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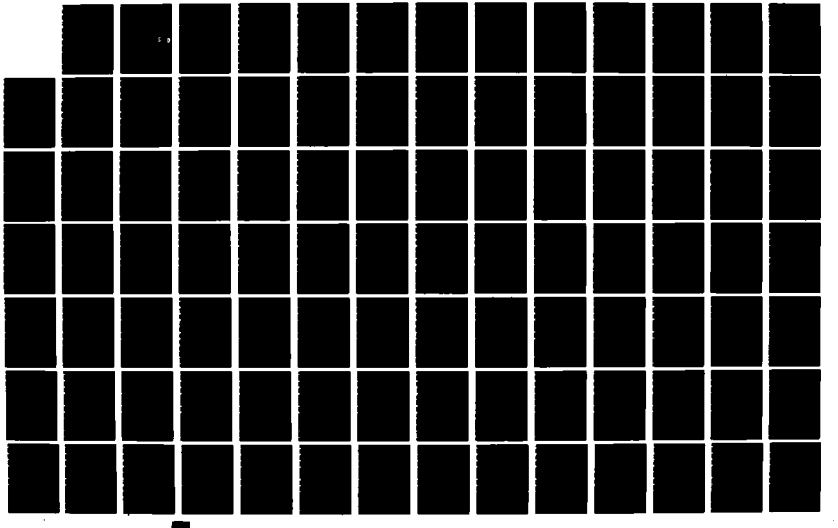

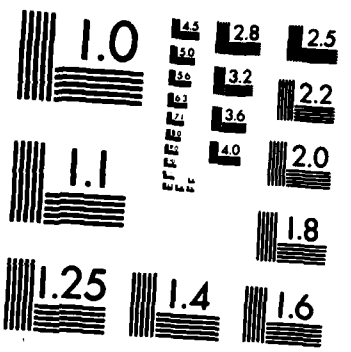

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Washington, D.C. 20591

Task Force Report on Emergency Evacuation of Transport Airplanes

Volume I — Summary Report

Emergency Evacuation Task Force

Federal Aviation Administration
Washington, D.C. 20591

July 1986

U.S. Department of Transportation
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16. Abstract

This is one of two volumes that report on the study of the emergency evacuation of transport airplanes that was sponsored by the Federal Aviation Administration (FAA). The study included the September 1985 Public Technical Conference and the public meetings of the three technical working groups formed during the conference as part of a task force effort. The working groups are: Design and Certification, Training and Operations, and Maintenance and Reliability. The task force program focused on the reassessment of existing Federal Aviation Regulations pertaining to emergency evacuation. Topics considered in the study include: evacuation demonstrations; emergency exits; evacuation slide certification, inspection, and maintenance; emergency equipment; crewmember training and duties; passenger safety information; air carrier operations; and others. Volume I, Summary Report, summarizes the issues considered during the study and the outcome of those issues. Volume II, Supporting Documentation, contains meeting reports, formal presentation papers, and other documents on which the summary report is based.

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PREFACE

This is Volume I of two volumes that report on the study of the emergency evacuation of transport airplanes that was sponsored by the Federal Aviation Administration (FAA). The study included the Public Technical Conference held by the FAA in September 1985 and the public meetings of the three technical working groups that were formed during the conference as part of a task force effort to coordinate the program. The working groups are: Design and Certification, Training and Operations, and Maintenance and Reliability.

The task force program focused on the reassessment of existing Federal Aviation Regulations pertaining to emergency evacuation of air carrier airplanes. The program was of special significance because it was the first such public forum held by the FAA exclusively on emergency evacuation during the recent years of certification and operational experience of the new generation of wide body and narrow body transports. Participants were of exceptional expertise and integrity, and expressed a wide range of views on important emergency evacuation issues.

The task force examined emergency evacuation concepts, problems, and experiences, some of which had not been previously aired in a public forum. These two volumes are the record of the study that will have an impact on the regulations and practices pertaining to emergency evacuation for some time.

Volume I, Summary Report, summarizes the issues considered during the program and the outcome of those issues. Volume II, Supporting Documentation, is a compilation of a report summarizing the Public Technical Conference and records of the working group meetings, formal presentation papers, and other documents on which the summary report is based.

VOLUME I -- SUMMARY REPORT

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I. EVENTS LEADING TO THE ESTABLISHMENT OF THE TASK FORCE

The Emergency Evacuation Task Force was established in September 1985 at the request of the Administrator of the Federal Aviation Administration (FAA). It had as an immediate objective the pursuit of issues that had been raised by the public and the reassessment of regulations pertaining to the emergency evacuation of transport airplanes.

While not related, this task force followed closely a series of publicized changes in the Federal Aviation Regulations that the FAA had adopted earlier in the year to improve passenger safety in the air carrier fleet. These changes focused on protection of passengers against inflight and post-crash fires. Emergency evacuation, i.e., the rapid escape of passengers from the airplane, was not a primary focus of the regulation changes, although Amendment 121-183, Floor Proximity Emergency Escape Path Marking, did enhance escape capability under certain conditions involving dense smoke in the cabin.

While these regulatory changes were being introduced, questions were being raised by a number of parties in the general public concerning the adequacy of regulations pertaining specifically to emergency evacuation. Air carrier crewmembers who were experienced in matters of passenger safety and who had special insight into the problems of aircraft emergency evacuation expressed particular concern. They contended that some of the existing regulations on emergency evacuation are inadequate. They submitted to the FAA design analyses, accident data, and other information to substantiate their contentions.

These public concerns over emergency evacuation arose in conjunction with the approval by the FAA of the deactivation of a pair of emergency exits in a principal model in the air carrier fleet. The exit deactivation increased the distance between the remaining operable exits. Public objections to this approval were publicized widely.

On June 24-26, 1985, the Subcommittee on Investigations and Oversight, Committee on Public Works and Transportation, House of Representatives, conducted hearings on aviation safety. The greater portion of the hearings was devoted to air traffic control. Considerable testimony was heard on air carrier passenger safety, emergency evacuation, and the approval by the FAA of the deactivation of the exits.

Testimony was heard from safety experts including representatives of air carrier crew organizations and line crewmembers having firsthand knowledge of passenger safety at the working level. Several flight attendants who gave testimony had been involved in recent air carrier accidents and performed evacuation duties under conditions of actual emergencies. The

testimony of these experts afforded a critical insight into survival and escape in actual post-crash situations and the role of aircraft design and reliability and crew training and procedures. The witnesses questioned the safety of the exit deactivation and challenged the efficacy of certain existing rules and practices to assure survival in actual emergency situations. They addressed the regulations pertaining to the distribution and spacing of required emergency exits in the airplane cabin and the procedures for conducting full-scale emergency evacuation demonstrations, particularly the relevancy of these procedures to actual emergency conditions. Testimony was heard that challenged the adequacy of emergency training given flight attendants.

In testimony before the Subcommittee on June 26, 1985, the Administrator of the FAA recognized the importance of the issues raised by the witnesses and made the commitment to review in detail all of the issues raised and to reexamine in light of these issues the approval that the FAA had granted for the deactivation of the emergency exits.

The review of the issues and the approval was completed soon after the hearings. The review found that the deactivation of the exits complies fully with the applicable regulations and involved no exemptions, waivers, or other special considerations. The aircraft manufacturer was entitled to, and properly was granted, the approval.

The Administrator recognized that the issues did raise valid challenges to existing regulations and announced his commitment to have a rigorous reassessment conducted of the regulations and to have these issues, as well as any other issues that might be raised, considered in a public forum. The notice inviting open participation in the Public Technical Conference on Emergency Evacuation of Transport Airplanes was published by the FAA in the Federal Register on August 8, 1985. The conference was the first meeting of a series of public meetings to be held to discuss this subject.

The notice published in the Federal Register announcing the Public Technical Conference explained that the purpose of the conference was to enable the FAA to solicit and review information from the public on a variety of topics related to emergency evacuation. Subjects to be considered included the design standards for and certification of transport airplanes, as well as airplane operation and maintenance in service, including: (1) emergency exits, their number, size, distribution, and marking; (2) escape slides, their design standards, certification, testing, maintenance, and reliability; and (3) conduct of evacuation tests, when they should be required, how they should be conducted, and their validity as a reflection of actual accident scenarios. A detailed list of subtopics under those subjects was included. Parties were invited to express views on existing regulations and their application, and to make recommendations for either regulatory or non-regulatory changes.

The notice explained that recommendations should include technical justification, service history, and supporting data expressing costs and benefits.

The notice invited interested parties to make presentations during the conference or submit matrial for the record. Persons intending to make presentations were requested to provide the FAA a time estimate and an abstract of their presentation in advance.

The notice explained that all sessions would be recorded by a court reporter and that anyone interested in purchasing the transcript should contact the court reporter directly.

Public response to the conference announcement was good. The conference was held September 3-6, 1985, in Seattle, Washington with approximately 250 participants from many nations. These participants included experts in aircraft design, manufacture, operations and maintenance, passenger safety, and aircraft emergency evacuation. They represented the full range of viewpoints of the aviation community, including aircraft manufacturers, operators, equipment manufacturers, air carrier crews, maintenance personnel, international aviation authorities, accident investigators, aviation writers, and consumer advocates. The attendance list is contained in the Appendix.

The conference was co-chaired by three FAA division managers: Leroy Keith - Aircraft Certification Division, Ray Ramakis - Aircraft Maintenance Division, and Dave Harrington - Air Transport Division. A technical panel was composed of five FAA specialists: Fred Jenkins - Aircraft Certification, Joe Starkel - Aircraft Certification, Rick Cremer - Air Carrier Operations, Sheldon King - Air Carrier Maintenance, and Henri Branting - Aircraft Certification. The introduction and the discussion of conference procedures were given by Leroy Keith. Mr. Keith was the manager of the FAA coordinating office for the conference. The opening address was given by Charles Foster, Director, FAA Northwest Mountain Region.

The conference followed the published agenda that was developed from the public requests for presentations made in response to the conference announcement. There were formal presentations on a range of subjects. A list of presentations is included in the next section of this report, "Issues of the Public Technical Conference." The conference proceeded with the presentations by participants, with each presentation followed by a period of questioning from the FAA technical panel and then by open discussion and questioning of the presentation from the conference floor. All speakers were recognized and were given the floor by the Chairman.

All of the presentations were well prepared and drew extensive comments and questioning from the FAA technical panel and the conference floor. Important and thought provoking safety issues were brought before the conference. These are discussed in the next section, "Issues of the Public Technical Conference."

A number of presentations contained only a limited amount of substantiating data, and midway through the conference, it became apparent that an extended effort would be necessary to permit proper consideration and resolution of the issues that were being raised by the participants. As a result, the Administrator requested that the Emergency Evacuation Task Force be formed to pursue the issues, reassess the existing regulations on emergency evacuation, and prepare a public report of the findings and recommendations of the task force. The task force entailed the formation of three technical working groups to continue the consideration of the issues at later dates. An open invitation was extended for conference participants to join any one or more of the working groups. The working groups were: Design and Certification; Training and Operations; and Maintenance and Reliability. The FAA personnel charged with managing the task force were:

Task Force Chairman: William R. Hendricks, Deputy Associate Administrator for Aviation Standards

Group Program Coordinator: Henri P. Branting, Aerospace Engineer, Office of Airworthiness

Chairman, Design and Certification Working Group: Don E. Gonder, Certification Program and Special Projects Officer, Transport Airplane Certification Directorate

***Chairman*, Training and Operations Working Group:** Rick L. Cremer, Acting Manager, Air Carrier Branch, Office of Flight Standards

Chairman, Maintenance and Reliability Working Group: Fred W. Crenshaw, Manager, Air Transportation Branch, Office of Flight Standards

The meetings of the Design and Certification Working Group were held in November 1985 and February 1986. The meetings of the Training and Operations Working Group and the Maintenance and Reliability Working Group were held in December 1985. The meetings were conducted in an informal roundtable manner that allowed participants to express their views candidly and present arguments and information to support their views. In general, though, the technical information necessary to support their views was not presented.

With few exceptions, all of the issues brought out in the hearings of the House Subcommittee on Investigations and Oversight and in the Public Technical Conference were examined in detail in the meetings of the evacuation working groups. Those few issues that were not examined by the working groups generally were issues other than strictly emergency evacuation, such as issues of toxic gas emission by cabin materials and public participation in the aircraft certification process. These are discussed in the section "Issues of the Public Technical Conference."

Records of the working group meetings and an abstract of the transcript of the Public Technical Conference are contained in Volume II.

II. ISSUES OF THE PUBLIC TECHNICAL CONFERENCE

A. OVERVIEW

The issues raised in the Public Technical Conference centered around the formal presentations made by participants. These presentations served to promote periods of questioning and open discussion on the subject matter of the presentations. Except as discussed below, subject matter of the presentations and the issues fall into three general categories: Design and Certification; Training and Operations; and Maintenance and Reliability. These categories correspond to the three working groups formed during the conference as part of the Emergency Evacuation Task Force. A list of the presentations, not in chronological order, given during the conference is outlined below. Copies of those presentations submitted to the FAA are contained in Volume II.

General Presentations

General Concerns and Overviews:

Hans Anatol Krakauer, International Airline Passengers Association
Captain Martin Vanstone, International Federation of Air Line Pilots Association
Melvin Volz, United Airlines
R.J. Christie, European Airworthiness Authorities Steering Committee (JAR)
E. Tazewell Ellet, FAA

Airline Accident Emergency Evacuation Concerns:

Wayne Williams, National Transportation Safety Association

NTSB Recommendations and Study on Passenger Education:

Keith McGuire, National Transportation Safety Board

Presentations Related to Aircraft Design and Certification

Evacuation Demonstrations:

Barry L. Eberhardt, Boeing Commercial Airplane Company
George Veryioglou, Boeing Commercial Airplane Company
D.K. Lynch, Transport Canada
Steven Vincent, Association of Flight Attendants
Wolfgang Didszuhn, Airbus Industrie
Werner Munster, MBB Commercial Aircraft

Joellen Thompson, Joint Council of Flight Attendant Unions
Roger Brooks, Air Line Pilots Association
Ellen Hill, Joint Council of Flight Attendant Unions

Emergency Exits:

Werner Munster, MBB Commercial Aircraft
Wolfgang Didszuhn, Airbus Industrie
James T. Likes, Boeing Commercial Airplane Company

Floor Proximity Escape Path Marking:

Edward Scheu, Luminescent Systems, Inc.

Flight Attendant Jump Seats:

Karen Lantz, Joint Council of Flight Attendant Unions

Presentations Related to Training and Operations

Airline Cabin Operations Aspects of Emergency Evacuation:

Walter Coleman, Air Transport Association

Crew Training:

Karen Lantz, Joint Council of Flight Attendant Unions

Presentations Related to Maintenance and Reliability

Emergency Escape Slides:

Ken Dunkley, Qantas Airways
Russell Welker, Boeing Commercial Airplane Company
Janna Harkrider, Joint Council of Flight Attendant Unions
Vern Ballenger, Air Transport Association

The task force was formed to pursue the issues of the conference. Except for the few issues discussed below, all of the issues raised during the conference were examined during the meetings of the three working groups that were part of the task force. A complete summary of issues of the conference, based on the verbatim transcript of the conference, is contained in Volume II of this report. A copy of the transcript may be purchased from Cascade Reporting Company, 820 Securities Building, Seattle, Washington 98101, (206) 622-3548.

The issues raised during the conference that were not pursued in the working groups are briefly discussed below.

B. TYPE CERTIFICATION PROCESS

Several parties contended that the type certification process, including issuance of amended type certificates and supplemental type certificates, should be more open to the public and involve a greater degree of public participation than it currently does. They believe that a change to an emergency exit configuration, such as the recent deactivation of exits in a principal model in the fleet, should require the issuance of a special supplemental type certificate and that notice of the certification project should be published in the Federal Register. Parties suggested that any certification decision as important as deactivation of emergency exits should be reviewed by FAA Headquarters. One party contended that the FAA system of certification directorates creates a basic conflict of interest between the regulator and the regulated because of what the party considers a close FAA-industry relationship in the FAA regions.

These administrative issues in this category were raised prior to the conference during the hearings of the Subcommittee on Investigations and Oversight, Committee on Public Works and Transportation, House of Representatives, and in correspondence received by the FAA from the general public. These are major issues, many of which have been recognized for some time. The FAA is considering these issues in an effort separate from the activities of the Public Technical Conference, which is concerned mainly with technical issues directly affecting the design, operation, and maintenance of aircraft.

C. DEACTIVATION OF EXITS

Several parties stated objections to the recent approval by the FAA of the deactivation of a pair of emergency exits in a principal model in the fleet. They contended that the reliability of evacuation slides was not taken into consideration properly and that the airplane should have been required to undergo a full-scale emergency evacuation demonstration.

The objections and issues raised by the public regarding this specific approval were recognized by the FAA prior to the Public Technical Conference. The approval of the exit deactivation was resolved prior to the conference. These challenges raised by the public to the existing regulations were a basic reason why the FAA took the initiative and sponsored the conference. This is discussed further in the Section I, "Events Leading to the Establishment of the Task Force," and Section III, paragraph C.2, "Elimination or Deactivation of Exits."

D. SMOKE AND TOXIC GAS EMISSION

Several parties raised the issue of smoke and toxic gas emission by cabin interior materials involved in post-crash fires. This issue was not discussed in detail from the standpoint of thermal environment, material characteristics, or human tolerance. There was the basic recognition that smoke and toxic gases can constitute serious impediments to emergency evacuation and that this should be mitigated or otherwise accounted for in an evacuation system.

This issue was not pursued beyond the discussions of the conference and was not brought up for detailed discussions in the meetings of the working groups. It was pointed out that the FAA has recognized this safety issue for some time and has been working toward improvements in cabin fire safety and interior materials. Two recent regulatory actions by the FAA address this directly. One is Amendment 121-184, which requires air carriers under Part 121 to meet stringent flammability standards for seat cushions (fire blocking). The other is the proposed rule that would improve the fire resistance of cabin ceiling and wall panels. Both of these actions reduce the potential for smoke and toxic gas in cabin interiors.

III. DESIGN AND CERTIFICATION WORKING GROUP

A. INTRODUCTION

On September 3, 1985, the FAA convened the Public Technical Conference in Seattle, Washington, for the purpose of soliciting and reviewing information from the public on a variety of topics related to the emergency evacuation of transport category airplanes. The items pertaining to aircraft design and certification that were discussed at this conference covered four general categories: 1) emergency exits; 2) full-scale evacuation demonstrations; 3) escape slides; and 4) other concerns that were of no less importance than the topics of the first three categories, but rather did not fall clearly under any of the first three. The conference provided a forum for the FAA to gather information and for interested parties to express views and exchange information. At the conference, the FAA established the Design and Certification Working Group.

The working group was open to the public and consisted of approximately 40 individuals representing approximately 30 aviation related organizations. A list of participants is included at the end of this section. These individuals had either indicated at the conference an interest in being on the Working Group or had subsequently asked to participate.

An agenda of discussion items for the Working Group was assembled by reviewing the transcript of the Public Technical Conference. The agenda consisted of six major categories of issues. These were: 1) should evacuation demonstrations be required; 2) if so, when can analysis be accepted in lieu of demonstration; 3) how should a demonstration be conducted; 4) are the requirements for emergency exits adequate; 5) are the requirements for evacuation slides and other equipment adequate; and 6) other miscellaneous issues not easily included in any of the previous categories. In addition, participants were afforded an opportunity at the meetings of the Working Group to add additional topics for discussion.

The Design and Certification Working Group was chartered to develop specific recommendations in the areas of aircraft design and certification. The types of actions that were recommended include rulemaking, development of advisory material, or changes to methods of finding compliance with existing rules.

In preparing its recommendations, the group decided which actions on the part of the FAA would be the most effective and the most responsive to these concerns.

Finally, the group attempted to achieve some sort of a consensus of position on the various controversial issues. In the event that a consensus could not be reached, participants were offered an opportunity to prepare and submit their positions in writing for the FAA to consider.

A series of meetings was held. The first meeting was in Seattle, Washington, from November 19 to 22. Due to the large number of participants, the Working Group was subdivided into three smaller groups. Each subgroup discussed one of the following categories: evacuation demonstrations, emergency exits, and evacuation slides and miscellaneous issues. As a result of the first meeting, numerous work assignments and requests for additional information were given to the participants. In addition, position papers on controversial issues were requested. Upon receipt of these data and position papers, it was determined that the two subgroups discussing the evacuation demonstration and emergency exits should meet again. This second meeting was held in Long Beach, California, from February 4 to 7. As a result of this meeting, the participants were again offered an opportunity to submit final positions on controversial issues.

As a result of the Working Group's discussions, the FAA has identified a list of approximately 21 rulemaking and/or advisory material projects concerning design and certification of transport airplanes that it should pursue. These can be found in Section VIII of this report. It needs to be pointed out that these action items involve drafting certain proposals for public comment. The term "draft" as it is used means that within the specified time period these proposals will be drafted, coordinated with the other Aircraft Certification Directorates, and forwarded to FAA headquarters for its final action prior to issuance of the proposal. The following is a compilation of the Working Group's discussions and resolutions of the issues.

B. EVACUATION DEMONSTRATIONS

1. CONTINUED USE OF FULL-SCALE DEMONSTRATIONS

The question that prompted discussion on this issue was whether or not full-scale demonstrations should be discontinued. It was stated that these tests represent a danger to the participants and that they no longer provide new data. A related concern was that these tests are not a valid test of evacuation procedures. In considering this issue, it was proposed that the FAA disclose the average number of injuries in such demonstrations and their severity.

The Working Group's consensus was that the full-scale demonstrations are a validation of the total airplane design including crew training and passenger management. While it was agreed that the demonstration does not reflect an accident scenario, it was also agreed that the demonstration cannot reflect accidents since the participants should not be exposed to the hazards associated with an accident.

There was also a consensus in the Working Group on the continued need for full-scale demonstrations under certain circumstances. The criteria for requiring a full-scale demonstration are discussed under the next section, "Full-Scale Demonstrations vs. Analysis."

Injury data for numerous recent evacuation demonstrations were provided to the Working Group to support discussions on this issue.

Based on these discussions, the FAA will continue to require demonstrations as necessary. Further discussion on the use of analysis in lieu of demonstration follows.

2. FULL-SCALE DEMONSTRATIONS VS. ANALYSIS

There were many positions on when an analysis would be acceptable in lieu of a full-scale demonstration. It was stated that an analysis is not a valid means of testing the full emergency evacuation system and that the current data base used for analyses is invalid. For example, it excludes human factors. At the other extreme, it was stated that full-scale demonstrations should be conducted only to test unconventional aircraft configurations; all conventional configurations can be certified by analysis. There were numerous proposals on when to require a demonstration that fell between these two extremes. For example, it was proposed that a demonstration be required for a new airplane model, when there is a major structural change,

when there is an increase in the passenger capacity, or when excess exits are removed. Finally, it was proposed that accident data be included in the data base used for analysis.

The Working Group discussed FAR 25.803(d) that allows the use of analysis in lieu of full-scale demonstration. The positions presented would allow analysis under some conditions; but, as previously mentioned, there were many divergent views on the conditions under which analysis should be accepted by the FAA. The preamble to FAR 25.803(d) states that the analysis should not be based on insufficient test data such as in the case of a completely new airplane model or a model with major changes or a considerably larger passenger capacity.

Recent demonstration results compare very closely with the analysis done prior to the demonstration. The analyses have been shown to be conservative and accurately reflect both evacuation times and passenger distribution.

With respect to using accident data, the demonstration or analysis is to demonstrate that the airplane can be evacuated under the conditions of FAR 25.803(c), not that it can be evacuated in an accident. To understand this statement, one must realize that for a test requirement to be meaningful, the test must be repeatable and the results reproducible. It is difficult, if not impossible, for the test or analysis to represent an accident since no two accidents are the same. In addition, there are not enough details available from accident investigations to allow the use of accident data. For example, the evacuation time is often not available. Even when it is available, it is only an estimate and the number of passengers to use each particular exit and the flow rates are not available. However, post-crash data pertaining specifically to which exits were used during an evacuation are usually available.

The Working Group was unable to reach a consensus on when to accept an analysis in lieu of a demonstration. In the absence of a consensus, the FAA intends to issue guidance material better defining when analysis is acceptable in lieu of a full-scale demonstration and the extent of the data base needed to support such an analysis. The guidance will address the magnitude of the passenger increase and the changes to the airplane which would warrant a demonstration. Since the intent of the analysis is to show that the particular airplane under review can meet the demonstration requirements of FAR 25.803(c) and not that the airplane can be evacuated during any possible accident scenario, analysis may be used when the data base is sufficient to show that under the test conditions of FAR 25.803(c) the airplane can be evacuated in less that 90 seconds. The data base should include the results of full-scale or partial demonstrations conducted under the conditions of FAR 25.803(c). It should not include data from mini-evacuations, escape slide evacuation rate tests conducted under the Technical Standard Order (TSO), or "Latin-square" tests that do not meet all the requirements of FAR 25.803(c). The data should include average passenger flow rates

for each type of exit, considering the internal constraints as well as the escape slide being analyzed. This average should include as many demonstrations as possible, but no less than five individual exit rates for each type (A, I, III, etc.) of exit being analyzed or three individual rates for each exit type, if the analysis is for the same model airplane. In addition, a comparative analysis must be made with a full-scale demonstration of an airplane that has an identical exit configuration, similar passenger capacity and distribution, exit location, aisles, cross-aisles, and crew station and duties.

The FAA will, within six months, prepare a policy letter regarding the use of analysis in lieu of a demonstration. Within 18 months, the FAA will prepare, for public comment, advisory material regarding the substantiation required for analysis.

3. PROCEDURES AND SIMULATED CONDITIONS FOR FULL-SCALE EVACUATION DEMONSTRATIONS

(a) General

The basis for this issue is the statement that the evacuation demonstration does not adequately reflect the real accident scenario.

In general, it was stated that all evacuation decisions should be made by the FAA and that the requirements of Parts 25 and 121 should be integrated.

It was explained to the Working Group that the FAA currently makes all decisions regarding compliance with the regulations. It was further explained that Amendment 25-46 to Part 25 made Part 25 and Part 121 demonstration requirements the same. However, due to some confusion, the consensus was that a definition of "regularly scheduled line crew" should be provided for Parts 25 and 121. Based on this discussion, the Transport Airplane Certification Directorate will request that the Office of Flight Standards provide an appropriate definition. This definition will then be proposed for incorporation into the appropriate advisory material for conducting an evacuation demonstration. This proposed advisory material will be available for public comment. This will be accomplished within one year.

(b) Full-Scale Evacuation Demonstration Conditions

Numerous statements were made relating to the demonstration conditions. The following is a summary of that discussion.

It was questioned whether the 90 second evacuation criterion is valid. Information presented by the NTSB states that in accidents that involve life threatening fire, approximately 120 seconds are available for evacuation. This suggests that the 90 second criterion is valid. The group agreed with this conclusion.

There was a proposal to include smoke in the demonstration but there were no proposals as to what smoke density should be used. It appeared that no one had any idea of the effects of introducing smoke except that if dense smoke is used, the demonstration would be slowed considerably.

It was generally agreed that smoke should not be used. There is a technical problem with controlling the smoke density and there is no data to show what smoke density would be appropriate for the demonstration. The demonstration would become a test of human response to smoke rather than a test of the evacuation system.

The use of carry-on baggage, pillows, blankets, etc., was also discussed. It was explained that the current FAA practice was to distribute approximately one bag per seat row, which nearly saturates the aisles. The consensus on carry-on baggage and other materials used to clutter the aisles was that the current FAA practice was acceptable but it should be documented in advisory material.

It was proposed that rather than allowing all blocked exits to be on one side of the airplane, pairs of exits should be blocked. An alternate was also proposed that the choice of inoperative exits should be based on NTSB statistics.

It was explained that FAR 121.291 was the first regulation to require an evacuation demonstration. The time limit specified when the rule was adopted was two minutes using 50 percent of the exits.

In 1967, FAR 121.291 was changed to a time limit of 90 seconds and a similar 90 second evacuation demonstration requirement was incorporated into FAR 25.803. Part 25 specified that the exits on one side of the airplane were to be used in the demonstration. NPRM 66-26 proposed reducing the time to 90 seconds, the decrease made possible by equipment advances, primarily improved slides. The 90 second limit was predicated on the conditions required for the demonstration, i.e., darkness, age/sex mix, use of exits on one side of the airplane, etc.

Amendment 25-46 (effective December 1, 1978) changed Part 25 to match Part 121 and the requirement of the exit selection was changed to not more than 50 percent of the exits in the sides of the fuselage, the exits must be representative of all the emergency exits on the airplane, and at least one floor level exit must be used. All demonstrations conducted under Part 25 have used one of each pair of exits in order to use representative exits.

The NTSB also stated at the meeting that the statistics necessary to choose inoperative exits for the demonstration do not exist as each accident is unique.

Two basic proposals were presented at the Working Group meetings. One was to continue selecting one of each exit pair and the other a random or critical 50 percent of the exits.

It was acknowledged that some of the airplanes currently in service could not meet the 90-second criteria for certain random combinations of 50 percent of available exits.

One unique version of the random selection of exits was discussed. This version would require the applicant to consider a random 50 percent of the exits blocked. The proposal would require the applicant to submit an analysis for each combination of 50 percent of the exits blocked with the additional condition that at least one floor level exit is usable. The FAA would then validate the analysis by requiring one of the scenarios to be actually demonstrated. The 90 second time limit would apply to the scenario in which one of each pair of exits is blocked. For other possible scenarios, the test time limit would be the time shown in the analysis, which may be more or less than 90 seconds. An upper time limit for the worst case would also have to be developed since the exits selected may have less capacity than the rated capacity of the airplane (e.g., all the small exits are chosen). It was questioned why not select 50 percent of each type of exit. Use of 50 percent of each type of exit would not be feasible since it would, for example, penalize airplanes configured with all the same type of exits.

It was the consensus of the Design and Certification Working Group that the FAA should continue investigating the modified version of the random selection proposal.

It was suggested that the 50 percent blocked exit criteria be reviewed for validity. As a result of the Working Group discussions, the NTSB reviewed 11 emergency evacuations that indicated an average of 63 percent of the exits were used and suggested the 50 percent criteria be maintained. In most cases, the data do not indicate how many exits were usable but not used. In at least one case, a crew chose not to use some of the available exits. It can be assumed that the number of usable exits is higher than 63 percent. It was concluded that the 50 percent criteria is valid.

Some Working Group members felt that the FAA should designate the exits to be used for demonstration. The Working Group was advised that FAR 25.803(c)(17) states that the applicant must designate the exits to be used for the demonstration subject to approval by the FAA. The requirement for FAA approval has lead to the practice of the FAA designating the exits to be used for the manufacturer's demonstration. If the FAA is not satisfied with the applicant's choice, the FAA would then pick the exits to be used.

There was no discussion of this item after the FAA explained the current procedure outlined above. The current wording is considered satisfactory.

There was a proposal to render at least one flight attendant occupied seat exit and one unoccupied exit inoperative. This refers to the placement of flight attendants at operative and inoperative exits for the demonstration. The concern was that flight attendants are placed only at operative exits. This was discussed at the Working Group and the FAA explained that it is current policy to place the attendants at both operative and inoperative exits.

The consensus of the Working Group was that the current FAA practice is acceptable but that it should be documented in the advisory material.

It was proposed to use high-velocity fans to simulate adverse weather conditions. This item was not discussed by the Working Group. However, slides are certified for wind by other regulations and the use of fans would be difficult to control and would present undue hazards for the demonstration participants.

The FAA has concluded that, based on these discussions, several actions are warranted. The Transport Airplane Certification Directorate will, within one year, draft advisory material for public comment to define the amount of carry-on baggage to be distributed in the aisles as one bag per seat row per aisle. The distribution of pillows, blankets, and other debris will also be discussed in the advisory material. In addition, the positioning of flight attendants during a demonstration will be explained in this advisory material.

Finally, the Transport Airplane Certification Directorate will continue to investigate the proposal for selecting which exits to use in light of a possible draft NPRM if it is determined to be feasible and would provide an increased level of safety. Due to the research involved, this action is to be completed within 18 months.

(c) Flight Crew Duties and Training

Three principal issues were discussed by the Working Group. The concern for the duties of the flight deck crew was that the time delay between the start of an evacuation demonstration and when the flight deck crew assumed evacuation duties was not realistic. It was stated that the time delay does not represent the real time required for the crew to complete their cockpit duties.

There was a proposal to delay the flight deck crew 30 seconds, and another proposal not to use the flight crew at all. The group members, except one, agreed that for the demonstration,

the flight deck crew should take no active role in the evacuation since, under some conditions, the flight crew may not be available or may be delayed. Also, some airline procedures call for one or more of the flight crew to immediately evacuate and assist on the ground.

It was concluded that a conservative approach should be taken and the flight deck crew not be used. This proposal was coordinated with the Operations Working Group so that the Part 25 requirements remain consistent with Part 121.

There was a proposal to use a simulated injured flight attendant at one of the exits. The demonstrations are conducted using the minimum number of flight attendants. Using one to simulate an injured flight attendant would be the same as reducing the number of flight attendants. Also, use of an injured flight attendant has the potential for confusing the method of determining the minimum number of required flight attendants per airplane type, model, and number of seats. Finally, it would cloud the principle that the evacuation demonstration is a test of the total airplane design, training and procedures.

The last suggestion was that flight attendants other than those participating in the demonstration should be used to ready the cabin of the test airplane. At the Working Group meeting, it was explained that the FAA distributes the carry-on baggage, etc., prior to the start of the demonstration. The Working Group considered this satisfactory.

Based on these discussions, the Transport Airplane Certification Directorate will draft an NPRM for Parts 25 and 121 to prohibit an active role for the flight deck crew during an evacuation demonstration. This action will be completed within 18 months.

(d) Demonstration Participants

There were numerous suggestions concerning how to select test participants, frequency of participation, and type of participant.

There were various proposals presented to place limitations on the type of participants in addition to the limitations of FAR 25.803(c)(8)(v). These included one proposal that no employee of an airline or manufacturer should be used. The consensus of the Working Group was that people involved with the design and certification of escape systems should not be used in the demonstration.

It was questioned whether or not to use handicapped, obese, etc., persons as test participants. The Working Group agreed that these type of people should not be included in the demonstration.

There was a suggestion that participants should only be used once rather than no more frequently than every six months as is now allowed by Parts 25 and 121. As the discussion progressed, there were proposals to extend the six month requirement (one year, three years, and four years were suggested), and to retain the six month requirement. One participant stated that out of 847 participants in recent demonstrations (since 1981), only 25 (3 percent) had ever previously participated in an evacuation demonstration.

No evidence was presented to show a problem with the six month prohibition. Manufacturers do not conduct demonstrations often (usually several years apart) and they are usually on different model airplanes.

No consensus was reached on this issue. The FAA believes the current regulation is satisfactory, especially since the percentage of repeating participants is so low. It prohibits participants from repeating if a demonstration fails since the repeat demonstration is conducted within days of the first demonstration.

Concern was expressed that the laws governing informed consent might conflict with the requirements that the test not be described to the participants. The principle of informed consent was discussed and the Civil Aeromedical Institute did research on the applicable Federal regulations dealing with informed consent. The consensus was that the FAA needs to issue advisory material on how much information may be given to participants to obtain informed consent without violating FAR 25.803(c)(14). For drafting the advisory material, 45 CFR 46.116 should be used as a guideline.

It was recommended that random seating be used. That is, participants should select their own seats. The FAA explained that its current policy was to have random seating. It was concluded that this policy should be included in the advisory material on how to conduct an evacuation demonstration.

One final topic was discussed. It was stated that the passenger mix should reflect a typical mix of passengers and exemptions to the requirement should not be permitted for demonstrations and that the FAA should revalidate the age range requirements.

At the request of the Working Group, the ATA conducted a survey review of seven member airlines to estimate the average passenger age/sex distribution. The CAA conducted a survey of transatlantic passengers in the United Kingdom to determine the age distribution. The ATA and CAA data are very close in percentage distribution. The data show fewer children and more older passengers than that shown in FAR 25.803(c)(8), but the percentage does not vary enough to warrant an immediate change to the regulation.

In order to use an age/sex distribution other than that required by FAR 25.803(c)(8), it must be shown that the proposed distribution will give equivalent results (evacuation rates) as the age/sex distribution specified in the regulation. The relative evacuation rate of each subgroup to be eliminated or added must be determined and changes in other subgroups must be made to account for the deleted or added subgroup.

Alternatively, the 90 second time limit could be adjusted (a penalty time used) to account for the alternative age/sex mix. However, an age/sex mix different from those already approved would be considered a substantial change from the intent of having an age/sex distribution, and "Latin-square" or other comparative testing may be necessary to substantiate an alternate age/sex distribution.

There have been two alternate age/sex distributions approved by the FAA as equivalent to that required by FAR 25.803(c). These alternatives eliminate children and older (over age 60) participants due to child labor laws and the greater possibility of injury to these age groups. Based on substantiating data, the percentage of females and those of the 51 to 60 age group was increased to compensate for the elimination of children and the over 60 age group.

A comparison of the passenger evacuation rates using the age/sex mix of FAR 25.803(c)(8) and rates obtained in demonstrations using the alternate age/sex distributions shows little difference.

The group was advised that at recent demonstrations conducted in Europe using children, the airplane manufacturer and FAA observers commented that children do not impede the evacuation. While the reaction of children in an accident is not known, their use in demonstrations is not considered useful as they may treat the demonstration as a game.

The group members favored elimination of children and the [illegible] if compensating factors are applied.

As a result of these discussions the FAA has concluded that [illegible] actions are warranted. As part of its efforts to draft advisory material for public comment on how to conduct an evacuation demonstration, the Transport Airplane Certification [illegible] in drafting this material will within one year:

(1) Further define the type of people intended to be excluded by FAR 25.803(c)(8)(v);

(2) Clarify that random seating be used;

(3) Define how much information may be given to participants to obtain informed consent without violating the requirements of FAR 25.803(c)(14);

(4) Include information covering the approval of alternative age/sex distributions.

As a longer term effort, the Transport Airplane Certification Directorate will draft an NPRM to eliminate participants under 18 and over 60 in full-scale evacuation demonstrations and require an increase in other age groups to provide an equivalent group. The CAA and ATA age/sex surveys will be taken into account when increasing or decreasing the age groups as necessary. This action is to be completed within 18 months.

C. EMERGENCY EXITS

1. CRITERIA FOR NUMBER OF EXITS

A number of suggestions were made regarding exit ratings. Some group members felt that the number of passengers per exit should be increased; others felt that this number should be decreased or at least remain the same. A suggestion was made that the full credit of 110 passengers for a Type A exit should be limited to those aircraft that carry over 200 passengers in order to avoid a situation in which a 100 passenger aircraft could be certified with only one exit. It was also recommended that a Type B exit with a rating of 80 passengers be added to the regulations.

Some members thought that making changes in existing exit ratings is not sufficient. They emphasized the need for the FAA to examine the validity of flow rates by determining how they were established and verifying their accuracy. Some felt that a governing factor in determining how many exits are necessary should be a review of the adequacy of the current number of exits based on real accident experiences, rather than on a theoretical model.

Others found the method of evaluation adequate, but thought there should be some modifications. One such modification would be to formalize the "Latin-square" test* method by including it in the Appendix to Part 25. Currently, the "Latin-square" test method is in FAA Order FS 8110.12. It was suggested that the age/sex requirement be deleted since the inherent nature of the test method normalizes such anomalies. Further, it was suggested that there should be a greater number of persons in each group for certain testing.

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*The Latin-square test method is a procedure to compare the egress rates of two different evacuation systems. It uses groups of evacuee test subjects in a manner that normalizes the variances in the subjects.

In response to these issues, it was noted that the requirements for the number of exits have been in the regulations for over 30 years. Today's regulations have been a continual developmental process based on the service experience during those years. Each accident is scrutinized by the industry, NTSB, and FAA in relation to the existing rules.

Regarding the specific exit ratings, the group agreed that the passenger seating configuration table of FAR 25.807(c)(1) was too restrictive. A more flexible requirement should be developed. Passenger ratings for each exit type, including a Type B, with appropriate constraints were discussed.

The Working Group agreed on the following ratings and constraints.

Exit Type	Rating
A	110
B	80
I	45-55
II	40
III	35
IV	10

For 11 to 20 passengers, there must be at least one pair of Type III exits. For 21 to 80 passengers, there must be at least two pairs of exits. For more than 80 passengers, there must be at least three pairs of exits. The group could not agree on one rating for a Type I exit.

It was noted that 1) the rating for a Type B was 75 on a 757; 2) this proposal allows combinations such as 3 Type III for 105 passengers, which may not be acceptable; 3) the term "pairs of exits" should be defined; and 4) the Type B exit should be defined.

Based on these discussions, the Transport Airplane Certification Directorate will draft an NPRM for exit ratings within 18 months based on the group's conclusions noted above.

All working group members concurred with the suggestions regarding the "Latin-square" test method. However, the FAA Order describing the method (FS 8110.12) will be incorporated into the Crashworthiness Handbook Advisory Circular*, rather than in the Part 25 appendix. The Transport Airplane Certification Directorate will draft this proposal within one year.

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*A draft of the Advisory Circular will be published in the Federal Register inviting public comment.

2. ELIMINATION OR DEACTIVATION OF EXITS

Initially, some members proposed that there should be a prohibition on exit removal. As discussions progressed, it became apparent that this position was based on a consideration for distance between exits and the distribution of the exits. Eventually, a consensus was reached that exits may be deleted or deactivated under certain circumstances as long as there is proper consideration for the distance between exits and the distribution of exits. (See sections on distance between exits and placement of exits for further discussion.)

3. EXIT-TO-EXIT AND SEAT-TO-EXIT DISTANCE

Exit-to-exit and seat-to-exit distances have a direct bearing on the escape path distance a passenger must traverse to reach an exit in an emergency evacuation. This issue was the subject of considerable discussion with strongly held views by all parties. While some members felt that distance to an exit does not affect the rate of aircraft evacuation, others felt it was a significant factor and that a maximum distance should be established. One party recommended a maximum distance of 60 feet between exits. Others decided that further study was needed to substantiate either position.

Exit distance was addressed originally in Amendment 25-15, although the amendment did not establish specific limits on distance. Notice 66-26, the proposal for the amendment, explained the significance of exit distance as a factor affecting survivability. Exit-to-exit distances at the time of Notice 66-26 typically were less than 60 feet. Subsequent to Amendment 25-15, the Civil Aeromedical Institution (CAMI), through accident studies, investigated the significance of escape path distance. Comparative evacuation tests conducted by CAMI have shown that the flow capacity of a main passenger aisle is substantially reduced if the aisle floor becomes canted, as would happen if one of the main gears were to collapse following a crash landing. In such a situation, the length itself of the aisle could become a critical factor determining the outcome of the evacuation.

Even though no consensus could be reached on a specific distance, some of the Working Group members felt that criteria for a maximum distance between exits needed to be proposed. Two important considerations influenced this conclusion. The first is that some of the Working Group members believed that extra long distances could have an impact on the successful evacuation of an actual airplane accident and that some maximum distance criteria should be considered. The second comes from the discussions on whether or not to allow the deletion of exits. The consensus on deletion of exits was that it could be permitted so long as proper consideration was given to a maximum distance between exits, a uniform distribution of the remaining

exits, and the possible need for a full-scale evacuation demonstration.

It was discussed that the distance selected should not impose an undue burden on manufacturers to redesign and/or modify existing airplanes in service.

The Transport Airplane Certification Directorate will draft an NPRM for Parts 25 and 121 that includes consideration of the distance to exits. It is anticipated that this can be accomplished within six months.

4. PLACEMENT OF EXITS

A recommendation was made that future aircraft should be designed with a distance to the midpoints of the exits as equal as possible.

Although the use of the term "uniform distribution" is vague, flexibility for such concerns as servicing the airplane or placement away from the hazardous areas near the engines is needed. An advisory circular is needed to define uniformity and help determine compliance with the regulation.

The consensus of the Working Group was to recommend that an advisory circular and/or rule be published to better define uniform distribution. Within one year, the Transport Airplane Certification Directorate will draft an advisory circular for public comment discussing the uniform distribution requirements of FAR 25.807(c).

One issue that came to light after the Working Group meetings was that, regardless of the placement of other exits, there should be over-wing exits for launching of life rafts and to protect passengers from unnecessary exposure to water.

The FAA recognizes that a ditching could cause considerable damage to the leading and trailing edge high lift devices making launching the life rafts off the wing hazardous and impractical. Also, the use of slide rafts makes ditching evacuations easier than using just rafts. The Lockheed L-1011 does not have these exits over the wing and has been operational for over 13 years. To date, there has been no adverse service history that would indicate any reason to require exits at this location. Finally, airplane manufacturers should have as much latitude as possible to comply with the regulations. Specifically requiring over-wing slides would unduly restrict design freedom and innovation. For these reasons, it is considered that the recommendation would offer little benefit to the problem of ensuring the safety of passengers in the event of a ditching.

5. EXIT MARKINGS AND OPERATION

The group discussed whether or not the means for marking exits are adequate (FAR 25.811 and FAR 25.812). Also discussed was whether or not exit markings/placards could be better standardized (FAR 25.811). The relevant regulations were reviewed and found to be adequate. All members of the Working Group concurred with the conclusion.

6. EXIT OPERATING MEANS

It was suggested that a rule be developed requiring that the exit be able to be closed after it has been opened. This could be needed if a fire developed outside of the exit. After discussion, it was decided that there was not sufficient service experience to require this rule change.

D. EVACUATION DEVICES--SLIDES/RAFTS

A number of proposals were submitted regarding slide and slide/raft capabilities: all floor-level slides should be designed to inflate automatically; slide/rafts should be mounted at the doors; slide/rafts should be portable so that they can be transported to another exit; wide-body slide/rafts should be as easy to use as narrow-body slides; and inflation time requirements should parallel state-of-the-art technology.

No consensus was reached by the group. However, FAR 25.809(f) already requires that the escape slide be automatically deployed. Since this regulation applies to new type design airplanes, the recommendation becomes a question of whether or not to retrofit the existing fleet. The retrofit of automatic slides is a relatively old issue. It was the subject of the 1975 NTSB Recommendation A-74-108 and was considered in the public First Biennial Operations Review that was sponsored by the FAA. At that time, for practical and economic effectiveness reasons, the FAA decided not to require the retrofit, pointing out that PART 25 requires automatic slides and PART 121 requires automatic slides for airplanes in service, except at passenger entry and service doors. At these doors, slide deployment must be automatic, but inflation may involve the pulling of an inflation lanyard. Since that time, the overall fleet picture has improved by virtue of additional airplanes entering the fleet that have been certificated under the PART 25 automatic slide requirement. No new information was brought out during the working group meetings that would indicate that the FAA position is inappropriate. The FAA does not plan to take additional action on this issue at this time.

With respect to the mounting of slide/rafts, these installations provide an efficient means for raft function/deployment when required in a ditching situation. Slide/rafts by their very nature of being an evacuation device have to be mounted at doors, otherwise they could not perform their slide function.

All U.S. certificated aircraft with slide/rafts have demonstrated portability for the reason given below. If portability is not provided, additional rafts would be required to satisfy the need of providing flotation capability under adverse conditions. This issue is already considered during the certification process. Thus, no additional action is required.

Regarding the contention that wide-body slide/rafts are too complicated to operate when installed, slide/rafts are required to be plainly marked as to their method of operation and to have clearly marked operating instructions (FAR 25.1561). In addition, there is a requirement that the slide/rafts be easily transferred by two persons. The certification requirements are, therefore, considered satisfactory. If the complaint was to imply that slide/rafts are too complicated and thus suspect in reliability, the FAA is currently working on a proposal to require reporting of slide deployment failures. (Refer to Section V, D, of this report for additional information.) In-service reliability can then be better addressed by the service difficulty and airworthiness directive process. It was also considered by the Working Group that crew training in the operation of slide rafts should be reviewed for adequacy (refer to Section IV for further information).

In order to upgrade the requirements for evacuation devices so that they parallel the state-of-the-art inflation time, it was recommended to reduce the inflation time from the current requirements of 10 seconds to 6 seconds for a door exit and of 15 seconds to 10 seconds for an overwing exit system. The FAA concurs with this recommendation and the Transport Airplane Certification Directorate will, within 12 months, draft proposed changes to FAR 25.809(f)(1)(ii) and TSO C-69a to incorporate the recommended changes.

Additional proposals regarding slide and slide/raft capabilities included the following: all slides should be modified to have quick-detachable girts to facilitate their use for emergency flotation; and evacuation devices should be certified to the same wind condition as the aircraft crosswind capability.

Evacuation slides have proven to be useful as flotation devices during an unplanned ditching situation when slides were able to be released from the aircraft. It was proposed that all slides be equipped with quick-detachable girts to facilitate their use as an emergency flotation device. ATA reported that there are 1,973 slides in their member airlines aircraft that are not of the quick-detachable type. There was no consensus of view

on the subject of quick-detachable girts but the FAA considers it worthy of further action. As a first step, the Office of Airworthiness is preparing a proposal to revise TSO-C69a to require quick-detachable girts and hand-holds along the sides of slides to facilitate their use as emergency flotation equipment. The Transport Airplane Certification Directorate will review the need for such a requirement for new design airplanes. If such a requirement is warranted, the Directorate will draft an PART 25 NPRM within 18 months. A decision regarding retrofit will be made after receipt of the comments from the public on the draft revision of the TSO. (This issue is discussed further in Section IV in the context of retrofit requirements.)

It was proposed that evacuation devices should be certified to the same wind condition as the aircraft crosswind capability. As was discussed, the difficulty with this proposal is that an airplane, upon stopping, can assume any orientation with respect to wind direction. Certification to a crosswind capability would, therefore, have little meaning. It was the opinion of the group that the 25 knot wind criteria is an adequate requirement and that aircraft crosswind capability should not dictate escape system performance.

Several proposals were suggested regarding slides relative to aircraft attitude. One recommendation was to design slides to accommodate changing aircraft attitude. Another was to determine whether or not adverse airplane attitude should be a criterion for requiring a slide [FAR 25.809(f) and (h)]. Yet another suggestion involved reviewing the six foot sill/flap height requirements to determine their origin and appropriateness.

It was suggested that consideration be given to adverse aircraft attitudes in applying FAR 25.809(f) and (h). The working group requested that FAA Civil Aeromedical Institute (CAMI) provide the needed information/research to define the possible need to revise these requirements. Research has not uncovered any evidence that the 6 foot height criterion is unacceptable. Based on this conclusion, no proposed revision to the regulations was considered necessary.

The group concurred with the conclusion that the regulations determining when a slide should be required are adequate.

Regarding the change of slide design to accommodate different aircraft attitudes, it was felt that adverse aircraft attitudes are acceptably accounted for because slides are demonstrated to be acceptable under the conditions prescribed in FAR 25.809. FAR 25.809(f)(1)(iii) and (h) require consideration for the safe evacuation of occupants to the ground after collapse of one or more legs of landing gear.

There were a number of proposals regarding the structure and components of slides and slide/rafts: the requirements of TSO C-69a should apply to all slides in service; there should be more stringent puncture requirements for slides; the girt fabric of

the 26 foot slide/rafts should be strengthened; there should be a requirement for hydrolysis testing for slide/rafts; there should be a requirement for a positive indication of girt bar engagement; the slide/raft back support requirement should be deleted; the test requirements of FAR 25.809(f)(1)(v) should be strengthened; and there should be a life limit placed on slides.

The main difference between TSO C-69, under which most slides in the fleet are approved, and TSO C-69a is the radiant heat standard for slide material. The upgrading of slides per TSO C-69a is the subject of an NTSB recommendation. During the Public Technical Conference, the NTSB representative explained that the desired upgrading refers to the radiant heat resistance, and not the entire TSO C-69a. Under TSO C-69a, slides not designed to the radiant heat standards cannot be manufactured after December 3, 1984. Thus, the slides in service are upgraded on an attrition basis through routine slide replacements. Although no consensus was reached by the Working Group, the FAA is currently reviewing an NTSB recommendation to retrofit older slide equipment to the radiant heat requirements. The Office of Airworthiness will determine the timeliness and effectiveness of the upgrading through attrition and review the need for regulatory action in response to the NTSB recommendation.

There was a group consensus that the puncture resistance for slides should be more stringent. The Transport Airplane Certification Directorate will, therefore, prepare a proposal to revise TSO C-69a to include puncture and tear resistance tests as specified and contingent upon approval of ARP 495(c). ARP 495(c) is the Society of Automotive Engineers (SAE) standard for slide devices. This action is expected within 12 months.

In recent years, the industry has had a bad experience with slides and slide/rafts developing porosity. The problem has mainly been associated with heat reflective slides manufactured from polyurethane material. Pressure loss on affected units can be great enough that performance of a slide/raft or a slide can be compromised. The FAA concurs that a requirement for hydrolysis testing is needed and the Transport Airplane Certification Directorate will prepare a proposal to revise TSO C-69a to include hydrolysis test requirements within 12 months.

The basis for the proposal to strengthen the girt fabric of the 26 foot slide/rafts was NTSB Recommendation A-79-17 stating that the girt material on the PICO 26 foot slide raft should be strengthened. The FAA disagreed with the recommendation. The basis for the disagreement was that the girt design was not unique with respect to other approved designs, and testing established that the material strength met the appropriate standards. The FAA did state that it planned to review the need for upgrading the loading requirements applicable to all slide/raft devices. Subsequently, TSO C-69a was revised June 3, 1983, to incorporate upgraded girt strength requirements and to clarify testing procedures for establishing the strength of the

girt under adverse conditions. No further action is considered necessary.

It was proposed that a requirement for a positive indication of girt bar engagements be promulgated. FAR 25.809(f)(1)(ii) requires the assisting means to be automatically deployed and erected. Therefore, a positive indication of girt bar engagement is indirectly required in order for the assisting means to comply with the automatic deployment and inflation requirements. Also, there were no data presented that would indicate a generic problem with existing systems.

It was recommended that Paragraphs 4.1.1.1 and 4.1.1.2.2 of TSO C-69a be revised to remove the requirement for back support in slide/raft for the following reasons: 1) It restricts the design of the slide/raft; i.e., it forces the design to incorporate sponsons that adversely affect the performance of the slide in 25 knot winds; 2) The 8 inch back support appears to provide a comfort factor for extended at-sea periods. Today's search and rescue operations preclude extended periods at sea before rescue is made. Therefore, it was concluded that the back support requirement does not appear warranted. The FAA concurs that the back support requirement may be deleted. Within 12 months, the Transport Airplane Certification Directorate will draft a proposal to revise TSO C-69a to delete this requirement.

It was the opinion of the group that the present aircraft certification slide testing requirements incorporated in the TSO and certification requirements are adequate design standards.

Regarding a life limit for slides, it was the consensus of the group that if proper overhaul, test, and inspection procedures are adhered to, slide deterioration will be identified and those units will be removed from service prior to degradation becoming a factor. No finite life should be specified for evacuation devices. It should be noted that the Maintenance and Reliability Working Group also discussed this issue and reached a different conclusion (refer to Section V for additional information). They concluded that manufacturers and operators should determine life limits for materials. The FAA will consider whether further action is appropriate.

Finally, a concern was raised regarding the lack of alternate emergency evacuation means in the event of escape slide failure. It was suggested that escape lines or ropes should be available at all exits.

The FAA has previously considered the issue of whether there should be a requirement for alternate escape means. Past discussions and research on this issue indicated several problems. There is a definite potential for interference with the primary escape means. Also, only the young and strong can use ropes. In addition, paragraph 4.5 in TSO C-69a requires the slide device to be so constructed as to permit its use as a non-inflated slide in the event of a puncture or tear.

The consensus of the group was that the FAA should review past actions on this issue. After reviewing previous decisions, the FAA has concluded that no evidence was presented to contradict previous decisions on this issue and that these decisions are still valid.

E. CABIN FURNISHINGS AND EQUIPMENT

1. PASSENGER SEATS, FLIGHT ATTENDANT SEATS, AND SEAT BELTS

There were a number of issues raised regarding seat design. A suggestion was made that seats for flight attendants in excess of the minimum number required should be designed to the same standards as primary flight attendant seats so that excess flight attendants would be able to perform their safety-related functions. The proposed redesign would include the addition of full restraint systems and communication capability.

FAR 121.311(f)(3) excludes the requirements of FAR 25.785(h) when passenger seats are occupied by flight attendants not required by FAR 121.391 (minimum flight attendant complement). The recommendation would change the minimum equipment to FAR Part 121 levels and associated procedures for non-required flight attendants onboard the aircraft. The PART 121 impact is discussed further in Section IV, B. No further action will be taken on this issue.

Another issue raised concerned the size of double flight attendant seats, considered too narrow by some. A suggestion was made that seat design should consider the 5th percentile female and the 95th percentile male. Others objected to the double seat, stating that the possibility of losing two flight attendants is increased. The FAA agrees that AC 25.785-1 should be reviewed and amended, if necessary. The Transport Airplane Certification Directorate anticipates drafting a proposed advisory circular for public comment within 18 months.

Objections were raised to the in-aisle flight attendant seats that are attached to the galley bulkhead in some MD-80s and some 727s because they protrude into the aisle and have no headrests.

Flight attendant seats, which are positioned in the aisles or passageways to exits, are required to be designed to fold automatically and provide the required aisle width and access to exits. No data were presented to determine whether the functional problems reported were generic or related only to specific installations. The consensus of the Working Group was that flight attendant seats that do not fold correctly should be addressed through the service difficulty and airworthiness directive process. However, since it is not mandatory to report in-service difficulties with these seats, sufficient information

to determine the appropriate corrective action is not available. The FAA considers it appropriate to ask persons most familiar with in-service problems to document those problems to assist the FAA in determining any future action that would deal with the problems of these flight attendant seats.

Furthermore, information that would affect a decision on the continued use of galley mounted flight attendant seats was not well documented for the Working Group. The FAA considers it appropriate to request additional data from the proponents for eliminating galley mounted flight attendant seats prior to any further consideration of this issue. Ideally, specific installations should be identified by either photograph or a drawing as well as by the airplane model on which it is installed and the carrier operating the airplane.

Flight attendant seats on new type certificated airplanes are required by FAR 25.785 to have headrests. The question of headrests, therefore, is one of whether or not to require retrofit of the existing fleet. FAR 121.311(f) requires all required flight attendants to have FAR 25.785 seats regardless of when the aircraft was certificated. That has meant retrofit for some pre-FAR 25.785 aircraft to bring them up to that standard in order to comply with FAR 121.311(f).

The Transport Airplane Certification Directorate will request that the flight attendant representatives provide the FAA with two specific sets of data. The first would be the identification of specific galley mounted flight attendant seat installations with the carrier, model of airplane, airplane serial number or registration number, galley and seat part numbers, and a photograph or drawing of the installation. If possible, potential problems with galley stowage or other items of mass should be included with the data on specific installations. The FAA will then use this information to review the use of galley mounted flight attendant seats and to decide the appropriate corrective action for this type of installation.

The second set of data would be the documentation of in-service problems with galley mounted flight attendant seats. It should include the carrier, model of airplane, airplane serial number or registration number, seat part number, and the date the problem was initially identified. It is anticipated that it will be necessary to report this information for a period of six months to establish a data base. The FAA will then review this information and decide if there is sufficient justification to support further action.

It is anticipated that these two activities will take 18 months to either conclude that no action is appropriate or to draft an appropriate NPRM to deal with any identified problems.

Regarding seat belts and shoulder harnesses, a proposal that seat belts should be designed for quick entry and egress and should not inflict injury on the flight attendants was made.

It was noted that flight attendants routinely do not have adequate advance warning prior to required entry into their seat restraint system. They are also required to expeditiously egress from their restraint system during emergency evacuation. Additionally, it was stated that some restraint systems do not fit; that seat belts hit mid-chest rather than across the lap; or, as on some 747s, the shoulder harness attachment is placed so high that the harness crosses the sides of the neck or face.

The FAA notes that: 1) There are no current requirements for quick-entry capability into restraint systems. 2) The current requirements in TSO C-22 (seat belts) specify quick release capability and are considered for seat belts. A draft of aircraft torso restraint systems is currently under development and will include quick release connectors and performance standards for retractors. 3) CAMI has provided data on acceptable installation criteria for restraints systems. It was concluded that the CAMI data should be provided in an advisory circular. The Transport Airplane Certification Directorate will draft an advisory circular on restraint systems and their installation criteria for public comment within one year.

Additionally, the FAA was asked to consider a requirement for standardization of seat belts and shoulder harnesses. It was offered that standardization of seat belts and shoulder harnesses will not only cause a more safe environment through uniformity, but will also protect the airlines and manufacturers who might hesitate to take the lead in improved flight attendant safety because of industry competition. The opposing position is that standardization would restrict design innovation and be counter-productive. No data were submitted that would support a change in the regulations. Thus, the FAA plans no action at this time.

There were complaints that flight attendants seated in galley areas and other areas where items of mass are stored may be impaired from performing their duties if the items of mass come free from their restraints. It was proposed that the FAA retrofit present latch systems to include double latches on galleys and mass stowage facilities that are in the vicinity of flight attendant seating locations.

Although the regulations do not specifically require secondary latches, the provisions of FARs 25.785 and 121.311 and Advisory Circular 25.785-1 are considered to adequately address the flight attendants' concerns provided the regulations and guidance are complied with. A survey of several air carriers has indicated that some carriers do carry latches on a deferred maintenance list. If the flight attendants identify a problem with compliance for a particular air carrier or if they believe that the maintenance deferral is too long, they should notify the Flight Standards District Office responsible for the carrier.

It was suggested that the FAA should eliminate any injurious objects within striking radius of the flight attendants when they

are seated. Special emphasis was placed on the lateral direction. FAR 25.785(a) requires that a person making proper use of each seat and restraint system will not suffer serious injury in an emergency landing as a result of inertial forces specified in FAR 25.561 (minor crash landing). FAR 25.785(e) requires that each projecting object that would injure persons seated or moving about the airplane in normal flight must be padded.

Although current regulations are considered satisfactory to address the flight attendants' concerns, The Transport Airplane Certification Directorate will draft a proposal to revise AC 25.785-1 for public comment within 18 months to provide more specific information and guidance regarding acceptable means of compliance with FAR 25.785.

2. COMMUNICATIONS EQUIPMENT

A suggestion was made that consideration be given to requiring audio devices that would automatically activate upon the opening of an emergency exit. For dense smoke conditions, research has been conducted by the FAA Civil Aeromedical Institute to evaluate both light and sound to attract passengers. Nothing was found to be feasible. The sound could draw the passenger to a usable or unusable exit. Further, if more than one sound is initiated, which is highly probable, the passenger can become disoriented and confused.

The group concluded that automatic sound could cause worse problems than the safety it would provide. In addition, the FAA is now requiring that floor proximity lighting systems be installed on transport airplanes. The purpose of this lignting is to illuminate the path to the exits under smoke conditions.

A requirement for an independently powered public address system was suggested. Another proposal included a requirement for an alarm system that would be operable from each flight attendant station and the cockpit and silenceable from the activating station.

The consensus of the group was that an audio evacuation alarm offered more problems than benefits and that an independently powered public address system was the preferred solution. The FAA already has a regulatory project in progress that proposes to require an independently powered public address system. The FAA also considers that a comment related to requiring switches on public address system handsets is worth pursuing. Within one year, the Transport Airplane Certification Directorate will draft a PART 25 NPRM for Part 25 and/or Part 121 to require "deadman" switches on public address system handsets.

3. EMERGENCY LIGHTING

There was some discussion of requirements for escape path marking and emergency lighting standards. In the criteria listed for escape path marking (FAR 25.812(e), Amendments 25-58 and 121-183), the stated acceptable means of compliance for floor proximity lighting needs to be clarified for the public, particularly the foreign airworthiness authorities and manufacturers. It was stated that either an amendment to AC 25.812-1 or a policy letter from the Transport Airplane Certification Directorate would be appreciated. All Working Group members concurred with this conclusion. The Transport Airplane Certification Directorate will within one year draft a proposal to revise AC 25.812-1 to clarify the phrase "identify the emergency escape path and exit" and to include approved general system guidelines.

Regarding current emergency lighting standards, the regulations are adequate. However, FAR 25.811(e) allows two options for Type I and Type A emergency exit handles relative to the requirements to be self-illuminated or to be conspicuously located and well illuminated. Both options should be applicable to all exits and not limited to Type I and Type A handles. All group members concur with the discussion. The Transport Airplane Certification Directorate will draft a PART 25 NPRM to this effect within 6 months.

A criticism of the lighting schemes currently used on aircraft was raised. If one light battery is lost, the lighting for one door and the aisles leading to that door are effectively lost. The stated problem would be true no matter where the battery was located. If the battery is damaged by structural deformation, it is likely the exit will be inoperable and therefore there is less need for lights at that location. FAR 25.812(l)(1) requires that after any single transverse vertical separation of the fuselage, no more than 25 percent of the emergency lights are rendered inoperative, in addition to the lights that are directly damaged by the separation. The FAA considers that the regulation is adequate.

A suggestion was made that electroluminescence should replace the use of incandescent lighting systems on aircraft. The FAA regulations are written in general terms, not specifics, to set design goals. This allows design flexibility and purposely does not dictate design. Therefore, the regulations do not require any particular kind of light. The regulation should not be changed.

F. AIRPLANE CONFIGURATION

1. ACCESS SPACE

There were a number of topics related to access space at exits and between certain rows. One topic addresses the distance between seat rows at over-wing (Type III) exits. It was recommended that a minimum distance between the seat rows be established.

Airworthiness Notice (AN) 79, issued by the British CAA, was presented to the Working Group. This AN requires certain changes to the access to Type III exits on U.K. registered airplanes.

The following comments were offered and discussed. Some participants felt that 1) the available information from the British does not substantiate that increased access width will increase flow, 2) no other data are available, and 3) that the exit is the orifice and increased access width will not increase flow. The resulting conclusion of these comments was that the current rules are satisfactory.

The counterview was that the criteria of AN 79 should be incorporated into the FARs or that possibly a 20 inch aisle is needed to aid exit openability and passenger flow.

No consensus could be attained. The FAA does consider that this issue is worthy of research to determine what effect changes in access to Type III exits will have on the flow rate through the exit.

In response to these discussions, the Transport Airplane Certification Directorate will request that the Civil Aeromedical Institute conduct tests to evaluate openability and effect of access width on flow. The results of these tests will be used in the development of an NPRM on this issue.

There was a recommendation that there should be a minimum distance established between aft facing flight attendant seats and forward facing passenger seats. At the request of the Working Group, the Civil Aeromedical Institute furnished anthropomorphic data for passenger hand, foot, and head strike distance. The following comments were offered:

(1) To separate the passenger and flight attendant longitudinally would require quite a bit of lost space.

(2) Require a shoulder harness for the passenger.

(3) What has been the service experience to justify a rule or advisory circular change?

(4) The passenger could be offset from the flight attendant.

It was agreed that AC 25.785-1 should be reviewed and amended if necessary. This would help assure that the requirements of FAR 25.785 are complied with. In part, these requirements state that a person making proper use of the facilities will not suffer serious injury as a result of a minor crash landing. The FAA Transport Airplane Certification Directorate will review, and, if necessary draft a proposal to amend, AC 25.781-1 within 18 months.

It was suggested that the rationale that resulted in seat cushions extending into the projected opening of exits be reexamined. As discussed by the Working Group, FAR 25.813(c)(1) does not allow seat cushions to extend into the projected opening of the exit for a distance from the exit not less than the width of the narrowest passenger seat installed on the airplane. It was concluded that this recommendation may have been based on previous versions of the regulation.

Another recommendation was that FAR 25.807(c)(6), concerning access to excess exits, should be amended to require that excess exits meet the same access requirements as those for required exits. The requirements for excess emergency exits were put into the regulations by Amendment 25-15, effective October 24, 1967. The excess exit must comply with FARs 25.809 through 25.812 and be readily accessible.

The consensus of the Working Group was that there has been no adverse service experience for the past 18 years and there are only a very few number of excess exits in operation today. Therefore, there is no need to change the regulation.

2. AISLES AND EXIT PASSAGEWAYS

The general question of whether aisle widths are adequate was raised. There were a number of positions on this issue: too wide an aisle can cause reduced flow; tests have shown that flow is better between smooth walls; the present rules are adequate. The question arose from the possibility of passengers traversing the tops of seats and then forced to join the flow in the main aisle at obstructions such as a galley on each side of the aisle. It was agreed that there is insufficient data or tests to substantiate a rule change.

It was also suggested that the intent of FAR 25.807(a)(7)(v) should be clarified--is the purpose of the requirement to allow one line of passengers to use a serviceable Type A exit and its slides with minimum interference with another line of evacuees approaching from the main aisle? It was further suggested that one way to achieve this objective would be to have the extended center line of the cross-aisle meet each exit at its center

point, or between its center point and the edge that is away from the main aisle leading to it.

The regulation requires that the cross-aisle lead directly to the exit passageway. There has not been any particular problem in determining compliance with this regulation. The Working Group concluded that the regulation is adequate and that advisory material is not necessary.

The FAA has reviewed this issue subsequent to the Working Group meetings and does not concur that advisory material is not required. Within 18 months, the Transport Airplane Certification Directorate will draft a proposed advisory circular for public comment clarifying FAR 25.807(a)(7)(v).

It was suggested that guidance material be developed to discuss the location of the flight attendant assist space adjacent to the floor level emergency exits. There are possible configurations where the flight attendant might better assist when positioned away from the immediate vicinity of the exit, such as those cases in which the view of the cabin by the flight attendant next to the exit is shadowed by a galley, lavatory or wind screen. It was decided that the flight attendant should be located next to the exit during the time the passengers are exiting. When the supply of passengers dries up, the flight attendant can step back to the main aisle to observe the rest of the airplane. Therefore, there is no need to take any action on this subject.

3. UNUSUAL AIRPLANE DESIGNS

It was suggested that criteria for multi-deck airplanes be added to the regulations. The criteria should be similar to that of the 747 special conditions for the upper deck configurations. After reviewing the various 747 special conditions, it was determined by the FAA that the time and effort involved to process a rule would not be justified. Further, a new application could be considerably different from the 747 configuration such that special conditions would still be necessary.

It was suggested that criteria relative to passenger emergency evacuation be developed for prop-fan airplanes. It was determined that the rules currently in Part 25 were adequate, particularly FAR 25.783(d).

G. ATTENDANCE LIST

DESIGN AND CERTIFICATION WORKING GROUP MEETINGS

NOVEMBER 18-22, 1985

FEBRUARY 4-6, 1986

ATTENDANCE LIST

NAME	AFFILIATION/ORGANIZATION
Vern Ballenger	Air Transport Association of America (ATA), Washington, D.C.
Tony Bonanno	FAA, ANM-130L, Long Beach, CA
William Beebe	ATA - Delta Airlines
Gale Braden	FAA, ASF-300, Washington, D.C.
Henri Branting	FAA, AWS-100, Washington, D.C.
David Britton	United States Air Force ASD/AFEE
Roger Brooks	Airline Pilots Association (ALPA)
Richard F. Chandler	FAA/CAMI, AAM-119
John Clark	ATA - American Airlines
J.D. Collier	ATA, Washington, D.C.
Kirke Comstock	ATA - United Airlines
Rick Cremer	FAA, AFS-220, Washington, D.C.
Fred W. Crenshaw	FAA, AFS-300, Washington, D.C.
Jim Danaher	NTSB, TE-10, Washington, D.C.
Jean-Paul Deneuville	DGAC, Paris, France
C.L. Dickinson	Allied Pilots Association (APA)
Yves Dorin	DGAC-STPA, France
Arnold Ebneter	Aerospace Industries Association of America (AIA) - Boeing, Seattle, WA
David Eckert	AIA - Boeing, Seattle, Washington

ATTENDANCE LIST(CONT)

NAME	AFFILIATION/ORGANIZATION
Wayne Gallimore	International Association of Machinists and Aerospace Workers (IAMAW), Burlingame, CA
Don Gonder	FAA, Seattle, WA
Gary Goodwin	FAA, ANM-270S, Seattle, WA
Ian Goodyear	AIA - Douglas Aircraft
Bill Hendricks	FAA, AVS-2, Washington, D.C.
Fred Jenkins	FAA, ANM-130L, Long Beach, CA
Daniel Johnson	Interaction Research, Olympia, WA
Dick Johnson	FAA Tech Center, Atlantic City Airport
Peter Kavaloski	AIA - Lockheed, California Co.
Toni Ketchell	Independent Union of Flight Attendants - Association of Professional Flight Attendants (IUFA-APRA), Dallas, TX
Dick Livingston	International Airline Passenger Association (IAPA)
Ed McNeil	FAA, ANM-270L, Long Beach, CA
Werner Muenster	MBB - Commercial Aircraft, Hamburg, Germany
Mike Oswald	ALPA, Kirkland, WA
Andrew Palmer	British Airways, England
Donnell Pollard	FAA/CAMI, AAC-119, Washington, D.C.
Ron Refenberg	ALPA, Leucadia, CA
W.T. Reiners	APA, Brentwood, TN
Paul R. Robinson	ALPA, Marietta, GA
Lowell Roemke	B.F. Goodrich, Akron, OH
Ronda Ruderman	Society of Automotive Engineers, SAE-S9 Committee, Seattle, WA

ATTENDANCE LIST(CONT)

NAME	AFFILIATION/ORGANIZATION
Dennis W. Schroll	United States Air Force, ASD/ENECE, Wright/Patterson AFB
Dan Smith	IAPA, Irving, TX
Bill Shook	AIA - Douglas Aircraft Co.
Hans Tappendorff	Association of European Airlines (AEA), Seattle, WA
Jodi Thompson	Joint Council of Flight Attendants .
Frank Tiangsing	FAA, ANM-130L, Long Beach, CA
Martin S. Vanstone	International Federation of Airline Pilots Associations (IFALPA), Vancouver, Canada
George Veryioglou	AIA - Boeing, Seattle, WA
Steven Vincent	Airline Flight Attendants (AFA)
Lionel C. Virr	Civil Aviation Authority, United Kingdom
Ray Walder	International Air Transport Association (IATA), Canada
Ivor A. Williams	British Aerospace, England
Roger Young	FAA, Seattle, WA

IV. TRAINING AND OPERATIONS WORKING GROUP

A. INTRODUCTION

On September 3, 1985, the FAA convened the Public Technical Conference in Seattle, Washington, for the purpose of soliciting and reviewing information from the public on a variety of topics related to the emergency evacuation of transport category airplanes. The items pertaining to training and operations that were discussed at this conference covered four general categories: 1) crewmember training; 2) number, location, and duties of flight attendants; 3) passenger safety information; and 4) air carrier operations. The conference provided a forum for the FAA to gather information and for interested parties to express views and exchange information. At the conference, the FAA established the Training and Operations Working Group.

The working group was open to the public and consisted of approximately 40 individuals representing flight attendants, flight crewmembers, airline operations, and airline passenger interest groups. A list of participants is included at the end of this section. These individuals had either indicated at the conference an interest in being on the working group or had subsequently asked to participate.

An agenda of discussion items for the working group was assembled by reviewing the transcript of the Public Technical Conference. The agenda consisted of four major categories of issues. These were: 1) crewmember training; 2) number, location, and duties of flight attendants; 3) passenger safety information; and 4) air carrier operations.

The Training and Operations Working Group was chartered to develop specific recommendations in the four areas described above. The types of actions that were recommended include rulemaking, development of advisory material, or changes to methods of finding compliance with existing rules. However, the Office of Flight Standards will also work with the Design and Certification Working Group in the preparation of the Advisory Circular (AC) on evacuation demonstrations concerning those parts pertaining to use of crewmembers and crew training.

To achieve this result, the working group first reviewed the concerns and information aired at the technical conference in Seattle. Second, in preparing its recommendations, the group decided which actions on the part of the FAA would be the most effective and the most responsive to these concerns.

The group attempted to achieve a consensus of position on a variety of controversial issues. In the event that a consensus could not be reached, coalitions of differing opinions prepared and submitted their positions in writing for the FAA to consider.

B. CREWMEMBER TRAINING

1. MINIMUM REQUIREMENTS

(a) Initial Training

A recommendation was made that the FAA should monitor total compliance with the FARs for initial training and stress compliance with FAR 121.417(c) which requires each crewmember to operate emergency equipment once each 24 calendar months, including: emergency exists, fire extinguishers, emergency oxygen systems, slides, individual flotation equipment and to participate in drills, including evacuation procedures. A recommendation was also made that the FAA should clarify the meaning of "individual instruction" as required by FAR 121.417(b). FAR Section 121.433(b)(5) states, in part, that no certificate holder may conduct a check or any training in operations except for the following checks and training required by this part or the certificate holder, including flight attendant training and competence checks. However, there were no recommendations as to the specific wording or definitions.

There was no consensus of the group as to the adequacy of the current FARs as they pertain to crewmember training. Some of the group expressed the opinion that existing regulations were inadequate and/or needed clarifying while other members believed that the regulations were adequate as written.

The group did not make formal recommendations; however, the working group asked if the FAA could provide guidance in these areas, and the FAA is in the process of developing an AC for flight attendant training. This AC will provide guidance to the public, as well as to FAA personnel, and will contain guidance on all training subjects. It is a mid-term project and should be completed by May 1987.

(b) Transition Training

Some members of the working group recommended that the FAA amend its regulations to ensure that flight attendants moving from one airline to another undergo the regular, approved training program of the receiving airline without reductions in hours. In addition, transition training (FAR 121.421) should not be approved by the FAA unless it provides for a minimum of 4 classroom hours, including hands-on training on each type of exit in the normal and emergency modes aboard the acquired aircraft.

There was not a consensus among group members on this issue. Other members believed that existing regulations and standards are adequate. FAR Section 121.421 contains the requirements for transition training. This regulation requires, in part that flight attendants' transition training include: the authority of the pilot-in-command, passenger handling, a general description of the airplane which emphasizes emergency evacuation and in-flight emergency procedures, the use of public address systems, proper use of electrical galley equipment, and a competence check. The regulation does not speak to the number of hours required in transition training.

The FAA believes that the proposed AC on evacuation demonstrations (which will address training of crewmembers used in evacuation demonstrations) and the AC on flight attendant training will adequately cover the requirements and provide enough guidelines to address the concerns regarding transition training.

(c) Recurrent Training

The Association of Flight Attendants submitted written recommendations suggesting that the FAA issue a directive to its inspectors prohibiting them from approving less than 12 hours of recurrent classroom training at airlines operating three or more aircraft types and programs providing less than 9 hours of classroom recurrent training. Further, the Association of Flight Attendants recommended that flight attendants receive the recurrent training required under Section 121.417(c) on an annual basis instead of once every 24 months.

Section 121.417(c) addresses drills required every 24 months. Recurrent training of flight attendants is required every 12 months under Section 121.433(c)(ii) with pictorial displays, discussions, lectures, and other training techniques supplementing the drills required every 24 months. Many members of the work group indicated they thought that present training standards were adequate. The proposed AC will address the importance of classroom time and provide guidelines for the reduction of classroom time below the number presently required by Section 121.427(c)(3) which requires that recurrent ground training for flight attendants (unless reduced under Section 121.405) be 4 hours for reciprocating powered airplanes, 5 hours for turbo-propeller powered airplanes, and 12 hours for jet aircraft.

2. ADEQUACY OF TRAINING REQUIRED BY FAR 121.417

(a) Home Study vs. Hands-on Training

Some members of the group recommended that the FAA clarify the meaning of "performed . . . emergency drills" and "actually operate . . . equipment" under FAR 121.417 for each type of equipment listed in the regulation. They also recommended that the FAA issue a statement indicating what topics are too important to be covered in take-home materials under recurrent training, that hands-on drills replace written exams whenever feasible, and that simulation drills be more realistic, perhaps even duplicating actual past emergencies. They stated further that home study should never replace classroom training.

They also recommended that the FAA amend FAR 121.417(c)(4) to eliminate the provision that permits carriers to use demonstrations alone to train crewmembers for certain emergency situations. The amendment would require the performance of drills in the operation and use of emergency exits.

Finally, those members recommended that, for transitional and recurrent training, there should be hands-on training with all emergency equipment, actual door operation, and emergency procedure training. FAA inspectors should ensure that this training involves actual removal of emergency equipment from brackets, and instruction in the location, operation, and use of each type of oxygen system. FAA inspectors should also ensure that air carriers operating applicable Boeing 727 aircraft include emergency procedures for operation of the ventral airstair door in their training programs for cabin crews. The sequence and procedure for a planned practice emergency should be identical to that which is to be used in an actual emergency.

The group did not reach a consensus on these subjects. Some members believed that the existing regulations, standards, and policies are adequate and were firm in their resolve that there is no safety justification for amending existing regulations. The existing FAR §121.417(c) requires drills and actual operation of emergency equipment during initial training and once each 24 months. In the case of the B-727 ventral exit, FAR 121.417(c)(1) requires each type of emergency exit to be opened in normal and emergency mode. The certificate holder should make use of all available exits when formulating evacuation procedures; therefore, all crewmembers should be trained on the use of these exits in applicable B-727s.

The FAA believes that drills and situations which require that crewmembers actually operate the equipment are extremely important; however, some subjects may be reviewed and learned through the use of "take-home" exercises. The proposed AC on

flight attendant training will provide guidance to the public and to the inspectors regarding which subjects are appropriate for "take-home" exercises and provide suggestions for ensuring these subjects are adequately covered.

(b) Wet Ditching Training

Some members of the group recommended that FAR 121.417 be amended regarding ditching training. Presently, Section 121.417 requires that every 12 months each crewmember receive instruction in the handling of ditching and other evacuation situations and that each 24 months, crewmembers perform an emergency drill which includes the actual donning and inflation of life preservers, deployment, inflation and detachment of each type of slide/raft pack, use of life-lines and the boarding of occupants into a raft or a slide/raft pack. The proposal was to amend Section 121.417 to include demonstrated minimum proficiency in the operation of water survival equipment by all crewmembers on carriers conducting passenger service in extended overwater operations. This training would be conducted in a deep water environment (a depth of 8 feet or more) and would include such activities as:

- Directing passenger evacuation in a ditching situation;
- Donning of life preservers both in and out of the water;
- Deployment of raft, slide/raft combinations (would include removing life rafts from storage compartments);
- Directing and marshaling survivors;
- Demonstrating proficiency in boarding rafts from the water and getting passengers aboard the raft;
- Demonstrating proficiency in operation of any survival equipment carried, with emphasis on Emergency Locator Transmitter operation in rough water conditions and operation of flare signaling devices.

They also recommended that the FAA amend FAR 121.417 to include basic water-survival training as a part of initial and recurrent training for all flight crews. This training would emphasize coordination between flight and cabin crews with little or no pre-water contact preparation time. It would provide for post-crash survival training including, but not limited to, operation of all water survival equipment on board the aircraft, prevention of hypothermia, and crew leadership.

Regarding the frequency of this type of training, one suggestion was to require proficiency in actual water conditions on a one-time basis in initial training. For current flight

crewmembers, this one-time water training would be required during recurrent training. Another suggestion was to require a wet ditch every 5 years.

Again, there was not a consensus of the group as to these recommendations. Some group members believe that the extremely low occurrence of water incidents/accidents shows that there is no need for actual in-water training.

The FAA does believe that some of these recommendations may have merit and will consider establishing a regulatory project that would propose to amend FAR 121.417 to require actual in-water training for crewmembers. The FAA recognizes that the use of flotation equipment in an actual water environment is a learning experience difficult to simulate in a non-water training facility.

(c) Fire Training

Some members of the group recommended that FAR 121.417(c)(2) be clarified to actually require extinguishing a fire or, at a minimum, to require the deployment of extinguishers.

The current requirement pertinent to fire and/or fire extinguishers contained in 121.417(c)(2) requires actual operation of each type of fire extinguisher. The group also recommended that flight attendants have actual experience in a "smoke-filled" cabin for initial training. And finally, they recommended that the FAA should require that Airplane Flight Manuals, Air Carrier Flight Operations Manuals, and Flight Attendant Manuals be amended to include comprehensive discussions and illustrations showing the proper use of a fire ax and the locations in each model of aircraft operated where a fire ax can be used safely to gain access to a fire or smoke emission source.

The group also recommended that the FAA require that Air Carrier Principal Operations Inspectors review the training programs of their respective carriers, and if necessary, specify that they be amended to emphasize requirements:

- for flight crews to take immediate and aggressive action to determine the source and severity of any reported cabin fire and to begin an emergency descent for landing or ditching if the source and severity of the fire are not positively and quickly determined, or if immediate extinction is not assured;

- for flight attendants to recognize the urgency of informing flight crews of the location, source, and severity of any fire or smoke within the cabin; and,

- for both flight crews and flight attendants to be knowledgeable of the proper methods of aggressively attacking a cabin fire by including hands-on training in the donning of

protective breathing equipment, the use of the fire ax to gain access to the source of the fire through interior panels that can be penetrated without risk of essential aircraft components, and the discharge of an appropriate hand fire extinguisher on an actual fire.

There was not a consensus among the group members as to these recommendations. FAR 121.417 requires, in part, that crewmember emergency training conducted each 12 months provide instruction in emergency assignments and procedures, including coordination among crewmembers and individual instruction in the location, function, and operation of emergency equipment including portable fire extinguishers, with emphasis on the type of extinguisher to be used on different classes of fires and instruction in handling emergency situations including 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. It also requires review and discussion of previous aircraft accidents and incidents pertaining to actual emergency situations.

The FAA currently has a regulatory project underway that will address the issues of hands-on training for fire equipment and protective breathing equipment. This proposed regulation would amend the existing crewmember emergency training requirements of FAR 121.417.

With respect to the subject of using a fire ax to gain access to a fire, this has been the subject of a recent NTSB safety recommendation. The FAA, in response to the NTSB, has stated its concerns over crewmembers chopping holes in an aircraft's sidewall when there may be a multitude of plumbing in the vicinity of the chopping (e.g. fuel lines, electrical, hydraulic, flight controls, etc.). Rather, the FAA believes it would be better for crewmembers, after identifying smoke or fire, to attack the situation with available equipment through existing openings and at the same time land the aircraft at the next appropriate airport and have the problem resolved on the ground.

(d) First Aid Training

The Association of Flight Attendants submitted a written recommendation requesting that the FAA, through rulemaking, develop a minimum number of hours of training for first aid in consultation with appropriate emergency care groups. This training should be separate from current recurrent training requirements.

During the Training and Operations Working Group meeting, some of the participants indicated they would provide additional information regarding the need for additional first aid training

and that they would submit suggestions for joint flight/cabin crew training in specific areas. These participants have not submitted written recommendations.

No data were introduced during any of the meetings nor were any submitted in writing which would indicate the current first aid training is not adequate. Further, all evidence indicates that since present first aid training (as opposed to emergency medical technician training) is adequate, and therefore, no regulatory activity is anticipated. However, an Advisory Circular regarding air carrier first aid programs is in the final stages of preparation and has been sent to the Office of Aviation Medicine for comment.

(e) Security Training

The Association of Flight Attendants recommended that the FAA ensure that any increase in recurrent security training is not implemented at the expense of classroom training on regular subjects.

The Security Training program of an airline is approved by the Principal Security Inspector (PSI). When the Principal Inspector assigned to a certificate approves a training program, the approval is based on many things including: an assessment of the operator's procedures, routes, equipment, physical plant, and experience. Security training presently given does not reduce the amount of time devoted to emergency training.

(f) Operations of the Public Address System

Some members of the group recommended that the FAA amend FAR 121.417 to include megaphones as items of emergency equipment that crewmembers must actually operate during initial and recurrent training procedures. Also, recurrent training programs should contain instructions on the use of the public address system.

FAR 121.417(b) requires each crewmember have individual instruction in the location, function, and operation of emergency equipment, and 121.309 lists emergency equipment which must be part of the aircraft equipment for aircraft in Part 121 operations. Subparagraph 121.309(f) specifies megaphones as part of the required equipment. Therefore, crewmembers must have individual instruction in the location, function, and operation of this required emergency equipment. In addition, FAR 121.421(a)(2)(ii) specifies that initial and transition ground training for flight attendants must include instruction in the use of both the public address system and the means of communicating with the other flight crewmembers.

The FAA will address the subject of megaphones and public address system training in the proposed AC on flight attendant training. In the AC, the importance of the megaphone and public address/interphone communication systems will be stressed. In addition, the proposed AC will stress the fact that FAR 121.415(g)(1) stipulates that each training program must insure that each crewmember remains adequately trained.

(g) Training on Personality and Behavior of Passengers

Another recommendation was to require airlines to include, during initial and recurrent flight attendant training programs, information on how personality and behavior of passengers can be manifested in non-routine and emergency situations; and to provide instruction on how flight attendants can compensate for these interpersonal dynamics when they must assign duties to passengers in emergencies. Training should also be given to flight attendants on how to improve the motivation of passengers to pay attention to the oral briefings and to the demonstrations regarding safety features of the aircraft.

FAR 121.417 requires training of crewmembers regarding abnormal situations involving passengers and crew. FAR 121.421 requires flight attendants, during initial and transition training, to have training on handling passengers. The FAA believes that this and the requirement for additional security training adequately addresses the issue of "required" training on passenger reaction problems. However, the proposed AC on Flight Attendant training will address passenger behavior in emergency situations and the proposed AC on Passenger Information will provide suggestions about making briefings more dynamic.

3. JOINT CREW TRAINING

Some members of the group recommended that pilots should receive thorough training on cabin FARs to ensure cockpit/cabin crew coordination. Some also suggest that there should be joint training with pilots and ground fire fighting and emergency crews. It was also recommended that the FAA should establish requirements for intercarrier crew compositions to assure that adequate training and standardization of emergency procedures have been accomplished in all facets of the operation.

There was not a consensus among the group members on these issues. Some members of the group pointed out that flight crews are well aware of cabin FARs and that FAR 121.417 already requires crew coordination training. FAR 121.417 states, in part, that emergency training must provide instruction in emergency assignments and procedures including coordination among crew members. In addition, while Flight Attendant safety representatives and emergency procedures instructors may possess

more knowledge of pertinent FARs than the average line flight crewmember, cabin safety en route inspection reports and inspector experience indicate that many times it is the flight crew member, especially the pilot-in-command who exhibits the most complete knowledge of the applicable FARs. Furthermore, the logistics of trying to train pilots and flight attendants at the same time and place are difficult at best. The FAA will provide guidelines regarding crew coordination training and emphasizing the authority and responsibility of the pilot-in-command in the proposed AC on Flight Attendant Training.

4. ASSESSMENT OF CREW PERFORMANCE

Some group members recommended that the FAA establish a procedure to require air carrier management to create and implement a system that would provide a method for continual assessment of the pilot-in-command's performance in executing management's operational control responsibility. In addition, the FAA should review and revise, where necessary, the operations manuals of air carriers to clearly state management's operational control procedures with regard to the pilot-in-command and other crewmembers and the manner in which each crewmember is expected to execute his duty.

This recommendation was not supported by many of the group members. Many airlines and crewmember associations have procedures for peer review. In addition, air carrier inspectors are asked to monitor crew coordination and other aspects of crew behavior when conducting en route inspections. At this time, there does not appear to be a problem in this area which can be documented to the extent that would require regulatory action. The proposed AC on Flight Attendant Training will provide guidelines regarding the responsibility, authority and role of the pilot-in-command in cabin safety.

5. FAA ACTIONS ON FLIGHT ATTENDANT TRAINING ISSUES

The Office of Flight Standards sponsors periodic Cabin Safety Workshops at the FAA's Civil Aeromedical Institute in Oklahoma City. During these workshops, many of the issues raised by the Training and Operations Work Group are addressed. The purpose of the cabin safety workshops is to provide emergency procedures instructors, safety representatives, FAA inspectors and others with cabin safety responsibilities with the most recent FAA information on cabin safety. The workshop discussions are led by researchers from the Protection and Survival Laboratory and include: research in protective breathing equipment, time of useful consciousness, seat and restraint system use and design, water survival techniques, flotation equipment, over water equipment, protective brace positions, aircraft evacuation techniques, emergency lighting, communication

in emergency situations, crash injury protection, infant/child restraint systems, and recent accident/incidents. In addition, with the coordination and cooperation of the Air Transportation Division discussions are also conducted which include: FAA cabin safety enroute inspection findings and procedures; FAA policy and guidance on crewmember training in such areas as fire safety, crew coordination, authority of the pilot-in-command, passenger education, passenger behavior and recent regulatory activity. This program requires the cooperation of many people at all levels of the FAA and provides an example of the FAA providing current information to the public.

These small-group workshops have been attended by over 1,000 people, many of whom have reported they made changes in their manuals and procedures following these sessions. Flight Standards will continue to encourage open discussions regarding current cabin safety issues during these workshops.

The proposed Advisory Circular on Flight Attendant Training will address several areas including:

- guidelines for reduction of the number of programed hours;
- time devoted to transition training;
- the meaning of "individual instruction";
- the meaning of "competence check";
- the meaning of "performed emergency drills";
- the meaning of "actually operate";
- the meaning of "deployment and use of fire extinguishers";
- the appropriate subjects for use in take-home materials;
- the management of subjects used in take-home materials;
- guidance on training in the operation of slide/rafts;
- guidance on training in prevention and control of in-flight fires;
- training on the use of public address/interphones;
- training on the use of megaphones;
- anticipated types of passenger behavior in emergency situations;
- crew coordination;

- responsibility and authority of the pilot-in-command as they relate to cabin safety;

- emphasize that all training programs should ensure that crewmembers stay adequately trained.

In addition, there is an AC in final stages regarding airline first aid programs. This proposed AC addresses air carriers' first aid programs, including training.

C. FLIGHT ATTENDANTS: NUMBER, DUTIES, LOCATION

1. NUMBER

Several issues were raised regarding the number of flight attendants present during various air carrier operations. One recommendation was that under no circumstances should an airline be allowed to reduce the number of flight attendants on an aircraft by blocking passenger seats; the number of flight attendants used to certify a particular type and model aircraft should be the required number of flight attendants to operate the aircraft regardless of the number of passengers aboard. Another proposal called for the FAA to enforce its interpretation requiring all flight attendants to be onboard the aircraft during boarding and deplaning. A recommendation was also made to reinstate the previously effective FAR 121.391, which required two flight attendants for more than 44 passengers, without any waivers, exemptions, or deviations (as allowed under Exemption 1108B).

Present interpretations do not allow the blocking of seats in order to reduce the number of flight attendants. The FAA at present interprets 121.391 to require a full complement of flight attendants at originating stations during passenger boarding and a full complement of flight attendants at termination station during deplaning of passengers. A full complement of flight attendants as required by FAR 121.391(a) is one flight attendant for airplanes having a seating capacity of more than nine but less than 51 passengers; for airplanes having a seating capacity of more than 50 but less than 101 passenger - two flight attendants; for airplanes having a seating capacity of more than 100 passengers - two flight attendants plus one additional flight attendant for each unit (or part of a unit) of 50 passenger seats above a seating capacity of 100 passengers.

At intermediate stops when passengers are on board, there is a requirement that flight attendants also be on board. However, the number of flight attendants may be reduced in accordance with the provisions stipulated in 121.391(c). The FAA is aware of the confusion which exists over the interpretations of the conditions when the number of flight attendants can be reduced during

intermediate stops and, consequently, has established a regulatory project that will propose to amend the regulation in order to clarify the conditions when the number of required flight attendants can be reduced. Empirical evidence has not been brought to light that indicates the need for two flight attendants in aircraft operating with fewer than 50 passenger seats. The service experience under current regulations, which call for one flight attendant for from nine to 50 passengers, has been favorable.

2. DUTIES

A suggestion was made that the FAA should require that air carriers designate the flight attendant(s) who will be responsible for use of the megaphone(s) during an evacuation. Research of accident/incident files does not reveal use of megaphones during these occurrences even in cases when the megaphone was located immediately adjacent to the flight attendant seat and when subsequent testing revealed adequate flight attendant knowledge regarding the location and use of the megaphones.

Under current regulations and practices, airlines assign crewmember evacuation duties in accordance with §121.397. FAR 121.397 requires certificate holders assign to each category of required crewmember the necessary functions to be performed in an emergency situation requiring emergency evacuation. A review of a sample of Flight Attendant manuals reveals that carriers' procedures usually have one flight attendant assigned to evacuate the airplane with the megaphone. In the case when one aircraft is equipped with more than one megaphone, a crewmember is assigned to evacuate the aircraft with each megaphone.

As previously stated, a review of aircraft evacuation histories contained in the FAA Civil Aeromedical Institute (CAMI) Cabin Safety Data Bank for a 10-year period reveals only one occurrence in which even an attempt was made to use the megaphones. Since most airlines already have procedures assigning flight attendant responsibility for megaphones and since there is no service experience to indicate that when the responsibility is not assigned a serious injury or fatality has occurred, the FAA does not see the need for a regulation requiring the assignment of a specific Flight Attendant to a megaphone. However, the FAA will continue to monitor accidents, incidents, and flight attendant assigned emergency evacuation duties to evaluate the need for a regulation which would require the assignment of specific flight attendants to specific megaphones in emergency situations. The proposed AC on Flight Attendant Training will address the training of Flight Attendants to use the megaphones.

3. LOCATION

An issue was raised regarding the distribution of flight attendants. The proposal was that flight attendants should be so distributed within the cabin as to assure safe evacuation of passengers should the injury or fatality of one flight attendant during the impact sequence render him partially or fully incapacitated; two flight attendants, offering leadership and assistance from all available window exits and the main cabin door, would expedite any evacuation.

When an airplane operates with more than one flight attendant, the FAA requires the flight attendants be evenly distributed when feasible and when their seat assignments for takeoff and landing are the same as those used in the evacuation demonstrations. Present regulations require flight attendant seats to be evenly distributed at floor level exits. FAR 25.785(h) states, in part, that flight attendant seats in passenger compartments must be near required floor level emergency exits, while FAR 121.311(d) requires each flight to have a seat for takeoff and landing that meets the requirements of 25.785. The FAA based the decision to locate flight attendant seats at floor level exits on research and tests which indicate the passenger flow rate to be significantly higher at these exits. It is believed that getting these "more efficient" doors opened and used in an evacuation will enable more occupants to rapidly egress the aircraft. It has been suggested that when the number of required flight attendants exceeds the number of required exits, that once the required exits are covered, the additional flight attendants should be seated in the vicinity of the non-floor level exits. Based on the fact that existing empirical data show the much greater efficiency of floor level exits, it appears that a change in the present regulation is not advisable. However, should examination of future data reveal that passenger egress times can be reduced by moving one of the "extra" required flight attendants to a location away from the floor level exits, the FAA will consider appropriate action at that time.

D. EQUIPMENT ISSUES

1. FLIGHT ATTENDANT SEATS

Some participants of the working group recommended that in order that all flight attendants may perform their safety-related functions, secondary flight attendant jump seats, (i.e., those passenger seats which are designated for flight attendants who are in addition to the required flight attendant complement) should have the same provisions as the primary flight attendant seats (i.e. full restraint systems and communication capability).

The FARs have no requirement for numbers of flight attendants beyond those required by FAR 121.391. FAR 121.391, in part, requires for airplanes with over nine passenger seats, that there be one flight attendant for each 50 passenger seat unit. An air carrier may use "extra" flight attendants for various purposes, such as passenger service activities. These "extra" flight attendants are not required by the FARs and may or may not be trained or qualified. The flight attendants, who are not part of the complement required by 121.391 must not be assigned safety-related duties in such a manner that their presence becomes necessary, and these extra flight attendants may occupy a designated flight attendant seat or any seat in the passenger compartment that the air carrier's needs dictate. The FAA-required flight attendants must occupy seats that meet the requirements of FAR 25.785(h). FAR 25.785(h) states, in part, that flight attendants seats must be located at floor level exits, be equipped with a shoulder harness, provide a direct view of the cabin, must have an energy absorbing rest, and must be positioned so that when not in use they will not interfere with passageways and exits. If the FAA were to require that any seat occupied by a non-required flight attendant meet the same standards as designated flight attendant seats than seats which may be used by passenger on some flights would have to be equipped with such things as shoulder harnesses and energy absorbing rests. In addition, they would have to provide a direct view of the cabin. This might, in fact, encourage airlines to decide not to put additional flight attendants (over the amount required by 121.391) on some equipment. In addition, all seats must meet FAA standards, so in essence, these "additional" flight attendants are being provided the same protection as passengers. Since they cannot be assigned duties which makes their presence necessary, the FAA believes this protection is sufficient.

2. SLIDES AND SLIDE/RAFTS

A proposal was made to amend FAR 121.310 so that all floor-level slides are designed to inflate automatically. As discussed by the Design and Certification Working Group, the installation of automatic deployment and inflation slides on all doors would increase aircraft evacuation efficiency by reducing the time to produce a useable evacuation device. Slide manufacturers have service information and the required parts to convert non-automatic slides to automatic slides. The opposing viewpoint is that there will be an increase in inadvertent slide inflations when automatic slides are installed on all doors. (For the FAA position on this issue, refer to Section III D.)

One issue raised indicated that wide-body aircraft slide/rafts are too complicated to operate; they should be like the more easily operated narrow-body aircraft slide/rafts. As discussed by the Design and Certification Working Group, when installed, these slide/rafts are required to be plainly marked as

to their method of operation and to have clearly marked operating instructions (FAR 25.1561). In addition, there is a requirement that the slide/rafts be easily transferred by not more than two persons. Aircraft certification requirements are considered satisfactory. Inservice reliability can be addressed better by the service difficulty and airworthiness directive processes. The Office of Flight Standards is currently working on a proposal to require reporting of slide deployment failures (refer to Section V for additional information). The subject of crew training in the use of slide/rafts and life rafts will be addressed in the FAA's proposed flight attendant training Advisory Circular.

The Advisory Circular on Flight Attendant Training will provide guidance regarding training on the portability of slide/rafts and importance of training on the operation of slide/rafts used on wide bodied aircraft.

A suggestion was made to require the modification of all slides to add quick-detachable girts to facilitate their use as emergency flotation devices. As discussed by the Design and Certification Working Group, evacuation slides have proven to be useful as flotation devices during an unplanned ditching situation, when slides were able to be released from the aircraft. It was proposed that all slides be equipped with quick-detachable girts to facilitate their use as an emergency flotation device. For FAA action on this issue, see the Design and Certification Group's Section III D.)

E. PASSENGER SAFETY INFORMATION

A number of comments, suggestions, and recommendations were made regarding the passenger information system. Proposals were made that would require some sort of testing for passenger comprehension to ensure that the briefings were conveying their message properly by determining whether these persons are able to perform the actions described, such as using the supplemental oxygen system, life preservers, and exit doors.

Several recommendations on changes in the content of the briefings and cards were made. These included the following: adults donning oxygen masks before placing masks on accompanying children; fastening an adult size life preserver or personal flotation device on a child; and brace positions for children.

Another proposal was to amend Part 121 to require, on airplanes that are equipped with life preservers, that the safety briefings include demonstrations of how to open the life preserver's sealed protective pouch. In addition, a recommendation was set forth to amend FAR 121.571 to state that the appropriate crewmember must physically point out the location of all emergency exits on each aircraft prior to takeoff.

Also included in these recommendations was a requirement to amend Part 121 to require pre-landing safety announcements to reinforce the pre-takeoff briefings on release of seatbelts, the location of exits, the location and operation of life preservers (in the case of overwater landings), and to urge passengers to refer to safety cards prior to landing. Yet another suggestion was to generally "toughen" the language used in passenger safety briefings.

Along with various suggestions on briefing content, there were also recommendations on briefing method. A suggestion was made to conduct research in the application of communication techniques, behavioral sciences, and optimum learning situations. Another suggestion was made to incorporate audio-visual materials in the briefing. Another was to develop a program to test the feasibility, effectiveness, and passenger acceptance of providing safety briefing information in airport terminal gate areas, and of providing printed safety information on or inside the ticket envelopes. Another recommendation was that the emergency instructions for the individual airplane should be displayed on the back of the seats at the passenger's eye level to provide added assurance that the passenger is fully aware of vital safety and survival information.

A proposal was made to require that automatically activated safety messages be used for explaining the operation of the supplemental oxygen systems following loss of cabin pressurization in all newly manufactured air carrier airplanes and, after a specified date, in all other air carrier airplanes that operate under 14 CFR 121. Furthermore, the FAA should, according to one proposal, explore the feasibility of providing public service messages in the media which acquaint air travelers with safety features aboard air carrier aircraft.

Also, it is recommended that the FAA revise, based on the results of testing passenger comprehension of safety information and performance of emergency procedures, Air Carrier Operations Handbooks and Bulletins and air carrier inspector training programs to include instruction to prepare FAA inspectors to provide better guidance to airlines when assisting them in improving the content and presentation of passenger safety information to their passengers.

In response to these various suggestions, it should be noted that no empirical or objective evidence was submitted to the working group which documented either a passenger fatality or serious injury which resulted from deficiencies within the passenger information system. The number of passenger-initiated unwarranted evacuations may in fact indicate that additional passenger training could have a negative effect on overall passenger safety. Also, we have reported cases of passenger interference with crew. Perhaps it would be better to address most of our resources to improvements in crew emergency training.

Motivating passengers to read cards or pay attention to announcements is complex and difficult. Motivating people is very difficult and usually considered long term. These problems are also experienced by professional educators and trainers when they seek to motivate people in 'required' classes. People who have studied motivation regarding safety practices know that one sure way to motivate people is to show them the consequences of a failure to follow safety practices. For example, in the case of encouraging people to wear their seatbelts, states have shown scenes of anthropomorphic dummies going through windshields and cars following accidents. In the case of aviation safety, similar attempts at motivation could consist of pictures of accident victims, crashes, etc., posted in strategic places at airport boarding gates or on airplanes. This may result in more people paying attention to the briefings and briefing cards, however, the FAA does not believe that the airlines and traveling public would support this approach.

Development of tests and standards to measure comprehension and performance would be quite difficult and costly. For example, most of the results would be based on the 'typical' passenger. It would be necessary to define the typical passenger, which would be difficult. In addition, there is ample evidence which indicates that passengers have been able to open exits and doors in accidents. While they may have difficulty donning life vests, this could be more of a design deficiency than lack of education and information.

Passenger information cards are almost too cluttered right now. Adding pictures of children in brace positions and children in lifevests would only add to the clutter and possible confusion. Furthermore, depicting a brace position for children on cards would be difficult since any protective position varies according to the size of the child. In any case, in the event of an anticipated evacuation, there should be ample time for the flight attendants to show the adult accompanying the child the correct position. In the event of an unanticipated evacuation, it is doubtful there will be enough time for the adult to do more than assume the brace for impact position himself. This may be the most important thing the adult can do, since it is important for the adult to survive in order to help the child get out of the airplane.

In the event of a ditching (anticipated water landing), there would be ample time for the crewmembers to instruct children and the adults accompanying them in the donning and wearing of lifevests. In the event of an unanticipated water landing, the most important thing would be for the adult to get his/her lifevest on, and then perhaps he/she and other adults would be able to hold up the child. The chances of being able to assist anyone in donning a lifevest in an unanticipated water landing are minimal unless lifevests which are much easier to don are developed.

Airlines with operations that may indicate that it is important to depict infant/child brace positions or infant/child procedures for donning and wearing lifevests are free to do so as long as the depiction is accurate.

There is an air carrier operations bulletin which was jointly prepared by Flight Standards and the Protection and Survival Laboratory at CAMI, which provides all the information available on brace for impact positions.

Development of a program to test the public acceptance of safety messages at airports should be preceded by considerations of whether these messages could be placed at airports and who would pay for them. Again, the single best message to people who are unmotivated would be to have messages that depict what the rewards are for following the safety instructions. It might also be wise to request information from the National Highway Traffic Safety Administration (NHTSA) about the measurable effect of their safety messages and which ones were the most effective. It is quite possible the research has already been done.

In addition to the suggestions regarding the form and content of passenger safety briefings, a recommendation was made that the FAA sponsor a government/industry task force open to foreign participants made up of representatives from the aircraft manufacturers, air carrier and commuter operators, researchers, flight attendants, and consumers to: 1) identify the type of safety information that is most useful and needed by passengers; 2) identify and develop improved instructional concepts for conveying the safety information; and 3) recommend appropriate changes to the operating requirements regarding passenger oral briefings and information briefing cards.

Furthermore, it was proposed that the FAA amend Part 129 to include the safety provisions of Subpart T of Part 121 governing the briefing of passengers, or include these provisions in the operations specifications issued to foreign air carriers by the Administrator; and require that approved wording for such briefings be included in the appropriate flight/operations manuals of the applicable crewmembers.

The FAA feels that a joint industry-government task force might be productive if there were specific, objective, documentable information about the types of problems (as evidenced by official NTSB accident/incident reports) caused by passengers not receiving safety information.

Part 129 applies to foreign air carriers operating into the United States. The FAA has only limited authority over a Part 129 operator. This authority is valid only when operating within the United States and is limited to certain air traffic regulations. The FAA does not have any authority over passenger safety issues.

A suggestion was made to amend the regulations so that each operator and/or producer of aircraft passenger briefing materials submits a documentary report to the FAA/POI containing substantive data on the instructional effectiveness of the briefing material and/or method.

It is the position of the FAA that having the carrier submit substantive data regarding the effectiveness of its passenger information system would impose a financial burden on the carrier that does not appear justified because of the lack of empirical evidence indicating that passenger information systems have contributed to the death or injury of passengers.

The FAA continues to monitor all aircraft accidents and incidents to assess possible trends or problem areas. Should a demonstrable problem occur which the FAA believes could be solved by addressing the passenger information system, the FAA will take appropriate action at that time. In the meantime, as stated above, the FAA is preparing an Advisory Circular that will address passenger information systems, including: the opening of life preserver pouches, flight attendants or crewmembers identifying emergency exits, automatically activated oxygen announcements in new aircraft, approval of briefing cards, depiction of brace-for-impact positions, pre-landing announcement, and presentation of material.

Finally, the National Transportation Safety Board presented a Safety Study entitled, "Airline Passenger Safety Education: A Review of Methods Used to Present Safety Information." This is an extensive report, the details of which were not considered by the working group. The report contains approximately 14 NTSB Safety Recommendations pertaining to passenger education and briefings. These safety recommendations have been sent to the FAA by the NTSB through the formal NTSB Safety Recommendation System. The FAA will consider each of the recommendations and respond to the NTSB through the normal system.

F. AIR CARRIER OPERATIONS

1. MINIMUM EQUIPMENT LIST (MEL)

Objections were raised to the practice of allowing the dispatch of aircraft with one door inoperative. A proposal was made calling for the FAA to revoke exemptions allowing aircraft to fly more than 50 miles from land without life rafts. Also, a recommendation was made to change the regulations governing Master Minimum Equipment Lists (MMELs) for passenger-carrying aircraft to require that the public address system be operable from the cockpit and from at least one flight attendant station at all times. These amendments should include provisions that the aircraft may continue the flight or series of flights with other portions of the system inoperative for a reasonable number

of flight hours, but may not depart a station where repairs or replacements can be made. The Master Minimum Equipment List provides that an aircraft may operate with the Public Address System inoperative when the interphone between the cabin and flight deck is operative and there is an additional system such as megaphones working. The FAA will continue to monitor accidents and incidents to determine if there is a problem with the present MMEL concerning Public Address Systems.

The FAA's Office of Flight Standards is studying the one door inoperative MEL practice and anticipates providing additional guidance regarding this matter in the near future. With respect to the 50 mile exemptions, the FAR being referred to is Section 121.339. The FAA has not granted an exemption to that regulation for the removal of liferafts. Deviations to the liferaft requirement have been authorized provided certain conditions have been met.

2. BLOCKED SEATS

A comment was made that exemptions to FAR 121.391 (and allowing fewer flight attendants by blocking seats) may be improper; seats should be removed rather than blocked; seats next to inoperable exits should not be occupied by passengers. Others felt that analysis is needed on evacuation flows with seats blocked. The FAA recognizes the valid concerns expressed in these comments. The FAA has not recently granted any exemptions to FAR 121.391 and does not believe it is in the public interest to do so.

3. TAXIING

A proposal was made that the FAA should stipulate that it is an unsafe operation of the aircraft for pilots to move the aircraft before the flight attendants have informed them that the aircraft is secured (e.g., carry-on baggage and galley items secured). The FAA is pursuing a regulatory project that will address this issue.

4. PASSENGER SEATING

A recommendation was made that the FAA should prohibit less than agile passengers from occupying seats in an exit row, as well as those seats one row forward and one row aft of exits. This is a difficult issue from the standpoint of federal regulatory action in an area of individual human rights. The FAA is not in a position to initiate regulatory action in this area. However, Advisory Circular 120.32 does contain guidelines regarding the carriage of handicapped passengers.

5. ALCOHOL

Because of the problems in removing intoxicated persons from the aircraft during evacuations, a recommendation was made that the FAA suggest to the Air Transport Association that it consider developing an industry-wide rule on the amount of alcohol served to passengers. Such a rule would also protect the airlines and crewmembers from civil and criminal liability in cases where intoxicated passengers leave the aircraft and cause injury to others in automobiles. Also, FAR 121.575 prohibits the boarding or serving of persons who appear to be intoxicated.

G. ATTENDANCE LIST

TRAINING AND OPERATIONS WORKING GROUP MEETING

DECEMBER 3-4, 1985

NAME	AFFILIATION/ORGANIZATION
Ms. Connie Stevens	Association of Professional Flight Attendants, Homewood, CA
Mr. Dan Smith	International Airline Passengers Association, Dallas, TX
Mr. Thomas L. Anderson	B.F. Goodrich, Akron, OH
Mr. Ray Walder	International Air Transport Association, Montreal, Canada
Mr. John Reese	Aerospace Industries Association Washington, DC
Mr. Roger Brooks	Air Line Pilots Association Aurora, CO
Mr. Walt Coleman	Air Transport Association Washington, DC
Ms. Janna Harkrider	Union of Flight Attendants Pasadena, CA
Ms. Barbara Dunn	Canadian Airline Flight Attendants Association, Vancouver, Canada
Mr. Hector Berrera	Frontier Airlines, Denver, CO
Mr. Wayne Williams	National Transportation Safety Association, Dania, FL
Mr. Al Hastings	Arlington, TX
Ms. Ellen Hill	Teamsters Local 2707, Berkeley, CA
Mr. Steve Johnson	Flight Engineers Independent Association, Washington, D.C.
Ms. Karen Lantz	Independent Federation of Flight Attendants, New York, NY
Ms. Terry Singleton	Independent Union of Flight Attendants, Honolulu, HI

ATTENDANCE LIST (CONT)

NAME	AFFILIATION/ORGANIZATION
Captain S. Martin Vanstone	International Federation of Air Line Pilots Association, Vancouver, Canada
Mr. Matt Finucane	Association of Flight Attendants Washington, DC
Ms. Donell Pollard	FAA, AAC-119, Oklahoma City, OK
Ms. Marcia Bryars	Pacific Southwest Airlines, San Diego, CA
Mr. Steve Huntley	DOT/Transportation System Center, DTS-45, Cambridge, MA
Mr. Edmond Boullay	French Embassy, Washington, DC
Mr. Bill Weeks	Air Line Pilots Association Aurora, CO
Mr. Dan Johnson	Interaction Research Corporation Olympia, WA
Mr. Lawson C. White	International Air Transportation Association, Montreal, Canada
Mr. William H. Shook	Douglas Aircraft Company Long Beach, CA
Ms. Toni F. Ketchell	Association of Professional Flight Attendants, Euless, TX
Mr. George Veryiouglou	Boeing Commercial Airplane Company Seattle, WA
Ms. Joellen M. Thompson	Independent Union of Flight Attendants, El Segundo, CA
Mr. Anthony Adamski	Chrysler, Pentastar, Ypsilanti, MI
Mr. H. Beau Altman	Chrysler, Pentastar, Olympia, WA
Mr. Roger Vesely	Frontier Airlines, Denver, CO
Ms. Allison Johnson	Delta Airlines, Atlanta, GA
Mr. Mark Storm	Eastern Airlines, Miami, FL
Ms. Kay Avery	American Airlines, Dallas, TX
Mr. Jim Danaher	National Transportation Safety Board Washington, DC

ATTENDANCE LIST (CONT)

NAME	AFFILIATION/ORGANIZATION
Ms. Nora Marshall	National Transportation Safety Board Washington, DC
Mr. Steven Vincent	Association of Flight Attendants Seattle, WA
Ms. Sandy Noller	Pan American World Airways, Miami, Fl
Mr. R.E. Livingston	Washington, DC
Captain John Mimpriss	Civil Aviation Authority London, England
Mr. E.E. Campbell	The Boeing Company, Seattle, WA
Mr. Paul Robinson	Air Line Pilots Association Marietta, GA
Mr. W.S. Weeks	Air Line Pilots Association Winston-Salem, NC
Mr. William A. Gill, Jr.	Flight Engineers International Association, Washington, DC
Ms. Isabell Burgess	Air Line Pilots Association Washington, DC
Mr. Ian Goodyear	Douglas Aircraft, Long Beach, CA
Mr. Gale Braden	FAA, ASF-300, Washington, D.C.
Mr. William Hendrix	FAA, AVS-2, Washington, D.C.
Mr. Rick Cremer	FAA, AFS-200, Washington, D.C.

V. MAINTENANCE AND RELIABILITY WORKING GROUP

A. INTRODUCTION

Formation of the Maintenance and Reliability Working Group was announced during the Public Technical Conference and conference participants were invited to join. Meeting announcements were sent by the FAA to all parties who expressed interest in the group during the conference and to any additional parties who wished to participate. The meeting of the Working Group was open to the public.

The meeting of the group was held December 4 and 5, 1985, in Washington, D.C. Fred Crenshaw, of the Aircraft Maintenance Division, FAA, Washington, was Chairman of the meeting. Opening remarks and an expression of appreciation to all participants were given by Raymond Ramakis, Manager of the Aircraft Maintenance Division. Approximately 40 experts in the field of aircraft design, maintenance, and operation attended. The attendance list is included at the end of this section.

The agenda issues for the meeting were determined by the FAA after review of the verbatim transcript of the Public Technical Conference. The review identified six issues that had been raised by the public during the conference. These issues were: Improper Maintenance, Training/Qualifications, Mandatory Reporting of Malfunctions, Defects, and Failures of Evacuation Systems, Required Inspection Items (RII), Functional Testing of Evacuation Systems on the Aircraft, and Inspection Intervals. Participants at the meeting were provided with an opportunity to discuss additional issues. The issues that follow and the outcome of these issues cover all of the issues raised during the Public Technical Conference pertaining to maintenance and reliability of evacuation slide and door systems.

The discussions during the meeting were held in an informal round-table manner. Although there was some disagreement among participants on how the safety measures in response to the issues should be implemented, the majority of participants did agree that the basic safety concerns of the issues were valid and that corrective measures should be considered.

In addition to the information brought out during the discussions in the meeting, information was submitted by some parties in writing for the record. The issue summaries below take into consideration these written submittals, copies of which are contained in Volume II. The submittals include comments of the International Association of Machinists, comments of the French Civil Aviation Authority, and service information from several carriers.

B. IMPROPER MAINTENANCE

The term "improper maintenance" as recognized by the Working Group encompasses field practices that do not adhere to the accepted instructions or guidelines established for an evacuation device. This includes improper packing of slides and slide/rafts by repair facilities and improper installation of slide/rafts on the aircraft by the operator. It was pointed out that it is a matter of record that malfunction and failure of equipment due to improper maintenance has been experienced during actual emergencies, evacuation demonstrations and functional testing.

It was the consensus of the Working Group that improper maintenance can be addressed by proper training, current and adequate procedures, adequate facilities and equipment, and quality control. The group agreed that all of these should be addressed in the operator's maintenance program. Also, good communications between the operator and the manufacturer are necessary for purposes of training and current maintenance instructions. The group consensus was that the FAA should continue to emphasize surveillance and enforcement activities.

The FAA has considered the views and recommendations of the Working Group for corrective action and has a project in progress to develop an advisory circular that will address this issue and other issues discussed by the Working Group concerning the maintenance/reliability of aircraft evacuation systems. Those issues will also be addressed in the Airworthiness Inspector's Handbook, which is presently being revised. The draft advisory circular will be published in the Federal Register for review and comment by the general public.

C. TRAINING/QUALIFICATIONS

It was recognized by the Working Group that personnel involved in the inspection, packing and installation of slides on aircraft should be properly trained and qualified and must always follow current procedures. The group agreed that initial training should be received from the slide manufacturer and that the air carrier should have periodic recurrent training as part of its program. FAA inspectors should receive hands-on training. This hands-on training would be an aid for the FAA in monitoring operator and repair facility maintenance and training programs.

The FAA has considered the views and recommendations of the Working Group for corrective action and has a project in progress to develop an advisory circular that will address this issue and other issues discussed by the Working Group concerning the maintenance/reliability of aircraft evacuation systems. Those

issues will also be addressed in the Airworthiness Inspector's Handbook, which is presently being revised. The draft advisory circular will be published in the Federal Register for review and comment by the general public.

D. MANDATORY REPORTING OF MALFUNCTIONS, DEFECTS AND FAILURES OF EVACUATION SYSTEMS

Although current regulations require the reporting of malfunctions, defects, or failures in a number of specific aircraft components that are critical to the safety of flight, the regulations do not require such reporting for equipment items in the emergency evacuation system. This lack of mandatory reporting impairs the monitoring of reliability of evacuation equipment in service. One party believes that the FAA does not have a sufficient data base to make sound judgments on door failures in the automatic mode, and the repairs or modifications required to insure a reliable escape system. The Working Group recommended that a system of comprehensive mandatory reporting be established to provide a basis for equipment reliability monitoring. This would require reporting by an air carrier under FAR 121.703, Mechanical Reliability Reports (MRR), and by a repair facility under FAR 145.63, Reports of Defects or Unairworthy Conditions.

It was the consensus of the group that the FAA should initiate a rule change project to incorporate reporting requirements that include corrective actions, to provide both the FAA and the aviation industry with a total picture concerning problems. Such an action would greatly improve the reliability of evacuation systems. Even though certain malfunctions are being reported voluntarily, the MRR system does not reflect the total picture.

The FAA has considered the views and recommendations of the Working Group and has established a regulatory project to propose an amendment to FAR 121.703, Mechanical Reliability Reports (MRR), to require the reporting of malfunctions, defects and failures of evacuation systems during demonstrations, testing or actual emergency situations. It will also require corrective action documentation. Mandatory reporting of evacuation systems also will be addressed in the advisory circular to be prepared on the other issues discussed by the group. The proposed regulation change and the advisory circular will be published in the Federal Register for public review and comment.

E. REQUIRED INSPECTION ITEMS

As discussed under Improper Maintenance, there have been incidents involving slide malfunctions due to improper packing and improper installation of slides on the aircraft. Failure of a slide in an emergency situation could result in occupants not being able to evacuate an aircraft.

It was the consensus of the Working Group that for aircraft in service, there should be assurance that the slides have been properly packed and properly installed on the aircraft. Two sets of eyes during these maintenance processes would provide that assurance. Most members of the group agreed that the most practical means to accomplish this would be for the manufacturer to identify in its overhaul manual the critical tasks during the packing process that could affect proper deployment, and the critical tasks to be observed during installation of the slide on the aircraft. All of those tasks should be identified in the air carrier's manual as RIIs. Some air carriers already designate critical slide packing tasks and slide installation tasks as RIIs and others do not. Some believe RIIs should not be considered for narrow-body airplanes.

The FAA has considered the views and recommendations of the Working Group for corrective action and has a project in progress to develop an advisory circular that will address this issue and other issues discussed by the Working Group concerning the maintenance/reliability of aircraft evacuation systems. Those issues will also be addressed in the Airworthiness Inspector's Handbook which is presently being revised. The draft advisory circular will be published in the Federal Register for review and comment by the general public.

F. FUNCTIONAL TESTING OF EVACUATION SYSTEMS ON THE AIRCRAFT

The Working Group recognized that functional deployment testing of the slide on the aircraft would test the total evacuation system. This would include operation of door systems with the slide engaged, and slide pack deployment and inflation. Some carriers believed that functional deployment should not be considered for narrow body airplanes. Several carriers already conduct deployment tests on a basis of "each year all slides on one aircraft of a type." One of these carriers has noted a considerable improvement in test results since the testing was begun in 1974.

Proper documentation of functional tests would be necessary to account for evacuation system reliability. Functional tests could be accomplished when a slide is due for a shop visit or by whatever method an operator chooses to include in its program and is acceptable to the assigned FAA principal maintenance

inspector. An added benefit to scheduled functional testing could be in conjunction with hands-on flight attendant training. This suggestion was presented to the Training and Operations Working Group.

The FAA has considered the views and recommendations for corrective action of the Maintenance and Reliability Working Group and has a project in progress to develop an advisory circular that will address this issue and other issues discussed by the working group concerning the maintenance/reliability of aircraft evacuation systems. Those issues will also be addressed in the Airworthiness Inspector's Handbook, which is presently being revised. The draft advisory circular will be published in the Federal Register for review and comment by the general public.

G. INSPECTION INTERVALS

The manufacturer initially establishes the inspection intervals for its product. The air carrier incorporates the evacuation system equipment into its own program and establishes inspection intervals based on its experience and evaluation, that are approved by the assigned FAA principal maintenance inspector. Air carrier maintenance programs are not all identical and, in some cases, inspection intervals may not be adequate. One party pointed out that slides, life rafts and life preservers have been found to have deteriorated in service to the point of being unairworthy. This party favors a time-change system of inspections and tests: slides and slide/rafts every 3 years, life rafts every 4 years, and life preservers every 5 years.

It was the consensus of the Working Group that when inspection intervals are considered, the manufacturers with the operators should determine life limits for materials. Tests should be established to check for deterioration, age vs. fabric integrity, and in-service environmental conditions. It should be noted that the Design and Certification Working Group also discussed this issue and concluded that a life limit was not appropriate. The FAA will consider whether further action is necessary.

The FAA has considered the views and recommendations of the Maintenance and Reliability Working Group for corrective action and has a project in progress to develop an advisory circular that will address this issue and other issues discussed by the working group concerning the maintenance/reliability of aircraft evacuation systems. Those issues will also be addressed in the Airworthiness Inspector's Handbook, which is presently being revised. The draft advisory circular will be published in the Federal Register for review and comment by the general public.

H. ATTENDANCE LIST

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DECEMBER 4-5, 1985

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Lorraine B. Parker	FAA, Washington, D.C.
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MAINTENANCE AND RELIABILITY WORKING GROUP MEETING

DECEMBER 5, 1985

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VI. SUMMARY AND VIEW TO THE FUTURE

The program of the Emergency Evacuation Task Force received wide public support and participation. It assembled many of the world's top experts in aviation safety for an assessment of existing regulations. The program brought issues under close public scrutiny in light of service experience for the first time since the adoption of a number of principal regulations on evacuation. The FAA is responding without delay to many of the findings and recommendations of the task force and to the information brought out during the activities. Numerous actions, both regulatory and non-regulatory, are being initiated by the FAA.

Several of these actions represent major long term improvements in the design, operation, and maintenance of air carrier transport airplanes. A detailed list of actions being taken by the FAA, including time frames, follows this section.

One of the major issues considered by the task force was that of escape path distance (seat-to-exit or exit-to-exit distance). This concerns the distance evacuees must traverse to reach an exit in an emergency. As a result of the task force, the FAA is moving ahead with regulatory action to establish a safe and practical limit on escape path distance.

The maintenance and reliability of emergency exit and escape slide systems was dealt with on a comprehensive basis by addressing the training and qualification of maintenance personnel, inspection requirements, functional testing, and the mandatory reporting of service difficulties. The FAA has initiated regulatory and advisory material on this critical matter. The mandatory reporting will provide a new data base and insight into equipment reliability and establish the foundation for long term improvements.

The requirements pertaining to full-scale emergency evacuation demonstrations were reassessed from the standpoint of airplane design and certification and the standpoint of crew training and procedures. The FAA is developing regulatory and advisory material to incorporate an increased realism in the simulated emergency conditions of an evacuation demonstration and to resolve matters of regulatory intent.

The drive toward increased passenger safety made a major advance through the Emergency Evacuation Task Force. Crash impact structural protection and post-crash fire protection are technical areas which, together with emergency evacuation, greatly increase the chances of occupants surviving a crash landing. The FAA currently is preparing to issue proposed regulations to increase passenger seat strength and new fire resistance standards for cabin interior materials.

The future of transport airplane designs will bring new evacuation system configurations and new materials of construction, and most likely new challenges in seeing these vis-a-vis the "accident scenario." Clearly, the FAA has demonstrated a willing responsiveness to the critical issues raised by the public in the Emergency Evacuation Task Force and will continue to respond in the future in a prudent manner as new issues of safety arise.

VII. FAA ACTIONS ON ISSUES

The FAA actions outlined below are categorized according to working group subject area. Several actions take into consideration the discussions and resolutions of more than one group. For example, the issue of emergency evacuation demonstrations was a major issue for both Design and Certification, and Training and Operations. The actions in this case have been assigned to a single FAA office. For the time frames specified below, Short Term implies approximately six months, Mid Term implies approximately one year, and Long Term implies approximately eighteen months. Within these specified time periods, detailed drafts of the proposals will be prepared and forwarded to FAA headquarters for final review and action prior to issuance. The proposal documents will become available to the public for review and comment upon issuance.

A. DESIGN AND CERTIFICATION

Exits

Distance to Exits: Prepare an NPRM to establish a maximum distance between exits. Short Term.

Type III Exits: Prepare NPRMs for FARs 25 and 121 to improve access to Type III exits. Mid Term.

Exit Rating: Review and prepare proposals to revise, as necessary, the FAR 25 exit rating criteria. Long Term.

Uniform Distribution: Prepare an Advisory Circular proposal to provide a better definition of what uniform distribution means. Mid Term.

Exit Cross-Aisles: Prepare an Advisory Circular to clarify FAR 25.807(a)(7)(v). Long Term.

Evacuation Demonstrations

Use of 50% of Available Exits: Review criteria on how to select 50% of available exits for use in a demonstration and prepare an FAR 25 NPRM if appropriate. If the FAR 25 rule change is promulgated, prepare an Advisory Circular proposal on means of compliance. Long Term.

Flight Deck Crew: Prepare an NPRM for FAR 25 and 121 to prohibit assigning specific duties to the flight deck during the evacuation demonstration. Crew

Training for use in Evacuation Demonstrations: Flight Standards will work with the office assigned to write the Advisory Circular on Evacuation Demonstration in the preparation of the Crewmember Training section. Long Term.

Age Limits: Prepare an FAR 25 NPRM to eliminate the use of persons less than 18 or more than 60 years old. Long Term.

Analysis vs. Demonstration: Prepare a policy letter on use of analysis in lieu of an evacuation demonstration (Short Term) and an Advisory Circular (AC) on substantiation necessary for analysis. Long Term.

Evacuation Demonstration: Prepare a proposal to add to the Crashworthiness Handbook how to conduct an evacuation demonstration and add the following information: Mid Term.

a. prohibit use of flight deck crews
b. how to position flight attendants
c. persons prohibited from participating
d. random seat selection
e. informed consent
f. passenger mix criteria
g. define a regularly scheduled line crew
h. define the use of carry-on baggage, pillows, etc.

Latin Square Method: Prepare a proposal to incorporate in the Crashworthiness Handbook, information on the use of the Latin Square method for analyzing non-standard exit arrangements. Mid Term.

Lighting Standards

Floor Proximity Lighting: Prepare a proposal to revise AC 25.812 within one year to clarify what the phrase "identify the escape path and exit" and to include general system guidelines that have been approved. Mid Term.

Flight Attendant Seating

Revision of AC 25.785-1: Prepare a proposed revision to AC 25.785-1 to emphasize a lateral head strike safe zone for flight attendant seating. Review the AC with respect to double occupant flight attendant seats and minimum distance between an aft facing flight attendant and the forward facing passenger. Prepare a proposal to revise AC 25.785-1, if appropriate. Long Term.

Flight Attendant Restraint Systems: Prepare an AC to provide guidance on the proper installation of seat and shoulder belts. Mid Term.

Galley Mounted Seats: Request that the flight attendant associations assist the FAA in collecting data on galley mounted seat installations. Data will be used to determine what corrective action is necessary. Long Term.

Specific Design Features

Exit Marking: Prepare an FAR 25 NPRM to allow the illumination option for other than Type A and I exit handles. Short Term.

PA System: Prepare an FAR 25 NPRM to require a deadman switch on the public address system handsets. This will parallel the independently powered PA system proposal currently being promulgated. Mid Term.

Quick Release Girts: Prepare an FAR 25 NPRM to require quick release girts on slides. Long Term.

TSO Changes

TSO C69a: Prepare a proposal to revise the TSO to require quick-detach girts to facilitate use of escape slides as emergency flotation devices. The proposal also would revise the TSO to reduce slide inflation time, increase tear and puncture resistance, add hydrolysis test, and revise the slide raft back support requirement. Prepare an FAR 25 NPRM to parallel the TSO slide inflation time revision. Mid Term.

B. TRAINING AND OPERATIONS

Crewmember Emergency Training: Appropriate action to be determined.

Equipment Issues: Subject to flight attendant training on the use of slides and slide/rafts, will be addressed in the FAA proposed flight attendant training advisory circular.

Adequacy of Passenger Briefings: Passenger briefing Advisory Circular 121-24 is being rewritten. Short Term. New NTSB recommendations (A-85-93 through A-85-104) also pertain to this subject. No regulatory action is planned.

Standardization of Emergency Equipment on a Carrier Fleet: Appropriate action to be determined. No regulatory action planned.

Carry-on Baggage: Regulatory project in progress.

Flight Attendant Duty Time: Regulatory project in progress.

Flight Attendants on the Aircraft During Deplaning, Boarding, and While Parked: Regulatory project in progress.

Inoperative Doors/Slides and MEL Compliance: Appropriate action to be determined.

C. MAINTENANCE AND RELIABILITY

Maintenance and Reliability of Exit/Slide Systems: Draft an advisory circular to address the following issues considered by the working group (Short Term): improper maintenance; training and qualifications necessary for slide maintenance; reporting of malfunctions, defects and failures of evacuation equipment; required inspection items (RIIs) for packing of slides and installation on the aircraft; functional testing of evacuation systems on the aircraft; and, inspection intervals.

Reporting of Service Difficulties: Draft an NPRM to revise Section 121.703, Mechanical Reliability Reports, to include reporting of malfunctions, failures, and defects of emergency equipment. Short Term.

APPENDIX

ATTENDANCE LIST

EMERGENCY EVACUATION OF TRANSPORT AIRPLANES

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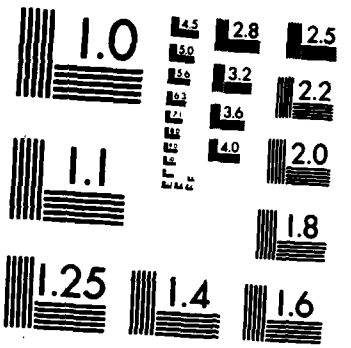

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