continued to build upon cross-cultural studies, believing that it was important to refrain from judgement until more information had been discovered. Gert Jan Hofstede (the son of Geert Hofstede) continued his father’s cross-cultural research. Language was identified as one barrier to effective cross-cultural communication (Hofstede & Pederson, 2001). This finding is of particular interest to the present study as English is the language to be used in aviation communications throughout the world. Often communication is not completely understood and it is necessary to take cultural differences into consideration. A tragic example of miscommunication was the crash of an Avianca Airlines flight short of the runway at New York. On January 25 1990 Avianca Flight 052 had left Columbia on a flight to John F Kennedy (JFK) international airport in New York City. The flight deck crew of the B707 aircraft had recognized that they were short of fuel due to delays caused by bad weather. Air Traffic Control (ATC) had put the aircraft into a holding pattern and the crew did not notify ATC that they were so short of fuel that they needed immediate clearance to land. When the aircraft finally notified ATC they were facing total fuel exhaustion they could not make the emergency clearance to land and crashed after the fuel ran out sixteen miles short of the airport. The Air Accident Report (NTSB, 1991) noted the failure of the pilots to communicate the critical fuel situation along with the English language proficiency of foreign crews.

This accident showed how communication is critical to safety in the operation of modern aircraft which is an underlying theme of this thesis. However, it could also be examined in terms of Hofstede’s cultural dimensions and the effects of national culture (Helmreich & Merritt, 1998). They identified the dimensions of power distance (PD) and uncertainty avoidance (UA) as factors in the accident sequence. The Flight Engineer was aware of the dangerous fuel situation and tried to communicate this to the Captain by reading directly from the flight manual. Helmreich and Merritt (1998) believed that it would be culturally inappropriate to directly question a superior’s
actions due the effects of PD. Others crew members did not question the Captain’s actions in not declaring an emergency. The Captain also did not declare the urgency of the situation to ATC controllers as it would be culturally inappropriate. People high in uncertainty avoidance are believed to follow their original course of action rather than look for alternatives. The Captain also did not consider diverting to alternative airports after being committed to land at JFK. It was seen as important for both the listener and speaker to ask for further clarification when necessary (Hofstede & Pederson, 2001).

Hofstede and Pederson (2001) built upon Hofstede’s cultural dimensions by adding a fifth dimension named as long-term versus short-term orientation. Their book aimed at producing a number of different exercises and stories about different cultures. For example, drawings were commissioned from an artist who was asked to draw a number of different situations. Each drawing was followed by a set of questions for groups to discuss. The illustration that would have a particular relevance to this present study showed five people seated at an oblong table which contained a set of written work. The options provided included:

- People thinking hard to solve a problem
- A difficult conversation
- A meeting with the two women on the left talking about a mobile cell-phone
- People looking for a solution to a major problem with two members at the table keeping important information to themselves

CRM group training often includes discussion of relevant photographs, videos and illustrations. The above example could be discussed separately by a flight attendant group in one room and the pilots in another in a break out time. This could examine whether flight attendant and pilot groups
known to represent different sub-cultures would interpret the questions in different ways. The two groups would also rejoin together to discuss their thoughts.

**Earlier research on groups and teams**

**Models for understanding group formation**

In 1984 Foushee wrote an article on the importance of teamwork skills for flight deck crews. He believed that aviation accidents were still occurring due to less than optimum communication skills between the captain and other flight deck team members. While recognizing that each individual flight deck team member was a highly trained and skilled individual, it was important to acknowledge that psychological research should include studies of small groups in the highly structured flight deck environment.

Foushee stated that:

“However, in situations when a high level of teamwork is required, the individual skills of the team members are often not enough to guarantee satisfactory outcomes in all situations.”  (p.885)

Foushee (1984) therefore recommended that research should focus on observations of group behaviours in realistic LOFT type exercises (as described in Chapter 1), as opposed to laboratory settings.

It is essential to understand the organizational contexts in which groups work and the ways in which teams are formed (Ginnett, 1990). In 1987 Ginnett had conducted empirical research to investigate what happened in the formation of airline flight crews and to find out whether there were differences in the behaviours of effective and ineffective captains. It was realized that such research could not be undertaken in a controlled laboratory experiment. Ginnett (1987) therefore designed a field observation study where qualitative data were collected through cockpit operations with B727-200 crews on regular line flights.
Two check airmen had been asked to identify twelve effective and ineffective cockpit leaders. Two additional check pilots along with the chief pilot (who operated on the B737 fleet) were asked to evaluate these lists. In order for a captain to be included in the study they needed to have been identified on each of the two categories by at least four of the independent raters. This resulted in six effective leaders (Type A captains) and four less effective leaders (Type B) captains being used as subjects.

Data were collected over six months and consisted of 300 hours of direct observation and 110 hours of cockpit observations. This included crew briefings which the company required to be held one hour before departure. It is of particular interest to the present research that crew briefings included flight attendants in 1987 and that the whole crew was in attendance. This will be discussed in more detail in future chapters.

This piece of research by Ginnett (1987) was robust in that it involved observations of Captains in real-life flying, the use of check airmen as independent raters, inter-rater agreement, and a considerable amount of time in direct observations once categories for ineffective and effective Captains had been identified. It also showed how valuable real-life empirical research could be conducted. Ginnett (1987) found that Type A captains discussed how the whole crew would work together as a team focusing on the interface between the cockpit and the cabin. Several factors were discussed. These included the physical boundary created by the flight deck door and how it would be managed along with making sure that flight attendants played an important role as crew members. Type A captains made clear verbal statements as to how work should be done, including safety, communication and coordination issues. They also involved the whole crew as individuals with specific roles to play with in the group. Type B captains were found to lead ineffective briefings which along with their inconsistent behaviour in flight resulted in the failure to build and maintain effective teams.
Models of organizational group shells

Edward’s SHEL model (1972)

The concept of a group operating within an organizational shell was first developed by Edwards in 1972. This shell contained three resources; hardware (buildings, aircraft), software (rules, regulations, and SOPs), and liveware, (the human resource). All three resources were embedded within an environmental context which included physical, economic, political, and social factors.

Edward’s 1972 group shell became known as the SHEL model as it contained four factors represented by the letters SHEL:

S Software
H Hardware
E Environment
L Liveware

Aviation accidents had the potential to occur when there were mismatches between boundaries. The liveware resource represented the ways in which humans behave within this interactive environment. This could include crew selection, initial training, and recurrent training.

Ginnett’s shell model (1987)

Ginnett (1987) introduced another concept of the “shell” model likening this to ways in which a set of predefined operations make operations easier. The organizational shell consisted of four circles; the innermost circle consisting of teams at work, moving out through group formation, the organization, with the final outermost circle representing industry. These shells are formed and influenced by environmental factors. Edwards (1972) had identified these environmental factors as: physical, economic, political, and social. Therefore, both models acknowledged the importance of environmental factors. Ginnett (1987) also identified additional factors of task, norms, boundaries, and authority, which influenced the group at work. Although Edward’s (1972)
model used different headings there are many similarities with Ginnett’s model. Edwards used the word “software” to include rules, regulations, and SOPs while Ginnett used “authority”. Both models acknowledge the importance of the operating environment and how this influenced the behaviour of crews; Edwards named the human resource as “liveware” while Ginnett referred to the “norms” and “boundaries” under which each crew operated. The role of the crew is expanded on by Ginnett in the next paragraph.

In a commercial airliner the shell would consist of the captain, first officer and flight engineer linked to the flight attendants. This model provided the boundaries for accepted norms of behaviour, correct role behaviours and actions right back to the command authority established by the captain in the pre-flight briefing. Correct behavioural role expectations were set for each crew member that had been set time and time again in effective pre-flight briefings and in flight behaviour. Ginnett (1987) saw the shell model as consisting of dotted lines which could expand when necessary. Effective captains were able to affirm and expand the dotted lines as the observations of Type A captains had shown. When the captain reinforced the pre-flight briefing with good team work skills during the flight the dotted lines filled in and reinforced effective coordination and communication team behaviours. Ginnett concluded by stating that it was also important to understand the organizational context in which groups worked in the real world.

Both organizational shells (Edwards, 1972; Ginnett, 1987) were conceived from the scientific model of cells which contain spaces for electrons, protons and neutrons. However, while both models can be applied to organizational shells outside of aviation; Ginnett's (1987) model is used to describe group formation specifically within the aviation environment. Ginnett (1990) reinforced the shell model and the way airline crews form within conditions in the industry, the organizational structure of the airline, and environmental conditions.
O’Hare and Roscoe (1990) recognized the importance of crew coordination in the cockpit acknowledging the role of the unforeseen nature of the human factor where pilot behaviour could be influenced by psychosocial reasons such as limitations in communication and social skills. The importance of the human factor is emphasized in the title of their book “Flight Deck Performance: The Human Factor”.

**Leadership Research**

The role and development of effective leadership in groups has been shown to play an important part in team performance (Ginnett, 1993; Hackman & Wageman 2007; Graen, 2007; 2009; Kaiser, Hogan & Craig (2009).

The formulation of relevant key questions to guide leadership has been suggested by Hackman and Wageman, (2007). These questions have been included as a direct quote from the journal article in order to provide information that the authors intended in its complete wording. With an academic discussion still occurring in the literature, it is important to provide the exact framing of the research questions, especially as they have been written in an accept or reject format.

1. “Not do leaders make a difference, but *under what conditions does it matter?*
2. Not what are the traits of leaders, but *how do the leaders’ personal attributes interact with situational properties to shape outcomes?*
3. Not do there exist common dimensions on which all leaders be arrayed, but *are good and poor leadership qualities a qualitatively different phenomenon?*
4. Not how do leaders and followers differ, but *can models be reframed so that they treat all system members as both leaders and followers?*
5. Not what should be taught in leadership course courses, but *how can leaders be helped to learn?*” (p.43)
Hackman and Wageman (2007) further explained their model by using the example of the basketball coach losing his job after the team lost several games, while when a team was winning it was often the coach who received the accolades. In social psychology this is known as the leadership attribution error when the sum of the team’s performance is viewed as resulting from the leader’s performance. The importance of different variables interacting together is seen to be of prime importance in the interactionist theory. This model looks at identifying any key variables that may shape the behaviour of leaders and how this behaviour is linked to job related outcomes. However, leaders like their followers, have their behaviour shaped by a number of different factors. Therefore, the need for robust conceptual models to guide future empirical research is important (Hackman and Wageman, 2007).

Hackman and Wageman (2007) believed the identification of what could be poor and good leadership models has been reliant on a two dimensional approach which could be problematic if there was no single model on which poor and good leadership dimensions could be displayed. Two different systems may have to be developed. The authors then support their viewpoint by quoting work by Ginnett (1993) which is highly relevant for the aviation industry.

“The same asymmetry may operate for leadership. Research by Ginnett (1993) on the leadership of airline captains, for example, showed that leaders who had been identified by their peers as excellent crew leaders used their authority to accomplish three generic functions (bonding the crew as a performing unit, helping the crew come to terms with its task, and establishing basic norms of conduct for the team.) Leaders who had been identified as poor crew leaders by contrast, did not merely fail to accomplish these three leadership functions; instead they all demonstrated some kind of difficulty with control issues (for example, being over controlling, or under controlling, or vacillating between the two.) Poor leaders were not individuals with low scores on the same
dimensions which good leaders excelled; instead, they exhibited entirely different patterns of behaviour.” (Hackman & Wageman, 2007, p. 45)

Hackman and Wageman (2007) continued their discussion by suggesting that emotional maturity could be seen as a sign of good leadership skills. It was believed that these processes could be taught within a real-life context in a safe environment. In aviation the simulator could provide a safe environment to practice skills. CRM programmes in the present research provide a number of opportunities to practice behavioural skills, including LOFT simulator sessions, proficiency check simulator sessions, the use of relevant scenarios conducted in mock-up aircraft as well as classroom discussions.

While Graen (2007) believed that the five accept-reject leadership questions developed by Hackman and Wageman (2007) had made a major contribution to research he suggested the following reframing of the questions:

1. In what context do team leader behaviours and relevant network characteristics matter?
2. How do leadership and network characteristics interact with context variables?
3. What characteristics are linked to successful outcomes?
4. How can leadership characteristics include all followers?
5. How can leaders help all team members?

Graen (2007) believed that it was the quality of the leadership in dyadic and triadic groups that worked to encourage effective team communication, commitment and coordination. A good team leader would show excellence in his/her work that would encourage other team members to work together in a pleasant team relationship. This supports the present study where effective
Captains set the tone for cooperative teamwork not only on the flight deck but also amongst the flight attendants in the cabin.

Grean (2009) focuses more on the precise teamwork behaviours and network characteristics of leaders and also asks how leaders can assist all team members rather than just focusing on how leaders could be helped to learn. However, the third question formulated by Hackman and Wageman asks whether good and bad leaders show two sets of totally different characteristics, a question not asked by Graen. It is suggested that anyone wishing to study leadership qualities should pay careful attention to both sets of questions as they both contain valuable points which have been associated with leadership.

Kaiser, Hogan and Craig (2009) noted that effective leadership involved the coordination of a group to meet its goals. In the present study this would include the motivation of the flight deck and cabin crew to work together as a team for the common good. This would include effective coordination and communication from the pre-flight stage to the successful landing at the aircraft’s destination. The authors reviewed ten meta-analytic studies which included over 280,000 leaders, discovering two categories of leadership each with two sub-categories. The first category looked at the characteristics of individual leaders which included leadership emergence and perceived effectiveness. Measures used included a five-point Likert rating scale including such items as “this person is effective in meeting others’ job related needs”. Performance at a group level looked at the effects leaders have on team performance by using such measures as peer ratings and observer ratings.

While the research by Kaiser et al. (2009) was completed within the setting of companies and their mangers, it does have application to the aviation setting where the Captain is viewed as the leader of a team. More research is recommended by the authors in applied contexts again
providing support for the view that aviation can learn from company management structure and similarly companies can learn from aviation research in its applied setting.

**Social Identity Theory and the Social Categorization Approach**

**Where Theory Informs Practice**

This major section will provide a critical review of the literature on the social identity and social categorization approaches as a way of understanding how two different sub-groups separated by power and status could become more willing to engage in positive intergroup behaviours. It is postulated that an emphasis placed on the social/organizational aspects of identity (as opposed to personal identity) would increase positive teamwork behaviours. Such a theoretical approach could be explored in an experimental manipulation of social and personal identities and may well provide another tool to use in the development of joint CRM training for pilots and flight attendants.

It is essential to provide short definitions of these theories before they are discussed in more detail below. The following succinct definitions have been referenced from a book entitled “Psychology in Organizations-The Social Identity Approach” by Haslam (2004).

**Definitions of the Social Identity Theory (SIT)**

Social identity approach

“A psychological meta theory that encompasses the principles and assumptions articulated within the social identity and self-categorization theories.” Haslam (2004, p.281)

Social identity

“An individual’s knowledge that he or she belongs to certain social groups together with some emotional value or significance to him or her of this group membership”, Tajfel (1972, p.31), Haslam (2004, p.281)

Social identification

“A relatively enduring state that reflects an individual’s readiness to define him- or herself as a member of a particular social group.” Haslam (2004, p.281)

A Definition of the Social Categorization Approach (SCT)


Social Identity Theory and the Social Categorization Approaches

The present research is based on a conceptual framework developed in social psychology that involves group behaviour and team performance. The social identity approach asserts that society is made up of social categories with each category linked to the other in terms of status and power. People are seen to obtain their identities through the social categories they belong to. Hogg and Abrams (1988) believed that the social identity approach could be applied to greatly enhance an understanding of social groups. They stated that such an approach would involve an examination of the psychological processes involved in translating these social categories into
human groups, focusing on how group behaviour can influence the behaviour of the individual. Brown (1988) described the social identity approach as based on an individual’s need to work hard to keep a positive social identity. Group membership was seen as an important part of an individual’s social identity with a positive social identity built on favourable comparisons with other groups.

The social identity approach applied within organizational contexts

The social identity approach has great relevance for organizational contexts as organizations are internally structured groups placed within networks of intergroup relationships that differ from each other in terms of power, status, and prestige (Hogg & Terry, 2001). Such a viewpoint would be applicable to the aviation industry in general and more specifically to intergroup relationships between pilots and flight attendants. While this intergroup relationship between pilots and flight attendants has not been explored to date there is evidence of social identity research undertaken with workers in other workplace organizations.

Social identity within a workplace organization was investigated by Bergami and Bagozzi in 2000. This research was undertaken in Italy (a non-Anglo country) within an Italian food company and represents an important piece of work as social identity research had frequently been conducted in artificial settings, often with university students in laboratory settings. Bergami and Bagozzi (2000) explored the cognitive, emotional and evaluative components of social identity. The cognitive component of organizational identity had been defined as the self-awareness of one’s membership category in the organization, a process that would involve self-categorization. A scale was developed consisting of visual and verbal measures of organizational identity with one measure including the presentation of eight pairs of circles in varying degrees of overlap. Participants were asked to identify which pair best suited the level of overlap between their own (personal) and organizational identities. The circles ranged from being drawn as far
apart to complete overlap. Bergami and Bagozzi (2000) found that when employees identified circles with a close or near total overlap a strong cognitive identification with the organization existed. A strong cognitive identification acted as a main arbitrator between status and stereotypes, and affective commitment and self-esteem. Such employees were more likely to be more committed to the organization and work satisfaction resulted in a higher group identity and self-esteem. However, the research does not identify which groups of employees (those in perceived high or low status roles) were more committed to the organization.

The application of a social identity approach in organizational mergers was examined by Terry (2003). Group status, permeability of groups and similarity in groups were identified as key points. The effects of an airline merger on airline pilots of high status (an international carrier) and low status (a domestic carrier) was studied by Terry, Hogg and Blackwood (2001); cited by Terry (2003). Members of the lower status group showed more ingroup bias than workers in the higher status organization. Ingroup bias in members from the lower status organization was shown on status-irrelevant dimensions. However, members from the higher status organization showed evidence of ingroup bias only on the status-relevant dimensions. The researchers acknowledged that this study was based on a cross-sectional research design and that it would be important to see if these differences would continue over time. While the study examined the attitudes of pilots additional understanding of intra-group attitudes and ingroup bias of flight attendants could have been investigated at the same time. This would have added to the paucity of studies using the social identity approach to explain the group behaviour of the sub-group of flight attendants.

The role of social influence in groups was discussed by Brown (1988) who believed that while conforming to the majority could influence groups, it would also be possible for groups to be influenced by a dissenting minority. This discussion is particularly relevant to intra-group
influences within an aviation environment, in this instance being linked back to the group influence exerted within a flight deck crew. The following example used by Brown well could have been used to advocate for CRM training, as it occurred back in 1986 when CRM programmes for pilots were being developed. Brown effectively uses an example of an air accident screened in a British television documentary in 1986 to demonstrate the power of the majority and the persuasiveness of conformity.

The cockpit voice recorder showed how the Captain and the Flight Engineer ignored the concerns voiced by the co-pilot as to the incorrect glide slope. The co-pilot had made increasingly concerned comments about the incorrect altitude for the approach. These concerns were heard but ridiculed by the other two flight deck crewmembers. This demonstrated the power of group factors at work. The Captain was a person of higher status whose decision making was also confirmed by the opinion of the Flight Engineer. While the social influence exerted by the power of the majority has been demonstrated using a vivid and tragic example based on lack of teamwork and effective communication it is interesting that examples of other aviation accidents (as described in Chapter 1) have not been used in the social identity literature to provide such clear illustrations of the importance and utility of using social identity theory to demonstrate ways in which theory should inform training and practice.

Theories of intergroup contact and their effect on teamwork and communication in two different sub-groups need to be explored. Such theories have been put forward by (Brewer & Miller, 1984; Hewstone & Brown, 1986; Hogg & Abrams, 1988; Pettigrew, 1988; Brown, 1995, 2000).

**The Contact Hypothesis (Allport 1954)**

Allport’s Intergroup Contact Hypothesis (1954) outlined four situational conditions, all of which were deemed necessary to reduce intergroup prejudice. Pettigrew (1988) explained these four key
conditions as: equal group status within the situation, common goals, intergroup cooperation, and the support from the authorities. The literature had also suggested four interrelated processes would operate through contact and result in attitude change. These processes were: learning about the outgroup, changing behaviour, generating affective ties, and ingroup reappraisal. Once attitude change had occurred through these processes it was important to discover whether such change would generalize to other situations (Pettigrew, 1988).

Pettigrew (1998) then discussed whether attitude change would generalize to other situations. He stated that there were three strategies which could be used to enhance generalization; namely, decategorization, salient group categorization, and recategorization. It was believed that each of these three strategies worked together to effect attitude change. He believed that the initial stages of intergroup contact would be helped by not making the membership categories a salient feature. After some degree of contact, when anxiety over the situation had decreased, it would be important for group membership to become salient to allow for the generalization of positive contact effects beyond the situation at hand. Recategorization would then be possible as the group members take on all-inclusive group identification. This perspective based on decategorization, salient group categorization, and recategorization links in well with Brown’s (2000) description of three different modifications to the Contact Hypothesis discussed below.

**Modifications to the Contact Hypothesis**

Modifications to the Contact Hypothesis (Allport, 1954) have been put forward by various well respected social psychologists (Brewer & Miller, 1984; Hewstone & Brown, 1986; Gaertner, Mann, Murrell & Dovidio (1989) Gaertner & Validzic, 1998; Brown, 2000; Terry, 2003). There is some degree of debate in the literature as to whether all four key conditions (equal group status within the situation, common goals, intergroup cooperation, and the support from the authorities) described above by Pettigrew (1988) needed to be present to effect attitude change. While Allport
(1999) had emphasized the importance of equal group status within the situation it is possible that the actual research context has a moderating effect on this condition.

While most research supported the importance of equal group status, it was difficult to define exactly what was meant as “equal status” (Pettigrew, 1998). He cited research by Mullen, Brown, and Smith (1992) where it was recorded that ingroup bias increased with relative status in laboratory groups but decreased in field research that used real groups. However, while the two groups in the present research hold unequal status it is recognized that the captain is the leader of the team and that there is a power gradient in operation on every commercial airline flight. Such a power gradient is necessary with every aircrew team member highly trained in their respective roles. It could be that the highly specialized setting of a modern commercial aircraft with two highly trained sub-groups could moderate the need for “equal status”. As the present research is based within a field research setting with real groups it is thought that positive contact effects will still occur even though the equal group status condition is not fully met in the manner recognized by Allport. Pettigrew (1988) believed that this would be possible, citing recent research studies that showed positive contact effects.

The modifications to the Contact Hypothesis as described below by Brown (2000) also show that all four of Allport’s conditions need not be present for positive intergroup change to occur. Such an argument would be reinforced by noting that the present research meets the requirements of the additional three conditions; common group goals, intergroup cooperation and support from the authorities.

**The application of the social identity model to reduce ingroup discrimination**

Brown (2000) believed that that the social identity approach has provided the basis for three different modifications to the Contact Hypothesis (Allport, 1954), which are all focused on the
The social identity approach was viewed as a powerful explanatory tool in exploring a range of problems in group behaviour; including both ingroup bias and responses of subordinate groups to their unequal status position (Brown, 2000). These three models were based on an extensive literature undertaken and reported by Brown (2000).

The first of these models is the decategorization model put forward by Brewer and Miller (1984) which is based on the view that the best way to reduce intergroup discrimination is to make these categories less useful as psychological tools. One way of doing this would be to add additional categories that replace and diminish the original categories, leading to a depowering of the current categories. Brown stated that there is much research evidence available supporting this viewpoint, although most has been conducted in laboratory settings with ad hoc groups.

The second model is based on redrawing the category boundaries so that the out-group is included in a new and bigger superordinate category. It is thought that because both groups now share a common identity that they should be seen as closer together with less intergroup discrimination occurring. Brown reported that there is much support in the literature for this viewpoint citing research by Gaertner and Validzic (1998) and Gaertner, Mann, Murrell and Dovidio (1989).

The redrawing of boundary categories outlined above is a key approach used in the present research.

However, as Brown believed that such strategies would be more difficult to apply in real life settings he described a third approach put forward by Hewstone and Brown (1986) in which some sub-group significance remained while contact conditions were optimized. Brown outlined various research approaches, which have been used to investigate ways to optimize intergroup contact. Work by Wilder (1984) has taken the approach of stressing ways in which the in-group
share common characteristics with the out-group members. Another approach used by van Oudenhouven, Groenewoud and Hewstone (1996) focused the members’ attention to their respective group memberships during the encounter. This would help members maintain and value their sub-group identity while intergroup contact was optimized.

This third perspective provides a useful model for the present research as it allows for research to be conducted using real-life groups in organizational settings in which experimental manipulations would be difficult to achieve. Its emphasis on the cooperative nature of group interaction is another relevant feature. The second perspective with its emphasis on the redefinition of category boundaries is also a main approach in the present research.

Therefore, both approaches are relevant to this thesis.

- decategorization, salient group categorization, and recategorization; (Pettigrew, 1988)
- decategorization, redrawing of category boundaries, and optimisation of contact while maintaining some sub-group contact (Brown, 2000)

**The relational identity orientation framework**

Such an approach fits in well with a relational identity orientation framework put forward by Brickson and Brewer (2001). They argued that there were three loci of self-definition. In addition to the self as an individual or the self as a group member they proposed a third locus, which was described as the self as an interpersonal relationship partner. In the relationship identity orientation the welfare of others is central. In role relationships there would be a focus on responsibility for both others as well as a focus on the safety of the whole group. Brickson and Brewer (2001) believed that this would involve cooperative interdependence between group members, which would require individuals to understand each other’s perspectives. This mutual interdependence would result in a greater level of trust between minorities and majorities than
would occur under the other identity orientations. The use of this third processing mode with its focus on interpersonal relationships, along with the individuation and categorization modes, is viewed as essential in adding to the understanding of ways in which to create positive intergroup relationships. A key point is that relational interventions create more positive attitudes between group members. Thus, any strategies used need to consider the importance of activating a relational orientation as a vital part of any intervention strategy.

*The common identity model*

An additional approach known as the common identity model was proposed by Gaertner, Rust, Dovidio, Bachman and Anastasio (1996) following on from their discussion of the contact hypothesis. They stated that a common in-group identity could be achieved through increasing the relevance of common superordinate group membership that is already in existence or by introducing common tasks or fate, which both groups would perceive as shared. It was thought that the change in perception from two groups to one should reduce intergroup bias and that more positive feelings towards former out-group members should be seen. As noted in the preceding paragraphs the redrawing of group boundaries to include a common superordinate group membership was a way to create a common in-group identity (Brown, 2000).

Gaertner et al (1996) believed that the development of a common ingroup identity would not necessarily imply that each group would have to give up their sub-group membership. This is important as at the end of the day one would expect flight attendants and pilots to still belong to their sub-group as the role descriptions and skill sets, are by definition, quite different. However, both sub-groups are also “aircrew” (as seen in the superordinate model) who have to communicate and work together as a team. Gaertner et al (1996) provided the example of offensive and defensive squads in a United States football team, noting that both these groups
operate independently within the context of a superordinate identity. It was the presence of cooperative interaction, which was seen to be of prime importance.

Ways to change attitudes through intergroup contact focusing on the effects of group membership salience were investigated by Allport, Brown, Vivian and Hewstone (1999). They explored conditions that would assist the generalization of positive attitude change following opportunities for cooperative interaction. Based on their findings from both laboratory and field settings they maintained that positive effects from intergroup contact were related to the maintenance of the salience of group categories, rather than the reduction of emphasis on group categories (Allport, Brown, Vivian and Hewstone, 1999). Once again the need for the provision of opportunities for cooperative activities while also allowing the sub-groups to retain some of their group distinctiveness was emphasized.

The following is an anecdotal example of the need for teamwork in a non-aviation setting. One reason put forward by the All Blacks’ former coach Laurie Mains for losing a crucial World Cup quarter-final was a lack of playing rugby as a team with players working more as individuals. This links in well with previous descriptions of the need to work as a team right through the whole game (in aviation until all engines shut down, reports filled in by both the Captain and cabin crew team leader, and passengers disembarked).

Cooperative interaction as a team has been shown to be an important factor in successful intergroup contact Gaertner et.al. (1996). An additional study conducted by Gaertner, Mann, Dovido, Murrell, and Pomare (1990; cited by Gaertner et al (1996) investigating the conditions for successful intergroup contact also provided support for this view. Two separate three-person groups were brought together in conditions that contained the presence or absence of intergroup cooperative interaction. They explored whether the members’ viewed their groups as one group
or two separate groups. Groups that viewed themselves as one group rather than two, showed reduced bias in evaluative ratings of out-group members. In addition, when cooperative interaction was added, bias in evaluative ratings further reduced. Thus, cooperation helped the members to perceive the group as one group, which in turn led to lower bias.

Further experimental research conducted with high-school students in a large multi-racial school in the United States also provided support for the common ingroup identity model (Gaertner et al., 1996). A survey was administered to over one thousand students who were asked to rate their agreement with items on a number of different scales. Each scale was designed to measure the school’s interracial climate looking at subgroups of items which examined perceived equal status, cooperative interaction, supportive norms and interpersonal interaction. Students’ attitudes to ingroup and out-group students were measured on the 90-item Likert questionnaire. When students perceived they were on the same team and belonged to one group, bias decreased as a common ingroup identity was developed (Gaertner et al., 1996).

The following quote discusses research from an aviation setting. The work by Helmreich & Wilhelm (1991) has been discussed in the previous chapter. However, it is noteworthy that the authors commented on the effects of group interaction:

“It seems that the dynamics of group interaction can drive attitudes and evaluations in one direction or another, over and above the personality and attitudinal predispositions of group members.” (p.297)

**Group membership salience**

An investigation of the occurrence of upward or downward social comparisons was conducted by Brown and Haeger (1999). A survey examined the frequency of spontaneous social comparisons
used when people evaluated their in-group and how out-group comparators were chosen. Brown stated that this was an area in need of research in naturalistic settings, as much of the research has been conducted in laboratory settings. Such research has involved the creation of various social situations and examined factors leading to upward or downward social comparisons. People had been found to use spontaneous social comparisons in the description of their in-group and had compared the in-group on an upward bias using higher status comparators.

A survey instrument was given to 293 university students from six European Community (EC) countries. The questionnaire contained four major sections. The first section examined social comparisons with participants being asked to write down whatever came to mind when thinking about their own country and then to explain why these things came to mind. The second section examined the status rankings of countries with participants asked to define a “well-off” country and a “badly off” country. They were then asked to rank twelve European Community countries in terms of being “well off” and to explain how they decided where to rank their own country. In the third section, comparison choice was investigated with participants being asked to choose two comparison countries for their own country and to explain the reasons for their choice. The fourth section focused on identification, social orientation, and perceived threat with participant’s strength of national identification measured by existing scales. The final six items investigated the perceived threat to national identity with statements that the participants were required to rank on a seven-point Likert scale ranging from ‘strongly agree’ to ‘strongly disagree’.

These data showed that intergroup social comparisons play a part in the evaluation of the ingroup as, before there was any suggestion of an intergroup context, one-fifth of the participants used another country to compare with their own. Five out of the six groups of students made an upward comparison choice while still wishing to keep some relationship with the chosen group.
Brown (1995) in his discussion of the Contact Hypothesis stated that there was little doubt that relationships between group members who interact together become more tolerant, citing applied research examples which investigated the integration of black and white students in United States schools. He believed that specific integration programmes for desegregation, particularly those involving cooperative learning had been very successful while acknowledging that research has not been so successful due to the fact that all four key conditions of the model had not been met. Brown (1995) emphasized the condition of equal status between groups stating that this was important as many prejudiced stereotypes of the out-group were built upon the basis that the out-group showed inferior ability in performing certain tasks. It is important to note that in the present research both groups (the pilots and the flight attendants) have specific roles to perform which have to be performed to a high standard and that successful completion of every flight involves mutual interdependence.

Brown (1995) believes that most intergroup relationships involve unequal status and power and examines the implications that this would have on intergroup relationships. He discussed research in which intergroup attitudes are obtained by asking group members to evaluate their own groups and other groups on a number of positive aspects, such as how friendly the groups are perceived to be. This involves an assessment of the comparative worth of groups. High status groups have shown obvious indications of positive ingroup bias by giving answers that show their apparent superiority. Brown cited research by Mullen et al. (1992) that found that high status groups tended to show more ingroup bias than lower status groups. However, they cautioned that this result was mainly found in laboratory settings as other variables could interact with the effects of status in field settings.

Brown (1995) illustrated this overall tendency by citing a study by Sachdev and Bourhis (1987) in which subjects were given a test of creativity and then placed in groups of equal and unequal
ability. The participants were then asked to assess the creativity of the groups on a different test of creativity. The findings showed that high and equal status groups showed obvious in-group bias with a tendency for lower status groups to favour the out-group.

Hewstone and Brown (1985) cited research by Amir (1969, 1976), who had reviewed the Contact Hypothesis and outlined favourable conditions that would reduce intergroup prejudice. One of these was when members of both groups needed to interact in functionally important activities and shared common goals. Another important condition relevant to the present research was when the contact was between members from a majority group with higher status members from the minority group. Large commercial airliners carry a greater number of flight attendants than flight deck crew, who are considered to be the higher status group.

Crisp and Turner (2009) further explored the Contact Hypothesis already discussed above to further explore ways to reduce intergroup prejudice. They believed that by simply imagining positive intergroup contact with an out-group could result in positive perceptions. Three experimental studies were conducted to investigate this theory in which participants were asked to imagine positive contact with an out-group member. The results supported the theory that the use of mental imaginary could be used successfully to increase positive interactions and reduce prejudice between groups. The first study had asked younger participants to think about positive interactions with older people, while the second study asked another group of young people to simply think about an older person. The third experiment had asked a group of heterosexual men to think about their attitudes about homosexual men. The participants who were asked to think about talking with homosexual men on a train journey showed greater positive attitudes and reduced level of prejudice than did the group that was just asked to imagine a homosexual group of men in an outdoor setting. The three studies showed that imagined contact with an out-group could reduce intergroup prejudice and increase positive intergroup contacts. Levels of anxiety
associated with meeting outgroup members were reduced and along with the effect of stereotypical attitudes.

**Limitations**

The studies discussed in this section have often been conducted in ad hoc laboratory groups rather than in real life settings. The authors have wisely noted this limitation and believed that it would be possible to discover different patterns of interaction in real-life settings.

While these studies employed adults who could hold prejudices about out-groups, it was shown that imagined successful intergroup contact could be applied to different groups and settings (Crisp and Turner, 2009). This would be a very inexpensive way of reducing stereotypes and perceived prejudices between flight attendants and pilots in the present study. In aviation any intervention must be evaluated and positive evaluations of imagined contacts could save Airline ABC both money and resources. The final comment by Crisp and Turner (2009) is important. The authors concluded that while imagined intergroup contact had positive effects, that they may not be as long lasting as the real life meeting of the two groups and that this was a need of future research.

**Summary**

The underling theme of the present research is that aircrew rostered to operate on any given flight represent two different sub-groups, each with its own distinctive culture (Chute & Wiener, 1996, 1997). Each sub-group is separated from the other in terms of status and power, with the pilots being perceived as having more power and status than the flight attendants. Each of these sub-groups has different roles and responsibilities but each has to form an effective team of aircrew very quickly. The social identity and social categorization frameworks have suggested ways that
two different sub-groups could become more willing to engage in positive intergroup behaviours (Hewstone & Brown, 1986; Hogg & Abrams, 1988; Pettigrew, 1988; Brown, 1995; 2000).

Strategies focusing on relational interventions were seen as creating positive interdependence between groups as each sub-group needed to understand each other’s perspectives. Such optimum conditions for intergroup contact would involve a focus on responsibility for others, which would involve a focus on the safety of the whole group (Brickson & Brewer, 2001). As noted in Chapter 1, CRM programmes have been developed to emphasize the importance of communication and teamwork skills and the mutual interdependence of airline crews.

The creation a new and bigger superordinate category which included the out-group (the flight attendants) would show both sub-groups that they could be closer together than first thought. The creation of a common in-group identity (which did not necessarily imply that each sub-group would have to give up their unique identity) was similar to the superordinate group model. This strategy was particularly relevant to the present study as while it was extremely important to provide effective joint CRM training (which could be guided by the above strategies) pilots and flight attendants would still belong to their own sub-group as role descriptions and skill sets are quite different.

The differences in power and status on intergroup relationships had also been also been explored by Hofstede (1991). Hofstede’s research was found to be applicable to the aviation environment by a major international study on pilots’ safety attitudes conducted by Helmreich and Merritt (1998). Conceptual models used to explain group formation in aviation have emphasized the importance of effective teamwork and communication in the highly structured flight deck environment (Foushee, 1984; Ginnett, 1990). Behaviours of effective and ineffective Captains were identified by Ginnett (1987) through observations conducted during real-life flight
segments. Models of organization group shells applicable to the complex aviation environment have provided an additional conceptual framework (Edwards, 1972; Ginnett, 1987). Models of accident causation developed by (Reason, 1990, 1997, 1998, 2004) have shown how each member in a safety critical industry could have important information to be conveyed that would help identify and trap potential threats and errors before they could occur.

Senior airline management have recognized the importance of new safety training programmes, including CRM training and joint training, as the airline’s size and fleet type increases. However, hard research data are needed to evaluate the effectiveness of these programmes. It is important to note here that this research could not be undertaken, particularly over an extended time-frame, without strong support from the airline. Six empirical studies were conducted using a range of research methodologies. Study 6 used an experimental manipulation based on the social identity and social categorization frameworks described in the present chapter. The following chapters will also outline how the results were reported back to airline ABC and used to develop and improve safety attitudes and safety training.
CHAPTER THREE

STUDY ONE

Introduction

The unifying research theme is that while modern aircraft are allocated to operate with a rostered group of aircrew, in reality this one group consists of two sub-groups; pilots and flight attendants. The relationship between flight deck crews and flight attendants had been identified in the literature as an area of importance for future research in the early 1990s (Chidester, 1993; Kayten, 1993; Helmreich, Wiener & Kanki, 1993) following incidents and accidents which occurred after failures in effective teamwork and communication between the two groups. Therefore, it would be important for research to focus on attitudes to safety held by the flight attendant group. This has the potential to provide valuable data before the introduction of new training CRM curricula for flight attendants.

The following two empirical studies (Studies One and Two) were designed to explore this theme and obtain data from the flight attendants’ perspective both before (1998) and after (2000) Airline ABC had introduced CRM training designed specifically for the flight attendant sub-group with its own distinctive culture. The present chapter focuses on the data collected prior to the changes in CRM training (Study One), while the following chapter will focus on the data collected after the changes (Study Two).

Early Cockpit Management Research

As discussed previously, new programmes known as CRM training had been developed for pilots to increase their awareness of cockpit crew communication and coordination issues. It was
important to evaluate any changes in attitudes to evaluate whether these new CRM programmes had been successful. For example, Helmreich, Foushee, Benson and Russini (1986) considered that measures of cockpit attitudes could be used to evaluate the effectiveness of CRM training. They believed that CRM programmes could result in attitude change, although it was viewed as essential to link CRM training with practical exercises to enable the new skills and attitudes to be practised and reinforced in a real aviation setting. Helmreich, et al (1986) concluded that it would be necessary to build a larger data base and evaluate training with pre and post-training measures.

Questionnaires were one of the main methods of evaluating CRM programmes. The Cockpit Management Questionnaire (CMAQ; Helmreich, 1984; Helmreich, Wilhelm & Gregorich, 1988; Gregorich, Helmreich & Wilhelm, 1990) had been developed to determine the effectiveness of CRM training at a time when there was only anecdotal evidence available. These questionnaires have been discussed in Chapter One.

Helmreich and Merritt (1998) had been sponsored by FAA/ NASA to gather data on safety attitudes from airlines around the world. Airline ABC had (and still has) a strong research ethos and had participated in data collection from its pilot population in the interests of adding to this aviation safety data base. Data collection instruments in the form of questionnaires had been provided with data to be stored at a data base set up at the University of Texas (Helmreich & Merritt, 1998).

**The development of the FSAQ**

The FSAQ was a product of Airline ABC designed specifically to obtain data before and after the introduction of the new CRM training for flight attendants. The following steps guided its’ development:
A small team of pilots had met in 1997 to discuss how to measure safety attitudes for flight attendants.

Members of this team had also been involved in organizing the collection of data for the University of Texas database described above.

The team then consulted with Merritt who kindly provided a 60-item questionnaire which she had used with flight attendants from a major United States carrier.

This was adapted to meet the cultural conditions in the airline’s country.

The team then invited a small group of flight attendants to identify “hot spots” from their perspective.

This resulted in a 36-item Likert type questionnaire.

The five-point Likert scale ranged from “strongly disagree” to “strongly agree”. Background information was included with the participants asked to identify their length of service, crew position flown, crew base, gender, first language spoken, and whether they were employed on a full or part-time basis.

This resulted in the new FSAQ questionnaire which was based on an amalgam of earlier questionnaires (CMAQ; Helmreich, 1994; Gregorich, Helmreich & Wilhelm, 1990).

Chidester (1993) summarized the importance of including flight attendants in CRM training.
“The unit of analysis should become the flight and cabin crew. Almost every safety problem encountered on one side of the cockpit door soon becomes a problem for the other. Coordination between these parts of the crew has been assumed in the operational community and unstudied by the research community.” (p.322)

The FSAQ focuses on attitudes to safety amongst the flight attendant group at Airline ABC. However, the following description of an-flight emergency clearly highlighted what could occur when there was a lack of communication, a lack of a pre-flight briefing, language difficulties; and different cultural expectations and norms.

This in-flight emergency was documented by Ganse (1995), the Director of Flight Safety at a major United States carrier. A FAA Workshop on Flight Crew Accident and Incident Human Factors was held in the United States in June 1995. Representatives and speakers came from the aviation industry, government bodies and academia to discuss and make recommendations on a range of human factor safety issues. The 135 page published Workshop Proceedings (Proceedings of the Workshop on Flight Crew Accident and Incident Human Factors, 21-23 June 1995, McLean Virginia) contained recommendations related to communication and coordination issues between pilots and flight attendants. Ganse (1995) reported an example of severe turbulence encountered over the Pacific. The cabin crew consisted of a United States male lead flight attendant with a team of Asian flight attendants. The flight had left Tokyo and encountered large thunderstorms. The Captain had illuminated the “Fasten Seat Belt” sign and this was to remain on until the aircraft would have cleared the area with thunderstorm cells.

Severe turbulence hit the flight just after it had reached cruise altitude. Less than one minute after the Second Officer had determined that the aircraft was still under control he attempted to contact
the cabin via the interphone. However, the male Chinese flight attendant could not understand the questions due to language difficulties associated with the technical questions. The Captain then asked the Second Officer to go back and assess the situation in the cabin. He reported that there were many injured passengers and debris in the cabin. The Captain assessed the situation and decided to return to Narita (NRT) in Japan where there would be more hospital facilities. The Asian flight attendants had been waiting on instructions on how to deal with the injured passengers as they had been trained, while the lead flight attendant had expected each flight attendant to act on their own initiative as he had been trained. The airline did not have joint CRM from its Asian crew bases. The lead flight attendant had to direct cabin crew activities when he should have been on the interphone with the pilots.

The debriefing led to the following findings:

1. Communication difficulties due to English as a second language
2. Lack of full crew briefings
3. Flight attendants lack of knowledge of aircraft terminologies which prevented the communication of accurate information to the flight deck
4. Designated flight attendant interpreters reported that it was difficult to interpret the flight deck’s instructions to passengers due to the noisy environment
5. The lead flight attendant had three uninjured flight attendants and had to decide their placement for landing without knowing of any structural damage
6. Cultural differences in communication
7. No requirement for the interphone speaker to identify themselves

This real life accident scenario which occurred on a flight in the Asia/Pacific region (where Airline ABC also operates) happened before the development of the FSAQ. Airline ABC did not
have crew based in Asian countries at that time. However, flight attendants with English as a second language had been employed by the airline both to help in general translation requirements and more importantly to translate instructions in emergency situations.

**Research Questions**

Which variables (length of service, crew position flown, seniority, leadership roles, flight attendant crew size, length of route flown, English as a first language, and crew bases) would best predict safer attitudes in the flight attendant group as measured by total score summed on the FSAQ?

**Hypotheses**

It was predicted that:

1. The length of service as a flight attendant would result in significantly different safety attitudes with flight attendants with less experience showing lower mean scores on the FSAQ indicating less safe attitudes than flight attendants with a greater length of service.

2. Flight attendants in positions of responsibility and leadership (seniority) would display significantly higher mean scores in safety attitudes than flight attendants in less senior roles as measured by the FSAQ.

3. Crew position flown would influence safety attitudes of flight attendants as measured by differences in the mean scores on the FSAQ.

4. The number of crew operating on an aircraft would influence safety attitudes with aircraft operated by a smaller number of flight attendants displaying significantly higher mean scores on safety attitudes as measured by the FSAQ, than aircraft operating with a large number of flight attendants.

5. Short-haul and long-haul crews would display different safety attitudes as measured by the FSAQ, with short-haul crews displaying higher means.
6. Male and female flight attendants would display different safety attitudes as measured by the mean scores on the FSAQ.

7. Full-time and part-time flight attendants would display different safety attitudes as measured by the mean scores on the FSAQ, with full-time flight attendants displaying higher mean scores.

8. Flight attendants with English as their first language would display significantly different mean scores on safety attitudes as measured by the FSAQ, than non-English first language flight attendants.

9. Flight attendants operating from different crew bases would display different safety attitudes.

**Method**

**Participants**

The participants were the complete complement of flight attendants from Airline ABC who flew on jet aircraft, including short-haul and long-haul routes. Flight attendants had differing lengths of service and operated in different crew positions. The flight attendant group was representative of those with clearly defined roles of responsibility and leadership. The majority of participants were based at the airline’s main base, but flight attendants from other crew bases in other parts of the country were also included. The group included both male and female flight attendants, English and non-English first language speakers. While the vast majority of crew were employed on a full-time basis the opportunity to participate was also given to part-time and temporary crew. This provided a large sample which was representative of the airline’s flight attendant group.
**Procedure**

A letter written by the CRM Training Manager in June 1998 was sent out with the questionnaire. The stated purpose of the research was to obtain data on existing safety attitudes before the new CRM training programme, developed specifically for flight attendants, was introduced in August 1998. It emphasized that participation was on a voluntary basis. Participants were assured that all responses would be strictly confidential and were reminded not to write their name on the questionnaire form. A gift basket containing six bottles of wine and nibbles such as cheese were used as an incentive to encourage participation. Cooperation from In-flight Services Management had been obtained. Union permission had also been obtained. This introductory letter is shown in Appendix A.

Administration staff placed the envelope containing the letter of introduction and the questionnaire in the flight attendants’ personal airport mail boxes at their particular crew base. Crew who wished to participate would complete the questionnaire at a convenient time, usually at their homes. As crew collected their mail from their personal mail boxes located at the airport it was thought that some long-haul crew might also complete the questionnaires in their rest periods on long-haul flights. The flight attendants were asked to return the questionnaire in the sealed envelope provided addressed to the Crew Resource Training Manager by August 28 1998. The questionnaires were returned through the company mail system. This was convenient for crews to use and was also a familiar method for mail delivery.

**Materials**

The FSAQ Questionnaire is contained in Appendix A.
**Results**

**Descriptive Statistics**

Table 3.1 Flight Attendants Safety Questionnaire (FSAQ) 1998 by percentages

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<th>C</th>
<th>D</th>
<th>E</th>
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**Multivariate Analysis**

**Reliability Analysis**

Cronbach’s alpha for the 36-item FSAQ was .844. Item 29 had a negative item-total correlation and if this one item was removed the overall reliability would increase to .856.

**Principal Components Analysis**

The 36-items of FSAQ (1998) were analyzed by using a principal components analysis (PCA) with Varimax rotation using SPSS Version 15. Ten components with eigenvalues greater than 1 were extracted. This is within the expected range (Tabachink & Fidell; 2001, pp.620-621). The largest component represented 18.3 % of the variance. These extracted components accounted for 55.2% of the variance.

The scree plot test (Cattell, 1966) was conducted where the eigenvalues are plotted against the factors. This is shown below in Figure 3.1. A close inspection of where the line graph changed shape indicated that there could be two interpretable components. The rotated component matrix showed that there were 7 items with loadings of .3 or greater on the first component with 7 items loading on the second component. The greater the loading the more confidence there is that the variable is a true measure of the factor (Tabachink & Fidell; 2001, p.625). The measures of factorability were of a good quality and indicated that the solution was an appropriate one.

In summary the 36- item FSAQ demonstrated an internally consistent and reliable scale. It is recommended that a slightly smaller 35-item test should be accepted for future use.
As noted in the above section, an exploratory PCA was conducted. The following steps were carried out:

- an inter-correlation matrix to create a table of factor loadings before rotation was performed
- a rotated component matrix was used to identify the number of extracted factors with eigenvalues greater than 1
- a scree plot test plotted the eigenvalues against the factors; this was an additional check to check on the number of factors identified which should be extracted

Figure 3.1: Scree plot of eigenvalues from principal components analysis of the FSAQ (1998).
The items loading on each factor are usually then examined to identify any underlying psychological constructs. It is admitted that any underlying psychological constructs should have been identified and named in Study 1 (and Studies 2 and 4). However, the main aim in this PCA was to examine whether the research instrument was an internally consistent and reliable instrument. The results described above showed that the FSAQ was exactly this.

In Study 6, the reader will notice that exploratory PCA was also conducted. The additional step of identifying sub-scales and naming underlying psychological was applied. There were two reasons for this; firstly, the investigation was based on a complex study of social identity and underlying constructs needed to be explored from analyses of the survey data; secondly, this study was conducted at the final stages of the present research when the researcher had been able to explore the uses of PCA analyses in more depth.

**Flight Attendant Characteristics and Scores on the Flight Safety Attitudes Questionnaire**

The background information section asked the participants to indicate their gender, crew base, first language, employment status (part or full-time), years of experience as a flight attendant and crew position flown. This included whether the flight attendant had a leadership role (In-flight Service Director, Purser) or worked as a flight attendant in economy or premium service areas. Total scores for the questionnaire were calculated by summing across all 36-items.

A list of crew positions and the number of aircrew rostered to operate on different aircraft types on different routes is provided for the reader in Appendix B.
Gender

There were 262 females and 182 males with 119 participants leaving this item blank. There is no apparent reason for the large number of participants who left this item blank. The Questionnaire design had placed Gender (M or F) as the first item and General Background item, so this is clearly seen by the reader. I would suspect that many participants thought that this was not relevant to their role or “none of your business!”

The overall attitude of females and males to flight safety, as measured by the FSAQ, was nearly identical. Mean scores are the summed scores of each participant which are then divided by the number of scores. In this report the group which has the higher mean score is indicative of more positive safety attitudes. Female flight attendants mean scores were (M = 126.7, SD = 13.6) and the male scores were (M = 128.3, SD = 12.6).

Crew Base

The majority of the participants were based at airline’s ABC main base (n = 410), while another 34 were based at three additional bases around the country. The mean scores and standard deviations for the main crew base participants were (M = 127.0, SD = 13.2) with the other crew bases (M = 131.7, SD = 12.3). A one-way ANOVA showed a significant difference between the two groups (F(1, 442) = 4.0, p = .044).

First Language

The majority of participants indicated that English was their first language (n = 400). Another 24 participants indicated that they regarded a number of different languages as their first language. These languages included Korean, Cantonese, Mandarin, Hokkien and Japanese to French, German, Dutch, Polish or Swedish. The remaining 139 did not provide this information. There was a difference between the mean scores of those who had indicated English as their first
language and those who had indicated other languages. There was no significant difference between scores.

**Employment Status**

The majority of participants were employed on a full-time basis (n = 369), while only 11 had indicated that they were part-time or casual employees. However, it is important to note that 183 participants did not provide information about their employment status. There were no significant differences found. The large number of participants who had left this item blank could have been due to sensitivities over whether their jobs were safe in a volatile aviation industry. The questionnaire design could have been clearer for this item which had asked participants to circle all that applied: Full-time, Temporary, Casual or Part-time. There might have been some confusion as to the distinction between temporary, casual, or part-time employment. Some participants in these categories may well have made frequent, unsuccessful applications for employment on a full-time basis and could have been unwilling to respond to this item. This latter comment needs to be considered against the argument that such employees would not have spent time completing a company questionnaire in the first instance.

**Years Experience**

Information on years of experience as a flight attendant was provided by 98.6% of participants. The range of experience was from 1-33 years (M = 11.23, SD = 8.35). A histogram of years experience (Figure 3.2) showed three distinct cut-off points at 7 years and 17 years. Flight attendants were then divided into three groups based on their years of experience; (Group 1: 1-7 years; Group 2: 8-17 years; Group 3: 18 years or above). Flight attendants with less than seven years experience showed significant differences in their scores on the questionnaire (M = 124.1, SD = 12.6) compared to more experienced flight attendants (F (2, 438) = 9.2, p <.0001). Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the least experienced
flight attendants were significantly different from the middle group (8-17 years experience; \( M = 128.6, \ SD = 12.8, \ \text{Mean diff} = -4.5, \ p = .005 \)). The comparison with the most experienced group also showed highly significant differences (\( M = 130.6, \ SD = 13.9, \ \text{Mean diff} = -6.4, \ p < .0001 \)).

![Histogram](image)

**Figure 3.2:** Histogram of years experience as a flight attendant

**Crew Position**

Participants were asked to identify their crew position by selecting from one of the following six positions (FA, Purser, FAPC, FAPS, ISC or ISD). The largest group was FAPS with 179 participants. The smallest group was Purser with 23. An ANOVA on the questionnaire scores showed a highly significant difference as a between-groups overall result (\( F(5, 431) = 8.9, \ p < \))
The FAPS had the lowest score (M = 123.9, SD = 12.4). The ISD’s had the highest questionnaire score which indicated more positive safety attitudes (M = 133.9, SD = 14.1). Pursers had a score that was nearly identical to the ISD’s (M = 133.0, SD = 10.1) A second ANOVA was run to compare the three most senior positions (ISD, ISC, & Purser) with the more junior positions. The scores between junior and senior positions was again found to be highly significant (F(1, 435) = 15.8, p < .0001). Flight attendants in the more senior crew positions had significantly higher questionnaire scores which indicated safer attitudes (M = 130.8, SD = 13.5) than those in more junior crew positions (M = 125.5, SD = 12.6).

As seniority and years of experience as a flight attendant are significantly correlated (r (555) = .57, p<.0001) an analysis of covariance (ANCOVA) was carried out to determine if the effects of job seniority on questionnaire score would continue to be significant after adjusting for years of experience. The results showed that job role remained significant (F(1,431) = 10.0, p < .0001) even after controlling for years as a flight attendant.

**Short and Long Haul Flight Attendants**
The majority of participants were long-haul flight attendants (n = 372) while short-haul represented a smaller group (n = 65). Long-haul flight attendants used the crew positions ISD, ISC, FAPS, or FAPC to designate their job role. Short-haul flight attendants used the crew positions Purser or FA for their role. An ANOVA on questionnaire scores showed a highly significant difference between the two groups (F(1, 435) = 16.5, p<.0001). Flight attendants on short-haul routes had significantly higher questionnaire scores indicating more positive safety attitudes, (M = 133.2, SD = 10.7) than those flying on the long-haul routes (M = 126.1, SD = 13.2).
Discussion

Predictors of FSAQ scores

In the present study, a number of variables were identified which could be used as indicators of safer attitudes. These variables were described as:

- length of service
- crew position flown
- seniority
- leadership roles
- flight attendant crew size
- length of route flown
- English as a first language
- crew bases

Length of service (Hypothesis 1)

In the present study, the length of time which a person had served as a flight attendant on jet aircraft was one important variable in whether safer attitudes, as measured by the FSAQ, were shown. The longer a flight attendant had flown corresponded with increasingly safer attitudes. The flight attendants had been divided into three groups according to their length of service with the most junior group showing less positive safety attitude scores than did the middle and most senior groups. This difference was more noticeable when the junior group was compared with the most senior group who showed much more positive safety attitudes than the junior flight attendants. One reason for these results could be the longer a flight attendant has flown the more recurrent training in safety and emergency procedures would have been completed. Another
possible explanation could be that those with less positive safety attitudes would have moved onto other positions, both within the airline or elsewhere.

While this would generally have a positive effect (as shown by training course evaluation forms) it is recognized that some flight attendants would become less receptive to training that had been attended on numerous occasions. However, this could have been partly overcome as the course facilitators update the courses on at least a yearly basis to provide best practice and current aviation incidents and accidents. A major incentive to learn as a life long learner is that it is one’s own life as well as up to 400 others that is at risk. Incidents occurring at Airline ABC would help to further focus attention as “it might just happen to me.”

The additional time with the airline of the longest serving flight attendant group would have provided an extensive experience base to call upon if needed and this could help identify unsafe practices or situations in the cabin sooner than the more junior crew members. The longest serving flight attendants would have flown on many different aircraft as the airline updated its fleet and would have undergone training courses specific to each aircraft type. Experience is a great teacher in most working roles and it would be a good idea if more junior flight attendants could be paired with more experienced colleagues. Senior flight attendants could be asked if they would like to be trained as mentors to junior flight attendants and new hires. Rostering demands would mean that the same mentor could not be paired with the same junior flight attendant on each flight so a pool of mentors would need to be developed. Long-haul routes have an additional flight attendant member known as a concierge specifically trained to handle passengers’ on-going travel needs and give suggestions of different activities and where to stay at particular destinations. This could reduce some of the high cabin workload periods and allow for mentoring to take place. Training occurring more informally on flights would also be very helpful. Such learning would occur when a junior flight attendant happens by chance to be in the right place to
observe how more efficiently a specific task is carried out or how a difficult passenger is calmed down. For example, I observed a simple but effective technique used by a senior flight attendant to close the cabin window blinds so passengers would not be woken as the aircraft flew through time zones and into daylight hours. The flight attendant used the hook of a coat hanger to reach across rows to slide the blinds down without awakening the passengers who were already asleep.

**Seniority (Hypothesis 2)**

Flight attendants in senior roles with the accompanying responsibility had shown safer attitudes than those not in roles of responsibility. This could be explained by the fact that in addition to length of service additional training had been provided for crew in leadership roles. This could have included rides on the flight deck jumpseat where the pilots’ roles and responsibilities could be observed first hand. The flight attendant team leader would also have a pre-flight briefing with one of the pilots before briefing their flight attendant team. This would serve to result in increased contact between the pilots and senior flight attendants.

Collegial support amongst flight attendants has been posited as an important predictor of team performance (Xanthopoulou, Baker, Heuven, Demerouti and Schaufeli, 2008). These authors had recruited flight attendants from a major European airline to keep a diary of work related events during three long-haul return trips. During these six sectors flight attendants did not fly with the same team. As flight attendants have a limited duration as a working group it is vital for safety reasons that collegial and supportive working relationships are formed quickly. The tone for this is usually set by the pre-flight attendant team briefing. For example, one of the Likert scale research items was “During today’s flight my colleagues showed a personal interest in me.” The findings showed that a supportive team environment improved both work engagement and work performance. Of special importance, the flight attendants felt more confident in their professional roles including dealing with disruptive passengers and medical emergencies. The small number of
completed work diaries (n = 44) which were returned was noted by the authors as a limitation of the generalization of this research. The present study had a large sample size (n = 563) and could therefore provide more statistically robust data.

**Crew position flown (Hypothesis 3)**

Crew position flown was found to be significant even after years as a fight attendants had been controlled for. Flight attendants with a more senior job role displayed safer attitudes than their colleagues in more junior crew positions. Senior flight attendants were in roles with more responsibility and could have been promoted to these positions as they has demonstrated technical proficiencies and leadership qualities during their recurrent CRM safety training courses. Written exam type papers which would include questions relating to safety would have also been passed. Differences in safety attitudes according to crew position flown do not only relate to flight attendants as Helmreich, Wilhelm, Gregorich, and Chidester (1990) had found. The attitudes of pilots also varied according to the crew position flown (Captain, First Officer, and Flight Engineer).

**Number of flight attendants on an aircraft (Hypothesis 4)**

A smaller number of flight attendants operating on board an aircraft would indicate that the aircraft fleet type was either a B737 or A320 as opposed to the larger cabin crew complement operating on the B747 or B767 aircraft. The lower crew numbers would mean that communication would be easier in the cabin as crew would be able to see each other. They would also be able to quickly react as team if needed. This could involve immediately supporting each other in the case of an unruly passenger, for example, and could also mean that each crew member could help each other out in busy times such as meal or beverage service. It would also be more likely that crew had flown together due to the smaller numbers available for rostering. It could also more likely that flight attendants would have served the pilots’ meals and beverages.
Stopovers with a smaller number of flight attendants would also mean that pilots and flight attendants would travel on the same crew transport and stay at the same hotels.

**Short or long-haul routes flown (Hypothesis 5)**

In the present study, highly significant differences in safety attitudes between flight attendants operating aircraft on short or long-haul routes were discovered. Airline ABC operates B747 and B767 aircraft on its long-haul route; however in periods of high passenger demand these larger capacity aircraft will be put on short-haul routes when the aircraft are available. Short-haul routes are operated by the B737 and A320 aircraft types. Research undertaken by Helmreich, Wilhelm, Gregorich, and Chidester (1990) had also found differences between fleet types amongst pilots for both overall safety attitudes and technical performance ratings as measured by the CMAQ survey and LOFT observations. The pilots were all flying for the same airline. Highly significant differences in safety attitudes were also discovered between pilots operating on different aircraft fleets by Helmreich and Wilhelm in 1991.

**Gender differences (Hypothesis 6)**

Gender differences between male and female flight attendants were not discovered as predicted. A worldwide survey collected 15 000 Flight Management Safety Attitudes Questionnaires with only 248 collected from female pilots (Helmreich & Merritt, 1998). Even though there were vast differences in the number of responses from male and female pilots held very similar safety attitudes. Research with population samples from North America found that men and women responded in similar ways in the provision of supportive communication (Mac George, Graves, Feng, Gillihan and Burleson, 2004).

Sell and Kuipers (2009) explored differences in cooperative communication patterns based on gender. They found that status and identity are related to communication differences between
male and females. It was considered that while status was usually more associated with males in leadership positions in high status roles, communication patterns could change when gender was made salient in context specific situations.

**Full and part-time employment status (Hypothesis 7)**

There were no significant differences found between full or part-time flight attendants. It is likely that the very small sample size for part-time flight attendants and the large number that did not provide this information provided a sample that would not be robust enough to identify significant differences.

**English as a first language and non-native speakers (Hypothesis 8)**

There were no significant differences found between English and non-native speakers. The small sample size and large number of participants who did not provide this information could account for this. The case study reported above by Ganse (1995) described language difficulties in communication between flight attendants and pilots following a severe incidence of turbulence. The lead flight attendant spoke English as a first language while the remainder of the flight attendants spoke a variety of Asian languages as their first language. The pilot’s interphone call to the cabin to ascertain injuries and damage was answered by an Asian speaking flight attendant who had difficulty understanding the questions. Clear communication is essential especially in emergency situations. As the flight had departed from Tokyo it was important that there were flight attendants skilled in communicating with passengers speaking Asian languages especially in emergency situations. However, the advisability of having the entire flight attendant crew with English as a second language with the exception of the lead flight attendant could be questioned. This is especially noteworthy as the airline was a large United States carrier with English speaking pilots.
**Crew Bases (Hypothesis 9)**

A significant difference was discovered in the safety attitude scores for flight attendants working out of different crew bases with crew from the smaller bases showing more positive safety attitudes. The small sample size from the other crew bases could account for this. However, the three smaller bases are based in the same country as Airline’s ABC main base. The flight attendants would have been flown to the main base for CRM joint training and recurrent training. This is unlike the case study described by Ganse (1995) where there was no joint training for crew based in Asian countries. As previously discussed crews need to form quickly as effective teams and it is more likely that the flight attendants from the smaller bases had all flown with each other on a regular basis. This would create better communication and could account for the higher safety attitudes scores.

**Summary**

The data collected in this study on flight attendants’ attitudes to safety, prior to introduction of CRM training designed specifically for flight attendants, identified predictor variables which could be used as indicators of safer attitudes. The most useful variables were described as: length of service, crew position flown, seniority, leadership roles, flight attendant crew size, and length of route flown.

The longer a flight attendant had operated on jet aircraft corresponded with increasingly safer attitudes. The flight attendants had been divided into three groups according to their length of service with the most junior group showing less positive safety attitude scores than did the middle and most senior groups. This difference was more noticeable when the junior group was compared with the most senior group who showed much more positive safety attitudes than the junior flight attendants. While, length of service is related to seniority, it does not necessarily imply the same meaning. Some flight attendants could have elected not to take up senior roles.
However, with this caveat, flight attendants in senior roles with the accompanying responsibility did display more positive safety attitudes than those not in roles of responsibility. Flight attendants operating in team leadership roles also showed that crew position flown was found to be significant a significant predictor of with more positive safety attitudes even after years as a flight attendants had been controlled for. Flight attendants on short-haul routes, on most occasions operated with narrow-bodied aircraft with a smaller number of flight attendants, had significantly higher questionnaire scores indicating more positive safety attitudes than those flying on the long-haul routes.

The FSAQ was developed as a research instrument to target this previously unstudied area. Airline ABC had recognized this vital need and sought to obtain data related specifically to the operational needs of their airline training as well as providing data that would increase the knowledge base from the flight attendants’ perspective in the wider aviation community. Another aim was to increase links between academia and industry.

It is important that safety evaluation programmes be well designed and based on a sound theoretical base. Airline ABC had been working closely with aviation safety research programmes at the University of Texas headed by researchers of international standing including Helmreich and Merritt. Funding for research within airlines has to be put forward with clear safety outcomes linked closely to mandatory regulations. A strong business case also has to be developed for research funding linked to outcomes that could demonstrate that results using particular research designs and methodologies would prove to be cost-effective and provide more effective and efficient safety training initiatives.
Study One has provided data on flight attendant safety attitudes at a time when there was a paucity of research which focused specifically on the flight attendant group. Information on the safety attitudes of this largely unstudied sub-group was needed in order to better understand interactions occurring both within the cabin and with the pilot sub-group on operating on the flight deck (Chidester, 1993; Kayten, 1993; Helmreich, Wiener & Kanki, 1993).

Study One has provided very useful data in its own right, but the major aim was to provide information on attitudes to safety in the flight attendant group before the introduction of CRM training, which could then be compared with safety attitudes following the completion of initial CRM training. The following chapter, Study Two (2000), involved the distribution of the same FSAQ as used in the present study. This would enable data collected both before and after training to be compared in order to explore training effects.
CHAPTER FOUR

STUDY TWO

Introduction

The underlying research theme is that while airline crews are rostered to operate on aircraft as one team there are two distinctive sub-groups on board; namely the pilots and flight attendants. Chute and Wiener (1995) believed that the basic problem in building both groups into one effective team was that the groups represented completely different cultures. It was also believed that barriers to effective teamwork could be attributed to historical, organizational, environmental, psychosocial, and regulatory factors which served to highlight the separation between the two groups. CRM training, especially joint CRM training for pilots and flight attendants, was seen a way of providing opportunities for positive group interactions.

The development of the FSAQ as a measurement tool has been discussed in the introduction to Chapter Three. Chapter Three also described how Airline ABC used the FSAQ to collect baseline data before the introduction of the airline’s CRM training for flight attendants in 1998. The FSAQ was also designed with the aim of collecting data on the safety attitudes of flight attendants following completion of initial CRM training. Therefore, the FSAQ was also administered in 2000. In order to collect, analyze and compare pre and post training results it was essential to apply the same measurement tool. Data from both collection points (1998 and 2000) will be analyzed using the chi-squared statistic. Multivariate data analyses will be conducted on the 2000 data using the same procedures that have been described in Chapter 3. These results will be described and discussed, including how the flight attendant sub-group perceived their job role and
responsibilities and their perceptions of how the pilot sub-group felt about the flight attendants’ role.

**Research Questions**

Which variables would best predict safer attitudes in the flight attendant group as measured by total score summed on the FSAQ?

**Hypotheses**

It was predicted that:

1. The length of service as a flight attendant would result in significantly different safety attitudes with flight attendants with less experience showing lower mean scores on the FSAQ indicating less safe attitudes than flight attendants with a greater length of service.

2. Flight attendants in positions of responsibility and leadership (seniority) would display significantly higher mean scores in safety attitudes than flight attendants in less senior roles as measured by the FSAQ.

3. The number of crew operating on narrow-bodied aircraft would influence safety attitudes with narrow-bodied aircraft operated by a smaller number of flight attendants displaying significantly higher mean scores on safety attitudes as measured by the FSAQ, than wide-bodied aircraft operating with a large number of flight attendants.

4. Flight attendants operating from different crew bases would display different safety attitudes due to the influence of different sub-cultures at the different bases.

5. Male flight attendants would score higher mean scores on the FSAQ, than female flight
attendants as they would not be subjected to behaviour patterns associated with gender differences from passengers.

Method

Participants

As in 1998 the participants were the complete complement of flight attendants from Airline ABC who flew on jet aircraft, including short-haul and long-haul routes. Flight attendants had differing lengths of service and flew in different crew positions. The flight attendant group was representative of those with clearly defined roles of responsibility and leadership. The majority of participants were based at the airline’s main base, but flight attendants from other crew bases in other parts of the country were also included. The group included both male and female flight attendants, English and non-English first language speakers. While the vast majority of crew were employed on a full-time basis the opportunity to participate was also given to part-time and temporary crew. This provided a large sample which was representative of the airline’s flight attendant group. There had not been any large recruitment campaigns in the intervening time, although a small number of flight attendants would have retired or left for other personal reasons. It is equally important that there had not been any large scale redundancies, although a small number of flight attendants may have elected to take early retirement to take up positions in other areas of the airline. Thus, the complement of flight attendants on jet aircraft would have been very similar to that of 1998 and therefore would have again provided a representative sample.
Procedure
The FSAQ is shown in Appendix A. To keep the distribution of the FSAQ (2000) as close as possible to the FSAQ (1998) the same procedures were followed. These have already been described in Chapter Three.

Materials
The Flight Safety Attitudes Questionnaire (FSAQ) 1998 (as described in Appendix A) was again used as the data collection instrument. The derivation of the FSAQ was described in the introduction to Chapter Three.

Results
Reliability Analysis
Cronbach’s alpha for the 36-item FSAQ was .842. One item (Q29) had a negative item-total correlation and if this item was removed the overall reliability would increase to .855.

Principal Components Analysis
The 36-items of FSAQ (1998) were analyzed by using a principal components analysis (PCA) with Varimax rotation using SPSS Version 15. Ten components with eigenvalues greater than 1 were extracted. This is within the expected range (Tabachink & Fidell; 2001, pp.620-621). The largest component represented 18.6 % of the variance. These extracted components accounted for 55.5% of the variance.

The scree plot test (Cattell, 1966) was conducted where the eigenvalues are plotted against the factors. This is shown below in Figure 4.1. A close inspection of where the line graph changed shape indicated that there could be 2 interpretable components. The rotated component matrix
showed that there were 8 items with loadings of .3 or greater on the first component with 11 items loading on the second component. The greater the loading the more confidence there is in that the variable is a true measure of the factor (Tabachink & Fidell; 2001, p.625). The measures of factorability were good and indicated that the solution was an appropriate one.

In summary the 36-item FSAQ demonstrated an internally consistent and reliable scale. It is recommended that a slightly smaller 35-item test should be accepted for future use.

![Scree Plot](image)

Figure 4.1: Scree plot of eigenvalues from principal components analysis of the FSAQ (2000)
Flight Attendant Characteristics and Scores on the Flight Safety Attitudes Questionnaire

A background information section asked the participants to indicate their gender, crew base, first language, employment status (part or full-time), years of experience as a flight attendant and crew position flown. This would include whether the flight attendant had a leadership role (In-flight Service Director, Purser) or worked as a flight attendant in economy or premium service areas. Total scores for the questionnaire were calculated by summing across all 36-items.

Gender

There were 276 females and 178 males with 72 participants leaving this item blank. No significant differences were found for this variable. Possible reasons for the number of participants who did not respond to this question have been discussed in Study 3.

Crew Base

The majority of the participants were based at airline’s ABC main base (n = 390), while another 55 were based at three additional bases around the country. The mean scores and standard deviations for the main crew base participants were (M = 132.8, SD = 11.8) with the other crew bases (M = 137.4, SD = 10.9). A one-way ANOVA was run which showed a significant difference between the two groups: F(1, 443) = 7.4, p = .007.

First Language

The majority of participants indicated that English was their first language (n = 417). Another 31 participants indicated that they regarded a number of different languages as their first language. These languages ranged from Thai, Cantonese, or Japanese to German, Dutch or Swedish. The remaining 78 did not provide this information. There was a significant difference between the scores of those who had indicated English as their first language and those who had
indicated other languages. The scores of non native English speakers were significantly lower (M = 129.1, SD = 10.5) than the native English speakers (M = 133.6, SD = 11.9; F (1, 446) = 4.0, p = .045).

**Employment Status**

The majority of participants were employed on a full-time basis (n = 291), while only 42 had indicated that they were part-time, casual or temporary employees. However, it is important to note that 193 participants did not provide information about their employment status. No significant differences between groups were found. Possible reasons for the number of participants who did not respond to this question have been discussed in Study 3.

**Years Experience**

Information on years of experience as a flight attendant was provided by 99.2 % of participants. The range of experience was from 0-35 years (M = 12.09, SD = 8.3). A histogram of years experience (Figure 4.2) showed three distinct cut-off points at 10 years and 20 years. Flight attendants were then divided into three groups based on their years of experience; (Group 1: 0-10 years; Group 2: 10-20 years; Group 3: 20 years or above). Flight attendants with less than ten years experience showed significant differences in their scores on the questionnaire (M = 130.8, SD = 11.7) than did more experienced flight attendants (F (2,451) = 7.6, p = .001). Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the least experienced flight attendants were significantly different from the middle group (10-20 years experience; M = 134.5, SD = 10.6, Mean diff = -3.68, p = .011). The comparison with the most experienced group also showed highly significant differences (M = 136.0, SD = 13.8, Mean diff = -5.12, p = .002).
Histogram

Figure 4.2: Histogram of years experience as a flight attendant

**Crew Position**

Participants were asked to their crew position selecting one of the following six positions (FA, Purser, FAPC, FAPS, ISC or ISD). The largest group was FAPS with 122 participants. The smallest group was Purser with 38. An ANOVA on the questionnaire scores showed a highly significant difference between the FSAQ scores of the six positions ($F(5,438) = 4.78$, $p < .0001$). The FAPS had the lowest score ($M = 125.9$, $SD = 10.8$). The Pursers had the highest score ($M = 134.6$, $SD = 12.2$). As the FAPS flew on long-haul flights and were not in senior positions compared with the Pursers who flew on short-haul flights and were in senior positions, a second ANOVA was run to compare the three most senior positions (ISD, ISC, and Purser) with the
more junior positions. The difference in scores between junior and senior positions was again found to be highly significant (F(1,453) = 17.4, p <.0001). Flight attendants in the more senior crew positions had significantly higher FSAQ scores (M = 132.3, SD = 12.4) than those in more junior crew positions (M = 127.5, SD = 11.4).

As seniority and years of experience as a flight attendant are significantly correlated (r (522) = .53, p<.0001) an analysis of covariance (ANCOVA) was carried out to determine if the effects of job seniority on questionnaire score would continue to be significant after adjusting for years of experience. The results showed that job role remained significant (F(1, 429) = 13.6, p < .0001) even after controlling for years as a flight attendant.

**Short and Long-Haul Flight Attendants**

The majority of participants were long-haul flight attendants (n = 345) while short-haul represented a smaller group (n = 89). Long-haul flight attendants used the crew positions ISD, ISC, FAPS, or FAPC to designate their job role. Short-haul flight attendants used the crew positions Purser or FA for their role. An ANOVA on questionnaire scores showed a significant difference between the two groups (F(1, 432) = 7.6, p = .006). Flight attendants on short-haul routes had significantly higher FSAQ scores (M = 136.7, SD = 11.8) than those flying on the long-haul routes (M = 132.4, SD = 11.9).

**A comment on statistical significance versus practical significance**

Statistically significant differences were found on the following predictor variables: length of service, crew position flown, seniority, leadership roles, flight attendant crew size, and length of route flown (as reported above). The SPSS statistical package (version 15), had been used to calculate each ANOVA (Analysis of Variance) conducted in Studies 1 and 2. SPSS reports the exact p value which is the probability of obtaining the F-ratio by chance alone. The p level needs
to be less than .05 for the F-ratio to be seen as significant (Brace, Kemp & Snelgar, 2003). The reader will note that in some cases the level of probability was p<.0001 which would indicate that there would be only one chance in 10,000 that the result would have occurred by chance alone.

While it could be said that the absolute differences in the mean scores of some groups were relatively small, significant effects had been identified because of the very large sample sizes (n=500+) in both studies. It is now usual to include a measure of the effect size when reporting statistical results. This provides a good indication of whether or not a statistically significant difference is also likely to have a practical significance. In the exacting world of aviation even a practical difference of 1% in improved safety performance between groups could represent the difference between the occurrence of an incident or accident, as opposed to a successful and safe outcome for the flight.

Discussion

Multivariate analyses (FSAQ 2000)

Length of service (Hypothesis 1)

In the present study, the length of time which a person had served as a flight attendant on jet aircraft was one important predictor variable in whether safer attitudes, as measured by the FSAQ, were shown. The longer a flight attendant had flown corresponded with increasingly positive safety attitudes. The flight attendants had been divided into three groups according to their length of service with the most junior group showing significantly lower safety attitude scores than did the middle and most senior groups. This difference was more noticeable when the junior group was compared with the most senior group who showed much higher safety attitudes than the junior flight attendants. One reason for this could be that flight attendants demonstrating
a high degree of professionalism and job motivation would remain longer in their careers and this would contribute to more positive safety attitudes.

Another reason for these results could be the longer a flight attendant has flown the more recurrent training in safety and emergency procedures would have been completed. Course evaluation forms showed that this training was perceived as both relevant and practical. Flight attendants could see that while this training was mandatory it was also had a clear application in creating a safer working environment. This in turn could contribute to the prevention of incidents and accidents. Preventive actions taken at the first possible signs of an incident developing in the cabin could diffuse the situation from becoming more serious. It often takes many years of experience to recognize such signs. For instance, a passenger who appears to be drunk could also be going into a diabetic coma and would need urgent medical treatment. It is also difficult to recognize an abusive passenger as someone who is displaying a fear of flying response. Again a different approach, such as calmly talking and sitting by the passenger would help diffuse the situation. Thus, the most experienced group of flight attendants would have observed and taken action when safety to the aircraft had been threatened on many more occasions than the least experienced flight attendant group. This was displayed in higher mean scores for safety attitudes representing more positive safety attitudes from the most experienced group.

An alternative explanation could be that flight attendants with less positive safety attitudes could have left the airline to pursue other careers. Research into safety attitudes held by in pilots (Helmreich, Merritt, & Wilhelm, 1999; Helmreich & Merritt, 2000) indicated that not every pilot had seen the usefulness of CRM training which was then named as the “boomerang effect”. The same might be true for flight attendants which could also account for those with less safer attitudes leaving the aviation world.
Seniority (Hypothesis 2)

Flight attendants in senior roles with the accompanying responsibility had shown more positive safety attitudes than those not in roles of responsibility. This could be explained by the fact that in addition to length of service additional training had been provided for crew in leadership roles. The more senior flight attendants would have been employed before “9/11” 2001 and pilots often invited flight attendants to come and observe from the flight deck. As well as providing additional insights into the pilot’s roles and responsibilities, this practice would have increased the contact between the flight attendant and pilot groups.

Today when a flight attendant is upgraded into a senior role they are required to complete jump seat rides. However, these could be carried out by sitting in on simulator training sessions. From the 1990s, research has recommended that LOFT training exercises would have additional realism if the flight attendants sat in on such training exercises and provided scripted cabin related comments from the observer’s seat in the simulator (Butler, 1993; Helmreich, Merritt & Wilhelm, 1999). Another possibility for the safer attitudes from more senior flight attendants could be that flight attendant team leader would also have a pre-flight briefing with one of the pilots before briefing their flight attendant team. This would again serve to result in increased contact between the pilots and senior flight attendants.

Crew position flown was found to be significant even after years as a flight attendants had been controlled for. Flight attendants with a more senior job role displayed safer attitudes than their colleagues in more junior crew positions. Flight attendants with more senior roles (ISD, ISC, and Purser) moved throughout the different cabins for premium and economy class passengers and would have had an increased awareness of what was occurring throughout the entire cabin area. This overview could result in the more positive safety attitudes as a result of crew position flown.
Flight attendants in a more senior position would also be called upon by their junior colleagues for assistance when needed; although it is important to note that Airline ABC’s training emphasised that each flight attendant (whether junior or senior) should show initiative and take immediate action when necessary. Each flight attendant would also be expected to delegate a nearby colleague to act as a “communicator” to use the interphone to inform the flight deck immediately of any emergency situation and then locate and inform the lead flight attendant of the situation. Some flight attendants had noted that it was on occasions difficult to find the location of the lead flight attendant quickly, especially on the double-decked B747. This could be achieved by the delegation of a colleague to move quickly through the aircraft in search of the lead flight attendant, or to put out an interphone announcement asking for the lead flight attendant to return to a particular “zone” of the aircraft. Flight attendants in all crew positions would know where this “zone” or cabin area was located. Each situation faced often differs in the degree of danger represented to the flight, so in potentially low danger incidents it would be possible to do this without alarming the entire passenger group. In circumstances representing immediate danger flight attendants would probably already be at their assigned stations, in accordance with their crew position flown, giving safety briefings. They would have safety manuals to provide instructions to be given according to the particular emergency situation. Each crew member would have responsibilities according to the crew position flown. The lead flight attendants would have additional responsibilities.

In emergencies, one of the pilots would ask for the lead flight attendant to report to the flight deck immediately. Airline ABC has a requirement that the pilots brief the lead flight attendants on the situation. This could include requiring the preparation of the cabin for ditching into the water or an emergency landing at the nearest airport. It would also include the expected timeframe to prepare the passengers and cabin.
Narrow and wide-bodied aircraft (Hypothesis 3)

A smaller number of flight attendants operating on board an aircraft would indicate that the aircraft fleet type was a narrow-bodied aircraft (either a B737 or A320) as opposed to the larger cabin crew complement operating on the wide-bodied B747 or B767 aircraft. The smaller crew numbers on narrow-bodied aircraft would mean that communication would be easier in the cabin as crew would be able to see each other. They would also be able to quickly react as a team if needed. This may have resulted in more positive safety attitudes. The smaller number of flight attendants would mean that crews would have flown together more frequently than aircraft with a large number of flight attendants. Flight attendants and crews with smaller numbers would often stay at the same hotel and share the same crew transport. This would provide support for the contact hypothesis (Allport, 1954) which forms an important part of the social identity theory.

In the present study, highly significant differences in safety attitudes between flight attendants operating aircraft on narrow and wide-bodied aircraft were discovered. Airline ABC operates wide-bodied B747 and B767 aircraft on its long-haul routes. Short-haul routes are operated by the narrow-bodied B737 and A320 aircraft types. Flight attendants operating on aircraft flying narrow-bodied aircraft showed more positive safety attitudes. Again, the ability to form a cohesive team quickly could account for this.

Crew Bases (Hypothesis 4)

Significant differences had been found in the safety attitudes of flight attendants from the three different smaller crew bases and the airline’s main crew base. Crews from the smaller bases displayed higher safety attitude mean scores than those from the main crew base. It is possible that different subcultures could exist outside of the main crew base due to the absence of large crew numbers which could make it more incumbent on each flight attendant to put into practice what had been taught in CRM training, joint training and recurrent training. The flight attendants
would also know most of their team at their base which would help facilitate effective team formation and improve safety attitudes. Flight attendants at these bases would also know the pilots as they would have flown together on previous occasions. While the vast majority of the airline’s pilot complement would have been based out of the country’s major domestic and international airport, there were some pilots at the additional crew bases. This would also facilitate better communication between pilots and flight attendants as they would have flown together before.

**Gender differences (Hypothesis 5)**

The predicted gender differences between male and female flight attendants were not discovered. Gender differences had not been discovered in Study 1 and this similar result showed that the professional culture of flight attendants had overridden any differences in safety attitudes related to gender. It supported the research discussed in Study 1 (Helmreich & Merritt, 1998, 2004; Mac George et. al. 2004). However, Williams (2004) applied both qualitative and quantitative methodologies to examine flight attendants attitudes and gender issues. William’s data had come from a sample of nearly 3,000 flight attendants who had been surveyed in 1994. All of these flight attendants were from Australian airlines. Sexual harassment and unruly passengers were a major focus of this research. Gender was a key factor as to whether flight attendants had experienced sexual harassment. However, positive organizational factors would mitigate this response. The majority of flight attendants had received training that “the customer is always right” and if/when cabin crew management supported the flight attendant after a customer had complained this was a powerful mitigating factor.

Ballard et al. (2004) investigated stress, fatigue and health of a group of female Italian flight attendants. They discovered that sexual harassment from passengers was a factor that affected the health of these women. The small group size of the focus groups and in depth interviews provided
qualitative data of the coping strategies used. These indicated that the flight attendants had additional difficulties attempting to maintain a stable home life, and reconcile the airline’s belief that the customer is always right. One flight attendant said she had learnt to put on a smile and say “I am sorry sir, but I think my bottom just fell into your hand”, in order to deal with sexual harassment from male passengers. Airline ABC’s flight attendants would be strongly supported by senior flight attendant members in such cases and would be more direct in their comments, even to the extent of stating that if such actions continued the Captain would be informed. The female flight attendants would know that both their male and female colleagues would be supportive and this could be another reason why gender differences were not discovered in this present study.

Descriptive Statistics FSAQ (2000)

The descriptive data from 2000 were analyzed on the same SAS statistical programme as in 1998. Table 4.2 summarizes these results in one concise table.

Table 4.1  Flight Attendants Safety Questionnaire (FSAQ) 2000 by percentages

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<th>B</th>
<th>C</th>
<th>D</th>
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</tr>
<tr>
<td>Q30</td>
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<td>12.5</td>
<td>1.9</td>
<td>0.6</td>
</tr>
<tr>
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<td>Q34</td>
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<td>37.6</td>
<td>26.0</td>
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<td>0.8</td>
</tr>
</tbody>
</table>

**Written comments from flight attendants (FSAQ 2000)**

As shown in Appendix A there was no section for handwritten qualitative comments to be written. However valuable qualitative data was obtained as flight attendants felt strongly enough about some safety issues to write on the sides, top, or bottom of the questionnaires. These have been collated and also reported back to the airline as summarized below.

The comments provided additional insights into the two distinct pilot and flight attendant cultures operating in the airline. These provided both positive comments on the impact of CRM training as well as suggesting areas where further work is needed. For example, a comment from one international flight attendant suggested that pilots should have to spend a day as a passenger
sitting in economy class observing the flight attendants’ duties first hand in order to gain a better understanding of “what goes on outside the cockpit door”. Another insightful comment from a flight attendant was:

“I think all pilots should spend 1 day on a flight in economy class and watching what a crew member does from the time they board to the time they get off- I feel many of them either passenger in First or Business class or stay in the cockpit and have absolutely no idea of what goes on outside their door. (I think this will help them relate better with crew members and become a closer team in an emergency or it should be filmed and the flight deck watch it on one of their courses and vice versa for us).”

**Stress and fatigue issues**

Flight attendants identified fatigue as a major issue, especially on long-haul flights. Particular sectors were identified and the airline has changed the rostering system to address this issue. The present research provided additional data on fatigue which contributed to this change. These results have been supported by research amongst flight attendants employed by other international airlines. Stress has often been portrayed as having a major influence on both the flight attendants’ professional job roles and their own personal lives. This was confirmed by a study of 70 flight attendants (57 females and 13 males) from a major Irish airline (Kelleher & McGilloway, 2005). Although this preliminary study contained a small sample size the findings have been supported by additional surveys from a range of countries which indicate that flight attendant stress is an on-going problem. For example, Sonnentag and Natter (2004) studied the recovery period of flight attendants from stress. Although their sample size was small (n = 47), results showed that flight attendants spending evenings away in hotels did not affect well-being. Physical exercise was also seen as a way of reducing stress.
The majority of flight attendants expressed confidence in their team leaders. Flight attendants commented that while most of management understood their safety concerns, they felt that paperwork took up too much time and management was not available after hours. There was also concern voiced that service not safety came first. Time was mentioned as a factor as to whether safety checks were always completed before passengers boarded. Long-haul flight attendants felt that there was not enough time to do all their safety checks and also set up for premium service passengers. Some domestic flight attendants felt that they had faced pressure to continue serving hot drinks during turbulence on flights of less than 30 minutes. One international flight attendant commented that the some pilots would get out of their bunks and would expect a hot breakfast before landing. This was difficult as it was a particularly busy time for the flight attendants.


**Differences between the 1998 and 2000 FSAQ data for flight attendants**

Earlier descriptive analyses on data collected from over 500 flight attendants in the FSAQ (1998) had provided the first set of data for the present study. These had been conducted before flight attendants had started the airline’s new CRM training programme. The FSAQ (2000) had been given out again once all flight attendants had completed the course. These two Questionnaires contained exactly the same 36 questions based on a five-point Likert scale with responses ranging from ‘Strongly Disagree’ to “Strongly Agree” which were anchored by a “Neutral” mid-point.

A set of descriptive data had been produced from the 1998 Questionnaire which displayed the number of respondents for each of the five response categories as a percentage table and chart. This showed percentage agreement between the items. The data from the FSAQ (2000) were also analyzed and presented in the same way. This now enabled a series of additional analyses to be
performed using the SAS statistical package. The statistical method for these data analyses was chi-squared. This determines the significance of differences between the distribution of responses between the two groups (1998 and 2000). These data have been summarized for each of the 36-items and are presented in the following table.

Table 4.2  Chi-Squared Analyses of 1998 and 2000 FSAQ Data

<table>
<thead>
<tr>
<th>FSAQ (1998, 2000) Questionnaire</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pilots see the flight attendants as valuable contributors to flight safety.</td>
<td>30.7103</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>2. I am encouraged by other flight attendants to report any unsafe conditions.</td>
<td>2.4190</td>
<td>4</td>
<td>0.1199</td>
</tr>
<tr>
<td>3. Pilots notify the flight attendants about unusual situations.</td>
<td>3.4500</td>
<td>4</td>
<td>0.0633</td>
</tr>
<tr>
<td>4. I know enough aircraft terms to describe a safety concern to the pilots.</td>
<td>0.0056</td>
<td>4</td>
<td>0.9406</td>
</tr>
<tr>
<td>5. I am confident about reporting cabin condition defects.</td>
<td>0.0014</td>
<td>4</td>
<td>0.9697</td>
</tr>
<tr>
<td>6. Pilots encourage cabin crew to voice their safety concerns.</td>
<td>28.7372</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>7. I think (the airline) has a positive safety culture</td>
<td>38.2145</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>8. Pilots and flight attendants work together effectively at (the airline).</td>
<td>22.3043</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>9. I would take action if other crew did not fully complete their safety checks.</td>
<td>1.8143</td>
<td>4</td>
<td>0.1780</td>
</tr>
<tr>
<td>10. Cabin crew have a good understanding of the flight deck’s responsibilities and role.</td>
<td>20.3021</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>11. Initial Flight Attendant training is relevant and prepares crew for flying duties.</td>
<td>0.0046</td>
<td>4</td>
<td>0.9462</td>
</tr>
<tr>
<td>12. Pre-flight safety checks are performed every time I step onto a new aircraft.</td>
<td>3.7897</td>
<td>4</td>
<td>0.0516</td>
</tr>
<tr>
<td>13. Pilots have a good understanding of the flight attendant’s job.</td>
<td>29.4437</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>14. All ISD/Purser pre-flight briefings are relevant and thorough.</td>
<td>1.7788</td>
<td>4</td>
<td>0.1823</td>
</tr>
<tr>
<td>15. I am confident in my ability to properly assess potential hazards to safety</td>
<td>0.3141</td>
<td>4</td>
<td>0.5751</td>
</tr>
<tr>
<td>16. I understand the need for “sterile cockpit” procedures.</td>
<td>147.7426</td>
<td>4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>17. ISD’s/Purser’s actively contribute to teamwork on every flight.</td>
<td>3.4094</td>
<td>4</td>
<td>0.0648</td>
</tr>
<tr>
<td>18. I receive a pre-flight operational briefing from the captain on every flight.</td>
<td>6.7426</td>
<td>4</td>
<td>0.0094</td>
</tr>
</tbody>
</table>
19. I do not compromise safety for on-time performance. 0.0499 4 0.8232
20. Crewmembers should not question the decisions or actions of the captain 'except when they affect the safety of the flight. 0.0061 4 0.9380
21. Passenger concerns about abnormal situations are always taken seriously by the crew. i.e. odd noises, smells, anything out of the ordinary. 0.8298 4 0.3623
22. If I am unclear about something, I am not embarrassed to speak up. 4.7979 4 0.0285
23. ISD’s/Pursers who encourage suggestions from crewmembers are weak leaders. R 0.3992 4 0.5275
24. Crewmembers should monitor each other for signs of stress and fatigue. 0.5239 4 0.4692
25. I appreciate the high workload times within the flight deck 21.7657 4 <.0001
26. Good communication and crew co-ordination are important for flight safety. 1.2969 4 0.2548
27. I get total operational support from my FA team on every flight. 8.0180 4 0.0046
28. My decision making ability is as good in an emergency as in normal flying conditions. 0.0015 4 0.9687
29. Often crew do not understand what I am communicating due to cultural differences. 4.9160 4 0.0266
30. Casuals and Temporary Cabin Crew always feel part of crew team 0.1572 4 0.6917
31. In abnormal situations, I rely on my superiors to tell me what to do. R 0.7001 4 0.4027
32. Pilots always understand the time constraints governing service delivery. 16.6283 4 <.0001
33. I tell crewmembers when my workload is becoming excessive. 2.4024 4 0.1211
34. I find it difficult to maintain a consistent level of alertness on all sectors R 0.7849 4 0.3756
35. I have confidence in the leadership abilities of my ISD/Purser 3.8807 4 0.0488
36. In-flight Services Management responds to the safety concerns of the flight attendants. 8.4701 4 0.0036

R reversed scored item

These items are also presented as 100% stacked bar charts with trend lines to provide a clear visual comparison of the results from 1998 and 2000.
Flight Safety Attitude Questionnaire (FSAQ)

<table>
<thead>
<tr>
<th>KEY</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other/Blank</th>
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</thead>
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<tr>
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<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
<td>Other/Blank</td>
</tr>
</tbody>
</table>

**Question 1**
Pilots see the flight attendants as valuable contributors to flight safety.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
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**Question 6**
Pilots encourage cabin crew to voice their concerns.

<table>
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QUESTION 7
I think (the airline) has a positive safety culture.

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
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<th>C</th>
<th>D</th>
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</tbody>
</table>

QUESTION 8
Pilots and flight attendants work together effectively at (the airline).

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<td>30.4</td>
<td>53.6</td>
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</tbody>
</table>
QUESTION 10
Cabin crew have a good understanding of the flight deck’s responsibilities and role.

<table>
<thead>
<tr>
<th></th>
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<th>B</th>
<th>C</th>
<th>D</th>
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<th>Other</th>
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<td>58.4</td>
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</table>

QUESTION 13
Pilots have a good understanding of the flight attendants job.

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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
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<td>0.9</td>
</tr>
<tr>
<td>2000</td>
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<td>32.5</td>
<td>38.2</td>
<td>4.6</td>
<td>0.4</td>
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</tbody>
</table>
QUESTION 16
I understand the reasons for “sterile cockpit” procedures.

<table>
<thead>
<tr>
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<th>A</th>
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<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
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<td>41.3</td>
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</table>

QUESTION 18
I receive a pre-flight operational briefing from the captain on every flight.

<table>
<thead>
<tr>
<th></th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
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<td>18.8</td>
<td>14.3</td>
<td>6.5</td>
<td>0.8</td>
</tr>
</tbody>
</table>
QUESTION 22
If I am unclear on something I am not embarrassed to speak up.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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</table>

QUESTION 25
I appreciate the high workload within the flight deck.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</table>
QUESTION 27
I get total operational support from my FA team on every flight.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
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<td>33.3</td>
<td>47.0</td>
<td>6.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

QUESTION 29
Often my crew do not understand what I am communicating due to cultural differences.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
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<td>41.1</td>
<td>22.6</td>
<td>12.9</td>
<td>3.0</td>
<td>1.9</td>
</tr>
</tbody>
</table>
QUESTION 32
Pilots always understand the time constraints governing service delivery.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<td>12.5</td>
<td>1.9</td>
<td>0.6</td>
</tr>
</tbody>
</table>

QUESTION 33
I tell crewmembers when my workload is becoming excessive.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</table>
QUESTION 35
I have confidence in the leadership abilities of my ISD/Purser.

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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</tbody>
</table>

QUESTION 36
In-flight Services Management responds to the safety concerns of the flight attendants.

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Other</th>
</tr>
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<td>21.5</td>
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<tr>
<td>2000</td>
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<td>37.6</td>
<td>26.0</td>
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Descriptive Data

Training effects following the completion of initial CRM training.

Data from FSAQ (1998) and (2000) were analysed and have been described in Table 4.2. The chi squared analyses showed that flight attendants had shown statistically significant changes in a positive direction following the completion of initial CRM training. These data could then be linked back to the course content which had been taught during training. Items which had reached a statistically significant level of significance have been grouped together and will be discussed in the following section.

CRM Course Objectives

It is clear that the training objectives outlined in Airline ABC’s CRM Course Booklet (described in Chapter One) linked in closely with items used in the FSAQ to assess the safety attitudes of the flight attendant group at Airline ABC. The course objectives had focused on different methods and applications of team problem solving strategies which would led to an understanding of how to apply a systematic approach in team decision making. Opportunities had been given to practice effective team decision making skills in carefully designed scenarios. Effective communication skills had been discussed and practised. This included the development of assessment skills to determine when particular communication strategies should be used. The major emphasis in the training curriculum was on the development of effective teamwork and communication skills. While effective teamwork and communication provided an overriding structure linking all sections of the curriculum together as a cohesive whole, there were specific subsections of course content which could be linked to a positive change in FSAQ items.
**Major themes: Teamwork, Decision Making and Communication Skills**

**The importance of effective communication and teamwork**

The Dryden accident (10 March 1989) was used in the course to emphasize the importance of effective communication and teamwork. This accident had been viewed on a video and then discussed. Participants were asked to identify instances when vital safety information had not been conveyed to the flight deck crew. They are also invited to address reasons (or identify barriers) that might have hindered flight attendants from taking a more assertive approach to ensure information flowed smoothly between both sub-groups of aircrew.

**Effective teamwork skills**

Flight attendants were then asked identify characteristics of high and low performing teams that they had been involved with in their aviation careers. Another short realistic video viewed based on a pre-flight briefing was used to identify efficient and effective teamwork, along with examples of ineffective teamwork.

**The SADIE model of Problem Solving**

The SADIE flow diagram consisting of a problem solving model was then introduced in the course content (this has been fully discussed in the introductory course for pilots).

- **S** Sharing Information
- **A** Analyzing Information
- **D** Developing Solutions
- **I** Implementing Decisions
- **E** Evaluating Performance
The flow of information was viewed as crucial with everyone in the flight attendant team seen as important contributors. The point was also made that Standard Operating Procedures (SOPs) and Emergency Procedure (EP) drills covered most of the processes involved. However, the SADIE model should be implemented to ensure that problem had been identified correctly and the correct drill had been implemented.

**Communication Styles**

Four main styles of communicating information: assertive, aggressive, supportive, and submissive were identified. The differences between Assertive and Aggressive behaviour were noted (“A”) category behaviours with the emphasis placed on assertive behaviour, which unlike aggressive behaviours, does not involve put-downs. Category “S” behaviours focus on skills in using supportive behaviours which focuses on helping others while not putting one down as in submissive behaviours. An Assertion Skills Exercise asked participants to record assertive style comments below two very short scenarios. The second scenario was based on a situation on board on an aircraft so it would have high face validity amongst the flight attendants.

**Teamwork in Emergency Situations**

The next heading is “Working Together in Emergencies” in which it is vital that each crew member is aware of their individual and team responsibilities. The question was asked as to whether cabin crews are aware of the flight deck crew’s responsibilities in the event of an oven fire. This booklet was written in 1998, many years before the example of successful CRM teamwork during an oven fire on an Airline ABC aircraft provided in the preceding section occurred. Course participants are then asked whether they felt that the flight deck crew realized how long it would take to prepare the cabin for a crash landing. (It should be noted, however, that even with this awareness from the pilots, the luxury of time is not always available. This in itself emphasizes the importance of knowing each other’s roles and responsibilities).
The linkage of FSAQ items to specific course content

The CRM Course Booklet contained sections of teaching material which were closely linked to items from the FSAQ which had shown significant change in a positive direction.

CRM Course Booklet: Understanding Other’s Roles

The Course Booklet contained teaching content on the importance of understanding each other’s job roles. The question “Do pilots and cabin crew really know any more than the bare bones of what the other group do?” was asked. Workload differences were identified as one reason why communication problems occurred. These often occurred as each sub-group cannot see each other’s workload when the flight deck door is closed and also as each group had different periods of high and low workload. Diagrams of each group’s workload provided a useful way to visualize each group’s peak load periods. Barriers to effective communication were discussed which were linked back to pre-course work based on articles by Chute. Flight attendants were acquainted with the five-factor model before examining an excellent chart listing the different characteristics of the pilots and flight attendants who represent two distinctive cultures. (Chute’s research has already been discussed in the literature review in Chapter One of the present research.)

FSAQ items linked to this section were:

**Flight attendants’ perceptions of the flight deck’s (pilot’s) roles and responsibilities**

Q10. Cabin crew have a good understanding of the flight deck’s responsibilities and role.

Q16. I understand the reasons for “sterile cockpit” procedures.

Q25. I appreciate the high workload within the flight deck.
**Flight attendants’ perceptions of how pilots perceived their job role and responsibilities**

Q32. Pilots always understand the time constraints governing service delivery.

Q13. Pilots have a good understanding of the flight attendants job.

All these items showed highly significant differences between the responses obtained in 2000 compared to those obtained prior to CRM training in 1998.

**CRM Course Booklet: Teamwork in Emergency Situations**

The section in the Course Booklet entitled “Working Together in Emergencies” built upon the knowledge of each other’s roles and responsibilities. The importance of working together as an effective team was discussed. It included addressing a tendency for flight attendants (in any airline) to assume that technical matters outside of the cabin area were not their responsibility. This assumption was counteracted by a detailed written (and video) description of the Kegworth accident in 1989 which was used as an example of what could occur when both sub-groups did not communicate information in a timely manner. The flight attendants from their position in the cabin had been able to see that the pilots had turned off the wrong engine which in a B737 had meant that both engines were inoperative. The pilots were trying to reach the nearest airport and despite their efforts the aircraft had crashed short of the runway. The summary of this section states the importance of teamwork and communication in this way:

“Crews are at their best when working together as a team. Team players know each other’s roles and responsibilities and intimately, understand each other, and cooperate and communicate effectively. All crew members must realize that the safety of the aeroplane is their responsibility.”

(CRM Course Booklet for Flight Attendants, Airline ABC, 1999, p.47)

FSAQ items linked to this section were:
Flight attendants’ perceptions of intergroup teamwork

Q8. Pilots and flight attendants work together effectively at (the airline).

Q1. Pilots see the flight attendants as valuable contributors to flight safety.

Q6. Pilots encourage cabin crew to voice their concerns.

Q18. I receive a pre-flight operational briefing from the captain on every flight.

All these items showed highly significant differences between the responses obtained in 2000 compared to those obtained prior to CRM training in 1998.

CRM Course Content: Effective Teamwork

Flight attendants had discussed the characteristics of low and high performing teams before being asked to identify attributes of effective teamwork. These sections included factors which contributed to effective teamwork within the flight attendant team in the cabin. This recognized that while the ISD/Purser was in a leadership role he/she needed the input from all the team in order to make knowledge-based decisions. The FSAQ questions related to this section were:

Flight attendant’s perceptions of intragroup teamwork within the cabin

Q27. I get total operational support from my FA team on every flight.

Q35. I have confidence in the leadership abilities of my ISD/Purser

Both these items showed significant differences between the responses obtained in 2000 compared to those obtained prior to CRM training in 1998.

CRM Course Content: Overall importance of effective teamwork and communication

The mere fact that CRM training designed specifically for flight attendants at Airline ABC could have shown flight attendants that their safety role was seen as vital in the safety of the airline’s operations. The fact that a specific questionnaire had been used to collect data on the safety
attitudes of this group would have reinforced the importance of the training. Flight attendants were now included in a similar type of training that had been used for pilots in the airline since 1988. Communication styles and the SADIE model of problem solving had also been included in the pilots CRM course content and this would have helped have both sub-groups able to operate from “the same page”. Flight attendants could have perceived that they would have more credibility in reporting safety concerns to management following their CRM training, and that management would investigate such concerns. Relevant items from the FSAQ included:

**Flight attendants’ perceptions of the safety culture at the airline**

Q7. I think (the airline) has a positive safety culture.

Q36. In-flight Services Management responds to the safety concerns of the flight attendants.

Both these items showed highly significant differences between the responses obtained in 2000 compared to those obtained prior to CRM training in 1998

**CRM Course Content: Importance of clear communication within the cabin crew team**

Course content had emphasized that every team member has an important contribution to the safety of the aircraft. Each team member’s contribution was valued; therefore, it would be more likely for flight attendants to seek clarification, as they could hold a vital piece of safety information. Flight attendants at Airline ABC were trained to initiate action immediately when faced with any threat to the aircraft (e.g. a fire on board) and then get another team member to locate the lead flight attendant. Either the flight attendant responsible for communicating information or the lead flight attendant would then immediately inform the Captain. Flight attendants were taught to speak out to clarify information or to state that they were concerned about a situation (e.g. a drunken passenger) when appropriate steps had not been taken. Flight attendants from other cultures were rostered on flights to non-English speaking countries to provide translation services during the course of the flight. However, the main objective was to
have crew who were able give emergency instructions in different languages. Ganse (1995) had described the difficulties that could occur due to language and cultural difficulties. CRM training could help to alleviate any such difficulties.

*Flight attendant’s recognition of the importance of clear communication.*

Q22. If I am unclear on something I am not embarrassed to speak out.

Q29. Often my crew do not understand what I am communicating due to cultural differences.

Both these items showed significant differences between the responses obtained in 2000 compared to those obtained prior to CRM training in 1998.

**Observations of CRM Training Sessions**

Training sessions and how the programmes provided additional opportunities for group interaction in line with the social identity theory were examined. Joint training sessions involving both pilots and flight attendants were observed. Flight attendant groups from airline ABC had commented on questionnaires that joint training was an extremely valuable exercise in breaking down barriers between the two groups.

One such comment was:

“The combined training is a huge move forward – enjoyed it so much more than the previous year - far more balanced” (FSAQ 2000)

**The CRM Course for Flight Attendants**

I was privileged to attend the new CRM course discussed above and also become one of the flight attendant participants when a flight attendant did not turn up for this rostered duty. Each of these courses was designed for ten participants as parts required the group to work in two teams of five before rejoining again.
Pilots’ Perspectives

A pilot from the company attended the first part of the afternoon’s session. He reinforced that the pilots were employed for their technical skills while flight attendants were required to have excellent social skills. This brought up the question as to who should start the crew introductions as the team assembled pre-flight. The pilot sub-group considered that the flight attendants with their strong social skills should be the group to initiate introductions. Technical issues were also discussed with the flight attendants considering that they lacked the vast knowledge required by the “tech” crew and therefore felt it difficult to describe observations in technical terms. The reply was “please get on the interphone and let the pilots know if you have safety concerns”. While technical terms would be helpful, the message was clear; the pilots just wanted to know! This was the beginning of joint CRM joint training at Airline ABC.

Observation and participation in joint CRM training sessions

I was also privileged to attend joint CRM training sessions which were designed for the pilots and flight attendants to work together as a team. Arrangements had been made through the CRM Programme Manager to view and participate in a one-day initial joint pilot and flight attendant training session. Union permission had been obtained. When all the jet pilots and flight attendants had been through this introductory programme, the course had been developed further to include joint training for both crews in the morning, while pilots and flight attendants carried out their job specific EP training in the afternoon. I observed and participated in a morning session. This included a short general introduction of names and crew positions and aircraft flown. This was followed by a short classroom session, including video accident clips and pictures for discussion. Joint CRM training was particularity important as on many occasions both crews did not have many opportunities to interact together.
Uniforms were not worn in CRM training sessions and joint EP training. This was of special importance as status could be conveyed by the uniforms worn, both within and between the flight attendant and pilot groups. The uniform worn by the Captain, while indeed indicating the most senior role and authority on an aircraft, would also designate status and someone at the top of the hierarchical structure (Postmes, 2003). Observations of such training sessions showed how communication patterns were enhanced when uniform was not worn. The first day of the two day recurrent EP training had a first session when everyone got to know each other. This was important as the airline had undergone substantial growth in the last ten years and many of the course members would not have known each other beforehand. Informal conversations before the session started showed relaxed conversations about family, hobbies, and general airline news.

The session started with participants sharing their particular role within the airline. For example, “I’m Tony and I’m a pilot on the 744s.” On some occasions the pilots did not add that they were a Captain and as uniform was not worn this particular status was not conveyed.

I had the opportunity to observe joint pilot flight attendant CRM training both in the classroom, and in the mock-up cabin/flight deck. The following brief outline is given here as it shows the importance of carefully scripted scenarios as a valuable part of CRM training. Written Evaluation Forms given out by the airline have indicated that these have been a very successful part of joint CRM and also provided additional insight into the development of new interventions in the present research.

Such training programmes are based on these intervention strategies and they are coordinated by staff that had undergone a specific training programme on the facilitation of CRM skills, emphasizing the need for practice and feedback. The scenario in the mock-up cabin/flight deck certainly emphasized the need to for mutual interdependence as it involved an emergency
landing, smoke in the cabin after landing, and an emergency evacuation. As the events unfolded
the importance of mutual interdependence was seen, even to the stage of communicating to the
flight deck that there was smoke in the cabin and that the emergency evacuation slides needed to
go down. The debriefing afterward included a discussion on what had happened and contained
ideas of different ways to solve problems. The importance of checking with the flight deck before
releasing the slides was emphasized by showing a photograph of an emergency slide which had
been blown into an engine as it was put down while the engines were still running, (not from this
airline). It is essential for any scenario development to be built on realistic and highly relevant
events for both the pilot and flight attendant groups.

Civil Aviation Rule Part 91 General Consolidation General Operating and Flight Rules

At this point joint CRM training for flight attendants is yet to be mandated. It is to the credit of
Airline ABC that they have had a Joint CRM programme running for over ten years. CAR Part 91
contains rules and regulations that relate to flight attendant training. Cabin crews are required to
be familiar with the authority of the PIC and possess knowledge of how this affects their role and
responsibilities. An interphone capable of cabin/cabin communication and pilot/cabin crew
communication while cabin crews are seated on jump seats is another requirement. Emergency
training for flight attendants is also mandated. Such emergencies could include, emergency
evacuations on land and water, fire fighting exercises, and emergency descents. While initial and
recurrent training sessions for flight attendants are required to cover these points, the joint CRM
training sessions (described above) have shown the positive benefits of joint training. Training
outcomes from recurrent training sessions for pilots and flight attendants (especially EP training)
have been reinforced in a positive manner by joint training when both groups interact together
and practice effective communication and teamwork skills.
Joint CRM Training

Joint CRM training has been seen as a particularly useful and effective method of course delivery. The importance of such CRM training was recognized in Canada in 1997 with issue of the following advisory circular. Transport Canada had issued an Air Carrier Advisory Circular (No. 0177, 1997. 04.15) on Crew Resource Management training to clarify regulatory requirements for training. The circular contained recognition of the flight attendants’ role and required one of three alternative options to be performed on an annual basis as part of recurrent training:

1. A joint training session for pilots and flight attendants which included a joint crew introduction, a pre-flight briefing between the Captain and lead flight attendant, combined team role play of realistic emergency scenario, followed by a full crew debriefing.
2. A joint fire fighting exercise that would emphasize the importance of crew coordination and communication, followed by a full crew debriefing
3. A joint crew emergency evacuation drill followed by a full team debriefing.

American Airlines Flight Safety Bulletin (2001) identified that flight attendants had expressed concern that some Captains had not been providing a thorough pre-flight briefing. The airline’s Flight Manual had stated that prior to departing the gate the Captain would have provided the Purser with the flight plan and would have personally discussed:

1. Number of flight attendants on board
2. Any anticipated route delays
3. Weather and any expected turbulence
4. Notification and required actions when unexpected turbulence occurred
Recurrent training

Flight attendants have been interviewed about the training provided to assist flight attendants to deal with disruptive passengers (Rhoden, Ralston & Ineson, 2007). They found that most training was seen as too short and did not provide enough realism. However, recurrent training provided more effective outcomes in the flight attendants’ perceived ability to address this issue. The authors concluded that this was the most effective training method as new flight attendants were taught skills to deal with disruptive, drunken and rude passengers on actual flights. This provided the most realistic setting for increasing skills and confidence. It is debatable that the flight attendants would wish to have these disruptive passengers to deal with at 36,000 feet; however their training would have provided methods and skills to deal with these situations. Flight attendants would also realize that they were part of a team and would have back-up and support from their colleagues. Following “9/11” 2001 the Captain is no longer permitted to go back to the cabin and warn the passenger(s) that unless this behaviour stops that they will be restrained by handcuffs. This permission is now obtained from the Captain over an interphone call by the lead flight attendant. Rhoden, Ralston and Ineson (2007) may not have realized that both pilots and flight attendants have been assaulted during this process. Such incidents present a real danger to the safety of the flight.

Therefore, recurrent training provides an additional way to reinforce safety attitudes amongst flight attendants (and pilots). CRM training courses and especially joint CRM training for both flight attendants and pilots are part of this recurrent annual training.

Summary

The data collected in this study on flight attendants’ attitudes to safety, following the completion of the introduction of CRM training designed specifically for flight attendants, identified predictor variables which could be used as indicators of safer attitudes. The most useful variables
were described as: length of service, crew position flown, seniority, leadership roles, flight attendant crew size, and length of route flown.

The evaluation of the introduction of CRM training in this present study was of importance as it provided robust data that supported the effectiveness of the FSAQ as a new measuring tool for CRM training for flight attendants. Significant differences in safety attitudes which were found in the evaluation of Study 2 provided sound baseline data as well as areas that needed to be addressed as part of both new hire and recurrent training. The FSAQ had demonstrated its usefulness a robust measure of safety attitudes for use with flight attendants. Flight attendants had provided data which had shown their sub-group had its own distinctive culture. Perceptions of how the flight attendant role was perceived by the pilots (and vice-versa) showed that these two sub-groups did indeed have their own distinctive cultures. Ways to reduce barriers to communication and teamwork due to such differing perceptions must be developed as part of joint CRM training.

The written comments on the FSAQ which have been summarized in this chapter indicated that flight attendants had appreciated the opportunity to express their viewpoints. As the FSAQ questionnaire did not provide a space for qualitative data these comments had been written at the top, bottom and sides of the pages. It was important that flight attendants’ safety attitudes, especially barriers to effective communication and teamwork between the sub-groups, be explored using a qualitative methodology. Focus groups were considered the most appropriate next step to pursue in the present research.
CHAPTER FIVE

STUDY THREE

Focus Group Study-Qualitative data from the flight attendants’ perspective

Introduction

The underlying theme of the present research is that while the aircrew rostered to operate on modern jet aircraft could be seen to represent one group, in reality the pilots and flight attendants represent two sub-groups, each with their own distinctive sub-cultures. This separation between the two groups has the potential to be a major factor in less than optimal teamwork. Barriers to communication and effective team performance need to be identified before effective solutions can be developed and implemented (Chute & Wiener, 1995; 1996; 2000; Dunbar et al, 1997).

Focus groups were conducted as part of an ongoing-programme evaluation to identify strengths, weaknesses and needed improvements to CRM training programmes. A major aim was to identify barriers to effective teamwork and communication between pilot and flight attendant sub-groups. Solutions to such barriers could then be explored. The focus groups would provide valuable data which could then be used to implement safety initiatives. Joint CRM training programmes would provide a very appropriate setting to practice these new skills.

In addition, focus groups were conducted to investigate patterns of interaction between flight attendant groups on aircraft, between flight attendants and pilots, and between flight attendants and the flight attendant management team. The aim was to seek more knowledge about the many interactions that had been shown to occur as well as providing further information in the key
areas identified from the Flight Safety Attitudes Questionnaire (FSAQ) data in Studies One and Two.

Stewart, Shamdansi and Rook (2006) noted that focus groups had moved rapidly into the behavioural sciences and were no longer used solely in the fields of advertising and market research. This provides broad support for the use of focus groups in the present study. They also noted the innovation used by researchers who held focus groups consisting of natural groups who were not strangers. Focus groups had moved into being conducted in workplace settings.

Morgan (1996) viewed focus groups as distinct from group interviewing as the researcher defined the topic. He believed that focus groups had three essential functions:

- as a data collecting tool
- data would be obtained from the interaction of the group
- the researcher would be the instigator of the focus group discussion.

Morgan (1996) acknowledged that focus groups were frequently used as a tool to combine qualitative and quantitative data. He suggested four possible combinations for this methodology. Firstly, the focus group was the main method of data collection while the second combination relied on the focus group to provide data based on the initial results from surveys. The third combination used surveys as the main method with the focus group giving information to help interpret the survey results. The fourth combination, like the first, used focus groups as the main source of data collection with the survey used to follow up on this information. The present study used the third combination when surveys provided the majority of data and focus groups were used to help add further clarification of the data obtained in Studies 1 and 2.
Bryman (1996) reviewed 232 social sciences journal articles published from 1994 to 2003 in which abstracts and titles had employed key words including “quantitative”, “qualitative,” and “triangulation”. He discovered that the majority of the articles (62%) employed a cross-sectional design which used both quantitative and qualitative research designs. The present research used a combination of quantitative and qualitative methodologies known as triangulation. Triangulation is used to find areas of corroboration of results between qualitative and quantitative data. Triangulation is also seen to result in greater research validity as data collection rounds can be mutually corroborated (Bryman, 1996).

Patton (1990) believed that focus groups have many advantages when used for programme evaluation purposes. Such groups were seen as a very efficient data gathering technique as it enabled information from a number of people to be gathered as opposed to just one person. Quantitative data from surveys and questionnaires would also gather large amounts of data efficiently. However, the qualitative method of research using focus groups would provide for interaction with prompts from the researcher allowing issues to be understood and expanded upon. Patton described the ideal group size as six to eight participants who respond to specific key questions over a time period of one-half to two hours. Focus groups were usually conducted using homogeneous samples, which bring together people with similar backgrounds and experiences.

Morgan, Kreuger and King (1998) also supported this viewpoint by suggesting that focus groups should include six to eight people with a similar background. Participants with a similar background would be able to relate to each other and provide examples of what was of real importance to them. Focus groups should be designed provide opportunities for group members to communicate with each other. Morgan, Kreuger and King (1998) noted that it was important for the researcher to remember that communication was a two-way process. They believed that:
“Focus groups work best when what interests their research team is equally as interesting to participants in groups. In high quality focus groups, the questions you ask produce lively discussions that address exactly the topics you hear about when the discussions are right on target, there are even more benefits. The groups are much easier to analyze, and the final report can capture some of the excitement of the original conversations.” (p. 10)

Kitzinger (1994) took the view that focus groups are distinguished from group interviews in that the participants are encouraged to interact with each other with their focus on particular topics of interest to both the researcher and the participants. Her review of the literature had revealed that many studies that had conducted only four or five groups would not capture a diversity of interactions. Kitzinger also selected groups of people who would hold a particular group membership in common. The communication between participants would encourage a greater variety of communication between participants and could be used to establish group norms. Albretch, Johnson and Walther (1993) believed that the group idea generation process would be helped when the focus group started as an individual process. This would mean that participants would first write down their own initial ideas about a particular issue. Participants would then be asked to share these with the group. This process is known as the nominal group technique (NGT) and is seen a means of generating a greater number of unique responses as listening to each other’s ideas stimulates additional thinking.

Kerr, Aronoff, and Messé (2000) also outlined the NGT for small group research as a means of allowing each of the participants the opportunity to express their views and to avoid one line of discussion being pursued. They supported the procedure as outlined above by Albrecht, Johnson and Walther (1993). The recommended group size was seven to ten members. It is important to note that focus groups when implemented effectively are seen to generate more ideas than the
one-to-one interview and are more cost effective with less time being taken to obtain the ideas of a number of different people who share a common group goal.

Vogt, King, and King (2004) discussed focus groups as a way to improve content validity by seeking the views of a target population. This would improve the development of future research instruments.

“…the focus group is technique that involves a moderator and facilitated discussion amongst multiple participants about a specified topic of interest. Focus groups generate qualitative data that can be used both to enrich and extend what is known about a concept and facilitate item development. In turn this knowledge can improve relevance and representativeness of the items”. (p.233)

The content is then identified and future items could then be written using language and technical terms that would be familiar to the group. Vogt, King, and King (2004) suggested that groups with both male and female participants prefer a female moderator regardless of whether the moderator is a member of the group herself.

Patankar and Driscoll (2004) had successfully used focus groups to assess the effectiveness of the Aviation Safety Action Programmes (ASAP) in an aviation maintenance context. The successes of the voluntary ASAP programme for pilots and flight attendants have already been discussed in Chapter One. Six United States airlines were involved in the study after the researchers had signed a Memorandum of Understanding (MoU) with the companies and union support had been obtained. The ASAP agreement with the airlines was intended to provide the mechanics a way of reporting safety related errors without fear of punishment. Such reports would be read by the companies and the FAA. Systems would be put in place to help prevent the same error from occurring again. Six structured focus groups were held using ten key questions to facilitate
discussion. The reader is referred to pages 99-101 of the report as each of the questions contained bullet points underneath to further explore the question. For example, Question 2 asked “What are some of the advantages of the ASAP programme?” One of the bullet points underneath was “we now know about things that are happening that we would not otherwise know about”. The results showed that focus groups could provide qualitative data about many maintenance issues, including the view that the aviation maintenance environment contained more personnel than the flight environment. A large quantitative survey to further understand the viewpoints from the focus groups was recommended.

Grawitch, Ledford, Ballard and Barber (2009) studied ways in which employers could create healthy work places through the involvement of their employees in the generation of new ideas. They believed that a “one size fits all approach” should not be adopted due to the distinct needs in each environment. They suggested that employees should be involved in initial survey development, feedback sessions, and design implementation followed by final feedback sessions with employees to evaluate and refine data. Focus groups could be one cost effective way of obtaining such data.

**Focus Groups were conducted:**

- To further explore issues identified from the Flight Safety Attitude Questionnaires (see Chapters 3 and 4).
- To identify barriers to communication and teamwork and to generate possible solutions.
- To collect specific in-depth data from flight attendants about programme issues that affected them.
• To obtain data from one subgroup (the flight attendants) to be compared with another subgroup (pilots) who are viewed to be of a different social status.

• To explore communication issues as perceived by the flight attendants between themselves and the pilot subgroup.

• To identify key issues for the development of work sample scenarios as a research tool.

• To generate future hypotheses to test.

Method

Participants

The participants consisted of both domestic and international flight attendants who had just completed the company’s annual Emergency Procedure (EP) training. They were all flight attendants from airline ABC’s jet aircraft fleets. They were representative of flight attendant group in terms of length of service, position flown, aircraft type flown and gender. Eighteen focus groups were held between 1 October 2002 and 8 November 2002. One hundred flight attendants participated with an average focus group size of five.

Sixty-seven participants were female and thirty-two were male, while one flight attendant did not provide this data. As there are more female flight attendants with airline ABC this would provide a representative example. There were also more flight attendants on long-haul aircraft which was shown by a total participation of seventy-seven flight attendants. The long-haul routes employed B747 and B767 aircraft that would need much higher staffing levels than the short-haul routes operated by B737 aircraft with lower staffing levels. The flight attendants in the focus groups on the B737 aircraft totalled twenty-four (six lead flight attendants and seventeen flight attendants.)
A further examination that focused on the crew position flown on long-haul routes showed that eleven flight attendants held leadership positions and thirty-three flight attendants served in the premium service area while another thirty-three served in economy class. On the B747, for example, there would be six flight attendants in premium service and six in economy class. The difference in levels of staffing in different service areas would reflect the fact that additional flight attendants are required to provide a higher level of service for the smaller number of passengers who had paid a higher price for this service. These data would be representative of crew position. The average length of service with airline ABC was eleven years and ranged from two years to thirty-five years. The crew base for 93% was the main company base while 7% of flight attendants had flown from bases around the country to attend the annual proficiency checks.

Patton (1990) and Morgan et al. (1998) had recommended that the average focus group should consist of six to eight participants. However, it is important to remember that these focus groups were held in a real life work setting within the constantly changing aviation environment. The numbers of flight attendants in each EP group varied and it was not known how many might have had last minute roster changes which would mean that they were unable to attend. However, a university research setting would often recruit students for course credits or a small reward and would usually have a more predictable group number. As eighteen focus groups were held a diversity of opinion was gained.

Focus groups were not held with pilots as the number of pilots in the EP course would often only be three. These groups were not CRM teaching sessions when it would be valuable to have both groups together, but focus groups where free discussion was needed to validate data. The possibility of having telephone interviews with pilots was offered as a possibility by the CRM Programme Training Manager. However, as this would involve a large amount of time to set up
due to privacy issues and rostering requirements, it was decided not to use this method. Instead a survey was developed for pilots based on issues raised in the focus groups. This study will be discussed in detail in the next chapter.

**Setting**

The focus groups in the present study were held in a building complex at the airline’s jet base which was very familiar for the participants. The flight attendants may have known each other through flying on the line together and staying at the same hotels on stopovers. However, these groups had also been working together for the previous two days on their annual CRM and EP proficiency checks which would have required working together as a team. The airline provided a room which was private and had all the necessary requirements. These included tables and chairs which were moved into a U-shaped formation, an overhead projector and a white board.

**Procedure**

A letter of introduction from the airline’s CRM Programme Manager and Cabin Crew Training Development Manager, along with an Information Sheet for Participants and Consent Form had been given out to flight attendants on day one of their EP course. This gave the individual flight attendants time to consider whether they would wish to take part. Participation was on a voluntary basis with participants given the assurance that data from the groups would be presented so that their anonymity would be preserved. Prior support from the flight attendants unions had also been obtained. The positive support from the flight attendants unions was negotiated through the CRM Programme Manager.

It was decided to use the Nominal Group Technique (NGT) as outlined above by Albretch, Johnson and Walther (1993) and Kerr, Aronoff, and Messé (2000). This enabled data to be recorded without any tape recording or the introduction of a third party to act as a scribe as earlier
data collected had indicated some crews could be sensitive to maintaining their anonymity. This also provided the researcher with the opportunity to observe while the participants discussed their views. It would be also easier to redirect the discussions back to the key issues if necessary when not recording notes.

Each group followed the same format. Participants were asked to record possible hindrances to communication with the flight deck crew on an A4 piece of white paper. This was followed by asking participants to take part in a short discussion. Participants were asked to write down any additional ideas that supported their own views. They were then asked to highlight these ideas with a blue highlighter pen. Participants were then asked to record possible solutions before participating in a group discussion. Additional ideas were recorded and highlighted with an orange highlighter pen. The overhead projector in the room was also used to remind flight attendants what the key issues were. The overhead transparency used stated:

- Identify possible hindrances to communication
- Identify possible solutions to communication

Results

After the completion of each of group the A4 pages were collected and read the same evening to identify possible key themes. The key themes that emerged at the conclusion of the eighteen focus groups are recorded below under ‘barriers to communication’ and ‘solutions to communication barriers’ respectively. The ideas and illustrative quotes recorded under the sub headings were representative of the flight attendants views. When quotes are given the gender, length of service, and crew position flown were not given as an additional step to preserve anonymity.
Barriers to Communication

**Locked flight deck door and interphone protocols**

The locked flight deck door was seen as a significant barrier to communication, creating both a physical and psychological separation between crew. Flight attendants reported that the locked door has meant that they could no longer see the current workload on the flight deck and sometimes felt more hesitant to use the interphone. Concerns were also expressed that the severity of the situation might not be conveyed as clearly as in a face-to-face situation. Discussion frequently centred on the vital role played by the interphone in communication to/from the flight deck in appropriate circumstances. It is important to remember that this data had been collected just a year after ‘9/11’ and security issues were often mentioned. One FA said “I think they should install video cameras by the flight deck doors”. Another FA commented “we do not even see the pilots on the B747 if we are not working on the top deck” Another FA said “The pilots often leave the plane while passengers are still disembarking. If a passenger (PAX) needed the ‘physician’s kit’ or we needed to use the restraints the pilots’ permission was needed.”

**“Sterile cockpit” Standard Operating Procedures (SOP)**

Flight attendants reported that there was a general confusion over the definition of the “sterile cockpit” SOPs and that it was difficult to know under what circumstances these procedures needed to be set aside for the safety of the flight.

**Pre-flight briefings**

The lack of flight attendant and pilot combined pre-flight briefings was viewed as a barrier to communication. It was accepted that while these briefings were in two different buildings for international crews, a common briefing area in the future would be very helpful. Flight attendant
and pilots briefings were held in two separate buildings due to available space constraints. It was hoped one common location could be allocated in any future design plans.

**Knowledge of basic aircraft terminology**

Flight attendants, both junior and senior, discussed how difficult it was to describe a problem to pilots because they did not feel comfortable with their technical knowledge of aircraft terms. It was felt that, whilst this would not deter communication in emergency situations, there would be more reluctance to do so more routine situations. Flight attendants consistently pointed out the vast gap between the groups in terms of technical knowledge.

**Debriefings after incidents**

Debriefings were seen as an important need following incidents. Flight attendants discussed examples when these had not occurred leaving the crew facing stress and needing to know answers as to what had happened. One particular question was “how dangerous was this incident?” For example, after an incident of smoke in the cabin a debriefing for the FA team was not held, many of whom had been quite concerned over this particular situation. Effective debriefing sessions including both the flight attendants and pilots could allow both groups to actually meet each other and discuss what had occurred. Accurate knowledge would help to decrease stress associated with the unknown. In another example discussed, one FA (who had been directly involved following the death of a passenger) did not receive any information passed back from the pilots. The pilots could also have asked if the passenger’s death had been confirmed by any doctor on board. The passenger manifest (the number and names of all passengers on board) is also available to the pilots and whether the passenger had relatives or travelling companions could have been identified. A simple question to the flight attendant could have ascertained what support was needed. An example would be whether the relatives wished the airline to contact additional family members to meet the aircraft. The FA could also have been
notified that police and paramedics would meet the aircraft at its arrival destination. A word of thanks to the flight attendant for her professionalism in coping with a difficult situation could also have been conveyed from the pilots as they had not been involved in the debriefing.

**Differences in hotels, meals and allowances**

Flight deck crews and flight attendant crews often stayed at different hotels on stopovers. Different crew buses were also used. This resulted in crews not being able to meet up on the bus and get to know each other. The differences in hotels, meals and allowances between flight deck and cabin crew were seen to reinforce differences between the two groups. This is an industrial matter as hotels and transport are negotiated by the separate unions. However it still remained a barrier to effective communication. It was noted that pilots positioned in Business Class, while flight attendants travelled in Economy Class, to reach their next duty location or home base. Again this would have been determined in the different union negotiations.

The following additional concerns remained as an area of stress to the flight attendants and are listed as stress can affect clear communication.

**General safety issues raised included concerns over:**

- Crew rest areas should also be reinforced to protect crew from hijackers or unruly passengers.
- Drunken passengers
- Passengers smoking secretly
- Heavy baggage and bottles of duty-free placed in overhead lockers
- Uniforms need to be made in fire-retardant materials; special concern voiced over nylons
Solutions to communication barriers

Pre-flight briefings

Flight attendants reported that it would be easier to pick up the interphone if a combined briefing had been held as they would have briefly met at least one flight deck crew member. The pilots could have been given a short list of points to cover which could include that they would wish to hear sooner than later of any concerns. Flight attendants reported that whenever time constraints would allow for this, a short introductory PA and/or walk around from one flight deck member before passengers boarded would be useful. It was suggested that the premium service area, which was usually located nearest to the flight deck, could be used after the lead flight attendants had alerted crew to be in this area in two minutes for a very short briefing. Lead flight attendant pre-flight briefings could make it very clear whether all information to the pilots goes through them or whether each team member is free to pick up the interphone, especially with critical flight safety information. These were viewed as very important especially on the long-haul routes when the flight attendants often did not even see the pilots. One FA commented “we do not even see the pilots on the B747 if we are not working on the top deck”.

A key point of implementing fast and efficient briefing would be for both crews to have briefings in the same room. Even if at least one of the pilots could join in the flight attendants briefing this would encourage the free flow of information to the flight deck as pilots would be told to encourage feedback from the flight attendants who are their eyes and ears in the cabin. Time was a crucial factor so these briefings needed to be effective and to the point in order to be cost efficient for the airline. Ways in which to allow for such briefings need to be explored so that the crews reporting times for flights would not have to be increased. Crew duty times are a very important factor in the operation of commercial aviation. Flight delays can result when the stand-by crew has to be called in, especially on long-haul flights.
**Knowledge of basic aircraft terminology**

Flight attendants wished to have basic aircraft terminology reinforced in recurrent training programmes. This would give them more confidence to pick up the interphone to communicate what they were viewing outside or inside the window. They would also feel more confident if pilots discussed how it was important to pick up the interphone regardless of the words used to describe a perceived technical problem. This could occur during CRM training and some flight attendants noted that they had been in a group where this had occurred. While it is important to continue to provide training on the correct use of aircraft terminology it should be emphasized that the pilots would want to know if the aircraft’s flaps were not working properly or if smoke was coming from an engine. Then use of clear plain descriptive language would be of great benefit. Key technical knowledge could be introduced in training and it was also thought important for pilots to reinforce that they wanted to hear of any concerns regardless of the terminology used. If the Captain felt the description was serious he/she could release a pilot on rest duties and send them back to convey concise technical descriptions and actions needed. In one CRM training session a flight attendant suggested that photo(s) could be taken on a cell phone which would then be sent up to the pilots.

**Locked flight deck door and interphone protocols**

These data indicated that training programmes should continue to reinforce the correct use of the interphone, including actual times during flight when this should not be used. Training in ways of communicating the urgency of information over the interphone should be taught, especially as visual cues are not available. Procedures to be used following the failure of the interphone should be reinforced along with security issues and regulations regarding access to/from flight deck.
“Sterile cockpit” SOPs

The SOPs surrounding the “sterile cockpit” continue to need further clarification. The words themselves created a barrier and make it more difficult for crew to decide when they would be allowed to pick up the interphone, particularly in urgent situations.

Debriefings after incidents

Airline management should continue to ensure that the importance of debriefings after incidents should be reinforced. Such briefings should be led by the Captain with both the pilots and flight attendants included together as one group. These should happen as soon as possible after the incident. Time should be allowed for questions with everyone told that there is no such thing as a “silly” question. This would encourage flight attendants to speak out regardless of their technical knowledge or length of experience. A follow up phone call from management would also be helpful. This would help to put counselling services in place if needed and also show the flight attendants that management was concerned for each individual flight attendant involved.

Information following incidents could be communicated quickly and accurately to all crew through the company’s intranet system, giving key facts before hearing reporting that was on occasions incorrect in the media. This would reduce speculation and factual error as to what had exactly occurred.

CRM Training

CRM training was viewed in very positive ways with groups agreeing that positive changes had taken place over the last few years. This training should be continued with the incorporation of incidents from Airlines ABC’s operations. Joint CRM training was seen as particularly helpful in understanding each other’s perspective. Groups also shared how they had learned new ideas through the combined EP/CRM training on day one of the EP course. For example, flight attendants had been encouraged to take information to the flight deck sooner rather than later. For
instance, if a drunken passenger was starting to cause a problem they were confident that the flight deck wished to be informed. The results showed that the flight attendants had found this training to be helpful in breaking down communication barriers between their group and the pilot group. One flight attendant had said “I think CRM is great for cabin crew to hear from the technical crew directly that it is important to communicate safety issues and that cabin crew can phone to obtain flight deck entry.”

**Perceptions of jobs and workload**

Training opportunities should be provided which would allow both flight deck and cabin crew a better understanding of each other’s role and heavy workload periods. One way to achieve this would be to provide the opportunity for flight attendants to attend simulator training sessions. This could be started when a flight attendant is upgraded to the lead flight attendant position and further training including the observation of a simulator session is required by airline ABC. The opportunity of flying on the flight deck jump seat when positioning should also be provided to give flight attendants a better understanding of the pilots’ roles and responsibilities. The flight attendants would also be able to observe the busy workload periods. “I think it would be good to sit in on sim sessions” one flight attendant commented. Another flight attendant said “it would be good for pilots to travel a few times in Economy Class when positioning so they could observe the high workload times”

**Differences in hotels, meals and allowances**

Flight attendants realized that hotels and meals are covered under different union awards. It would be very helpful if whenever possible for both crews to stay at the same hotels and have similar meal allowances. Travel on the same crew transport would also help to break down barriers. Management and unions should work together to explore cost effective options.
In one group a flight attendant said that “a good way to break down barriers would be for the pilots to buy the first round of drinks at the hotel.” This suggestion was agreed to by the rest of the group however as noted crews often stayed at different hotels. The flight attendants thought that this gesture would be remembered and appreciated. However, a pilot who would be representative of the pilot body has since informed this researcher that cabin crew often reject pilot offers to go out for drinks.

**Communication patterns differed with aircraft type.**

Domestic crews on the B733 outlined excellent communication practices with the pilots. Both the pilots and cabin crew were able to get together briefly before the flight and often stayed at the same hotel. They often knew each other well having flown together on previous occasions.

In summary these data were reported at the descriptive level in which themes were presented along with a few descriptive quotes. A report was collated and presented to airline management.

**Discussion**

**Future Research Development**

The decision to hold the focus groups using the Nominal Group Technique enabled the researcher to have clear records of the data without having the additional presence of a recorder or employing the use of a tape recorder or video camera proved to be justified as the participants shared ideas freely and used this information to generate new ideas. One hundred flight attendants participated out of a total sample of one hundred and four. The introductory letter had stated that the groups would take approximately twenty minutes and were run to time. It was important to keep this time commitment to the groups on ethical grounds. Earlier data from the surveys had also shown that the flight attendants had a very good “grapevine”. The researcher’s independence
from the airline also provided the flight attendants with a unique opportunity to discuss issues in confidence, knowing that their anonymity would be maintained.

**Relationship to theoretical perspectives**

Cabin crew frequently mentioned differences in social status, age, and gender between the two crews. A flight attendant had said that “CRM has been useful in removing the invisible wall between the “them and us syndrome”. CRM programmes along with the above recommendations and observations will continue to address perceived differences in status. Pilots in airline ABC used their first names when communicating on the flight deck and would use these when briefing with the cabin crew whenever a briefing was possible due to time constraints.

The hierarchal nature of the crew composition was frequently noted. The flight attendants perceived that there were real differences in power differentials and status between pilot and flight attendant groups. Research by Merritt (1998) had identified that airline’s ABC home country had a low power distance gradient. This should assist in the reduction of such barriers as there was a lower perceived difference between airline crews. While making this statement, it is with the provision that crews recognized and respected the command authority of the Captain. Such data from the focus groups strongly supported the social identity approach which asserts that society is made up of social categories with each category linked to the other in terms of power and status (Hogg & Abrams, 1988). People were seen to obtain their identities through the social categories they belonged to. The social identity and social categorization approaches have been discussed in Chapter 2.

**Potential limitations**

This practical study which applied a qualitative research methodology in the form of focus groups had been conducted with members from the flight attendant complement at Airline ABC. The
study has generated a number of important safety recommendations. I would suggest that the focus group study has been consistent with the one aircrew/two sub-groups approach. Pilots and flight attendant groups each have their own sub-cultures. The focus groups provided the flight attendant sub-group with the opportunity to voice their viewpoints on a number of safety issues. Barriers impeding effective communication between pilots and flight attendants had been identified as a major concern to flight safety (Chute & Wiener, 1995; 96; Dunbar et al., 1997). The flight attendants who participated in this study had been asked to identify such barriers. They were then asked to generate possible solutions which gave additional insights into how flight safety could be improved. I believe that it would have been extremely difficult to have obtained such perspectives other than by applying such a practical, qualitative data gathering technique. Focus groups have also been recommended by Helmreich and Merritt (1998) as an additional research methodology to obtain information from employees on matters pertaining to safety within an aviation setting. Having said this, it still could have been useful to have provided additional linkage to the theoretical framework provided by the social identity and social categorization viewpoints

**Summary**

These data from the focus groups linked back well with the quantitative data obtained from the Flight Safety Attitudes Questionnaire conducted at the airline in 1998 and 2000. The following questions were of particular relevance and have been reported in detail in Studies One (Chapter 3) and Two (Chapter 4):

Q26 Good communication and crew co-ordination are important for flight safety.

Q6 Pilots encourage cabin crew to voice their concerns.

Q1 Pilots see flight attendants as valuable contributors to the flight safety.

Q10 Cabin crew have a good understanding of the flight deck’s responsibilities and role.
Q4 I know enough aircraft terms to describe a safety concern to the pilots.
Q13 Pilots have a good understanding of the flight attendants job.
Q16 I understand the reasons for “sterile cockpit” procedures.
Q32 Pilots always understand time constraints governing service delivery.
Q14 All ISD/Purser pre-flight briefings are relevant and through.
Q25 I appreciate the high workload within the flight deck.

This practical focus group study has provided far more detail and provided many examples from the crew’s own experiences at a far more personal and detailed level than the questionnaires did. The material obtained in focus group discussions would be explored further using quantitative methods. The FSAQ (pilots) was developed following the flight attendants comments from the focus groups. This would provide the pilots with the opportunity to provide their views on safety attitudes using both quantitative and qualitative methodologies. It would be important to obtain information based on the pilot’s perspectives and to investigate common ground held by both sub-groups. It could be possible that both sub-groups would have more in common than first perceived. The development and application of the Flight Safety Attitudes Questionnaire (FSAQ) for pilots is described in the next chapter.
CHAPTER SIX

STUDY FOUR


Introduction

The underlying theme of this research is that the aircrew on modern aircraft represent two distinctive cultures, as they are neither a group of separate individuals nor one single homogeneous team with identical attitudes and behaviours (Chidester, 1993; Chute & Wiener, 1995). Pilots and the flight attendants are characterized by a hierarchial structure both within and between the sub-groups with pilots, especially the Captain, viewed at the top of this structure (Merritt, 1996; Helmreich and Merritt, 1998). The social identity framework asserts that such intergroup interactions would differ from each other in terms of power, status, and prestige (Hogg & Terry, 2001). The attitudes and perceptions of the pilot sub-group will be explored in this study as both sub-groups are required to learn to work as an effective team which is of crucial importance in non-normal and emergency situations. This knowledge could then be applied to create joint training programmes to develop effective communication and teamwork skills.

The development of a measuring tool to examine pilot safety attitudes specifically relating to communication and crew coordination was the next stage of the present study. Flight attendants had given their perspectives in the Flight Safety Attitude Questionnaire (FSAQ) administered in 1998 (Chapter 3) and 2000 (Chapter 4). Data had also been obtained from the focus groups conducted with the flight attendants in 2002 (Chapter 5). An extensive review of the literature on pilot safety attitudes provided guidance for the development of a measuring tool specifically based on the needs of Airline ABC.
The literature review also provided direction for the research questions to be addressed and the hypotheses to be tested.

Helmreich, Foushee, Benson and Russini (1986) had discovered that measures of cockpit attitudes from the Cockpit Management Attitudes Questionnaire (CMAQ) (Helmreich, 1984; Gregorich, Helmreich & Wilhelm, 1990) could be used to evaluate Cockpit Resource Management training. They also discovered an unexpected finding which indicated that cockpit management attitudes differed as a function of the crew position flown (Captain, First Officer, or Flight Engineer). An additional unexpected finding was that attitudes also differed as a function of the aircraft type flown and that this had occurred in fleet types within the same airline. The authors did not name the fleet types flown apart from distinguishing between two or three-person crews and whether the particular fleet had electromechanical instruments or used the new glass cockpit technology. Therefore it was not possible to determine whether the age and seniority of the crews could have acted as confounding variables.

Helmreich and Wilhelm (1991) noted that highly significant differences had been found between fleet types flown. They also discovered significant differences in safety attitudes according to crew position flown. Research data reported seven years later still showed highly significant differences in pilot safety attitudes between aircraft fleets as well as crew bases within one major airline (Helmreich & Merritt, 1998). These results suggest that such differences are durable over time and would provide a key area to further pursue. Research findings relating to fleet type and crew position flown would provide a guide to hypothesis development in the present study.

Sexton and Helmreich (1999) studied the way flight crews used language to communicate on the flight deck. The NASA B727 simulator was used to collect data on language use for crews over five flight segments. They found that crew position flown and high workload periods influenced
communication patterns. Individual crew members communicated more during high workload periods with Captains speaking a greater number of words. There was a positive correlation between the number of words used and crew performance. Captains who used the words “we”, “us” and “our” were more effective in building a team. This is especially important as crews often change for different sectors and it indicates that each crew member is welcome to speak out with any concerns which would also contribute to safer flying attitudes. Sexton and Helmreich (1999) emphasized this point stating that these language patterns could be due to the status and role of the Captain. They cautioned that their findings with three-person crews should not be generalized to a two-person crew where a different hierarchical structure operated.

Airline ABC operates with up to four person crews on long-haul fights often led by a senior Captain. The power gradient on the flight deck would be high as two of the crew would be junior Second Officers. However, instructors who are also current line Captains on the aircraft type are also called in to fly in the positions of Second and First Officers when there is a crew shortage. Such crewing situations with a highly experienced Captain acting as a Second Officer have the potential to reverse the power gradient on the flight deck, especially when the rostered Captain is newly appointed to this role. This would be mitigated as Airline ABC is based in a low power distance country (Hofstede, 1991). Every crew member has a specific role and understands that they are encouraged to speak out with any query. The airline also has a SOP which requires all four crew members to have their heads up scanning for traffic and threats while on the taxiways and runways.

The leadership by the Captain during a galley fire was discussed in Chapter One. A ‘Mayday’ call had been issued by the Captain which immediately indicates the highest level of emergency in aviation. The Second Officer was asked by the Captain to actually fly the aircraft while he overviewed the situation. The First Officer was asked to go back into the cabin to assess the
situation and provide regular updates to the Captain. This incident showed that CRM skills and emergency training were major factors in the successful outcome from an emergency situation. This also showed that each flight deck member regardless of the size of the team has a role to play. It also illustrated how both the flight attendants and pilots can work successfully as a team.

Merritt and Helmreich (1995) questioned whether there could be “one size fits all” in CRM courses and concluded that training should be based on the particular needs of the airline. The literature provides support for the view that any CRM evaluation tool developed should consider the specific safety, national, and organizational factors of each airline and country. Successful CRM training needed to view the pilot culture as part of an organizational culture set within a national culture (Helmreich, Merritt and Wilhelm, 1999). The development of the Flight Safety Attitude Questionnaire (FSAQ Pilots) for Airline ABC would need to address issues specifically identified by the pilot group and take into account the national culture of most of the airline’s staff.

Seamster (2001) discussed tools and strategies used to help develop expertise in pilots’ roles as he believed that when such tools are better understood CRM courses could also include more effective skills in training. Seamster believed that such expertise needed to be developed over a period of time and would include three stages; basic training and practice, full-time involvement in a flying career, followed by expert performance. He identified three types of cognitive skills that pilots would use. The first stage would be the development of basic skills such as automated and procedural skills. The second intermediate stage would include decision making skills and practice. The final stage involved expert strategies which included metacognitive skills (or “thinking about thinking”). Such skills would be of great importance in problem solving unusual difficulties encountered during flight. No matter how effective any training programme is in the
aviation world it is impossible to plan and train for all eventualities. Expert cognitive skills could be of great assistance in such circumstances.

It was decided to investigate the influence that length of service, experience and expertise would have on pilots’ safety attitudes.

**Hypotheses**

1. Following the discussion in the Introduction to this Chapter that showed that expertise would need time and practice to develop, it is hypothesized that pilots with additional years of experience (10 years+) would show more positive safety scores on the FSAQ (Pilots), than those with less experience.

2. Following the discussion in Chapter One that showed pilots operating on narrow-bodied fleets scored more highly than pilots on wide-bodied aircraft on the CMAQ, it is hypothesized that pilots operating on narrow-bodied aircraft will score more highly on the FSAQ (Pilots) than pilots operating wide-bodied aircraft.

3. Following the discussion in Chapter One that showed Captains scored more highly than more junior crew on the CMAQ and had a higher recognition of threats and errors; it is hypothesized that Captains will score more highly on the FSAQ (Pilots) than pilots in more junior crew positions.

**Item derivation and development**

In Study One the (FSAQ-Flight Attendants) had been derived from a 60-item questionnaire developed by Merritt specifically for flight attendants from a major US carrier in the mid 1990s.
This had been used with Merritt’s permission by Airline ABC and reduced to 36-items by the Crew Resource Management team to reflect areas that were to be specifically targeted in the introduction of the airline’s own CRM training programme and would also reflect cultural conditions in the airline’s country. The development of the present measuring tool went through several drafts, with feedback provided from the airline’s pilots. Many of the changes were minor in that they involved slight changes in the wording of items in order to make them clearer. The Flight Safety Attitude Questionnaire (FSAQ-Pilots) is shown in Appendix C.

The following items Q1, 2, 3, 4, 5, 6, 7, 8, 11, 12 and 13 were taken from the (FSAQ-Flight Attendants) after the questions had been appropriately reworded for the pilot population. For example, some questions were reworded to start with “I” (rather than pilots) while the one reversed scored question was started with “Captains” rather than “ISD’s/ Pursers”. There were three new items developed specifically for this questionnaire following feedback from pilots working in the CRM team. These were items 9, 10, and 14 (Appendix C).

The questionnaire was presented in a shortened format as it was felt that reliable and valid data could be still obtained and pilots would be more likely to complete a shortened questionnaire. Question 14 had been designed to investigate pilots’ views on command authority. A recent LOSA audit of Airline ABC had just been completed and it had shown that some pilots had noticed that a lack of respect from flight attendants for flight deck crew, especially the Captains has been emerging. Such a lack of respect could reflect on safety in critical incidents such as when the command “evacuate now” is given. This would need to be carried out immediately and could be a decision made by the Captain often under very tight time pressure. So the words “command authority” were selected for this item.
Method

Participants

The participants were the complete complement of pilots from Airline ABC who flew jet aircraft, including short and long-haul routes. Pilots had differing lengths of flying service within the airline and flew in different crew positions. The pilots also flew on different types of aircraft within the airline’s fleet.

Procedure

The distribution of the questionnaire had been delayed due to financial uncertainties within the airline and the very real possibility of job losses. After this period was over, an extensive period of training associated with the introduction of a new aircraft type to the airline’s fleet, meant that the distribution of questionnaire was further delayed. The FSAQ (Pilots) was distributed in 2004.

The questionnaire was sent out with a Letter of Introduction from the CRM Training Manager, along with the required Information Sheet and Consent Form. The FSAQ (Pilots) was placed into large envelope (A4 -176mm. by 250mm.). This meant that the Letter of Introduction would be read first followed by the Information Sheet and Consent Form. This was followed by the FSAQ (Pilots). The size of the envelope meant that the items did not need to be folded. An envelope sized DLE (110mm. by 220mm.) with a label addressed to the CRM Manager’s company mail box was included inside this package. Pilots had also been alerted to look out for this questionnaire through a mention in an airline in-house magazine for pilots. Union permission had been obtained. The FSAQ (Pilots) was delivered in a personal mail box drop to all international and national pilots’ mail boxes at their airport bases. Pilots were used to clearing their mail boxes prior to flights and it was thought that long-haul pilots might be able to complete their
questionnaires in rest breaks during these flights. Questionnaires were returned through the company mail system. This was familiar to flight crews and would be easy to use.

**Materials**

*Part A*

This consisted of 14-items related to safety, with participants asked to rate their viewpoint on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’.

*Part B*

This section contained two questions. Participants were asked to write down in a blank text box placed directly underneath possible hindrances to effective communication between pilots and flight attendants when working on the aircraft. The second section also contained a blank text box with space in it to write down possible solutions from the question above. These two questions were included as they were the key questions used in the focus groups with flight attendants.

*Part C*

This provided the opportunity to record background information, including years as an Airline ABC pilot, crew position and aircraft type. It was decided not to ask for gender as this could readily identify participants due to the small number of female pilots in Airline ABC.
Results

Part A

Descriptive data analyses

Table 6.1 The Flight Safety Attitudes Questionnaire (Pilots) (FSAQ for Pilots) 2004 by Percentages

Table Key

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<td>53.2</td>
<td>3.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Q5 (R)</td>
<td>88.4</td>
<td>10.0</td>
<td>0.4</td>
<td>0.4</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Q6</td>
<td>14.7</td>
<td>43.4</td>
<td>29.0</td>
<td>12.9</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Q7</td>
<td>0.4</td>
<td>4.3</td>
<td>19.9</td>
<td>65.4</td>
<td>10.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Q8</td>
<td>2.2</td>
<td>20.8</td>
<td>31.6</td>
<td>44.6</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Q9</td>
<td>0.4</td>
<td>2.6</td>
<td>14.7</td>
<td>69.3</td>
<td>12.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Q10</td>
<td>11.3</td>
<td>39.4</td>
<td>32.0</td>
<td>16.0</td>
<td>1.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Q11</td>
<td>0.8</td>
<td>0.0</td>
<td>0.0</td>
<td>10.0</td>
<td>89.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Q12</td>
<td>0.0</td>
<td>8.2</td>
<td>26.8</td>
<td>54.6</td>
<td>10.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Q13</td>
<td>4.8</td>
<td>32.0</td>
<td>20.8</td>
<td>31.6</td>
<td>10.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Q14</td>
<td>9.1</td>
<td>23.8</td>
<td>22.5</td>
<td>35.9</td>
<td>8.7</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Pilots Safety Attitudes Questionnaires Results

Overview

The statistical software package SPSS version was used to analyze the descriptive data.

The Pearson Chi -Square test was used on each of the 14 questions, with Questions 1, 4, 6 and 13 showing highly statistically significant differences between the responses from pilots in different fleets and also between different crew positions. Part A of the Questionnaire had been completed by 231 pilots; however 9 pilots had overlooked filling in crew position details on the written questionnaire form. This left a sample size of 222 pilots and chi-square cross tabs were run on the
remaining data. Sample sizes according to fleet type were: B747 pilots (n = 64), B767 pilots (n = 85), B737 pilots (n = 53) and A320 pilots (n = 20).

**FSAQ (Pilots) results according to the four different fleet types (Hypothesis 2)**

Q1. Flight attendants as valuable contributors to flight safety.
\[ \chi^2 = 14.442, \, df = 6, \, p = .025 \]

Q4. Pilots and flight attendants work effectively together at (the airline).
\[ \chi^2 = 35.631, \, df = 15, \, p = .002 \]

Q6. All cabin crew have a good understanding of the pilot’s responsibilities and roles.
\[ \chi^2 = 28.090, \, df = 9, \, p = .001 \]

Q13. Flight attendants should not question the decisions of the captain, except when they threaten the safety of the flight.
\[ \chi^2 = 29.349, \, df = 12, \, p = .003 \]

These differences are illustrated in the following graphs.
Q1: Flight Attendants as Valuable Contributors to Flight Safety

Q4: Pilots and Flight Attendants Work Together Effectively
Q6: Cabin Crew Have good Understanding of Pilots' Role

Q13: F/As Should Not Question Decisions
There was a strong relationship between pilot safety attitudes and fleet type which indicated that a strong and at times different fleet culture existed between pilots on the four fleet types in the survey. These descriptive results supported Hypothesis 2.

**FSAQ (Pilots) results according to crew position (Hypothesis 3)**

The Chi-square test was used on each of the 14 questions, with Questions 2 and 12 showing highly statistically significant differences. Part A of the Questionnaire had been completed by 231 pilots; however 9 pilots had overlooked filling in crew position details on the written questionnaire form. This left a sample size of 222 pilots and chi-square cross tabs were run on the remaining data. Sample sizes according to crew position flown were: Captains (n = 109), First Officers (n = 71) and Second Officers (n = 36).

Q2. I always notify the flight attendants about unusual situations.

\[\chi^2 = 22.972, \text{ df} = 8, \text{ p} = .003\]

Q12. I always understand the time constraints regarding service delivery.

\[\chi^2 = 13.460, \text{ df} = 6, \text{ p} = .036\]

These results are illustrated in the following graphs.
Q2: I Always Notify F/As about Unusual Situations

Q12: I Understand Time Constraints on Cabin Service
**Multivariate data analyses**

**Reliability Analysis**

Cronbach’s alpha for the 14-item FSAQ (Pilots) was .655. Item 13 had negative item-total correlations and if this item was removed the overall reliability would increase to .741.

**Principal Components Analysis**

The 14-items of FSAQ (Pilots) were analyzed by using a principal components analysis (PCA) with Varimax rotation using SPSS Version 15. Five components with eigenvalues greater than 1 were extracted. This is within the expected range (Tabachnik & Fidell; 2001, pp.620-621). The largest component represented 17.0 % of the variance. These extracted components accounted for 60.1% of the variance.

The scree plot test (Cattell, 1966) was conducted where the eigenvalues are plotted against the factors. This is shown below in Figure 6.1. A close inspection of where the line graph changed shape indicated that there could be 3 interpretable components. The rotated component matrix showed that there were 4- items with loadings of .3 or greater on the first component with 3-items loading on the second component and 3 on the third. The greater the loading the more confidence there is in that the variable is a true measure of the factor (Tabachink & Fidell; 2001, p.625). The measures of factorability were good and indicated that the solution was an appropriate one.

In summary the 14-item FSAQ (Pilots) demonstrated an internally consistent and reliable scale. It is recommended that a slightly smaller 13-item test should be accepted for future use.
Interpretation of the Component Matrix

Items from the three components from the rotated matrix component were examined to identify what each component had in common. Questions 4, 6, 8, and 14 loaded on the first component. These items involved the pilots’ ratings for intergroup cooperation and how they thought flight attendants perceived their job role and responsibilities. Questions 7, 9, and 12 involved the pilots’ ratings of the flight attendants understanding of their job roles and responsibilities. Questions 2, 3, and 13 concerned how the pilots rated their communication with flight attendants on safety issues. Question 13 showed a negative item-total correlation.

![Scree Plot](image)

**Figure 6.1:** Scree plot of eigenvalues from principal components analysis of the FSAQ (Pilots)
Pilot Characteristics and Scores on the Flight Safety Attitudes Questionnaire

A background information section asked the participants to indicate their years of experience as a pilot, crew position flown and aircraft type flown. This would include whether the pilot had a leadership role as a Captain. Total scores for the questionnaire were calculated by summing across all 14-items.

Length of service (Hypothesis 1)

Information on years of experience as a pilot was provided by 96.6% of participants. The range of experience was from 1 to 38 years (M = 16.09, SD = 9.24). A histogram of years experience (Figure 6.2) showed three distinct cut-off points at 14 years and 23 years. Pilots were then divided into three groups based on their years of experience; (Group 1: 1-14 years; Group 2: 15-22 years; Group 3: 23 years or above). The means scores of the pilots in the three groups were nearly identical; Group 1 (M = 53.0, SD = 4.76, Group 2 (M = 51.8, SD = 4.79) and Group 3 (M = 51.5, SD = 4.48). No significant differences were found between the groups. The hypothesis that pilots with additional years of experience (10 years +) would show more positive safety attitudes scores on the FSAQ (Pilots), indicating safer attitudes than those with lesser than experience was then tested. Again no significant differences were found between the groups; Pilots with less than ten years experience (M= 52.2, SD = 4.6) did not differ from pilots with more than ten years experience (M = 52.4, SD = 4.8). However, when job seniority and years as a pilot data were analyzed it was found that seniority and years of experience as a pilot were significantly correlated (r (223) = -.74, p<.0001).
Figure 6.2: Histogram of years experience as a pilot

**Aircraft Flown Wide and Narrow-bodied Aircraft (Hypothesis 2)**

Participants were asked to record their aircraft type flown by selecting one of the following four aircraft (B747, B767, B737, A320). The largest group was B767 pilots with 85 participants while the smallest group was the A320 pilots with 20. The B767 pilots had the lowest scores (M = 51.0, SD = 5.0) while the B737 pilots had the highest scores (M = 54.4, SD = 4.1). An ANOVA on questionnaire scores showed a highly significant difference according to aircraft flown (F(3,216) = 6.2, p<.0001). The majority of participants flew on wide-bodied aircraft (n = 148) while a smaller number of participants (n = 72) flew on narrow-bodied aircraft. Long-haul pilots flew on
the B747 or B767 aircraft fleets (wide-bodied aircraft) while short-haul pilots flew on either the
B737 A320 fleets (narrow-bodied aircraft). An ANOVA on questionnaire scores showed a
significant difference between the two groups ($F(1, 218 ) = 17.0\ p<.0001$). Pilots on narrow-
bodied aircraft had significantly higher questionnaire scores ($M = 54.2, SD = 4.1$) than those
flying on the wide-bodied aircraft. ($M =51.5, SD = 4.7$).

**Crew Position (Hypothesis 3)**
Participants were asked to indicate their crew position by selecting one of the following three
positions (Captain, First Officer or Second Officer). The largest group was Captains with 108
participants; the First Officers group had 71 while the smallest group was Second Officers with
35. Captains scores were the highest ($M = 53.0, SD = 4.7$) while the First Officers and Second
Officers had almost identical scores. (First Officers $M= 51.8, SD = 4.7$) and Second Officers $M =
51.5, SD = 4.4$) An ANOVA on the questionnaire scores did not show significant differences
between the groups. However, when a second ANOVA was run comparing senior positions
(Captains) with more junior positions (First and Second Officers) the differences in scores
between junior and senior positions were found to be significant ($F (1,212) = 4.1, p = .042$).
Captains in the more senior crew position had significantly higher questionnaire scores ($M =
53.0, SD = 4.7$) than those in more junior crew positions ($M = 51.7, SD = 4.6$).

As seniority and years of experience as a pilot are significantly correlated ($r ( 223) = -.74.,
p<.0001$) an analysis of covariance (ANCOVA) was carried out to determine if the effects of job
seniority on questionnaire score would continue to be significant after adjusting for years of
experience. The results showed that job role remained significant ($F(1,210) = 8.6, p = .004$) even
after controlling for years as a pilot.
In the present study a number of variables were identified which could be used as predictors of safer attitudes as reflected in the FSAQ (Pilots). These variables were:

- length of service
- crew position flown
- seniority
- leadership roles
- aircraft fleet type flown
- flight deck crew size
- length of route flown

Discussion Part A

**Length of Service (Hypothesis 1)**

In the present study the length of time which a person had served as a pilot on jet aircraft was one potentially important variable in whether safer attitudes, as measured by the FSAQ (Pilots), were shown. The hypothesis was not supported as no significant differences were found between the scores of pilots with different lengths of service with the airline. However, seniority and years of experience as a pilot were significantly correlated \( r(223) = -.74, p<.0001 \). This could be as promotion to more senior roles such as Captain is linked to the seniority list which consists of the time served with the airline. However, promotion is not automatic as pilots have to pass a series of examinations and tests of their flying skills in flight simulator exercises before promotion is granted. Airline ABC sets very high standards for its command positions.
Reasons why there was not a significant difference found in the FSAQ (Pilots) scores between pilots with less or more than ten year experiences could be that pilots are usually already very experienced before flying on jet aircraft in the airline.

Pilots would have at least 3000 flight hours logged and would have passed all of their papers for the most advanced aviation qualification for pilots in the country. Airline ABC requires this qualification as one of the pre-entry requirements for recruitment. Many would have up to 6,000 hours on jets with another 3-6,000 hours on multi-engine aircraft. In future questionnaires it would be a good idea to ask for total flying hours on jets to be included in any Background Information Section while still keeping the question relating to Years of Service. It would also be a good idea to ask for years on jets with any other airline or in the military. This would help to provide data which could assist additional analyses.

There is also the possibility that the proficiency checks carried out every six months could have reinforced safety attitudes amongst the entire pilot group. Pilots would have also attended recurrent CRM programmes as part of annual training. This would have included joint CRM training with the flight attendant group.

Taylor, Kennedy, Noda and Yesavage (2007) conducted a three year longitudinal study investigating pilot age and expertise. Data had been obtained from an ongoing study conducted in flight simulators at Stanford University. While the study participants were general aviation pilots aged between 40 and 69 years (n=118), the results are consistent with findings from studies with commercial aviation pilots who had been assessed as having expert skills. Expertise and prior experiences provided the older pilots with an advantage over younger pilots which the authors described as “specialized knowledge”. This knowledge base remained consistent over time.
Li, Baker, Grabowski, Qiang, McCarthy, and Rebok (2003) studied whether pilots were more at risk from aircraft crashes as they grew older. The researchers collected longitudinal data over a period of eleven years from a cohort of 3,306 air taxi and air carrier pilots in the United States. This cohort of pilots was selected from the NTSB and NASA data bases. The selection criteria had been that the pilots had:

- the highest category of medical license
- written pilot as occupation
- logged 500 flying hours in the prior year, including 20 hours in the prior six months
- described age as between 45-54 years at start of the study

Data analyses had shown that that pilots with less than 5,000 hours flight time were twice as likely to have been involved in a crash than those with than 5,000-9,999 hours flight time. Flight time over 10,000 hours was not an additional protective factor against accidents. In summary, flight time was a greater predictive factor of the likelihood of accidents than the age of the pilots (Li et al, 2003).

The data from the present study had shown that pilots had a lengthy period of service with airline ABC ranging from 1 to 38 years, with a mean of 16.09 years. Pilots could have shown liking for their job by flying with the airline for long periods of time. Another reason could be that pilots, especially senior Captains are very well paid in most countries. In Airline ABC this is also true so financial incentives (including a generous superannuation package) could also provide a very compelling reason for continuing to fly up to the compulsory retirement age of 65 years. Some individual pilots with 30 years plus service displayed some of the lower mean safety scores in the
entire sample. It is also possible that some of the pilots could have remained flying in their professional capacity due to the perceived status associated with their job roles.

It is also possible that pilots who had chosen to retire at an earlier age would not have been included in this sample. During the course of the present study I have spoken to many pilots who have stated that although they love flying they do not like the long periods of time away from families. Long-haul pilots have also conveyed that they were finding fatigue and jet lag more noticeable as each year passed especially on night flights across trans-meridian zones.

Kandelaars, Fletcher, Eitzen, Roach and Dawson (2006) studied the effects of trans-meridian flights on a group of pilots from an Anglo country that would fly similar long-haul routes as pilots from ABC. The mean age of the pilots was 46.7 years. Both biological and social factors were studied. If pilots stayed awake until their usual sleep time on stopovers it was found that these social factors rather than biological factors were better predictors of the amount of sleep obtained. The authors believed that although the sample size of 86 pilots was small that it would provide an excellent basis for further research.

Pilots in senior roles with the accompanying responsibility had shown safer attitudes than those not in roles of responsibility. Pilots are given an employment number when they join the airline which also serves to designate seniority. This does not take into account a pilot’s previous flying experience with the military or another airline. Management would consult the seniority list when vacancies occurred and also would check that the pilot met the qualifications to be promoted. Once this occurs an extensive period of upgrade training to the left hand seat (the Captains’ seat) is undertaken with a number of simulator checks and examinations to be completed. The additional training could influence the development of safer attitudes. The role of command is taken very seriously by pilots as although it takes a team approach to achieve improved safety attitudes, it is the Captain or the Pilot in Command (PIC) who is legally charged to make the final
decisions often within a short time frame. CRM training started for pilots in 1988 and pilots with more seniority would have attended more courses.

Narrow and wide-bodied aircraft flown (Hypothesis 2)

In the present study, highly significant differences in safety attitudes between pilots flying narrow-bodied and wide-bodied aircraft were found. Airline ABC operates the B737 and A320 in its narrow-bodied fleets, while the B747 and B767 are in the wide-bodied fleets. Narrow-bodied aircraft operate with fewer crew and this could mean that both the pilots and flight attendants could form an effective team more quickly. Many crews would know each other having flown together before.

This hypothesis is closely linked to hypothesis four which has been discussed in the above paragraph as short-haul routes are operated by B737 and A320 aircraft with the long-haul routes operated with the B747 and B767. Pilots operating on short-haul routes displayed safer attitudes. This could be due to the opportunity for increased communication with the smaller teams as effective team building and communication are linked with safer attitudes.

The B737 and A320 are usually operated by two pilots while the B747 and B767 have three to four pilots. However as the pilots stay at the same hotel during stopovers they have the opportunity to get to know each other better which would help build an effective team more effectively on the return sectors. Pilots usually stay together as a team during their tour of duties. However there could be a wide distance in age between senior Captains and junior Second Officers who might wish to socialize within their own age groups. This is definitely an area in need of further research.
Flight attendants present an additional factor to be considered in building effective communication patterns on long-haul aircraft. In the long-haul B747 the flight attendants often do not even see the flight deck crew which could make them appear more distant and result in less effective communication. The B747 is also a doubled decked aircraft with only a few of the premium service flight attendants serving food and beverages to the pilots. Another very important role is to check on the pilots every 30 minutes to ensure that the pilots are not too sleepy. As flight attendants and pilots stay at different hotels on stopovers it would be difficult to get to know each other.

**Crew Position Flown (Hypothesis 2)**

Captains had displayed higher mean scores on the FSAQ (Pilots) indicating that that they displayed safer attitudes. This is consistent with earlier research by Helmreich et al. (1986) when safety attitudes scores on the CMAQ had shown that Captains displayed higher safety attitudes.

In Airline ABC the Captain is required to hold a pre-flight briefing with the team leader from the flight attendants. This would increase contact between the two groups and help to create a better understanding of each others’ roles and responsibilities. The Captain would also be aware of the critical role in regard to the safety of the flight played by the flight attendant team. He/she would also be aware of the support they could provide to the flight attendants. The Captain would assess information provided over the interphone in regard to safety or medical issues. For example, they are required under law to give the flight attendants permission to restrain an abusive or drunken passenger.

It is important to remember that although senior pilots would have attended many CRM sessions, the new hire and younger flight attendants have not had this experience. In a personal communication I was informed that one CRM session had been discussing an issue raised by a
flight attendant. She said that her team could not get a male passenger to stop using his cell phone after the safety briefing. The aircraft had left its departure gate and the flight attendants had finally been successful. One Captain present asked why they had not informed the flight deck crew. The flight attendants had perceived this to be a high workload time for the pilots and did not wish to interrupt their tasks. The Captain’s response was that the flight attendants should pick up the interphone. In this case the Captain said he would have made an intercom PA announcement stating that unless all cell phones had been turned off he would return to the gate and disembark the offending passenger as this was a danger to the safety of the flight. The flight attendants were pleased with the support indicated by such a comment.

The following section is a summary of the comments that were written in the text boxes under Part B of the (FSAQ Pilots).

**Part B Qualitative data**

The following areas were identified and summarized below.

**Interphone use**

<table>
<thead>
<tr>
<th>Hindrances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of face-to-face contact</td>
</tr>
<tr>
<td>Poor interphone technique, not giving name and location</td>
</tr>
<tr>
<td>Difficulty in hearing voices, sometimes due to noise/workload factors and lack of voice projection</td>
</tr>
<tr>
<td>Number of interphone calls at high workload periods can cause problems</td>
</tr>
<tr>
<td>Number of interphone calls to flight deck could cause an incident</td>
</tr>
<tr>
<td>Time spent locating ISD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
Upgrade training so that non face-to-face communications on matters of Security/Safety/Operation are Precise/Understandable/Direct. Use of common aviation jargon
Reinforcement and correct use of interphone protocols

Cabin crew to ask for read back confirmation of information

Voice projection training for clearer cabin crew speaking voices, (particularly important during high workload times)
Relocate B744 tech crew interphone to LHS of present location for easier use interphone
Install a “flight deck busy” signal by interphone handset
New “Cabin Clear” electronic alerting system working well on B737
Design a system to enable pilots to instantly locate ISD
Place B737 interphone in a more convenient position i.e. closer to flight deck door

Lack of combined pre-flight briefing

Hindrances

Lack of opportunity to exchange flight information and information and expectations in person before flight
Lack opportunity for introductions and opportunity to set the tone for the flight e.g. Cabin crew welcome to visit flight deck pass on information or for just a friendly hello

Solutions

Hold compulsory full crew pre flight briefings
Design/ build a purpose built area for combined crew briefings compulsory
Airline management to realize that this would mean increased duty time, as an earlier reporting time would be involved

Until this is in operation:

A short crew get together for briefing prior to passengers boarding
One of the pilots to walk down aircraft to introduce themselves and share flight information
Additional efforts needed to find the time for this due to operational pressures.
Introduce increased reporting times to allow for commercial operational pressures.
Crew could share same crew bus on way to airport on from stopover hotels

**Size/Layout of B744**

<table>
<thead>
<tr>
<th>Hindrances</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size and 2 decks results in more difficulties in communication, especially for cabin crew at rear of aircraft</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Solutions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue to work on improved interphone procedures, install video cameras, ISD’s/Captains to encourage visits to flight deck</td>
<td></td>
</tr>
</tbody>
</table>

**Existence of a “them and us” culture amongst a few cabin crew, particularly amongst a few ISDs**

<table>
<thead>
<tr>
<th>Hindrances</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Reluctance of some ISDs to encourage flight deck visits/contact with tech crew</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Solutions</th>
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</thead>
<tbody>
<tr>
<td>Attitudes have been noted to improve over time with the introduction of CRM training and the promotion of new, younger Pursers/ISDs</td>
<td></td>
</tr>
<tr>
<td>Positive attitudes of ISDs are viewed as crucial to setting the tone for good communication practices with the flight deck during flights</td>
<td></td>
</tr>
<tr>
<td>Continue with CRM education programmes (but not general joint Pilot/Cabin crew sessions). Specific CRM related joint EP training viewed as very beneficial</td>
<td></td>
</tr>
</tbody>
</table>

**Safety related formation to be communicated through ISD**

<table>
<thead>
<tr>
<th>Hindrances</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Still a concept amongst cabin crew that all safety operational information has to be passed on directly and then filtered through ISD</td>
<td></td>
</tr>
<tr>
<td>Cabin crew work in a hierarchal structure under ISDs rather than as a team. ISD in turn does not always pass on information</td>
<td></td>
</tr>
<tr>
<td>ISDs do not always pass on information that pilots would like to know, e.g. pilots rarely hear of passenger on oxygen until logbook entry</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Solutions</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Make it clear that each cabin crewmember has an equal weight and responsibility to report safety/operational matters directly to the PIC</td>
<td></td>
</tr>
</tbody>
</table>
Sector reports to be sighted and signed by Captain

Information to be given face to face whenever possible by the person directly involved

**Lack of understanding role of command authority/chain of command**

<table>
<thead>
<tr>
<th>Hindrances</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Cabin crew perception that ISD is second in command or equal to the captain</em></td>
</tr>
<tr>
<td><em>Perception that Captain has little authority over matters pertaining to the cabin</em></td>
</tr>
<tr>
<td>Belief that cabin crew can decide a course of action without reference to PIC</td>
</tr>
<tr>
<td>Lack of understanding re role of First/ Second Officer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make it clear that each cabin crewmember is responsible directly to the PIC</td>
</tr>
<tr>
<td>Address issue of filtering funnelling information through ISD</td>
</tr>
<tr>
<td>Safety important information to be reported by the first observer directly to flight deck (and then to ISD to keep them in the loop)</td>
</tr>
<tr>
<td>Continued training “there can only be one Captain on an aircraft”</td>
</tr>
<tr>
<td>Continued education on roles of First and Second Officers</td>
</tr>
<tr>
<td>Captains and ISDs should sit down in small groups around a table to iron out difficulties in perceptions of roles</td>
</tr>
</tbody>
</table>

**Cabin crew understanding of pilot’s roles.**

<table>
<thead>
<tr>
<th>Hindrances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locked flight deck door seen as both a physical and psychological barrier to communication and contact.</td>
</tr>
<tr>
<td>Busy workloads mean less time for flight deck visits</td>
</tr>
<tr>
<td>Some ISDs discourage cabin crew to visit flight deck</td>
</tr>
<tr>
<td>Cabin crew’s lack of respect for flight deck crew could be lack of knowledge of the pilot’s role and responsibilities</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
## Solutions

Captains to invest some time pre-flight in encouraging cabin crew to visit flight deck

Invite cabin crew to ride on jump seat whenever possible, especially for takeoffs, landings

Famil. rides on jump seats for new cabin crew

Pursers/ISDs to see a SIM detail as part of their training

Arrange for a few ISDs to see pilot incapacitation drills in SIM. Not everyone would need to do this but a few would help spread the word. Pilots would also learn from Purser/ISD feedback

## Pilot's understanding of cabin crew roles

Pilots indicated that they thought that they had a good understanding of cabin crew roles commenting on the following issues:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busy workload times in the cabin and insights gained when travelling as a passenger on some sectors, especially when seated near the galley.</td>
<td>Need for cabin crew to be given additional meals during long flights (as the pilots obtain)</td>
</tr>
<tr>
<td>Need for increased cabin crew numbers, mainly from a safety perspective from a safety perspective, but also and to ease cabin service workload.</td>
<td></td>
</tr>
</tbody>
</table>

## Commercial factors: Cabin Service Demands/Focus

### Hindrances

<table>
<thead>
<tr>
<th>Hindrance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“apparent high priority of cabin service requirements and procedures to the detriment of other factors”</td>
<td>“strong customer service focus could impinge on safety in unusual situations”</td>
</tr>
</tbody>
</table>

### Workload/Time pressure factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High workload on flight deck during short domestic sectors (less time available for cabin crew to visit flight deck, even just to say hello)</td>
<td>High workload time in cabin during short domestic sectors also means less time available for flight deck communication</td>
</tr>
<tr>
<td>Lack of time for briefing cabin crew due to short turnaround times</td>
<td>PArents sometimes arrive late to aircraft (factors outside their control)</td>
</tr>
<tr>
<td>Multiple cabin crew changes on same TOD (B737)</td>
<td></td>
</tr>
</tbody>
</table>

### Solutions

On B737 aircraft increase cabin crew size back to 4
One additional cabin crewmember on all aircraft types

Rostering to keep flight deck/cabin crews together on multiple stop Tour of Duties (TODs), whenever possible

“teamwork improves dramatically, the longer the team works together”

Crews staying at different hotels

<table>
<thead>
<tr>
<th>Hindrances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of opportunities for crews to meet or get together before/after flights</td>
</tr>
<tr>
<td>This was viewed as an issue affecting crew communication (as well as an industrial contract issue)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crews to stay at same hotels. This would allow for the opportunity to get together on a more informal basis and to get to know each other</td>
</tr>
<tr>
<td>Share same crew buses, which would allow for introductions</td>
</tr>
</tbody>
</table>

General Discussion

Joint training sessions have been highlighted as being extremely beneficial by both the flight attendant group (Chapters 3 and 4) and the pilot group as shown above. Joint EP training specifically related to CRM communication and coordination skills should continue to be used. The use of up-to-date and relevant scenarios should continue to be developed with specific scenarios to provide opportunities to practice skills in key areas when both groups are together for recurrent training.

Additional ways to encourage team work and understanding of each other’s roles should also be given careful consideration for implementation. The pilots had identified these as:

- Continue to provide training opportunities, which would allow both flight deck and cabin crew a better understanding of each other’s role and perspective,
particularly during heavy workload periods. The role of the Captain’s command authority also needs to be reinforced.

- This could be achieved through:
- Opportunities for flight attendants to sit in on simulator (SIM) sessions.
- This could start with Purser/ISD upgrades. One way to overcome practical difficulties with this would be as one pilot stated would be to arrange for a few ISDs to sit in on SIM details and word would soon get around regarding pilots’ roles and responsibilities.
- Familiarization rides on jump seats, especially for take off and landing.
- Training should continue to emphasize correct interphone usage, including increasing cabin crew awareness of busy workload times on the flight deck.
- Training should emphasize that safety critical information needs to be conveyed immediately by the first cabin crewmember that has observed the problem.
- ISD pre-flight cabin crew briefings should make it very clear that each team member is able to communicate safety critical information directly to the flight deck
- Continue to look for opportunities to hold combined pre flight briefings until new buildings are completed.
- Use the same hotels for both crews whenever possible, or at the least, shared crew transport.

A Line Orientated Safety Audit (LOSA) was conducted for airline ABC in 1998 by staff from the University of Texas. It contained a question asking pilots to identify any barriers, which could hinder flight deck/cabin operations. The main issue identified was the absence of joint flight deck
and cabin crew training. The pilots were strongly in favour of the introduction of joint training. The need for a joint flight deck and cabin crew reporting area was also seen to be important as it would help with pre-flight briefings. Training which involved the sharing of each other’s roles and responsibilities was also seen as important and it was felt that this could be addressed in the joint training sessions. This provides support for the data obtained in Part B of the FSAQ (Pilots) conducted in 2004, although it must be remembered that this LOSA had been conducted before the attacks of September 11 2001.

The results from the FSAQ – Pilots (2004) have indicated that there are highly significant differences in perceived safety attitudes between fleet type and crew position flown. These results are consistent with similar differences which had been noted in a number of research studies in the literature (Helmreich, Foushee, Benson & Russini, 1986; Helmreich et. al., 1990; Helmreich & Wilhelm, 1991; Helmreich & Merritt, 1998).

**Relationship of data to theoretical issues**

Sexton and Helmreich (1999) had discovered that crew position flown moderated communication. Captains used language to build an effective team by using inclusive words such as “we,” “us” and “our”. Such Captains also displayed higher safety attitudes on the CMAQ. One strategy used in the social identity framework to assist in the development of a cohesive team was the creation of an inclusive superordinate category (Gaertner et al, 1996; Brown, 2000). The use of inclusive language as described by Sexton and Helmreich (1999) would help to create a common superordinate identity.

The findings of the present study have also been supported by research by Helmreich and Merritt (1996, 2004). Their research contained a sub-sample of flight attendants and pilots from United
States crew bases. Participants were recruited from the same United States international airline using different crew bases. The CMAQ was used as the measuring tool. Two hundred pilots (only five were female) and 200 flight attendants of whom 170 were female from a United States West Coast crew base were recruited. An additional 185 male flight attendants and 200 female flight attendants were recruited from the same airline’s mid-West crew base. Attitude change in a positive direction was found to be significant.

The flight attendants valued Captains who would encourage their questions, but would also show command leadership in emergencies. The United States Captains preferred an interactive leadership style where participation from the whole team was encouraged. The flight attendant and pilot groups showed differences related to occupation and national identity. The pilot and flight attendant groups differed in leadership styles and personalities with the flight attendant group seen as more socially orientated. Gender differences showed that national culture and organizational identity took preference over gender and organizational differences. The all male group of flight attendants identified with their female counterparts (Helmreich & Merritt, 2004). This finding supports the social identity theory in that while membership of a particular group (e.g., gender) is important it can be overridden when a superordinate category is formed when groups focus on shared group goals.

**Reasons for the delay in the distribution of the FSAQ (Pilots)**

The airline had undergone a period of financial uncertainty with the very real possibility of job losses so it was decided to wait until this unsettling period for crew was over. I was informed by the CRM Training Manager when this time had passed. This meant that it was now possible to continue to collect data from the pilot sub-group due to the more settled work environment. However, the questionnaire was delayed in going out to all national and international pilots due to
a heavy training programme in the airline related to the introduction of a new single-aisle jet aircraft on short-haul routes. As a result the FSAQ (Pilots) had not been distributed until 2004. The FSAQ (Flight Attendants) had followed up on the safety attitudes of the flight attendant sub-group after the completion of initial CRM training in 2000. It had been intended to conduct telephone interviews with the pilot group in 2000. However, the release of crew telephone numbers, cell phone numbers or an email address to be used set up these interviews had not been possible due to privacy issues.

**Potential limitations**

While the reasons for the delay were valid, this time lapse meant that that confounding variables could have been introduced if a direct comparison was made between similar items on the FSAQ versions for flight attendants and pilots. The major confounding variable would have been the events of ‘9/11’ 2001 which changed the aviation environment in a way that could not have been imagined. Airlines rewrote their protocols and related SOPs to reflect new security environment.

The major change was reflected in the reinforced and locked flight door which was perceived to be the major barrier to effective communication from the pilots’ perspective. The focus groups with flight attendants, conducted in late 2002, also identified the same major barrier. It is suggested that the comparison of data from the flight attendants' perspectives obtained in the focus groups could be compared with pilots’ perspectives obtained from the qualitative data in Part B of the FSAQ (Pilots). This could provide a way to mitigate against the time frames issues. However, in a modern aviation environment the pace of the research is governed by the host organization (Airline ABC) and it would be very difficult to suggest any factors that could mitigate against this. Throughout this entire research Airline ABC had been an excellent host and I was extremely privileged to have been granted unprecedented access over such a long time.
frame. This research could not have been undertaken without the support of the CRM Manager and Human Factors Manager along with senior airline management.

**Conclusion**

*Opportunities for flight attendants to sit in on simulator (SIM) sessions*

Data showed that pilots supported the idea of flight attendants sitting in on their training sessions in the simulator. The previous studies undertaken in the present research have recommended that flight attendants should be able to observe such sessions in order to increase their understanding of the pilot’s job role and responsibilities. It was extremely pleasing to be informed that flight attendants were now able to have this opportunity. This was introduced on one fleet type for lead flight attendants and positive feedback had been received. The flight attendants would need a rostered duty day for these observations which would mean that they were not available for a day of flying on line. The safety training benefits had been recognized by management and the necessary financial costs covered as part of the training budget. Permission from the individual pilots in the simulator detail also enabled this new type of joint CRM training to occur.

While both the pilot and flight attendant sub-groups represented two distinctive cultures, both groups valued the importance of CRM training (especially joint CRM sessions) as a way to break down barriers and to work more effectively as a team.

Valuable insights into the pilot’s safety attitudes at Airline ABC had been obtained through the use of a combination of quantitative and qualitative data collecting methodologies. Data had now been provided by both pilots and flight attendants groups so it was important to obtain views from both groups at the same point in time on safety critical incidents/accidents. Study 5 described in the following Chapter provided the opportunity to assess these safety attitudes.
CHAPTER SEVEN

STUDY FIVE

WHAT WOULD YOU DO? (WWYD)

Introduction

Background
The development of effective teamwork and communication skills between both sub-groups of aircrew operating on an aircraft have been identified as a proactive way to address differences between two different subcultures (Chute & Wiener, 1995; 1996; Chidester, 1993; Kayten, 1993; Helmreich, Wiener, & Kanki, 1993). An understanding of the role of the flight attendant sub-group along with their contribution to safety of the pilot sub-group, passengers and the aircraft was beginning to emerge. The training curriculum for pilots was extended to include knowledge of the flight attendants’ important safety role, while new CRM programmes designed specifically for flight attendants were initiated (Byrnes & Black, 1993).

The social identity framework discussed the importance of activating a relational orientation as a key component of any intervention strategies designed to increase intergroup cooperation. Brickson and Brewer (2001) believed that any strategies should involve cooperative interdependence between group members with individuals given the opportunity to understand each other’s perspectives. Hogg and Terry (2001) suggested that the social identity approach has great relevance for organizational contexts as organizations were internally structured groups placed within networks of intergroup relationships that differ from each other in terms of power, status, and prestige. This would be true of the hierarchical structure in place both between pilots and flight attendants, as well as within the flight attendant team itself.
Item Development

In Study Five I aimed to develop realistic and relevant scenarios, involving examples of teamwork and intergroup cooperation, and to develop a questionnaire containing both attitude questions and open-ended questions as a measuring instrument to explore attitude change.

The Event-Based Approach to Training (EBAT) as described by Fowlkes, Dwyer and Salas (1998) provided a useful model for the development of specific scenarios for this research. The authors outlined a methodology for the development of simulator-based and other experiential-based exercises based on specific events which would provide the opportunity to observe targeted behaviours or behaviours of interest. They described EBAT as a generalizable methodology that could be used to guide the development of extremely context-specific training. Explicit links were developed and maintained between training competencies and specific exercises. Events were included which would require the use of specific skills. As previously discussed in the introduction to the present study, the cost and organization of simulator time would have been prohibitive. In order to partly overcome this situation, actual video clips of real life scenarios will be used instead.

The use of scenarios as a research tool has been successfully used in previous research (Pettitt, 1995; Chute & Wiener, 1996). Pettitt (1995) investigated pilots’ decision-making strategies under stress. She explored three constructs, which were seen as vital to flight deck decision-making in crisis situations. These were identified as the perception of crisis, sense of urgency, and response rigidity. The research tools used consisted of a crisis scenario, a nineteen-item questionnaire, and a background information sheet. The scenario and questionnaire had been pre-tested with a small group of pilots from a major American airline before being distributed to pilots from three other major American airlines. Chute and Wiener (1996) presented scenarios to both pilots and flight attendants in order to investigate the perceptions of both groups as to the urgency of conveying
flight-related information to the flight deck. The scenarios used had been designed by Alaskan Airlines (Rinehart, 1991).

The realism of the scenario built around emergency evacuations can be found in the literature. For example, Hynes (1995) investigated emergency evacuations from large passenger aircraft in the United States and discovered examples of break-downs in communication between the flight deck and cabin crew, and between the cabin crew and flight deck. For example, it was found the evacuation orders were given to cabin crew without any warning of the need for such an event. It was also found that cabin crew initiated evacuations without notifying the flight deck with the evacuation starting while the aircraft was still moving. These observations have provided a sound basis for the further development of intervention strategies.

Lyall (1995) discussed ways to increase realism in LOFT exercises. She suggested that the scripts should be realistic and worded in such a way that they would be consistent with the scenario. Events such as an unruly passenger concern, communicated to the pilots by the cabin crew that would require the Captain to make decisions, should be included. Situations involving cockpit-cabin communication were viewed as an important part of LOFT as these would provide experience in communicating between the crews, especially in emergency situations. Reports recorded in The New Zealand Herald showed that unruly passengers and air rage incidents are occurring on commercial airliners. For example, the edition of 14 January 2002 contained a report that suggested that air rage incidents were on the increase since the events of ‘9/11’ 2001 as passengers are more likely to react to anything that was seen as a little bit out of the ordinary.

Data have already been obtained (see Chapters 3, 4, and 5) following the introduction of CRM training programmes. Pre-test data gathered from the Flight Safety Attitudes Questionnaire (FSAQ-Flight Attendants) have been collated and analyzed and then compared with post-test data
following completion of the introductory round of CRM training for flight attendants (Chapter 4). Data already obtained from the Flight Safety Questionnaires were used to write specific and relevant items for this study. Helmreich and Merritt (1998) reported that the FMAQ was adapted in 1996 to include organizational items that would reflect the importance of other professionals in the aviation environment, including flight attendants.

**Item Derivation**

Published journal articles also provided research-based evidence of a range of aviation incidents and accidents. The ASRS database with its confidential reporting system provided a record of incidents from both pilot and flight attendants’ perspectives of the event.

**Scenario One: Landing Gear Malfunction**

Landing gear malfunctions and the associated ‘tunnel vision’ of flight deck crews have already been documented in Chapter One as a cause of aviation accidents where, in effect, no crew member had been nominated to actually fly the plane.

**Scenario Two: Drunken Passengers**

Anglin, Neeves, Giesbretch, and Kobus-Mathews (2003) believed that 40% of air rage incidents were associated with alcohol use either before boarding the aircraft or through excessive drinking during the flight. They suggested that bars selling alcohol in airports should be reduced and that intoxicated passengers should be identified by ground staff and prevented from boarding. The consumption of alcohol should be limited on board an aircraft and that intoxicated passengers denied further service.
An incident with a drunken and unruly passenger (CallBack, ASRS, Number 250, April 2000) can be briefly summarised as follows:

“…Passenger became unruly and drunk. The Captain advised him no alcohol, no touching flight attendant or passengers. The Captain returned to the cockpit and was then advised by the flight attendant that the passenger was brandishing a knife. [We initiated] a descent and diversion to [alternate airport]. Exceeded 250 knots below 10,000 feet due to gravity of situation. SWAT team removed passenger and he was taken to jail.”

It is important to recall that this event occurred prior to ‘9/11’ 2001 and under regulations at that time the Captain was able to delegate another crew member (which could be a pilot) to go back into the cabin to warn the passenger. The incident report does not indicate the aircraft type or what security screenings were required before passengers boarded. It demonstrates the volatility with which situations can change increasing the danger to crew and passengers. It also demonstrates that harsh penalties are enforced for such passengers. This could prove a deterrent to some, but once intoxicated or on drugs such as methamphetamine any attempt to reason with passengers in this condition may be extremely difficult. The best course of action would be to restrain the passenger with the restraints on board every aircraft and land as soon as possible. It would also be prudent to move fellow passengers away into other seats whenever space is available. Flights in United States airspace often carry armed US marshals without the knowledge of the Captain. These trained marshals when aboard could assist if the flight was in danger. However, there would a fine balance to this as if the flight attendants had controlled the situation, they would not wish to intervene and let their identity be known in case another more serious threat eventuated.
Scenario Three: An In-flight Medical Emergency

NASA’S Aviation Safety Reporting System contains an incident report written by a MD-88 Captain, which demonstrated excellent teamwork in a medical emergency (CallBack ASRS, Number 293, February 2004):

“During descent… the lead flight attendant called the cockpit to advise that an elderly passenger was pale and not feeling well and that she was going to administer oxygen. We discussed our options and decided to ask any doctor on board to assist us. A doctor came forward and while he was doing an examination, the passenger began to experience chest pains. We were descending through FL 200 on arrival when the flight attendant told us about the chest pains and that they were going to get out the defibrillator. I declared an emergency and asked for priority assistance. I turned the radios and aircraft over to the First Officer and I began coordinating medical assistance for our arrival. Centre and approach control did an excellent job getting us into the airport immediately. The doctor onboard determined that it would be safe to take the passenger to a gate and have the paramedics ready there, so I advised [ZZZ] of our intentions. I had the First Officer fly at our maximum speed to about 15 miles from the airport. We slowed, configured, and made an uneventful landing. We were able to get to the gate within two to three minutes and our passenger was assisted there. This emergency demonstrated excellent coordination between the cockpit and cabin crew and between Air Traffic Control and the flight crew. All the training really pays off under these time compressed and stressful situations.”

Donaldson and Pearn (1996) investigated the number of significant medical incidents that had occurred on one major long-haul carrier in 1993. A total of 454 incidents were recorded. These included cardiac problems, stomach upsets, breathing difficulties and panic and anxiety conditions. Such results emphasized the importance of training in first aid for flight attendants. All Airline ABC’s flight attendants have advanced first aid training which is renewed each year.
as part of annual Emergency Procedure (EP) training. The “Physician’s Kit” is carried on all aircraft and contains multiple compartments. Some items are able to be used immediately while others require the Captain’s permission before use. The defibrillator is a stand-alone item which is able to be used immediately with the Captain informed as soon as possible. Flight attendants are trained in the use of this emergency equipment.

There is often a doctor travelling as a passenger on board on large aircraft carrying over 400 passengers and the flight attendants will make a PA announcement asking for any doctor to identify themselves to the crew. However, Donaldson and Pearn (1996) make the point that often doctors are not current on the correct use of the defibrillator and it would be better if trained flight attendants used this piece of equipment. A trained trauma specialist has told me that she was travelling on a flight when the call was made for a doctor and she went forward. However, as she was not carrying her medical credentials her offer was declined and another doctor’s assistance was accepted. It was unfortunate that an offer of help from someone so experienced in emergency care was declined. This specialist also made the comment that as she had been dressed in jeans she did not look appropriately dressed for her role as a doctor.

Long-haul oceanic flights do not have the opportunity to divert to a nearby airport so flight attendants take their training very seriously as it is not possible to assume that there will be a doctor or other trained medical staff on board. Long-haul trans-continental flights do have the opportunity to divert to an airport equipped to accommodate the aircraft type e.g. in terms on length of runway and availability of navigational aids. It is the Captain who makes this final decision based on the information received from the flight attendants and/or medical staff on board. He/she also can obtain advice from doctors on the ground to make this decision. Donaldson and Pearn’s (1996) research had been conducted in 1993 and there has been a great increase in the number of long-haul flights as aircraft capable of transporting a much larger
The number of passengers over further distances come on line. The addition of the 600 plus passengers on the two decked A380 is one aircraft type in question. Additional aircraft and increased passenger capacity make it more likely that medical incidents and emergencies will continue to increase in number. This is an important issue that needs to be continued to be addressed.

Ruskin, Hernandez and Barash (2008) described in-flight emergency care from a specialist anaesthesiologist’s perspective. They also noted that two billion passengers travelled on commercial flights per year and that the age of passengers travelling had increased over time. The increasing age of passengers could mean that more medical incidents and emergencies would occur. They cited data from an FAA study during 1996 and 1997 when 4,745 medical emergencies occurred or thirteen events per day. While fainting was the most frequently reported medical event, the most serious were described as cardiac, neurological or respiratory emergencies.

The FAA had mandated that flight attendants be trained in advance first aid and had also mandated that fully equipped medical kits be carried on aircraft. Ruskin, Hernandez and Barash (2008) believed that specialist anaesthesiologists would be the best equipped doctors on board to deal with emergencies as they had been trained in advanced resuscitation techniques along with crew resource management skills. The training of anaesthesiologists, surgical teams and Intensive Care Unit (ICU) staff in crew resource management skills specific to their profession will be discussed in the concluding chapter of the present study.

In cases when doctors were not on board the aircraft the senior flight attendant was permitted to use an especially designed Automated External Defibrillator, (AED). The design meant the defibrillator would only issue a shock when the patient’s heart was not in a normal rhythm. The
flight attendant would also have support from a specialist medical service based in Arizona in the United States. Its specialists could also advise the Captain whether diversion to the nearest airport would be required. This is a command decision ultimately made by the Captain of the aircraft based on best medical advice available. Diversions are a costly exercise for airlines and would be made only when medical advice said that this was essential. The Captain or another flight deck member would have been in contact with the Flight Operations Section of the airline also taking advice. Ruskin, Hernandez and Barash (2006) noted that the medical team at Arizona would also have information on diversion airports available.

Therefore, Scenario Three was based on a medical emergency as it was representative of situations that occur on aircraft and require teamwork between the pilots and flight attendants in order to achieve the best possible outcome for the patient.

*Scenarios 4 and 5: An Explosive Decompression and Emergency Landing*

The discussion of successful CRM training outcomes in real-life emergencies in Chapter One had included the example of United Airlines Flight UA 811. The B747 aircraft had left Hawaii en route to Australia early in 1989 when a catastrophic decompression had occurred after a faulty cargo door had blown out. It was decided it would be essential to include examples of emergencies which had occurred resulting in the Captain issuing a Mayday call. This would be realistic and an example was sought that would be relevant in terms of both the type of aircraft operated and the route flown. Airline ABC along with a number of other large air carriers operates B747 aircraft on similar routes. Two video clips from a documentary about this accident were included in the last two scenarios as examples of extreme situations encountered in aviation. This would have been familiar to many of the crew from Airline ABC and would provide items with high face validity.
**Scenarios used as exemplars of crew coordination**

An in-depth perusal of aviation research data bases also showed that drunken passengers, abusive passengers, medical emergencies, incidents of smoke in the cabin, fire on board an aircraft, severe turbulence and more severe situations such as explosive decompression had been documented. The ASRS data base had been initially searched to find exemplars of good crew coordination and team work between the pilots and flight attendants. The following incidents from the ASRS database were written by pilots and flight attendants describing the situations that they had experienced.

**Exemplar One**

NASA’S Aviation Safety Reporting System contains an incident report written by a B757 Captain describing the important communication role played by the cabin crew in a dangerous incident (Callback, ASRS Number 293, February 2004).

“At FL330…we had a foul, noxious odour in the cockpit… The flight attendants also had a burning sulphur-like odour in the cabin. They quickly checked to be sure that the odour was not coming from the ovens or from someone smoking in the lavatories. The odour was overpowering, so the decision was made to divert to ZZZ. ATC was notified. The First Officer flew the airplane while I ran the checklists. The time from the first smell to touch down was approximately 12 minutes. While in the descent, I informed the flight attendants that we might need to do an emergency evacuation and to prepare the cabin. After landing…. The smell was getting stronger so I gave the order to evacuate. Our flight attendants did an outstanding job. I talked with the passengers at the emergency wing exits and they were well briefed and understood what they had to do perfectly. The aircraft was evacuated in excellent time, with only minor injuries. Our flight attendants were calm, professional, and completely in charge of the situation…”
Exemplar Two

NASA’s Aviation Safety Reporting System contains an incident report written by flight attendants on a B767 aircraft. This was another incident which also involved smoke in the cabin and is included as it was written from the flight attendants’ perspective (Callback ASRS, Number 293, February 2004).

“A passenger came up to the galley and said he smelled something burning. As I went into the first class cabin there was a strong smell of smoke…. I turned off all the power to the entertainment and power port systems. When I entered the cockpit, the Captain and First Officer had donned oxygen masks and smoke goggles and smoke was pouring out of the instrument panel. At this point, the Captain was far too busy to communicate with me, other than to acknowledge they were working on the problem. It was at least ten minutes before the Captain and I were able to discuss the situation. During that time the flight attendants did a great job of dealing with a possible crisis with no real answers…. When the Captain and I could talk, it was determined that he felt the source of the smoke and electrical smell had been contained, but that we should make an emergency landing. The crew had turned off extra power needed in the cabins, there was no way to dissipate the smell and haze, and our nearest airport was one and a half hours away…. The flight attendants remained calm and kept reassuring the passengers that the situation was contained and that we would land safely. We had no lights in the cabin, galleys, or lavatories, no power in the galleys, and of course we had the smell and haze created by the electrical problem. The passengers did not overreact, and no one panicked. I attribute this to the fact that the flight attendants were visible, spent time with each and every passenger, and that the Captain made many announcements to reassure the passengers…. The Captain made a beautiful landing and the relief everyone felt being on the ground was expressed by applause, The Captain and First Officer did an outstanding job. The lines of communication were definitely open. Their confidence, expertise, and leadership skills influenced how the rest of the crew reacted to a potentially dangerous situation.”
The following ASRS database report demonstrates the need for team work between the pilots and flight attendants. Effective communication is also illustrated as vital to good decision-making and to the safety of the flight. This also illustrates once again that the decision to use restraints and divert to another airport belong with the Captain or Pilot in Command (PIC).

**Synopsis**

A B747 passenger became unruly attacking Cabin Attendants. The passenger was handcuffed and the flight diverted to an enroute oceanic destination:

“I had been on second break for 1 hour when the 2 co-pilots awoke me. A few minutes later I was sitting in the center seat talking to the Purser and then the Dispatcher. The passenger in XXA had started being crazy and assaulted one of the Flight Attendants. The 3 of us discussed whether it was a threat level 2 or 3 and were unsure at first. We settled on condition 2. Discussions with Dispatcher cantered on best landing site ZZZZ1, ZZZZ2, and finally we decided ZZZZ was just as close with good weather. The Flight Attendants were told to cuff the out-of control passenger and also to tie his legs with plastic cuffs. Since he was also out of control verbally, I suggested duct taping his mouth, though that ended up not being necessary. Nearby passengers were moved. We declared an emergency and got nearly direct clearance to ZZZZ. Dispatch coordinated our arrival, law enforcement, medical, fuel and cargo. We got an onboard physician to check the individual and ensure that there was nothing seriously wrong with the passenger. The Flight Attendant who was choked by the passenger was also OK. We landed without incident and the passenger was removed by authorities. Lessons learned: Neither the Flight Attendant nor First Officer flight manuals showed the new location of the security kit and handcuffs on the newly configured -400's. It took 10
minutes to find the cuffs. I requested that the Dispatcher keep our Satphone connection open so that as events evolved we could instantly make decisions -- worked great! I also finally got a Flight Attendant to stay on the interphone at the top of the stairs so that I could maintain a running account of events upstairs where the passenger was assigned. We were fortunate to have a doctor on board to make sure the passenger’s health was not in jeopardy. Declaring an emergency and making a slight divert to ZZZZ turned out to be a good decision. Supplemental information from ACN 819073: Approximately 5 hours into flight in cruise with Captain in bunk, Aft Purser called to notify us that there was an unruly passenger in seat XXA, the passenger had thrown mini liquor bottles around, was shouting and had grabbed the Flight Attendant after being cut off from alcohol. Other First Officer and I broke out the FOM and determined that this was a level 2 threat. Other First Officer woke Captain up while at the same time we received another call from the Flight Attendants letting us know that the passenger had grabbed him by the throat. At that point we locked down the cockpit and turned on the seatbelt sign, while concurrently notifying Dispatch. Captain then contacted dispatch via Satcom while also keeping a Flight Attendant on the line continuously. Pilot in the left seat stayed the pilot not flying and coordinated with ATC, while I ran the checklists and helped the Captain with communications. Dispatch recommended ZZZZ1 or ZZZZ2 -- both about 1,150 miles away. Flight Attendants called again stating passenger was still shouting, now throwing water, etc. and the Captain made the decision with our concurrence that the passenger was to be handcuffed. He also had the Flight Attendants ask for a doctor to monitor the passenger while handcuffed. Passenger kept yelling and shouting and the decision was made to divert to ZZZZ due to the distance being equal to ZZZZ1 by this time, and the excellent facilities there as well. At this time we declared an emergency with ATC and received clearance to ZZZZ. Passenger remained unruly but no further significant disturbances occurred as 2 Flight Attendants were around him at all
times. We landed at ZZZZ without incident and the appropriate authorities met the aircraft and escorted the passenger off. Dispatch had set up all services required and made our stop very efficient. The authorities in ZZZZ were very helpful and efficient as well. Crew coordination was excellent between flight deck members, the Flight Attendants, as well as dispatch.”

**Summary**

The first three video clips, a landing gear malfunction, drunken passengers, and a medical emergency, were similar to those based on incidents reported by pilots and flight attendants on NASA’s Aviation Safety Reporting System (ASRS). For instance, the monthly safety bulletin “CallBack” published by the ASRS in May 2001 recorded the details of a drunken passenger who had been so drunk that he needed to be assisted on board by the airline’s passenger assistance staff. It is interesting to note that both the Captain and Senior Flight Attendant reported this incident. This showed that both the cabin crew and cockpit crew perceived this to be a threat to the safety of the flight. It is also important to note that it was the Flight Attendant who brought this matter to Captain’s attention, providing an excellent example of effective team work.

The focus groups in the present study had also indicated that drunken passengers were of concern. Thus the video clips were generic in nature, dealing with incidents such as unruly and drunken passengers and medical emergencies. The fourth and fifth video clips were taken from the explosive decompression incident which occurred when the cargo door blew open at high altitude on United Flight 811. The way the cabin and flight deck crew worked together in this emergency has been discussed in Chapter One as an example of excellent crew resource management. The video clips were chosen to show a range of situations to explore what participants perceived to be of low or high danger to the safety of the flight.
Previous research discussed in Studies One, Two and Four had shown that pilots safety attitudes had differed as a function of aircraft flown and crew position flown (Helmreich, Foushee, Benson & Russini, 1986; Helmreich & Wilhelm 1991; Helmreich & Merritt, 1998).

It was hypothesised that:

Pilots and flight attendants would differ in their perceptions of key characteristics of the incidents. The six dependent variables were: the degree of potential danger; the volatility of events; the complexity of problem solving skills required; the importance of following the captain’s commands; the importance of the cabin crew’s role; and the importance of interaction between the cabin crew and the flight deck crew. Ratings of each characteristic were made on a 7-point Likert scale.

1. Pilots and flight attendants of more than seven years experience would show lower mean ratings than pilots and flight attendants with less than seven years experience as seven years was considered by the airline as the time it would take for crew to achieve higher skill levels.

2. The pilot group and the flight attendant group would show different mean ratings with flight attendants showing higher mean ratings.

3. Pilots and flight attendants operating on different aircraft types would show different mean ratings with pilots and flight attendants operating short-haul narrow bodied aircraft showing lower mean ratings than pilots and flight attendants on the wide-bodied long-haul B747 aircraft.
Participants

The participants were pilots and flight attendants at the airline’s home bases and included the 130 flight attendants based in the U.K. All participants needed to be operating on jet aircraft which in the present study were B737, B767, B777, B747, and A320 aircraft.

Materials

These scenarios were pre-tested with a small group of pilots and flight attendants, before being given to the larger sample. They were presented on a CD Rom named “What Would You Do?” or (WWYD). It was decided after investigation into methods of mass production of multimedia material that a CD Rom would be the best method of presentation for the scenarios. These were given out in a clear plastic sleeve format which was familiar to the crews as they received training material in the same clear sleeve. This also allowed immediate viewing of the cover of the CD. The illustrated cover included a picture of a B777, chosen as the airline had just introduced this new fleet type and was presented in a neutral livery. The only other cover material was the title “What Would You Do?” This was to keep the cover with a clear and simple message. A copy of the WWYD CD Rom has been included with this thesis.

The following five scenarios were on the CD Rom:

- Video Clip One: Landing Gear Malfunction
- Video Clip Two: Drunken Passengers
- Video Clip Three: Medical Emergency
- Video Clip Four: Explosive Decompression
- Video Clip: Five: Emergency Landing Honolulu
The participants were asked to rate the scenarios on a seven-point Likert scale ranging from one as (very low) to seven as (very high). The ratings were made under the following headings:

a) The degree of potential danger to the flight
b) The volatility of events and their potential to quickly change the situation
c) The complexity of problem solving skills required
d) The importance of following the Captain’s commands without question
e) The importance of the cabin crew’s role
f) The importance of interaction between flight deck/cabin crew

The participants were then asked to respond to the open ended questions “What would you do first?” and “What would you do next?” by writing their responses in a blank text box provided at the conclusion of each scenario.

Background information included current crew position, aircraft type, and length of service. The flight attendants were asked to circle Male or Female for gender. This was considered not appropriate for pilots as there were very few female pilots flying with the airline. The WWYD Questionnaire and the letter of introduction are shown in Appendix D.

The Questionnaire was sent out with a Letter of Introduction from the Human Factors Manager, along with the required Information Sheet and Consent Form. The CD Roms and “What Would You Do?” Questionnaires were placed into large envelope (A4 -176mm. by 250mm.). This meant that the Letter of Introduction would be read first followed by the Information Sheet and Consent Form. This was followed by the WWYD CD Rom and Questionnaire. The size of the envelope meant that the written items on A4 paper did not need to be folded and the CD Rom was easily
included. An envelope sized DLE (110mm. by 220mm.) with a label addressed to the Human Factors Manager’s company mail box was included inside this package.

The WWYD Questionnaire was delivered in a personal mail box drop to all international and national pilots’ and flight attendants’ mail boxes at their airport bases courtesy of the airline’s administration staff. Flight crew would place the labelled return envelopes in the company’s mail system or in the labelled and sealed boxes which had been placed in crew briefing rooms. Union permission had been obtained as well as approval from pilot and flight attendant management groups. The U.K.-based flight attendants’ Questionnaires had been couriered to the U.K. and distributed and returned through the support of the U.K. Cabin Crew Manager.

Three hampers of gourmet food were provided as an incentive. For the Prize Draw confidentiality was maintained by asking the participants to write an easily remembered six letter or numeric code. After the Prize Draw had been conducted the winning codes would be published in the in-house flight crew magazine. Posters were placed in crew rooms to remind crews to participate. Line managers also gave their support and reminded crew of the research project. Senior flight attendants were also asked to publicize the project during crew briefings.

Results

A series of repeated-measures ANOVAs were conducted for each of the six dependent variables; (Perceptions of Danger, Volatility, Complexity, Captaincy, Cabin Crew, and Communication). The within-subjects independent variable was the video segments (5 levels) and the between-subjects independent variable was the overall experience as a pilot or flight attendant (2 levels).
An alpha level of .05 was used to evaluate all statistical tests. Partial eta-squared ($\eta^2$) effect sizes are reported. This statistical test is used to define levels of statically significance for effect size ($\eta^2$) where .01 represents a small effect, .06 represents a moderate effect, and values above .14 represents a large effect size (Pallant, 2007).

**Results for the Perceptions of Video Clips as Function of Experience**

**Perception of danger**

Table 7.1: Means and Standard Deviations for the Perception of Danger as a Function of Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Clip 1</th>
<th>Clip 2</th>
<th>Clip 3</th>
<th>Clip 4</th>
<th>Clip 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6 years</td>
<td>6.13</td>
<td>3.88</td>
<td>2.01</td>
<td>6.97</td>
<td>6.88</td>
</tr>
<tr>
<td>Total</td>
<td>5.98</td>
<td>3.72</td>
<td>1.89</td>
<td>6.97</td>
<td>6.85</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.79</td>
<td>3.53</td>
<td>1.74</td>
<td>6.96</td>
<td>6.81</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video ($F(4,1172) = 1762.6, p<.0001, \eta^2 = .86$) showing that there were clear differences in the perception of danger across the five video clips. There was also a highly significant main effect of experience level ($F(1,293) = 9.4, p<.002, \eta^2=.03$). Experienced pilots and flight attendants consistently perceived lower levels of danger
than did less experienced pilots and flight attendants. The interaction between video clip and experience level was not significant (F=2.21, p = .066). For the present study low experience was defined as one to six years flying experience while more than six years flying experience was defined as high experience.

Perception of Volatility

Table 7.2: Means and Standard Deviations for the Perception of Volatility as a Function of Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.92</td>
<td>1.199</td>
<td>154</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.71</td>
<td>1.431</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>5.82</td>
<td>1.315</td>
<td>291</td>
</tr>
<tr>
<td>Clip 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.35</td>
<td>1.197</td>
<td>154</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.24</td>
<td>1.179</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>5.30</td>
<td>1.188</td>
<td>291</td>
</tr>
<tr>
<td>Clip 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>4.16</td>
<td>1.819</td>
<td>154</td>
</tr>
<tr>
<td>7+ years</td>
<td>3.65</td>
<td>1.722</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>3.92</td>
<td>1.789</td>
<td>291</td>
</tr>
<tr>
<td>Clip 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.82</td>
<td>.491</td>
<td>154</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.91</td>
<td>.340</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>6.86</td>
<td>.428</td>
<td>291</td>
</tr>
<tr>
<td>Clip 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.73</td>
<td>.716</td>
<td>154</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.72</td>
<td>.603</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>6.73</td>
<td>.664</td>
<td>291</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1156) = 354.1, p<.0001, \( \eta^2 = .55 \)) showing there were clear differences in the perception of volatility across the five video clips. There was also a significant interaction between video and experience level (F(4,1156) = 3.2, p = .013, \( \eta^2 = .01 \)). Experienced pilots and flight attendants perceived lower levels of volatility than did the less experienced pilots and flight attendants in video clips 1, 2 and 3. The difference was reversed for clip 4 and there was virtually no difference between the groups for clip 5.
**Perception of Complexity**

Table 7.3: Means and Standard Deviations for the Perception of Complexity as a Function of Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.93</td>
<td>1.139</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.60</td>
<td>1.336</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>5.78</td>
<td>1.244</td>
<td>294</td>
</tr>
<tr>
<td>Clip 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>4.67</td>
<td>1.278</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>4.77</td>
<td>1.273</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>4.71</td>
<td>1.275</td>
<td>294</td>
</tr>
<tr>
<td>Clip 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.31</td>
<td>1.390</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.12</td>
<td>1.207</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>5.22</td>
<td>1.309</td>
<td>294</td>
</tr>
<tr>
<td>Clip 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.78</td>
<td>.654</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.83</td>
<td>.447</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>6.81</td>
<td>.566</td>
<td>294</td>
</tr>
<tr>
<td>Clip 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.66</td>
<td>.722</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.64</td>
<td>.639</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>6.65</td>
<td>.684</td>
<td>294</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video ($F(4,1168) = 259.2, p < .0001, \eta^2 = .47$) showing that there were clear differences in the perception of complexity across the five video clips. There was also a significant main effect of experience level ($F(1,293) = 9.4, p < .002, \eta^2 = .03$). Experienced pilots and flight attendants consistently perceived lower levels of complexity than did less experienced pilots and flight attendants. The interaction of video clip and experience level was not significant ($F = 1.1, p = .293$).
Perception of Captaincy

Table 7.4: Means and Standard Deviations for the Perception of Captaincy as a Function of Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.93</td>
<td>1.139</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.60</td>
<td>1.336</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>5.78</td>
<td>1.244</td>
<td>294</td>
</tr>
<tr>
<td>Clip 2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>4.67</td>
<td>1.278</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>4.77</td>
<td>1.273</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>4.71</td>
<td>1.275</td>
<td>294</td>
</tr>
<tr>
<td>Clip 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.31</td>
<td>1.390</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>5.12</td>
<td>1.207</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>5.22</td>
<td>1.309</td>
<td>294</td>
</tr>
<tr>
<td>Clip 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.78</td>
<td>.654</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.83</td>
<td>.447</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>6.81</td>
<td>.566</td>
<td>294</td>
</tr>
<tr>
<td>Clip 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.66</td>
<td>.722</td>
<td>157</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.64</td>
<td>.639</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>6.65</td>
<td>.684</td>
<td>294</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video ($F(4,1168) = 259.2$, $p<.0001$, $\eta^2 = .47$) showing that there were clear differences in the perception of captaincy across the five video clips. The interaction between video clip and experience level was also significant ($F(4,1168) = 2.5$, $p<.038$, $\eta^2 = .009$). There was also a significant main effect of experience level ($F(1,293) = 9.4$, $p<.002$, $\eta^2 = .03$). Experienced pilots and flight attendants perceived lower levels of the variable captaincy than did less experienced pilots and flight attendants in video clips 1 and 3 while there were only very small differences in clips 2, 4, and 5.
Perception of the variable Cabin Crew

Table 7.5: Means and Standard Deviations for the Perception of Cabin Crew as a Function of Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.10</td>
<td>1.207</td>
<td>155</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.07</td>
<td>1.126</td>
<td>136</td>
</tr>
<tr>
<td>Total</td>
<td>6.09</td>
<td>1.168</td>
<td>291</td>
</tr>
<tr>
<td>Clip 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.69</td>
<td>.717</td>
<td>155</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.68</td>
<td>.580</td>
<td>136</td>
</tr>
<tr>
<td>Total</td>
<td>6.69</td>
<td>.655</td>
<td>291</td>
</tr>
<tr>
<td>Clip 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.46</td>
<td>.606</td>
<td>155</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.40</td>
<td>.549</td>
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</tr>
<tr>
<td>Total</td>
<td>6.43</td>
<td>.580</td>
<td>291</td>
</tr>
<tr>
<td>Clip 4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.54</td>
<td>.832</td>
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<tr>
<td>7+ years</td>
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<tr>
<td>1-6 years</td>
<td>6.35</td>
<td>.972</td>
<td>155</td>
</tr>
<tr>
<td>7+ years</td>
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<tr>
<td>Total</td>
<td>6.37</td>
<td>1.007</td>
<td>291</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1156) = 27.7, p < .0001, η² = .08) showing that there were clear differences in the perception of the variable cabin crew across the five video clips. The interaction between cabin crew and experience was not significant (F = .389, p = .817). The main effect of experience level was also not significant. (F = .007, p = .936).

Experienced pilots and flight attendants of high experience showed very little differences in the perception of the variable cabin crew across all five video clips when compared with pilots and flight attendants of low experience.
Perception of Communication

Table 7.6: Means and Standard Deviations for the Perception of Communication as a Function of Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Mean</th>
<th>Std. Deviation</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.36</td>
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<tr>
<td>7+ years</td>
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<td>1.014</td>
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<tr>
<td>Clip 2</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.03</td>
<td>1.071</td>
<td>156</td>
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<tr>
<td>7+ years</td>
<td>5.86</td>
<td>1.230</td>
<td>136</td>
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<tr>
<td>Total</td>
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<td>Clip 3</td>
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<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>5.99</td>
<td>1.244</td>
<td>156</td>
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<tr>
<td>7+ years</td>
<td>5.76</td>
<td>1.336</td>
<td>136</td>
</tr>
<tr>
<td>Total</td>
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<td>1.291</td>
<td>292</td>
</tr>
<tr>
<td>Clip 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
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<td>156</td>
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<tr>
<td>7+ years</td>
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<td>Clip 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-6 years</td>
<td>6.32</td>
<td>1.035</td>
<td>156</td>
</tr>
<tr>
<td>7+ years</td>
<td>6.35</td>
<td>1.118</td>
<td>136</td>
</tr>
<tr>
<td>Total</td>
<td>6.33</td>
<td>1.073</td>
<td>292</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1160) = 41.7, p<.0001, η² = .126) showing that there were clear differences in the perception of communication across the five video clips. The interaction between communication and experience was not significant (F = 1.6, p = .172). The main effect for communication and experience was not significant (F = .515, p = .474) indicating that pilots and flight attendants of both low and high experience consistently perceived virtually the same levels of communication across the video clips.
Results for the Perceptions of Video Clips as Function of Crew Position

Perception of Danger

Table 7.7: Means and Standard Deviations for Perception of Danger as a Function of Crew Position

<table>
<thead>
<tr>
<th>Clip</th>
<th>FA or Pilot</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FA</td>
<td>6.34</td>
<td>1.009</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>5.26</td>
<td>1.250</td>
<td>99</td>
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<tr>
<td></td>
<td>Total</td>
<td>5.98</td>
<td>1.201</td>
<td>299</td>
</tr>
<tr>
<td>2</td>
<td>FA</td>
<td>4.07</td>
<td>1.276</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>2.98</td>
<td>1.212</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.70</td>
<td>1.355</td>
<td>299</td>
</tr>
<tr>
<td>3</td>
<td>FA</td>
<td>2.20</td>
<td>1.385</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>1.28</td>
<td>.516</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1.89</td>
<td>1.246</td>
<td>299</td>
</tr>
<tr>
<td>4</td>
<td>FA</td>
<td>6.97</td>
<td>.171</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.97</td>
<td>.172</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.97</td>
<td>.171</td>
<td>299</td>
</tr>
<tr>
<td>5</td>
<td>FA</td>
<td>6.92</td>
<td>.297</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.72</td>
<td>.516</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.85</td>
<td>.393</td>
<td>299</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F (4, 1192) = 131.3, p<.0001, η² = .306) showing that there were clear differences in the perception of danger across the five video clips.

There was also a highly significant main effect of crew position (F(1, 298) = 56, p<.0001, η² = .273). There was also a highly significant interaction between the perceptions of danger and crew position (F(8, 1192) = 11.8, p<.0001, η² = .273. Pilots consistently perceived lower levels of danger across the video clips than did flight attendants with the exception of Clip 4 and 5 where both groups perceived an extremely high level of danger.
Perception of Volatility

Table 7.8: Means and Standard Deviations of Perception of Volatility as a Function of Crew Position

<table>
<thead>
<tr>
<th>Clip</th>
<th>FA or Pilot</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td>FA</td>
<td>6.20</td>
<td>1.052</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>5.07</td>
<td>1.445</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5.83</td>
<td>1.308</td>
<td>295</td>
</tr>
<tr>
<td>Clip 2</td>
<td>FA</td>
<td>5.44</td>
<td>1.106</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>4.99</td>
<td>1.305</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5.29</td>
<td>1.198</td>
<td>295</td>
</tr>
<tr>
<td>Clip 3</td>
<td>FA</td>
<td>4.41</td>
<td>1.721</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>2.96</td>
<td>1.538</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.92</td>
<td>1.796</td>
<td>295</td>
</tr>
<tr>
<td>Clip 4</td>
<td>FA</td>
<td>6.88</td>
<td>.412</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.83</td>
<td>.453</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.86</td>
<td>.425</td>
<td>295</td>
</tr>
<tr>
<td>Clip 5</td>
<td>FA</td>
<td>6.82</td>
<td>.638</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.55</td>
<td>.674</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.73</td>
<td>.660</td>
<td>295</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1176) = 26.5, p<.0001, η² = .083) showing that there were clear differences in the perception of volatility across the five video clips. There was also a highly significant main effect of crew position (F(1,294) = 43.443, p<.0001, η² = .228). There was also a highly significant interaction between video clip and position flown (F(8,1176) = 10.572, p<.0001, η² = 0.67). Pilots experienced lower levels of volatility in some of the video clips (clips 1, 2, 3) than did flight attendants. There was virtually no difference between the groups for clips 4 and 5.
Perception of Complexity

Table 7.9: Means and Standard Deviations of Perception of Complexity as a Function of Crew Position

<table>
<thead>
<tr>
<th></th>
<th>FA or Pilot</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clip 1</strong></td>
<td>FA</td>
<td>6.27</td>
<td>.952</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>4.81</td>
<td>1.175</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5.79</td>
<td>1.237</td>
<td>298</td>
</tr>
<tr>
<td><strong>Clip 2</strong></td>
<td>FA</td>
<td>4.84</td>
<td>1.268</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>4.51</td>
<td>1.273</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4.73</td>
<td>1.274</td>
<td>298</td>
</tr>
<tr>
<td><strong>Clip 3</strong></td>
<td>FA</td>
<td>5.40</td>
<td>1.283</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>4.89</td>
<td>1.293</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5.23</td>
<td>1.305</td>
<td>298</td>
</tr>
<tr>
<td><strong>Clip 4</strong></td>
<td>FA</td>
<td>6.82</td>
<td>.557</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.79</td>
<td>.576</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.81</td>
<td>.561</td>
<td>298</td>
</tr>
<tr>
<td><strong>Clip 5</strong></td>
<td>FA</td>
<td>6.73</td>
<td>.678</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.48</td>
<td>.660</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.65</td>
<td>.680</td>
<td>298</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4, 1188) = 18.668, p<.0001, η² = .059) showing that there were clear differences in the perception of complexity across the five video clips. There was also a highly significant main effect of crew position F(1,297) = p<.0001, η² = .151. There was also a significant interaction between video clip and crew position (F(8,118) = 12.118, p<.0001, η² = .076.) Pilots perceived lower levels of complexity in video clips 1, 2, and 3 while a small difference was perceived in video clip 5 and identical means were obtained for video clip 4.
**Perception of Captaincy**

Table 7.10: Means and Standard Deviations of Perceptions of Captaincy as a Function of Crew Position

<table>
<thead>
<tr>
<th>Clip</th>
<th>FA or Pilot</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FA</td>
<td>6.48</td>
<td>.927</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>4.67</td>
<td>1.616</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5.87</td>
<td>1.472</td>
<td>294</td>
</tr>
<tr>
<td>2</td>
<td>FA</td>
<td>4.96</td>
<td>1.665</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>4.65</td>
<td>1.649</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4.86</td>
<td>1.664</td>
<td>294</td>
</tr>
<tr>
<td>3</td>
<td>FA</td>
<td>3.95</td>
<td>1.852</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>3.44</td>
<td>1.836</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.79</td>
<td>1.864</td>
<td>294</td>
</tr>
<tr>
<td>4</td>
<td>FA</td>
<td>6.59</td>
<td>.917</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>5.65</td>
<td>1.223</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.28</td>
<td>1.119</td>
<td>294</td>
</tr>
<tr>
<td>5</td>
<td>FA</td>
<td>6.56</td>
<td>.995</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>5.65</td>
<td>1.189</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.26</td>
<td>1.145</td>
<td>294</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1172) = 8.344, p<.0001, η2 = .028) showing that there were clear differences in the perception of captaincy across the five video clips. There was also a highly significant main effect of crew position (F(2,293) = 29.838, p<.0001, η2 = .169) showing that pilots consistently perceived lower levels of the factor captaincy than did flight attendants. There was also a significant interaction between video clips and the factor captaincy (F(8,1172) = 9.0, p<.0001, η2 = .058 with flight attendants perceiving much greater levels of captaincy in clips 1, 4, & 5.
Perception of Cabin Crew

Table 7.11: Means and Standard Deviations for the Perception of Cabin Crew as a Function of Crew Position

<table>
<thead>
<tr>
<th>Clip</th>
<th>FA or Pilot</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td>FA</td>
<td>6.24</td>
<td>1.118</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>5.79</td>
<td>1.239</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.09</td>
<td>1.177</td>
<td>295</td>
</tr>
<tr>
<td>Clip 2</td>
<td>FA</td>
<td>6.70</td>
<td>.675</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.67</td>
<td>.606</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.69</td>
<td>.651</td>
<td>295</td>
</tr>
<tr>
<td>Clip 3</td>
<td>FA</td>
<td>6.49</td>
<td>.568</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.30</td>
<td>.579</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.43</td>
<td>.578</td>
<td>295</td>
</tr>
<tr>
<td>Clip 4</td>
<td>FA</td>
<td>6.71</td>
<td>.702</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.30</td>
<td>.920</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.58</td>
<td>.902</td>
<td>295</td>
</tr>
<tr>
<td>Clip 5</td>
<td>FA</td>
<td>6.56</td>
<td>.884</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
<td>6.03</td>
<td>1.129</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.38</td>
<td>1.000</td>
<td>295</td>
</tr>
</tbody>
</table>

There was a significant main effect for video (F(4,1176) = 2.474, p<.043, η2 = .008) showing that there were clear differences in the perception of cabin crew across the five video clips. There was also a significant interaction between video clip and crew position (F(8,1176) = 2.714, p<.006, η2 = .018). There was a highly significant main effect of crew position (F(2, 294) = 11.515, p<.0001, η2 = .073. Pilots’ perceived lower levels of the factor cabin crew in all of the five video clips than did flight attendants.
Perception of Communication

Table 7.12: Means and Standard Deviations for the Perception of Communication as a Function of Crew Position

<table>
<thead>
<tr>
<th>FA or Pilot</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FA</td>
<td>6.54</td>
<td>.921</td>
<td>198</td>
</tr>
<tr>
<td>Pilot</td>
<td>6.07</td>
<td>1.133</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>6.38</td>
<td>1.019</td>
<td>296</td>
</tr>
<tr>
<td>Clip 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FA</td>
<td>6.11</td>
<td>1.126</td>
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<td>Pilot</td>
<td>5.63</td>
<td>1.143</td>
<td>98</td>
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<tr>
<td>Total</td>
<td>5.96</td>
<td>1.149</td>
<td>296</td>
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<td>Clip 3</td>
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<td>FA</td>
<td>6.09</td>
<td>1.249</td>
<td>198</td>
</tr>
<tr>
<td>Pilot</td>
<td>5.50</td>
<td>1.278</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>5.90</td>
<td>1.284</td>
<td>296</td>
</tr>
<tr>
<td>Clip 4</td>
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</tr>
<tr>
<td>FA</td>
<td>6.76</td>
<td>.647</td>
<td>198</td>
</tr>
<tr>
<td>Pilot</td>
<td>6.45</td>
<td>.775</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>6.66</td>
<td>.704</td>
<td>296</td>
</tr>
<tr>
<td>Clip 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FA</td>
<td>6.55</td>
<td>.975</td>
<td>198</td>
</tr>
<tr>
<td>Pilot</td>
<td>5.92</td>
<td>1.128</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>6.34</td>
<td>1.065</td>
<td>296</td>
</tr>
</tbody>
</table>

There was no significant main effect for video (F(4,1180) = 2.098, p = .079). There was no significant interaction for crew position (F(8,1180) = .930, p = .491). However there was a highly significant main effect for crew position (F(2,295) = 16.7, p < .0001, η² = .102). Flight attendants perceived higher levels of the factor communication across the video clips than did the pilot group who consistently perceived and rated the importance of the video clips at a lower level.

Results for the Perception of Video Clips as a Function of Aircraft Type

The present study had pilots and flight attendants operating on five different fleet types: the B747, B767, B777, B737 and A320 aircraft. The crews operating on the aircraft fleets (B767, B777, B737 and A320) were collapsed into one group for the analyses. The B747 aircraft crews were used as the other group. The B747 crews operate on a two-decked aircraft and seniority means that the pilots would have a high level of service and experience. There would also be at least one additional pilot on the flight deck providing the opportunity for more problem solving.
and teamwork. This would mean that the combined experience levels could rate a lower level of perceived danger as they had increased experience levels.

Perception of Danger

Table 7.13: Means and Standard Deviations for Perception of Danger as a Function of Aircraft Type

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Clip 1</th>
<th>Clip 2</th>
<th>Clip 3</th>
<th>Clip 4</th>
<th>Clip 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>N</td>
<td>Mean</td>
<td>Std. Deviation</td>
</tr>
<tr>
<td>All Others</td>
<td>5.51</td>
<td>1.451</td>
<td>125</td>
<td>5.12</td>
<td>1.293</td>
</tr>
<tr>
<td>B747</td>
<td>6.02</td>
<td>1.163</td>
<td>151</td>
<td>5.41</td>
<td>1.109</td>
</tr>
<tr>
<td>Total</td>
<td>5.79</td>
<td>1.324</td>
<td>276</td>
<td>5.28</td>
<td>1.202</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1108) = 1715.362, p<.0001, η2 = .861) showing that there were clear differences in the perception of danger across the five video clips. There was also a highly significant main effect of aircraft type (F(1, 227) = 28.368, p<.0001, η2 = .093. There was also a highly significant interaction between video clip and aircraft type (F (4, 1108) = 6.686, p<.0001, η2 = .024. Pilots and flight attendants operating on B747 aircraft perceived higher levels of danger than pilots and flight attendants operating on all other aircraft types on three of the video clips (clips 1, 2, and 3) with identical levels on clip 4 while there was virtually no difference on clip 5.
Perception of Volatility

Table 7.14: Means and Standard Deviations for Perceptions of Volatility as a Function of Aircraft Type

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td>5.51</td>
<td>1.451</td>
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</tr>
<tr>
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</tr>
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<td>276</td>
</tr>
<tr>
<td>Clip 2</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
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<td>1.293</td>
<td>125</td>
</tr>
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<td>1.109</td>
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<tr>
<td>B747</td>
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<td>.436</td>
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<tr>
<td>All Others</td>
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<td>.758</td>
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<tr>
<td>B747</td>
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<td>.586</td>
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</tr>
<tr>
<td>Total</td>
<td>6.72</td>
<td>.674</td>
<td>276</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4,1096) = 349.894, p<.0001, \( \eta^2 = .561 \)) showing that there were clear differences in the perceptions of volatility across the five video clips. There was also a highly significant main effect of the aircraft type operated by pilots and flight attendants (F(1,124) = 27.863, p<.0001, \( \eta^2 = .092 \)). There was also a highly significant interaction between video clip and aircraft type (F(4,1096) = 10.345), p<.0001, \( \eta^2 = .036 \).

Pilots and flight attendants on the B747 aircraft showed higher levels of the perception of volatility in three of the video clips (clips 1, 2, and 3) while there were virtually no differences for the groups between clips 5 and 6.
Perception of Complexity

Table 7.15: Means and Standard Deviations for Perceptions of Complexity as a Function of Aircraft Type

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td>All Others</td>
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</tr>
<tr>
<td>B747</td>
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</tr>
<tr>
<td>Total</td>
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<td>Clip 2</td>
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<tr>
<td>B747</td>
<td>4.68</td>
<td>1.291</td>
<td>153</td>
</tr>
<tr>
<td>Total</td>
<td>4.72</td>
<td>1.266</td>
<td>278</td>
</tr>
<tr>
<td>Clip 3</td>
<td>All Others</td>
<td>5.01</td>
<td>1.359</td>
</tr>
<tr>
<td>B747</td>
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<td>1.268</td>
<td>153</td>
</tr>
<tr>
<td>Total</td>
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<tr>
<td>Clip 4</td>
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<tr>
<td>B747</td>
<td>6.81</td>
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<tr>
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<td>.618</td>
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<td>B747</td>
<td>6.71</td>
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</tr>
<tr>
<td>Total</td>
<td>6.67</td>
<td>.662</td>
<td>278</td>
</tr>
</tbody>
</table>

There was a highly significant main effect for video (F(4, 1104) = 259.869, p<.0001, η² = .485) showing that there were clear differences in the perception of complexity across the five video clips. There was also a highly significant main effect of complexity and aircraft type (F(1, 276) = 7.242, p<.008, η² = .026. There was also a highly significant interaction between complexity and aircraft type (F(4,1104) = 8.458, p<.0001, η² = .030. Pilots and flight attendants on the B747 aircraft perceived a higher level of complexity on video clips 1 and 3 than did the pilots and flight attendants on the other aircraft types. The difference was reversed for Clip 2 and there were virtually no differences between clips 5 and 6.
Perceptions of Captaincy

Table 7.16: Means and Standard Deviations for Perceptions of Captaincy as a Function of Aircraft Type

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td>5.35</td>
<td>1.643</td>
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<tr>
<td>B747</td>
<td>6.17</td>
<td>1.257</td>
<td>150</td>
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<tr>
<td>Total</td>
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<td>274</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td>4.80</td>
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<td>B747</td>
<td>4.87</td>
<td>1.684</td>
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</tr>
<tr>
<td>Total</td>
<td>4.84</td>
<td>1.659</td>
<td>274</td>
</tr>
<tr>
<td>Clip 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td>3.51</td>
<td>1.815</td>
<td>124</td>
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<tr>
<td>B747</td>
<td>3.93</td>
<td>1.881</td>
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</tr>
<tr>
<td>Total</td>
<td>3.74</td>
<td>1.860</td>
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</tr>
<tr>
<td>Clip 4</td>
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<td></td>
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<tr>
<td>All Others</td>
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<td>1.198</td>
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<td>6.47</td>
<td>1.041</td>
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<td>274</td>
</tr>
<tr>
<td>Clip 5</td>
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<td></td>
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<tr>
<td>All Others</td>
<td>5.98</td>
<td>1.162</td>
<td>124</td>
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<tr>
<td>B747</td>
<td>6.39</td>
<td>1.152</td>
<td>150</td>
</tr>
<tr>
<td>Total</td>
<td>6.21</td>
<td>1.172</td>
<td>274</td>
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</tbody>
</table>

There was a highly significant main effect for video (F(4, 1088) = 226.040, p<.0001, \(\eta^2 = .454\)) showing that there were clear differences in the perception of danger across the video clips. There was also a highly significant main effect for aircraft type (F(1, 272) = 12.781, p<.0001, \(\eta^2 = .045\)). Flight attendants and pilots on the B747 consistently perceived higher levels of captaincy across the video clips, with the exception of virtually no difference in clip 2, than did pilots and flight attendants on the other aircraft types. There was also a highly significant interaction between video clip and captaincy (F(4, 1088) = 3.625, p<.006, \(\eta^2 = .013\)).
Perception of Cabin Crew

Table 7.17: Means and Standard Deviations for Perceptions of Cabin Crew as a Function of Aircraft Type

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>All Other</td>
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<tr>
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<td></td>
<td></td>
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<tr>
<td>Total</td>
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<td>.668</td>
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</tr>
<tr>
<td>Clip 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td>6.39</td>
<td>.581</td>
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<tr>
<td>B747</td>
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</tr>
<tr>
<td>Total</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
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</tr>
<tr>
<td>Total</td>
<td>6.37</td>
<td>1.004</td>
<td>275</td>
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</table>

There was a highly significant main effect for video (F(4, 1092) = 29.014, p<.0001, η2 = .096) showing there were clear differences in the perceptions of cabin crew across the five video clips. There was not a significant main effect for aircraft type (F(1, 273) p = .103, η2 = .010. There was not a significant interaction between video clip and aircraft type (F(4,1092) = 1.993, p = .093, η2 = .007). Pilots and flight attendants on the B747 aircraft consistently perceived higher levels of cabin crew across all five video clips, than did pilots and flight attendants on the other aircraft types.
Perception of Communication

Table 7.18: Means and Standard Deviations for Communication as a Function of Aircraft Type

<table>
<thead>
<tr>
<th>Aircraft</th>
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</tr>
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<tr>
<td>Total</td>
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<tr>
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<tr>
<td>Clip 5</td>
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<td></td>
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<tr>
<td>All Others</td>
<td>6.15</td>
<td>1.162</td>
<td>124</td>
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<tr>
<td>B747</td>
<td>6.51</td>
<td>.963</td>
<td>152</td>
</tr>
<tr>
<td>Total</td>
<td>6.35</td>
<td>1.070</td>
<td>276</td>
</tr>
</tbody>
</table>

There was a significant main effect for video (F(4, 1096) = 39.525, p<.0001. η² = .126) showing there were clear differences in the perception of communication across the video clips. There was also a significant main effect for communication (F1, 274) = 4.47, p = .035, partial η² = .016). Additionally, there was a highly significant interaction for between video clip and communication (F(4,1096) = 3.034, p = .017, η² = .011). Pilots and flight attendants on the B747 aircraft consistently perceived higher mean ratings across the video clips with the with the exception of virtually no difference in clips 2, and 4, than did the pilots and flight attendants on other aircraft types.
Results Part B

The second part of the questionnaire had asked participants to complete two open-ended questions in the text box provided at the end of the same page as the quantitative Likert scale responses for each scenario. The two questions were:

1. “What would you do first?”
2. “What would you do next?”

The data analyses at this stage were qualitative in nature and consisted of recording and collating the written responses to identify attitudes, knowledge and behaviours of both the flight attendant and pilots groups. Patterns of behaviour and recurrent themes were then identified and highlighted with a marker pen. This is considered an appropriate method for dealing with open-ended questions (Wiggins & Stevens, 1999).

The five scenarios were:

- Video Clip One: Landing Gear Malfunction
- Video Clip Two: Drunken Passengers
- Video Clip Three: Medical Emergency
- Video Clip Four: Explosive Decompression
- Video Clip: Five: Emergency Landing Honolulu
Video Clip One: Landing Gear Malfunction

The written responses to this scenario showed the following key themes:

*The pilot group*

- Fly the aircraft!
- Monitor terrain
- Recycle gear, check light bulbs
- Work out fuel endurance and time available before landing
- Consult QRH (Quick Reference Handbook)
- Consult with maintenance
- Consult/coordinate with cabin crew
- Prepare for possible emergency landing
- “Controlled hold, gather information from all sources, flight deck crew, cabin crew, maintenance, Flight Operations, ATC (Air Traffic Control)”
- PA to passengers explaining problem and what is being done to fix the problem

*The flight attendant group:*

- Prepare passengers and cabin for possible emergency evacuation
- Find out time available for preparation of cabin
- Await instructions from flight deck and listen for emergency evacuation instruction from Captain
- Seated and secured in harness for emergency prepared landing
- Instruct passengers on ‘Brace’ position
- Ensure crew in ‘Brace’ position
Video Clip Two: Drunken Passengers

The pilot group

- Consult with lead flight attendant
- Instruct that no more alcohol served
- Support cabin crew with PA announcement
- Continue to consult with cabin crew
- Ask if a PA from Captain would help stating that passengers are obliged to follow the legal instructions of their crew or plane would be met by police.
- If situation deteriorates consider a diversion
- Turn seatbelt sign on
- Isolate key trouble makers

The flight attendant group

- Stop serving alcohol
- Advise Captain and continue to provide updates
- Ask for seatbelt sign to be illuminated
- Ask for PA from Captain
- Isolate ringleader
- Coordinate actions with other crew
- Prevent by denying initial boarding if passenger intoxicated
Video Clip Three: Medical Emergency

The pilot group

- PA call for emergency assistance
- Assessment of passenger’s condition
- Work out plans including fuel requirements if a diversion necessary
- Use the defibrillator (as in video clip)
- Authorize use of any necessary items from ‘physician’s kit’
- Keep consulting with cabin crew
- Consult with on the ground experts (in-flight medical advice provided by a company called International S.O.S. or I.S.O.S.)
- Consult airline’s medical team

The flight attendant group

- Assess patients condition
- Start CPR and use the defibrillator if needed
- Call for another flight attendant
- Notify Captain and ask for release of ‘physician’s kit’
- PA to seek medical assistance from doctor on board
- “only divert if safe for the aircraft and passengers”
- If patient deceased respectfully remove and take care of the body
**Video Clip Four: Explosive Decompression**

*The pilots group*

- Don (put on) oxygen mask
- Fly the aircraft
- Emergency descent to 10,000ft
- Put out a ‘mayday call’
- Assess, gather information and make a plan
- Identify problems, identify what could be done to solve problems
- Prioritize issues
- Consult with all crew
- Third flight deck member to liaise with cabin crew to obtain more information on state of cabin, crew, and passengers
- Plan for an emergency landing
- Make certain that ground has alerted all available emergency services
- Actions much the same as this crew did (hopefully)

*The flight attendants group*

- Get on oxygen (either spare passenger’s face mask or oxygen bottle)
- Secure myself in seat or wedge in as securely as possible
- Communication with flight deck (do they need medical attention?)
- Treat injured crew and passengers when safe to move, also check toilets
- Keep assessing aircraft state and communicating with flight deck
- Await briefing from flight deck
- Prepare passengers for an emergency landing
Video Clip: Five: Emergency Landing Honolulu

The pilot group

- Fly the plane
- Establish a landing configuration after ascertaining which systems are working
- Establish plan and ensure flow of vital information
- Prioritize actions
- Head to nearest airport, reduce aircraft weight, dump fuel
- Communicate with cabin- prepare for emergency landing /ditching
- Check cabin crew and passengers are secure as possible
- Land plane, then check if emergency evacuation needed
- Actions would be very similar to crew on video

The flight attendant group

- “Listen for instructions from Captain, assess conditions, report back to Captain, keep passengers in ‘Brace’ position, seat belt fastened, keep control, keep passengers calm, and keep giving instructions authoritatively”.
- Prepare for impact command
- Prepare cabin, wait for Captain’s instruction for evacuation

Key themes

- Communication and coordination between the pilots and flight attendants
- Communication within the flight deck and communication within the cabin
- Both groups recognized the necessity for clear and effective communication
- Pilots ready to help cabin crew in anyway available
- Pilots recognition of the importance of having a nominated flight deck member to actually fly the plane
• Continual assessment and transfer of information between the pilot and flight attendant groups
• Recognition of teamwork in formulating a plan
• Importance of briefing cabin crew
• Use of ground resources (International S.O.S. (I.S.O.S); Maintenance, Flight Operations, ATC)

Discussion Part A

Years Experience (Hypothesis 1)
The results supported the hypothesis that pilots and flight attendants of more than seven years experience would show lower mean ratings than pilots and flight attendants with less than seven years experience. Seven years was considered by the airline as the time it would take for crew to achieve higher skills levels. Experienced pilots and flight attendants consistently perceived lower levels of danger, volatility, complexity, and the importance of the Captain’s role. There was little difference in the mean scores for the perceived ratings of the role of cabin crew and communication. One reason for this may have been that after a skill base had been built up, pilots and flight attendants were more familiar with the company’s operating procedures and role expectations. Additional opportunities for working as a team to solve problems had been presented either in real life situations on aircraft, in CRM training sessions and in joint EP drills. This would have also increased confidence levels of both crews in their ability to work as a team.

Crew Position Flown (Hypothesis 2)
The results supported the hypothesis that the pilot group and the flight attendant group would show different perceptions of the events with flight attendants showing higher mean ratings. Pilots consistently perceived lower levels of danger, volatility, complexity, along with the
importance of the Captain’s role, the cabin crew’s role and communication. One reason for this could be that they were in working on the flight deck and could see the instrument panels showing signs of the condition of the aircraft and in that sense were more in control of the situation in clips 1, 4, and 5. Pilots are called the “tech crew” and have had years of training in aeronautical knowledge along with extensive flying experience.

However, as has been indicated in previous chapters, flight attendants were often unsure of the correct aeronautical terms to be used and were often reluctant to display this lack of knowledge. In contrast the pilots would have been reliant on their input for initial damage reports in video clips 4 and 5. Therefore the pilots had a more comprehensive understanding of opportunities to achieve safe outcomes while the flight attendants did not. This information would have been conveyed to the flight attendant team at the earliest opportunity. However, the flight attendants who would be directly involved in dealing with drunken passengers and medical emergencies as in clips 2 and 3 would be trained to deal with such situations. The flight attendants also showed higher perceived ratings on these clips too. The pilots were reliant on information received from the cabin and tended to view the situations as less serious than did the flight attendants.

**Aircraft type flown (Hypothesis 3)**

The hypothesis that pilots and flight attendants operating on different aircraft types would show different mean ratings with pilots and flight attendants operating short-haul narrow bodied aircraft showing lower mean ratings than pilots and flight attendants on the wide-bodied long-haul B747 aircraft was also supported. Pilots and flight attendants on the larger double decked B747 do not either see or know each other and communication during incidents which could affect the safety of the aircraft is limited. In contrast, the crew on the narrow-bodied aircraft often know each other through having worked together before and communication on a smaller aircraft is more easily achieved.
Crew resource management was defined in Chapter One as the effective use of all available resources. The results of the present study have shown that crews are putting this into practice. The written self-reports of behaviour show that CRM skills are being recognized by both pilots and flight attendants. The similarity of key points in responses shows that CRM skills have been identified and according to the self-reported data would be immediately implemented in such scenarios.

The scenarios had been carefully chosen to represent a range of situations that have been faced and could be faced by any airline crew. They were readily identified as realistic and some pilots said they would implement similar actions as on the video for Scenarios 4 and 5.

**Scenario One**

In Scenario One the aircraft had a landing gear malfunction and the responses from pilots identified the key factors. They suggested that one pilot should be nominated to actually fly the aircraft while other pilots worked on possible solutions. The pilot flying (PF) would fly a holding pattern, monitor the terrain, and monitor the remaining fuel before it was imperative to land. The flight attendants also had correctly undertaken their job roles in waiting for instructions from the Captain and preparing the cabin and passengers for a possible emergency landing. Accidents discussed in Chapter One have already shown what could happen if all flight deck members were fixated on landing gear problems associated with faulty light bulbs.

On 29 December 1972 Eastern Airlines Flight 401, a Lockheed L-1011-Tri-Star jet, crashed into the Florida Everglades while on final approach to Miami International Airport. The flight crew’s preoccupation with the landing gear had allowed the aircraft to descend to 2,000 feet as no one was monitoring the instruments. In 1978 United Flight 173 had crashed near Portland after the
pilots had become focused on dealing with a landing gear malfunction associated with a faulty light bulb. Warnings about fuel status from the flight engineer who had also suggested that the aircraft establish a holding pattern near the airport went unheeded. The aircraft crashed after the fuel had run out (O’Hare and Roscoe, 1990, p.218). Kayten, 1993 stated that this was the first time that the NTSB recognized the need for crew resource management training.

**Scenario Two**

In Scenario 2 excellent teamwork had been shown in the self-reported responses. Both groups on board the aircraft (the pilots and the flight attendants) coordinated their actions. The Captains offered any assistance that might be needed, including a general PA announcement saying that alcohol would no longer be served to a more authoritative announcement stating that if the situation did not improve police would be meeting the aircraft on arrival. Seat belt signs were to be illuminated in order to get the passengers to return to their seats. The authorization of restraints was also made available to the flight attendants. There were regular updates on the situation between the pilots and flight attendants. One response summed up the situation from a flight attendant who said that intoxicated passengers should not be boarded by ground staff and if the flight attendants identified such passengers before take-off they would be disembarked immediately.

The scenario on this flight involved soccer players who often have a few too many drinks while waiting for the boarding announcement. Duty Free alcohol also poses a problem as this means that passengers have their own supply. Such bottles are also often dangerously stowed in overhead lockers and pose a fire risk during emergency landings. They also add to the total weight of an aircraft which may seem insignificant but when one considers that 400 passengers have boarded with two bottles of alcohol each, this is no longer an insignificant matter. Last month a friend told me she had been hit on the head by a bottle falling from the lockers and it was
very fortunate that she only sustained a minor injury. It would be greatly preferable if Duty Free liquor was either bought on arrival at the passenger’s destination or pre-ordered on their departure to be collected on return. Most Duty Free shops offer this service which is also made easier by using the internet and internet enabled phones.

**Scenario Three**

Scenario Three concerned the actions to be taken in a medical emergency. Again responses indicated that both groups worked as team keeping each other informed. The first flight attendant to find the passenger would assess the situation, start CPR if needed, call for help from another flight attendant and then use the defibrillator. The Captain would then be notified after medical help was underway and an assessment of the passenger’s condition made. A PA call would have gone out for assistance from a doctor on the flight. The in-flight medical company which provides medical advice for many airlines would have also been consulted. The pilots would have been listening for updates and would use this information to decide to divert to the nearest airport or carry on with stabilizing the passenger’s condition. Pilots have to weigh up the safety of the flight and their responsibility to all passengers and crew. If the nearest appropriate airport had weather closing in and a shorter than usual runway the Captain could make the decision to carry on to the original destination. A diversion is often not possible on long-haul flights due to no suitable airport nearby.

**Scenarios Four and Five**

Scenario 4 and 5 are from the same catastrophic decompression accident which has been cited in Chapter One as an excellent example of effective CRM skills (Kanki & Palmer, 1993). On 24 February 1989 United Airlines flight 811 has suffered a rapid decompression after the loss of a cargo door. This necessitated an emergency descent and the issuing of a “Mayday” call. These two scenarios have been made into documentaries and would be familiar with many of the older
flight attendants and pilots who would have been flying at that time. Pilots recorded that their first actions would be to don their full-face oxygen masks before commencing this descent. The need for a rapid emergency descent is required so the aircraft can descend to 10,000ft so passengers and crew can have air which is saturated with sufficient oxygen to support life. This is particularly important as the release of the passengers’ oxygen face masks may have been damaged and not all those on board would be on oxygen.

Ten thousand feet is taken by airline training programmes as the standard height to reach in an emergency descent. However, one younger pilot indicated that 8,000ft would be more preferable as the breathable air would contain more oxygen. This view is supported by research by Henderson (2000) who carried out major experimental studies with pilots from an Air Force Base. The base’s decompression chamber was made available and pilots were asked to volunteer to take part. The major finding was that pilots showed individual differences in the way their bodies responded to cognitive and psychological effects due to mild oxygen deprivation at different altitude levels (sea level, 6,000ft, 8,000ft, 10,000ft, and 14,000ft). Thus, the recommendation of descent to 10,000ft may not be appropriate as individual pilots had responded with different heart rates and blood oxygen saturation levels for the same altitude levels. The recommendation regarding an appropriate descent height would come with the caveat that the flight deck crew would have an awareness of terrain and the lack of additional protections in uncontrolled airspace. Henderson, a highly experienced military and commercial pilot, suggested that the variation in results should be of concern to aviation as advanced cognitive and decision-making skills are needed in cases of rapid depressurisation.

Both the pilots and the flight attendants group then detailed their next actions which would be determined by their job role. Flight attendants had noted that their first action would be to get to oxygen masks and/oxygen bottles and secure themselves at best as possible. This is the stage
where communication would be possible after the emergency descent when the flight deck crew
would have been focused on getting a badly damaged aircraft down to 10,000ft as soon as
possible. Both crews indicated that communication with each other was vital. The flight deck
crew would want to know of injuries (and in this case deaths) as well as the state of the
cabin/fuselage. The flight attendants would want to know if the pilots needed any medical
assistance before moving to assess and help injured cabin crew and passengers.

CRM training which makes use of all available resources would include off-duty pilots and flight
attendants from the airline who would identify themselves to crew. In Chapter One the crash at
Sioux City has been discussed in detail. On July 19 1989 a DC-10 operating as United Airlines
flight 232 crashed at Sioux Gateway after suffering failure of all three hydraulic systems after fan
rotor blades had dislodged and crashed into the fuselage. A check airman travelling as a
passenger had identified himself to a flight attendant saying that he would be available if needed.
This was quickly passed onto the Captain who immediately asked him to the flight deck.

The NTSB investigation noted:

- “The CVR recorded the flight crew’s discussion of procedures, possible solutions,
  and courses of actions in dealing with the loss of the hydraulic system flight controls,
  as well as methods of attempting an emergency landing. The captain’s acceptance of
  the check airman to assist in the cockpit was positive and appropriate. The Safety
  Board views that the interaction the pilots, including the check airman, during the
  emergency as indicative of the value of cockpit resource management training which
  and been in existence at UAL for a decade.” (p. 76).
The Safety Board believes that under the circumstances the UAL flight crew was highly commendable and greatly exceeded expectations” (NSTB, 1990, p. 81)

Pilots and flight attendants both indicated that they would implement emergency procedures as trained. Support from the ground (fire and paramedics) and ATC would be organized. The Captain would brief the lead flight attendant on the time to landing and to prepare the cabin for possible evacuation. The flight attendants would follow their procedures and inform the Captain that the cabin was prepared. Flight attendants noted that after landing (other than in cases of fire) they would wait for instructions to evacuate from the Captain. Any evacuation down emergency slides has its risks for further injury and the Captain would need to make the decision to use the slides or wait until stairways have been placed by exits.

**Summary**

The results showed that both pilots and flight attendants had benefited from joint CRM sessions. The comments summarized in Part B indicated that both sub-groups had recognized the importance of sharing information in a timely and concise manner along with the need for effective teamwork to achieve the best possible outcome. While the comments showed that each sub-group had initially focused on their own job roles and responsibilities both groups showed an awareness of each other’s perspectives. The two sub-groups operating on the aircraft used the skills and knowledge obtained joint CRM training to work as one effective team. Joint CRM training initiatives in Airline ABC had included teaching material that involved cooperative interdependence between sub-group members. This is consistent with the social identity framework which suggests that groups would be able to work as one team following the application of strategies which necessitated cooperative interdependence between groups with individuals given the opportunity to understand each other’s perspectives (Brickson & Brewer, 2001).
CHAPTER EIGHT

STUDY SIX

An Experimental Intervention Study

Introduction

The present study and the following experimental intervention were designed to investigate the ability of social identity theory to predict social interactions within the crew of a commercial aircraft. The present study will be the first to apply the social identity framework as a way to understand the complex interactions both within and between the pilot and flight attendant sub-groups. The need for such research within this specific aviation context was identified following an extensive search of the social science literature which revealed that an experimental manipulation with the flight attendant occupational group had not been previously undertaken.

Both the pilot and flight attendant sub-groups hold different levels of social status with the pilot sub-group viewed as holding greater status and power. This is consistent with the social identity theory which asserts that society is made up of social categories with each category linked to the other in terms of prestige, status and power. People are seen to obtain their identities through the social categories they belong to. For those who believe that they belong to a low-status group this could involve a reluctance to speak out due to a perception that their viewpoint would not be received in a favourable light (Hewstone & Brown, 1986; Hogg & Abrams, 1988; Pettigrew, 1988; Brown, 1995; 2000).

Both sub-groups are separated by a hierarchical structure which can be a barrier to effective communication. However, there is also a hierarchical structure which operates within the flight attendant group. While the literature has paid much attention to how the hierarchical structure
operating within the flight deck crew can hinder effective communication (Helmreich & Merritt, 1998; Hackman, 1993; Helmreich & Foushee, 1993) little research has acknowledged the hierarchical structure which operates within the flight attendant group.

Data from previous studies in the present research has indicated that some flight attendants believed that the Flight Services Manager (FSM) or lead flight attendant were the people in ultimate authority. Large jets have up to fourteen flight attendants led by the FSM who is under the authority of the Captain. Under international aviation regulations the Captain has been given the role of leader of both groups and holds the ultimate authority for the safety of the flight. However with the locked flight deck door protocols since the events of ‘9/11’ 2001 junior flight attendants rarely even meet the Captain. It is understandable that this perception has been further ingrained in social attitudes. Discussion with the airline’s human factors team have indicated that this area of command authority needs to be further addressed in training programmes as in emergency situations the lines of authority must be clearly defined and instantly understood and acted upon.

Therefore, the hierarchical structure operating within the cabin crew can also hinder effective communication as there are occasions when more junior flight attendants have indicated that they would convey information to the pilots via the FSM. This could be dangerous when vital information needed by the pilots is not conveyed immediately by the first flight attendant who has identified an urgent problem. Flight attendants need to understand that even when the FSM has stated that information should be conveyed through themselves to the flight deck crew, that this does not preclude any member of the team from querying an action or communicating vital information to the flight deck directly via the interphone. The ISD occupies the second-in-command position within the cabin on wide-bodied aircraft. He/she has completed upgrade training (described in Chapter 1) and has the training and experience to take over the leadership
role if the FSM is ill or injured. While this can be seen to reinforce the hierarchical structure within the cabin it is important for flight safety to have trained crew in command and able to communicate effectively with the Captain in emergencies.

**Previous Social Identity Research**

Pettigrew (1998) explored four processes, which he believed, would be helpful in learning about intergroup contact. He started with an outline of Allport’s Intergroup Contact Hypothesis describing the four situational conditions which would need to be present in order to reduce intergroup prejudice. These four key conditions were; equal group status within the situation; common goals; intergroup cooperation; and support from the authorities. It is important to note at this stage that two conditions (common goals and intergroup cooperation) are emphasized in CRM training sessions as effective means of promoting safer aircraft operations. The fourth condition of support from authorities is also apparent. The equivalents of authorities or law in the present study would be the management of the airline and aviation regulatory bodies respectively.

The present study had been based on the theoretical framework of mutual interdependence with the implication that flight crews would have to work together as a team when faced with safety critical events. Tjosvold (1990) had investigated whether mutual collaboration amongst flight crews would help when faced with safety threats. The 35 participants were all volunteers from a major international carrier and consisted of 27 Captains, First Officers, and Second Officers along with eight flight attendants. It is important to note that flight attendants were included at a time when most research focused exclusively on the flight deck crew. The airline crews were interviewed on an individual basis and asked to provide examples of both safe, and in contrast, ineffective management of safety threats which they had experienced. The 35 participants were able to identify 60 such events. Tjosvold (1990) had hypothesized those crew members who perceived their goals as cooperative (as opposed to competitive) would be more willing to share
their opinions in an open and positive manner. This was substantiated as crews stated that they felt their ability to speak their views in a positive and open environment had led to more effective problem solving and team behaviours. Common tasks and a shared purpose (the safety of the flight) had produced mutual positive interdependence.

Van Knippenberg and Ellemers (2000) have also outlined the links between social identity and group performance. They believed that:

> “the social identity approach proposes that identification with a group only affects behaviour to the extent that the group membership is salient.” (p.36.)

Thus, although a person might identify with a particular group, it would not necessarily mean that group membership is always salient. Group membership would be more likely to be salient when an individual identifies strongly with the group. They recommended that attempts to enhance group efforts should focus on methods that would make the social identity of a group salient. One way to do this would be to focus on shared group goals, which would be to emphasize a common collective identity.

Wegge and Haslam (2003) stated that group goals make social identities more relevant by providing the group with a common purpose.

> “When group goals are set they help to direct and give meaning to a shared social identity which is used as a framework for coordination and organizing behaviour of (potentially) disparate individuals.” (p.51).
A shared understanding of common group goals should make social identity salient, which in turn would provide the motivation for group members to coordinate their efforts as a team.

Eggins, Reynolds and Haslam (2003) studied the relationship between social identity processes and perceptions of fairness in decision-making. They investigated the influence of emphasizing sub-group and superordinate identities in negotiation processes in which sub-group differences were salient. They described the ASPIRe model of Organizational Planning, Negotiation, and Development. This model was based on the social identity theory, including de-categorization, and re-categorization with a common in-group identity. It was found that participants felt more satisfied when a sub-group identity was emphasized.

Research by Eggins, Haslam, Reynolds (2000) provided additional support for this viewpoint. This in turn provided a good model for the development of a research instrument in the present study to investigate the role played by the emphasis of a salient sub-group identity. Eggins et al. (2000) used a three-scale negotiation process where participants had to make decisions about healthcare for males and females.

The following stages were used:

- Decisions were first made as individuals
- Decisions were made as part of a two person sub-group
- Decisions were made as members of a subordinate group

Half the participants completed the second stage sub-group with members of the same sex, with their sub-group identity as males and females emphasized. The other half of the participants completed this stage with a member of the opposite sex. They did not have their social identity validated in the same way as the first group.
Dependent measures were:

- In-group identification
- Perceptions of the representativeness of agreed positions
- Perceptions of the out-group
- Nature of the relations between negotiators at each stage.

The emphasis on pre-existing identities (male or female) increased the salience of the identity of each group. This was viewed as a positive outcome as it provided a practical way to successfully increase salient social identities through the negotiation process. It was important that participants felt their views had been valued as this could increase positive intergroup relationships and help in the creation of a superordinate group identity (Eggins et al., 2002).

Verkuyten and Hagendoorn (2002) investigated in-group favouritism using self-categorization (SCT) theory to predict different levels in self-esteem when personal and national social identities were manipulated along with the conditions of positive and negative self-esteem. The participants consisted of 109 Dutch university students who were randomly selected into two treatment conditions. Two different versions of questionnaires were given out. Part One contained the experimental manipulation which asked half of the students to answer questions when a personal identity had been primed using the “me/not me” task (Markus, 1977). Students were asked to think of themselves as Dutch and rate descriptors of their behaviour. For example, descriptors such as “stubborn” were anchored “ME” or “NOT ME” on a nine-point bipolar scale. The second group answered questions which had been designed to prime a national identity using the ‘us/them’ task (Turner & Onorato, 1999). These students were asked to consider themselves as German citizens and the descriptors were anchored by “THEM” or US”. Part Two was identical for both the personal/national identity priming conditions and contained variables to
measure individual differences. Parts One and Two had been written on completely separate pages to help participants’ better focus on each part and not to provide any clues as to the various conditions in the experiment.

The results showed that personal self-esteem was related to negative in-group favourtism when personal identity had been primed, but not when national identity had been primed. Therefore, in the personal identity condition personal viewpoints had become relevant. However, the opposite was found to be true when social categorization (national identity) had been primed as collective and shared viewpoints became more important. These results emerged when negative rather than positive dimensions of self-esteem had been primed. The results changed when national identity had been primed as participants had demonstrated a temporary improvement in their rated perceptions of their self-esteem in the positive condition while decreased ratings were discovered in the negative condition.

**Item Development and Derivation**

Social psychological theories as discussed above were used as a tool to enhance teamwork and coordination between cabin and cockpit crews. The literature review discussed above showed that it would be possible to manipulate participants’ personal versus social identity by a set of prior questions that would be asked about an actual incident on one of the airline’s aircraft. Personal identity would be made salient through questions about personal development and the acquisition of personal skills and resources.

This survey consisted of three parts (three short six, seven and eleven-item Likert scale Questionnaires) which were called Part A, Part B and Part C. In Part A flight attendants received one of two questionnaires designed to manipulate their social identity. Half of the group received a questionnaire which focused on making aspects of their personal identity salient while the other
half of the group received a questionnaire aimed at emphasizing their social/organizational identity. Personal identity was made salient by the inclusion of questions about how individuals think about personal development and how individuals think of themselves in terms of these personal development skills. Part B contained a small case study based on an extract of a serious incident on-board one of the airline’s aircraft which was given out to all flight attendants following the manipulation of social identity. Part C consisted of a Teamwork/Communication Questionnaire containing items designed to distinguish whether flight attendants would be likely to engage in more positive coordination behaviours with the flight deck crew.

**Part A**

**Personal Salience Questionnaire**

This questionnaire focused on personal identity salience. It was based on a survey by Verkuuyten and Hagendoorn (1998). The self-esteem manipulation had been used to manipulate the salience of national identity. The researchers’ noted that this seven-point Likert scale could be adapted into different organizational contexts. The personal identity salience section of this short questionnaire was adapted from the original ten questions. Seven questions which focused on the flight attendants attitudes to their personal identity were developed. The personal salience questions focused on personal as opposed to group or corporate identity.

**Social/Organizational Salience Questionnaire**

The other condition focused on organizational identity and was given out to the other half of the cabin crew on a pseudo-random basis. The six-item questionnaire on organizational identity was developed by Mael (1988) was selected as the Social/Organizational Identity Questionnaire for the present study due to its close links to social identity theory and successful validation and use in previous research. This questionnaire asked participants to respond to each of the six-items on a seven-point Likert scale ranging from ‘Strongly Disagree’ to ‘Strongly Agree’.
Ashforth and Mael (1989) had written a seminal paper on social identity theory (SIT) which made the distinction between organizational commitment and organizational identification. In order to develop this distinction they cited work by Mowday, Steers, and Porter (1979) which described the development of the Organizational Commitment Questionnaire (OCQ). Ashforth and Mael (1989) acknowledged that this 16-item Questionnaire had been the most frequently used scale for rating organizational commitment from 1979-1989. Ashforth and Mael (1989) believed that this scale measured an individuals’ belief in sharing organizational goals (which could be similar to those in another organization; willingness for hard work to meet such goals, and a wish to continue to work for the organization). These goals seem very similar to those held in an individual’s organizational identity; however a distinction is made in the commitment of an individual to a particular organization. Ashforth and Mael (1989) interpreted this difference by stating that while a member of an organization could decide to leave if a better job offer was received, a member who has identified with the organization and had lost their job would show signs of distress.

Ashforth and Mael (1989) cited work from Mael’s unpublished doctoral dissertation completed in 1988 to support this theory. The participants in this dissertation had been employed business and psychology students. Mael had constructed a six-item measure of organizational identity and then conducted confirmatory factor analysis with this scale and the Organizational Commitment Scale (OCQ). Ashforth and Mael (1989) believed that the goodness-of-fit index of .825 in the two-factor model compared with .780 in the one-factor model showed that two different constructs were being measured, stating:

“The superior fit of the two factor model suggests that the identification and commitment constructs are indeed differentiable. In summary, the SIT conception of organizational identity as
shared identity is new to the organizational behaviour literature. To date, the perception of identification has been confused with the internalization of goals and values, and with behaviour and affect. This is most clearly evident in research on organizational commitment.” (p.23)

They suggest that:

- Individuals choose activities and organizations that match the salient aspect of their identities
- Social identification affects ways in which groups form, including intergroup cohesion and cooperation
- Social identity helps make an individual feel part of the organization

**Part B**

This brief section asked participants to read a short paragraph on an incident involving a galley fire in one of the airline’s aircraft. This incident would give high face validity to the questions as it occurred on one of the airline’s own aircraft. The phrase “a galley fire” was used in order that crew could not identify the aircraft type. Details as to where and when this emergency situation occurred were omitted as well in order that additional cues were not given. It was brief because the emergency procedures taken were deliberately left out so crew would not be influenced on teamwork issues and would give their own opinions to the teamwork/communication questions in Part C.

It was also used to make crew want to read through the Survey to find out what had occurred as this particular emergency was kept confidential within the company and was not reported in the media. This incident was used with the permission of the aircraft’s Captain and the airline’s
management. The whole emergency was written up by the Captain to be used in this research. This is recorded in Chapter One on page 76. The airline is also using this real life scenario as part of emergency teamwork training for pilots.

**Part C**

These post intervention questions were written to focus on cooperation and teamwork. A set of items that investigated a variety of possible individual actions that could be taken in response to a particular circumstance was developed. Questions that tapped into collective actions such as communication with the flight deck were also developed. It was important for these questions to be written in specific terms about a particular behaviour or action rather than on a more general level. Eleven questions related to teamwork and cooperative actions were developed. Again these were on a seven-point Likert scale Questionnaire in order to keep the format similar to the previous parts. As social identity could be primed by company logos it was important to leave out the groups’ airline logos from Personal Salience Questionnaires along with any logo for Parts B and C for both groups. Therefore company branding logos printed in colour were only placed on Part A for the Social Salience Questionnaires to strengthen corporate identity. Parts B and C were also identical in both conditions except for the use of the company’s name for the lead flight attendant, sometimes known as FA1. The company called flight attendants in this role Flight Service Manager (FSM) and In-Flight Service Manager (ISM).

**Summary**

**Part A**

Social /organizational priming or personal identity priming
Part B
A brief description of the in flight incident consisting only of basic details of the event with any crew actions left out.

Part C
Questionnaire on teamwork/communication

| Personal Salience Questionnaire to half of the UK-based flight attendants | Social Salience Questionnaire to half of the UK-based flight attendants |
| Personal Salience Questionnaire to half of the home-based flight attendants | Social Salience Questionnaire to half of the home-based flight attendants |

The questionnaires for this study are found in Appendix E.

The Social Identity Manipulation
This investigation was a split half manipulation of social and organizational salience for two separate crew groups. As each of the two groups differed in many ways one group could not be the control group and one the experimental group. Each group was therefore divided in half and each half received one of the two treatments:

- Treatment 1  Personal identity primed
- Treatment 2  Social identity primed

The following information is also of relevance to the present study. The UK-based flight attendants operate on wide-bodied aircraft and fly on long-haul routes to non-UK destinations. As the pilots are based in the airline’s major home-based crew base they stay at hotels in the UK and do not share the same crew transport out to the airport. The flight attendants and pilots do share
the same crew transport at the non-UK destinations. However, the crews stay at different hotels which are arranged under industrial agreements. The pilots’ hotels are generally perceived by the flight attendants as being of a higher quality and in better locations. The flight attendants only fly from the UK to some non-UK destinations while the pilots have a wider range of destinations. The large size of the aircraft means that flight attendants often do not often see the pilots, with the exception of the lead flight attendant who has a short briefing with the Captain before they brief the cabin crew. An additional two flight attendants (usually from the premium service section which is closer to the flight deck) would have limited contact with the pilots when serving food and beverages. Therefore these UK-based flight attendants have limited contact with the flight deck crew.

However, home-based crews fly on narrow-bodied aircraft to short-haul international destinations as well as some domestic locations. The home-based flight attendants are based at four domestic locations with the majority located at the airline’s main base. Flight attendants share the same crew transport on arrival at their stopover destination and on most occasions stay at the same hotels. Flight attendants are far more likely to know the pilots having flown with them before or having shared the same crew transport and stayed at the same hotels. Recently I was invited by the Captain to share the same crew transport into the city. The flight attendants and pilots sat next to each other and chatted together before staying overnight at the same hotel. The smaller aircraft size also means that the flight attendants would be more likely to see or meet the pilots during work time.

These distinctions show that the UK-based flight attendants have very limited contact with the pilots while the home-based flight attendants have increased opportunities to meet the outgroup (the pilots). Allport’s Contact Hypothesis suggests that intergroup contact between the in-group
(the flight attendants) and out-group (the pilots) would result in more cooperation between the groups.

**Major Research Questions**

- Does crew base (UK or airline’s home-bases) affect the attitudes of cabin crew to their personal identity as shown in Part A of the Personal Salience questions?

- Does aircraft type flown (wide-bodied-UK-based cabin crews or the smaller narrow-bodied aircraft for the home-based cabin crews) influence ratings of personal identity or self-esteem?

- Do the UK-based cabin crew or Airline ABC’s home based cabin crews show higher self-esteem (as measured by Part A)?

**Hypotheses**

1. When social/organizational identity was made salient flight attendants would show greater levels of teamwork and cooperation as measured by the Teamwork/Communication Questionnaire than when personal identity was made salient.

2. In accordance with the contact hypothesis flight attendants operating on wide-bodied aircraft with little contact with the pilots would show lower teamwork and cooperation skills as measured by the Teamwork/Communication Questionnaire than flight attendants operating on narrow-bodied aircraft with more contact with the pilots.

3. In accordance with the contact hypothesis flight attendants working in leadership positions with increased contact with the pilots would show greater levels of teamwork
and cooperation as measured by the Teamwork/Communication Questionnaires than flight attendants with less/little contact with the pilots.

Method

Participants

Two different groups of cabin crew who were isolated by distance from each other and would not work together were asked to volunteer to take part in this social identity experiment. The two different organizational groups also differed in terms of crew size, age and experience. The first group consisted of 230 cabin crew based in the UK flying long-haul routes on wide-bodied aircraft. The second group consisted of 254 cabin crew based within four of the airline’s home bases for the shorter-haul narrow-bodied aircraft.

It is important to note that the population groups were selected on a pseudo-random basis using two completely separate groups of cabin crew who would not have any contact with each other. One group was based in the UK flying to long-haul routes from the UK to USA and the UK to Asia. The aircraft type flown was a wide-bodied aircraft. The second group consisted of cabin crew based in three of Airline ABC’s home-bases who were flying domestic and short-haul international routes. A different aircraft type was also flown - the narrow-bodied aircraft.

Group 1: Domestic and short-haul flight attendants

This group consisted of the flight attendants who fly on a narrow-bodied aircraft fleet. While employed by the airline, they operate under different contract conditions. This group contains many young people (commonly known as Generation Y). They are well trained to a high standard, but their depth of knowledge in abnormal flight conditions would not be the same as senior flight attendants of twenty years plus experience. There had been concern expressed over flight attendants’ experience levels in emergency situations. A high turnover rate had also been a
cause for concern and has had an impact on the airline’s training budget. This group has the potential to provide some interesting data that could to some extent give reasons for the high turnover rate.

**Group 2: Airline ABC’s flight attendants based in UK**

This group consisted of the 230 flight attendants based in the UK who did not have regular contact with other long-haul flight attendants. They also had little (if any) interaction with the pilot groups who are based back at the airline’s major crew base. The crew serving food and beverages to flight deck will have limited contact, while the crew serving at the back of the wide-bodied aircraft would often not even see the pilots. The FSM would have a pre-flight briefing with the Captain, but due to on-time departures restraints such meetings are often brief.

**Materials**

It was essential that participants did not read Part B and C before having completed Part A (either the personal salience questionnaire or the social salience questionnaire). This was achieved by using an envelope system as follows:

Part A was put into the largest envelope (A4 - 176mm by 250mm.) and included a Letter of Introduction by the Human Factor Programme Manager and an Information Sheet for Participants. This large envelope was labelled “CRM Survey” while the words “Questionnaire” Part A, B or C were used for the forms inside. Parts A, B or C was also used to help ensure that the Questionnaires were answered in the correct order. This letter also emphasized the fact that it was important to complete Part A before opening the envelope containing Parts B and C. In addition in order to help ensure that Part B and Part C were not read before Part A, a second smaller envelope (C5 162mm. by 229mm.) was used. This envelope was also labelled “Have you completed Part A? Thank you. Now please open the envelope labelled Parts B and C.”
After completing Part C participants were asked to place their responses into a smaller envelope DLE (110mm. by 220mm.) This was put inside the Part B and C envelope so that it was easily found. Participants were asked to place this addressed and sealed envelope into the company mail system. Four separate Adobe files were sent to the airline’s Printery. These were named:

- Personal Salience Airline ABC
- Personal Salience Airline ABC (short-haul)
- Social Salience Airline ABC
- Social Salience Airline ABC (short-haul)

This was done to minimize any Printery errors and the files were also marked “read only” so that they could not be altered during the printing process. The Questionnaires were printed on double sided A4 paper and in order to help ensure that both sides were completed a reminder was written at the bottom of each page. After Part A this read: “when completed please open the envelope labelled “Parts B and C” and continue.” For Part C the reminder read: “please turn over the page and continue answering the questions.” It was thought that these measures would help capture as much data as possible. The home-based crews received their questionnaires through a mail box drop kindly done by administration staff. The UK-based crew questionnaires were taken back to the UK by a senior UK-based flight attendant who was at the airlines’ main base and had very kindly offered to take these two boxes back with him. They were then distributed and returned through the assistance of the Cabin Crew Manager in the UK.

A reminder notice in the form of an A4 poster was sent out two weeks before the closing date of 12 November 2007. This poster was kept simple without any company branding logos or
University of Otago logo. Cabin crew leaders were also asked to remind crews to complete the CRM Survey. The support of cabin crew line managers was acknowledged and appreciated.

The questionnaires were distributed on a pseudo-random basis. Half of the personal salience Questionnaires and half of the social salience questionnaires were distributed to the UK-based flight attendants. The remaining half of the personal salience questionnaires and the social salience questionnaires were distributed to flight attendants at three of the airline’s home bases.

Results

Reliability Analysis

Cronbach’s alpha for the 11-item Teamwork/Communication Questionnaire was .605. One item (Q2) had a very low item-total correlation when compared with the other items. However, if this item were removed the overall reliability would increase slightly to .615. As this represented only a very small increase in Cronbach’s alpha for the scale it was decided to retain this item.

Principal Components Analysis

The 11-items of the Teamwork/Communication Questionnaire were analyzed using a principal components analysis (PCA) with Varimax rotation using SPSS Version 15. Four components with eigenvalues greater than one were extracted. This is within the expected range (Tabachink & Fidell; 2001, pp.620-621). The largest component represented 20.4% of the variance. These four extracted components accounted for 59.6% of the variance.

The scree plot test (Cattell, 1966) was conducted where eigenvalues are plotted against factors. This is shown below in Figure 8.2. A close inspection of where the line graph changed shape indicated that there could be three interpretable components. The rotated component matrix
showed that there were 4 items loading on the first component, 3 items loading on the second component and 3 items loading on the third component. Component 1 (Q7, 8, 9 & 10) was labelled ‘job roles, procedures and responsibilities’; Component 2 (Q1, 2, & 3) was labelled ‘cooperation amongst pilots and flight attendants’ while Component 3 (Q4, 5, & 6) was labelled ‘leadership’. The greater the loading the more confidence there is that the variable is a true measure of the factor (Tabachink & Fidell; 2001, p.625). The measures of factorability were good indicating the solution was an appropriate one.

In summary, the 11-item Teamwork/Communication Questionnaire demonstrated a reliable and internally consistent scale. It is recommended that a slightly smaller 10-item test should be considered for future use.
Flight Attendant Characteristics and Scores on the Flight Safety Attitudes Questionnaire

A background information section asked the participants to indicate their gender, crew base, years of experience as a flight attendant and crew position flown. This would include whether the flight attendant had a leadership role (Flight Service Manager FSM, ISM, and Purser) or worked as a flight attendant in economy or premium service areas. Total scores for the each of questionnaires were obtained by summing across the items for each of the following:

- the seven items in the Personal Salience Questionnaire
- the six items in the Social Salience Questionnaire
- the eleven items in the Teamwork/Communication Questionnaire

Analysis of Variance

A two-way between-groups ANOVA was conducted to determine the impact of the independent factors (Sample: UK or home-based flight attendants; Treatment: Personal or Social Salience Priming). The dependent variable was score on the Teamwork/Communication Questionnaire. This meant that it was possible to simultaneously test for the effect of treatment and sample factors on the total score on the dependent variable and to identify any interaction effect. The results are reported below.

A two-way between-group ANOVA was conducted using the total score of the Teamwork/Communication Questionnaire as the dependent variable. The main effect for priming (personal or social) was not significant (F(1, 129 = .339), p = .529. The main effect for sample
was also not significant (F(1, 129 = .072) p = .789. There was no significant interaction between priming (personal or social) or crew bases (F(1, 129 = .004), p = .951.

However, analyses from the three subscales from the PCA from the Teamwork/Communication Questionnaire showed some significant results which are described below (Subscales A, B and C).

**PCA Subscales and Salience Manipulation Results**

Principal Components Analyses run on the Teamwork/Communication Questionnaire had shown three components which were labelled:

- **Component 2** Subscale A (Q1c, 2c, & 3c)
- **Component 3** Subscale B (Q4c, 5c, & 6c)
- **Component 1** Subscale C (Q7c, 8c, 9c, & 10c)

**Subscale A (Q1c, 2c, & 3c)**

Component 2 (Q1c, 2c, & 3c) was labelled ‘cooperation amongst pilots and flight attendants’ or intergroup cooperation. As discussed below, the priming manipulation on component 2 showed significant effects on items 2 and 3 and it was decided to investigate the effects of the salience manipulation in more depth. Scores were summed across Items 1c, 2c, & 3c and this resulted in an intergroup cooperation subscale. This method of estimating factor scores was considered satisfactory for the present study. Such a technique is supported by Tabachink & Fidell, (2001) who state that “For many research purposes this ‘quick and dirty’ estimate of factor scores is entirely adequate” (p. 626).
A 2 by 2 ANOVA was run to determine the effect of the two factors (Sample: UK or home-based flight attendants; Treatment: Personal or Social Salience Priming). The dependent variable was score on the 3-item subscale A (intergroup cooperation). The main effect of priming (personal or social) was highly significant ($F(1, 143 = 7.92); p = .006$). The main effect of crew base was also highly significant ($F(1, 143 = 11.99, p = .001$). There was no significant interaction between priming (personal or social) and crew base ($F(1, 143 = .704, p = .403$).

There were 68 flight attendants in the personal salience priming condition with 79 flight attendants in the social salience priming condition. The personal salience group had significantly lower scores ($M = 13.05, SD = 1.72$) while the social salience group scored significantly higher ($M = 13.89, SD = 1.35$); ($F(1, 145 = 10.90, p = .001$).

These results supported the first hypothesis that had predicted that when social/organizational identity was made salient flight attendants would show greater levels of teamwork and cooperation as measured by the Teamwork/Communication Questionnaire than when personal identity was made salient

**Subscale B (Q4c, 5c, 6c)**

Component 2 (Q4c, 5c & 6c) was labelled leadership. There were 69 flight attendants in the personal salience priming condition with 80 flight attendants in the social priming condition. The personal salience group had lower scores ($M = 13.72, SD = 1.55$) while the social salience group scored slightly higher ($M = 14.02, SD = 1.27$).

A 2 by 2 ANOVA was run to determine the effect of the two factors (Sample: UK or home-based flight attendants; Treatment: Personal or Social Salience Priming). The dependent variable was score on the 3-item subscale B (leadership). The main effect of priming (personal or social) was
not significant (F(1, 145 = 7.92); p = 2.10). The main effect of crew base was also not significant (F(1, 145 = .909, p = .342). There was no significant interaction between priming (personal or social) and crew base (F(1, 145 = 2.18, p = .142). Hypothesis 3 had predicted that in accordance with the contact hypothesis flight attendants working in leadership positions with increased contact with the pilots would show greater levels of teamwork and cooperation as measured by the Teamwork/Communication Questionnaires than flight attendants with less/little contact with the pilots. There were no significant results found for this subscale which showed that Hypothesis 3 had not been supported.

Subscale C (Q7c, 8c, 9c, & 10c)

A 2 by 2 ANOVA was then run on to determine the effect of the two factors (Sample: UK or home-based flight attendants; Treatment: Personal or Social Salience Priming). The dependent variable was score on the 3-item subscale C (job roles, procedures and responsibilities). The main effect of priming (personal or social) was not significant (F(1, 139 = .066, p = .798). The main effect of crew base was highly significant (F(1, 139 = 8.28, p =.005). There was no significant interaction between priming (personal or social) and crew base (F(1, 139 = .931, p = .336).

There were 67 flight attendants in the personal salience priming condition with 76 flight attendants in the social salience priming condition. The scores on subscale C were slightly higher for the personal salience group (M = 14.26, SD = 3.55) compared with the social salience group (M = 13.88, SD = 3.26).

In accordance with the contact hypothesis it was predicted that flight attendants operating on wide-bodied aircraft with little contact with the pilots would show lower teamwork and cooperation skills as measured by the Teamwork/Communication Questionnaire than flight attendants operating on narrow-bodied aircraft who would have more contact with the pilots. This
hypothesis was not supported by the analyses conducted on the overall Teamwork/Communication Questionnaire. However, Subscale C (Q7c, 8c, 9c, & 10c) which was labelled job roles, procedures and responsibilities indicated a different result. The interpretation of this result will be outlined in the following discussion section.

**Analysis of variance for individual items**

_Question 2c. “I am confident in describing an emergency technical problem to the pilots even if I do not know the correct technical terms”. _

The main effect priming (personal or social) salience priming condition was not significant (F(1, 145 = 3.53), p = .062. There was a significant main effect for crew bases (F(1, 145 = 6.86), p = .010. There was no significant interaction between priming (personal or social) or crew bases (F(1, 145 = 2.90), p = .091.

_Q3c. “It is important to realize the Captain is in overall command and may delegate communication and teamwork tasks”._

The main effect of priming (personal or social) was significant (F(1, 145 = 6.38), p = .013. There was a highly significant main effect for crew bases (F(1, 145 = 16.14), p <.0001. There was no significant interaction between priming (personal or social) or crew bases (F(1, 145 = .851), p = .358.

_Q4c. “It is essential that there is one person delegated to give clear, concise and regular updates to the Captain”. _

The main effect of priming (personal or social) was not significant (F(1, 145 = .556), p = .457. There was no significant main effect for crew bases (F(1, 145 = .096), p = .758. There was a significant interaction between priming (personal or social) and crew bases (F(1, 145 = 6.30), p = .013.
Q7c. “I feel more confident in reporting to the FSM/ISM than the pilots as we work together more frequently in the cabin and know each other better.”

The main effect of priming (personal or social) was not significant (F(1, 139 = .195), p = .660. There was a significant main effect for crew bases (F(1, 139 = 5.67), p = .019. There was no significant interaction between priming (personal or social) or crew bases (F(1, 139 = 1.58), p = .210.

Q8c. “It is vital for one of the pilots to come back (when directed by the Captain) and see the technical emergency for themselves”.

The main effect of priming (personal or social) was not significant (F(1, 145 = .040), p = .841. There was a highly significant main effect for crew bases (F(1, 145 = 10.39), p = .002. There was no significant interaction between priming (personal or social) or crew bases (F(1, 145 = .512), p = .475.

Q11c. “Joint EP training has helped me feel more confident in reporting cabin emergencies to the pilots”.

The main effect of priming (personal or social) was not significant (F(1, 136 = .701), p = .404. There was a highly significant main effect for crew bases (F(1, 136 = 15.08), p < .0001. There was no significant interaction between priming (personal or social) or different crew bases (F(1, 136 = .763), p = .384.

ANOVA were run for each of the eleven-items on the Teamwork/Communication Questionnaire. The six questions which had shown significant results are recorded above.
Crew Bases by Personal Salience

There were 35 flight attendants at the UK crew base with 30 flight attendants at the home-bases. The home-based crews had significantly lower scores (M = 16.76, SD = 3.03) while the UK-based crews had significantly higher scores (M = 19.42, SD = 3.72); (F(1, 63 = 9.77,  p = .003). Higher scores indicated lower perceived ratings of self-esteem; thus the UK-based crews had indicated lower self-esteem with the home-based crews indicating higher perceived ratings of self-esteem.

There were 67 flight attendants in the personal salience priming condition with 76 flight attendants in the social salience priming condition. There was no significant differences between the personal salience group (M = 14.26, SD = 3.55) and the social salience group (M = 13.88, SD = 3.26). A 2 by 2 ANOVA was then run on to determine the effect of the two factors (Sample: UK or home-based flight attendants; Treatment: Personal or Social Salience Priming). The dependent variable was score on the 3-item sub-scale labelled job roles, procedures and responsibilities. The main effect of priming (personal or social) was not significant (F(1, 139 = .066, p = .798). The main effect of crew base was highly significant (F(1, 139 = 8.28, p = .005). There was no significant interaction between priming (personal or social) and crew base (F(1, 139 = .931, p = .336).

Discussion

There were two major findings from the present research study which showed that social identity theory (SIT) could be used as a tool to enhance teamwork and communication between cabin and cockpit crews. The flight attendants whose identity had been primed by reading a short questionnaire on social/organization identification had shown significantly higher scores on the items on the Teamwork/Communication Questionnaire which had been designed to tap into
cooperative intergroup behaviours between the pilots and flight attendants on commercial jet aircraft, than flight attendants who had been primed by reading items on personal identity.

Therefore, the first major result of Study 6 was the finding that social salience priming (as opposed to personal salience priming) showed highly significant results in terms of intergroup cooperation between the flight attendants and pilots. The personal salience group had significantly lower scores (M = 13.05, SD = 1.72) while the social salience group scored significantly higher (M = 13.89, SD = 1.35); (F(1, 145 = 10.90, p = .001).

The second major finding from this experimental study based on the social identity theory was that Hypotheses One had been supported by the results reported in the subscale labelled cooperation and intergroup communication between pilots and flight attendants. The results supported Hypothesis One which had predicted that in accordance with social identity theory when social identity was made salient flight attendants would show greater levels of teamwork as measured by the Teamwork/Communication Questionnaire than when personal identity was made salient.

The results in the present study are consistent with the findings of previous research which had been conducted in a non-aviation environment. For example, Gardner, Gabriel and Hochchild (2002) discovered that when individual university students from a United States university had been primed to think of themselves as interdependent groups which consisted of people they knew, they longer felt concerned if they were outperformed by others as the groups’ successes were viewed in a positive manner. It is appropriate to cite the title of the paper by Gardner et al. (2002): “When you and I are “we” you are not threatening: The role of self-expansion in social comparison.” CRM training aims to create opportunities for the two separate groups of pilots and flight attendants to think of themselves as one superordinate group and the use of the word “we”
is frequently seen in course materials, joint training exercises, in debriefings as well as in questionnaire designs. The interdependence of the skills of both groups to achieve safe outcomes for flights is also emphasized.

This is consistent with Haslam’s (2004) summary of the literature which had also shown that when a person’s social identity was made salient they were more likely to contribute to the group’s goals, and view the organization in terms of “we”. A common shared group membership helped to develop greater loyalty, rule following, and helpful behaviours towards colleagues. Information would be shared more effectively both at the intra-group and intergroup level, group performance would be coordinated, and relevant feedback on task performance provided. On the other hand when personal identity was salient people defined them more in terms of “I” and look to the acquisition of personal skills and resources to reach their own individual goal.

Item 3 from the Social Salience Questionnaire (Part A) in Study Six is an excellent example:
Q3. “When I talk about the airline I usually say “we” rather than “us”.

Part C of Study Six also included other carefully developed items:
Q5. “It is essential, especially in an aircraft emergency that we (cabin and pilots) work as a team with clear leadership shown by the FSM/ISM.”
Q6. “It is important for everyone to show initiative and share ideas in cabin emergencies”.
Q11. Joint EP training has helped me feel more comfortable in reporting cabin emergencies to the pilots”.

Examples from the FSAQ discussed in Studies One and Two included items 6 and 8 which emphasized positive interdependence of both groups:
Q6. “Pilots encourage cabin crew to voice their safety concerns.”
Q8. “Pilots and flight attendants work together effectively at (the airline).”
Major research questions in the present study had been:

- Does crew base (UK or airline’s home-bases) affect the attitudes of cabin crew to their personal salience identity as shown in Part A of the Personal Salience questions?

- Does aircraft type flown (wide-bodied aircraft UK-based cabin crews or the smaller narrow-bodied aircraft for the home-based cabin crews) influence ratings of personal salience or self-esteem?

- Do UK or Airline ABC’s home based cabin crews show more self-esteem (as measured by Part A)?

The results of the previous ANOVAs had shown that the home-based crews had significantly lower self-esteem scores (M = 16.76, SD = 3.03) while the UK-based crews had significantly higher scores (M = 19.42, SD = 3.72); (F(1, 63 = 9.77, p = .003). Higher scores indicated lower perceived ratings of self-esteem; thus the UK-based crews had indicated lower self-esteem with the home-based crews indicating higher perceived ratings of self-esteem.

The large wide-bodied aircraft meant that up to fourteen flight attendants each worked in their own section (or ‘zone’) of the aircraft often with little contact with the two senior flight attendants in a leadership role. There was also very limited (if any contact) with the flight deck crew or the Captain who is the overall leader of the aircraft. This could result in less personal recognition from the two lead flight attendants due to the size of the plane. A flight attendant in the focus groups had commented that she had dealt with a distressing death of a passenger and the Captain did not even thank her for the professional way in which this was handled. There were many occasions on the interphone when a thank-you could have been communicated. I know of a
Captain who made it a policy to write to cabin crew or maintenance management to thank an individual member(s) for outstanding work. The individuals were also copied in. These letters would have also been placed in the individual's employment file. This would have raised a person’s self-esteem. Over 20 years ago on a long-haul flight I also heard the lead flight attendant thanking a new junior flight attendant for her excellent work on the flight.

Crew on the short-haul narrow-bodied aircraft fleet would have flown with the flight deck crew before, shared the same crew transport and overnighter at the same hotel. Personal recognition also helps to increase self-esteem. This would have provided opportunities for crews to provide in-person recognition for excellent work.

Self-esteem was identified by Haslam (2004) as a personal construct which people would seek to enhance through cooperative intergroup behaviours which would create personal recognition from team members. Self-esteem of team members can also be enhanced when the leadership is perceived as fair and open to suggestions from individual team members (De Cremer, van Knippenberg, B, van Knippenberg, D and Mullenders, 2005). De Cremer et al. (2005) had investigated the effect of leadership styles and perceived procedural fairness had upon employees’ self-esteem amongst two groups of University students from a Dutch University. One group was asked to read an employment scenario where employees had no voice where the other group read a scenario where the employees had a voice and could contribute their own viewpoints. Following this a 1-7- point Likert scale type questionnaire was completed. The results showed that those in the voice condition reported having more impact than those in the no voice condition.

De Cremer et al. (2005) summarized their findings:
“The finding that procedural fairness had more impact on people’s self reports of self-esteem was high in rewarding behaviour is consistent with the notion that both procedures and empowering leadership styles are assumed to have a profound effect on the development and strength of people’s self-esteem”. (p. 10)

Hypothesis 2 had predicted that flight attendants on the large wide-bodied aircraft would show lower mean scores on the Teamwork/Communication Questionnaire than their colleagues on the smaller narrow-bodied aircraft. Flight attendants on the wide-bodied aircraft based in the U.K. showed higher means than those on the narrow-bodied aircraft on subscale C. Individual items in this subscale looked at job roles, procedures and responsibilities and the crew on the wide-bodied aircraft had shown higher mean scores on these items. I suggest that a possible reason for this is that a large complement of fourteen flight attendants means that each crewmember is working in a particular section or “zone” of the aircraft with clearly defined job roles. Premium service flight attendants worked entirely within this area and often did not see their colleagues working in the larger economy area of the aircraft. The perceived mean ratings from wide-bodied aircraft flight attendants on the subscale showed that the flight attendants thought there were clear definitions of job role and procedures to be followed:

- Q7c. Communication should be through the FSM rather than directly to the pilots. In fact data from previous chapters had indicated that some FSM’s insisted on following this procedure.
- Q8c. It was vital for pilots to come back to see technical emergencies for themselves.
- Q9c. It was the pilots’ responsibility to keep passengers informed and to reassure them.
Part B of the Questionnaire had contained a short excerpt taken from a very serious incident onboard one of Airline ABC’s aircraft. The reader is referred to Chapter One page for the entire summary. This summary shows how the flight attendants had acted quickly in accordance with their emergency training in fighting a fire in one of the ovens in the aircraft galleys following standard rules and procedures for such an event. The wide-bodied aircraft’s Captain had declared a Mayday and the aircraft was on an emergency descent to the nearest airport. This aircraft has fourteen flight attendants led by the FSM. Not all of the flight attendants had been involved in the fire fighting team and I would imagine that some were moving around the aircraft to check for any additional source of smoke or threat to the aircraft that could have been overlooked. It is important the situation on all parts of the aircraft had been assessed so that the crew did not act on narrow tunnelled vision perception. Two examples of tunnel vision amongst flight deck crew had contributed to aircraft crashing after the flight deck crew had been focused on faulty light bulbs instead of monitoring all aspects of flight. These accidents have been discussed in Chapter One (Eastern Airlines, NTSB/AAR-73-14; United Airlines, NSTB/AAR-79-7).

**Conclusion**

The theoretical framework of social identity theory (SIT) and self-categorization theory (SCT) had been shown to apply to teams within the specialized organizational environment of aviation. This result has provided knowledge that is new to the research literature in that it is the first time that such an experimental manipulation has shown the usefulness of SIT and SCT to provide research-based evidence on ways to improve teamwork and communication skills amongst the flight attendant occupational group.

The results of the experimental manipulation had shown that when social/organizational identity had been made salient, flight attendants indicated that they would be more likely to engage in effective coordinated team action, than when personal identity had been primed. Consensus
towards appropriate team action would also be more likely as the flight attendant team would be working towards a common goal. The research data were also applicable to both of the flight attendants groups who either operated on short or long-haul routes with different aircraft types.

In accordance with the social identity framework the priming of a salient social/organizational identity (as opposed to a personal identity) has been shown as a useful strategy to apply in aircrew training. This would provide Airline ABC with a cost-effective way of making CRM training and joint EP training more effective by priming the organizational (airline) identity based on emphasizing a common superordinate group identity.
CHAPTER NINE

CONCLUDING DISCUSSION

Introduction

The unifying research theme of the present study was that while modern aircraft were intended to operate with one crew, in reality there were two subcultures on the aircraft as the crew are neither separate individuals nor a single homogenous group. Since the early to mid 1990s it has been suggested that ‘crew’ consisted of two separate sub-groups or two distinctive cultures represented by pilot and flight attendant sub-groups (Chidester, 1993; Kayten, 1993; Chute & Wiener, 1995, 1996; Wiener & Kanki, 1993). Incidents and accidents (e.g. Kegworth, 1989; Dryden, 1989) which highlighted failed teamwork and communication between the two sub-groups led the aviation industry to examine joint CRM training as a way to overcome these problems and improve teamwork and communication.

Chapter One had described how there had been widespread concern in the aviation industry following a series of commercial aviation accidents. The accident reports had identified a lack of coordinated action amongst cockpit crews as a major contributing factor (e.g. L1011-Tristar crash, Miami, NSTB/AAR-73-14; United DC-8 crash, Portland, NSTB/AAR-79-7). Industry and academia had met and the need for a new type of specialized cockpit training for flight crews was identified. This led to the development of CRM training for pilots. Airline ABC had developed a new CRM training manual and course for its pilots which had been introduced in 1988. The curriculum acknowledged the importance of effective communication skills and teamwork both within the flight deck crew and between pilots and flight attendants. Accidents which had involved a deficiency in the timely flow of information between the flight attendants
and pilots had indicated that it would be necessary to expand CRM training to include flight attendants as the other sub-group in the aircrew team operating on an aircraft (e.g. Kegworth, 1989; Dryden, 1989). In 1998 Airline ABC had developed a new course for flight attendants developed specifically for the cultural conditions and needs identified from both the international literature as well as areas identified by the airline’s CRM working party.

While the aviation accidents outlined above were used to advocate for CRM training, airlines recognized that while such accidents were very public, training was needed to address specific causes, and CRM came to be embedded in both applied academic research and lessons learned from incidents and accidents. CRM developed to be part of mandated training programmes for both pilots and flight attendants. The Civil Aviation rules and regulations discussed in Chapter One demonstrated the linkage between the CARs and CRM training course content that Airline ABC had developed. The CRM course content outlined in Airline ABC’s training curricula has been described in detail in Chapter One so that such material can both be read by interested parties and can also be linked back to the outcomes of the research in the present study.

The ultimate aim of this present study has been to investigate ways in which Crew Resource Management (CRM) training programmes can be developed, evaluated and refined in order to optimise communication and coordination between the flight deck crew and flight attendants. In order to do so I conducted six major studies. Flight attendants and pilots from a major commercial air carrier had been invited to participate in this longitudinal research study. Each study consisted of large samples sizes of aircrew; either:

- flight attendants (Studies 1, 2, 3, 5, 6) or
- pilots (Study 4) and
- flight attendants/pilots (Study 5)
Studies One and Two

Chapters 3 and 4 described Studies 1 and 2 which used the FSAQ (Flight Attendants) Questionnaire to assess attitudes towards safety related behaviours following the introduction of the new CRM training programme which had been specifically designed for flight attendants. Airline ABC had recognized this vital need and sought to obtain data related specifically to the operational needs of their airline training as well as providing data that would increase the knowledge base from the flight attendants’ perspective in the wider aviation community. Another aim was to increase links between academia and industry.

The FSAQ (Flight Attendants) was subjected to a principal components analysis (PCA) which showed that this measure had demonstrated an internally consistent and reliable scale and could be used in the future to assess the introduction of CRM training programmes for flight attendants with other airlines. I then analyzed the results which showed that the introduction of CRM training had resulted in a significant positive change in safety attitudes of the airline’s flight attendants. The large number of participants (n = 563) in Study 1 and Study 2 (n = 526) provided a convincing demonstration of the training results. Any airline needs to justify the costs associated with the implementation of safety training programmes and these two studies provided objective evidence that there had been positive changes in the safety attitudes of its flight attendants. Any evaluation carried out must also clearly define the extent of the change in measurable manner so that positive areas can be enhanced and areas that might need additional fine-tuning identified. These studies met both these purposes.

The data collected in this study on flight attendants’ attitudes to safety, following the completion of introduction of CRM training designed specifically for flight attendants, identified several
predictor variables which could be used as indicators of safer attitudes. The most useful variables were described as: length of service, crew position flown, seniority, leadership roles, flight attendant crew size, and length of route flown.

One possible reason why more senior flight attendants provided more positive ratings on attitudes to safety could be that flight attendant team leader would also have a pre-flight briefing with one of the pilots before briefing their flight attendant team. This would again serve to result in increased contact between the pilots and senior flight attendants.

**Study Three**

Chapter 5 discussed the results of Study 3 which were based on qualitative data obtained from a series of 17 focus groups with flight attendants (n = 100). The aim had been to explore barriers and solutions to effective communication between flight attendants and pilots from the flight attendant’s perspective. The data provided a range of solutions which should provide important information for flight safety. The data also linked back to the FSAQ (Flight Attendants). For instance, the locked flight deck door was identified as a significant barrier as pilots and flight attendants could no longer see each other as information was conveyed via the interphone. It was suggested that a CCTV camera should be installed by the flight deck door as a possible solution which would mitigate the effects of such a barrier.

Focus groups were conducted as part of an ongoing-programme evaluation to identify strengths, weaknesses and recommended improvements to CRM training programmes. A major aim was to identify barriers to effective teamwork and communication between pilot and flight attendant sub-groups. Solutions to such barriers could then be explored. The focus groups would provide valuable data which could then be used to implement safety initiatives. Joint CRM training programmes would provide a very appropriate setting to practice these new skills.
Study Four

Chapter 6 (Study 4) contained a 14-item questionnaire (FSAQ Pilots) which gave the pilots the opportunity to express their views. This questionnaire was shown to be an internally consistent and reliable scale through a principal components analysis (PCA).

The results from the FSAQ (Pilots) (2004) indicated that there were highly significant differences in perceived safety attitudes between fleet type and crew position flown. Pilots on narrow-bodied aircraft (B737, A320) had significantly higher questionnaire scores than those flying on wide-bodied aircraft (B767, B747). Higher questionnaire scores indicated more positive safety attitudes. Captains had displayed higher mean scores in the FSAQ (Pilots) as expected, indicating that they displayed safer attitudes than those in the two more junior crew positions (FO, SO).

These results were consistent with similar differences which had been noted in a number of previous research studies in the literature (Helmreich, Foushee, Benson & Russini, 1986; Helmreich et al., 1990; Helmreich & Wilhelm, 1991; Helmreich & Merritt, 1998). These studies have been described in Chapter One.

The importance of effective pre-flight briefings had been identified by flight attendants in Studies 2, 3 and 4, and pilots in Study 4. Time pressures had been acknowledged but both groups consistently had wanted full crew briefings. Pre-flight briefings are an operational requirement at Airline ABC. However, on large wide-bodied aircraft which have a large flight attendant crew compliment, the requirement is for the Captain to brief the lead flight attendant who then has the responsibility of briefing his/her flight attendant team. On the smaller narrow bodied aircraft the Captain is also required to give a pre-flight briefing to the lead flight attendant who is also then
required to brief the flight attendant team. However, due to the smaller number of crew on these aircraft, Captains described how they would brief the whole cabin team pre-flight whenever possible. Both pilots and flight attendants had acknowledged that combined briefings would help in the formation of a more cohesive team which in turn would promote more effective teamwork and communication.

Recent research into effective teamwork from the social identity literature has emphasized the role of leaders and followers in the formation of effective teams (Graen, 2009; Gibson, Copper, & Conger, 2009). Graen summarized research into the relationships between leaders and followers stating that those leaders who had demonstrated excellence would be more effective in developing successful working relationships based on respect and mutual interdependence.

Pilots identified similar viewpoints as to safety attitudes as the flight attendants had indicated in the first two studies. Joint EP training was viewed as an important way to break down barriers between the two groups operating on board an aircraft so that they could act as one mutually interdependent team.

These results are consistent with theories of group formation and empirical studies, as described in Chapter Two, under the sub-heading group formation. One such empirical study by Ginnett (1987) had described how the behaviours of ineffective and effective Captains could be reliably distinguished in operational line flying. Six effective (Type A) Captains and four ineffective (Type B) Captains had been identified through consultation with the airline’s check Captains and verified through observations by independent raters. These Captains had been observed during their regular line flying duties (B727-200 aircraft) over a six-month period; the data collection consisted of 300 hours of direct observation and 110 hours of cockpit observations.
Type A Captains led effective pre-flight briefings with both flight deck crew and flight attendants in attendance. While it was a company requirement to hold such briefings one hour before departure Type A Captains had led effective briefings which encouraged group formation. In contrast, Type B captains had led ineffective briefings which along with their inconsistent behaviour in-flight resulted in the failure to build and maintain effective teams (Ginnett, 1987). Type A Captains had discussed how the whole crew would work together as a team focusing on the interface between the cockpit and the cabin. Such Captains made clear verbal statements as to how work should be done, including safety, communication and coordination issues. They also involved the whole crew (including flight attendants) as individuals with specific roles to play with in the group.

Sometimes crew members arrive late off a delayed flight and rush to the gate for the next flight that they will be operating on. Firstly, it is the Captain’s responsibility to ensure that all pre-flight checks are completed before take-off. CRM training can provide skills in the use assertive statements to refuse pressure from the company’s dispatch to expedite departure. In such cases Captains have only a few minutes to build a positive atmosphere between a group of individuals who may never have met before. However, under time pressure the importance of a welcoming hello and introductions can go a long way in team building. Pre-flight briefings before boarding the aircraft are important to team formation and ultimately to the safety of the flight. Captains use their CRM training and interpersonal skills to facilitate introductions within the flight deck crew, acknowledge everyone, and to provide guidelines and expectations as to how the crew will work as a team. This includes making the flight attendants feel part of the team and ensuring that they have an effective briefing covering such aspects as length of taxi; weather, especially any expected turbulence, and protocols for flight deck access. Updates from the flight deck crew on such issues as an earlier than expected arrival time serve to cabin crew informed. This means cabin crew have notice to start preparing the cabin for arrival sooner than expected.
While Ginnett (1987) did not comment on whether CRM training had commenced for the pilot group in his research, it could be possible that more positive outcomes, including skills in team building, would have been discovered amongst the Type B Captains following CRM training. It would also be consistent that Type A Captains would have been provided with additional skills to encourage effective teamwork and communication behaviours.

Ginnett’s empirical research is linked closely with his theoretical model of group formation. In Chapter Two Ginnett (1987) used the model of an organizational “shell” to describe the environment in which commercial aviation operates. The shell consisted of four circles; the innermost circle consisting of teams at work, moving out through group formation, the organization, with the final outermost circle representing industry. Additional factors influencing the group at work which were task, norms, boundaries, and authority. The shell consisted of dotted lines which could be expanded when necessary. Effective captains were able to affirm and expand the dotted lines as the observations of Type A captains had shown. When the Captain reinforced the pre-flight briefing with good teamwork skills during the flight the dotted lines filled in and reinforced effective coordination and communication team behaviours.

Studies 2, 3, and 4 had demonstrated that both pilots and flight attendants wished to stay together as a team within their tour of duty (TOD) as they would have more of an opportunity to get to know each other. A TOD can last from one day to several days and crewing rosters can be changed due to illness, family circumstances or operational demands. In Study 3 domestic crews on the B733 outlined excellent communication practices with the pilots. Both the pilots and cabin crew were able to get together briefly before the flight and often stayed at the same hotel. They often knew each other well having flown together on previous occasions.
In Study 4 pilots operating on short-haul routes displayed more positive safety attitudes. This could be due to the opportunity for increased communication with the smaller teams as effective team building and communication are linked with safer attitudes. The B737 and A320 are usually operated by two pilots while the B747 and B767 have three to four pilots. However, as the pilot team operating on all aircraft types stay together as a group in the same hotel during stopovers they have the opportunity to get to know each other better which would help build an effective team more effectively on the return sectors. Pilots usually stay together as a team during their tour of duties. The qualitative data from Part B of Study 4 indicated the lack of whole crew combined briefings meant that the long-haul pilots did not have the opportunity to exchange flight information and expectations in person before the flight. The lack of an opportunity for just a friendly hello was also identified.

This is consistent with research by Hackman (1993) who identified that frequent crew changes adversely affected the opportunities for crews to form effective teams. Effective teams would be more able to make decisions and initiate appropriate actions in non-normal situations. Hackman supports this statement by citing experimental research by Foushee, Lauber, Baetge and Acomb (1986). Foushee et al. (1986) had compared the performance of two different groups of crew on a LOFT exercise in the simulator. The first group consisted of flight deck crews who had flown together for several days while the second group consisted of pilots who had not flown together before. The initial research had set out to examine crew fatigue but an unexpected finding resulted. The crews who had flown together before (although tired) made significantly fewer errors than those who had not yet flown together as a team.

The findings discussed in this thesis are consistent with previous research by Helmreich and Merritt, (1996, 2004). Their research contained a sub-sample of flight attendants and pilots from United States crew bases. Participants were recruited from the same United States international
airline using different crew bases. The 20-item shortened version of the CMAQ was used as the measuring tool. Two hundred pilots (only five were female) and 200 flight attendants of whom 170 were female from a United States West Coast crew base were recruited. An additional 185 male flight attendants and 200 female flight attendants were recruited from the same airline’s mid-West crew base. The pilot data were collected in 1989 while the flight attendant groups were surveyed in 1992. A significant change in safety attitudes in a positive direction was found following the completion of CRM training. Reasons why the pilot data were collected in 1989 and flight attendant data collected in 1992 were not identified. It could be possible that some confounding variables had been introduced over the three year time period. However, it is also possible that this would reflect the difficulty in collecting data from both groups at the same point in time due to operational requirements within the airline. It could be that CRM for flight attendants had not been introduced within the airline until 1992.

Research by Merritt (1996) had used The Flight Management Attitude Questionnaire (FMAQ) to assess the safety attitudes of both pilot and flight attendant groups. Once again a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’ was used. The first two items represented positive safety attitudes while the final three assessed attitudes with represented negative safety attitudes. The cockpit-cabin expectations were assessed by the following items:

Table 9.1: Mean Scores for the items in the FMAQ relating to Cockpit-Cabin Expectations (Merritt, 1996)

<table>
<thead>
<tr>
<th>FMAQ Item</th>
<th>Pilots Mean</th>
<th>Flight attendants Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Captains should encourage crew suggestions</td>
<td>4.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Q2. I’ll speak up if I see a problem</td>
<td>4.75</td>
<td>4.00</td>
</tr>
<tr>
<td>Q3. Junior crew should not question senior’s decisions</td>
<td>1.00</td>
<td>2.00</td>
</tr>
</tbody>
</table>
The pilots believed more strongly than the flight attendants that the Captain should encourage suggestions from the crew, and also felt that they would be more likely to speak up if they saw a problem. However, the flight attendants felt that they should not question the Captain’s or senior crew member’s decisions. They also felt that there were occasions when subordinates were afraid to disagree.

**Relationship of data to theoretical issues**

The United States flight attendant group showed a preference for a ‘top-down’ method of communication and coordination. There was also a preference for a consultative leadership style and a denial of the effects of stress and fatigue (Merritt, 1996). The flight attendants valued Captains who would encourage their questions, but would also show command leadership in emergencies. However, the United States pilots valued participative leadership with less reliance on crew communication and coordination. The United States Captains preferred an interactive leadership style where participation from the whole team was encouraged. The flight attendant and pilot groups showed differences related to occupation and national identity. The pilot and flight attendant groups differed in leadership styles and personalities with the flight attendant group seen as more socially orientated (Helmreich and Merritt, 2004). National culture and organizational identity took preference over organizational differences. The all male group of flight attendants identified with their female counterparts. This finding supports the social identity theory in that while membership of a particular group is important it is overridden when a superordinate category is formed when groups focus on shared group goals.
Study Five

Chapter 7 (Study 5) described a study involving five video clips of aircraft accidents and incidents. These clips were designed to include scenarios within the cabin as well as emergency situations which would require effective teamwork. The video clips were presented in the following order: A landing gear problem, drunken passengers, a medical emergency, an explosive decompression, and an emergency landing. Both pilots and flight attendants participated in the study which provided data obtained from both groups at the same point in time. The clips were presented on a CD Rom entitled “What Would You Do?” or “WWYD?” A copy of the “WWYD?” CD Rom has been included with this thesis. Pilots and flight attendants were asked to rate the variables of danger, volatility, complexity, and the role of the Captain, cabin crew, and communication for each of the video clips on a 7-point Likert scale.

The results showed differences in perceptions of the characteristics of the situations shown as a function of length of service with pilots and flight attendants with seven years or more service showing lower perceived ratings for the clips than their colleagues with less than seven years experience. Pilots showed lower perceived ratings for the clips than did flight attendants. The crews on the wide-bodied double decked B747 indicated higher perceived ratings for the video clips than did their colleagues on other types of aircraft. This demonstrated that length of service, crew position and aircraft type are important variables which should be considered in future aviation research conducted in an applied setting. It could also be possible that the lower perceived ratings from aircrew with seven or more years of service had been influenced by additional annual CRM and joint CRM training along with experience which indicated that the problem was still serious but not as serious as indicated by those with less than seven years experience. Drunken passengers would have been dealt with on many more occasions and the crew would have carried out procedures associated with medical emergencies more frequently.
Crews on the double decked B747 had indicated higher perceived ratings than crew operating on other aircraft types. The flight deck crew would not be able to visualize the problem by opening their flight deck door and looking back into the main cabin areas situated downstairs. Flight attendants could not see all of the cabin areas on the aircraft and would need to take additional time to provide an assessment to the pilots. Airline ABC’s long-haul flights often operate over expansive areas of ocean and any diversion airport could be several hours away. Therefore, any emergency would require prompt decision-making based on the best available knowledge as if a diversion is decided as the most appropriate action the flight deck crew would need to activate an emergency plan which could include the declaration of a “Mayday” situation.

The qualitative comments written in the two blank text boxes labelled “What would you do first?” followed by “What would you do next?” showed that pilots and flight attendants first indicated job-specific actions set out by relevant SOPs. Examples of effective teamwork and communication behaviours as had been contained in joint CRM training sessions were then described. This included the use of the SADIE problem-solving acronym which encouraged team problem-solving in a format that would be more readily recalled under emergency conditions. In emergencies (time permitting) the Captain is required to provide a briefing to the lead flight attendant. Another potentially useful acronym (specific to Airline ABC) was written down frequently by both pilots and flight attendants. Both pilots and flight attendants had illustrated very similar patterns of effective teamwork and communication. I was appreciative of the additional time taken by both groups to describe the aviation specific language used. This indicated that the research had been seen as useful and that the participants wanted to ensure that I understood their actions and required duties. The reader is again referred back to Chapter One which describes CRM training material in more detail.
Study Six

Study 6 which is described in Chapter 8 was based on an experimental intervention using research from social identity and social categorization theories. Social identity theories (Tajfel, 1972; Turner 1985; Hogg & Abrams, 1988; Brown, 1988; Haslam, 2004) were used to provide a theoretical framework to identity key factors to predict effective new ways of training for airline crews. While there is a vast body of literature-based social identity research, there has been no previous research based on the organizational identities of flight attendants.

Moreover, ways in which the social identity approach can be used to increase intergroup cooperation and teamwork between two different groups of people (pilots and flight attendants) have not been found in the literature to date. While research had been conducted exploring different personality types in an attempt to predict retention rates from the flight attendant group (Ferris, Youngblood, & Yates, 1985; Ferris, Bergin, & Gilmore, 1986) these studies did not specifically explore the implications of social identity theory. Later research explored the use of problem-solving training with flight attendants but did not discuss the use of the social identity theory to enhance teamwork (Ayres & Malouff, 2007). However, Eisenbeiss and Otten (2008) investigated both group identification and organizational commitment with a small group of trainee flight attendants (n = 59). Training group identification was determined by the personal interactions in the particular training group studied while organizational identification was linked to their prospective professional identity as flight attendants. However, this research used a small sample from one training group and its results should not be generalized across the flight attendant occupation which would include flight attendants with 30+ year’s experience.

Flight attendants from the home-based group in Study 6 had a high level of turnover along with the associated high cost for the training of new-hires. Studies of leader and follower perceptions in the airline industry, with the airline itself viewed as the macro unit for analyses as opposed to
the pilot/flight attendant crew on one aircraft as a micro unit become cost-effective studies for individual airlines.

Chapter Two included a discussion of research by Hofstede which had identified four different cultural dimensions: Power Distance Index, PDI; Masculinity-Femininity Index, MAS; Individualism- Collectivism, (IDV); and Uncertainty Avoidance (UA). Hofstede (1991) showed that an individual’s perception of power and status was determined by both occupational group and home country. The relevance of Hofstede’s work within an aviation environment was replicated using a large sample of pilots from many countries where different cultural boundaries operated (Helmreich & Merritt, 1998).

Helmreich and Merritt (2004) then investigated whether Hofstede’s cultural dimensions would replicate to the flight attendant occupational group. Their large-scale study had included 200 (170 female) flight attendants from the west coast base of a large United States carrier. There were also 180 male flight attendants and a third sample of 200 female flight attendants from the same major mid-west base. All flight attendants were employed by the same air carrier. The 20-item CMAQ had been administered before the flight attendants had attended a CRM training course. These data had been collected in 1992.

Dimension 1 was named Collectiveness and Power, Dimension 2 Individualism and Moderate Power Distance, and Dimension 3 Individualism and Low Power Distance. Dimension 1 was based on the belief that communication and coordination were important and led by the Captain and this was linked in to the importance of pre-flight briefings. Dimension 2 was based on the belief that crew coordination and pre-flight briefings were an important part of the Captain’s role while the crew should not question the Captain’s decisions. However, a good Captain should also encourage questions from the crew. Crew worked more independently within specific roles. In
Dimension 3 there was less reliance on the Captain’s total authority and increased belief that crew members should question decisions. The subject ratings varied between 0 and 1 with higher scores under a particular dimension showing that crew were operating more within that particular dimension.

Table 9.2: Group Subject Weights for the Three-Dimensional Solution (Helmreich and Merritt, 2004)

<table>
<thead>
<tr>
<th>Flight attendants</th>
<th>Dimension 1</th>
<th>Dimension 2</th>
<th>Dimension 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Midwest</td>
<td>.63</td>
<td>.68</td>
<td>.21</td>
</tr>
<tr>
<td>Female Midwest</td>
<td>.59</td>
<td>.75</td>
<td>.11</td>
</tr>
<tr>
<td>Mixed West Coast</td>
<td>.44</td>
<td>.85</td>
<td>.08</td>
</tr>
</tbody>
</table>

The table displays that most flight attendants indicated that they worked under Dimension 2 which was an individual and moderate power distance model.

**Strengths of the study**

The present research was conducted within the setting of a major airline who provided unprecedented cooperation through all stages of this thesis. The opportunity to work with pilots and flight attendants resulted in the ability to obtain large sample sizes which provided a wider range of suitable methods for statistical analyses. This was applied psychological research based within an aviation setting which provided data from pilots and flight attendants whose length of service ranged from 1-36 years.
Studies 1 and 2 collected quantitative data to assess flight attendants' safety attitudes both prior to and following the introduction of the new CRM training designed specifically for flight attendants. A major strength was the large sample sizes (500+) in both studies. Such large sample sizes from an applied real world setting are unusual in aviation research and as such were a real strength of the study. Any evaluation needs to clearly define the extent of change in a measurable manner so that positive areas can be enhanced and areas that might need fine-tuning identified. These studies met both these requirements. Each study was interlinked both to and from previous studies. This provided an additional strength as data were used to inform the development of the next research measures.

Study 3 provided qualitative data from seventeen focus groups held with the airline’s flight attendants. This provided the opportunity to further explore the data from the first two studies as well as to provide a confidential way for safety information to be discussed. The number of flight attendants (n = 100) who stayed on after a day of EP training showed that there was a demand for their voice to heard by an independent researcher from a well recognized top university. The issues raised in each of the seventeen groups were very similar. This indicated that the information was representative of the flight attendant group and that no red herrings had been discussed.

Studies 4 and 5 provided the opportunity to assess the safety-related attitudes of pilots using various measures to collect both quantitative and qualitative data. These data supported the view that both pilots and flight attendants perceived similar attitudes to safety issues. Study 5 used this information to develop scenarios on a CD-Rom which were presented in video-clip format and represented actual events which had occurred on aircraft. Both the flight attendant and pilot group would readily relate to these incidents which provided the study with high face validity.
An additional strength of the present study was the development of an experimental intervention based on theories of social identity. The participants were two groups of flight attendants who would not meet up as they were based at two geographically distinct locations. These results provided experimental data which indicated that when social (as opposed to personal) identity had been primed, flight attendants indicated greater willingness to engage in cooperative intergroup teamwork behaviours with the pilot group. This was a major finding as such results from a large sample of flight attendants had not been described in the literature to date. The importance of intergroup cooperation has been a theme throughout this thesis as it provided a way to for both groups to work together to prevent emergencies from occurring, and to handle emergencies by productive communication, coordination and problem-solving skills.

The results from the empirical research studies have been incorporated into Airline ABC’s updated CRM training and material in their Course Booklets reflects this. During the research process at Airline ABC I was asked if I would summarize results obtained in relation to joint training for pilots and flight attendants. This was then shared with a major airline from another Anglo country to provide research-based evidence of the benefits of joint training. Such training programmes are an additional cost in the training budget of any airline and need to be justified with such evidence. The sharing of information relevant to aviation safety is common between airlines. The important point to make is that the research should have been conducted in a country with a similar cultural background, and even then, adapted to the needs of the particular country and airline. Airlines would have the ability to target areas where specific additional training modules are needed. Two airlines within the same country could also adapt the programmes to suit the needs of their individual airline.

In summary, the present research has several key points that have increased the reliability and validity of the findings. The use of both quantitative and qualitative research designs had been
carefully selected to provide appropriate data gathering measures for each of the six studies. Each study was linked back to results from previous studies which enabled further exploration of key findings.

**Limitations of the present study**

The first five studies provided large samples of data which when analyzed had each produced highly significant results. However, these studies were essentially correlational in nature and causation could not be attributed to the results. The data were also based on self-reports rather than direct observations. Flight attendants and pilots live a lifestyle dictated by their job requirements and duty rosters. Some long-haul crews were away for two weeks at a time. Therefore, it was difficult to conduct studies using different methodologies. This was overcome in part by the last study which was an experimental study based on social identity theories.

I was extremely fortunate to be able to conduct this research over an extended period as it is often difficult to obtain permission to conduct research within a major air carrier. It is necessary to have the approval of senior management and to keep management updated on the benefits of the research. Union approval is vital and industrial issues which arise from time to time in any organization can affect the timing of the research. It is just as important to keep the aircrew participants updated, unless it is considered that feedback of specific results could exert an influence on future data collection rounds. It is difficult to control the time frame of research within the complexities of a modern aviation environment. Such an environment can be influenced by training needs, operational requirements, and economic conditions which could affect passenger numbers and therefore profitability. Sensitivity is required at all stages.
Future Research Recommendations

Recommendations for flight attendant observations of simulator sessions

It is recommended that Human Factor Programmes in aviation be continued to be evaluated according to best practice based on both theoretical models and applied aviation psychology research. In future research in the area of interaction between pilots and flight attendants it is recommended that experimental studies be conducted where possible. Adequate funding would be required in order to use simulator time. The flight simulator provides a reliable and valid method of data collection which does not put the participants at risk. Simulator sessions are often videotaped, and following debriefing the video data are destroyed. Measures to satisfy both union and pilot requirements would have to be clearly discussed and a suitable plan worked out. Permission forms would need to be signed at least two weeks in advance to allocate simulator time. Any observations could not be permitted to affect the regular training requirements of the airline. CRM skills could be specifically observed during simulator training sessions.

At the conclusion of each of the first five studies I recommended that flight attendants sit in on simulator sessions to observe the roles and responsibilities of pilots and to see when heavy workload periods occur. It is encouraging to hear this recommendation is being put into place in early 2010. Lead flight attendants from one fleet have been given a duty day to observe simulator sessions provided the pilots have given prior approval to be observed. This is an important step forward as it requires additional costs to take flight attendants off their line flying duties even for one day. It is recommended that the opportunity to observe simulator sessions be extended to all fleet types within the airline.

Recommendations for the development of LOFT training

LOFT training in the simulator, as has been discussed in Chapter One, presented flight crews with a range of compounding in-flight scenarios which necessitated effective communication and
teamwork. The first real LOFT type research was the Ruffell Smith (1979) simulator study which had used a scenario scripted to involve the emergency shut down of one engine during a trans-Atlantic flight to explore crew interactions. The results showed that breakdowns in communication distinguished low performing crews from high performing crews. Errors were in the areas of communication, crew interaction and leadership rather than in technical flying skills. Errors occurred when a crewmember was interrupted by other crewmembers, including cabin crew when they were occupied with performing a particular task (Ruffell Smith, 1979, cited in Foushee, 1984). This would have been one of the first LOFT scenarios to involve flight attendants as part of the overall team function. Foushee (1984) had recommended that research focused on observations of group behaviours in realistic LOFT type simulator sessions as opposed to laboratory settings.

I would make the same recommendation based on my longitudinal research findings from 1998-2007. LOFT exercises should be used to conduct research into aircrew teamwork and communication between the two sub-groups of pilots and flight attendants. The LOFT simulator is a full-fidelity simulator also used for pilot’s six-monthly proficiency checks (as discussed above). However with airline, union, and pilot approval; flight attendants could be part of the research process during the LOFT simulator detail. Carefully scripted scenarios could involve the flight attendant conveying information and responding to questions from the pilots. Important data on teamwork and communication could be captured through observations based on this type of research conducted in a safe and highly realistic environment. This research function could also be very useful to assist flight attendants see the workload and associated job responsibilities for the pilot group unfold in real time. Such research could also be a valuable adjunct to joint CRM training.
An additional function of LOFT exercises could be to include flight attendants as part of their annual recurrent joint CRM training. As space in the simulator is limited it would be recommended that flight attendants on upgrade training to a lead flight attendant be included.

**Jumps seat rides for flight attendants**

A cost-effective way could be achieved by providing flight attendants who are positioning as passengers the opportunity to sit in on the jump seat on the flight deck (with the pilots’ permission). This could be for the entire flight on short-haul routes or for high workload periods on long-haul flights. All flight attendants have the security clearance which would permit this to happen.

**The use of CDs as a training intervention**

What Would You Do Next (WWYD) CDs could be developed along with a questionnaire targeting specific training areas which would be completed as part of the pre-course material that is sent out before training. This material could be completed as a learning exercise which would be discussed as part of the training session. It could be completed online as well. Such an exercise would not be assessed (other than participation and completion of the task) and could be done with reference to EP manuals. Another option would be to view the CD/DVD in class and complete the form then. I would suggest that the questions to each scenario would be “what would you do first?” and “what would you do next?”

A DVD could also be produced in the simulator showing an in-flight emergency from the pilot’s perspective. Clips filmed in the cabin mock-ups could be added to show the safety role of the flight attendants. This would be cost-effective and should provide a training method to meet the CRM training outcomes.
Joint CRM training in the mock-up aircraft provided the opportunity for both sub-groups (flight attendants and pilots) to work together and practice and demonstrate communication and teamwork skills. Scenarios could be developed from incidents occurring on Airline ABC’s own fleet. This was the case with a galley fire which had occurred during cruise level on long-haul flight. The teamwork displayed by both the flight attendants and pilots, under the leadership of the Captain, was an example of the effective use of CRM skills applied to deal with a very dangerous situation. This incident has been described in Chapter One and a short succinct summary was used in Part B of the social identity manipulation in Study 6. A fuller description written by the aircraft’s Captain for this research is found in Chapter One, page 79. Airline ABC is using this incident in its pilot training. While galley fires at cruise level are infrequent occurrences, incident reports from aviation safety bodies contain detailed summaries of in-flight emergencies can provide useful sources from which to develop CRM training material.

**Human Factors in Aviation**

_The extension of social identity and social categorization research_

The further use of the social identity and social categorization theories is highly recommended. Social/Organizational identity could be primed by a short pre-flight DVD showing team of people working together using the words “we” and “us” instead of “I” and ‘them’. The present study demonstrated that this approach has benefits in increasing flight attendants’ social/organizational identity (as opposed to personal identity). This in turn resulted in flight attendants indicating that they would be more willing to engage in intergroup communication with the pilots. This is essential when up to 400 passengers, fourteen cabin crew and at least three pilots could be flying at 35,000ft in a small metal tube when an incident occurs. Research in this thesis has demonstrated that since such emergency incidents and accidents do occur, it is important for any additional safety training strategies to be researched in more depth. While both the pilots and
flight attendants of Airline ABC are highly qualified and trained professionals it is imperative that both groups work as a well coordinated team to achieve safe outcomes.

A specialized DVD could be developed showing the specific airline’s staff in their work-related uniforms with a company logo occurring unobtrusively in the background at various stages. This should include maintenance staff working in the hangar on an aircraft displaying the company logo and the aircraft then being towed across to the departure gate. The pilots could then be shown checking the maintenance log (a pre-departure requirement) while the cabin crew are being briefed by the Captain (in smaller short-haul aircraft) or by the lead flight attendant in the larger long-haul aircraft. Ground support staff could be shown checking passengers in for their flights. This should be coordinated with the Human Factor team and marketing could provide valuable assistance in producing such a DVD.

Future research in the area of organizational commitment could investigate the interaction between procedural fairness (where people either had an input in the organization’s practices or had no input) and whether their behaviour was rewarded or not, when people’s self-evaluations was the dependent variable as opposed to a measure of organizational commitment (De Cremer et al. (2005). Studies 1, 2 and 3 have shown that procedural fairness could be seen as a way to break down barriers between the flight attendant and pilot groups.

**The extension of Human Factors training across the aviation environment**

It is recommended that Human Factors models continue to be developed which would assist safety training in maintenance, ramp, dispatch, and traffic. Check-in staff could also be included as they need to ask safety questions such as checking whether a passenger has packed dangerous goods such as matches and fireworks. Security teams should also be involved as they are the ones
who screen passengers before boarding and need to feel that they are part of the wider aviation
community.

The development and refinement of research instruments

Studies 1, 2, 4, 5, and 6 from the present research had been conducted using pen and paper
surveys where the participants were asked to place their completed survey in a pre-addressed
envelope to the CRM/Human Factors Manager. The Company mail system was chosen as it was a
familiar method for the collection and return of mail. In addition, sealed boxes with large labels
designating the study had been placed in crew briefing areas as an additional means of collection.
(Study 3 consisted of Focus Groups conducted with the researcher who collected in the
highlighted key points which each flight attendant had written down on a piece of A4 white
paper).

It is recommended that future research could be designed and conducted through the use of online
surveys. In order to remain confidentiality and gain the trust of potential participants it is
recommended that the researcher uses the technology resources associated with his/her
Department within the University system. There will also be considerable interest from airlines in
conducting surveys online. This would be particularly cost-effective in the collection of data from
crews at overseas bases. A system would need to be developed which would guarantee that the
airline would have no way of tracking responses back to any one participant. Internet-based
surveys will be the way of the future provided web sites are accessible and easy to use.
Pilots have advanced skills in this area and Generation Y flight attendants are technologically
adept. Flight attendants are also used to checking for information on the company’s intranet
system so this would provide an appropriate and effective method of data collection for both pilot
and flight attendant groups.
The design of online surveys should include asking for additional information in the Background Section. Pilots should be asked to provide flying hours logged on jet aircraft and other multi-engine aircraft. Years of service with the airline for which the research is being undertaken still provides a valuable indication of experience levels. Pilots could also be asked for years of service on jet aircraft with any other airline (as one pilot had written onto his/her questionnaire). Consultation with key Human Factors staff would indicate whether it would be appropriate to ask for age. This could possibly be done in age bands of five years which crews might be happier in answering. Helmreich and Merritt, (1998, p.256) did not ask for information on age, but did ask for information under the subheading Status; Line Pilot, Instructor, Check Airman, Management, Other. They also asked “how many years have you been involved in the flying industry in general?” The nature of a pilot’s background had also been asked (military or civilian). Questions from Dunbar et al. (1997) regarding time since recurrent training, and previous piloting experience should be included in the Background Information section on Surveys designed for flight attendants.

The questionnaire in Study 6 provided a good model for additional information on length of service “Years with airline ABC” and “Years flying on any other airline’s jet aircraft.” The researcher would then total these two answers, but information should be kept separate so the SPSS data file would read Years ABC, Years Other, and Total Years. This would provide different ways of examining the data if required. Again flight attendants working within Human Factors should be asked whether it would be appropriate to ask for age. It could also be considered whether it would be appropriate to ask for tertiary qualifications as a number of flight attendants are university graduates. It could also be appropriate to ask if any flying licenses are held as some of the flight attendants fly either fixed wing general aviation aircraft or helicopters. This could be contained in reports in the airline’s in-house publications and would increase the
knowledge of the wide skill sets that many flight attendants have. Such knowledge could help increase the perceived status of flight attendants held by other groups in aviation.

This research has shown that joint emergency procedures for flight attendants and pilots have been highly rated as a way of getting to know each other and understand each others job roles and responsibilities. This training should be continued and extended to other groups. For instance, it would be useful to enhance wider team coordination by including maintenance in such emergency drills in the mock-up aircraft. Examples of maintenance problems and catastrophic failures on aircraft have been provided throughout this thesis.

Some problems such as gear landing failures have led to crashes which could have been averted if pilots had not displayed “tunnel vision” when working to solve problems with faulty light bulbs (Chapter One; (Eastern Airlines Flight 401, NSTB/AAR-73-14; United Airlines flight 173, O’Hare and Roscoe, 1990, p.218). Catastrophic failures have also been discussed in detail in Chapter One; United Airlines flight 232 crashed at Sioux Gateway after losing all hydraulics after rotor fan blades crashed into the fuselage (NTSB, 1990); UA 811 underwent rapid decompression after the loss of a cargo door (this accident was also discussed in Study 5).

Joint EP training could discuss such accidents with the pilots and flight attendants giving the pilots information on actions to take when the green lights indicating the landing gear had not been locked did not appear on the instrument console. Scenario one from Study Five indicated that pilots would seek the help of maintenance while ensuring that one flight deck member had been designated to fly the aircraft monitoring terrain and fuel status. Flight attendants could be included as to what their role would be following catastrophic failures. Flight attendants had indicated that they were not familiar with exact aircraft terminology so maintenance and the pilots could discuss effective ways of communicating the conditions in the cabin without necessarily
using specialized terminology. Often the pilots are so busy dealing with the situation that they cannot spare a crew member to go back and report on the damage.

Maintenance crews fly to short-haul destinations for maintenance repairs or to provide safety training for maintenance employees. It is recommended that these employees fly on the flight deck jump seat whenever possible on such occasions. This is similar to the recommendation that flight attendants experience jump seat rides so they can better understand the pilot’s responsibilities and roles. Maintenance employees have provided invaluable assistance when flying as passengers.

For instance, on one reported occasion the Captain had announced that the flight would be delayed due to technical difficulties. The passengers had already been boarded and a senior maintenance engineer identified himself to cabin crew. This information was passed on to the Captain who invited the engineer to come to the flight deck. The Company confirmed that he was licensed to carry out such a repair and his assistance was gratefully received. Once the repair was undertaken and the documentation completed the aircraft could depart. The long-haul flight had been departing from an airport where servicing at that time was carried out by another airline. This way departure was expedited and the airline would have saved a significant amount of money. It was also an excellent example of teamwork between pilots, flight attendants and maintenance engineers. (Personal communication, B747 Captain, retired).

*The extension of future research beyond the aviation environment*

It is recommended that the model provided by CRM training within the aviation environment be extended to any safety critical areas with discrete groups. This would include the medical, rail
and maritime environments. Simulators based on hospital operating theatres have already been designed for training purposes. Bridge simulators are also in use for the maritime environment.

The aviation model has been applied to coordination and communication amongst surgical teams (Helmreich & Merritt, 1998). These authors described the similarities between the airline cockpit and the operating theatre believing that both cultures provide rich research environments. However, it was noted that the aviation industry has a greater emphasis on group formation than the medical organizations. The benefits of team training to the medical profession would need to be evaluated before general acceptance. Surveys to evaluate teamwork, leadership and stress recognition were recommended by Helmreich and Merritt (1998). These would be reinforced by observations of operating teams, and the analysis data related to patient outcomes.

Helmreich and Merritt (1998) cited a study by Helmreich and Schaefer conducted in 1994 in which this effect was replicated with surgical teams. The study was conducted in Switzerland, a country in which a low power distance culture operates. It was the surgeons, followed by the anaesthesiologists, the occupations with high status, who perceived the lowest power distance in relationships with work colleagues. It was found that the nurses perceived a higher level of power distance between themselves and the doctors.

A Surgical Safety Briefing and Checklist was designed by Martinsen (2009) in consultation with a team of experts (Doris, Twist, Gillespie, & Jennings). Fraser Health, a healthcare organization in Surrey, Great Britain, had requested that such a checklist be designed to take account of the specific needs within their healthcare area. The aim was to create more effective OR teams which would in turn increase patient safety. There were four main headings used:
1. Before Incision Checklist
2. Surgeon’s Team Briefing
3. Before Incision Checklist
4. Surgeon’s Team Debriefing

Job roles and responsibilities are clearly set out in the different subheadings of the checklist and a team member is required to callout that the item has been checked as required. The team briefing is led by the surgeon to set the tone of the OR environment and to ensure that each team member is certain of their roles ensuring everyone would be working towards the same outcome. The checklist notes the importance of introductions and thanking the team for good work at the end of the surgery. The term Team Resource Management (TRM) is used rather than CRM in aviation. This was defined as the team’s ability to identify and use all available resources to manage workload and stress and to communicate effectively with each other. This is clearly based on the aviation model of briefings and checklists. The Captain has a team briefing with the flight deck crew before briefing the lead flight attendant. The lead flight attendant then briefs the flight attendant team. Checklists are used by pilots working as a team to check all items have been covered before departure; pilot’s cross-check each item together, often pointing to the aircraft’s instrument panels to enhance safety.

A colleague who has conducted many observations of surgical teams in the operating theatre has commented that either the surgeon or the anaesthetist could lead the team depending on what the nature of the crisis was. This would involve precise teamwork and communication as unlike airline flights there is no ultimate leader. (Personal Communication, January 2010).
Summary

Joint CRM training for flight attendants provided this occupational group with the opportunity to better understand the pilot’s roles and responsibilities. The pilots also gained a better understanding of their colleagues’ work in the cabin. Discussion in the classroom and teamwork in the mock-up aircraft often shows the flight attendants that pilots do recognize that flight attendants are professional, well-trained individuals who have learnt to work together as a team in the cabin. This recognition of the flight attendants knowledge and skills can go a long way to lessen perceived differences between the two sub-groups of aircrew. The opportunity to have contact with a sub-group perceived to hold higher status and prestige is also important.

The importance of joint CRM training for both pilots and flight attendants is vital. The opportunity for both crews to meet helps to break down barriers and often preconceived perceptions. Joint emergency training using a combined exercise in a mock up plane followed by a joint debriefing is one way of achieving this. Both pilots and flight attendants gain a better understanding of each others role. This helps to align perception to reality.

It is essential that management at all levels agrees on the importance of joint CRM training and will therefore provide the necessary enthusiasm and financial support. CRM programmes need to be continually fine tuned from evaluation sheets given out to crew after each training session. It is also vital to recognize that the existing programme may need to be completely rewritten to meet current needs. Safety efficiencies from joint CRM training have resulted in an increased understanding of the importance of teamwork and accurate, timely communication between both pilot and flight attendant sub-groups. This could well prevent incidents from becoming accidents.

The six studies in this thesis have made a valuable contribution to aviation safety and firstly need to be communicated to the airline’s management teams. The flight attendants and pilots who
operate on the airline’s fleets also need to be informed of these results. It is recommended that short, concise summary files be collated from each study and put on the airline’s intranet system to be downloaded by interested parties. In addition it is recommended that articles based on the present study be written and submitted to peer-reviewed international journals for dissemination and discussion amongst the wider aviation and human factors communities.
Appendix A: Flight Safety Attitudes Questionnaire (FSAQ-Flight Attendants)

Study 1 (1998) and Study 2 (2000)

Airline ABC’s Safety Attitudes Survey Questions

Participants were asked to respond to the questions by placing a letter from the rating scale below.

Part 1 General Attitudes

<table>
<thead>
<tr>
<th>KEY</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Strongly Disagree</strong></td>
<td><strong>Disagree</strong></td>
<td><strong>Neutral</strong></td>
<td><strong>Agree</strong></td>
<td><strong>Strongly Agree</strong></td>
</tr>
</tbody>
</table>

1. Pilots see the flight attendants as valuable contributors to flight safety.

2. I am encouraged by other flight attendants to report any unsafe conditions.

3. Pilots notify the flight attendants about unusual situations.

4. I know enough aircraft terms to describe a safety concern to the pilots.

5. I am confident about reporting cabin condition defects.

6. Pilots encourage cabin crew to voice their safety concerns.

7. I think (the airline) has a positive safety culture.

8. Pilots and flight attendants work together effectively at (the airline).

9. I would take action if other crew did not fully complete their safety checks.

10. Cabin crew have a good understanding of the flight deck’s responsibilities and role.

11. Initial Flight Attendant training is relevant and prepares crew for flying duties.

12. Pre-flight safety checks are performed every time I step onto a new aircraft.

13. Pilots have a good understanding of the flight attendant’s job.

14. All ISD/Purser pre-flight briefings are relevant and thorough.

15. I am confident in my ability to properly assess potential hazards to safety.

16. I understand the need for “sterile cockpit” procedures.
17. ISD’s/Purser’s actively contribute to teamwork on every flight.

18. I receive a pre-flight operational briefing from the captain on every flight.


20. Crewmembers should not question the decisions or actions of the captain ‘except when they threaten the safety of the flight.

21. Passenger concerns about abnormal situations are always taken seriously by the crew. i.e. odd noises, smells, anything out of the ordinary.

22. If I am unclear about something, I am not embarrassed to speak up.

23. ISD’s/Pursers who encourage suggestions from crewmembers are weak leaders.

24. Crewmembers should monitor each other for signs of stress and fatigue.

25. I appreciate the high workload times within the flight deck.

26. Good communication and crew co-ordination are important for flight safety.

27. I get total operational support from my FA team on every flight.

28. My decision making ability is as good in an emergency as in normal flying conditions.

29. Often crew do not understand what I am communicating due to cultural differences.

30. Casuales and Temporary Cabin Crew always feel part of crew team.

31. In abnormal situations, I rely on my superiors to tell me what to do.

32. Pilots always understand the time constraints governing service delivery.

33. I tell crewmembers when my workload is becoming excessive.

34. I find it difficult to maintain a consistent level of alertness on all sectors.

35. I have confidence in the leadership abilities of my ISD/Purser

36. Inflight Services Management responds to the safety concerns of the flight attendants
Part 11 Background Information

GENERAL BACKGROUND:

Gender: (M or F) __________

Crew base: ___________________

Years as a ----- Flight Attendant: __________years

Native Language: ________________

CURRENT STATUS: (Please circle all that applies)

<table>
<thead>
<tr>
<th>ISD</th>
<th>ISC</th>
<th>FAPS</th>
<th>FAPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purser</td>
<td>FA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Full Time    Temporary    Casual    Part Time

The CRM Team appreciate your time and feedback.
Appendix B: A List of Crew Positions and Crew Levels on Different Aircraft Types

Cabin Crew Abbreviations on (Wide-Bodied Aircraft)

FSM                Flight Services Manager
ISD               In-flight Service Director who is also deputy FSM
FA                Flight Attendant
FAPS              FA premium service = business service
FAPC              FA pacific class = economy service

Cabin Crew Abbreviations on (Narrow-Bodied Aircraft – as appropriate)

Purser            Lead flight attendant on domestic/regional flights
ISM              In-flight Service Manager Lead flight attendant on domestic/regional flights
FA                Flight Attendant

Flight Deck Crew Abbreviations

Capt              Captain
FO                First Officer
SO                Second Officer

Crew levels on different routes and aircraft type

747

Cabin Crew

Total 14 including a Flight Service Manager (FSM) and an In-flight Service Director (ISD) who is also deputy FSM

6 of the Flight Attendants (FA) would be qualified as FAPS
6 would be qualified as FAPC

**Pilots -**

Captain plus First Officer for short-haul flights

Captain plus First Officer plus Second Officer for all other flights except for 2 routes- ABC and DEF to XYZ, which both carry an additional Second Officer

777

**Cabin Crew –**

Total 10 including an FSM and an ISD.

3 of the FAs would be qualified as FAPS

5 would be qualified as FAPC

**Pilots -**

Captain plus First Officer for short-haul flights

Captain plus First Officer plus Second Officer for all other flights except for two routes- ABC and DEF to XYZ, which both carry an additional Second Officer

767

**Cabin Crew –**

total 8 including an FSM and an ISD.

2 of the FAs would be qualified as FAPS

4 would qualified as FAPC

**Pilots -**

Captain plus First Officer for short-haul flights

Captain plus First Officer plus Second Officer for all other flights
A320 and B737 (regional flights)

Cabin Crew –

total 4 including an ISM or Purser (as appropriate).

1 of the FAs would be qualified as FAPS;

2 would be qualified as FAPC

Pilots -

Captain plus First Officer on all regional flights

A320 and B737 (domestic flights)

Cabin Crew - total 3 including an ISM or Purser (as appropriate).

Pilots -

Captain plus First Officer

NB: Cabin Crew leadership positions in Studies 1, 2, 3, 4, and 5 were known as:

ISD In-flight Service Director

ISC In-flight Service Coordinator who was also deputy for ISD
PILOT SAFETY ATTITUDES Questionnaire

for

International and National Pilots

Communication and Crew Coordination

As part of an ongoing investigation into communication practices and coordination between the flight deck and cabin, we are collecting data from Airline ABC pilots.

BEFORE YOU START, PLEASE READ THE FOLLOWING:

In order for the survey to be successful, it is important for you to answer the questions as honestly as you can.

There are no right or wrong answers, and often the first answer that comes to mind is the best.

Finally, do not write your name on the survey.

All individual responses are strictly confidential.

Part A
Communication and Crew Coordination Attitudes
Please answer the questions below by placing a letter from the following rating scale in the space provided.

<table>
<thead>
<tr>
<th>Scale</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Strongly Disagree</strong></td>
<td><strong>Disagree</strong></td>
<td><strong>Neutral</strong></td>
<td><strong>Agree</strong></td>
<td><strong>Strongly Agree</strong></td>
</tr>
</tbody>
</table>

___ 1. I see the flight attendants as valuable contributors to flight safety.
___ 2. I always notify the flight attendants about unusual situations.
___ 3. I always encourage cabin crew to voice their safety concerns.
___ 4. Pilots and flight attendants work together effectively at Airline ABC.
___ 5. Captains who encourage feedback from flight attendants are weak leaders.
___ 6. All cabin crew have a good understanding of the pilot’s responsibilities and role.
___ 7. I have a good understanding of the flight attendant’s job.
___ 8. Flight attendants appreciate the high workload times on the flight deck.
___ 9. I appreciate the high workload times in the cabin.
___ 10. I like all information from the cabin to be communicated through the ISD/ISC/Purser.
___ 11. Good communication and crew co-ordination are important for flight safety.
___ 12. I always understand the time constraints governing cabin service delivery.
___ 13. Flight attendants should not question the decisions of the captain and flight deck crew, except when they threaten the safety of the aircraft.
___ 14. Flight attendants always show respect to the captain and for the Command position.
Part B

Identify possible hindrances to effective communication between Pilots and Cabin Crew when working on the aircraft.

Describe possible solutions from the question above.

Part C  Background Information

Years as Airline ABC Pilot ________ years

Crew Position (Please circle all that applies)

- Captain
- First Officer
- Second Officer
- B747
- B767
- B737
- A320

Thank you for your time. Your feedback is appreciated.
What Would You Do?

Research Survey 2006

CRM communication and crew coordination CD

for

International and Pacific Pilots and Cabin Crew

Prize Draw
Hand in your completed questionnaire by May 19 2006
and be in to win one of three prize draws for a wonderful
hamper of goodies
Video Clip 1: Landing Gear Malfunction

Crew of a B737 unable to fully lower landing gear. Repeated attempts to dislodge port main gear unsuccessful. Landing made on starboard main gear only. Emergency evacuation on runway.

Please rate the following aspects of the scenarios on a scale of 1-7 (1 very low - 7 very high) Circle the appropriate rating

a) The degree of potential danger to the flight
   1                   2                     3                      4                          5                        6                            7

b) The volatility of events and their potential to quickly change the situation
   1                   2                     3                      4                          5                        6                            7

c) The complexity of problem solving skills required
   1                   2                     3                      4                          5                        6                            7

d) The importance of following the Captain’s commands without question
   1                   2                     3                      4                          5                        6                            7

e) The importance of the cabin crew’s role.
   1                   2                     3                      4                          5                        6                            7

f) The importance of interaction between flight deck/cabin crew
   1                   2                     3                      4                          5                        6                            7

Please note your actions in this particular situation.

1. What would you do first?

2. What would you do next?

Please turn to the next page for Clip 2.

Video Clip 2 Drunken PAX
Several PAX on an Easy Jet flight had been drinking before boarding and continued to drink on flight.

Please rate the following aspects of the scenarios on a scale of 1-7 (1 very low - 7 very high)

Circle the appropriate rating

a) The degree of potential danger to the flight
1 2 3 4 5 6 7

b) The volatility of events and their potential to quickly change the situation
1 2 3 4 5 6 7

c) The complexity of problem solving skills required
1 2 3 4 5 6 7

d) The importance of following the Captain’s commands without question
1 2 3 4 5 6 7

e) The importance of the cabin crew’s role.
1 2 3 4 5 6 7

f) The importance of interaction between flight deck/cabin crew
1 2 3 4 5 6 7

Please note your actions in this particular situation
1. What would you do first?

2. What would you do next?

Please turn to the next page for Clip 3.

Video Clip 3  Medical Emergency
PAX suffered heart attack. Emergency first aid given by cabin crew using the on-board defibrillator.

Please rate the following aspects of the scenarios on a scale of 1-7 (1 very low - 7 very high) Circle the appropriate rating

a) The degree of potential danger to the flight

b) The volatility of events and their potential to quickly change the situation

c) The complexity of problem solving skills required

d) The importance of following the Captain’s commands without question

e) The importance of the cabin crew’s role.

f) The importance of interaction between flight deck/cabin crew

Please note your actions in this particular situation.

1. What would you do first?

2. What would you do next?

Please turn to the next page for Clip 4.

Video clip 4 Explosive Decompression

En route from Honolulu – Auckland a B747 suffered a massive explosive decompression. No 3 engine failed. Crew made emergency descent.
Please rate the following aspects of the scenarios on a scale of 1-7 (1 very low - 7 very high)
Circle the appropriate rating

a) The degree of potential danger to the flight
   1 2 3 4 5 6 7

b) The volatility of events and their potential to quickly change the situation
   1 2 3 4 5 6 7

c) The complexity of problem solving skills required
   1 2 3 4 5 6 7

d) The importance of following the Captain’s commands without question
   1 2 3 4 5 6 7

e) The importance of the cabin crew’s role.
   1 2 3 4 5 6 7

f) The importance of interaction between flight deck/cabin crew
   1 2 3 4 5 6 7

Please note your actions in this particular situation.

1. What would you do first?

2. What would you do next?

Please turn to the next page for Clip 5.

Video Clip 5  Emergency Landing Honolulu

This continues on from Clip 4.
Cabin crew prepared for emergency landing. Aircraft lands Honolulu.

Please rate the following aspects of the scenarios on a scale of 1-7 (1 very low - 7 very high)
Circle the appropriate rating

a) The degree of potential danger to the flight
1 2 3 4 5 6 7

b) The volatility of events and their potential to quickly change the situation
1 2 3 4 5 6 7

c) The complexity of problem solving skills required
1 2 3 4 5 6 7

d) The importance of following the Captain’s commands without question
1 2 3 4 5 6 7

e) The importance of the cabin crew’s role.
1 2 3 4 5 6 7

f) The importance of interaction between flight deck/cabin crew
1 2 3 4 5 6 7

Please note your actions in this particular situation.

1. What would you do first?

2. What would you do next?

Please turn to the final page for Background Information.

Please write in your 6 digit alphanumeric code number in the boxes below. Keep a separate record of this number.

Part 2
General Background Information

<table>
<thead>
<tr>
<th>Years as -----Pilot ________ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crew Position (Please circle current position)</td>
</tr>
<tr>
<td>Captain                   First Officer           Second Officer</td>
</tr>
<tr>
<td>B747                   B777                 B767                      B737                          A320</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years as a ------flight attendant ________ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (M or F) ________</td>
</tr>
<tr>
<td>Crew Position (Please circle all current crew ratings)</td>
</tr>
<tr>
<td>ISD                        ISC              Purser               FAPS                      FAPC</td>
</tr>
<tr>
<td>B747                   B777                  B767                        B737                        A320</td>
</tr>
</tbody>
</table>

Thank you for your time. Your feedback is appreciated.

Please check that you have filled your answers on the both sides of this double backed page Survey. Thanks. Please check that you have filled in your 6 alphanumeric codes into the boxes at the top of the page to be in to win one of the 3 prize draws. Place the completed survey and the CD in the sealed envelope and place in the boxes located on the first page or alternatively you could drop the Questionnaire in the OCS and return to: Jane Ford C/- ------------ Airline Centre

Are there any further safety related communications issues that you would like to comment on in a confidential manner? (These do not have to be related to the specific video clips.)

INFORMATION SHEET ABOUT THIS PROJECT

The following sheet information is provided to assist you to decide whether or not to participate in this survey. This project is being undertaken as part of the requirements for a PhD in Psychology.
What is the Aim of the Project?
The purpose of this research is to investigate how CRM training programmes can be
developed, evaluated and refined in order to optimise communication and coordination
between the flight deck crew and flight attendants. The need for further research in this
area has been clearly identified and it is also viewed as one of the key themes to CRM
training. The potential benefits of the research include the development of improvements
in CRM training as well as adding to the body of knowledge on flight safety.

Who is being asked to Participate?
………………International and National Pilots and Flight Attendants.

What are You being Asked to do?
If you agree to participate, you will be asked to view a short CD and complete a
questionnaire. The viewing of the CD and completion of the questionnaire will take
approximately 20 minutes. You may choose to not participate or to withdraw from the
project at any time without any disadvantage to yourself.

What Use will be Made of the Data or Information Collected?
Data gathered from the CD/questionnaire, will be included as part of the PhD Thesis.
All data will be de-identified.

Results of this project may be published. You may request a copy of the results of the
project should you wish. Information will also be summarised in report format to
………………on ways to improve the effectiveness of CRM training courses.

Original data will be securely stored with only Associate Professor O’Hare and Jane Ford
having direct access to this.
………………will not have direct access to any of the original data. At the end of the
project any personal information will be destroyed immediately. The raw data from
which the results are derived will be retained in secure storage for five years, as required
by University policy, after which it will be destroyed.

What if Participants have any Questions?
If you have any questions about our project, either now or in the future, please contact:

Jane Ford or  Associate Professor O’Hare
Department of Psychology  Department of Psychology
University of Otago  University of Otago
jane.ford@xtra.co.nz  ohare@psy.otago.ac.nz
Mobile: 027 295 5893  Phone: (03) 479-7643
CRM SURVEY

September 10, 2007

To: Cabin Crew
From: HF Programme Manager

Dear Colleagues

Flight Operations sponsors research in a number of areas. One current project is being undertaken by Jane Ford for her PhD in Psychology through the University of Otago. Jane has been conducting a longitudinal survey on various crew and flight safety issues. Many of you have participated in those surveys. Thank you for your participation.

The survey results have provided and are continuing to provide us with valuable information on key factors that impact on our CRM and Human Factors Training.

Jane has been preparing the final stage of her research. This involves completing a short survey that asks for your responses to a very short number of questions.

I would appreciate you taking 15 minutes of your time to complete this survey. You will be asked to:

- Complete a very short questionnaire (Part A)
- Then read a short summary of an incident on one of the airline’s aircraft (Part B)
- Then following this reading complete another very short questionnaire (Part C)
- Place all parts of the questionnaire in the OCS addressed envelope for return

Parts B and C and the OCS envelope will be found in a separately labeled envelope inside this mail out. It is really important that you complete the short survey in this order. Please do not open the envelope labeled Parts B and C until you have completed Part A. Your cooperation here will be really appreciated and will provide valuable information.

All information is de-identified. Please do not put your name on the questionnaire.

There is no foreseeable harm or discomfort associated with this research and by participating you are seen as giving your consent.

Please return all the two questionnaires (Part A and Part C) to me, using the OCS addressed envelope, by November 12, 2007.

Thanks for helping with this research

Best Regards

Bob Henderson

021 717 569
INFORMATION SHEET ABOUT THIS PROJECT

The following sheet information is provided to assist you to decide whether or not to participate in this survey. This project is being undertaken as part of the requirements for a PhD in Psychology.

What is the Aim of the Project?
The purpose of this research is to investigate how CRM training programmes can be developed, evaluated and refined in order to optimise communication and coordination between the flight deck crew and flight attendants. The need for further research in this area has been clearly identified and it is also viewed as one of the key themes to CRM training. The potential benefits of the research include the development of improvements in CRM training as well as adding to the body of knowledge on flight safety.

Who is being asked to Participate?

| London based flight attendants | Auckland, Hamilton and Christchurch based flight attendants |

What are You being Asked to do?
If you agree to participate, you will be asked to complete a very short questionnaire, read a short incident summary, followed by completing another very short questionnaire in the order presented. **These take approximately 15 minutes in total.** You may choose to not participate or to withdraw from the project at any time without any disadvantage to yourself.

What Use will be Made of the Data or Information Collected?
Data gathered from the Survey, will be included as part of the PhD Thesis. All data will be de-identified. Your participation will be viewed as your consent to take part.

Results of this project may be published. You may request a copy of the results of the project should you wish. Information will also be summarised in report format to improve the effectiveness of CRM training courses.

Original data will be securely stored with only Associate Professor O’Hare and Jane Ford having direct access to this. [replacement text] will not have direct access to any of the original data. At the end of the project any personal information will be destroyed immediately. The raw data from which the results are derived will be retained in secure storage for five years, as required by University policy, after which it will be destroyed.

What if Participants have any Questions?

If you have any questions about our project, either now or in the future, please contact:

Jane Ford  
Department of Psychology  
University of Otago  
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or  
Associate Professor O’Hare  
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ohare@psv.otago.ac.nz  
Phone: (03) 479-7643
Cabin Crew Questionnaire (Part A)

Thank you for taking the time to complete this very short survey
It should take only approximately 3 minutes.

<table>
<thead>
<tr>
<th>Please rate your opinion on the following seven statements using the following scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Strongly Disagree  B Disagree  C Neutral  D Agree  E Strongly Agree</td>
</tr>
</tbody>
</table>

Please simply circle the appropriate rating from A to E from the above scale

1. On the whole I am satisfied with myself
   A               B             C              D             E

2. At times I think I am no good at all
   A               B             C              D             E

3. I feel I do not have much to be proud of
   A               B             C              D             E

4. I take a positive attitude towards myself
   A               B             C              D             E

5. I certainly feel useless at times
   A               B             C              D             E

6. All in all I am inclined to feel that I am a failure
   A               B             C              D             E

7. I wish I could have more respect for myself
   A               B             C              D             E

Years as a ZEAL flight attendant    …………………

Years as a flight attendant on any other airline’s jet aircraft    ...……………….

Gender (M or F)

Crew Position (please circle current rating)    ISM   FA   Crew Base

When completed please open the envelope labeled “Parts B and C” and continue
CRM SURVEY

September 10, 2007

To: Cabin Crew

From: HF Programme Manager

Dear Colleagues

Flight Operations sponsors research in a number of areas. One current project is being undertaken by Jane Ford for her PhD in Psychology through the University of Otago. Jane has been conducting a longitudinal survey on various crew and flight safety issues. Many of you have participated in those surveys. Thank you for your participation.

The survey results have provided and are continuing to provide us with valuable information on key factors that impact on our CRM and Human Factors Training.

Jane has been preparing the final stage of her research. This involves completing a short survey that asks for your responses to a very short number of questions.

I would appreciate you taking 15 minutes of your time to complete this survey. You will be asked to:

- Complete a very short questionnaire (Part A)
- Then read a short summary of an incident on one of the airline’s aircraft (Part B)
- Then following this reading complete another very short questionnaire (Part C)
- Place all parts of the questionnaire in the OCS addressed envelope for return

Parts B and C and the OCS envelope will be found in a separately labeled envelope inside this mail out. It is really important that you complete the short survey in this order. Please do not open the envelope labeled Parts B and C until you have completed Part A. Your cooperation here will be really appreciated and will provide valuable information.

All information is de-identified. Please do not put your name on the questionnaire.

There is no foreseeable harm or discomfort associated with this research and by participating you are seen as giving your consent.

Please return all the two questionnaires (Part A and Part C) to me, using the OCS addressed envelope, by November 12, 2007.

Thanks for helping with this research

Best Regards

Bob Henderson

021 717 569
INFORMATION SHEET ABOUT THIS PROJECT

The following sheet information is provided to assist you to decide whether or not to participate in this survey. This project is being undertaken as part of the requirements for a PhD in Psychology.

What is the Aim of the Project?
The purpose of this research is to investigate how CRM training programmes can be developed, evaluated and refined in order to optimise communication and coordination between the flight deck crew and flight attendants. The need for further research in this area has been clearly identified and it is also viewed as one of the key themes to CRM training. The potential benefits of the research include the development of improvements in CRM training as well as adding to the body of knowledge on flight safety.

Who is being asked to Participate?

| Based flight attendants | Auckland, Hamilton and Christchurch based ZEAL flight attendants |

What are You being Asked to do?
If you agree to participate, you will be asked to complete a very short questionnaire, read a short incident summary, followed by completing another very short questionnaire in the order presented. These take approximately 15 minutes in total. You may choose to not participate or to withdraw from the project at any time without any disadvantage to yourself.

What Use will be Made of the Data or Information Collected?
Data gathered from the Survey, will be included as part of the PhD Thesis. All data will be de-identified. Your participation will be viewed as your consent to take part.

Results of this project may be published. You may request a copy of the results of the project should you wish. Information will also be summarised in report format to improve the effectiveness of CRM training courses.

Original data will be securely stored with only Associate Professor O’Hare and Jane Ford having direct access to this. Associate Professor O’Hare will not have direct access to any of the original data. At the end of the project any personal information will be destroyed immediately. The raw data from which the results are derived will be retained in secure storage for five years, as required by University policy, after which it will be destroyed.

What if Participants have any Questions?
If you have any questions about our project, either now or in the future, please contact:

Jane Ford
Department of Psychology
University of Otago
jane.ford@xtra.co.nz
Mobile: 027 295 5893

or

Associate Professor O’Hare
Department of Psychology
University of Otago
ohare@psv.otago.ac.nz
Phone: (03) 479-7643
Cabin Crew Questionnaire (Part A)

Thank you for taking the time to complete this very short survey

It should take only approximately 3 minutes.

Please rate your opinion on the following six statements using the following scale

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Please simply circle the appropriate rating from A to E from the above scale

1. When someone criticizes _______ cabin crew it feels like a personal insult

2. I am very interested in what others think of _______ cabin crew

3. When I talk about _______ I usually say ‘we’ rather than ‘us’

4. _______’s successes are my successes

5. When someone praises _______ cabin crew, it feels like a personal compliment

6. If a media story criticized _______ cabin crew I would feel embarrassed

Years as a _______ flight attendant  .....................

Years as a flight attendant on any other airline’s jet aircraft  .....................

Gender (M or F)

Crew Position (please circle current rating)  ISM  FA  Crew Base  

When completed please open the envelope labeled “Parts B and C” and continue
Cabin Crew Questionnaire (Part B)

Instructions

Please read the following very brief outline of a situation that actually occurred in-flight and then answer the following questions in Part C.

“At night approximately 480 nautical miles west of XYZ on the ABC-DEF track, the ISM advised the Captain that there was fire in an oven in a galley. The area around this particular oven was very hot and when the door was opened a fire was observed in the back of the oven. The inside rear of the oven was glowing red. It was described as looking like Grandma’s bar heater.”

Cabin Crew Questionnaire (Part C)

Instructions: Thank you for now taking the time to complete this short final questionnaire

Please rate your opinion on the following eleven statements using the following scale

A  Strongly Disagree  B  Disagree  C  Neutral  D  Agree  E  Strongly Agree

Please simply circle the appropriate rating from A to E from the above scale

1. In an emergency I would take immediate action and then report to the ISM
   A               B             C              D             E

2. I am confident in describing an emergency technical problem to the pilots even if I do not know the correct technical terms
   A               B              C             D            E

3. It is important to realize the Captain is in overall command and may delegate communication and teamwork tasks
   A               B              C             D            E

4. It is essential that there is one person delegated to give clear, concise and regular updates to the Captain
   A               B              C             D            E

Please turn over and continue answering the questions
5. It is essential, especially in an aircraft emergency that we (cabin and pilots) work as a team, with clear leadership shown by the ISM
   A   B   C   D   E

6. It is important for everyone to show initiative and share ideas in cabin emergencies
   A   B   C   D   E

7. I feel more confident in reporting to the ISM than the pilots as we work together more frequently in the cabin and know each other better
   A   B   C   D   E

8. It is vital for one of the pilots (when directed by the Captain) to come back and see the technical emergency for themselves
   A   B   C   D   E

9. It is the pilots’ responsibility to keep the passengers informed of the situation and reassure them
   A   B   C   D   E

10. The most important factor in successfully dealing with an emergency situation is the expertise and motivation of the individual FA
    A   B   C   D   E

11. Joint EP training has helped me feel more confident in reporting cabin emergencies to the pilots
    A   B   C   D   E

Thank you for your time. Please place the completed questionnaire in the attached and addressed OCS envelope and return by November 12, 2007.
CRM SURVEY

September 10, 2007

To: International Cabin Crew

From: HF Programme Manager

Dear Colleagues

Flight Operations sponsors research in a number of areas. One current project is being undertaken by Jane Ford for her PhD in Psychology through the University of Otago. Jane has been conducting a longitudinal survey on various crew and flight safety issues. Many of you have participated in those surveys. Thank you for your participation.

The survey results have provided and are continuing to provide us with valuable information on key factors that impact on our CRM and Human Factors Training.

Jane has been preparing the final stage of her research. This involves completing a short survey that asks for your responses to a very short number of questions.

I would appreciate you taking 15 minutes of your time to complete this survey. You will be asked to:

- Complete a very short questionnaire (Part A)
- Then read a short summary of an incident on one of the airline’s aircraft (Part B)
- Then following this reading complete another very short questionnaire (Part C)
- Place all parts of the questionnaire in the OCS addressed envelope for return

Parts B and C and the OCS envelope will be found in a separately labeled envelope inside this mail out. It is really important that you complete the short survey in this order. Please do not open the envelope labeled Parts B and C until you have completed Part A. Your cooperation here will be really appreciated and will provide valuable information.

All information is de-identified. Please do not put your name on the questionnaire.

There is no foreseeable harm or discomfort associated with this research and by participating you are seen as giving your consent.

Please return all the two questionnaires (Part A and Part C) to me, using the OCS addressed envelope, by November 12, 2007.

Thanks for helping with this research

Best Regards

Bob Henderson

+64-21 717 569
INFORMATION SHEET ABOUT THIS PROJECT

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What is the Aim of the Project?
The purpose of this research is to investigate how CRM training programmes can be developed, evaluated and refined in order to optimise communication and coordination between the flight deck crew and flight attendants. The need for further research in this area has been clearly identified and it is also viewed as one of the key themes to CRM training. The potential benefits of the research include the development of improvements in CRM training as well as adding to the body of knowledge on flight safety.

Who is being asked to Participate?
Air New Zealand London based flight attendants
Auckland, Hamilton and Christchurch based ZEAL flight attendants

What are You being Asked to do?
If you agree to participate, you will be asked to complete a very short questionnaire, read a short incident summary, followed by completing another very short questionnaire in the order presented. These take approximately 15 minutes in total. You may choose to not participate or to withdraw from the project at any time without any disadvantage to yourself.

What Use will be Made of the Data or Information Collected?
Data gathered from the Survey, will be included as part of the PhD Thesis. All data will be de-identified. Your participation will be viewed as your consent to take part. Results of this project may be published. You may request a copy of the results of the project should you wish. Information will also be summarised in report format on ways to improve the effectiveness of CRM training courses.

Original data will be securely stored with only Associate Professor O’Hare and Jane Ford having direct access to this. will not have direct access to any of the original data. At the end of the project any personal information will be destroyed immediately. The raw data from which the results are derived will be retained in secure storage for five years, as required by University policy, after which it will be destroyed.

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Phone: +64 3 479 7643
# Cabin Crew Questionnaire (Part A)

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It should take only approximately 3 minutes.

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<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>A</td>
</tr>
</tbody>
</table>

Please simply circle the appropriate rating from A to E from the above scale

1. On the whole I am satisfied with myself
   
   A  B  C  D  E

2. At times I think I am no good at all
   
   A  B  C  D  E

3. I feel I do not have much to be proud of
   
   A  B  C  D  E

4. I take a positive attitude towards myself
   
   A  B  C  D  E

5. I certainly feel useless at times
   
   A  B  C  D  E

6. All in all I am inclined to feel I am a failure
   
   A  B  C  D  E

7. I wish I could have more respect for myself
   
   A  B  C  D  E

Years as an _________ flight attendant  ......................

Years as a flight attendant on any other airline’s jet aircraft  ......................

Gender (M or F)

Crew Position (please circle current rating)  FSM  ISC  FAPS  FAPC

When completed please open the envelope labeled “Parts B and C” and continue
CRM SURVEY

September 10, 2007

To: International Cabin Crew

From: HF Programme Manager

Dear Colleagues

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All information is de-identified. Please do not put your name on the questionnaire.

There is no foreseeable harm or discomfort associated with this research and by participating you are seen as giving your consent.

Please return all the two questionnaires (Part A and Part C) to me, using the OCS addressed envelope, by November 12, 2007.

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Who is being asked to Participate?
_________________________ based flight attendants
_________________________ flight attendants

What are You being Asked to do?
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Results of this project may be published. You may request a copy of the results of the project should you wish. Information will also be summarised in report format to_________________________ in ways to improve the effectiveness of CRM training courses.

Original data will be securely stored with only Associate Professor O’Hare and Jane Ford having direct access to this._________________________ will not have direct access to any of the original data. At the end of the project any personal information will be destroyed immediately. The raw data from which the results are derived will be retained in secure storage for five years, as required by University policy, after which it will be destroyed.

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Phone: +64 3 479 7643
Cabin Crew Questionnaire (Part A)

Thank you for taking the time to complete this very short survey
It should take only approximately 3 minutes.

Please rate your opinion on the following six statements using the following scale
A Strongly Disagree    B Disagree    C Neutral    D Agree    E Strongly Agree

Please simply circle the appropriate rating from A to E from the above scale

1. When someone criticizes cabin crew it feels like a personal insult
   A   B   C   D   E

2. I am very interested in what others think of cabin crew
   A   B   C   D   E

3. When I talk about I usually say ‘we’ rather than ‘us’
   A   B   C   D   E

4. 的成功 are my successes
   A   B   C   D   E

5. When someone praises cabin crew, it feels like a personal compliment
   A   B   C   D   E

6. If a media story criticized cabin crew I would feel embarrassed
   A   B   C   D   E

Years as an flight attendant  

Years as a flight attendant on any other airline’s jet aircraft  

Gender (M or F)  

Crew Position (please circle current rating)  FSM    ISC    FAPS    FAPC

When completed please open the envelope labeled “Parts B and C” and continue
Cabin Crew Questionnaire (Part B)

Instructions

Please read the following very brief outline of a situation that actually occurred in-flight and then answer the following questions in Part C.

“At night approximately 480 nautical miles west of XYZ on the ABC-DEF track, FA1 advised the Captain that there was fire in an oven in a galley. The area around this particular oven was very hot and when the door was opened a fire was observed in the back of the oven. The inside rear of the oven was glowing red. It was described as looking like Grandma’s bar heater.”

Cabin Crew Questionnaire (Part C)

Instructions: Thank you for now taking the time to complete this short final questionnaire.

Please rate your opinion on the following eleven statements using the following scale:

A  Strongly Disagree  B  Disagree  C  Neutral  D  Agree  E  Strongly Agree

Please simply circle the appropriate rating from A to E from the above scale

1. In an emergency I would take immediate action and then report to the FSM
   A               B             C              D             E

2. I am confident in describing an emergency technical problem to the pilots even if I do not know the correct technical terms
   A               B              C              D            E

3. It is important to realize the Captain is in overall command and may delegate communication and teamwork tasks
   A               B              C             D            E

4. It is essential that there is one person delegated to give clear, concise and regular updates to the Captain
   A               B             C              D             E

Please turn over and continue answering the questions.
5. It is essential, especially in an aircraft emergency that we (cabin and pilots) work as a team, with clear leadership shown by the FSM

6. It is important for everyone to show initiative and share ideas in cabin emergencies

7. I feel more confident in reporting to the FSM than the pilots as we work together more frequently in the cabin and know each other better

8. It is vital for one of the pilots (when directed by the Captain) to come back and see the technical emergency for themselves

9. It is the pilots’ responsibility to keep the passengers informed of the situation and reassure them

10. The most important factor in successfully dealing with an emergency situation is the expertise and motivation of the individual FA

11. Joint EP training has helped me feel more confident in reporting cabin emergencies to the pilots

Thank you for your time. Please place the completed questionnaire in the attached and addressed OCS envelope and return by November 12, 2007.