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Cockpit and Cabin Crew Coordination

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Final Report

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16. Abstract

Cockpit and cabin crew coordination is crucial not only in emergencies, but also during normal operations. The purposes of this study were to determine the status of crew coordination in the industry and to identify the implications for flight safety. This examination of crew coordination included: an examination of accidents and incidents in which cockpit and cabin crew coordination was a factor, an analysis of the results of surveys of pilot and flight attendant safety representatives, a survey of manuals and training programs for flight attendants and pilots, interviews with training administrators from seven Part 121 carriers, and interviews with Principal Operations Inspectors and their managers. Problem areas identified in this study included: inadequate crew communication in emergencies, confusion over the "sterile cockpit" (FAR 121.542) concept, inadequate instruction on the duties of the other crew in training, failure to properly secure the cabin for takeoff and landing, and inadequate support for and staffing of the FAA inspector workforce. Recommendations for improving the status of cockpit and cabin crew coordination include changes in training and operational procedures.

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PREFACE

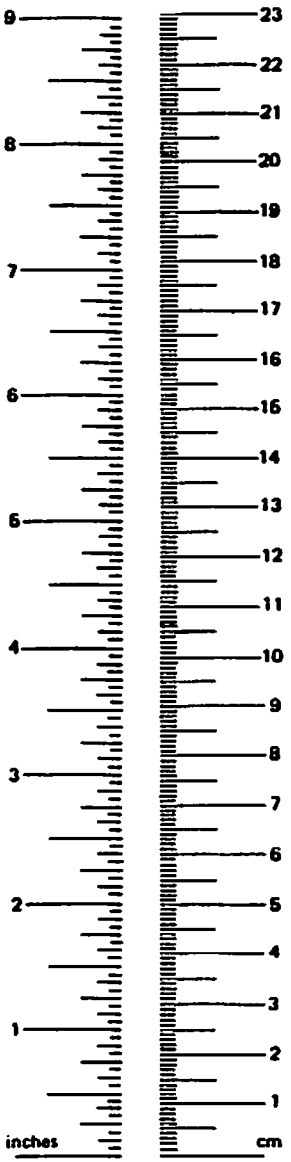
This work was sponsored by the U.S. Department of Transportation, Federal Aviation Administration, Office of Flight Standards. We would like to express our appreciation to the Association of Flight Attendants and to the Air Line Pilots Association for allowing us to publish their survey results. We are particularly grateful to Noreene Koan of the Association of Flight Attendants for her invaluable assistance and willingness to share her time and expertise and to Captain Bill Weeks of the Air Line Pilots Association for his support. We also thank the airline training instructors and managers, FAA personnel, and the numerous pilots and flight attendants who were interviewed and surveyed; their time and frankness were very much appreciated. This report would not have been possible without the cooperation of all of those people, and many of them played key roles by sharing their knowledge and lending their support.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 In. = 2.54 cm (exactly). For other exact conversions and more detail tables see NBS Misc. Publ. 286, Units of Weight and Measures. Price $2.25 SD Catalog No. C13 10 286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	36	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
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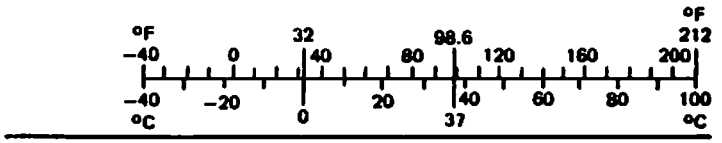

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EXECUTIVE SUMMARY

BACKGROUND

One of the objectives stated in the 1985 FAA Human Factors Research Plan is to improve the effectiveness of communication and coordination between cockpit and cabin crews. Crew coordination is crucial not only in emergencies, but also during normal operations. Lack of crew coordination can result in unnecessary injury and needless risk for passengers and crewmembers alike. The cockpit and cabin crewmembers must act as one cohesive crew, even though they are trained, scheduled and generally regarded as two independent crews.

In order to investigate the current status of crew coordination, the following activities were conducted:

- a review of the literature that included relevant reports from the National Transportation Safety Board and the Aviation Safety Reporting System, and articles in aviation periodicals;
- analysis of the results of surveys of pilot and flight attendant safety representatives;
- a survey of manuals for flight attendants and pilots (from both the air carrier and the aircraft manufacturer);
- a survey of training for cockpit/cabin crew coordination that included interviews with training administrators from seven major air carriers (regulated under FAR Part 121), interviews with eight Principal Operations Inspectors (from three FAA regions) and their managers, observations of recurrent training, and an examination of training aids and programs developed by airlines to improve crew coordination; and
- observations of cockpit/cabin crew interactions from the cockpit jumpseat.

FINDINGS

All of the problems associated with cockpit/cabin crew coordination that were addressed by the Air Carrier Operations Bulletin issued in July 1984 (see Appendix E) still exist today, even though most of the procedures recommended in the bulletin are company policy for many airlines. Furthermore, since the bulletin was issued, a new problem has arisen - confusion over FAR 121.542, the "sterile cockpit" rule. A summary of the problem areas that were identified in this study is given below.

Communication in emergencies - In emergencies, the cockpit and cabin crews do not always exchange vital safety information in a timely manner. This problem occurs even though instructions to relay such information to the other crew are explicit in crew manuals.

"Sterile cockpit" (FAR 121.542) - Flight attendants are usually not informed when the aircraft is crossing 10,000 feet. Furthermore, the training that flight attendants receive on sterile cockpit does not give them a good understanding of the operational applications of the sterile cockpit concept. This results in flight attendants violating sterile cockpit procedures unnecessarily and failing to contact the cockpit with important safety information.

Knowledge of the other crew's duties - Not all airlines give instruction on the duties of the other crew. Only 83% of the flight attendants surveyed said that their training covered the duties of the cockpit crew during emergencies; only 49% covered cockpit crew duties before takeoff and landing. Seventy-six percent of the pilots surveyed said their training covered flight attendant duties during normal operations; 88% said they covered flight attendant duties during emergencies. During normal operations each crew needs to have a general idea of what the duties of the other crew are so that they know when that crew is most fully occupied. Such knowledge helps to avoid inappropriate requests and unnecessary friction between the two crews. During emergencies, it is imperative that each crew know exactly what to expect from the other crew so that they can work together effectively.

Preparation for takeoff and landing - The cabin is not always secured for takeoff and landing, due to insufficient notice before takeoff or landing. This has resulted in articles not being properly stowed and flight attendants not being seated at all, or at least not in their proper jumpseats for takeoff roll or touchdown.

Turbulence - Flight crews do not always give the flight attendants timely notification of turbulence. While this is not a common problem, it is one that has resulted in severe injury.

Inspector staffing and support - Most inspectors felt that there was a shortage of inspectors in their office and in other offices. Duties such as clerical work and responding to public inquiries and requests from other inspectors exacerbate the problem as they detract from an inspector's primary duties. As a result, the time available for activities such as examining the details of training for cockpit/cabin crew coordination is severely constrained, and training conducted outside the inspector's geographical region is rarely monitored.

Timely guidance for Principal Operations Inspectors - Interpretations of Federal Air Regulations are currently issued only to the party who requests them. Also, responses from headquarters to inquiries are sometimes too slow to be useful. For these reasons, inspectors often opt for regional interpretations. This promotes regional differences in interpretations of the FARs and FAA directives, and consequently, in airline operational practices. The inspectors also suggested better handbooks for inspectors as another way to help alleviate this problem.

RECOMMENDATIONS

A summary of the recommendations contained in the report is presented below.

(1) Most of the operational procedures that could improve cockpit/cabin crew coordination are contained in the 1984 Air Carrier Operations Bulletin. However, since the problems that led to the bulletin still persist, it is recommended that the procedures suggested in ACOB No. 1-76-19 be required.

(2) FAR 121.417 mandating that "instruction in emergency assignments and procedures, including coordination among crewmembers" should include specific topics such as a review of different types of emergencies, the information that each crew needs during such emergencies, and when such information should be presented. Part N (121.419, 121.420 and 121.421) should also be modified to include information on the other crew's duties during pre-flight, takeoff, cruise, and landing. In addition, FAR 121.417 should be amended to include rules governing sterile cockpit as one of the subjects to be covered in training.

(3) Airline training administrators and Principal Operations Inspectors should ensure that the standard operating and emergency procedures for cockpit crews and flight attendants are compatible.

(4) Flight attendants should be informed when "sterile cockpit" procedures are in effect; and

(5) Interpretations of relevant Federal Aviation Regulations made by the FAA General Counsel should be distributed to all Flight Standards District Offices and Air Carrier District Offices.

1. OBJECTIVES

The present research on cockpit and cabin crew coordination was conducted in response to the requirements set forth in the FAA's 1985 Human Factors Research Plan. The purposes of this research were to review problems that have arisen with cockpit and cabin crew communication and coordination, to determine the extent to which the current status of crew coordination could be improved, and to generate specific recommendations for training and standard operating procedures to help ensure that cockpit and cabin crewmembers work together effectively. Specifically, the objectives of this research were to:

- Document safety problems related to a lack of coordination of cockpit and cabin crewmember activities.

- Describe current company training practices including programs designed to promote good communication between cockpit and cabin crews and coordination of their activities.

- Identify problem areas in the airline industry that must be considered in training and in establishing standard operating procedures, and identify the methods used by the airlines to deal with these problem areas.

- Generate recommendations for the development and the evaluation of:
  - training programs that promote coordination of cabin and cockpit crewmember activities; and
  - safety-related operating procedures.

2. ACTIVITIES

The activities conducted for this study included a review of the aviation safety literature, a survey of pilots and flight attendants, a survey of manuals used by flight crews and flight attendants, a survey of training, interviews with Air Carrier

Operations Inspectors, and observations of cockpit and cabin crew interactions from the cockpit jumpseat.

2.1 REVIEW OF THE LITERATURE

A computer search for reports of accidents and incidents in which cockpit and cabin crew coordination was an important factor was conducted by the National Transportation Safety Board (NTSB). A computer search for relevant reports from the Aviation Safety Reporting System (ASRS) was conducted by Battelle Columbus Laboratories. Additional information was obtained from Aviation Week and Space Technology, Air Line Pilot, the Society of Automotive Engineers Technical Paper Series, and the proceedings of the 1984, 1985, and 1986 Cabin Safety Symposia conducted by the University of Southern California's Institute of Safety and Systems Management.

2.2 SURVEY OF PILOTS AND FLIGHT ATTENDANTS

Pilot and flight attendant safety representatives were surveyed through the Air Line Pilots Association and the Association of Flight Attendants, respectively. (See survey forms in Appendix A). The survey addressed many aspects of cockpit and cabin crew coordination including training, standard operating procedures and problems associated with crew communication. Twenty-five pilots (each from a different airline) and 35 flight attendants (from 16 different airlines) responded.

2.3 SURVEY OF MANUALS

Several flight crew manuals (both company and aircraft-specific) and flight attendant manuals were examined for consistency in emergency procedures and for the information that they present on the duties of the other crew during normal operations and emergencies.

2.4 SURVEY OF TRAINING

Airline training managers from seven major Part 121 carriers were interviewed regarding training programs (both past and present) used to specifically address cockpit and cabin crew coordination. Information regarding other airlines' programs was obtained from Principal Operations Inspectors. Training aids and programs designed and used by airlines to improve cockpit and cabin crew coordination were examined in detail.

Flight attendant recurrent training was observed during site visits to four major airlines. Information on pilot recurrent and new hire pilot training at these airlines was obtained from airline training administrators. Information on training and procedures at other airlines was obtained from the airlines' Principal Operations Inspectors and from the surveys of pilots and flight attendants (see above).

2.5 INTERVIEWS WITH PRINCIPAL OPERATIONS INSPECTORS (POIS)

Eight POIs and three managers from three FAA regions were interviewed. Their opinions on the status of cockpit and cabin crew coordination in the industry were solicited and they were asked to identify problems they have encountered in approving and monitoring training programs. They were also asked for suggestions as to how these and other problems could be resolved. Since the regulations regarding training for crew coordination are not specific and much is left up to the discretion of the individual Principal Operations Inspector, standardization was also discussed. The inspectors were asked if they experienced any problems in this area and whether or not more specific regulations would be beneficial. Other topics covered in the interviews included training for POIs, and airline operations procedures related to cockpit and cabin crew coordination.

3. BACKGROUND

Cockpit and cabin crew coordination is a topic that has received sporadic attention for at least ten years. Many of the same problems that were addressed by the FAA in 1977 (Action Notice N8430.284, see Appendix D) still exist today. In fact, in a 1986 survey of pilots and flight attendants (see Appendices A and B), only 37% of the flight

attendants and 60% of the pilots said that they thought that communication between the cockpit and cabin is adequate. A number of factors have influenced the quality of communication between the cockpit and cabin crews over the years. One factor is the growth of the industry. Within small airlines, communication between the two crews is rarely a problem; the same cockpit and cabin crews fly together often and tend to know each other quite well. As an airline grows, so does the number of crewmembers. On a jumbo jet flight on a large airline, a flight attendant may know a few of the other flight attendants, but probably will not know any of the cockpit crewmembers. Of course, as the number of crewmembers on an aircraft increases, so does the complexity of crew communication. Unfamiliarity among crewmembers further complicates the problem. While keeping the same cockpit and cabin crews together as often as possible (e.g., for all of the legs of a flight) may present insurmountable scheduling problems, the benefits of such a practice are undeniable.

Sprogis (1984) attributes the division of cockpit and cabin crewmembers into two departments within the company as a major cause of the deterioration of communication between the two crews, citing that this division creates a "separatist atmosphere" and inhibits cooperation. He advocates a return of responsibility for cockpit and cabin crew operations to a common department. Other safety specialists (e.g., Mott, 1984) have also advocated a return to one jurisdiction. However, many airlines prefer the autonomy of two departments and would not want to change their departmental structure. Other factors that Sprogis identifies as influencing crew coordination include deregulation and economics. In the current economic climate, airlines have had to become increasingly cost conscious. This cost factor is weighed heavily when changes in equipment, training programs, and operational procedures are considered.

Perhaps, the most insightful report on cockpit and cabin crew communication, to date, is by Koan (1985). In it, she lists the necessary prerequisites for good crew communication: respect and rapport among crewmembers, communication equipment that will not fail in an emergency, an understanding of the other crews duties, and the same or compatible (as opposed to conflicting) information on specific topics (e.g., code words). In other words, the crewmembers must <u>want</u> to communicate; they must have

the mechanical means to do so; and, when they do communicate, the two crews must be working from the same knowledge base for the communication to be effective.

The first step in addressing problems in cockpit and cabin crew coordination is to identify the types of problems that have occurred in the past. Since effective communication between the two crews is a prerequisite for cockpit and cabin crew coordination, the terms "communication" and "coordination" are practically interchangeable in this context. Problems with cockpit and cabin crew coordination can logically be divided into two categories -- those involving cockpit-to-cabin communications and those involving cabin-to-cockpit communications. These problems can occur during normal operations or during emergencies.

4. COCKPIT-TO-CABIN COMMUNICATIONS

4.1 NORMAL OPERATIONS

The most common examples of lapses in communications between the cockpit and the cabin crews during normal operations involve the pilot's notification to the cabin crew to prepare the cabin for takeoff, landing, and turbulence.

4.1.1 Takeoff and Landing

It is vitally important that flight attendants be given adequate time to prepare the cabin and themselves for takeoff and landing, especially since most accidents occur during these critical phases of flight. One of the problems that can arise on takeoff is that flight attendants are not informed of the takeoff in sufficient time to complete their safety duties and reach their proper jumpseats before the takeoff roll. This problem is exacerbated by unusually short taxi times. Even when flight attendants are informed that takeoff is imminent, problems can arise that result in flight attendants not being properly seated for takeoff. Several instances of this type have been reported to ASRS and in the surveys of pilots and flight attendants (and it is reasonable to assume that there are many more instances than those reported). The reasons reported in ASRS reports for flight attendants not being seated properly include problems

encountered during the passenger briefing announcements (e.g., a problem with the public address (PA) system) and passengers standing in the aisles and stowing their baggage while the aircraft is taxiing. These situations add to the time required for flight attendants to complete their pre-takeoff duties. It should be noted that the latter situation is not a common one and that captains who taxi with passengers standing now risk suspension by the FAA (see Air Line Pilot, May 1986, p. 42).

Excessive amounts of carry-on baggage can also add to the time required to prepare the cabin for takeoff. Problems with carry-on baggage were cited by several of the inspectors interviewed as a safety hazard and by flight attendant safety representatives as a hazard that has lead to conflicts between the cockpit and cabin crews. This problem begins when ground crews are reluctant to confront and detain a passenger with an excessive amount of carry-on baggage. Flight attendants are then faced with the problems of finding a place to stow the baggage or risking a delay by having additional bags checked. Flight crews are sometimes unsympathetic to the storage space problem and are reluctant to return to the gate. This situation has lead to disputes between cockpit and cabin crewmembers. Such disputes can deteriorate the working relationship between the two crews and result in an atmosphere that inhibits effective communication.

This, however, is not a problem that can be solved solely by improving crew communication. Ground personnel and gate attendants must screen and limit the carry-on baggage brought aboard. Airlines, operating in a competitive and service-oriented environment, are not likely to voluntarily restrict what the passengers perceive as a service. Therefore, a feasible solution is that the number, size, and weight of carry-on baggage be regulated by the FAA and screened by ground personnel. (See Appendix F for specific limitations offered in the FAA report, "Emergency Equipment and Carry-On Baggage," 1984).

On most, if not all, U.S. airlines, a cockpit crewmember makes an announcement on the PA system for the flight attendants to prepare for takeoff (or for flight attendants to please be seated). This procedure ensures that the cabin crew is seated for takeoff, as long as there is sufficient time to prepare the cabin and take the proper seats. Only at

a few airlines does a flight attendant inform the captain, either by interphone or signal, that the cabin is secured for takeoff. However, this procedure is regarded as important and desirable by 96% of the pilots and 91% of the flight attendants surveyed. This procedure was also endorsed by the chairman of the Air Line Pilot's Association's Accident Survival Committee (see Stenblick, 1986, p. 42).

A similar problem arises when flight attendants do not have adequate time to prepare the cabin for landing and take their jumpseats. Some airlines use the illumination of the "Fasten Seat Belts" sign as a signal to begin to secure the cabin for landing. (The "No Smoking" sign is then the signal to complete their duties.) This is fine as long as the captain is aware of this use of the seat belt sign. In at least one recorded instance (ASRS 1982), this was not the case. In this case, as well as others reported by flight attendants, the time available between the illumination of the "No Smoking" sign and landing was inadequate for the flight attendants to complete their duties. This problem has resulted in flight attendants not being seated for landing and items not being properly stowed.

An example of the potential for serious problems that can arise from flight attendants not being adequately prepared for landing is found in the National Transportation Safety Board (NTSB) report of a landing accident (NTSB: AAR-76-20). In this case, a normal landing was anticipated. The time between the illumination of the "No Smoking" sign and touchdown was unusually short and was inadequate for the flight attendants to secure the cabin and return to their proper jumpseats. The plane overran the runway, crashed into a ravine and erupted into flames. Although not cited by the NTSB as a crucial factor in this accident, emergency evacuations can be seriously hampered when flight attendants are not seated in their proper jumpseats. It is also important to note that, in this case, the "No Smoking" sign was illuminated when the landing gear was lowered. This is important because an automatic link between the landing gear and the "No Smoking" sign has been proposed to ensure that the flight attendants receive the signal to prepare for (a normal) landing with adequate time to complete their duties. However, such a system alone has proven to be inadequate as it does not allow sufficient time for flight attendants to prepare the cabin. The potential for problems in this area is heightened when meal or beverage service is offered on very short flights

(30 minutes or less). Again, notifying the cockpit that the cabin is prepared for landing is preferred.

4.1.2 Turbulence

It is difficult to estimate the number of flight attendant injuries that occur each year due to turbulence, since not all injuries are reported to any single agency. However, it is known that the majority of the serious injuries that occur as a result of turbulence are incurred by flight attendants (Marshall, 1985). A review of the accidents and incidents recorded in the combined data bases of the National Transportation Safety Board, the Federal Aviation Administration and the Civil Aeromedical Institute between 1979 and 1983 reveal that flight attendants received 65% of the 34 (reported) serious injuries incurred as the result of turbulence.

Notification of turbulence en route may come too late to prevent injury as it was for an Airbus 300 flight in May, 1985 (NTSB, Survival Factors Specialist Report of Accident No. MIA 85FA178). Flight attendants should receive information on expected turbulence from a member of the flight crew prior to a flight. This is best accomplished by covering en route weather in a captain/flight attendant preflight briefing. While this practice is considered to be standard operating procedure, it is not always done. Only 56% of the flight attendants surveyed said that en route weather is typically covered in a captain/flight attendant briefing. (However, 84% of the pilot safety representatives reported covering it.) During the flight, flight attendants should also be informed as to the immediacy and severity of unexpected turbulence so that they know whether to secure the cabin or be seated immediately.

Unexpected turbulence remains a problem. Furthermore, on the larger jets, turbulence experienced in the cockpit may be much less than that experienced in the cabin. So, in some cases, flight attendants should advise the cockpit of potentially hazardous conditions so that the seat belt sign can be illuminated. In large jets, when the degree of turbulence is greater in the cabin than the cockpit, flight attendants should participate in decisions to postpone or suspend food or beverage services so that these services are neither unnecessarily delayed, nor unduly hazardous. Needless to say, when

flight attendants are informed of a certain degree of turbulence, they should act accordingly and immediately heed any advice that the captain gives.

4.2 EMERGENCIES

The most common examples of problems of communication in emergencies involve the cockpit crew not informing the cabin crew of the nature of the emergency and the time available to prepare the cabin (see NTSB reports AAR-84-04, AAR-79-7, AAR-78-3). This problem has arisen several times, despite instructions in flight manuals to relay such information to the cabin crew.

The quality and timing of the information given to the cabin crew is extremely important in an emergency. Communication from the cockpit must be clear, unambiguous and instructional. A vague description of the situation without specific instructions may be misinterpreted and result in valuable time being misspent. An example of this is found in the report of a ditching of a DC-9 turbojet (NTSB- AAS-72-2). The purser was called to the cockpit and informed of the low fuel state. He was not given an estimate of the time to prepare for the ditching even though it was estimated that only five to seven minutes elapsed between the time the purser was informed of a possible need to ditch and the actual impact. This led the purser to an unrealistic estimate of the time available to prepare for the ditching, which led to an unprepared cabin. Five or more survivors and one flight attendant did not have their seat belts fastened at the time of impact.

The timing of the information transfer is as important as the quality of the information. For example, when told to do a full preparation for an emergency evacuation, flight attendants will select passenger volunteers and instruct them on the operation of a particular exit and emergency procedures. If the flight attendants are later told to relocate passengers, then they may have to reassign their volunteers. Therefore, when a plane will be landing without a functional nose gear and the captain decides to move passengers to the rear of the airplane, the flight attendants should be informed of this decision at the same time that they are informed of the emergency so that they are aware of all the conditions before they select and instruct their passenger volunteers.

Also, in any emergency or unusual situation, it is important that the flight attendants be informed before the passengers, so that they have time to prepare.

Granted, in any emergency, the workload of the cockpit crew is high and there is not much time to do anything else but "fly the aircraft" and perform essential tasks. There may, in fact, be times when cockpit crewmembers do not have time to give the flight attendants as much information as they would like, particularly with a two person flight crew. However, it is also true that while communication with the cabin crew is essential to the safety of the flight, it is not always viewed as such by the cockpit crew. This may be due to a lack of emphasis on cockpit-cabin communications in flight training. A few lines in a manual stating what information to relay to the cabin will not lead to the proper response in an emergency, unless it is specifically reinforced in training. Crucial emergency procedures are not only in the flight manual, but are also stressed in flight training. Therefore, procedures for ensuring the cockpit and cabin crew coordination necessary for the most effective implementation of these emergency procedures should also be addressed in flight training.

5. CABIN-TO-COCKPIT COMMUNICATIONS

Problems with cabin-to-cockpit communications can be divided into two categories: the failure of the cabin crew to convey information to the cockpit in a timely manner, and inappropriate requests for information by cabin crewmembers. These problems include the failure of flight attendants to convey the severity of a problem (e.g., fire in the cabin) to the cockpit and flight attendants breaking the rules of "sterile cockpit" for reasons unrelated to safety. Both of these types of communication problems are integrally related to the "sterile cockpit" issue.

5.1 "STERILE COCKPIT" (FAR 121.542)

FAR 121.542 specifies that, during critical phases of flight and all other flight operations (except cruise) conducted below 10,000 feet, no crewmember may engage in any activity or conversation that is not required for the safe operation of the aircraft. This regulation specifically excludes nonessential communication between the cabin and the cockpit crews during the sterile period.

There are two problems associated with flight attendant observance of sterile cockpit procedures. First, it is difficult for the flight attendant to judge when sterile cockpit procedures should be in effect. Some airlines have advocated the ten-minute rule, i.e., sterile cockpit should be in effect for ten minutes after takeoff and ten minutes before landing. However, there are problems associated with trying to estimate a time span before an event. In some cases, the flight attendants are left to judge when the airplane has passed the 10,000 foot mark - a difficult task, at best, and one that is hampered by poor visibility. A few airlines have attempted to deal with this problem by using the chime-call or another signal when the 10,000 foot mark has been crossed. This provides a good indication of sterile cockpit as long as the signal is heard and is not confused with another signal (e.g., passenger requesting assistance). There is a great variety of signals for sterile cockpit in use today (see Appendix B, flight attendant questionnaire, question 6b). A good signal is a PA announcement made from the cockpit after takeoff (that they have just reached 10,000 feet) and before landing (that they are approaching 10,000 feet). However, the success of this method depends entirely on the reliability of the announcement. Even in cases where the announcement is company policy, it is not always made.

Perhaps the best signal as to when sterile cockpit procedures are in effect is an indicator light above the cockpit door or on the annunciator panel. This light has a duration as long as the sterile cockpit interval (as opposed to a discrete tone or announcement that could be missed) and it cannot be confused with another signal. The disadvantages to this system are that it requires installation of the light and that a light above the cockpit door would not be visible to all flight attendants on wide-body aircraft.

The second major problem associated with flight attendant observation of sterile cockpit is that the majority of flight attendants do not have an understanding of what "sterile cockpit" means. Eighty percent of the pilots and 86% of the flight attendants surveyed said that the concept needs to be clarified for flight attendants. That is, flight attendants need to be given specific information as to what the regulation means and what type of information merits contacting the cockpit during the sterile period. There have been many instances (some recorded in ASRS reports and in the surveys of

pilots and flight attendants) of flight attendants going into the cockpit to request passenger information (e.g., on connections) or for other reasons not related to safety when sterile cockpit procedures were in effect. Such interruptions can distract flight crewmembers and have a detrimental effect on their performance. However, even more serious than the possibility of an unnecessary distraction caused by a flight attendant needlessly violating sterile cockpit is the possible hesitancy or reluctance on the part of a flight attendant to contact the cockpit with important information because of a misconception of sterile cockpit. This latter possibility was realized on May 31, 1984 when a Boeing 727 struck a localizer antenna during takeoff (Aviation Week and Space Technology, September 9, 1985). The flight crew (contending with wind shear) was unaware that the antenna had been struck and returned to the airport when they were unable to pressurize the aircraft. The cabin crew, however, recalled "hearing and feeling a loud thump and vibration shortly after liftoff." This led at least one flight attendant to believe that the airplane had hit something. This information was never conveyed to the flight crew because of the senior flight attendant's desire to abide by the sterile cockpit rule (p. 105).

Flight attendants are typically instructed that they should not contact the cockpit with information unless it is "safety-related." This directive alone leaves much room for interpretation. While it would be impossible to describe every type of situation that should be relayed to the cockpit, perhaps it would be helpful to give a few examples in training. The quality of the decisions (as to whether or not to contact the cockpit) made by the flight attendants will be directly related to the information they received in training. The clearer the flight attendant's understanding of sterile cockpit procedures and flight operations, the better these decisions will be.

5.2 NORMAL OPERATIONS AND EMERGENCIES

Just as with cockpit-to-cabin communications, the timing and quality of the cabin-to-cockpit communications are critical. When flight attendants convey information to the cockpit crew, the information needs to be timely and specific. In June 1983, an in-flight fire on a DC-9 forced the flight crew to make an emergency landing (NTSB: AAR-84-09). Four minutes elapsed between the time the flight crew was first alerted

to the fire in the lavatory and their decision to initiate an emergency descent. This was due, at least in part, to a lack of effective communication. When smoke filled the lavatory, the flight attendant in charge discharged a CO_2 extinguisher towards the smoke and another flight attendant reported the incident to the captain, giving him no details as to the possible severity or source of the fire. The captain was never told, nor did he ask, whether the source of the fire had been determined.

Communication and crew coordination must be addressed in training. Flight crews should be trained to solicit information from the flight attendants when appropriate, just as flight attendants must be trained to solicit information from the captain in an emergency. Flight attendants should also be trained as to when, and with what information, to contact the cockpit. They also need to be given a clear, operational definition of "sterile cockpit" procedures so that they do not naively violate them or hesitate to contact the cockpit with relevant safety information.

The set of ASRS reports from May 1978 to April 1986 that deal with cockpit and cabin crew coordination also contain reports on topics unrelated to "sterile cockpit". They reveal that the captain is not always informed of cabin crew shift changes. There were a few instances of flight attendants deplaning, either with or without replacement without the captain's knowledge. It is important that a member of the cockpit crew be familiar with the cabin crew, or at least the flight attendant in-charge, for a number of reasons. First, it is the captain's responsibility to ensure that all required crewmembers are present for the flight. Second, familiarity fosters good communication. In fact, in airlines that are small enough to enable the two crews to know each other, crew communication is rarely a problem.

It is important to note that while NTSB and ASRS reports are indicative of the <u>types</u> of problems that arise, they cannot be used as a measure of the <u>prevalence</u> of a problem. The NTSB reports reveal problems with cockpit and cabin crew coordinaton only if they relate to accidents and incidents. ASRS reports would also be expected to contain only a small sample of communication-related problems for two reasons. First, very few flight attendants are aware of this reporting system so the reports are not representative of flight attendant concerns. Second, pilots are accustomed to reporting

only problems or situations that they consider to be hazardous or in violation of Federal Aviation Regulations.

6. RESULTS FROM THE SURVEY OF TRAINING

6.1 MANUALS

Several flight crew manuals (both company and aircraft-specific) and flight attendant manuals were examined for consistency in emergency procedures and for the information that they present on the duties of the other crew during emergencies and normal operations. While no inconsistencies were found between the emergency procedures presented to the cockpit crew and the emergency procedures presented to the cabin crew, very little information was found on the duties of the other crew. All of the flight attendant manuals that were examined in this study stated that, in the event of an emergency, the flight attendant in charge should ask the captain about the nature of the emergency, the time available to prepare the cabin and special instructions (e.g., what the bracing signal will be). The manuals also contain a brief statement of the general responsibilities and ultimate authority of the captain (e.g., that the captain is responsible for aircraft and the safety of the passengers), but very little on specific duties. The flight attendant manuals typically state that in an emergency, the flight crew will assist in the evacuation after the duties in the cockpit are completed. Very little, if any, additional information was available from the flight attendant manuals on the duties of the cockpit crewmembers. Similarly, very little, if any, information is offered on the duties of the flight attendants in the flight operations manuals. Typically, the emergency procedures sections of the pilots' manuals stated that, in the event of an emergency, the flight attendants should be informed of the nature of the emergency, the time available to prepare the cabin and special instructions. This information was found in some, but not all, of the aircraft-specific manuals, and most, but not all, of the airlines' flight operations manuals that were examined.

6.2 TRAINING PROGRAMS

Interviews with airline training administrators and safety representatives indicate that the degree to which training programs for flight attendants and for cockpit crews are coordinated varies widely from airline to airline. The training departments for flight attendants and flight operations can function autonomously with the training programs for the two crews developed and updated independently. Alternatively, the administrators for flight operations training and for flight attendant training can develop their programs in tandem and coordinate their efforts to ensure that the information given to each crew in their training is compatible and specifically addresses cockpit and cabin crew coordination. Generally, the greater the overlap between the two training departments (e.g., having pilots and flight attendants in the same classes or having the same instructors teach emergency procedures to both flight attendants and flight crews), the easier it is to address crew coordination effectively. With two separate training departments, the training administrators must make a concerted effort to provide a program that promotes good crew coordination.

There are a number of similarities among the various training programs observed in this study. At all of the major airlines surveyed, flight attendants and pilots are given the same information in their training as is stated in their manuals. Flight attendants are instructed that, in the event of an emergency, they should ask the captain about the nature of the emergency, the time available to prepare, and special instructions. Similarly, pilots are instructed that, in an emergency, the flight attendants should be given the information stated above. The review also revealed that most flight attendants receive more instruction on the cockpit and cabin communication than do pilots. Typically, flight attendants are encouraged to initiate the introductions to the cockpit crew, inform the captain of any irregularities or problems in the cabin and keep the lines of communication open. For various reasons (particularly time and monetary constraints), considerably more time is usually spent on this topic in flight attendant training than in flight training. However, some airlines are either incorporating, or are considering incorporating, cockpit resource management programs into their flight operations training. These programs typically include communication and managerial techniques and encourage the pilot to utilize the resources that the flight attendants

and ground personnel can provide. For these reasons, cockpit resource management programs present an ideal opportunity to cover cockpit and cabin crew communication and coordination in training. However, training for crew communication should not be limited to captains, as cockpit resource management programs often are. First and second officers often handle all of the communications with the flight attendants. In fact, second officers usually act as the communication link between the two crews. Therefore, it is important that first and second officers also receive training in cockpit and cabin crew coordination.

6.3 STRUCTURES OF TRAINING PROGRAMS

6.3.1 Joint Training

Joint training is a type of program that involves pilots and flight attendants training together on emergency procedures. The training that is joint is usually restricted to emergency evacuation drills. After consultation with airline administrators and flight attendant safety representatives, only five airlines were found to have, or have had, experience with joint training. Two of the airline training administrators that were interviewed reported a very negative experience with joint training. In one case, the training manager found that the presence of the other crew was counter-productive; it inhibited a free and open exchange of ideas and, in some cases, intimidated the participants and inhibited their performance. In the other airline's experience, the pilots and flight attendants did not participate in the drills with the seriousness that they did when the other crewmembers were not present. In that case, the presence of the other crewmembers proved disruptive. In both cases the joint training was discontinued.

The other three airlines had very positive experiences. As of March 1986, one of these airlines conducts joint training for all of its pilots and flight attendants, another merges pilot and flight attendant training at one of their training bases, and the third airline conducts joint training whenever recurrent classes for pilots and flight attendants coincide at a particular base. Each of these airlines found that joint training greatly increased the understanding of the other crew's duties, ensured that the two crew's

instructions were compatible (e.g., any inconsistencies were immediately apparent), and enhanced the working relationship between pilots and flight attendants. At one airline, the combined portion of the training consists of the pilots participating in the flight attendants' emergency evacuation drill as passengers and a discussion following the drill. Even this limited contact leads to an increased respect for, and understanding of, the other crew's duties (and, hence, an increased respect for the other crewmembers). In fact, pilots are often surprised to learn the extent of the flight attendants' training and responsibilities. Such training also provides more realistic training on emergency evacuation procedures than that which the pilots receive without the flight attendants present.

While the results of joint training can be very beneficial, there can be problems in trying to schedule pilots and flight attendants together in the same classes. This is particularly true for large airlines. Many airlines do not train all of their flight attendants and flight crewmembers at the same sites. In fact, a large airline may have several more training sites for flight attendants than for pilots and flight engineers. Also, many airlines typically conduct training (both initial and recurrent) for flight attendants more frequently than for pilots, since it employs many more flight attendants than flight crewmembers. At a large airline, these factors can create significant problems in trying to schedule training for pilots and flight attendants at the same sites and at the same times. Generally, joint training is much more practical for a smaller airline than for a larger one.

Finally, it is important to note that when aircraft manufacturers train flight crews and flight attendants for the emergency evacuation demonstrations performed for certification purposes, the flight crewmembers are trained with the flight attendants and play an important role in the evacuation. In training given by airlines, however, joint "hands-on" training is quite rare. Another major difference between training for emergency evacuation demonstrations given by manufacturers and the standard training given by airlines is that, in training for evacuation demonstrations, the training criterion is to train to proficiency. This means that pilots and flight attendants are encouraged to open exits, etc., until they feel that they have mastered the tasks. In recurrent training conducted by an airline, it is usually the case that each type of exit is opened only once by each participant.

6.3.2 Joint Instructors

Some training programs have the same instructors teaching both flight attendants and flight crews. These instructors present the same (or compatible) information on emergency equipment and emergency evacuation procedures to both crews. Three major U. S. airlines and British Airways use such a system. The training administrators at all four airlines have found that this is an excellent way to provide pilots and flight attendants with insights into the procedures and problems of the other crew without having them all in the same classroom. This method of instruction offers many of the advantages of joint training without the problems associated with scheduling the attendance of the participants. It also ensures that the emergency procedures of the two crews are complementary. Furthermore, at least two of these airlines have the emergency procedures section of the flight attendants' and flight crews' handbook written by the same individuals. This also helps to ensure that the sections are complementary and no conflicting information is presented.

6.3.3 Complementary Instructors

In some training programs, flight attendant instructors participate in flight crew training and a flight crew instructor or another pilot representative participates in flight attendant training. Such programs can range from sessions that serve more of a social function than an educational one, i.e., they include little more than an introduction and a brief question and answer session, to programs that present highly structured information that addresses the other crew's duties, training and expectations. One advantage of these programs is that they provide an opportunity for questions. However, the true strength of these programs can be easily judged by observing the topics that are covered and the extent to which they are covered.

6.3.4 Videotaped Presentations

After consultation with airline training administrators and flight attendant and pilot safety representatives, three airlines were found to have developed videotaped or slide presentations that specifically address cockpit and cabin crew communication and

coordination. These presentations are typically shown to both pilots and flight attendants. Two of these presentations were reviewed as part of this study. One presentation addresses emergency procedures by examining recent accidents and incidents in which crew communication was an important factor. The video examines an incident in which communication was poor and describes the ways in which the communication should have been better. The incident is then contrasted to an accident in which the excellent communication between the captain and the senior flight attendant was a causal factor in the safe outcome of the flight. The video stresses the importance of a captain/flight attendant briefing and emphasizes that the captain should inform the senior flight attendant of the nature of the emergency, the time available to prepare for the emergency, the bracing signal and special instructions.

The other videotaped presentation that was examined in the context of this study was designed specifically to enhance crew communication during normal operations as well as emergencies. The material covered in the video is divided into four sections: pre-flight communications, in-flight communications, post-flight communications and communication at overnight stations. For each of the three phases of flight, the presentation describes the duties of both the cockpit crew and the flight attendants, and advises pilots and flight attendants to be considerate and aware of each other's duties. The presentation also describes routine in-flight situations that require crew communication (e.g., expected turbulence or cabin service taking longer than planned) and presents the sequence of communications that should take place in an emergency. It states that the captain should notify the senior flight attendant of the nature of the emergency, the time available for cabin preparation, the bracing signal, and special instructions. The senior flight attendant then passes this information on to the other flight attendants. The presentation informs pilots that flight attendants are trained to request this information if it is not given to them. It also informs flight attendants that such communication may not always be possible, due to the nature of the emergency. The video also discusses the concept of "sterile cockpit", stressing that it should never inhibit the communication of a safety-related situation. The responsibilities of flight attendants and first officers concerning crew changes are also discussed and crews are instructed to relay information on flight irregularities and special instructions to the oncoming crew.

The third (slide) presentation examines the duties of each crew during normal operations and emergencies. The one-hour presentation reviews each crew's activities from pre-flight to the conclusion of the flight. It also contains material on each crew's duties during emergencies.

A videotaped or slide presentation, such as those described above, can enhance communication between the two crews when it is shown to both cockpit and cabin crewmembers in training. The ideal video training aid would cover both emergency and routine operations and present a synopsis of the duties of each crew during each stage of flight. Understanding the responsibilities of the other crewmembers helps to eliminate naive, unreasonable, and untimely requests of other crewmembers that can erode the working relationship. Information on the duties of both crews during an emergency is also important. Cockpit crewmembers need to know how the flight attendants are trained to respond in an emergency, and flight attendants need to be aware of the emergency procedures followed by the cockpit crew so that the two crews can work together effectively. This knowledge of the other crew's activities is an essential component of crew coordination.

7. FEDERAL AVIATION REGULATIONS

The Federal Aviation Regulations that address cockpit and cabin crew coordination are contained in Part 121, Subpart N - 121.417 (see Appendix C). This specifies that emergency training must include instruction in "emergency assignments and procedures, including coordination among crewmembers." Crew coordination is also mentioned as a topic to be covered when training for ditching. There are no other references to training for crew coordination in Subpart N of Part 121 (or in Subpart H of Part 135). Section 121.421 on flight attendant initial and transition ground training prescribes that one of the topics in this training will be the authority of the pilot in command. There are no other references to the cockpit crew or their duties in this section, nor are there any references to flight attendants or their duties in Section 121.424 on initial, transition, and upgrade flight training for pilots or in Section 121.425 on initial and transition flight training for flight engineers; or in Section 121.427 on recurrent training.

8. PRINCIPAL OPERATIONS INSPECTORS

8.1 DUTIES OF PRINCIPAL OPERATIONS INSPECTORS

Section 1 of Chapter 9 of the Air Carrier Operations Inspectors' Handbook (1984) states the general duties of a Principal Operations Inspector (POI) as follows:

> "The Principal Operations Inspector (POI) is responsible for granting the initial and final approval of the training program and revisions to an approved training program for his assigned FAR 121 air carrier or commercial operator. Approval of the training program will be based on the results of the findings, evaluations, and observations by the POI and Air Carrier Operations Inspectors (ACOI) assigned duties with that air carrier. Approval by the POI will be given only after he ascertains that the curriculum complies with the requirements of Subpart N and Appendixes E and F of FAR 121. ACOIs qualified and current in type aircraft used by the operator should be utilized in the evaluation and surveillance of the training program to assure conformance with the regulatory requirements, and that it is effective in qualifying crewmembers for the type of operation conducted."
>
> (p. 851)

The only reference to cockpit and cabin crew coordination in the inspector's handbook is found in paragraph 1430 on emergency training (FAR 121.417). This section states that Principal Operations Inspectors will be responsible for a periodic review of their assigned air carriers' emergency training program to assure that crewmembers are required to perform or observe a demonstration of those functions or actions which are considered necessary to successfully accomplish assigned emergency duties (FAR Section 121.417(c)). It also states that crewmembers requiring coordination with other crewmember(s) should receive initial and recurrent training in those duties. Thus, the requirements for POIs to review training for cockpit and cabin crew coordination are not specific, but they are as specific as the current regulations (121.417, see Appendix C) will allow. That is, the regulations are very general in that they specify only that emergency training must include "coordination among crewmembers"; the requirement to monitor such training cannot be more specific than the regulation it is designed to enforce.

POIs (as well as other Air Carrier Operations Inspectors) are also responsible for conducting en route inspections. One purpose of these inspections is to observe crew coordination. Section 121 of FAA Form 8430-16(2-77), the checklist for air carrier en route cabin inspections, lists five specific areas under crew coordination: monitor seat belt/no smoking signs, cabin occurrences/difficulties, response to cockpit calls, handling of emergencies, and arm/disarm evacuation slides. While these are the only areas of cockpit and cabin crew coordination covered on the en route inspection form, other areas have been addressed in Air Carrier Operations Bulletins.

8.2 AIR CARRIER OPERATIONS BULLETINS

Another duty of POIs is to keep airline administrators informed of regulatory changes and FAA recommendations such as those presented in air carrier operations bulletins. Two such bulletins have been issued on cockpit and cabin crew coordination (see Appendices D and E). The first was issued in August, 1977. In the bulletin, POIs are encouraged to observe and/or review a number of specific items including: pre-departure briefings of the entire crew by the captain, cabin status reports to cockpit prior to push back or prior to takeoff, applicability of seat belt sign to flight attendants, flight attendant activities during periods of anticipated or actual turbulence, and flight crew and flight attendant manual contents concerning all crewmembers' duties and responsibilities during emergencies to ensure that the cockpit knows what the cabin should be doing and vice versa.

The second bulletin was issued in July, 1984. It requests POIs to "review their assigned operator's training program and operations manuals to ensure that the operator has established a safe and effective means of coordination and communication between the flight and cabin crewmembers." The bulletin then lists eight specific areas to be addressed by the POI. These areas include:

- o use of the public address system to alert flight attendants and passengers of anticipated in-flight turbulence;
- o guidance for notifying flight attendants when they are to cease in-flight services, secure galley, be seated with their restraints fastened, and/or resume duties;

- standardized emergency procedures, and crew training that stresses the importance of coordination and communication between the flight crew and cabin crew during emergencies;
- standardized before takeoff and landing signals from the flight crew which are utilized to allow sufficient time for flight attendants to be seated; and
- standardized notification to the flight crew from the cabin crew when all pre-takeoff and pre-landing duties have been completed and the cabin is secured.

8.3 RESULTS OF THE INTERVIEWS WITH POIS

Generally, inspectors felt that, in the present system, the strength of an airline's training program can be directly related to the attitudes of the airline's management, the discipline provided by the POI, and, to some extent, the strength of the airline's unions. While some airlines will strive to provide training above and beyond the required minimums, other airlines will cut as many corners as possible in training in order to save money and become a stronger competitor in the economic market. Therefore, the responses to such non-regulatory directives as Air Carrier Operations Bulletins can range from changes in an airline's training program and operations procedures to no response, depending on the economic and operational climate of that airline.

On the subject of cockpit and cabin crew coordination, a few of the POIs interviewed stated that they felt that the FAA should mandate either changes in training or changes in operating procedures, or both, to improve cockpit and cabin crew coordination. The majority of the POIs agreed that the status of cockpit and cabin crew coordination is not normally a safety problem, but in abnormal or emergency situations, any weaknesses in communication between the two crews were likely to surface and exacerbate the problem. They stated that the FAA response to problems associated with cockpit and cabin coordination was, by and large, reactionary at both the local and national levels in that the issues were not addressed until a problem had arisen. On a regional scale, for example, it is not routine for a POI to check the emergency procedures and checklists stated in the flight attendants manual against those in the cockpit crew's manuals, after the training program has been approved. However, this

has been done after incidents where poor crew coordination was evident and inconsistencies have been found in at least one instance (see NTSB AAR-84/04, p. 46). The reason most often given for checklists, code words, etc., for one crew not being compared to those for the other crew was a lack of time and manpower to be able to examine the training and operations in such detail on a regular basis. They stated that after certification, procedures are no longer scrutinized to the same extent and such issues do not arise until either the airline requests major changes in their routing structure, or an accident or incident occurs. This may explain why not all of the POIs interviewed were familiar with the details of their airline's flight attendant training.

Another problem that most POIs mentioned regarding monitoring training was difficulty in monitoring training that takes place at training sites outside their jurisdiction. They said that requests made to other POIs to monitor training that is conducted in their regions are usually not granted, due to time and staffing constraints. Similarly, the POIs interviewed found it difficult to find the time to fulfill requests of POIs in different regions to monitor training being conducted in their area.

Most inspectors felt that there was a shortage of inspectors in their office and other offices. Contributing to this problem are duties such as clerical work, responding to inquiries and requests from other inspectors (e.g., to monitor training in their region), etc., that detract from an inspector's primary duties. Another factor that exacerbates the manpower shortage is the experience levels of the inspectors and the lack of formal training for POIs. (According to one POI, 60 percent of the inspectors had less than two years of experience.) Most of the inspectors interviewed felt that, while much of the training for the inspector's position was necessarily "on the job," POIs could benefit substantially from a formal training course, such as the one once offered at the Civil Aeromedical Institute. Of the POI's interviewed, one had taken the course, another had helped teach the course, and many had heard about it from other inspectors. The unanimous opinion was that the course was extremely helpful, that it should be reinstated and given to all newly-hired POIs, and that it should also be available to all inspectors who would be interested in taking it.

It should be noted that the FAA, through "Project Safe," is addressing these issues of inspector staffing and training. Project Safe has "developed and issued standards for objectively determining the number of inspectors necessary to monitor the aviation community (completed January, 1985);... and evaluated and recommended adjustments in headquarters and field staffing for 1986, 1987, and 1988 (completed September, 1985)". (Project Safe: A Blueprint for Flight Standards, 1985, p. iv). The report also suggested that adequate formal training for inspectors be ensured by "updating courses and improving the administration of training programs" (p. v).

The inspectors were asked about the feasibility and desirability of developing a cadre of inspectors who specialized in training and who would assume the responsibility for the approval and monitoring of training nationwide. This concept was unanimously considered to be impractical and undesirable for a number of reasons. First, different airlines have different needs and capabilities. A solid knowledge of the airline's operation is needed to be most effective as a POI. Also, the rapport established over time between the POI and the airline's training administrators is considered to be a vital component to a good working relationship.

While the concept of POIs who specialize in training was discounted by all who were asked, several POIs voiced a need for cabin safety specialists to be available to assist them with questions on flight attendant training and procedures, and other cabin safety issues. Generally, POIs are more familiar with flight training than with flight attendant training, since many, if not most, POIs have gone through flight training themselves.

The issue of standardization was also raised because, in the present system, much is left to the discretion of the POI. Many inspectors cited this lack of standardization as a problem as it prevents uniform interpretation and application of the Federal Aviation Regulations (FARs) and FAA directives. They suggested three measures that would significantly alleviate these problems: better handbooks for inspectors, faster responses to inquiries from headquarters, and national distribution of interpretations of regulations issued by General Counsel (rather than issuing the interpretation only to the party who requested it). Because of the time required to receive responses to inquiries from headquarters, some inspectors have assembled their own set of guidance

materials, that includes regional interpretations of regulations and guidelines. While this method is efficient, economical, and saves much time, it also hinders uniform application of the FARs, and can lead to problems when a regional interpretation differs from one issued by General Counsel. These problems were also noted in Project Safe. The report advises that the FAA "revise and standardize inspector handbooks and improve the distribution system to insure that inspectors have timely and accurate guidance" (p. vi). The revised handbooks are expected to be published by April 1987 (p. 43). Whether or not these handbooks will address cockpit and cabin crew coordination is not known. However, it is important that inspectors receive guidance on how to review an airline's training programs for crew coordination; in order to ensure uniform interpretation of standards for training in crew coordination, detailed requirements should be included in the inspector handbooks.

When the inspectors were queried as to whether or not they would like to see more specific requirements with regard to training and operating procedures, the opinions were divided. About one-half of those interviewed thought that FAA Part 121, Subpart N needed clarification and they thought more specific regulations would be beneficial. They thought that the increased standardization would be helpful to them and would lead to fewer conflicts between POIs and the airlines. They said that conflicts sometimes arise when an inspector requires a change in procedure, for example, and the airline representative responds by saying that the action is not required at other airlines (by their inspectors). More specific requirements could eliminate such problems. They also felt that the only way to improve training for cabin and cockpit coordination was to have new and specific regulations on training. The other half of the inspectors interviewed thought that further standardization was undesirable. They felt that adding to the existing regulations could lead some airlines with high training standards to come down to the minimums. Some also felt that increased standardization would add to their workload unnecessarily. Several inspectors, including some opposed to increased standardization, were in favor of regulations that require the cabin to be secured before the plane can taxi and regulations that limit the number, size, and weight of carry-on baggage. The importance of having all items secured in the cabin in takeoff and landing has already been discussed. Only with communication between the cockpit and the cabin crews can proper preparation of the cabin be ensured.

9. SUMMARY OF PROBLEM AREAS

The coordination of the activities of the cockpit and cabin crews is generally adequate and does not usually result in problems during normal operations. However, weaknesses in communication between the two crews can present serious problems during normal operations and can compound problems in an emergency resulting in unnecessary hazards to the safety of the passengers and crew. Summaries of the problems and factors that contribute to the current problems in cockpit and cabin crew coordination are presented below.

Communication in Emergencies - In emergencies, the flight crew does not always give the cabin crew timely notification of the nature of the emergency, the time available to prepare the cabin, and the necessary special instructions (e.g., to use only one side of the aircraft in the evacuation). Similarly, the cockpit crew does not always receive timely and precise information on irregularities in the cabin, e.g., fire, unusual noises, etc. These problems continue to occur even though instructions to relay such information to the other crew are explicit in the crew manuals.

"Sterile Cockpit" (FAR 121.542) - Flight attendants do not always know when sterile cockpit procedures should be in effect because reliable indications of sterile cockpit are not always available to the flight attendants. That is, flight attendants have no way of knowing when the aircraft is at 10,000 feet, unless they are told or signaled in some way. Furthermore, many flight attendants do not have a clear understanding of the operational applications of the sterile cockpit concept. Flight attendants have violated sterile cockpit procedures unnecessarily (e.g., with requests for connection information) and have failed to contact the cockpit with important safety information for fear of violating sterile cockpit procedures. Upon examining flight attendant manuals and recurrent training, it was found that most flight attendants are not given detailed information on sterile cockpit procedures in their training.

Knowledge of the Other Crew's Duties - Airlines vary widely on the degree of instruction given on the duties of the other crew, and some airlines give no instruction on this topic. Only 83% of the flight attendants surveyed said that their training

covered the duties of the cockpit crew during emergencies; only 49% covered cockpit crew duties before takeoff and landing. Seventy-six percent of the pilots surveyed said their training covered flight attendant duties during normal operations; 88% said they covered flight attendant duties during emergencies. Flight attendants need to be given instruction as to what the cockpit crew duties are during normal operations (e.g., preflight) and emergencies. Similarly, flight crews need to be given information as to the flight attendant's duties during normal operations and emergencies. During normal operations, each crew needs to have a general idea of what the duties of the other crew are so that they know when each crew is at their busiest. Such knowledge helps to avoid miscommunication, unrealistic expectations and inappropriate requests of other crewmembers. During emergencies, it is imperative that each crew know exactly what to expect from the other crew so that they can work together effectively.

Turbulence - Flight crews do not always give the flight attendants timely notification of turbulence. While this is not a common problem, it is one that has resulted in severe injury.

Preparation for Takeoff and Landing - The cabin is not always secured for takeoff and landing, due to insufficient notice before takeoff or landing. This has resulted in articles not being properly stowed and flight attendants not being seated, or in their proper jumpseats for takeoff roll or touchdown.

Inspector Staffing and Support - Most inspectors interviewed felt that there is a shortage of inspectors in their offices and in other offices. Duties such as clerical work and responding to public inquiries and requests from other inspectors exacerbate the problem as they detract from an inspector's primary duties. As a result, the time available for activities such as examining the details of training for cockpit and cabin crew coordination is severely constrained, and training conducted outside the inspector's area of jurisdiction is not routinely monitored.

Timely Guidance for Principal Operations Inspectors - Interpretations of Federal Aviation Regulations are currently issued only to the party who requests them. Also, responses from headquarters to inquiries are sometimes too slow to be useful. For

these reasons, inspectors often go through channels that are less time consuming (such as regional interpretation). This promotes regional differences in interpretations of the FARs and FAA directives, and consequently, in airline operational practices.

10. RECOMMENDATIONS

The results of this study indicate that some improvements need to be made in the coordination of cockpit and cabin crew activities. It is also clear that the key to improving cockpit and cabin crew coordination lies in improving the communication between the two crews and in increasing each crew's awareness of the other crew's duties and concerns. The specific recommendations for improving cockpit and cabin crew coordination suggested by this research can be divided into two categories - training and procedures. Most of these recommendations are not new. Some of them are contained in the 1984 Air Carrier Operations Bulletin (No. 1-76-19), and most of the others can be found in the literature (specifically, Koan, 1985; Mott, 1984; and Sprogis, 1984). Generally, airlines have not incorporated these recommendations into their procedures. For example, some pilots and flight attendants report that a captain/flight attendant pre-flght briefing is not standard at their airline; in some cases where it is standard, the briefing consists solely of introductions. However, most of the procedures recommended in the 1984 Air Carrier Operations Bulletin are stated as company policy for many airlines. Despite this, the problems still persist.

Training is widely regarded as the most effective means of improving crew coordination. Statements in manuals, without the appropriate emphasis in training, will not lead to the proper response in an emergency. Training for good crew coordination includes instructing each crew on the other crew's emergency procedures, codes, signals and safety-related duties. In an emergency, it is imperative that each crew interpret emergency signals and codes in the same way. For example, code words or signals for hijacking or evacuation are useless, unless both crews are aware of their meaning. Furthermore, emergency procedures for both crews must be compatible. For example, if the flight attendants are taught that the second officer will occupy a cabin seat in preparation for a ditching in a certain aircraft, then the flight crew needs to be

informed of this in their training. When manuals for the two crews are written and revised independently, it is imperative that they be cross-checked for consistency. Training administrators and Principal Operations Inspectors should ensure that the emergency procedures and safety-related information (e.g., on signals, codes, company policies, etc.) presented to one crew is compatible with the information presented to the other crew. In any emergency, the flight attendants need to know the nature of the emergency, the time available to prepare the cabin, what the bracing signal will be and if there are any special instructions. Consequently, the cockpit crew must be ready to give the cabin crew this information in a timely manner. A well-orchestrated preparation for an emergency evacuation, or the handling of any other emergency, requires stressing the appropriate procedures in training for both crews.

Cockpit and cabin crew coordination during normal operations also requires appropriate training. Each crew needs to be instructed on the other crew's safety-related duties and workload during preflight, takeoff, cruise, and landing. Such training helps to avoid miscommunication, unrealistic expectations and inappropriate requests of other crewmembers. Additionally, training must stress the types and quality of information that one crew expects from the other crew, both in emergencies and in normal operations. While this is best accomplished by either having pilots and flight attendants in classes together or by having the same instructors teach pilots and flight attendants on these topics, the material may also be covered by a flight attendant instructor participating in flight training and a pilot representative (e.g., check airman) teaching in flight attendant training. Furthermore, a videotaped or slide presentation of each crew's duties and procedures during normal operations and emergencies can also be extremely effective as well as cost efficient. Finally, flight attendants should be trained as to when, and with what information, to contact the cockpit. They also need to be given a clear, operational definition of "sterile cockpit" procedures so that they neither naively violate them nor hesitate to contact the cockpit with relevant information. The quality of the decisions (as to whether or not to contact the cockpit) made by the flight attendants will be directly related to the information they received in training. The clearer the flight attendant's understanding of sterile cockpit procedures and flight operations is, the better these decisions will be.

Practices such as respectful introductions and displays of common courtesy can help to enhance the working relationship between the two crews and foster an atmosphere that is conducive to good communication. Perhaps the single most important practice for setting the stage for good cockpit and cabin crew crew coordination on any flight is the cockpit/cabin (or captain/flight attendant) preflight briefing. A good cockpit/cabin preflight briefing gives the flight attendants the names of the cockpit crewmembers, the in-flight weather, the estimated flight time, and any unusual circumstances of the flight. Other topics can also be covered such as cockpit entry procedures, a review of emergency communication procedures, details of the meal service, or any topic that either crew considers to be important. The briefing should allow each crew to solicit information from the other crew and to bring to the attention of the other crew any information that they believe to be relevant.

Principal Operations Inspectors directly influence airline training and operational procedures and their potential for helping to improve crew coordination should not be overlooked. The problems of inspector staffing, support, training, guidelines and handbooks have been addressed by Project Safe and the recommendations contained in the report are supported by this research. With respect to cockpit and cabin crew coordination, POIs should be provided with specific guidelines and the necessary support to review an airline's training programs and operational procedures for crew coordination.

Project Safe also asserts that "flight standards will pursue a regulatory policy that recognizes the obligation of the air carrier to maintain the highest possible degree of safety. Federal regulations will exist to the extent necessary to attain this goal in the most economical and efficient manner to the government and the carrier" (p. 41). Therefore, in keeping with the directives of Project Safe, and given that the Air Carrier Operations Bulletins have not been effective in rectifying the problems associated with cockpit and cabin crew coordination, the following recommendations are made:

(1) FAR 121.417 requires that "instruction in emergency assignments and procedures, including coordination among crewmembers" be given to all crewmembers.

Training for pilots, flight engineers and flight attendants should, therefore, include information on the other crew's duties during pre-flight, takeoff, cruise, and landing; and a review of different types of emergencies and the information that each crew needs during such emergencies with emphasis on when such information should be presented. In addition, training for flight attendants (under FAR 121.417) should include FAR 121.542 and the operational applications of the sterile cockpit concept.

(2) The following procedures, which are addressed in ACOB No. 1-76-19, should be stressed in training as procedures to be followed on every flight:

(a) Pre-departure briefing by a flight crewmember of the senior flight attendant;

(b) Use of public address system to alert flight attendants and passengers of anticipated in-flight turbulence;

(c) Notification to flight attendants when turbulence is severe enough to cease in-flight services and/or be seated with their restraints fastened, and when it is safe for them to resume their duties;

(d) Notification to the flight crew from the cabin crew when all pre-takeoff and pre-landing duties have been completed and the cabin is secured;

(e) Pre-takeoff and pre-landing signals (or announcements) from the flight crew to allow sufficient time for the flight attendants to be seated; and

(f) Crew training that stresses the importance of communication and coordination between the flight crew and cabin crew during emergencies.

(3) Flight attendants should be notified when "sterile cockpit" procedures are in effect. A good signal for this is an indicator light above the cockpit door or on the annunciator panel that has a duration as long as the sterile cockpit interval (as

opposed to a discrete tone or announcement that could be missed) and cannot be confused with another signal. If the aircraft is not equipped with such a signal, then a member of the flight crew should make an announcement over the public address system when the aircraft has transcended 10,000 feet (after takeoff) or is approaching 10,000 feet (before landing).

(4) The issues of FAA inspector staffing and support have already been addressed in Project Safe. The following changes are recommended in addition to those presented in Project Safe:

(a) Interpretations of relevant Federal Aviation Regulations made by the FAA General Counsel should be distributed to all Flight Standards District Offices and Air Carrier District Office; and

(b) Cabin safety specialists should be made available to assist Principal Operations Inspectors in matters concerning flight attendant training and other cabin safety issues.

APPENDIX A

FORMS USED IN THE SURVEYS OF PILOTS AND FLIGHT ATTENDANTS

Please feel free to make comments in the space provided at the end of the survey.

1. Generally, do you think that communication between cockpit and cabin crewmembers is adequate? yes____ no____
2. Have you ever had any problems arise from a lack of communication between the cockpit and cabin crews? yes____ no____
3. Was there anything in your training that specifically addressed cockpit/cabin communication or coordination? yes_____ no____
4. Please check what areas were covered in your training, and the extent to which they were covered:

		briefly	in-depth
_____	Captain/Flight attendant preflight briefing	_____	_____
_____	Captain/Flight attendant emergency briefing	_____	_____
_____	cabin crew activities during emergencies	_____	_____
_____	cabin crew activities before takeoff and landing	_____	_____

b. Was this information covered: (please check as many as apply)

_____ in a video?
_____ by an instructor?
_____ by observing flight attendant training?
_____ other? (please specify) _____

5. Is any portion of your training:

taught by a flight attendant? yes_____ no_____
attended by flight attendants? yes_____ no_____

6. Do you think that the concept of "sterile cockpit" needs to be clarified for F/As (i.e., do you think that flight attendants need to be given specific information as to what "sterile cockpit" means and when it should be broken)?
yes_____ no_____

b. Have you ever had any problems resulting from a lack of information regarding "sterile cockpit"? yes_____ no_____

7. On what percentage of your flights (i.e., on the first leg of a flight or upon crew changes) are Captain/Flight attendant pre-flight briefings conducted? _____

b. What areas are typically covered in these briefings? (check as many as apply)

_____ introductions
_____ in-flight weather
_____ procedures for entering the cockpit (if there is a company policy for this, please respond "N/A")
_____ other _____

8. Do you participate in the flight attendant preflight briefings conducted on wide-body flights? yes_____ no_____

b. Do you think that pilot participation in flight attendant preflight briefings is desirable? yes_____ no_____

9. Do you think that it is important for the cockpit crew to be informed that the cabin is secured in preparation for takeoff and landing? yes _____ no _____

b. If so, what method do you recommend? interphone _____ call-chime _____ other_____

10. What percentage of your flying experience is in wide-body airplanes? _____

11. What information, if any, would you like to receive from the cabin that isn't normally transmitted?

12. Please briefly describe any problems you have had due to poor communication between cockpit and cabin crewmembers (including problems related to sterile cockpit).

13. How do you think cockpit/cabin communication could be improved?

14. What practices or procedures do you think enhance crew communication?

Additional Comments:

SURVEY OF SAFETY REPRESENTATIVES CONDUCTED BY THE ASSOCIATION OF FLIGHT ATTENDANTS

Please feel free to make comments in the space provided at the end of the survey.

What percentage of your flying experience is in wide-body airplanes? _____

1. Generally, do you think that communication between cockpit and cabin crewmembers is adequate? yes____ no____
2. Have you ever had any problems arise from a lack of communication between the cockpit and cabin crews? yes____ no____
3. Was there anything in your training that specifically addressed cockpit/cabin communication or coordination? yes_____ no____
4. Please check what areas were covered in your training, and the extent to which they were covered:

		briefly	in-depth
_____	Captain/Flight attendant preflight briefing	_____	_____
_____	Captain/Flight attendant emergency briefing	_____	_____
_____	cockpit crew activities during emergencies	_____	_____
_____	cockpit crew activities before takeoff and landing	_____	_____

b. Was this information covered: (please check as many as apply)

_____ in a video?

_____ by an instructor?

_____ by observing pilot training or procedures?

_____ other? (please specify) _____

5. Is any portion of your training:

taught by a pilot? yes_____ no_____

attended by pilots? yes_____ no_____

6. Do you think that the concept of "sterile cockpit" needs to be clarified for F/As (i.e., do you think that flight attendants need to be given specific information as to what "sterile cockpit" means and when it should be broken)?

yes_____ no_____

b. Do you have a signal or policy to indicate when sterile cockpit procedures are in effect? yes_____ no_____

If so, what is the signal or policy? _____

c. Have you ever had any problems resulting from a lack of information regarding "sterile cockpit"? yes_____ no_____

7. On what percentage of your flights are Captain/Flight attendant pre-flight briefings conducted? _____

b. What areas are typically covered in these briefings? (check as many as apply)

_____ introductions

_____ in-flight weather

_____ procedures for entering the cockpit (if there is a company policy for this, please respond "N/A")

_____ other _____

8. Do pilots participate in your preflight briefings conducted on wide-body flights? yes_____ no_____

Do you think that pilot participation in flight attendant pre-flight briefings is desirable? yes_____ no_____

9. Do you think that it is important for the cockpit crew to be informed that the cabin is secured in preparation for takeoff and landing? yes _____ no _____

If so, what method do you recommend? interphone _____ call-chime _____ other_____

10. What information, if any, would you like to receive from the cockpit that isn't normally transmitted?

11. Please briefly describe any problems you have had due to poor communication between cockpit and cabin crewmembers (including problems related to sterile cockpit).

12. How do you think cockpit/cabin communication could be improved?

13. What practices or procedures do you think enhance crew communication?

Additional Comments:

APPENDIX B

RESULTS OF THE SURVEYS OF PILOT AND FLIGHT ATTENDANT SAFETY REPRESENTATIVES

RESULTS OF SURVEY OF ALPA SAFETY REPRESENTATIVES *

1. Generally, do you think that communication between cockpit and cabin crewmembers is adequate? yes 60% no 40%

2. Have you ever had any problems arise from a lack of communication between the cockpit and cabin crews? yes 40% no 60%

3. Was there anything in your training that specifically addressed cockpit/cabin communication or coordination? yes 64% no 36%

4. Please check what areas were covered in your training, and the extent to which they were covered:

	area covered	briefly	in-depth
Captain/Flight attendant preflight briefing	84%	68%	16%
Captain/Flight attendant emergency briefing	84%	44%	40%
cabin crew activities during emergencies	88%	48%	40%
cabin crew activities before takeoff and landing	76%	56%	20%

b. Was this information covered:
(please check as many as apply)

in a video?	44%
by an instructor?	76%
by observing flight attendant training?	4%
other? (manual, bulletin, simulation, memo)	28%

5. Is any portion of your training:
taught by a flight attendant? yes 16% no 84%
attended by flight attendants? yes 16% no 84%

6. Do you think that the concept of "sterile cockpit" needs to be clarified for F/As (i.e., do you think that flight attendants need to be given specific information as to what "sterile cockpit" means and when it should be broken)? yes 80% no 20%

b. Have you ever had any problems resulting from a lack of information regarding "sterile cockpit"? yes 72% no 28%

*NOTE: PERCENTAGES REPRESENT THE PORTION OF THE 25 RESPONDENTS WHO GAVE THAT ANSWER

7. On what percentage of your flights (i.e., on the first leg of a flight or upon crew changes) are Captain/Flight attendant pre-flight briefings conducted?
Range = 0% to 100%; average = 60%

b. What areas are typically covered in these briefings? (check as many as apply)

introductions	88%
in-flight weather	84%
procedures for entering the cockpit (if there is a company policy for this, please respond "N/A")	32%

40% other. Responses included: emergency notification procedures, cockpit entry signal, number of flight attendants, details of flight (schedule, route, time, altitude, points of interest, type of service, planned load) offers of assistance

8. Do you participate in the flight attendant preflight briefings conducted on wide-body flights?
Of the 25 respondents, 9 (36%) had experience in wide-body aircraft. Of these 9, 2 responded "yes".

b. Do you think that pilot participation in flight attendant preflight briefings is desirable?
Of the 9 respondents with experience in wide-bodies, 6 said "yes". Of the 5 other respondents who answered this question, 3 said "yes".

9. Do you think that it is important for the cockpit crew to be informed that the cabin is secured in preparation for takeoff and landing? yes 96% no 4%

b. If so, what method do you recommend? interphone 56% call-chime 36% other 16% (Some respondents checked more than one). "Other" included personal visit and to inform the cockpit crew only if the cabin is NOT prepared.

10. What percentage of your flying experience is in wide-body airplanes? 36% of the respondents had experience ranging from 1% to 40% of their total flying time.

11. What information, if any, would you like to receive from the cabin that isn't normally transmitted?
16% - unusual situation or noise
12% - cabin prepared for takeoff, landing
12% - accurate passenger count

11. (continued)

12% - potentially problematic passengers

12% - passenger problems (sickness or injury)

8% - flight attendants seated and cabin prepared for turbulence

Each of the following was listed by one respondent:

- boarding problems
- catering problems
- all passengers seated
- when additional flight attendants have boarded
- service details (when meals will be served, when movies will be shown)

12. Please briefly describe any problems you have had due to poor communication between cockpit and cabin crewmembers (including problems related to sterile cockpit).

24% - problems related to sterile cockpit. These problems included unnecessary contact during critical phases of flight and reluctance to contact the cockpit with important information (in one case it was a fire in the rear galley trash container) due to a misconception of the sterile cockpit concept.

8% - flight attendants not seated for takeoff, landing, turbulence

8% - flight attendants being reluctant to contact cockpit for help with abusive or problematic passengers

Each of the following was listed by one respondent:

- improper cockpit entry procedure
- flight attendants did not notify cockpit crew of galley fire (reason not given)
- flight attendants did not inform cockpit crew that smoke in galley had ceased after galley power had been turned off

13. How do you think cockpit/cabin communication could be improved?

16% - joint training - topics included: emergency procedures (including rapid decompression, emergency descent, and emergency evacuation), and flight crew/flight attendant briefing

12% - require a captain/flight attendant pre-flight briefing

8% - notify flight attendants when sterile cockpit is in effect (and when it is no longer in effect)

13. (continued)

Each of the following was listed by one respondent:

- better training for flight attendants
  - -better training on sterile cockpit
  - -stress authority of captain and importance of common courtesy
- closer association of in-flight services and flight operations personnel
- better training for cockpit/cabin crew coordination
- pair the same two crews together as often as possible
- establish lead flight attendant as bid position
- improve relationship (and respect) between the two crews
- increase each crew's understanding of the other crew's needs
- better interphone equipment

14. What practices or procedures do you think enhance crew communication?

48% - mentioned a cockpit/cabin pre-flight briefing as important or highly desirable. Specific topics to be included in the briefing were also mentioned: emergency communication procedures, emergency equipment, weather, special passengers, and meal service.

12% - joint training on security and emergency procedures

8% - respect for other crewmembers and understanding of other crew's needs

8% - training for flight attendants that stresses the authority of the captain and the importance of informing the captain of problems and unusual occurrences

Each of the following was listed by one respondent:

- close association of personnel from in-flight services and flight operations
- comfortable, relaxed atmosphere (between cockpit and cabin) and an "open door" policy
- a company form signed by the senior flight attendant giving the names of the flight attendants and indicating that the flight attendants' pre-flight inspection of the cabin had been completed

Additional Comments:

Each of the following was listed by one respondent:

- Attendance of cockpit crewmember at flight attendant preflight briefing is not practical due to short ground times, multiple crews, late arrivals and preflight workload of two-man crews
- Interphone should be used more instead of call-chime
- Good training (for flight attendants) on the concept of sterile cockpit results in fewer problems.

RESULTS OF SURVEY OF AFA SAFETY REPRESENTATIVES *

1. Generally, do you think that communication between cockpit and cabin crewmembers is adequate? yes 37% no 63%

2. Have you ever had any problems arise from a lack of communication between the cockpit and cabin crews? yes 77% no 23%

3. Was there anything in your training that specifically addressed cockpit/cabin communication or coordination? yes 86% no 14%

4. Please check what areas were covered in your training, and the extent to which they were covered:

	area covered	briefly	in-depth
Captain/Flight attendant preflight briefing	86%	77%	9%
Captain/Flight attendant emergency briefing	94%	46%	48%
cockpit crew activities during emergencies	83%	54%	29%
cockpit crew activities before takeoff and landing	49%	43%	6%

b. Was this information covered: (please check as many as apply)

in a video?	43%
by an instructor?	97%
by observing pilot training or procedures?	0%
other? (manual, written material, company newsletter, chief pilot "stopped by")	11%

5. Is any portion of your training:
   taught by a pilot? yes 9% no 81%
   attended by pilots? yes 17% no 83%

6. Do you think that the concept of "sterile cockpit" needs to be clarified for F/As (i.e., do you think that flight attendants need to be given specific information as to what "sterile cockpit" means and when it should be broken)?
   yes 86% no 14%

*NOTE: PERCENTAGES REPRESENT THE PORTION OF THE 35 RESPONDENTS WHO GAVE THAT ANSWER

6b. Do you have a signal or policy to indicate when sterile cockpit procedures are in effect? yes 80% no 20% (NOTE: There was variability within airlines; some flight attendants responded "yes", while others from the same airlines said "no".) If so, what is the signal or policy? Responses included: bell chime, announcement, no smoking signoff, "fasten seat belt" sign on, 15 minutes after takeoff and 10 minutes before landing, 10 minutes after takeoff and 3 minutes before landing, 10 minutes after takeoff (only), green light on annunciator panel, engines operating to level cruise and descent from level cruise to shutdown, two cycles of "fasten seat belt" sign

c. Have you ever had any problems resulting from a lack of information regarding "sterile cockpit"? yes 26% no 74%

7. On what percentage of your flights are Captain/Flight attendant pre-flight briefings conducted? The range of answers was from 0% to 100%; the average was 23%.

b. What areas are typically covered in these briefings? (check as many as apply)

58% introductions

56% in-flight weather

18% procedures for entering the cockpit (if there is a company policy for this, please respond "N/A")

8. Do pilots participate in your preflight briefings conducted on wide-body flights? Approximately 50% of the flight attendants had experience in wide-body aircraft. Of these flight attendants, 18% of them said "yes".

b. Do you think that pilot participation in flight attendant pre-flight briefings is desirable?
88% of the flight attendants with experience in wide-body aircraft said"yes". 96% of the others also said "yes".

9. Do you think that it is important for the cockpit crew to be informed that the cabin is secured in preparation for takeoff and landing? yes 91% no 9%
If so, what method do you recommend? interphone 63% call-chime 31% other 6% (direct communication with captain)

10. What information, if any, would you like to receive from the cockpit that isn't normally transmitted?

26% - en route weather

20% - actual flight time

14% - names of cockpit crewmembers

9% - reasons for delays

9% - information on any irregularities before announcement is made to passengers

9% - emergency codes

6% - announcements to flight attendants and passengers regarding turbulence

6% - special instructions (e.g., regarding armed passengers)

6% - approximate taxi time

Each of the following was listed by one respondent:

- when "sterile cockpit" period is over after takeoff and when it begins before landing
- information on security
- hazardous material briefing
- deferred mechanical problems
- notification one hour before landing
- problems with auxiliary power unit
- whether or not maintenance items will be deferred
- whether or not all air packs will be used

11. Please briefly describe any problems you have had due to poor communication between cockpit and cabin crewmembers (including problems related to sterile cockpit).

9% - turbulence without any warning from cockpit

9% - pilots not answering chime call during "sterile cockpit" period

6% - flight attendants were reluctant to contact cockpit during "sterile cockpit" even when the situation merited doing so

6% - observed other flight attendants needlessly violating "sterile cockpit"

6% - air quality problems

6% - too little time between onset of "no smoking" sign and landing for thorough cabin check

Each of the following was listed by one respondent:

- landing without "seat belt" sign on and with flight attendants still standing
- no communication during a hydraulic loss

11. (continued)

- on short taxis, the flight attendants' safety demonstration has been interrupted by the announcement from the cockpit to take their seats for takeoff
- pilots have been reluctant to enter items into cabin log book for fear of incurring delays
- flight attendants were not informed of a mechanical problem because the cockpit crew did not want to "alarm them"
- flight attendant discovered that pilots were not aware that the flight attendant manual stated that the second officer would take a cabin seat in preparation for ditching in a DC-10
- flight attendants and passengers were in the brace position for over five minutes after the captain told them to brace for a planned emergency landing
- pilots who are accustomed to flying cargo (only) do not use the interphone
- pilots thought that they might overrun the runway but did not inform flight attendants of this
- cockpit did not act on flight attendant's request for medical assistance to be waiting for ill passenger at airport
- although company policy states that pilots will make an announcement when 10,000 feet is reached (to inform flight attendants of "sterile cockpit" period), pilots do not always comply

12. How do you think cockpit/cabin communication could be improved?

35% - train pilots and flight attendants together, particularly on emergency evacuation procedures

20% - good cockpit/cabin preflight briefing

17% - increase each crew's understanding of the other crew's duties, with special attention to when each crew is their busiest

17% - pilots and flight attendants should show more respect for all crewmembers

6% - put flight attendants and pilots under the same department

6% - teach pilots that communication with flight attendants is important and not to withhold information for fear of "upsetting" them

6% - airlines should encourage good relations between pilots and flight attendants

Each of the following was listed by one respondent:

- pilots and flight attendants should have some of the same instructors so that both crews get the same information
- cross-check pilot and flight attendant manuals for inconsistencies

12. (continued)

- keep flight attendants and passengers informed as to the reasons for delays with more announcements from the cockpit
- have pilots fill out a sheet of paper with their names on it
- have an "exchange program" where flight attendants ride in the cockpit jumpseat and pilots ride in the cabin
- teach pilots that flight attendant concerns regarding passengers and aircraft need to be taken seriously

13. What practices or procedures do you think enhance crew communication?

26% cockpit/cabin crew preflight briefing with entire crew present
23% keeping crews together
17% a good captain/flight attendant briefing
17% introductions
14% joint recurrent training
Each of the following was listed by one respondent:

- demonstrating common courtesy on and off the aircraft
- joint debriefings after accidents/incidents
- captain drilling flight attendants on emergency procedures during preflight briefing

Additional Comments:

Each of the following was listed by one respondent:

- Flight attendants appreciate it when a captain walks through the cabin before the passengers board to introduce himself to the flight attendants and give the anticipated weather, flight time, etc. The flight attendants may be very busy, and thus appear not to be paying attention, but they are actually quite interested.
- Pilots and flight attendants should realize that they must work as one team.
- On short flights, the only cockpit/cabin communication that takes place is relaying the passenger count.
- FAA guidelines on pilot and flight attendant training for crew coordination need to be more specific.
- Passengers often mistake the "sterile cockpit" signal (two cycles of the "fasten seat belt" sign) for the offset of the "fasten seat belt" sign.
- There should be a signal or code word for the captain to use to tell the flight attendants to start an emergency evacuation that would not alarm the passengers.

APPENDIX C

FAR 121.417 CREWMEMBER EMERGENCY TRAINING

§ 121.417 Crewmember emergency training.

(a) Each training program must provide the emergency training set forth in this section with respect to each airplane type, model, and configuration, each required crewmember, and each kind of operation conducted, insofar as appropriate for each crewmember and the certificate holder.

(b) Emergency training must provide the following:

(1) Instruction in emergency assignments and procedures, including coordination among crewmembers.

(2) Individual instruction in the location, function, and operation of emergency equipment including—

(i) Equipment used in ditching and evacuation;

(ii) First aid equipment and its proper use;

(iii) Portable fire extinguishers, with emphasis on type of extinguisher to be used on different classes of fires; and

(iv) Emergency exits in the emergency mode with the evacuation slide/raft pack attached (if applicable), with training emphasis on the operation of the exits under adverse conditions.

(3) Instruction in the handling of emergency situations including—

(i) Rapid decompression;

(ii) Fire in flight or on the surface, and smoke control procedures with emphasis on electrical equipment and related circuit breakers found in cabin areas including all galleys, service centers, lifts, lavatories and movie screens;

(iii) Ditching and other evacuation, including the evacuation of persons and their attendants, if any, who may need the assistance of another person to move expeditiously to an exit in the event of an emergency.

(iv) Illness, injury, or other abnormal situations involving passengers or crewmembers; and

(v) Hijacking and other unusual situations.

(4) Review and discussion of previous aircraft accidents and incidents pertaining to actual emergency situations.

(c) Each crewmember must perform at least the following emergency drills and (except with respect to the equipment specified in paragraphs (c)(6) (v), (vi), and (vii) of this paragraph) actually operate the following emergency equipment during initial training and once each 24 calendar months during recurrent training for each type aircraft in which they are to serve. Each crewmember is only required to participate in one emergency evacuation using a slide during initial training. (Alternate recurrent periods required by § 121.433(c) may be accomplished by approved pictorial presentation or demonstration.)

(1) Each type of emergency exit in the normal and emergency modes, including the actions and forces required in the deployment of the emergency evacuation slides.

(2) Each type of fire extinguisher.

(3) Each type of emergency oxygen system.

(4) Emergency evacuation including the use of a slide.

(5) Donning, use, and inflation of individual flotation means, if applicable.

(6) Ditching, if applicable, including but not limited to, as appropriate:

(i) Cockpit preparation and procedures.

(ii) Crew coordination.

(iii) Passenger briefing and cabin preparation.

(iv) Donning and inflation of life preservers.

(v) Removal from the airplane (or training device) and inflation of each type of life raft.

(vi) Transfer of each type of slide/raft pack from one door to another.

(vii) Deployment, inflation and detachment from the airplane (or training device) of each type of slide/raft pack.

(viii) Use of life-lines.

(ix) Boarding of passengers and crew into a raft or a slide/raft pack.

(d) Crewmembers who serve in operations above 25,000 feet must receive instruction in the following:

(1) Respiration.

(2) Hypoxia.

(3) Duration of consciousness without supplemental oxygen at altitude.

(4) Gas expansion.

(5) Gas bubble formation.

(6) Physical phenomena and incidents of decompression.

(Sec. 1111 of the Federal Aviation Act of 1958; 49 U.S.C. 1511; Secs. 313, 314, and 601 through 610, of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1354, 1355, 1421 through 1430); sec. 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)))

(Amdt. 121-55, 35 FR 90, Jan. 3, 1970 as amended by Amdt. No. 121-133, 42 FR 18394, Apr. 7, 1977; Amdt. 121-144, 43 FR 22647, May 25, 1978; Amdt. 121-148, 43 FR 46234, Oct. 5, 1978; Amdt. 121-151, 44 FR 25202, Apr. 30, 1979; Amdt. 121-179, 47 FR 33390, Aug. 2, 1982)

APPENDIX C

FAR 121.417 CREWMEMBER EMERGENCY TRAINING

§ 121.417 Crewmember emergency training.

(a) Each training program must provide the emergency training set forth in this section with respect to each airplane type, model, and configuration, each required crewmember, and each kind of operation conducted, insofar as appropriate for each crewmember and the certificate holder.

(b) Emergency training must provide the following:

(1) Instruction in emergency assignments and procedures, including coordination among crewmembers.

(2) Individual instruction in the location, function, and operation of emergency equipment including—

(i) Equipment used in ditching and evacuation;

(ii) First aid equipment and its proper use;

(iii) Portable fire extinguishers, with emphasis on type of extinguisher to be used on different classes of fires; and

(iv) Emergency exits in the emergency mode with the evacuation slide/raft pack attached (if applicable), with training emphasis on the operation of the exits under adverse conditions.

(3) Instruction in the handling of emergency situations including—

(i) Rapid decompression;

(ii) Fire in flight or on the surface, and smoke control procedures with emphasis on electrical equipment and related circuit breakers found in cabin areas including all galleys, service centers, lifts, lavatories and movie screens;

(iii) Ditching and other evacuation, including the evacuation of persons and their attendants, if any, who may need the assistance of another person to move expeditiously to an exit in the event of an emergency.

(iv) Illness, injury, or other abnormal situations involving passengers or crewmembers; and

(v) Hijacking and other unusual situations.

(4) Review and discussion of previous aircraft accidents and incidents pertaining to actual emergency situations.

(c) Each crewmember must perform at least the following emergency drills and (except with respect to the equipment specified in paragraphs (c)(6) (v), (vi), and (vii) of this paragraph) actually operate the following emergency equipment during initial training and once each 24 calendar months during recurrent training for each type aircraft in which they are to serve. Each crewmember is only required to participate in one emergency evacuation using a slide during initial training. (Alternate recurrent periods required by § 121.433(c) may be accomplished by approved pictorial presentation or demonstration.)

(1) Each type of emergency exit in the normal and emergency modes, including the actions and forces required in the deployment of the emergency evacuation slides.

(2) Each type of fire extinguisher.

(3) Each type of emergency oxygen system.

(4) Emergency evacuation including the use of a slide.

(5) Donning, use, and inflation of individual flotation means, if applicable.

(6) Ditching, if applicable, including but not limited to, as appropriate:

(i) Cockpit preparation and procedures.

(ii) Crew coordination.

(iii) Passenger briefing and cabin preparation.

(iv) Donning and inflation of life preservers.

(v) Removal from the airplane (or training device) and inflation of each type of life raft.

(vi) Transfer of each type of slide/raft pack from one door to another.

(vii) Deployment, inflation and detachment from the airplane (or training device) of each type of slide/raft pack.

(viii) Use of life-lines.

(ix) Boarding of passengers and crew into a raft or a slide/raft pack.

(d) Crewmembers who serve in operations above 25,000 feet must receive instruction in the following:

(1) Respiration.

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APPENDIX D

ACTION NOTICE N8430.284, AUGUST, 1977

NOTICE

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8430.284

8/2/77

Cancellation
Date: 4/1/78

SUBJ: COCKPIT/CABIN COORDINATION

1. PURPOSE. This notice is issued to assure that adequate emphasis is placed on air carrier cockpit/cabin crew coordination procedures through the publication of adequate procedures in crew manuals and the adherence to these procedures during line operations.

2. DISTRIBUTION. This notice is distributed to the Flight Standards Washington, Regional and Aeronautical Center Offices (to the branch level); to all Air Carrier District Offices and Flight Standards District Offices; and to all International Field Offices.

3. BACKGROUND. Flightcrew coordination is an integral part of effective cockpit performance. Likewise, cabin crew coordination is necessary to an efficient, safe cabin operation. Although cockpit crew coordination and cabin crew coordination may separately be excellent, it is evident that a need exists for an improvement in cockpit/cabin coordination. This need was expressed in a recent flight attendant survey and was the subject of Notice 8430.274, "Emergency Evacuation Duties of all Crewmembers." Recent occurrences involving an aircraft evacuation initiated without cockpit knowledge and injuries to flight attendants while working in the galley during conditions of in flight turbulence, indicate that greater efforts must be expended in this area.

4. ACTION.

a. Principal operations inspectors (POI) should again review their assigned carrier's procedures regarding cockpit/cabin coordination. This may also be included as an item of special emphasis during en route surveillances in accordance with Order 8430.6A, paragraph 1090. Possible areas for review and/or observation may include:

(1) Predeparture briefings of entire crew by captain.

(2) Delegation of responsibility for preflight inspection of cabin emergency equipment.

(3) Definition of responsibility (captain, flight attendant or passenger agent) for passenger boarding problems such as excess cabin baggage, intoxication, etc.

(4) Cabin status reports to cockpit prior to push back or prior to takeoff.

Distribution: WRCFS-3
FFS-2, 5 & 7 (wide)

Initiated By: AFS-223

(5) Use of seatbelts and/or no smoking signs.

(6) Applicability of seatbelt sign to flight attendants.

(7) Flight attendant activities during periods of actual or anticipated turbulence.

(8) Definitive responsibilities for initiation of emergency evacuations.

(9) Procedures for effecting cockpit/cabin coordination after a crew change of either flight attendants or cockpit crewmember.

(10) Responsibility for maintenance writeups concerning expended emergency equipment or defective cabin equipment that may affect safety.

(11) Flightcrew and flight attendant manual contents concerning all crewmembers' duties and responsibilities during emergencies. This is to assure that the cockpit knows what the cabin should be doing and vice versa.

b. Areas in need of improvement should be resolved by the POI's with the carriers concerned.

c. Each region is requested to advise AFS-200, within 120 days of receipt, the action taken or planned in response to this notice (RIS: FS 8430-0T).

C. A. McKAY, Chief
Air Carrier Division
Flight Standards Service

APPENDIX E

AIR CARRIER OPERATIONS BULLETIN NO. 1-76-19, JULY, 1984

*220. AIR CARRIER OPERATIONS BULLETIN NO. 1-76-19. FLIGHT AND CABIN CREWMEMBER COORDINATION AND COMMUNICATION, AND SAFETY DURING POTENTIALLY HAZARDOUS CONDITIONS OF FLIGHT (Includes NTSB Safety Recommendation A-84-18). (Formerly Air Carrier Operations Bulletin No. 71-14.)

A review of aircraft accidents/incidents and cabin enroute inspection reports indicates that there is a need for better communication between cockpit and cabin crewmembers, and better seat belt discipline by passengers and flight attendants.

Due to the nature of their cabin duties, flight attendants are susceptible to turbulence-related injuries. Close coordination between cabin and cockpit crewmembers can facilitate the timely completion of cabin services and preclude the exposure of flight attendants to potential injury during known or anticipated encounters with turbulence.

During flight, the pilot in command is responsible for the safety of passengers and crewmembers, therefore, the pilot in command should assure that the cabin crewmembers have completed their safety duties as appropriate for each phase of flight, and that the flight attendants are seated at their duty station during takeoff, and landing with safety belts and shoulder harnesses fastened. Additionally, during taxi, unless performing safety-related duties, required flight attendants must be seated with safety belts and shoulder harnesses fastened.

During emergency conditions, the flightcrew is primarily responsible for maintaining control of the airplane, however, as conditions permit, the flightcrew should brief the flight attendants on the nature of the emergency, the approximate amount of time for cabin preparation, and the contemplated course of action, to enable the flight attendants to more effectively carry out their duties. *

* Section 121.317(c) of the FAR states, in part, that "...each passenger shall fasten that passenger's seatbelt and keep it fastened while the seatbelt sign is lighted." Operators should be reminded that it is advisable to make a public address announcement to inform passengers to fasten their seatbelts when the seatbelt sign is turned on. Additionally, Sections 121.415 and 121.417 of the FAR specify training programs must ensure that each crewmember remains adequately trained. The training program should include instruction on coordination among crewmembers in abnormal/emergency situations, as well as review and discussion of previous aircraft accidents and incidents pertaining to actual emergency situations.

Air Carrier Operations Bulletin (ACOB) No. 1-76-18 discussed seatbelt and turbulence-related problems and should be reviewed while evaluating the certificate holder's programs. ACOB No. 1-76-18 is primarily directed to standup bar problems; however, the viewpoints expressed in this bulletin are also true of other situations that would require passengers to be out of their seats, such as a buffet meal service provided by some operators.

The FAA is concerned about coordination and communication between the cockpit and cabin crewmembers during all phases of flight. Principal operations inspectors are requested to review their assigned operator's training program and operational manuals to ensure that the operator has established a safe and effective means of coordination and communication between the flight and cabin crewmembers. The following operation, coordination, and communication procedures should be addressed.

a. Guidance to flight crewmembers on the importance of a predeparture briefing of the senior flight attendant to include forecast turbulence-related weather conditions, scheduling of cabin services, clean-up, securing of galley and cabin, carry-on baggage, and passengers.

b. Use of the public address system to alert flight attendants and passengers of anticipated in-flight turbulence.

c. Guidance for notifying flight attendants when they are to cease in-flight services, secure galley, be seated with their restraints fastened, and/or resume duties.

d. Standardized notification to the flightcrew from the cabin crew when all pre-takeoff and pre-landing duties have been completed and the cabin is secured.

e. Standardized before takeoff and before landing signals from the flightcrew which are utilized to allow sufficient time for flight attendants * to be seated.

* f. Standardized emergency procedures and crew training which stress the importance of coordination and communication between the flightcrew and cabin crew during emergencies.

g. Standardized use of the communications system on the aircraft to include various symbols under emergency conditions, e.g.; chimes, lights, codes and emergency backup systems, etc.

h. Emphasis on the use of the public address system by specified crewmember(s) to inform passengers to fasten their seatbelts on the ground prior to taxi and inflight when the seatbelt sign is turned on. *

APPENDIX F

EXCERPT FROM FAA REPORT ON EMERGENCY EQUIPMENT AND CARRY-ON BAGGAGE

The FAA Report, "Emergency Equipment and Carry-On Baggage," (1984, p.10-11) suggested that FAR 121.589 should be amended to include the following requirements:

(a) Maximum limit of two carry-on items per passenger, excluding women's purses.

(b) Maximum weight of 15 pounds or each carry-on item; and

(c) Each item carried on board must be of such a size so as to fit completely under a seat or in a designated carry-one baggage stowage area.

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