



ICAO

Doc 10072

Manual on the Establishment of Minimum Cabin Crew Requirements

First edition, 2017



Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION **Documents**
AVA Document Sharing Hub

ICAO 10072 2017



| ICAO

Doc 10072

Manual on the Establishment of Minimum Cabin Crew Requirements

First edition, 2017

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

Documents
Document Sharing Hub

Published in separate English, Arabic, Chinese, French, Russian
and Spanish editions by the
INTERNATIONAL CIVIL AVIATION ORGANIZATION
999 Robert-Bourassa Boulevard, Montréal, Quebec, Canada H3C 5H7

For ordering information and for a complete listing of sales agents
and booksellers, please go to the ICAO website at www.icao.int

First edition, 2017

Doc 10072, *Manual on the Establishment of Minimum Cabin Crew Requirements*

Order Number: 10072

ISBN 987-92-9258-242-5

© ICAO 2017

All rights reserved. No part of this publication may be reproduced, stored in a
retrieval system or transmitted in any form or by any means, without prior
permission in writing from the International Civil Aviation Organization.

AMENDMENTS

Amendments are announced in the supplements to the *Products and Services Catalogue*; the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

[illegible][illegible]

(iii)

.....

FOREWORD

Cabin crew members play a key role with regard to passenger and operational safety. The number of cabin crew on board, and their performance, are significant factors in the successful evacuation of aircraft. Therefore, a minimum number of cabin crew members are required to effectively conduct a timely evacuation and increase the survivability of passengers during an accident.

ICAO developed the *Manual on the Establishment of Minimum Cabin Crew Requirements* (Doc 10072) in order to provide guidance on provisions in Annex 6 — *Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes* related to the assignment of emergency duties and the minimum number of cabin crew required on board commercial passenger flights.

This manual contains guidance for States to develop the operating rules and approval processes regarding the number of cabin crew members required on board. It also provides guidance on other aspects related to the assignment of cabin crew members on board, including additional cabin crew requirements for specific situations, and considerations related to the use of personnel assigned to non-safety and non-emergency duties in the cabin by operators, if permitted by the State.

The content of this manual was developed with input from experts from civil aviation authorities, operators, aircraft manufacturers, training organizations and international organizations, and thereafter submitted for extensive peer review to take into account comments from the expert community.

ICAO gratefully acknowledges the contributions of the ICAO Cabin Safety Group and individual experts who provided support, advice and input for this manual.

TABLE OF CONTENTS

	<i>Page</i>
Glossary	(ix)
Abbreviations.....	(ix)
Definitions.....	(ix)
Chapter 1. Introduction	1-1
1.1 Background	1-1
1.2 Purpose	1-2
1.3 Scope	1-3
Chapter 2. Certification Requirements	2-1
2.1 General.....	2-1
2.2 Emergency exits	2-1
2.3 Cabin crew seats	2-2
2.4 Emergency evacuation	2-2
2.5 Number of cabin crew.....	2-3
2.6 Emergency evacuation demonstration by the manufacturer	2-3
2.7 Criteria for a full-scale evacuation demonstration.....	2-3
2.8 Ditching provisions	2-8
Appendix to Chapter 2. ICAO Standards and Recommended Practices (SARPs) related to Certification	2-App-1
Chapter 3. Operational Requirements	3-1
3.1 Number of cabin crew.....	3-1
3.2 Emergency evacuation demonstration by the operator	3-2
3.3 Criteria for a partial evacuation demonstration	3-3
3.4 Criteria for a simulated ditching demonstration	3-5
3.5 Determining which category of demonstration is required	3-8
Appendix A to Chapter 3. ICAO Standards and Recommended Practices (SARPs) related to minimum cabin crew requirements	3-App A-1
Appendix B to Chapter 3. Considerations for cabin crew per floor level exits	3-App B-1
Chapter 4. Planning and conduct of emergency evacuation and ditching demonstrations by operators.....	4-1
4.1 General.....	4-1
4.2 Instructions for the planning and conduct of a demonstration	4-1
4.3 Review and approval of the operator's plan	4-4
4.4 Planning the demonstration	4-4
4.5 Observing the demonstration	4-8

4.6	Evaluating the demonstration	4-11
	Appendix to Chapter 4. Sample emergency evacuation/ditching demonstration form.....	4-App-1
Chapter 5.	Considerations when establishing minimum cabin crew numbers.....	5-1
5.1	General.....	5-1
5.2	Ground operations.....	5-1
5.3	In-flight crew rest	5-3
5.4	Aircraft/cabin configuration	5-3
5.5	Special categories of passengers on board.....	5-4
5.6	Cabin crew incapacitation.....	5-4
5.7	Non-commercial operations.....	5-6
Chapter 6.	Modifying the minimum cabin crew requirements.....	6-1
6.1	General.....	6-1
6.2	Approval process.....	6-1
6.3	Safety risk assessment.....	6-2
6.4	Amendments by the operator	6-6
6.5	Emergency evacuation demonstration	6-6
6.6	Post-implementation activities	6-6
	Appendix to Chapter 6. Example of process to evaluate the modification of minimum cabin crew requirements.....	6-App-1
Chapter 7.	Additional considerations for cabin crew.....	7-1
7.1	General.....	7-1
7.2	Mixed fleet operations	7-1
7.3	Location of cabin crew on board.....	7-2
Chapter 8.	Personnel assigned non-safety and non-emergency duties in the cabin.....	8-1
8.1	General.....	8-1
8.2	Guidelines for personnel assigned non-safety and non-emergency duties in the cabin	8-1
8.3	Occupancy of cabin crew seats	8-3

GLOSSARY

ABBREVIATIONS

AOC	Air operator certificate
ABPs	Able-bodied passengers
I/C	In-charge cabin crew member
OPSPECS	Operating provisions/operations specifications
Pax	Passenger
PBE	Portable breathing equipment
SARPs	Standards and Recommended Practices
SMS	Safety management system
TC	Type Certificate

DEFINITIONS

When the following terms are used in this manual, they have the following meanings:

Able-bodied passengers. Passengers who are clearly physically able and are willing to help cabin crew maintain good order and discipline on-board the aircraft.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Air operator certificate (AOC). A certificate authorizing an operator to carry out specified commercial air transport operations.

Approved. Accepted by a Contracting State as suitable for a particular purpose.

Cabin crew member. A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

Direct access. A direct route or passage from a seat to an exit from which a passenger can proceed without entering an aisle or passing around an obstruction.

Disembarkation. The leaving of an aircraft after a landing, except by crew or passengers continuing on the next stage

of the same through-flight.

Duty. Any task that flight or cabin crew members are required by the operator to perform, including, for example, flight duty, administrative work, training, positioning and standby when it is likely to induce fatigue.

Duty period. A period which starts when a flight or cabin crew member is required by an operator to report for or to commence a duty and ends when that person is free from all duties.

Emergency exit. Door, window exit, or any other type of exit (e.g. hatch in the flight deck, tail cone exit) used as an egress point to allow maximum opportunity for cabin evacuation within an appropriate time period.

Emergency exit row seating. Each seat in a row of seats located at an emergency exit, having direct access to the exit.

Fatigue. A physiological state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, circadian phase, and/or workload (mental and/or physical activity) that can impair a person's alertness and ability to perform safety-related operational duties.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight duty period. A period which commences when a flight or cabin crew member is required to report for duty that includes a flight or a series of flights and which finishes when the aeroplane finally comes to rest and the engines are shut down at the end of the last flight on which he/she is a crew member.

Hazard. A condition or an object with the potential to cause or contribute to an aircraft incident or accident.

In-charge cabin crew member. Cabin crew leader who has overall responsibility for the conduct and coordination of cabin procedures applicable during normal operations and during abnormal and emergency situations for flights operated with more than one cabin crew member.

In-flight. The period from the moment all external aircraft doors are closed following boarding through the moment when one external door is opened to allow passengers to leave the aircraft or until, if a forced landing, competent authorities take over responsibility for the aircraft and individuals and property on the aircraft. For the purpose of the Tokyo Convention an aircraft is considered to be in flight from the moment when power is applied for the purpose of take-off until the moment when the landing run ends.

Mock-up. A training device that is a partial, functional replica of an actual aircraft, without motion.

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

Operator. The person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Person with disabilities. Any person whose mobility is reduced due to a physical incapacity (sensory or locomotor), an intellectual deficiency, age, illness or any other cause of disability when using transport and whose situation needs special attention and the adaptation to the person's needs of the services made available to all passengers.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Rest period. A continuous and defined period of time, subsequent to and/or prior to duty, during which flight or cabin crew members are free of all duties.

Safety. The state in which risks associated with aviation activities, related to or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.

Safety management system (SMS). A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Safety risk. The predicted probability and severity of the consequences or outcomes of a hazard.

Special categories of passengers. Persons who need special conditions, assistance, or equipment when travelling by air. These may include but are not limited to:

- a) infants;
- b) unaccompanied children;
- c) persons with disabilities;
- d) persons with mobility impairments;
- e) persons on stretchers; and
- f) inadmissible passengers, deportees or persons in custody.

State of Design. The State having jurisdiction over the organization responsible for the type design.

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

Type Certificate. A document issued by a Contracting State to define the design of an aircraft, engine or propeller type and to certify that this design meets the appropriate airworthiness requirements of that State.

Note.— In some Contracting States a document equivalent to a Type Certificate may be issued for an engine or propeller type.

Unstaffed exit. Emergency exit for which no cabin crew member has been positioned for the flight.

Chapter 1

INTRODUCTION

1.1 BACKGROUND

1.1.1 Past accident investigations have stated that the performance of cabin crew members was a significant factor in the successful evacuation of aircraft, especially when time is a critical factor in the survivability of occupants. The number of cabin crew members on board can impact the outcome of an evacuation. Their performance significantly influences the speed at which passengers are able to evacuate.

1.1.2 In addition to their role in an emergency evacuation, cabin crew members play an important proactive role in managing safety during normal operations, which can also contribute to the prevention of incidents or accidents. This role has become increasingly challenging and includes, but is not limited to:

- a) applying safety procedures, including continuous surveillance of the cabin;
- b) managing and assisting passengers, for example during in-flight medical emergencies;
- c) preventing and managing incidents from escalating in the cabin, such as smoke or fire;
- d) informing the flight crew of abnormal situations observed in the cabin or relating to the aircraft, such as pressurization problems, engine anomalies, and contamination of critical surfaces; and
- e) preventing unlawful interference and managing events that can compromise safety and security of the flight, such as hijackings or unruly passengers.

1.1.3 A minimum number of cabin crew members is needed to manage all such scenarios, mitigate the risk of injury to passengers and manage operational safety.

1.1.4 The assignment of cabin crew members for emergency duties on board commercial passenger aircraft is a requirement of Annex 6 — *Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes*, which states that an operator must establish, to the satisfaction of the State of the Operator, the minimum number of cabin crew members required for each aircraft type in its fleet, based on seating capacity or the number of passengers carried. This requirement is based on the need for cabin crew members to be present on board in order to conduct safe and expeditious evacuation of an aircraft, and perform the necessary functions in an emergency or in a situation requiring an evacuation.

1.1.5 The establishment of minimum cabin crew requirements (also referred to as minimum crew complement) should take into account two aspects:

- a) the minimum number of cabin crew members for a specific aircraft type as established at type certification between the aircraft manufacturer and the certification authorities of the State of Design (i.e. certification requirements); and
- b) the ratio of cabin crew members per number of passengers carried or installed passenger seats, as specified in the State of the Operator's operating rules (i.e. operational requirements).

1.1.6 The State should take both of these aspects into consideration when approving the minimum number of cabin crew required for each aircraft type in an operator's fleet. It should conduct an approval of the minimum cabin crew requirements in the following circumstances:

- a) as part of the process to issue a new air operator certificate (AOC);
- b) when an operator introduces a new aircraft type into its fleet; or
- c) in special circumstances (e.g. certain changes in the cabin configuration).

1.1.7 As stated in the *Manual of Procedures for Operations Inspection, Certification and Continued Surveillance* (Doc 8335), Part III — *The AOC Application, Evaluation and Certification*, an AOC applicant may be required, as part of the certification inspection, to conduct a demonstration of the adequacy of aircraft emergency procedures, crew member emergency evacuation training and emergency equipment (commonly referred to as an evacuation demonstration). The State may also require an applicant to conduct a simulated ditching demonstration for each aircraft type which will be operated on extended flights over water. Two aspects should be considered:

- a) if the State requires the operator to conduct an evacuation demonstration, the number of cabin crew members used by the operator to successfully complete the demonstration should be used to establish the minimum cabin crew required on that aircraft type for that operator; and
- b) where an evacuation demonstration was successfully completed by the aircraft manufacturer as part of the type certificate process with one cabin crew member per floor-level exit, that number should not be reduced by the operator (refer to Chapter 6 for further explanations). If the demonstration conducted by the manufacturer did not include one cabin crew member per floor-level exit, it is not expected that the operator would be required to add additional cabin crew to staff each floor-level exit when operating the same aircraft type unless the State determines that an acceptable level of safety is not maintained.

1.1.8 Additional considerations which should be addressed when establishing the minimum cabin crew complement are presented in Chapter 3.

1.2 PURPOSE

1.2.1 The *Manual on the Establishment of Minimum Cabin Crew Requirements* (Doc 10072) provides guidance related to ICAO requirements on the establishment and approval of the minimum cabin crew complement, found in Annex 6, Part I. It addresses the different aspects that should be taken into account by a State when developing or modifying its operating rules on the number of cabin crew members required on board commercial passenger flights, as well as when approving an operator's minimum cabin crew requirements. The manual provides detailed guidance for the planning, conduct and evaluation of operators' evacuation and simulated ditching demonstrations. It also provides an overview of minimum cabin crew requirements related to the certification of aircraft.

1.2.2 In addition, the manual provides guidance on other aspects related to the assignment of cabin crew on board aircraft, including specific considerations when establishing minimum cabin crew numbers (e.g. refuelling with passengers on board), and those related to the use of personnel assigned to non-safety and non-emergency duties in the cabin by an operator, if permitted by the State. For the purpose of this manual, "State" refers to State of the Operator, unless specified otherwise. The term "aircraft type" refers to a particular aircraft make, model and series, as well as a specific cabin configuration (if applicable). An example of an aircraft make, model and series is as follows: A330-200 – A-Airbus (make), 330 (model), 200 (series).

1.3 SCOPE

The content of this manual is presented as guidance material. The approach outlined was developed as an acceptable means, but not the sole means, to establish and approve minimum cabin crew requirements. States may also use guidance material issued by other States to assist with the approval process. Operators should consult specific requirements for the establishment of minimum crew complements with their State and comply with national regulations and operating rules, where applicable.

11/11/2017 10:11:11 AM

Chapter 2

CERTIFICATION REQUIREMENTS

2.1 GENERAL

2.1.1 Certification requirements related to design and construction, as well as crashworthiness and cabin safety are contained in Annex 8 — *Airworthiness of Aircraft* and Annex 6 — *Operation of Aircraft*. The relevant Standards and Recommended Practices (SARPs) can be found in the appendix to Chapter 2. Certification requirements address, but are not limited to, the following aspects:

- a) emergency exits;
- b) cabin crew seats; and
- c) emergency evacuation.

2.1.2 This chapter provides an overview of certification requirements related to cabin safety, focusing primarily on those linked to the establishment of the minimum number of cabin crew members required on board transport category aircraft. Most States' airworthiness standards related to design and construction of transport category aircraft are harmonized at the international level. Therefore, the content of this chapter should be applicable to a large audience. However, since differences between States may exist, the content should not be considered as the sole means of compliance with such standards.

2.2 EMERGENCY EXITS

2.2.1 Annex 8 requires that aircraft be equipped with sufficient emergency exits to allow maximum opportunity for cabin evacuation within an appropriate time (typically a timeframe of 90 seconds). Items to be considered include the number of seats, seating configuration, as well as number, location and size of exits.

2.2.2 When an aircraft is designed, the number of passenger seats fitted on board by a manufacturer is restricted by the types and number of exits in the aircraft's fuselage. States' airworthiness standards related to design and construction of transport category aircraft specify the maximum number of passenger seats permitted for each exit of a specific type installed in each side of the fuselage (i.e. per pair of exit type). Table 2-1 presents a maximum number of passenger seats permitted for each type of exit pairs.

Table 2-1. Maximum number of passenger seats permitted per each type of exit pairs

<i>Pair of exit type</i>	<i>Maximum number of passenger seats</i>
Type A	110
Type B	75
Type C	55
Type I	45
Type II	40
Type III	35
Type IV	9

2.2.3 The maximum passenger seating capacity on an aircraft is based predominantly on the numbers presented in Table 2-1. However, certification requirements also include other considerations that further restrict the maximum number of passenger seats permitted for each exit of a specific type installed in each side of the aircraft fuselage. Restrictions are linked to the number of passenger seats in the seating configuration and/or the combination of exit types installed on a given aircraft.

2.3 CABIN CREW SEATS

ICAO SARPs related to the equipage and location of cabin crew seats are found in Annex 6, Part I — *International Commercial Air Transport — Aeroplanes*. States' airworthiness standards also define the required layout of cabin crew seats in relation to the specific type of exits installed. Based on these requirements, aircraft manufacturers define standard locations of cabin crew seats for their aircraft. Criteria for the location of cabin crew seats include distance from emergency exits (adjacent to or near the exit) as well as visibility of the cabin from the cabin crew seats when occupied by crew members (direct view of passengers, main aisles, etc., in the cabin area). States' airworthiness standards typically specify that cabin crew seats must be near required floor-level exits. They also specify that a cabin crew seat must be located adjacent to each Type A and B exit.

2.4 EMERGENCY EVACUATION

ICAO Annex 8 requires that facilities be provided, related to the passenger and crew capacity, for the rapid evacuation of an aircraft in conditions likely to occur following an emergency landing. The interior layout of the cabin and the position and number of emergency exits, including the means of locating and illuminating the escape paths and exits, must facilitate rapid evacuation of the aircraft in conditions likely to occur following an emergency landing. In addition, the design of aircraft certificated for ditching conditions must give maximum practicable assurance that safe evacuation of the occupants can be executed in case of ditching. Whether or not ditching certification is requested by the manufacturer, ditching emergency exits must be provided as per States' airworthiness standards.

2.5 NUMBER OF CABIN CREW

As part of the Type Certificate (TC) process, the minimum number of cabin crew members is established by the aircraft manufacturer, in accordance with the specific requirements found in the State of Design's relevant standards. These standards take into consideration the optimum location and distribution of cabin crew members, to support an evacuation (refer to section 2.6.1). In addition, special interior features (e.g. bar, suite installation) may affect the number and distribution of cabin crew members and should be taken into account.

2.6 EMERGENCY EVACUATION DEMONSTRATION BY THE MANUFACTURER

2.6.1 As part of the TC process, and in accordance with the specific requirements found in the State of Design's relevant standards, a manufacturer must demonstrate that the maximum seating capacity of the aircraft for which certification is requested, including the number of crew members required under the operating rules, can be evacuated in a given layout within an appropriate time (typically a timeframe of 90 seconds). The goal of the actual demonstration or analysis is to satisfy the certification authority of an acceptable evacuation capability of the aircraft. Emergency evacuation demonstrations are typically conducted with the number of cabin crew members required by the operating rules. Based on these demonstrations, or analysis based on data, aircraft are certified with a minimum number of cabin crew members in relation to a number of passenger seats intended to be occupied for taxi, take-off, and landing. The requirement for a manufacturer to conduct an evacuation demonstration, as part of the TC process, is only applicable to aircraft having a seating capacity of more than forty-four passengers. The State of Design's regulations should cite when a demonstration must be performed, how it is to be conducted, and the specific criteria that must be met by the manufacturer.

2.6.2 The evacuation demonstration evaluates the following aspects:

- a) the basic design and efficiency with which passengers and crew can be safely evacuated in specific degraded conditions (i.e. half of the exits available);
- b) the aircraft's emergency evacuation systems; and
- c) the manufacturer's recommended emergency evacuation procedures.

2.6.3 The operating rules normally establish the minimum cabin crew requirements. If a manufacturer conducts an emergency evacuation with more than this minimum crew, the crew complement used in the successful demonstration would become the minimum for that TC. Furthermore, if one fewer cabin crew member than required by the operating rules is used in the successful demonstration by the manufacturer, the minimum cabin crew requirements are established by the operating rules, not by the manufacturer's demonstration.

2.6.4 The manufacturer's procedures applied in the evacuation demonstration become the baseline for the aircraft operator's procedures.

2.7 CRITERIA FOR A FULL-SCALE EVACUATION DEMONSTRATION

2.7.1 A full-scale (land) evacuation demonstration involves any scenario where the aircraft remains in the normal ground attitude, landing gear extended, and one of each pair of emergency exits in the sides of the fuselage remains usable. The applicant (manufacturer or operator) must prove that all of the aircraft's occupants (passengers and crew

members) can evacuate to the ground within an appropriate time (typically a timeframe of 90 seconds), when at full passenger seating capacity. The State¹ should define specific conditions that the applicant must meet as part of the demonstration. These conditions fall under the following categories:

- a) environmental conditions;
- b) aircraft conditions;
- c) crew and passenger conditions;
- d) confidentiality of information; and
- e) scenario conditions.

2.7.2 Environmental conditions

The demonstration should be conducted with exterior ambient light levels of no greater than 0.3 foot-candles prior to the activation of the aircraft emergency lighting system. However, the State may allow the demonstration to be carried out during daylight with simulated darkness so as to recreate night-time conditions. If the demonstration takes place indoors, during daylight hours, all windows of the aircraft should be covered and all exits should be closed to minimize the effect of daylight in the cabin. This lower level of illumination is needed to properly evaluate the aircraft's emergency lighting system and passenger and crew member performance in darkened conditions. Levels of illumination significantly darker may interfere with a proper evaluation of the demonstration, adversely affect safety, and/or test logistics. Therefore, this approximate level of illumination should be maintained by natural or artificial means. The most effective way of controlling the level of illumination is to conduct the demonstration in a darkened hangar. Although the State may allow the use of lighting on the ground, it should not shine against the aircraft exits or windows.

2.7.3 Aircraft conditions

The State should specify conditions related to the aircraft involved in the exercise. Aircraft conditions typically involve the following:

- a) the aircraft should be of the type (i.e. make, model, series and cabin configuration) for which approval is sought. However, the manufacturer may have to combine features of more than one configuration to provide the critical configuration for the demonstration, thus it may not reflect the configuration for which approval is sought;
- b) the aircraft should be at normal ground attitude with its landing gear extended;
- c) during the steps leading to the commencement of the timing of the evacuation, the aircraft's electrical systems should be fully powered (either by an external power unit or by the auxiliary power unit);
- d) the seating capacity and cabin configuration should be representative of the highest passenger version of that aircraft type that will be put into service;
- e) all exits and any internal doors and curtains should be in the take-off position;

¹ State of Design if the exercise is part of the TC process; State of the Operator if it is an operational requirement.

- f) all the safety and emergency equipment required for the planned operation of the aircraft should be installed;
- g) unless the aircraft is equipped with an off-wing descent means (i.e. slide), stands or ramps may be used by occupants to evacuate via the wings to the ground. Items like safety mats and barriers may be used to ensure safety of the participants provided they do not affect the test results. However, other equipment that is not part of the aircraft's emergency evacuation equipment should not be used;
- h) the aircraft's wing flaps should be fully extended, if required by the emergency evacuation procedures. Stands or ramps (if used) should be positioned accordingly. Wing flaps should not be repositioned until after the demonstration;
- i) not more than 50 per cent of the emergency exits in the sides of the fuselage of the aircraft may be used for the demonstration. If an aircraft has an odd number of emergency exits, one exit should be subtracted and; 50 per cent of the remaining number of exits should be used in the demonstration. Flight crew exits, and exits that are not part of a pair (such as ventral exits, tail-cone exits, and exits on only one side of the fuselage) should not be used for the demonstration². Exits that are not to be used in the exercise should have the exit handle deactivated. Red lights, red tape, or other means placed outside the exits may be used to indicate fire or other reasons that render the exits unusable during the exercise. The exits to be used during the demonstration should be representative of all exits on the aircraft and should be designated by the State. At least one floor-level exit should be used; and
- j) before the start of the demonstration, approximately one-half of the total average amount of carry-on baggage, blankets, pillows, and other similar articles should be distributed at several locations in aisles and emergency exit access ways to create minor obstructions.

2.7.4 Crew and passenger conditions

2.7.4.1 The State should specify conditions related to the participants that will act as crew members and passengers during the exercise. Conditions related to passengers are meant to recreate a representative passenger load, similar to what would be encountered on a routine flight. Persons involved should be in normal health. The term "normal health" means that participants should be free of medical conditions or physical limitations that could affect the demonstration results or increase the chance of injury to themselves or others. Passenger load ratios typically involve the following:

- a) 40 per cent of passengers should be female;
- b) at least 35 per cent of passengers should be over 50 years of age;
- c) at least 15 per cent of passengers should be female and over 50 years of age; and
- d) three life-size dolls not included as part the total passenger load should be on board the aircraft (to simulate infants).

2.7.4.2 The State should prohibit crew members, aircraft maintenance technicians and training personnel, who maintain or operate that specific aircraft type in the normal course of their duties to take part in the demonstration in the role of passengers. Passenger seating for the demonstration should be random. In addition, passengers should not receive any specific instructions except the pre-flight safety briefing prior to the exercise unless it is allowed by the State

² These restrictions on exits to be used are typically required if the exercise is part of the TC process.

(refer to section 2.7.5).

2.7.4.3 Cabin crew members involved in the demonstration should be qualified, regularly scheduled line cabin crew members, i.e. persons that have been trained by the operator in accordance with the standards detailed in the approved training syllabus. No additional training in evacuation procedures or techniques should be provided to those assigned responsibility for the exit operation. Since crew members may have additional knowledge from past experience with demonstrations, which can influence how they perform in the evacuation, every effort should be made to ensure that they have not participated in a demonstration in the past. Cabin crew to be used in the demonstration should not be instructors, supervisory personnel, safety representatives from worker organizations, or anyone else who may be expected to have knowledge of evacuation demonstrations beyond that of an average cabin crew member. When the demonstration is conducted for the purpose of a TC issuance, the cabin crew should be trained to the standards in the manufacturer's certification test requirement document. When the demonstration is conducted as part of the process to issue an AOC, or other operational requirements, the cabin crew should be trained to the standards in the operator's approved training programme.

2.7.4.4 The State may allow flight crew members who are not regularly scheduled line crew members to participate in the exercise (as flight crew), provided they are knowledgeable on the aircraft type.

2.7.4.5 A new (start-up) operator may not have regularly scheduled line cabin crew members. In such instances, the operator would need to utilize the first trained group of cabin crew members. It is possible that this initial group of cabin crew members will include instructors. Nevertheless, this group should not be given any additional instruction or experience that will not be given to other cabin crew members expected to operate the aircraft type on the line. For example, instructors should only receive "train the trainer" training after their participation in the evacuation demonstration. Persons who are responsible for the operator's overall cabin crew programmes should not be used as cabin crew members during demonstrations, unless no other cabin crew have been hired.

2.7.4.6 Smaller operators may also lack sufficient personnel to meet some of the restrictions noted in this section. In those instances, the State may need to work with the operator to address restrictions and establish necessary criteria, such as a specified time period within which cabin crew are prohibited from participating in the exercise.

2.7.5 Confidentiality of information

The State should define criteria regarding confidential information, which should not be disclosed to participants, to ensure unbiased results. The following points should be covered:

- a) no crew member or passenger should be given knowledge of the exits available for the demonstration (i.e. exits that have been chosen as usable);
- b) passengers may be told to follow crew member instructions, as part of the pre-flight safety briefing, but should not be instructed on the procedures to be followed in the demonstration;
- c) the operator should be prohibited from practising, rehearsing, or describing in detail the demonstration for the participants; and
- d) persons having recently participated in this type of demonstration should be prohibited from participating in the exercise.

2.7.6 Scenario conditions

2.7.6.1 The State should define the scenario, which describes how the exercise will be carried out. Conditions

regarding the scenario should include the following:

- a) the minimum number of crew members required (flight and cabin crew) should be on board;
- b) the complete number of passengers, which represents the full passenger seating capacity of the aircraft, should be on board;
- c) cabin crew members should conduct pre-flight safety checks, door arming procedures, cabin compliance checks, the passenger pre-flight safety briefing, and take their assigned jump seats as part of the normal departure preparations process;
- d) cabin crew members should be seated in their assigned jump seats for take-off with safety harness fastened, confirm "cabin readiness" for take-off and pass on the notification to the flight crew, as per established procedures;
- e) flight crew members should be seated in their normal positions with restraints fastened;
- f) once the flight crew advise the State team leader that the cabin is prepared, the State team leader decides when to initiate the evacuation;
- g) cabin crew members should remain seated with safety harnesses fastened until the initiation signal for the commencement of the evacuation is given;
- h) with the exception of the cabin crew members involved in the demonstration, the State should prohibit any employee of the operator to be seated at an emergency exit;
- i) the aircraft's normal electrical power sources should be interrupted. This action provides a clear initiation signal in the following ways:
 - 1) outside, the aircraft's external lights (e.g. taxi lights, anti-collision lights) should extinguish; and
 - 2) inside, normal cabin lighting should extinguish and the emergency lighting system should illuminate;
- j) for demonstrations conducted by the operator, other options of signalling the commencement of the evacuation may be available, as approved by the State (e.g. command from the flight deck or other established operator signals). If alternative initiation signals are used, the emergency lighting system must still be activated;
- k) upon receiving the initiation signal, cabin crew members should follow the approved emergency procedures and initiate the evacuation as follows:
 - 1) shouting of commands;
 - 2) unfastening of safety harnesses;
 - 3) leaving the assigned jump seats;
 - 4) assessing exits for usability (before opening);
 - 5) opening usable exits; and

- 6) deploying the slides, if fitted;
- l) all of the safety and emergency equipment that is normally available on that aircraft (slides, ropes, emergency lights, flashlights, megaphones, etc.) should be fully utilized, as applicable, during the demonstration;
- m) the flight crew should delay evacuating the flight deck by a time equivalent to that required to accomplish appropriate emergency procedures and take no active role in assisting others inside the cabin during the demonstration; and
- n) all occupants should escape the aircraft by a means provided as part of the aircraft's systems and equipment (e.g. via slides, stairs).

2.7.6.2 The evacuation time period is completed when the last occupant (including crew members) has evacuated the aircraft and is on the ground. If stands or ramps are used for over-wing egress, occupants are considered to be on the ground when they are on the stand or ramp, provided that the acceptance rate of the stand or ramp is no greater than the acceptance rate of the means available on the aircraft for descent from the wing during an actual accident scenario. In order for the demonstration to be considered successful, the total time which elapses between the interruption of electrical power (or other initiation signal used to indicate that the demonstration has commenced) until the last occupant has evacuated the aircraft and is on the ground should not exceed an appropriate time (typically a timeframe of 90 seconds).

2.8 DITCHING PROVISIONS

A ditching demonstration is not part of the TC process. Evacuation demonstration data may be used, but for aircraft design and construction, a ditching evaluation is typically done by analysis. Small-scale testing may be conducted by the manufacturer on one exit type or slide/raft configuration. Typically, egress rates for ditching are much lower than land evacuation demonstrations.

— — — — —

Appendix to Chapter 2

ICAO STANDARDS AND RECOMMENDED PRACTICES (SARPs) RELATED TO CERTIFICATION

Certification requirements related to design and construction, as well as crashworthiness and cabin safety are contained in Annex 8 — *Airworthiness of Aircraft* to the Convention on International Civil Aviation.

Paragraph 4.1.7 *Emergency landing provisions*, of Annex 8 — *Airworthiness of Aircraft*, Part III. *Large Aeroplanes*, Part IIIA. *Aeroplanes over 5 700 kg for which application for certification was submitted on or after 13 June 1960 but before 2 March 2004*, states that:

4.1.7.1 Provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.1.7.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane.

4.1.7.3 The interior layout of the cabin and the position and number of emergency exits, including the means of locating and illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

4.1.7.4 On aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

Paragraph 8.4 *Evacuation*, of Annex 8 — *Airworthiness of aircraft*, Part III. *Large Aeroplanes*, Part IIIB. *Aeroplanes over 5 700 kg for which application for certification was submitted on or after 2 March 2004*, states that:

The aeroplane shall be equipped with sufficient emergency exits to allow maximum opportunity for cabin evacuation within an appropriate time period. Items to be considered shall include:

- a) number of seats and seating configuration;
- b) number, location and size of exits;
- c) marking of exits and provision of instructions for use;
- d) likely blockages of exits;
- e) operation of exits; and

- f) positioning and weight of evacuation equipment at exits, e.g. slides and rafts.

The requirements for equipment and location of cabin crew seats are in Annex 6 — *Operation of Aircraft*. Paragraph 6.16 *Aeroplanes carrying passengers — cabin crew seats* of Annex 6, Part I, states that:

6.16.1 Aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1981

All aeroplanes shall be equipped with a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 12.1¹ in respect of emergency evacuation.

6.16.2 Aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1981

Recommendation.— *All aeroplanes should be equipped with a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 12.1 in respect of emergency evacuation.*

Note.— *Safety harness includes shoulder straps and a seat belt which may be used independently.*

6.16.3 Cabin crew seats provided in accordance with 6.16.1 and 6.16.2 shall be located near floor level and other emergency exits as required by the State of Registry for emergency evacuation.

¹

Refer to Appendix A to Chapter 3.

Chapter 3

OPERATIONAL REQUIREMENTS

3.1 NUMBER OF CABIN CREW

3.1.1 Annex 6 requires that an operator establish the minimum number of cabin crew required for each aircraft type in its fleet. The goal of this requirement is to allow for a safe and expeditious evacuation of the aircraft, and to enable cabin crew to carry out the necessary functions to be performed in an emergency or a situation requiring emergency evacuation. The detailed ICAO SARPs can be found in Appendix A to Chapter 3. As per these SARPs, the number of cabin crew required on board is based on:

- a) seating capacity; or
- b) the number of passengers carried.

3.1.2 In addition to the requirements cited above, the ratio of cabin crew members to floor-level exits¹, should also be considered when establishing minimum crew requirements (refer to Appendix B to Chapter 3).

3.1.3 The role of the cabin crew member involves much more than being prepared to respond in an evacuation. First aid, safety, security-related duties, customer service and other commercial responsibilities, as outlined in the *Cabin Crew Safety Training Manual* (Doc 10002), have increased significantly over the years adding extra workload for cabin crew members. Workload should be taken into consideration when establishing minimum crew requirements, in addition to the considerations presented in ICAO SARPs.

3.1.4 ICAO SARPs do not provide a numeric value (e.g. exact number of cabin crew) needed for the operator to comply with Annex 6 requirements. The minimum number of cabin crew members required for each aircraft type in the operator's fleet must be approved by the State, considering those factors noted above.

3.1.5 The State's operating rules should specify when cabin crew members are required and how the minimum cabin crew complement is determined (i.e. based on seating capacity or number of passengers carried). They should address the following:

- a) *Presence of cabin crew on board.* The requirement for the presence of cabin crew on board commercial passenger aircraft is typically based on the number of installed passenger seats (e.g. cabin crew are generally required for aircraft fitted with more than 19 seats).
- b) *Minimum cabin crew requirement.* This requirement is not internationally harmonized. Some States use seating capacity to determine minimum crew, while others use number of passengers carried. Some States have additional requirements related to evacuation aspects (e.g. direct view).

3.1.6 Most States use the 1:50 model (i.e. a ratio of 1 cabin crew member to 50 passenger seats installed). This includes the United States and States in the European Union. This method is based on the aircraft manufacturers' certificated evacuation capability, as part of the TC process. As an aircraft manufacturer intends to determine the

¹ Floor-level exits are defined in accordance with FAR 25.807.

maximum passenger capacity with the certification demonstration, the number of passengers carried is equal to the number of passenger seats.

3.1.7 Examples of States using different models include Canada and Australia. Canada uses a 1 cabin crew member to 40 passengers on board ratio as a basis. However, Transport Canada Civil Aviation (TCCA) permits operations with the use on the 1:50 model, if the operator meets a series of criteria to the satisfaction of the competent authority. Australia requires 1 cabin crew member to 36 passengers on board. However, the Civil Aviation Safety Authority (CASA) may grant permission to large aircraft operators to transition to a 1:50 model, if the competent authority is satisfied that an acceptable level of safety can be maintained as a result of implementing this model.

3.1.8 If an operator wants to modify the established minimum number of cabin crew required on a specific aircraft type, it should follow the applicable process established by the State (refer to Chapter 6).

3.2 EMERGENCY EVACUATION DEMONSTRATION BY THE OPERATOR

3.2.1 In order to establish the minimum cabin crew complement, the State may require an applicant of an AOC to conduct an evacuation demonstration, as part of the certification inspection. This exercise is carried out in addition to the demonstration conducted by the manufacturer as part of the TC process. An evacuation demonstration is usually required for each aircraft type with a seating capacity of more than 44 seats. A current AOC holder (i.e. an existing operator) may be required to conduct an evacuation demonstration under specific circumstances, such as the introduction of a new aircraft type into its fleet or other changes listed in section 3.5. An applicant may also be required to conduct a simulated ditching demonstration as part of the operational phase of the certification process for each aircraft type which will be operated on flights over water². A current AOC holder may be required to conduct a simulated ditching demonstration under specific circumstances (refer to section 3.5.9). The State's national regulation should cite when demonstrations must be performed, how they are to be conducted, and the specific criteria that must be met by the operator.

3.2.2 The goal of the demonstration is to satisfy the State that, in any of the circumstances described in section 3.2.1, an operator's cabin crew members are able to achieve an evacuation and ditching capability equivalent to that achieved for the same aircraft type by the manufacturer during the TC process.

3.2.3 For an operator, the evacuation demonstration evaluates the following aspects:

- a) cabin crew training programme and crew member competency in a new or modified design;
- b) the operator's emergency evacuation and ditching procedures; and
- c) the reliability and capabilities of the safety and emergency equipment on board the aircraft.

3.2.4 If the State requires an operator to conduct an evacuation demonstration, the number of cabin crew members used by the operator to successfully complete the demonstration should be used to establish the minimum cabin crew required on that aircraft type for that particular operator. If the number of cabin crew members used by the operator in the demonstration is higher to that used by the manufacturer to achieve the TC requirements, this higher number should become the operator's minimum cabin crew required for that aircraft type. Special considerations related to type certification are presented in Appendix B to Chapter 3.

3.2.5 Emergency evacuation demonstrations conducted by the operator are divided into the following categories:

² When flying over water and at a distance of more than 93 km (50 NM) away from the shore.