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Issues in cockpit/cabin communication and coordination

Rebecca D. Chute
San Jose State University

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San Jose State University, 1994

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**ISSUES IN COCKPIT/CABIN COMMUNICATION
AND COORDINATION**

A Thesis

Presented to

the Faculty of the Department of Psychology

San Jose State University

Kevin Jordan, Thesis Chairperson

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Rebecca D. Chute

May, 1994

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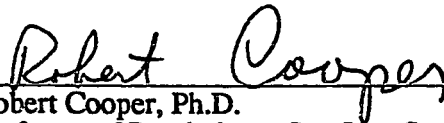
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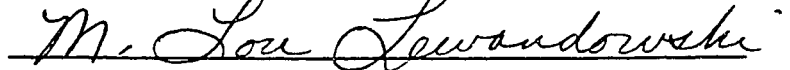


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ABSTRACT

ISSUES IN COCKPIT/CABIN COMMUNICATION AND COORDINATION

by Rebecca D. Chute

This thesis addresses the topic of cockpit/cabin communication and coordination in the commercial aviation industry. It examines misunderstandings, attitudes, and interactions between crew members and the possible impact on aviation safety. A survey was conducted of pilots and flight attendants at two U.S. airlines which revealed flight attendant confusion regarding appropriate conditions for violating the sterile cockpit regulation, as well as concern about the frequency of flight-deck briefings of the cabin crew and the frequency of crew introductions. Descriptive statistics were compiled for preferences regarding organizational unification, work-related differences with extended pairings, and other duty-related topics. The results of this study indicate that there are substantial differences in the attitudes of pilots and flight attendants; however, there is also agreement between them regarding potential organizational changes to reduce the isolation between them and maximize crew cohesion. Further research is recommended to determine the extent of the coordination problems and to recommend appropriate intervention strategies.

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I dedicate this thesis to the memory of Patricia Spomer of Trans International Airlines, who perished in Tenerife, for her inspirational role in my life.

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**Issues in Cockpit/Cabin Communication
and Coordination**

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Footnotes

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Abstract

This thesis addresses the topic of cockpit/cabin communication and coordination in the commercial aviation industry. It examines misunderstandings, attitudes, and interactions between crew members and the possible impact on aviation safety. A survey was conducted of pilots and flight attendants at two U.S. airlines which revealed flight attendant confusion regarding appropriate conditions for violating the sterile cockpit regulation, as well as concern about the frequency of flight-deck briefings of the cabin crew and the frequency of crew introductions. Descriptive statistics were compiled for preferences regarding organizational unification, work-related differences with extended pairings, and other duty-related topics. The results of this study indicate that there are substantial differences in the attitudes of pilots and flight attendants; however, there is also agreement between them regarding potential organizational changes to reduce the isolation between them and maximize crew cohesion. Further research is recommended to determine the extent of the coordination problems and to recommend appropriate intervention strategies.

Issues in Cockpit/Cabin Communication and Coordination

"Well, we have--the pilots and the flight attendants have respect amongst one another as friends but when it comes to working as a crew, we don't work as a crew. We work as two crews. You have a front-end crew and a back-end crew, and we are looked upon as serving coffee and lunch and things like that."

-Sonia Hartwick, surviving flight attendant, Air Ontario accident, Dryden, 1989
(Moshansky, 1991).

Traditionally, the commercial airliner has been separated into two geographical and sociological environments: the cockpit and the cabin. Each environment has distinct boundaries, space constraints, technological characteristics, and cultures. The cockpit is a confined area and the personnel involved perform highly-specialized tasks in an isolated, customarily authoritarian atmosphere. Those who work there generally do not come into contact with their customers. The cabin, on the other hand, is more spacious and the personnel working in it are more physically active and socially interactive than those on the flight deck. Additionally, the populations of these two crews have been separated by organizational and union barriers. It is these differences (and more) that contribute to misunderstandings and problems in coordination and communication on the part of airline crews in the performance of their duties. These issues can become even more apparent when, in abnormal situations, the two crews must unite and act as a cohesive team. Any impediment to crew cohesion could result in compromises to safety, as will be explored in this thesis.

The threat of terrorism and a new demography of passengers have added hazardous elements to the duties of the flight attendants. Prior to deregulation, air travel was an elite lifestyle restricted to the privileged few. Subsequently, competition has expanded the

opportunity for people of almost all socio-economic strata to avail themselves of this expeditious means of transportation. Some of these individuals do not subscribe to the genteel code of conduct as did their predecessors and can be unruly and even violent. Generally, the problems begin in the domain of the cabin crew. It then becomes incumbent upon both the flight deck and cabin crews to ensure that coordination is maximized and that communications are perspicuous.

There are different areas of responsibility for flight deck and cabin crews and, due to factors that will be examined in this study, two separate cultures in the aircraft. The captain is in charge of the operation of the aircraft and leaves the responsibility for the cabin to the flight attendants, until a problem is brought to his or her attention. Generally the crews function together with no major problems; however, communication is not always optimal and may even fall below standard requirements for safe operations. In the extreme, the crews can be antagonistic as seen in this excerpt from a NASA Aviation Safety Report System (ASRS) report by a captain on a flight from Denver to Dallas.

Asked to get crew meal during flight. Based on flight length and new copilot, requested flight attendant to bring meal to cockpit. Flight attendant refused to bring meal forward. Flight attendant waited until start of descent to bring meal forward. I wolfed down what I could of meal--copilot did not get a chance to eat. . . . ATC became very hectic and busy. Constant airspeed changes, vector headings, and altitude changes. . . Suddenly approach control said "Stop descent immediately. Unidentified traffic at 12:00." Did not see any traffic at 12:00, looked out left side of aircraft and saw light plane pass directly under in the dark. May have been near miss. During all the hectic action in the cockpit, well below 10,000', the flight attendant opened door, flooding cockpit with light and creating a distraction as trays were removed from the cockpit. The approach was unsafe. The captain is helpless to plan the approach anymore. The flight attendants ignore requests and directions

from the captain. They work for marketing department and don't hesitate to tell pilots they don't have to listen to them. On this flight, the flight attendant's blatant disregard of captain's request resulted in an unsafe approach. . . If the flight attendant had listened to captain's request to bring meals up, she would not have been in cockpit at low altitude causing a distraction. (ASRS No. 63881)

In the preceding example, there are clearly numerous communication and coordination problems. Moreover, it would appear that there is a level of animosity between the two crews that may be predicated on a lack of awareness and understanding of the duties of the other crew members during flight. From the captain's point of view, the flight attendant disobeyed his orders for a meal to be served immediately and exhibited a lack of concern for his well-being and, therefore, that of the flight. Additionally, she violated the "sterile cockpit" regulation by entering the cockpit below 10,000 feet to remove the meal trays. Furthermore, the division is intensified by the perception that the flight attendant is only answerable to the marketing department; therefore, the chain of command on board the aircraft is ineffectual. It should be noted that there is another side to this story to which we do not have access--that of the flight attendant involved.

There is ample evidence that a communication problem exists between the two crews and that this can have safety implications, as pointed out clearly by Kayten (1993). Kayten illustrates her point by including two examples of crew communication failures. The first was an Eastern Airlines L-1011 when, after all three engines failed, the passengers remained in the brace position for more than 10 minutes because the flight attendants were unaware of the amount of time remaining before impact. Her second example is that of an American Airlines inflight fire which shall be discussed in the section on psychological isolation.

In an extensive report on cockpit and cabin crew coordination, Cardosi and Huntley (1988) identified problematic aspects of cockpit-to-cabin communications such as the

notification to the cabin crew to prepare for takeoff, landing, and turbulence. Additionally, they isolated problems of notification of the timing and nature of emergencies to the cabin crew. Problems regarding cabin-to-cockpit communication established in their report included breaking the "sterile cockpit" rule and failure to convey the severity of a problem to the flight deck. The report also mentioned the issue of scheduling crews together and recommended joint training of flight deck and cabin crews. Most of the recommendations that the authors made were directed at FAA regulations and inspectors.

Historical Background

Two cultures are represented in the airline crews of today and some of the differences can be traced back to the origins of the professions themselves.

Pilots. The role of the commercial aviator of today bears little resemblance to that of his or her daredevil ancestors who were commissioned to deliver the mail from coast to coast in the 1920's. At that time, there were no airway maps, nor radio beacons to follow across vast expanses of land. Instead, farmers lit bonfires to guide the "flying postmen" through inclement weather and dark of night. Barnstormers, such as Jack Knight, were hailed as heroes for braving the elements in flimsy airplanes to speed the delivery of mail from San Francisco to New York in 33 hours 20 minutes (Taylor, 1951).

In 1925, a fledgling air carrier, Pacific Air Transport, was introduced to carry the mail between Los Angeles and Seattle. This route was considered one of the most dangerous in the country, since it involved flying over the Siskiyou Mountain Range. In the first winter alone, three of the company's ten pilots were killed in crashes. Despite the perils, people clamored to be passengers, alongside the mail sacks, on these flights. In 1927, Boeing Air Transport (BAT), a United Airlines predecessor, began passenger service in order to supplement revenue from the Post Office. BAT flew Boeing 40-A airplanes with room for two, and later four, passengers squeezed between the wings with the mail bags. Flying in these airplanes was still considered foolhardy by most of the

public since navigation consisted of flying below the clouds to watch for flashing beacons every 25 miles to stay on course.

Electronic aids, such as two-way radio communication and radio beacons, began to change the job of the pilot from a seat-of-the-pants flier to an engineer (Taylor, 1951). In the next generation of aircraft, a second seat was added for a co-pilot. The co-pilot assisted the pilot-in-command with flying the airplane and handed out box lunches to passengers unless bumpy weather precluded that task (or eating in general).

Flight attendants. In 1930, Steve Stimpson of BAT decided that passengers needed someone exclusively dedicated to them during a flight to pass out the lunches, pour coffee, and comfort them when airsick. He originally recommended hiring a Filipino boy for the job. However, a young nurse who had always wanted to be a pilot, Ellen Church, approached Stimpson with another idea. She proposed that Boeing should hire nurses and that she would find the nurses if Boeing would employ them. Stimpson felt it would be a great edge to have women flying on board those flights to show the public that air travel was safe after all. It did not escape him that stewardesses would be able to care for ill passengers and it would free up the pilots for flight duties. Stimpson convinced a reluctant Boeing management to give the idea a three-month trial. Pilots greeted the newest member of the crew with protests that they did not have time to take care of a "frail female" (Taylor, 1951, p. 71). However, after the three-month trial period, both management and the pilots were happy with the changes the stewardesses brought on board and, thus, the age of inflight passenger service dawned.

The first flight attendants, known as "skygirls," were professional nurses who dealt with airsick and apprehensive passengers. (FAA, 1991). Selection requirements were to be under 25 years of age, weigh less than 115 pounds, be under 5'4" tall, single, and, of course, female. Aside from serving box lunches to passengers, duties included swatting flies before takeoff and cleaning passengers' shoes during the flight.

Subservience and compliance were important attributes in the pioneering skygirls. A 1930 manual admonished them to "maintain the respectful reserve of the well-trained servant when on duty." Interactions between the pilots and stewardesses were guided by another rule to "treat captains and pilots with strict formality while in uniform. A rigid military salute will be rendered as they go aboard and deplane." (FAA, 1991). Passengers liked the attentive service that the stewardesses offered and airlines grew to view the skygirls as a marketing asset.

The glamorization of the job increased during the 1940's and peaked in the 1950's. Appearance standards steadily became more strict culminating in requirements including mandatory girdles, stockings and red nail polish. The travel aspects intrigued the media and they publicized the variety of destinations that the stewardesses traveled to and the famous people with whom they came into contact. While weight and height restrictions had a basis in necessity in the early days flying small aircraft where every pound and inch counted, airlines continued the tradition for marketing reasons.

Marketing became a driving force in the sexualization of flight attendant image during the 60's and 70's. Airline advertising departments began to woo the public, and businessmen in particular, with slogans such as " We really move our tail for you!" and "Fly me--I'm Cheryl!". Hot pants and Pucci jumpsuits replaced the conservative stewardess uniforms of the past, and the media had a field day with books such as *Coffee, Tea, or Me?* portraying the profession as a group of man-hungry party girls.

In airlines today there remain vestiges of the tough, courageous pilot and the subservient, yet glamorous, stewardess. This study examines some of the current characteristics of the two cultures and analyzes how the differences might lead to safety problems or other conflicts.

Personality Differences

There are basic personality differences between the two crews whether due to the selection criteria employed or the nature of the jobs. It may be that the myths perpetuated by the popular culture of the "macho pilot" and the "glamorous stewardess" cause a certain type of individual to self-select for positions in airlines. Additionally, the expectations of the public may reinforce the stereotypes.

America West facilitators utilized the Meyers-Briggs Type Indicator (MBTI) to explore differences in personality dimensions of pilots and flight attendants (Vandermark, 1991). They found pilots to be task-oriented, preferring a cognitive style of problem-solving based on logic and systems-oriented reasoning. Flight attendants, however, preferred an affective cognitive style and orientation to decision making.

Merritt (1993) in a study of crew member attitudes toward appropriate crew behavior, found large differences between U.S. pilots and flight attendants. Using multidimensional scaling, pilots' attitudes loaded heavily (.86) on a dimension that indicated self-reliance and personal responsibility for success or failure. While good crew coordination is seen as important, pilots exhibited less perceived need for pre-flight briefings, verbalization of plans, or coordination of cockpit and cabin crews. Three groups of US flight attendants all scored very low on this dimension (.21, .11, .08). The reverse was true on a dimension that emphasized good communication and the captain's encouragement of questions from other crew members. U.S. flight attendants scored .68, .75, and .85 while U.S. pilots scored .19, illustrating the differences in approaches to authority and teamwork, and perhaps the nature of their job.

While there is limited research on flight attendants, there is an abundance of research on pilot attributes. Novello and Youssef (1974a,b) found that pilots differ on many personality dimensions from the general population. They concluded:

It seems that piloting, regardless of the pilot's sex, either requires, attracts, and/or selects out the personality type that has been popularized for so long in song, movie, and verse; a person who is courageous and adventuresome, one who is oriented toward demonstrating competency, skill, and achievement; one who finds pleasure in mastering complex tasks; and one whose manifest sexual orientation is decidedly heterosexual. (1974b, p. 633)

Space constraints and demand characteristics of the job also impose some divergence between the two crews. The flight deck is a very confined area, contrasted with the cabin, and the pilots are isolated from interaction with others unless they venture into the other domain. Conversely, flight attendants interact with a great many individuals and employ a social orientation in the performance of their duties. The nature of the pilots' job is sedentary as opposed to flight attendants who are physically active. Traditionally, pilots have approached their job as a career; however, flight attendants have historically viewed theirs as a temporary job, even though many changed their minds once they had experienced it for a few years. Finally, piloting is male-dominated and considered a profession while being a flight attendant is female-dominated and considered an occupation. While the gender mix in both of these populations is changing, the identification with the dominant sex is still the prevalent view.

Sterile Cockpit

As a result of controlled flight into terrain (CFIT) accidents (Ruffell-Smith, 1968; Wiener, 1977), particularly EA 212 in Charlotte, the FAA initiated the "sterile cockpit" rule (FAR 121.542). This regulation states that no flight crew member shall perform "any duties during a critical phase of flight except those duties required for the safe operation of the aircraft." (Critical phases of flight include "all ground operations involving taxi, takeoff, and landing, and all other flight operations conducted below 10,000 feet, except cruise flight.") Furthermore, it states that no flight crew member may engage in any

activity during a critical phase of flight which could distract a crew member or interfere in any way with the proper conduct of the flight. As an example, "nonessential communications between the cabin and cockpit crews" were prohibited. It is this clause that has caused the greatest confusion in interpretation by airlines and crew members. Flight attendants, many already intimidated by the authority and mystique of the flight deck, are now expected to determine which situations are essential to the safe conduct of the flight. Rather than take the chance of being wrong and thereby breaking the law or at the least embarrassing themselves and perhaps subjecting themselves to a reprimand from the captain, they have not communicated valuable, safety-related information to the pilots. The Dryden accident, which shall be discussed, is a primary example of this problem.

Initially when the sterile cockpit law was instituted, it was the pilots who had created the distraction by conducting non-essential conversation, not the cabin crew. While this ruling was not the result of a problem caused by the cabin crew, the cabin crew were, nonetheless, affected and included. Additionally, there is no clear and easy way for the cabin crew to know the altitude of the aircraft. It appears that airlines have not resolved confusion, on the part of flight attendants, about knowing when in the flight sterile cockpit procedures are in effect and under what circumstances it is appropriate to interrupt them. In order to comply with the FAA, some airlines installed a warning light to signal the cabin crew not to enter the cockpit. Of course, this light is not visible to flight attendants in the back of the aircraft, especially on a widebody. [As a human factors note, one airline installed a *green* annunciator light on the cockpit door which was turned *on* when cockpit was sterile (Wiener, 1985). One can imagine the resulting confusion.] Cardosi and Huntley (1988) identified ten signals or procedures used to indicate the sterile cockpit. A problem they pointed out is that some carriers have more than one signal within the same airline. The signals included use of a bell chime, announcement, "no smoking" sign off (no longer applicable due to smoking ban on domestic flights), number of minutes after

takeoff and before landing, engine noises, or flashing the seat belt sign. The Federal Aviation Administration (FAA) did not specify what constituted a safety threat and there has been widespread perplexity among flight attendants regarding what hazards are critical enough to disturb the pilots. It is suspected by this author that many flight attendants decide to err on the side of caution and do not contact the flight deck when they may possess critical information.

Automation Implications

The advent of automation into the flight decks of the new generation of commercial aircraft has far-reaching implications. Most noticeably, the increased incorporation of automation has made possible the change in flight-crew complement from a three-person to a two-person crew, due to the capability of onboard computers to monitor aircraft systems. Those monitoring duties were previously the domain of the flight engineer (second officer). In emergency or irregular situations, it was also the responsibility of this crew member to physically inspect any problems that existed aft of the cockpit door. Now, however, in the two-person crew it is less likely (or advisable) that the first officer will be able to leave the cockpit for inspection purposes in an emergency. This will lead to an increased reliance on the cabin crew to diagnose problems, accurately transfer the information to and from the flight deck, make proper decisions with as much information as possible, and to efficiently execute the indicated procedures. A communication problem already existed between the two crews, but what was an advance in one field (automation) led to a retreat in another (crew communication). Automation exacerbated an existing problem.

Organizational Separation

As if there were not already enough barriers between the two crews, the companies and the unions encourage further division by disassociating the crews into different departments and unions. It is noteworthy that the pilots are usually under flight operations where safety is stressed, but the cabin crews are part of the marketing department where

service is emphasized. The segregation has historical roots which date back to 1930 and the inception of stewardess service. A quote from the BAT first stewardess training manual stipulates:

The pilots are from the Operating Department while the Stewardesses are from the Traffic Department so there is no real need for conversation or contact.

(Mahler, 1991, p. 47)

The stewardesses were also forbidden to conduct conversations with pilots on duty or to enter the field office except when necessary. Remnants of this historical philosophy still characterize some crew member interactions by avoidance unless absolutely necessary and distrust of motives for contact.

David Adams, Australian accident investigator, concluded regarding the impact of organizational separation of pilots and flight attendants:

If you look at almost any company, you will usually find that the cabin attendants and the flight crew are very very clearly separated. They work for different branches of the company in most cases. The culture is one of almost complete separation. Yet the fact of the matter is, in a safety situation, these two sections of the company have to work together. And the consequences of not efficiently working together quite often means a bunch of people get killed.

(Moshansky, 1992, vol. 3, p. 1087)

Training exaggerates the problem by creating gaps in the instruction that crews receive. As an example, through personal observation in a recurrent training class, flight attendants from one airline were trained for nine years that in an emergency they could expect to receive four critical pieces of information from the cockpit crew: type of emergency, signal to brace, signal to evacuate, and time available to prepare. To a person, the pilots had never heard of this and even had difficulty guessing what the four pieces of information might be.

Scheduling

Unions negotiate on behalf of their constituency, but since the crews have separate unions there is no uniformity of the contracts to coordinate issues such as scheduling, duty times, and hotels. In many airlines, the scheduling of crews is such that often the cockpit and cabin crews may see each other only briefly before a flight, if at all. While there are airlines which schedule crews together for the month, it is also the case that frequently crews split apart to join other crews during one day's schedule. This type of crew pairing strategy does not allow for a rapport to be established between the two crews. Additionally, while cabin crews typically board a flight 45 minutes before departure, pilots often join the flight minutes before, or during, boarding. Briefings, and often introductions, are therefore, precluded by this lack of availability. Consequently, there are implications in emergency situations when crew members must spring into action as a team but may not have met each other prior to the flight.

Research by Foushee and Manos (1981) supports the concept that familiarity plays an important role in the quality of flight operations. They found that post-duty flight crews, even though fatigued, performed at a higher operational level than pre-duty crews. In fact, there were no cases where pre-duty crews rated better than post-duty crews. This was attributed to the factor that those crews had increased familiarity, more accurate expectations, and comfort with each other's style of communication. It should follow that the entire flight crew would function at a higher level if they had an opportunity to develop a rapport and a smooth operating system.

Formal briefings and introductions can alleviate some of the detrimental impact of short crew pairings. A briefing can establish expectations, set the tone for crew interactions, address particular problems or requirements for a flight, and serve as a refresher for emergency and security procedures. At the very least, an introduction can set the tone and open the lines of communication for ongoing requests and clarifications.

Physical Separation

The cockpit door provides a physical barrier that exacerbates psychological differences and isolation. This geographical distinction means that neither crew can see or hear what the other is doing or become aware without a direct effort to make contact. The lack of contact results in little awareness on the part of either crew of the other's duties both during normal flight or in an emergency (Vandermark, 1991). This lack of awareness can result in unrealistic expectations in the performance of duties by the other crew. For example, a flight attendant may think the pilots are just sitting idly during cruise, when in fact, they are scanning the instruments, monitoring the radio frequency, or preparing for the approach. Conversely, the pilots may expect crew meals to be delivered at their request and be unaware of the high passenger service demands in the cabin, or how turbulence can affect the workload of the cabin crew.

Psychological Isolation

The factors cited above can result in psychological, as well as physical, isolation. Cabin crew reluctance to contact the flight deck can have disastrous consequences. In 1989, an Air Ontario Fokker jet crashed on take-off from Dryden due to ice on the wing. Before the aircraft was airborne, a flight attendant, Sonia Hartwick, saw wet snow building up on the wings but thought she should not call the cockpit because she had the feeling that pilots did not welcome operational information from flight attendants. In the past, she felt she had appeared stupid when relating safety concerns to pilots, due to their lack of responsiveness and disinterest. Hartwick testified she had the feeling that Air Ontario management was not supportive of flight attendants voicing operational concerns. She also placed an inordinate amount of faith in the pilots to be aware of every situation and that their professionalism and training would suffice. Additionally, two off-duty airline pilots saw the snow but were reluctant to inform the flight deck because they did not want to impose upon another pilot's authority due to "professional courtesy" (Moshansky, 1992).

The Commission of Inquiry concluded that lack of crew coordination contributed to the accident and that closer cooperation between pilots and flight attendants in operational safety matters was highly desirable. They recommended that CRM training be required of flight deck and cabin crews in all Canadian air carriers and made specific recommendations for the transfer of operational information between crew members, especially in hazardous weather conditions.

Flight deck crews are often skeptical when flight attendants report problems. In 1988, on approach into Nashville, an American Airlines flight attendant and an off-duty first officer notified the cockpit of smoke in the cabin. The captain was skeptical of their report of smoke as there had been a problem with the auxiliary power unit (APU) on a prior flight which resulted in fumes. This time the problem was the result of improperly packaged hazardous materials. Even when informed that the floor was becoming soft and passengers had been reseated, the cockpit crew persisted in refusing to acknowledge that there was serious jeopardy to the aircraft and their passengers. No inflight emergency was declared. Consequently the aircraft was not evacuated immediately on landing, exposing the crew and passengers to the threat of smoke and fire longer than necessary. The NTSB determined the cabin crew used CRM techniques well; however the cockpit crew did not. The NTSB found a "deficiency in communication between the cockpit and cabin crews and expressed concern about the reluctance by the captain to accept either crew member's report as valid or to seek additional information." NTSB recommendations were to "require joint cockpit and cabin crew training with respect to emergency procedures and that attention should be given to conducting drills where cockpit/cabin crew coordination and communication are practiced."(NTSB, 1988)

In a training video produced by Australian Airlines, David Adams reported on the Dryden investigation described earlier:

Flight attendants sometimes feel intimidated by the mystique surrounding the cockpit and believe their remarks will not be taken seriously. The natural difference in the two jobs, the different circumstances in which they work brings about a division. When this interferes with procedures, it is potentially dangerous. Often flight attendants feel prohibited from talking about technical matters and, quite justifiably, believe that flight crews don't regard such comments coming from them as legitimate. On the other hand, flight crews are so absorbed by what they have to do up front, that they can often feel isolated from what's going on in the cabin behind them. They risk disregarding crew and passengers as vital sources of information.

Operational Knowledge

It has become increasingly vital that cabin crews are knowledgeable concerning aircraft systems and architecture. Valuable time can be wasted in the inaccurate transfer of information, especially when pilots cannot leave the flight deck to validate the accuracy of the information. In the United Airlines Sioux City accident, a flight attendant called the cockpit and told the crew there was damage to the "back wing" (NTSB, 1992). The second officer proceeded to the cabin and looked at the wing, but the damage was to the horizontal stabilizer rather than the wing. The implications of an inadequate command of aircraft terminology and mechanical knowledge are potentially serious. Fortunately, in the Sioux City situation there was adequate time available and personnel in the cockpit to check the precision of the flight attendant's information. However, in a more time-critical situation, valuable minutes could be wasted re-diagnosing the problem or proceeding down the wrong solution path.

The Present Study

This research addresses some of the issues that Cardosi and Huntley identified as potential problems in cockpit/cabin communication. It additionally explores the general

characteristics of the two cultures that might be the basis of the problems. Attitudes may need to be revised and organizational structures redesigned in order to effect improved crew performance. This study explores factors that contribute to performance decrement on the part of those crews, and the current status of intracrew communication and coordination in two U.S. airlines.

In order to examine the status of intracrew interactions, the present study surveyed pilots and flight attendants from two United States airlines. Survey items addressed the topics covered in the introduction such as sterile cockpit confusion, joint preflight briefings and introductions, length of time crews spend together, attitudes about each other, and situational scenarios. For most items, the equivalent question was asked of both crews in order to detect differences in perceptions and behavior. In a few cases, a question was not relevant to both flight deck and cabin crews, such as a query regarding flight attendant-filed ASRS reports. Therefore, the question appears on flight attendant surveys only. Additionally, open-ended questions were included to provide free response and anecdotal data. These data are not included in the analyses.

Method

Subjects

The subjects in this study were 148 current line pilots and 92 flight attendants from two U.S. airlines who voluntarily returned surveys. Two hundred surveys of each type (airline and position) were distributed to the four groups of crew members for a total distribution of 800 surveys.

Analysis of the personal data for pilots revealed that the majority of pilots surveyed were males ($n = 144$) and the mean number of years as a pilot with the current airline was 7.33 ($SD = 4.79$). There was an equal distribution of captains ($n = 75$) versus first officers ($n = 69$) and second officers/flight engineers ($n = 4$). The mean number of total flight hours was 10,694 ($SD = 4067$). Fifty-two percent of the pilots received their

training in the military, while 48% received their training as civilians. Twenty-nine percent were on scheduling reserve while 71% were not.

An analysis of the flight attendant data revealed that about two-thirds of the flight attendants surveyed were female ($n = 65$) with the mean number of years as a flight attendant with the current airline as 6.73 ($SD = 3.32$). A similar percentage of flight attendants as pilots were on reserve (25%) as opposed to 75% who were not. In response to whether they view working as a flight attendant as a short-term job or long-term career, the majority (83%) view it as a career and 67% said their feelings about how long they would work as a flight attendant had changed since they were hired. These findings contradict the prevailing view that most flight attendants view their job as temporary, and therefore, do not take it seriously. Most flight attendants were qualified on three to five aircraft types with a mean of 4.13 ($SD = 1.05$).

Subjects were treated in accordance with the ethical standards and guidelines employed by NASA-Ames Research Center and San Jose State University Institutional Review Board. Confidentiality of individuals was protected.

Procedure

The surveys were distributed to a random sample of pilots and flight attendants. The amount of data was dependent on self-selection by those who chose to fill out the survey and return it. Each potential subject received the informed consent letter (see Appendix A), a copy of the survey (see Appendix B), and a stamped, addressed return envelope in his or her company mailbox. Subjects were instructed to complete the survey and return it in the provided envelope. Due to airline differences in terminology (America West calls their flight attendants "Customer Service Representatives) and training (Alaska Airlines refers to sterile cockpit issues as "safety of flight"), four versions of the survey were developed to accommodate those differences. The two basic versions (pilot and flight attendant) of the survey are included in Appendix B.

Results and Discussion

In order to compare differences between pilots and flight attendants, chi-square contingency tables were constructed for comparable items. There was no basis to predict differences between the two airlines and those potential differences are beyond the scope of the present study. Two airlines were used simply to increase the sample size and not for comparative purposes. Therefore, comparative analyses were confined to airline position (pilot versus flight attendant). Descriptive analyses were performed for noncomparable items and shall be reported under the topic headings.

Sterile Cockpit Confusion

Several items on the surveys investigated potential confusion among crew members regarding the sterile cockpit regulation. There was no significant difference between pilots and flight attendants regarding flight attendant awareness of times in flight that the cockpit is sterile. This would appear to be due to airline procedures that are uniform throughout each airline to indicate that the sterile cockpit conditions are in effect. From an analysis of the survey responses to items 4a and 4b, it is apparent that Alaska Airlines uses a chime in combination with a flashing seat belt sign to indicate that the cockpit is no longer sterile on takeoff and at the onset of the sterile period for landing. America West crews reported that number of minutes from takeoff is the guideline for the end of the sterile period, however 21% of the pilots responded that there was no way for the flight attendants to be sure. For landing, a coded public address (p.a.) announcement is the indication of the beginning of the sterile cockpit and there seemed to be no ambiguity about that as far as crew member responses. Since these procedures are unique to each airline which participated in this study, there is no basis on which to infer that the industry has designed concrete methods for flight attendants to detect sterile cockpit times inasmuch as there is no altimeter available to them in the cabin. Future research should survey other airlines to determine whether all

airlines have clearly delineated and consistent policies for the notification of the sterile cockpit onset and termination to the cabin crew.

There was substantial disagreement between pilots and flight attendants reporting the prevalence of flight attendant confusion regarding appropriate subject matter which warrants interruption of the sterile cockpit, $\chi^2(4, N = 239) = 14.26, p < .01$. Figure 1 illustrates the distribution of the responses by both groups. More than 50% of the flight attendants responded that they are "never" confused regarding what subject matter is appropriate to tell the flight deck during sterile times of flight. However, while 34% of the pilots agreed with them, 43% rated the frequency as a "2" on the 5-point Likert scale which could be interpreted as "rarely" or "less than half of the time."

Six scenarios were designed to investigate which subject matter flight attendants deemed appropriate to convey to the flight deck and what pilots want to know--especially in relation to the sterile cockpit. The pilots were given three options:

1. I would want the flight attendant to call the cockpit immediately with this information, even during sterile cockpit.
2. I would want the flight attendant to pass this information to the flight deck, but not during sterile cockpit.
3. I would not feel the information was important enough to tell the flight deck at all.

The flight attendants were given similar statements, but in the first person, about what they would do in each situation and were given an additional option:

4. I would tell the lead flight attendant and leave it to her/him to pass it on or not.

This choice was included to reflect the real-world and was interpreted to mean they would not contact the flight deck themselves.

Two findings emerged from this analysis. The first was in the following scenario: Three minutes before scheduled departure a flight attendant notices that catering didn't put

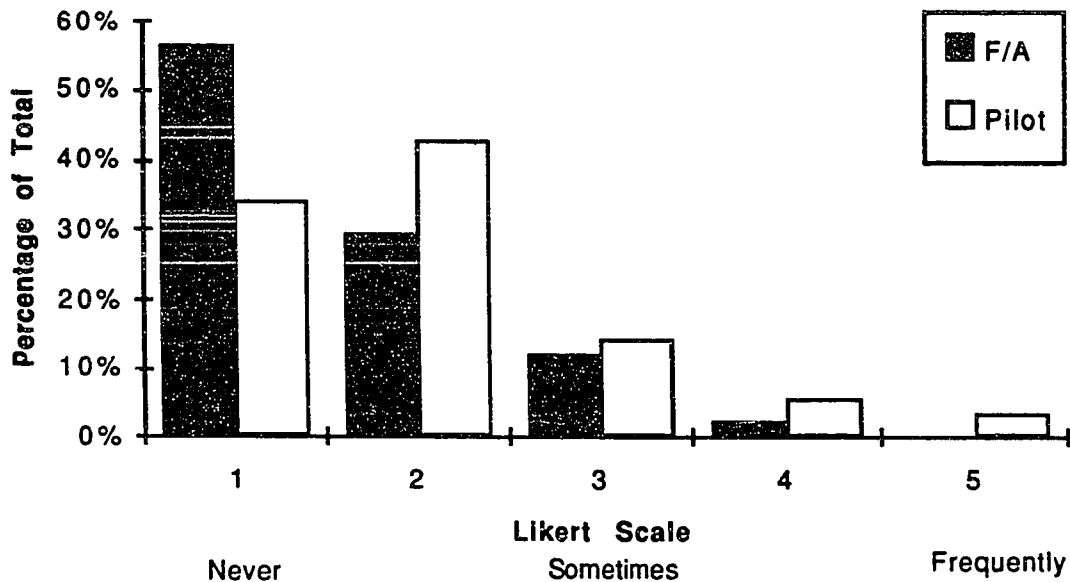


Figure 1. Frequency of flight attendant confusion regarding appropriate subject matter which warrants interruption of the sterile cockpit. Disparities in wording of the probe reflect company and training differences.

Alaska Pilots: How often do you encounter confusion among flight attendants regarding safety of flight issues which warrant interruption of the sterile cockpit?

America West Pilots: How often do you encounter confusion among CSRs regarding appropriate subject matter with which to interrupt the sterile cockpit?

Alaska Flight attendants: How often are you unclear under what specific circumstances (safety of flight issues) it is appropriate to break the sterile cockpit ?

America West Flight attendants: How often are you unclear regarding the appropriate subject matter that warrants interrupting the sterile cockpit ?

any milk on board. An analysis of the data revealed that 66% of the pilots wanted to be notified of this problem, 24% even if they had to be told during the sterile cockpit. However, only 4% of the flight attendants reported that they would tell the flight deck of this problem at all and not during the sterile cockpit period (see Figure 2 for the distribution of crew member responses). The results indicate pilots want to be kept informed regarding problems that affect the well-being of the flight and the happiness of the passengers and that factors, perhaps sterile cockpit and/or general reluctance, are preventing the cabin crew from the transfer of this information. Further research should be done to determine the bases of the hesitation and to investigate where other ambiguities in situational transference criteria exist.

Secondly, on all scenario items, the pilots consistently wanted to be informed more often than the flight attendants were willing to inform them. This may be due to three factors: The flight attendants may not understand the sterile cockpit regulation fully and err on the side of conservatism in the transfer of information fearing recriminations if they are mistaken. Additionally, cabin crews are sometimes intimidated by the status of the flight deck crews and do not want to bother them with what they consider to be trivial matters or incorrectly believe that the pilots are aware of all states of the aircraft at any given time. And finally, some flight attendants have been conditioned by negative experiences with pilots and avoid contact in general.

The sterile cockpit regulation seems to be a source of some confusion for both flight deck and cabin crews. It may be that neither crew has a clear-cut guideline for which information is appropriate for transference during sterile cockpit periods. It may also exacerbate existing reluctance on the part of flight attendants to contact the pilots. Clarification of the regulation by the FAA would assist crews in that determination and prevent valuable information from being withheld due to fear of breaking the law. As one captain put it:

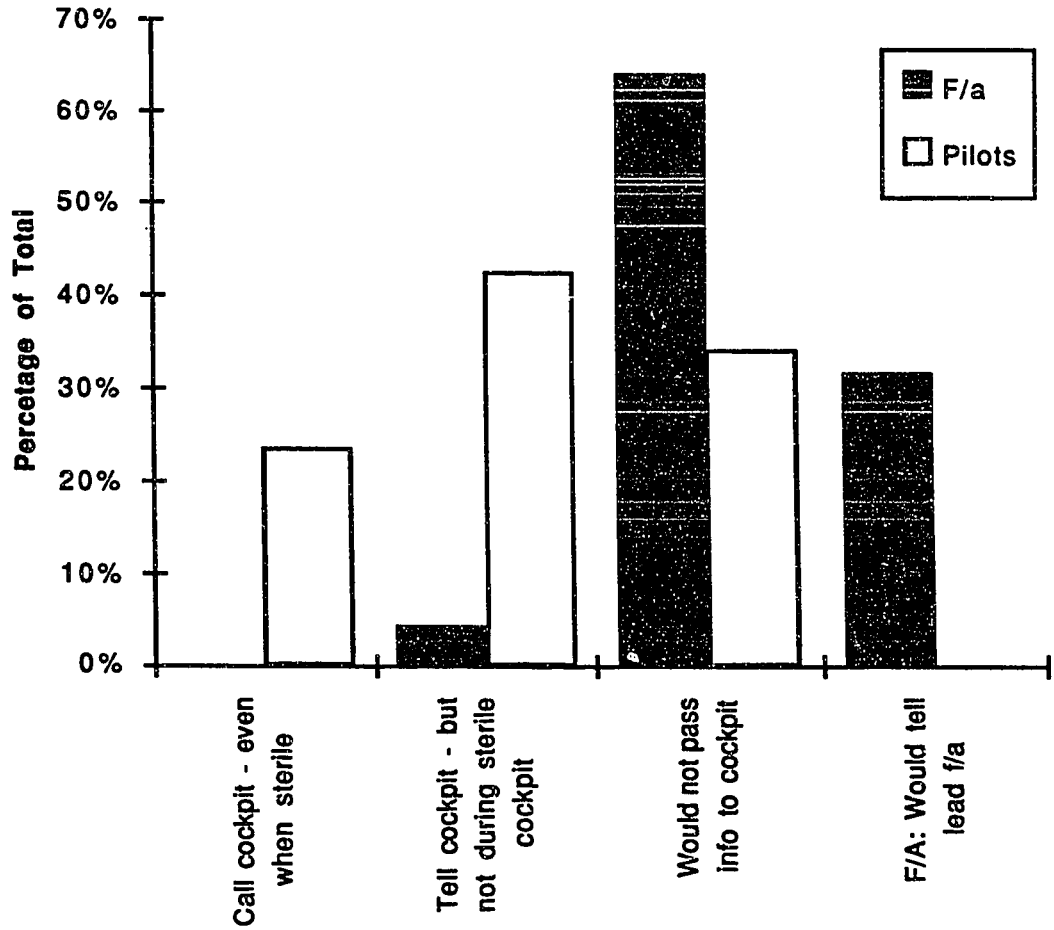


Figure 2. Responses to following scenario: Three minutes before departure, you/a flight attendant notices catering didn't put any milk on board.

I am well aware of the importance the FAA puts on this (sterile cockpit) time, however it is my experience that in the real world short interruptions do not compromise safety. I would rather hear about things that might not be important during this time than possibly miss some important information because someone was afraid to interrupt the "sterile cockpit".

Separation vs. Integration

In order to examine the interactions of flight crews and the degree of separation that exists, three types of segmentation were explored: organizational, physical, and psychological.

Organizational. In most U.S. airlines, pilots and flight attendants are separated into two departments that operate with little or no connection or communication between them. As cited earlier, the organizational isolation has its origins in the infancy of the airline industry. This segregation can lead to discrepancies in manuals and procedures and it can also create information gaps in common knowledge regarding mutual functions. The fragmentation fosters the feeling that there are two crews rather than one. In this study, the crew members were asked whether they felt it would be beneficial to have both pilots and flight attendants under one department (see Figure 3). Over 60% of both pilots and flight attendants, agreed that it would be in their mutual best interests if there were one department only for flight crews. While no statistical analysis of the reasons given has been done at this point, typical responses were as follows:

- Yes! Our jobs are to work together. Being in two different departments hinders communication and often times results in mis-information. (Pilot)
- I believe this would enable us to have more of a family effect: i.e. same goals and would make communication better. Our company builds walls between employees . . . by making everyone work in different groups. (Flight attendant)
- Commonality of manuals, procedures, training and communication. (Pilot)

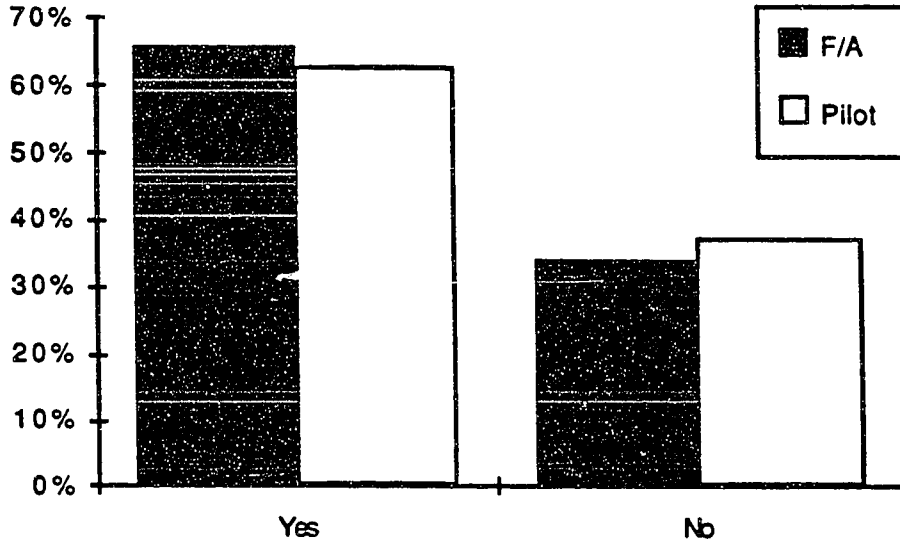


Figure 3. Crew member responses regarding whether it would be beneficial to have flight deck and cabin crews under one department. Wording of probe is same for both crews: *Do you think it would be beneficial to have both flight deck and cabin crews under the same department?*

- Even though our jobs are different, our goals are the same--safety and comfort of passengers. (Flight attendant)

Objections to combining the departments included that the jobs are dissimilar, with different needs and responsibilities. But many of those against unification cited that a more coordinated training effort would be advisable. Additionally, the lack of standardization of training, manuals, and procedures was perceived as a problem by many pilots and flight attendants. There were numerous complaints by pilots that new flight attendants are being trained to fear pilots and to stay away from them. While there is no way to validate those claims at this time, it is certainly disturbing and bears further investigation.

There are measures, such as introductions and briefings, which can alleviate some of the alienation and assist crews in conducting cohesive operations. Preflight briefings, while mandated in some crew manuals, seem to be the exception rather than the rule. When asked how often the cabin crew receives a formal briefing from the flight deck, there was substantial disagreement between the pilots and flight attendants, $\chi^2(4, N = 231) = 62.13, p < .01$. Figure 4 illustrates the difference in responses. Even if one allows for the fact that first or second officers rarely conduct briefings, there is still a difference in the perception of those surveyed regarding the frequency of crew briefings.

Crews were very clear regarding what elements of a briefing are important to them. They were asked to rank each element in terms of priority and could indicate that a topic was not important by leaving it blank. Figures 5 and 6 show the ranking and total of blanks by those surveyed. Flight attendants ranked emergency procedures as the most important and setting the tone as second while pilots reversed the order of those items. Both regarded information about crew meals as least important both in numerical ranking and number left blank. Items perceived as most important elements of a briefing are not a part of a normal printed briefing form that some airlines utilize which usually include flight time and weather information. These results underscore the need for airlines to provide the

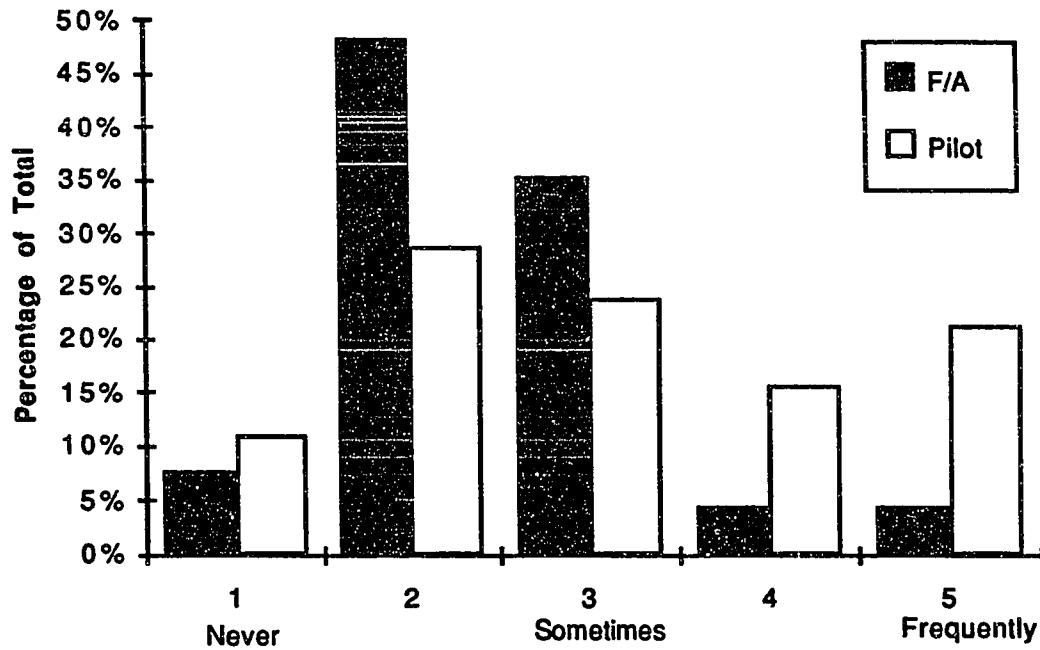


Figure 4. Frequency of flight deck briefings of the cabin crew.

Pilots: *How often do you brief your cabin crew?*

Flight Attendants: *How often do you receive a formal briefing from the flight deck?*

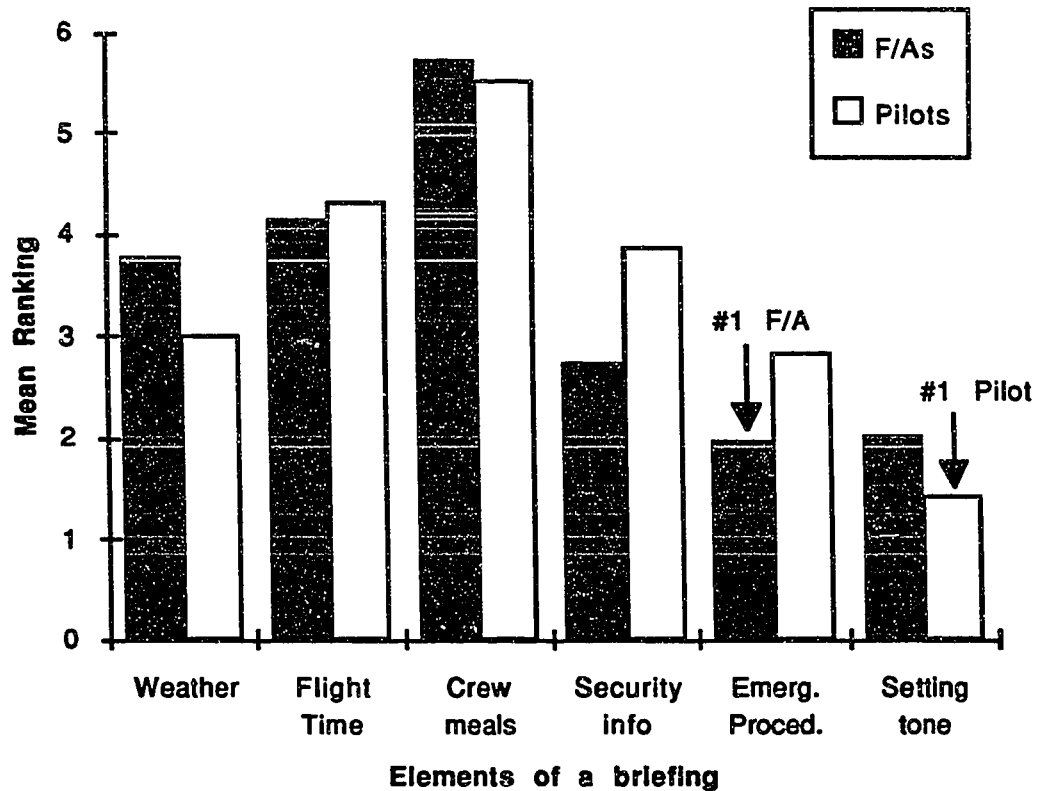


Figure 5. Elements of a briefing ranked in order of importance. Note that lowest rankings equate as most important.

Pilots: *What are the main points that you try to communicate (if it is the first flight of a pairing)? Please rank the following with "1" for the most important, "2" for the next most important, etc. (You may leave an item blank if you do not feel it is important.)*

- _____ a. Weather
- _____ b. Flight time
- _____ c. Crew meals
- _____ d. Security information
- _____ e. Emergency procedures.
- _____ f. Setting the tone for crew communication
- _____ g. Other _____

Flight attendants: *What are the main points covered in a briefing that you consider to be very useful? Please rank the following with "1" for the most important, "2" for the next most important, etc. (You may leave an item blank if you do not feel it is important.) (Listing same as above)*

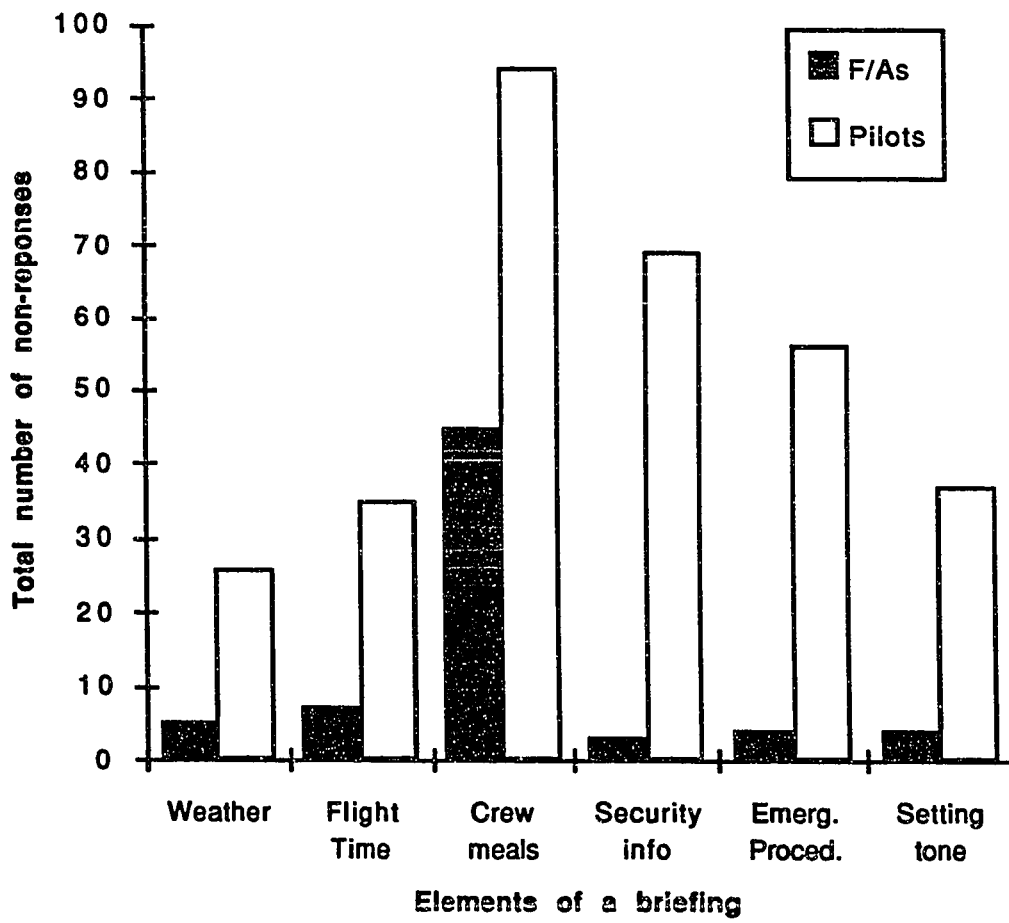


Figure 6. Totals of items left blank indicating no importance in a briefing.

time for crews to familiarize themselves with one another, the expectations of each during a flight, and any unusual circumstances pertaining to that flight. Failing adequate availability of time to perform a preflight briefing, introductions allow a rapport to be established and open the door for more complete information exchange as time permits.

Items 7a and b probed the frequency of flight attendant-initiated introductions and pilot-initiated introductions respectively. Once again there was considerable disagreement between pilots and flight attendants regarding the frequency of introductions [$\chi^2(4, N = 239) = 21.73, p < .01$ and $\chi^2(4, N = 229) = 30.11, p < .01$]. Forty one percent of the flight attendants stated that they initiated introductions frequently contrasted with 16% of the pilots reporting on flight attendant introductions. Furthermore, 59% of the pilots reported that they initiate introductions to the cabin crew frequently contrasted with 30% of the flight attendants reporting on pilot introductions. See Figures 7 and 8 for histograms of the comparisons. Flight attendants repeatedly request pilot briefings and introductions as the following indicate in completing the sentence "I like it when pilots . . .

- hold briefings—or at least introduce themselves and establish communication.
- introduce themselves and give a short briefing regarding communication, etc. It shows respect.
- introduce themselves, give us a briefing on what they like to do in emergencies. Let us know about any problems that may arise including weather and delays.
- introduce themselves and talk a little before a flight. That way you know who you're depending on.

Additionally, pilots also request that flight attendants go out of their way to introduce themselves although to a lesser extent.

Scheduling. Compounding the organizational obstacles, is the fact that crews often work together for only one or two flights of a sequence. They can work with as many as four or five different crews in one day. Although there are schedules in some

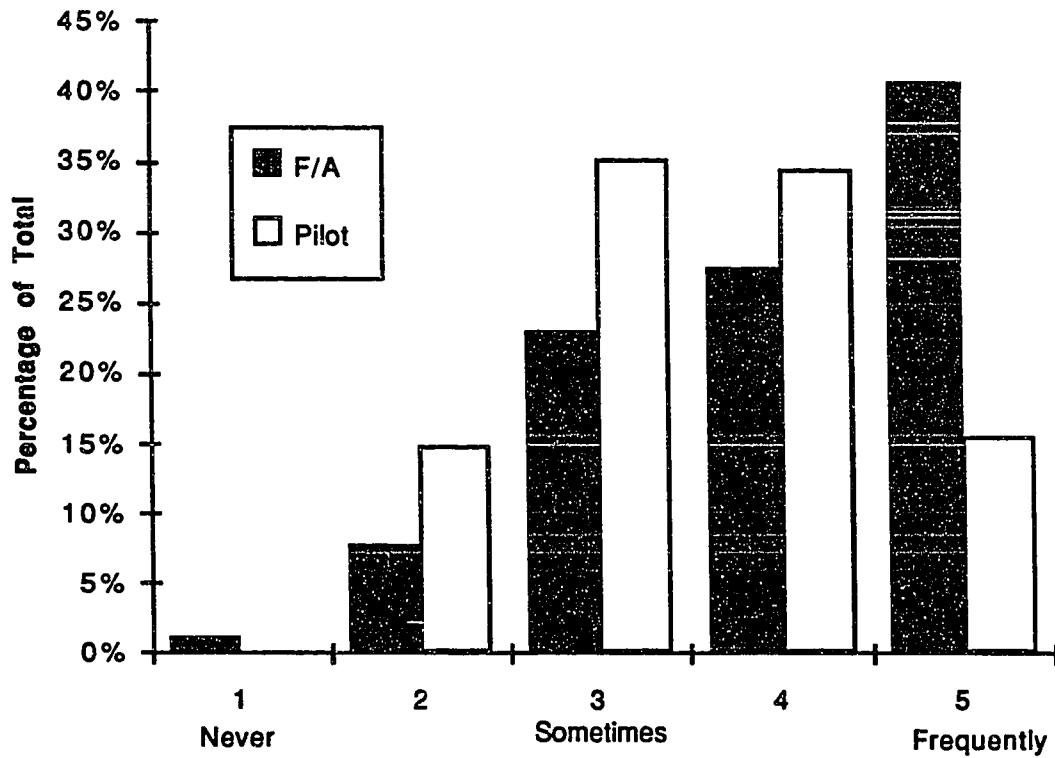


Figure 7. Frequency of flight attendant-initiated introductions to the cockpit crew.

Pilots: *How often do flight attendants introduce themselves to you?*

Flight attendants: *How often do you introduce yourself to the cockpit crew at the beginning of a flight sequence?*

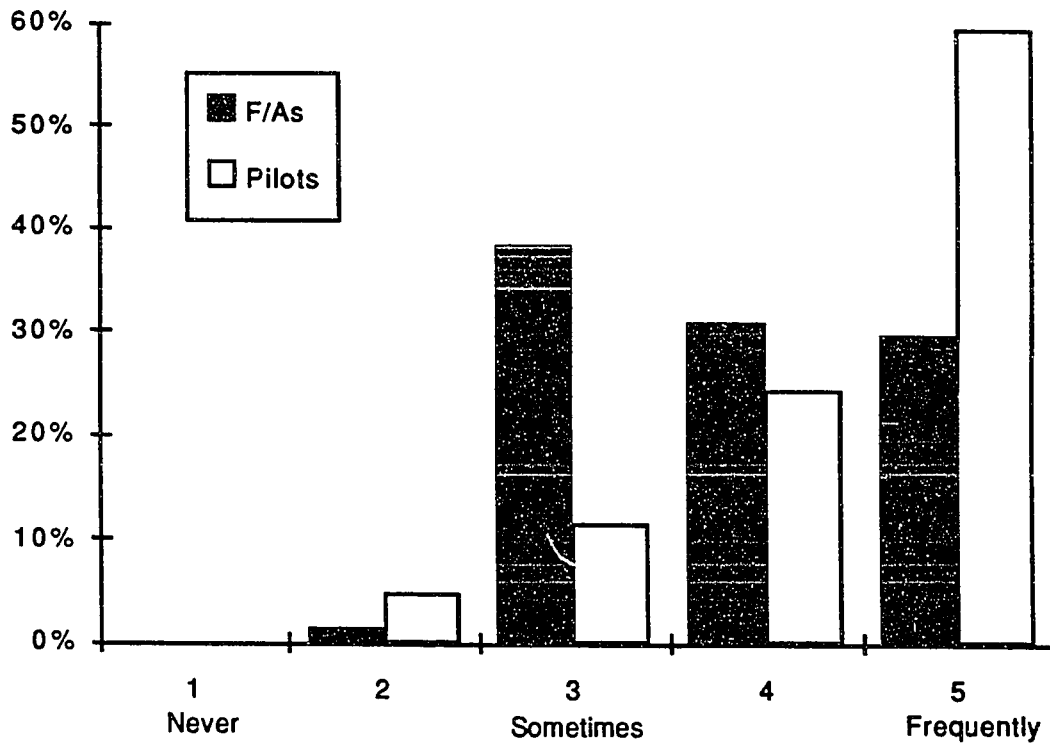


Figure 8. Frequency of pilot-initiated introductions to the cabin crew.

Pilots: How often do you introduce yourself to the cabin crew at the beginning of your flight sequence?

Flight attendants: How often do the pilots introduce themselves to you?

airlines where a crew may fly all of the trips in a month together, it would appear to be the exception in the industry rather than the rule. Different union contracts for flight attendants and pilots with different work rules and duty periods intensify the dilemma.

If the findings of Foushee and Manos (1981) that operationally crews improve with contact can be extended to the entire crew, it would follow that the quality of the working interactions would improve with exposure to each other. The subjects in this study were queried whether they notice any work-related differences when they are paired with the same crew for several legs, as opposed to one or two legs, of a trip. In support of the research of Foushee and Manos, the majority of crew members (77% of flight attendants, 71% of pilots) said that they do notice differences in the quality of interactions.

Representative comments regarding what the differences are included:

Flight attendants:

- Increased level of confidence and support.
- You know who is who. You know how the FD crew flies - what is normal and what is not. You can depend on them for the things they do, e.g. Capt. Jones always tells us if it's turbulent, he taxies fast so be aware, his landings are hard, etc.

Pilots:

- Cockpit and cabin crews learn what to expect from one another. Set routines, likes and dislikes, etc.
- Carryover procedures and problems are understood, i.e. weather problems, passenger problems, delays, mechanicals etc.
- Better communication and working relationship. More openness between crew.

Overall, the results of this analysis indicate that crew members prefer to have enough time to establish a smooth working relationship with one another. Their responses indicate that there are safety implications, especially in emergency situations. Further

research needs to be done to measure the quantity and quality of interaction that occurs with greater familiarity and the impact on aviation safety.

Physical separation. The cockpit door provides a physical barrier that results in a lack of awareness of each crew's normal duties. From that lack of awareness spring misperceptions about what the other crew is doing and also a feeling that there are two crews, each with their own responsibilities and that there is no overlap. As one pilot put it: "I don't like it when flight attendants feel that the door between us separates us and that we have separate duties that are not related." Because of the lack of physical proximity, there is no visual contact unless one crew member enters the other's territory. Pilots may be completely unaware of problems in the cabin such as the severity of turbulence in the rear of the aircraft when it is fairly mild up front.

In a question regarding the frequency of turbulence without warning (asked of flight attendants only) 87% rated those occurrences "sometimes" (3) or greater on a 5-point Likert scale. While there is no central tracking system of flight attendant turbulence injuries, the available data indicates that a problem exists that should be addressed. In 1992, at one major air carrier there were 206 turbulence-related injuries to flight attendants, many resulting in broken bones, crushed ankles, and back injuries (As reported in training session, 1993). In the second quarter of 1993 at another major carrier, there were 36 reports of turbulence-related injuries, 26 of which resulted in injuries solely to flight attendants (As reported in an airline memo, 1993).

In a related question, flight attendants were asked how frequently they call the cockpit and ask for the seat belt sign to be turned on if turbulence occurs and the flight deck has not turned it on themselves. The responses were fairly evenly divided across each of the five categories on the Likert scale, (see Figure 9). The results indicate that there is still

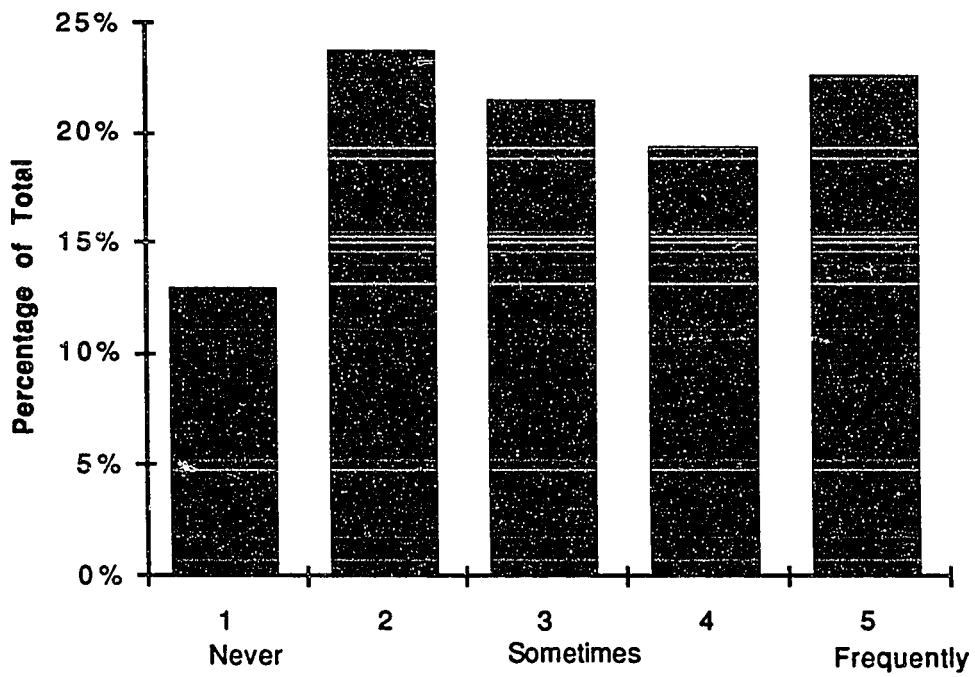


Figure 9. Frequency of flight attendant calls to cockpit to turn on seat belt sign during turbulence if it has not already been illuminated.

Flight attendants only: *If turbulence occurs and the flight deck does not turn on the seat belt sign, how often do you call them and ask for it to be turned on?*

substantial hesitation on the part of the cabin crew to contact the flight deck even in conditions that may jeopardize their safety. Future research is advised to determine how pervasive the problem is throughout the airline industry. A cause for concern is a response from a pilot completing the sentence "I don't like it when flight attendants: Tell pilots to turn on seat belt signs." Perhaps all crew members need to be enlightened regarding the extent of the problem and pilots reminded that turbulence can be far worse in the back of the aircraft than where they are sitting. As one flight attendant commented,

I can't tell you how many times I have been standing and gotten thrown around because of the turbulence. I know they (pilots) don't always know about it in advance. (But) I have had a flight deck insist that we do service when we could not stand without holding on to something.

There are countermeasures for the lack of awareness of crew members' duties which include joint training and cockpit jumpseat rides for flight attendants. At present, most airlines do not permit flight attendants to ride in the cockpit for takeoff and landing citing economic reasons. However, many pilots who responded to the survey requested that flight attendants be allowed, or required, to fly one or two legs in the cockpit jumpseat to familiarize themselves with the normal procedures and workload, and to learn more about the operation of the aircraft. Some pilots also suggested that they should have some cabin training themselves and perhaps work one flight in the cabin. This exchange of experiences could be invaluable in resolving many of the misperceptions and distrust that exist between the two crews. It is possible that many crew members would avail themselves of the opportunity to sample life on the other side of the cockpit door and would do so on their own time or as a part of recurrent training in order to minimize the economic impact on the airline.

Joint CRM training has been initiated at some airlines and has been met with favorable reactions from crew members who participated in it. While no numerical analysis

has been performed on the data, many subjects suggested that joint training would be beneficial and should even be mandated by the FAA. At one airline represented in this survey, joint training was conducted for one year. Several crew members remarked that it was a good program and should be reinstated. The other airline has a popular CRM program for the pilots, and those crew members requested it be extended to the cabin crew. At the very least, joint training classes give the opportunity for crews to see each other as human beings with concerns about the professional conduct of their jobs rather than "ogres" or "airheads." At the most, the opportunity to learn about the intricacies of the other job might inspire loyalty and renewed dedication on the part of employees whose job is the safety of the traveling public.

Psychological Isolation. As was apparent in the ASRS incident cited in the beginning of this thesis, there is some evidence of hostility and animosity between the flight deck and cabin crews. While the results of questions targeted at the frequency of those problems yielded no significant evidence of ongoing problems, some of the open-ended responses reflect problematic attitudes on the part of both crews. According to one pilot:

Even though many of our flight attendants are very attractive I have little respect for those who think their job is to stand around and be God's gift to men. Doing nails, primping, fixing hair, etc. should be done away from passengers. We don't need "Barbie dolls" who don't want to break a nail.

A flight attendant completed the sentence "I don't like it when pilots . . ."

jump on at the last minute. Don't back us up in situations. Make us feel stupid and, therefore, afraid to ask them questions on something that we may wonder (whether it) is dangerous on the aircraft.

Both crews repeatedly ask for respect from the other crew. The pilots want respect for the years of hard work and dedication that it has taken for them to get to the position they maintain. They would also like to be kept informed of the status of all non-routine

situations in the cabin--with the caveat that flight attendants use good judgment in high workload times of flight. The flight attendants want to be acknowledged for the professionalism with which they do their jobs and would like some credit from the pilots for knowing some things about the aircraft, even though they admit they would like more training in that regard. While this topic will be addressed further in the section on automation effects, the following illustrates the attitudinal problem well as reported by a flight attendant:

A passenger informed me that a piece of the wing was separating. Upon inspection, the metal covering was separating from the wing close to the flap. The flight deck said it was on the flap and was supposed to do that, even though I repeatedly described the problem accurately. The pilots told me if I checked the other wing I would see the same thing happening. I went back to the flight deck to tell them it was not the same and that what appeared to be insulation material was showing. I made four visits to the pilots and was not taken seriously. Upon landing (about 20 min. later) the pilots checked it out and made a joke about not believing me. The plane was grounded and the next flight was canceled. I really resented the pilots' attitude.

Passenger Disruptions

Despite the absence of questions directed at passenger problems on the survey, an alarming number of examples of intoxicated, unruly, and mentally disturbed passengers was reported as problematic. Flight attendants pointed out the need for support from the flight deck crew when these situations are encountered. There is no existing data on the magnitude of this problem, but *prima facie* evidence would indicate a substantial increase in recent years. Examples of responses from the surveys illustrate the need for a comprehensive program designed to prevent and effectively manage such problems. The first is from a pilot:

Several instances of disorderly, combative, drunk, or otherwise hostile customers hassling F/As during boarding or prior to pushback. . . . pilot not told or given adequate information. Good communication . . . could have helped a lot and precluded later problems in the air with same passengers.

The next incident is reported by a flight attendant:

I had a drunk, very unruly pax who was threatening me. I called the cockpit and told them I needed assistance. The captain said he would send the second officer back and didn't. Again I called after he pinned another FA to the wall and still no help.

Some examples are reported as good communication, however, they underscore the need for research to examine the extent of passenger behavior problems and the responsibility of gate agents in safety of the flight issues. The following are reported by flight attendants:

- Pilot overheard gate agents talking about boarding an extremely drunk passenger just 'to get rid of him'. Pilot told us and asked us to check passenger out and tell him if we wanted him on board. I went up to see this man and passenger could barely stand up, was incoherent, and reeked of booze from ten feet away. I told captain 'No way.' and captain went up and dealt with gate agents who kept insisting to put passenger on because it was the last flight of the day. Captain did not allow it.
- Passenger intoxicated. Threatened passenger(s) with gun. I notified F/O, moved passengers to rear of aircraft until we landed in Oakland. Captain never questioned my decision that security should be called.
- One evening all the F/As on a particular flight from MZT to SFO had a problem with a woman who was verbally abusive, angry, and demanding. On the stopover

in SFO, we met with the captain and all agreed that this woman was not fit to fly the next leg.

The following are accounts from pilots:

- A passenger was boarded who was acting strangely (laying face down in the aisle). My discussions with the flight attendants concluded in us removing her from the flight. The passenger was subsequently placed on the next flight to our destination. That next crew was not made aware of her previous behavior or of her being removed from our flight. They had to divert enroute to have her removed from the aircraft because she was climbing over the seat backs and beating her head against the windows.
- We had a problem passenger who was harassing the F/As. They kept us well informed. I warned him he would meet authorities in Seattle if he did not cease his behavior. He did not and he was arrested in Seattle. Turns out he was a convicted felon wanted in Washington and Alaska.

Gate agents are appearing to play a more important role in the prevalence of behavior problems on commercial airlines. The pressure to ensure on-time departures and to please the customer may be contributing to an unsafe flight environment. In one airline, unruly passengers have been met at the destination by gate agents who apologize to the passenger if he/she had an unpleasant flight and reward the behavior with a free ticket for use in the future. Once again, the safety of flight is subverted by the desire of marketing and sales to have every possible paying customer on board, regardless of the hazard they pose to the flight. The following ASRS report filed by a pilot says it well:

Flight attendant called and said a man was acting in a strange manner in back of the aircraft. As she was speaking he started to physically attack her. He started screaming obscenities and headed toward the cockpit. When another f/a tried to stop him, he either kicked her or pushed her aside. It took six passengers to

restrain him. . . . We diverted to Omaha. Omaha police removed the passenger from the flight. One f/a was taken to the hospital for x-rays. The passenger had boarded in Salt Lake City with another crew. He acted strange enough that the passenger agent and a supervisor talked to him about going from Denver to LaGuardia with us. I assumed he had walked off the aircraft in Denver because the supervisor and agent never came to the cockpit to tell me about the passenger. When I asked the first f/a about him, she responded the passenger supervisor said he was OK and going to behave himself. Unfortunately, this was not the case. I think a lot of ground people (read passenger agents) simply want to shut the door on the problem and have it fly out of town and leave it to the flight crew to handle in the air. This can lead to a very dangerous situation in the air. (ASRS No. 204390)

Passengers have always been a challenge to cabin crews and certainly there have long been problems. The confined space and lack of control bring out the worst in some people and the stress is sometimes manifested in unruly, and even violent, behavior. It appears that the frequency and magnitude of passenger outbursts may have increased in recent years. Sociological considerations may have amplified other stress factors that already existed for the problematic passenger. It may be that an increase of violent behavior in the culture is leading to behavior on aircraft that merely reflects the tendency of individuals to react more strongly to stimuli than in the past. Further research and documentation of passenger incidents should be conducted in order to conclude the extent of the problem and the contributing factors.

Efforts are now under way to collect data on cabin incidents, such as turbulence injuries, unruly passengers, and cockpit/cabin coordination issues in a common database. The FAA is compiling a cabin safety database at the Civil Aeromedical Institute in order to have a central source for cabin incidents. Additionally, the NASA ASRS database has been disproportionately deficient in reports from flight attendants. In a question on the present

survey asked of flight attendants only, 82% said that they had never heard of the reports while another 9% responded that they were not aware that flight attendants could file them. Clearly, a valuable source of information has been absent from this highly-regarded system. A campaign is being launched at this writing to raise the awareness of flight attendants about ASRS and encourage their participation in it.

Mechanical Knowledge

With the transition of aircraft fleets to the two-person flight deck, the cabin crew will progressively be more relied upon for the transfer of operational information. In this study, flight attendants were queried as to their confidence in their ability to describe mechanical parts or malfunctions of the aircraft. The results revealed an almost even distribution across the 5-point Likert scale, (see Figure 10). However, since 58% responded "moderately" or less there is considerable room for improvement in the training of theory of flight and basic aircraft systems. Cabin crew have numerous opportunities to assist the flight deck in the awareness of mechanical problems as the following excerpts from pilots will verify:

- A flight attendant reported to me an unusual vibration in the aft cabin. (She apologized for bothering me.) We reported it, and thought we got it fixed. It appeared again and she once again called me (during the next leg). I grounded the aircraft at the next stop. The engine had failed internally - it would not have made the next leg.
- During taxi-out the f/a's in rear of stretch DC-8 (another airline) informed Captain that they had heard a 'thump' during taxi. Captain called for inspection team out by the runway. They discovered a broken wheel rim and flat tire.

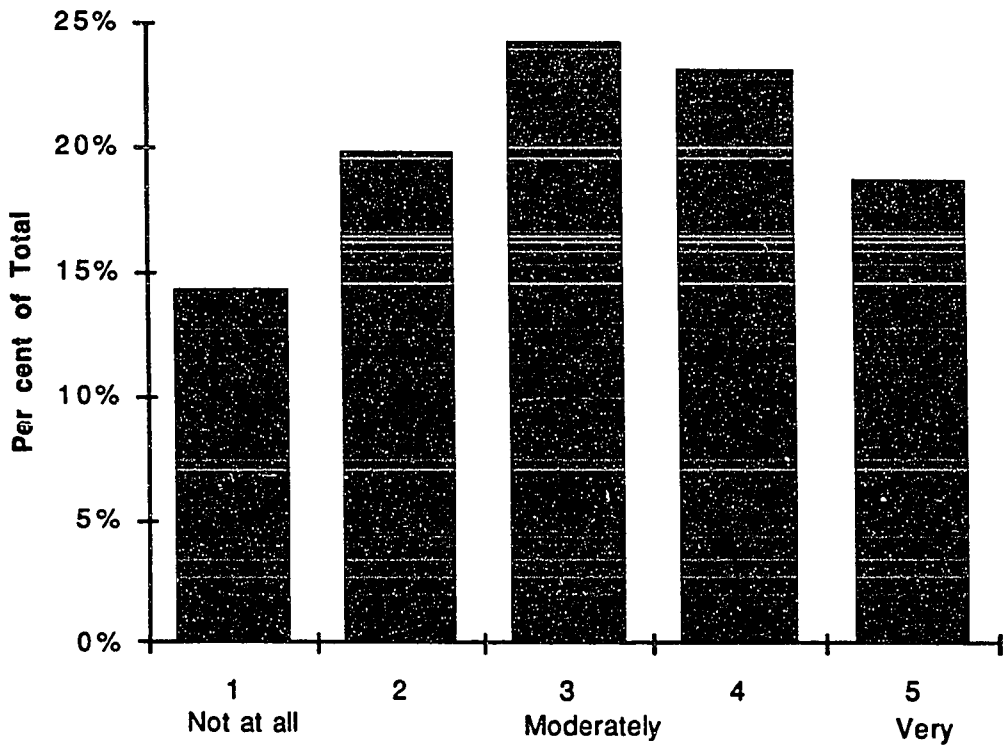


Figure 10. For flight attendants only: *How confident are you about your ability to accurately describe to the pilots parts or malfunctions of the aircraft that are visible to you (such as the flaps or the horizontal stabilizer)?*

The following was reported by a flight attendant:

F/A reported excessive oil spillage 727-200 tail engine. Missed on walk-around.
Found broken oil line.

The data indicated that flight attendants can be useful in the detection of mechanical anomalies. Furthermore, it seems that many flight attendants have not been informed regarding the consequences to the carrier of referring to landing as "hard" or implications to the flight deck crew of referring to turbulence as "severe." More research should be conducted to assess the training that airlines currently give flight attendants in operational matters and to determine what information should be included in flight attendant training programs. As recommended by Moshansky (1992) in the Dryden investigation, other appropriate subject matter could include assertiveness training and sensitivity to times in flight when interruptions can create a distraction.

Conclusion

The results of this investigation indicate that there are some areas of concern in cockpit/cabin communication. Clearly, flight deck and cabin crews feel they would benefit from a more cohesive approach by airline management to coordinated training and operational procedures. Joint CRM training classes would give flight crews an opportunity to enlighten each other about specific duty issues and concerns. Cockpit familiarization rides for flight attendants would assist their awareness of flight deck operations and ameliorate the avoidance that is based on myths and mystique. Mandatory briefings and introductions and the necessary support thereof by the airlines would assist crews in establishing a rapport that would increase flight safety. In the interim, it appears that any effort to show respect and support of the other crew by pilots or flight attendants would be appreciated and rewarded by increased cooperation and, therefore, a more effective safety team.

The results of this research indicate that the role of flight attendants in aviation safety have been minimized by government agencies and air carriers. Moreover, airline hull losses have stabilized at as low a rate as can be expected for some time (Boeing, 1992). Additionally, the survivability of the accidents that do occur has increased with the implementation of superior aircraft construction technology. Consequently, it is incumbent upon government agencies to encourage and fund research into survivability issues in order to optimize the safe egress of passengers and flight crews when the inevitable accidents do occur.

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Appendix A. Informed Consent Letter

College of Social Sciences • Department of Psychology
One Washington Square • San José, California 95192-0120 • 408/924-5600 • FAX 408/924-5605

May 26, 1993

Dear Crewmember:

I am a researcher in the Flight Human Factors branch at NASA-Ames Research Center, Moffett Field, CA. I would very much appreciate your help in conducting a study of cockpit/cabin communication and relationships. Your professional experience and feelings are very valuable to us and the time you spend in completing this survey with thoughtful answers will provide meaningful data for the recommendation of training and operations standards for the entire airline industry. Additionally, the results of this study should increase our understanding of the complex relationships that exist both on and off the aircraft. Attached is a questionnaire asking about your experiences as a crew member. Will you please spend some time completing the survey and send it back as quickly as possible in the envelope I have provided?

You should understand that your participation is voluntary and that choosing not to participate in this study, or in any part of this study, will not affect your relations with the airline that employs you, NASA, or San Jose State University.

There are no risks in participating in this study, and the benefit will be to have a potential impact on future airline safety guidelines.

The results of this study may be published, but any information that you provide will remain anonymous and strictly confidential.

If you have any questions about this study, I shall be happy to talk with you. I can be reached at NASA-Ames at (415) 604-0771. If you have questions or complaints about research subjects rights, please contact Serena Stanford, Ph.D., Associate Academic Vice President for Graduate Studies and Research, at (408) 924-2480.

Thank you for your time and participation in this research! It is greatly appreciated!

Yours truly,



Rebecca D. Chute

Concur:



J. Victor Lebacqz
Chief, Flight Human Factors Branch
NASA-Ames Research Center

Appendix B. Survey Forms

ALASKA AIRLINES FLIGHT ATTENDANT SURVEY

*** PERSONAL DATA ***

Gender (check one) Male Female

Number of years with the company _____

Number of years as a flight attendant _____

Are you a reserve flight attendant? Yes No

Are you a relief flight attendant? Yes No

On how many aircraft types (including variants) are you currently qualified? _____

What is the percentage of time that you prefer to act as lead flight attendant? _____%

What factors influence your choice? _____

In your case, is this a short-term job or a long-term career? Job Career

Have your feelings about how long you will be a flight attendant changed since you were hired? Yes No

If so, how? _____

↳ QUESTIONS ↳

For the following questions, please circle the number or letter that corresponds to your experience. Thank you.

→ 1. How well do you think that cockpit/cabin communication and coordination is working in your airline?

1 2 3 4 5
Poor Average Excellent

→ 2. Are you ever unsure whether the aircraft has passed 10,000 feet in order to determine whether the cockpit is under sterile flight rules?

1 2 3 4 5
Never Sometimes Frequently

→ 3. How often are you unclear under what specific circumstances (safety of flight issues) it is appropriate to break the sterile cockpit ?

1 2 3 4 5
Never Sometimes Frequently

→ 4a. How are you aware of sterile cockpit conditions on climb-out?

- a. Chime
- b. P.A. announcement
- c. Number of minutes from take-off.
- d. Annunciator light outside cockpit door.
- e. Flashing of seat belt sign.
- f. No way to be sure.
- g. Other _____

4b. How are you aware of sterile cockpit conditions on landing?

- a. Chime
- b. P.A. announcement
- c. Number of minutes from landing.
- d. Annunciator light outside cockpit door.
- e. Flashing of seat belt sign.
- f. No way to be sure.
- g. Other _____

→ 5a. How often have you inadvertently entered the cockpit during periods of high pilot workload?

1 2 3 4 5
Never Sometimes Frequently

5b. How comfortable are you with your knowledge of when periods of high pilot workload generally exist?

1 2 3 4 5
Not at all Somewhat Very

→ 6. How often do you think you could recognize the faces of the cockpit crewmembers in an emergency?

1 2 3 4 5
Never Sometimes Frequently

→ 7a. How often do you introduce yourself to the cockpit crew at the beginning of a flight sequence?

1 2 3 4 5
Never Sometimes Frequently

If not frequently, what is the primary reason? _____

7b. How often do the pilots introduce themselves to you?

1 2 3 4 5
Never Sometimes Frequently

→ **8a. How often do you receive a formal briefing from the flight deck?**

1 2 3 4 5
Never Sometimes Almost Always

8b. How useful are the briefings they give?

1 2 3 4 5
Not at all Moderately Very

8c. What are the main points covered in a briefing that you consider to be very useful? Please rank the following with "1" for the most important, "2" for the next most important, etc. (You may leave an item blank if you do not feel it is important.)

- _____ a. Weather
- _____ b. Flight time
- _____ c. Crew meals
- _____ d. Security information
- _____ e. Emergency procedures.
- _____ f. Setting the tone for crew communication
- _____ g. Other _____

→ **9. Do you notice any work-related differences when you are paired with the same flight deck crew for several legs, as opposed to 1 or 2 legs, of a trip?** Yes No If yes, what are the differences?

→ **10. How often do you interact with the flight deck crew on layovers?**

1 2 3 4 5
Never Sometimes Frequently

If not frequently, what is the primary reason? _____

➔ 11a. How often have you encountered turbulence without warning from the cockpit?

1 2 3 4 5
Never Sometimes Frequently

11b. How does the flight deck crew usually signal to you to take your seat for turbulence?

- a. P.A. announcement
- b. Interphone
- c. Flash seat belt sign
- d. Other _____

11c. If turbulence occurs and the flight deck does not turn on the seat belt sign, how often do you call them and ask for it to be turned on?

1 2 3 4 5
Never Sometimes Frequently

➔ 12. How confident are you about your ability to accurately describe to the pilots parts or malfunctions of the aircraft that are visible to you (such as the flaps or the horizontal stabilizer)?

1 2 3 4 5
Not at all Moderately Very

➔ 13. Do you think it would be beneficial to have the cockpit and cabin crews under the same department in your company?

Yes No Why or why not?

➔ 14. When reporting a problem to the cockpit crew, have you ever encountered skepticism or condescension ?

1 2 3 4 5
Never Sometimes Frequently

What do you think is the reason? _____

→ 15. How often have you encountered hostility, lack of cooperation, or unfriendliness on the part of the pilots?

1 2 3 4 5
Never Sometimes Frequently

What do you think is the primary reason?

→ 16. Have you ever filed a NASA Aviation Safety Reporting System report?

- Yes No If no, because:
- a. Not aware flight attendants could file them.
 - b. Don't know how to use them.
 - c. Takes too much time/trouble.
 - d. Forms are not available.
 - e. I'm not aware of the existence of these reports.
 - f. Other _____

→ 17a. How many consecutive days do you believe you can work without feeling fatigued? _____

17b. How often do you work more than 6 days in a row?

1 2 3 4 5
Never Sometimes Frequently

17c. How do you feel the effects of fatigue influence your performance?

For items 18-23, please indicate how you would respond in the following situations by writing the appropriate letter next to each statement.

Responses:

- a. I would call the flight deck immediately with this information, even during sterile cockpit.
- b. I would pass this information to the flight deck, but not during sterile cockpit.
- c. I would not feel the information was important enough and would not tell the flight deck at all.
- d. I would tell the lead flight attendant and leave it to him/her to pass it on or not.

→ 18. _____ On initial climbout from Phoenix to Seattle during sterile cockpit you need to put a passenger on supplemental oxygen.

- ➔ 19. ____ During taxi-out, you notice a substantial water leak filling the galley area and running out onto the floor.
- ➔ 20. ____ Three minutes before scheduled departure you notice catering didn't put any milk on board.
- ➔ 21. ____ After not hearing the first couple of required PA's from the flight deck, you suspect the PA is inop or the pilots forgot to make their calls.
- ➔ 22. ____ Right after takeoff you realize you have a very intoxicated passenger onboard who is a nuisance and is causing some problems in the cabin.
- ➔ 23. ____ As the aircraft is being pushed back from the gate, a passenger tells you that he thinks he saw hydraulic fluid leaking from under a wing when he was standing in the jetway.
- ➔ 24. Tell us about an incident in your experience when poor communication between the flight deck and the cabin crew caused or contributed to a problem. Please feel free to continue to the back of the page or a separate page.

- ➔ 25. Tell us about an incident when good communication between the flight deck crew and the cabin crew helped to prevent, solve, or lessen a problem. Please feel free to continue to the back of the page or add a separate page.

Please complete the following sentences regarding duty-related issues:

→ 26. I like it when pilots _____

→ 27. I don't like it when pilots _____

→ 28a. How often do you experience situations where pilots and flight attendants tell off-color jokes or make sexual innuendoes to each other?

1 2 3 4 5
Never Sometimes Frequently

28b. In those situations, who initiates it?

Pilot or Flight attendant

28c. How do you feel about that? (You may choose more than one answer.)

- a. I enjoy it.
- b. I don't mind. It's just all in fun.
- c. It makes me feel degraded.
- d. It makes me angry.
- e. Other _____

→ 29. Please use this space to tell us about any crew communication or coordination problems which were not covered in this survey and/or elaborate on any items that were.

✈ 30. In your opinion, what could be done to improve cabin/cockpit communication?

★Thank you for your time and thoughtful answers ★

→ 4a. How are the cabin crew aware of sterile cockpit conditions on climb-out?

- a. Chime
- b. P.A. announcement
- c. Number of minutes from take-off.
- d. Annunciator light outside cockpit door.
- e. Flashing of seat belt sign.
- f. No way to be sure.
- g. Other _____

4b. How are the cabin crew aware of sterile cockpit conditions on landing?

- a. Chime
- b. P.A. announcement
- c. Number of minutes from landing.
- d. Annunciator light outside cockpit door.
- e. Flashing of seat belt sign.
- f. No way to be sure.
- g. Other _____

→ 5. How often has a flight attendant entered the cockpit inappropriately during periods of high pilot workload?

1	2	3	4	5
Never		Sometimes		Frequently

→ 6. How often do you think you could recognize all of the faces of the flight attendants in an emergency?

1	2	3	4	5
Never		Sometimes		Frequently

→ 7a. How often do you introduce yourself to the cabin crew at the beginning of your flight sequence?

1	2	3	4	5
Never		Sometimes		Frequently

If not frequently, what is the primary reason?

7b. How often do flight attendants introduce themselves to you?

1	2	3	4	5
Never		Sometimes		Frequently

→ 8a. How often do you brief your cabin crew?

1 2 3 4 5
Never Sometimes Frequently

8b. If you brief your cabin crew, is it usually the entire cabin crew or just the lead flight attendant?

Entire cabin crew Just lead flight attendant

8c. What are the main points that you try to communicate (if it is the first flight of a pairing)? Please rank the following with "1" for the most important, "2" for the next most important, etc. (You may leave an item blank if you do not feel it is important.)

- _____ a. Weather
- _____ b. Flight time
- _____ c. Crew meals
- _____ d. Security information
- _____ e. Emergency procedures.
- _____ f. Setting the tone for crew communication
- _____ g. Other _____

→ 9. How often do you interact with the cabin crew on layovers?

1 2 3 4 5
Never Sometimes Frequently

If not frequently, what is the primary reason?

→ 10. Do you notice any work-related differences when you are paired with the same cabin crew for several legs, as opposed to 1 or 2 legs, of a trip?

Yes No If you do, what are they?

→ 11. How do you usually signal to the cabin crew to take their seats for turbulence?

- a. P.A. announcement
- b. Interphone
- c. Flash seat belt sign
- d. Other _____

➔ 12. Has a flight attendant ever given you important safety information about the aircraft?

Yes No If yes, please describe _____

➔ 13. Have you ever received safety information from a flight attendant that you thought was inaccurate?

1 2 3 4 5
Never Sometimes Frequently

➔ 14. Do you think it would be beneficial to have both flight deck and cabin crews under the same department? Yes No Why or why not?

➔ 15. Do you feel that the captain sets the tone for cockpit/cabin communication?

Yes No If not, who does? _____

➔ 16. How often do you encounter hostility, lack of cooperation, or unfriendliness on the part of flight attendants?

1 2 3 4 5
Never Sometimes Frequently

What do you think is the primary reason? _____

For items 17-22, please indicate how you would like a flight attendant to respond in the following situations by writing the appropriate letter next to each statement.

Responses:

- a. I would want the flight attendant to call the flight deck immediately with this information, even during sterile cockpit.
- b. I would want the flight attendant to pass this information to the flight deck, but not during sterile cockpit.
- c. I would not feel the information was important enough to tell the flight deck at all.

→ 17. ____ On initial climbout from Phoenix to Seattle, a flight attendant needs to put a passenger on supplemental oxygen.

→ 18. ____ During taxi-out, a flight attendant notices a substantial water leak filling the galley area and running out onto the floor.

→ 19. ____ Three minutes before scheduled departure a flight attendant notices catering didn't put any milk on board.

→ 20. ____ After not hearing the first couple of required PA's from the flight deck, the flight attendant suspects the PA is inop or the pilots forgot to make their calls.

→ 21. ____ Right after takeoff the flight attendant realizes there is a very intoxicated passenger onboard who is a nuisance and is causing some problems in the cabin.

→ 22. ____ As the aircraft is being pushed back from the gate, a passenger tells a flight attendant that he thinks he saw hydraulic fluid leaking from under a wing when he was standing in the jetway.

→ 23. Tell us about an incident in your experience when poor communication between the flight deck and the cabin crew caused or contributed to a problem. Please feel free to continue to the back of the page or a separate page.

→ 24. Tell us about an incident when good communication between the flight deck crew and the cabin crew helped to prevent, solve, or lessen a problem. Please feel free to continue to the back of the page or add a separate page.

Please complete the following sentences regarding duty-related issues:

→ 25. I like it when flight attendants

→ 26. I don't like it when flight attendants

→ 27a. How often do you experience situations where pilots and flight attendants tell off-color jokes or make sexual innuendoes to each other?

1 2 3 4 5
Never Sometimes Frequently

27b. In those situations, who initiates it?

Pilot or Flight attendants

27c. Are there times you think the flight attendants are too sensitive or have no sense of humor?

1 2 3 4 5
Never Sometimes Frequently

→ 28. Please use this space to tell us about any crew communication or coordination problems which were not covered in this survey and/or elaborate on any items that were.

→ 29. In your opinion, what could be done to improve cabin/cockpit communication?

★Thank you for your time and thoughtful answers ★

**Appendix C. Institutional Review Board
Human Subjects Approval**

Office of the Academic Vice President • Associate Academic Vice President • Graduate Studies and Research
One Washington Square • San Jose, California 95192-0025 • 408/924-2480

To: Rebecca Chute
26 Sutherland Dr.
Atherton, CA 94027

From: Serena W. Stanford *Serena W. Stanford*
AAVP, Graduate Studies and Research

Date: May 25, 1993

The Human Subjects-Institutional Review Board has reviewed and approved your request for exemption from Human Subjects Review for the proposed study entitled:

"Issues in Cockpit/Cabin Communication and
Coordination"

Provided that there are no changes in the procedure proposed, you may proceed with this study without further review by the Human Subjects-Institutional Review Board. You must notify the Human Subjects-Institutional Review Board of any changes in the subject population or procedure for this study

I do caution you, however, that Federal and State statutes and University policy require investigators conducting research under exempt categories to be knowledgeable of and comply with Federal and State regulations for the protection of human subjects in research. This includes providing necessary information to enable people to make an informed decision regarding participation in your study. Further, whenever people participate in your research as human subjects, they should be appropriately protected from risk. This includes the protection of the confidentiality of all data that may be collected from the subjects. If at any time a subject becomes injured or complains of injury, you must notify Dr. Serena Stanford immediately. Injury includes but is not limited to bodily harm, psychological trauma and release of potentially damaging personal information.

If you have questions, please contact me at 408-924-2480.

CC: Kevin Jordan