PREPARATION

OF AN

OPERATIONS MANUAL

SECOND EDITION – 1997

Approved by the Secretary General
and published under his authority

INTERNATIONAL CIVIL AVIATION ORGANIZATION
AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

**RECORD OF AMENDMENTS AND CORRIGENDA**

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Conventions

Convention on International Civil Aviation (Doc 7300)

Convention on Offences and Certain Other Acts Committed on Board Aircraft (Doc 8364) Signed at Tokyo on 14 September 1963

Convention for the Suppression of Unlawful Seizure of Aircraft (Doc 8920) Signed at The Hague on 16 December 1970

Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation (Doc 8966) Signed at Montreal on 23 September 1971

Annexes to the Convention on International Civil Aviation

Annex 1 — Personnel Licensing

Annex 2 — Rules of the Air

Annex 3 — Meteorological Service for International Air Navigation

Annex 4 — Aeronautical Charts

Annex 6 — Operation of Aircraft
  Part I — International Commercial Air Transport — Aeroplanes
  Part III — International Operations — Helicopters

Annex 8 — Airworthiness of Aircraft

Annex 9 — Facilitation

Annex 10 — Aeronautical Telecommunications
  Volume II (Communication Procedures including those (with PANS status)

Annex 11 — Air Traffic Services

Annex 12 — Search and Rescue

Annex 13 — Aircraft Accident Investigation

Annex 14 — Aerodromes
  Volume I — Aerodrome Design and Operations

Annex 15 — Aeronautical Information Services

Annex 17 — Security — Safeguarding International Civil Aviation against Acts of Unlawful Interference

Annex 18 — The Safe Transport of Dangerous Goods by Air

Procedures for Air Navigation Services

OPS — Aircraft Operations (Doc 8168)
  Volume I — Flight Procedures

RAC — Rules of the Air and Air Traffic Services (Doc 4444)

Manuals

Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335)

Manual of Model Regulations for National Control of Flight Operations and Continuing Airworthiness of Aircraft (Doc 9388)

Manual concerning Interception of Civil Aircraft (Doc 9433)

Manual of Aeronautical Meteorological Practice (Doc 8896)

Manual of Criteria for the Qualification of Flight Simulators (Doc 9625)

Continuing Airworthiness Manual (Doc 9642)
Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284)

Dangerous Goods Training Programme (Doc 9375)
   Book 2 — Load Planners and Flight Crew
   Book 3 — Passenger Handling Staff and Flight Attendants

Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481)

Accident Prevention Manual (Doc 9422)

Training Manual (Doc 7192)
   Part A-3 — Composite Ground Subject Curriculum

Manual of Civil Aviation Medicine (Doc 8984)

ICAO Security Manual

Airport Services Manual (Doc 9137)
   Part 1 — Rescue and Fire Fighting
   Part 7 — Airport Emergency Planning

Air Traffic Services Planning Manual (Doc 9426)

Manual of Radiotelephony (Doc 9432)

Aeronautical Chart Manual (Doc 8697)

Aeronautical Chart Catalogue (Doc 7101)

Manual of All-Weather Operations (Doc 9365)

Manual of Aircraft Ground De/Anti-icing Operations (Doc 9640)

Manual on Prevention of Problematic Use of Substances in the Aviation Workplace (Doc 9654)

Circulars

Wind Shear (Circ 186)

Flight Crew Fatigue and Flight Time Limitations (Circ 52)

Posters

ICAO Model Flight Plan (P656)

Marshalling Signals (P562)

Search and Rescue Signals (P636)

Other documents

Airport Handling Manual — International Air Transport Association

European Civil Aviation Conference Document No. 17: Common European Procedures for the Authorization of Category II and III Operations

Guidance and Information Concerning Air Navigation in the NAT Region (T13/5N) (ICAO European Office — Paris)

North Atlantic MNPS Airspace Operations Manual — United Kingdom CAA

NOPAC Operations Manual — United States FAA
Chapter 1

INTRODUCTION

1.1 This manual is intended to provide guidance to operators and to State authorities on the preparation and contents of operations manuals in line with the requirements of Annex 6, Part I — International Commercial Air Transport — Aeroplanes and Part III — International Operations — Helicopters. In several instances, specific requirements are reproduced from the annex to indicate the scope of the detail necessary. It should, however, be noted that Annex 6 requirements are likely to change from time to time to keep up with technological developments. It is therefore suggested that at the time of preparation of an operations manual, reference be made to the current edition of the annex.

1.2 Operations manuals normally address a far greater range of topics than is required by Annex 6, Parts I and III. This is because many of the other requirements contained throughout the ICAO annexes for the provision of information or guidance are best satisfied by the inclusion of the relevant material in an operations manual. It should also be noted that the State of the Operator may require that the operations manual include specified “mandatory” material. In addition, much of the material that goes to make up the complete operations manual is not produced by the operator, but is purchased from commercial agencies, or supplied with the equipment to which it refers, as in the case of route guides and aircraft operating manuals.

1.3 The primary purpose of this manual is to give guidance on those parts of the operations manual which are usually developed by the operator. This manual stresses the supervision of operations. Approval of the operations manual is a fundamental step in the approval of an operator and the issue of an air operator certificate.

1.4 This manual is not written as a checklist against which the contents of an operations manual should be compared, nor does it purport to be totally comprehensive as to the possible contents of an operations manual. It is intended to identify the topics that may need to be considered by the operator in developing an operations manual. The contents of a particular operations manual will depend on many factors, not the least of which will be the number and different types of aircraft being operated. The geographical extent of the operation will be another significant factor in this determination. In selecting the contents of an operations manual, the guiding principle should be to decide, in a pragmatic and common sense manner, what information and guidance must be included to ensure that a safe and efficient operation takes place. The operator should be allowed the greatest possible freedom in developing an operations manual, commensurate with the international obligations of the State of the Operator.

1.5 In preparing this manual the requirements of a number of States were examined, as were a selection of operations manuals. Most of the examples included in this manual are from these sources. It should be stressed, however, that in some of the examples the terminology and units of measurement are not strictly in accordance with ICAO requirements. In addition, throughout this document when the guidance or requirement being discussed is based on the provisions of Annex 6, Part I, the term “aeroplane” is used. When the requirements include the provisions of Annex 6, Part III, or are of a more general nature, the term “aircraft” is used.

1.6 This manual is also intended to be a companion document to the ICAO Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335) and the ICAO Manual of Model Regulations for National Control of Flight Operations and Continuing Airworthiness of Aircraft (Doc 9388).

1.7 Throughout this manual, the use of the male gender should be understood to include male and female persons.

1.8 Whilst this manual is directed mostly towards operations with aeroplanes, it could well be used as a guide
1.2 Preparation of an Operations Manual to the requirements for an operations manual in operations using other types of aircraft (e.g. helicopters).

1.9 Comments on this manual, particularly with respect to its application, usefulness and scope of coverage, would be appreciated from States and ICAO Technical Co-operation Field Missions. These will be taken into consideration in the preparation of subsequent editions.

Note.— Comments concerning this manual should be addressed to:

The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7
Chapter 2

ADMINISTRATION AND CONTROL OF
THE OPERATIONS MANUAL

2.1 REQUIREMENT FOR AN
OPERATIONS MANUAL

2.1.1 Annex 6, Parts I and III, requires that an operator provide an operations manual for the use and guidance of operations personnel. The manual must be revised and amended to keep it current, and operations personnel must be made aware of any amendments or revisions. The requirement to provide an operations manual is an integral part of the operator’s method of control and supervision of flight operations which must be approved by the State of the Operator. It follows, therefore, that the operator is required to provide the State with a copy of the operations manual and with all revisions and amendments. The operator must include in the operations manual such material as the State may require.

2.1.2 Annex 6, Parts I and III, lists the minimum requirements for material that must be included in the operations manual. In addition, there are throughout Annex 6, Parts I and III in particular, but also throughout the other ICAO annexes, requirements that can best be met by including material in the operations manual. Examples would be, from Annex 6, guidance on procedures to follow when fuelling with passengers on board; and from Annex 2 — Rules of the Air, interception of civil aircraft. In addition, operations manuals often contain information related to the operator’s own requirements, such as information on the operator’s company radio frequencies at different aerodromes. It is necessary, however, to guard against the inclusion of irrelevant material in the operations manual, as this document is intended to be easily usable in the operational environment.

2.2 VOLUMES OF AN
OPERATIONS MANUAL

A number of volumes normally go to make up the operations manual. Typically these would include a policy and administration manual, the aircraft operating manual, a minimum equipment list and configuration deviation list, a training manual, a performance manual, a route guide, an emergency evacuation procedures manual, a dangerous goods manual, an accident procedures manual, and a security manual. The actual contents of these manuals will vary from operator to operator, but a representative breakdown of contents would be as detailed below.

2.2.1 Policy and administration manual

This manual should contain information on the operator’s organization, management structure, departmental responsibilities and authority (with particular reference to the flight operations area). Information on the policies and objectives of the operator should be included. Information on the regulations of the State of the Operator and on the applicable regulations and requirements of other States over which operations are conducted must be presented. The manual should also contain operational policies and related procedures, guidance and information.

2.2.2 Aircraft operating manual

Annex 6, Parts I and III, requires that an operator provide operations staff and flight crew with an aircraft operating manual. This manual should contain information and guidance on the technical, procedural and performance aspects of the operation of the aircraft. This manual is often provided in two volumes. One volume presents “in-flight” data, i.e. limitations, normal and emergency checklists, normal, abnormal and emergency procedures and amplification of these procedures, and in-flight performance data. The second volume presents aircraft system descriptions and flight performance data for use in flight planning. All data and information in this manual must comply with the flight manual, where applicable. In general, the responsibility for developing and issuing amendments and revisions
to these manuals rests with the aircraft manufacturer. Operators may develop additional instructions, procedures or guidance to be inserted in this manual. Such operator-developed additions should only be for clarification or expansion of the manufacturer’s material, where necessary.

2.2.3 Minimum equipment list (MEL) and configuration deviation list (CDL)

Annex 6, Parts I and III, requires the operator to include in the operations manual the minimum equipment lists for aircraft types operated and specific operations authorized. These lists provide definitive guidance to the operations and maintenance personnel as to which equipment or part may be inoperative for a particular operation. The master minimum equipment list (MMEL), which is provided by the aircraft manufacturer and approved by the State of Design, serves as a guideline for the development of these lists. The minimum equipment list (MEL) is not intended to provide for operation of an aircraft for an indefinite period with inoperative systems or equipment. The basic purpose of the minimum equipment list (MEL) is to permit the safe operation of an aircraft with inoperative systems or equipment within the framework of a controlled and sound programme of repair and parts replacement. The minimum equipment list (MEL) may be more restrictive than the master minimum equipment list (MMEL) and may include additional restrictions for the operator’s own operational requirements. For ease of use, many operators extract the lists from the flight manual or aircraft operating manual and present them as a separate volume. The operations manual should contain guidance and information on the use and interpretation of the lists.

2.2.4 Training manual

This manual should contain information on the training policy and requirements of the operator. It should also contain guidance on the standards of training that will apply. The manual may be divided into a number of sections, one on general policy and guidance, with other sections dealing with specific aircraft types. The manual should also contain information on the syllabi of training courses, both ground and flight. When appropriate, minimum standards of experience for appointment or promotion should be specified, and information given on the training and testing, both initial and recurrent that will be required. Guidance on the selection, role and duties of staff for flying training, checking or testing should be included.

2.2.5 Aircraft performance manual

Aircraft performance data are published in the flight manual. Normally, an expanded version of this is published in the aircraft operating manual. Based on these data, operators often produce their own performance manual which presents performance information for the operator’s own route network. This manual typically contains take-off and landing data for each usable runway at each destination and alternate aerodrome. Where an operator has a very extensive route network, the information could be presented in separate volumes for different geographical areas. Cruise control information is often included in the aircraft performance manual. The manual must contain information on the method of derivation of the data presented, which must be in agreement with the data presented in the flight manual. Guidance on how to use the data presented and a number of examples of use of data are normally included.

2.2.6 Route guide

The route guide should contain information relating to communication facilities, navigation aids, air traffic services, aerodromes, etc. Normally the route guide also contains the required en-route charts and charts for aerodromes along the route. The charts carried in the route guide should be those for destination and alternate aerodromes, as well as for any aerodrome along the route at which the aircraft might land in the event of an emergency. Route guides are often produced in separate volumes for different geographical areas.

2.2.7 Emergency evacuation procedures manual

This manual should contain information on the emergency evacuation procedures for each aircraft type for both flight and cabin crew. In addition to specific aircraft procedures, the manual should contain general safety and survival information appropriate to the areas in which operations take place.

2.2.8 Dangerous goods manual

Annexes 6 and 18 require that the operator provide information in the operations manual to enable the flight crew to carry out its responsibilities with regard to the transport of dangerous goods and provide instructions as to the action to be taken in the event of emergencies. The requirements are normally met by the inclusion of the appropriate ICAO manuals in the operations manual. In
addition to the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284); the ICAO Dangerous Goods Training Programme (Doc 9375), Book 2 — Load Planners and Flight Crew; and Book 3 — Passenger Handling Staff and Flight Attendants; and the ICAO manual on Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc 9481) are used in training and day-to-day operations. The operator must ensure that appropriate information is immediately available at all times for use in emergencies involving dangerous goods in air transport. This information can be provided by the Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc 9481). The operator may wish to develop separate material based on this document or to include all or part of it in the operations manual.

2.2.9 Accident procedures manual

This manual provides details of the accident prevention and flight safety programme undertaken in the company as required by Annex 6, Parts I and III. It should include information on the role of the accident prevention adviser and on activities administered by the accident prevention adviser’s office; for example, incident reporting systems, confidential reporting systems, and information on general accident prevention activities. The manual should also detail the method of investigating incidents and the policy for representation at official accident investigations. The operator’s participation in airport emergency planning exercises should be described. Detailed information must be included on the administration and duties of the operator’s accident/emergency control centre.

2.2.10 Security manual

This manual should contain information on procedures and legal requirements pertaining to security matters. The manual should contain information and guidance on crew members’ response and authority in relation to the management of acts of unlawful interference in the most appropriate manner to minimize the consequences of such acts. It should contain information on the training policy and syllabi of training courses, both ground and flight, as well as a training programme to acquaint appropriate employees with preventive measures and techniques in relation to passengers, baggage, cargo, mail, equipment, stores and supplies intended for carriage on an aeroplane so that they contribute to the prevention of acts of sabotage or other forms of unlawful interference. It should also contain material on the carriage of persons under escort, and operator and State regulations on the carriage of weapons on board, including in-flight security guards. The aeroplane search procedure checklist required by Annex 6, Part I, and information on the least risk bomb location specific to the aeroplane could also be included in this manual. An example of a “least risk bomb location” for an aircraft involved is shown in Attachment A to this chapter. It might be necessary to publish a separate volume for each aeroplane type. The subject specifically mentioned in Annex 6, Part I, Chapter 13, is reporting acts of unlawful interference. The manual should also give information on the duties and responsibilities of the pilot-in-command in this connection. The format of the report is the responsibility of the local aviation security authority and guidance on when and how to fill out and return it is usually supplied with the report form. Further information pertaining to security matters is given in the ICAO Security Manual.

2.2.11 Volumes of the operations manual

The above list is for illustrative purposes only. In fact, an operator may combine many of these manuals into one or two volumes. On the other hand, because of the size of the operation, many more volumes may be required. An operator may choose to include, possibly at the requirement of the State, other manuals in the operations manual. An example would be a traffic manual on the procedures and methods of operation during ground handling of the aircraft. A description of the constituent volumes and manuals of the complete operations manual should be included, possibly in the policy and administration manual.

2.2.12 Operations personnel responsibilities

The operations manual must also contain a statement as to which executive is responsible for the contents of the operations manual and for approving revisions and amendments. In this document it is assumed that flight operations manager is the executive responsible for the operations manual. If this authority can be delegated, for example, if the chief training executive is made responsible for the training manual, this should be accurately described. A statement that the operations manual is approved by the appropriate State authority and contains the material specified by that authority should be included. A statement should also be made on the responsibility of all operations staff to be familiar with the contents of the operations manual, at least as these pertain to their duties, and to adhere at all times to the procedures and policies described in the operations manual. The responsibility for holders of the manual to enter and record any amendments to the manual should be stated.
2.3 ORGANIZATION OF THE OPERATIONS MANUAL

2.3.1 In selecting a format for the operations manual, the primary criterion is that the manual be easily used and understood. The volume size should make the manual easy to handle on the flight deck, at least for those volumes that are part of the aircraft library. The quality of the paper and of the printing and reproduction of the text and illustrations should be such that the material is readable under all operational conditions. The manuals should be in a format which is easily amendable, e.g. loose-leaf in a ring binder.

2.3.2 In selecting the number of volumes that make up the operations manual, the aim should be to limit the number while not allowing any one volume to become so large or full of pages that it would be unwieldy in actual use. The volumes should be designed so that, if possible, each is complete in itself. For example, all the performance information should be available in one volume. If this is not possible, as for example if the aircraft performance manual is divided into volumes for different regions of the world, the individual volumes of one manual must be logically numbered. Thus, if the aircraft performance manual comprised Volume 4 of the operations manual, then in the case of there being separate volumes they would be numbered Volume 4-1, Volume 4-2, and so on.

2.3.3 If the operator has a number of different aircraft types, it is common practice to differentiate the volumes of the operations manual that are specific to a particular aircraft type and to identify those volumes that are general in their application. Some operators achieve this by colour-coding the volumes. For example, all general volumes of the operations manual, such as the policy and administration manual, would have red covers, while volumes specific to a particular aircraft type, such as the ATR 42, for example, would have yellow covers. Within each fleet the volume numbering will be similar, so that Volume 4 on all aircraft types will be the performance manual. The result of this would be that in any aircraft library there would only be two cover colours (in the ATR 42 example, red and yellow) and, if possible, the numbering of all the volumes in an aircraft library should be sequentially complete.

2.3.4 The operations manual should have a master subject index, possibly placed in the policy and administration manual. In addition, each volume should have its own subject index. There should be a table of contents at the beginning of each volume and for each section or chapter. Each page should be numbered and have a date of original issue. Each volume should have a checklist of pages identifying page numbers and dates of issue to ensure the validity of the contents. Each amendment and/or additional page should be recorded on a page specially provided in each volume for that purpose and signed for by the person making the amendment or addition.

2.3.5 The executive charged with the responsibility for the control of the contents of the operations manual should also be responsible for the issuance of individual volumes and for ensuring that appropriate amendments are dispatched to the holders of the volumes. This task may obviously be delegated to another individual or unit reporting to the executive. To ensure adequate control of the volumes and their amendments, it is necessary to number each volume individually. Complete records must be kept of the disposition of each volume of the operations manual in aircraft libraries, in operations offices, etc. Records must also be kept of individuals who are holders of all, or part, of the operations manual. Certain parts of the operations manual, such as the emergency evacuation procedures manual, are usually issued to all crew members. Other parts of the operations manual should be available in sufficient quantities to allow copies to be issued to individuals for study and reference purposes.

2.3.6 Amendments, revisions and additions to the operations manual must be approved by the executive responsible for the manual. In some cases this will consist of ensuring that such changes issued by the originator of a particular volume are correct and appropriate to the operations manual. This would be the case with amendments issued by the aircraft manufacturer for the aircraft operating manuals, or with amendments issued for the route guide, when the route guide is purchased from a commercial agency. However, in the case of amendments or additions which originate within the organization, the executive responsible must ascertain that the proposed change is necessary and determine how it is to be promulgated. In most cases the amendment will be issued through normal channels to all holders of the operations manual. In other cases, because of the urgency of the information contained in the amendment it will be necessary to issue a notice to the flight crew and to other concerned operational personnel. This notice should be replaced by an amendment to the manual as soon as possible. In revising or altering the contents of the operations manual, operators must bear in mind that the State of the Operator is required to approve the contents of the operations manual and that certain parts of the manual include material which is considered mandatory. It is therefore necessary that the amendments be approved by the State authority. In practice, since much of the material in an operations manual only requires the general approval of the State of the Operator, it is often appropriate to agree with the authority which parts of the operations manual need the specific approval of that
Chapter 2. Administration and control of the operations manual

authority before they are amended and which parts only require notification of changes made.

2.3.7 Amendments to the operations manual must be produced as new or replacement pages. Handwritten amendments to an operations manual are generally not acceptable. The new or replacement pages must include a page identification number and a date of issue. A letter or covering sheet must identify the reason for the amendment and provide a checklist of the amendment to be made. This is particularly necessary when an amendment is made to any safety-related information. Instructions should be included for inserting the amendment in the appropriate volume and for recording insertion of the amendment. The signature of the executive approving the amendment must also appear. A revision to the list of effective pages must be included with any amendment to the operations manual.

2.3.8 Users of operations manuals should be encouraged to make comments on their contents. In particular, when errors in operational information are discovered, reports should be made immediately to the executive charged with control of the operations manual. Users also should be encouraged to comment on the general presentation of information in the manual and to suggest other subjects that should be addressed.
INTENTIONALLY LEFT BLANK
Attachment A to Chapter 2

Example of a “least risk bomb location”

Select appropriate “least risk bomb location” for the aircraft involved.

Note.— In order to reduce the possibility of large fragments outside the aircraft, each door used as a least risk bomb location should remain locked unless specified.

CV880, CV990, B737, DC-8: On the right aft galley service door on wet blankets on top of the escape chute bustle.

B727 Standard: On the right mid galley service door on wet blankets on top of the escape chute bustle.

B727 Stretch: On the right forward galley service door on wet blankets on top of the escape chute bustle.

DC-9: On bottom of fibreglass tailcone fairing in the middle and as far to rear as possible.

L1011: On centre of right lower galley service door just forward and below the wing root area.

L1011 (without lower galley): In centre of right aft cargo door (access via floor panel in right aisle).

CAUTION: The least risk bomb locations for the following aircraft afford minimum protection from blast for the cabin area. Therefore passengers must be moved as far from this location as possible and the maximum amount of blast-attenuating material must be used around the bomb, with only soft material being piled above the seat-back level.

B707: On left rear passenger entry door on wet blankets on top of escape chute bustle.

B747 Standard and SP: On centre of right aft (5R or 4R) door.

B757: On right rear door on wet blankets on top of escape bustle.

B767: On right rear door on wet blankets on top of escape bustle.

DC-10: On centre of right aft passenger/galley service door.

Airbus: On the right Type I emergency exit, UNLOCKED, 1 m (3 ft) above the floor.

Caravelle: At the level of the Type IV emergency exit, forward left, the exit panel having first been removed.

Concorde: On the right control door, UNLOCKED, about 1 m (3 ft) above the floor.

All other aircraft: On the centre of existing openings, such as doors and latches, which may be destroyed without causing structural damage to the aircraft.
3.1 GENERAL

3.1.1 Annex 6, Parts I and III, states that an operator shall establish and maintain a method of control and supervision of flight operations, as one of the prerequisites for the issue and continued validity of an air operator certificate.

3.1.2 Supervision of flight operations is the responsibility of the executive in charge of the control and administration of flight operations. The executive in charge is normally assisted by other managers and/or supervisory pilots. The number of management/supervisory personnel required depends on the size and complexity of the operation. Regardless of the size of the operation, it is necessary to establish the responsibilities and functions of the different individuals involved and their relationship to each other, both within the flight operations area and within the organization as a whole.

3.1.3 The maintenance of safety and efficiency of flight operations requires that all personnel be fully aware of the areas of responsibility of the different supervisory pilots/managers, etc. It is therefore necessary that the operations manual carry a description of the administrative structure of the flight operations department. This description should contain information on the functions of the supervisory personnel responsible for the establishment, administration and maintenance of operational standards. The manual should contain, at least, information on the areas of responsibility of the following management/supervisory personnel:

— senior manager responsible to the chief executive officer for flight operations, e.g. flight operations manager, vice president flight operations;

— chief pilot;

— training manager/chief instructor;

— accident prevention adviser.

3.2 FLIGHT OPERATIONS MANAGER

The flight operations manager is responsible to the company chief executive officer for the development and implementation of flight operations policy. In particular, it should be the responsibility of the flight operations manager to ensure that in developing a company plan, full recognition is given to the need for safe and efficient operations. Other responsibilities of this position include ensuring that operations are in compliance with all relevant regulations, both in the State of Registry and when operating into or over the territory of other States. In this respect, the flight operations manager must liaise with the local civil aviation authority and with the appropriate authorities of other States. The flight operations manager is responsible for liaison and coordination with other departments, for approving the contents of the operations manual and, ultimately, for authorizing all flight operations. An example of the terms of reference of a flight operations manager is at Attachment A to this chapter.

3.3 CHIEF PILOT

The chief pilot is the executive responsible for the day-to-day implementation of the company’s policies and for direct supervision of the operation. The chief pilot is directly responsible for the establishment of standards and the maintenance of discipline within the flight crew group and also for the establishment and supervision of methods of record-keeping for flight crew licences, type ratings, endorsements, appropriate renewal dates, and flight time/duty time records. The chief pilot assists the flight operations manager in establishing new policies and procedures for aircraft operations, flight crew duties, cabin crew duties and operational administration.

3.4 TRAINING MANAGER

The training manager is responsible for all crew training and for the establishment of a ground and flight training
programme which should ensure that crew members are adequately trained to perform their assigned duties. The training manager is responsible for monitoring the operation and identifying problems which may require the provision of extra training or changes in operational procedures, and for the selection and training of all training personnel and should ensure that common standards apply throughout. The training manager is responsible, together with the chief pilot, for the establishment and promulgation of the standards and piloting techniques with which flight crew will be expected to comply during flight operations and which the flight crew will be required to demonstrate during recurrent checks.

3.5 ACCIDENT PREVENTION ADVISER

Annex 6, Parts I and III, requires that an operator establish and maintain an accident prevention and flight safety programme. Therefore, accident prevention and flight safety activities require an accident prevention adviser (APA) as a focal point and driving force. The APA should aim to create an awareness and understanding of accident prevention methods throughout the organization. Having discovered, identified and assessed hazards, the APA should make recommendations to eliminate them and should keep management and pilots informed of safety trends and problems within the organization and within the industry. The APA should circulate safety data, information concerning the experiences of other operators and other relevant safety information. The APA should have no executive role or authority, this role being purely advisory. The APA should report periodically to the chief executive officer on safety matters and must be free to make recommendations to any manager within the organization if it is considered necessary in the interests of flight safety. To be fully effective, the APA must be given full and visible support by all management and supervisory personnel. Further information on the role of an accident prevention adviser is given in the ICAO Accident Prevention Manual (Doc 9422).

3.6 MANAGEMENT ORGANIZATION

Circumstances will dictate the number of managers or supervisors required. For example, in a small airline the position of flight operations manager and chief pilot might be combined. In a large airline a number of supervisors are usually required to ensure proper administration of flight operations. In any case, the overriding concern in establishing a management/supervisory structure is to ensure that proper control is exercised over the operation and that management decisions on company procedures and operational instructions are swiftly conveyed to the personnel affected. Moreover, the existence of a properly defined structure will mean that necessary operational information is conveyed back along the reporting lines to the appropriate administrative level. This is particularly necessary, as the nature of flight operations is such that in many instances flight crew are the only people aware of operational deficiencies or hazards. A structure which clearly delineates duties, areas of responsibilities and reporting lines will ensure a swift transmission of information to the appropriate point in the management structure for further necessary action. The absence of such a structure, or the failure to adequately respond to reports, will result in flight crew not making reports. An example of a management organizational chart is shown at Attachment B to this chapter.
Responsibilities

1. **Flight operations section**

1.1 The flight operations manager is responsible to the managing director for:

a) all flying and operational standards of all aircraft operated;

b) supervision, organization, manning and efficiency of the following departments within flight operations:
   1) all aircraft flight operations;
   2) cabin services;
   3) crew scheduling and rostering;
   4) flight watch;
   5) navigation and performance;
   6) air crew emergency training;
   7) flight safety committee; and
   8) flight operations at outstations;

c) the standards of the operations manuals governing each type of aircraft;

d) liaison with the DCA on matters concerning the operations of all company aircraft, including any variations to the air operator's certificate;

e) the supervision of, and the production and amendment of the operations manual and the air crew training manual;

f) liaison with any external agencies which may affect company operations;

g) ensuring that company operations are conducted in accordance with current legislation and company instructions;

h) ensuring that the rostering section complies with both company and current legislation concerning the rostering of air crew, and that crew members are kept informed of any changes to this legislation;

i) the receipt and actioning of flight information circulars;

j) the dissemination of aircraft safety information, both internal and external, in conjunction with the flight safety committee;

k) the administrative arrangements for air crew training courses (both recurrent and conversion);

l) all matters relating to flight time limitations; and

m) in the absence of the chief pilot, assuming responsibility for the duties normally carried out by the chief pilot.

1.2 The chief pilot is responsible to the flight operations manager for:

a) defining basic principles, methods and standards for flying instruction on all types of aircraft relative to:
   1) type conversion;
   2) recurrent training and checks; and
   3) route flying;

b) supervision of all items in 1), 2) and 3) above, on all types of aircraft operated by the company;

c) the supervision of the issue of Notices to Aircrew with the fleet managers who will issue notices applicable to their own fleets as they see fit;

d) the categorization of airfields in conjunction with the fleet managers;

e) the actioning and distribution of accident and incident reports;

f) the production of a company flight deck crew seniority list;
g) the welfare, promotion and discipline of flight crew, including possible suspension;

h) assuming any responsibilities delegated to him by the manager, flight operations; and

i) in the absence of the flight operations manager, assuming responsibility for the duties normally carried out by the flight operations manager.

1.3 The fleet managers are responsible to the chief pilot for:

a) ground and flying training of all air crew in their respective fleets to the standard required by the company and in accordance with the relevant air legislation;

b) supervision of the standards of, and amendments to their respective operations manuals;

c) the issue of the commander’s Area Competency Certificate for every captain in their fleet and for ensuring that each certificate is kept up to date;

d) the processing and actioning of the Voyage Reports of their respective fleets;

e) monitoring a selection of flight envelopes each calendar month and liaising with the chief pilot as necessary on any problems emerging;

f) the day-to-day administration of their fleets; and

g) the execution of any tasks or responsibilities assigned to them by the chief pilot.

1.4 The fleet captains, or deputy fleet managers, are responsible for:

a) assuming any responsibilities delegated to them by the fleet managers; and

b) assuming responsibility for the duties normally carried out by the fleet managers, in their absence.

1.5 The chief training captains are responsible to their respective fleet managers for:

a) the supervision of ground and flying training of all air crew in their respective fleets; and

b) liaison with the operations superintendent (crew scheduling) concerning training details.

1.6 The training captains are responsible to their respective chief training captains for the maintenance of the professional standard of all pilots as required by the company and in accordance with the relevant air legislation.

1.7 The line check captains are responsible to their respective fleet managers for periodical route checking and initial sector checking of all pilots.

1.8 The chief flight engineer is responsible to the manager, flight operations for the maintenance of the professional standard of all flight engineers as required by the company and in accordance with the relevant air legislation.

1.9 The fleet flight engineers are responsible to the chief flight engineer for ground and flying training of all flight engineers in their respective fleets, in liaison with their fleet managers, to the standard required by the company and in accordance with the relevant air legislation.

1.10 The training flight engineers are responsible to their respective fleet flight engineers for the maintenance of the professional standard of all flight engineers as required by the company and in accordance with the relevant air legislation.

1.11 The line check engineers are responsible to their respective fleet flight engineers for periodical route checking and initial sector checking of all flight engineers.
Attachment B to Chapter 3
Example of a management organizational chart
Chapter 4

TRAINING

4.1 GENERAL

4.1.1 The requirement for a flight crew training programme is detailed in Annex 6, Parts I and III. The annex also addresses the training of flight operations officers/flight dispatchers and describes the training requirement for cabin attendants. Many aspects of the training programme require the specific approval of the State of the Operator. Describing the training programme in some detail in the operations manual has obvious administrative advantages as it makes it easier for the State authority to approve and oversee the programme. It also acquaints the operational personnel with the contents of the programme, with the training philosophy of the operator, and with the standards, both in terms of skill and knowledge that flight crew and other operational personnel will be expected to meet.

4.1.2 The training programme could be described in detail in the operations manual or in a training manual issued as a separate volume. The choice will generally depend upon the extent of the operations and the number and types of aircraft in the operator’s fleet. For example, a small operator with one or two aircraft types may incorporate the training information directly in the operations manual. On the other hand, an operator with a large number of aircraft types and having an extensive network of operations may find it more convenient to incorporate the information in a separate volume perhaps consisting of several parts, each dealing with a different aircraft type. Whatever the format, the principal features of the training programme remain the same.

4.1.3 The training programme should contain information on:

a) training staff:
   — duties and responsibilities;
   — appointment and supervision;
   — experience and qualifications required;
b) syllabi of courses;
c) operational aspects of airborne training;
d) approval of flight simulators;
e) approval and use of other operators’ training facilities and instructors;
f) emergency duties training;
g) human factors training;
h) dangerous goods training programme;
i) cabin crew member training;
j) flight operations officers/flight dispatchers training; and
k) record keeping: licences/ratings; route/aerodrome qualifications; proficiency checks; recurrent training, etc.; date of issue/renewal of licences/ratings/approvals.

4.2 SYLLABI OF TRAINING COURSES (FLIGHT CREW)

4.2.1 The syllabus for a training course will vary from aircraft to aircraft. It will also be affected by many other factors, such as the basic qualifications and experience of the pilot and the training aids available (simulator, cockpit procedure trainer, etc.). Information should be given in the training programme on the syllabi for specific requirements, although it should be recognized that it will not be possible to address all eventualities. However, comprehensive information on syllabi will make it easier to select the appropriate training programme combinations which are relevant to the qualifications of the trainee and the facilities available. An example of an initial familiarization programme used by an operator is at Attachment A to this chapter.
4.2.2 A syllabus is normally divided into ground training and flight training. Ground training will be mainly concerned with gaining an understanding of the aircraft systems and any extra equipment, such as Loran, INS, Omega and GNSS; special procedures for the aircraft; performance and flight planning; emergency and survival training; etc. Details of the syllabus should be given in the training manual and information should also be given on what portions of the ground training can be accomplished using self-teaching aids and what portions will be accomplished through an instructor. Information should also be given on the form which technical examinations will take and the required standard of technical knowledge. An example of the layout of a technical course (ground training) offered by an operator is at Attachment B to this chapter.

4.2.3 Flight training can consist of combinations of use of an aircraft and synthetic flight trainers. A syllabus for flight training should take account of the experience and background of the pilot under training. For example, the syllabus for a newly trained, inexperienced pilot should be more detailed than that for an experienced pilot. The training manual should give as much guidance as is feasible in this regard. The manual should also give guidance on the particular sections of a training programme which can be accomplished in a flight simulator, those which must be accomplished during airborne training and those which form part of line or route training. The particular combination will depend on many factors, not the least being the sophistication of the flight simulator available, i.e. the realism of the simulator’s duplication of the aircraft handling characteristics, flight control loads and aircraft performance. This consideration could be further affected by the availability of a cockpit procedures trainer. A flight training programme could consist of cockpit procedure, flight simulator, airborne flight and line training. The time and resources allocated to each part of such a programme will vary, but the training manual should specify the optimum, which should be designed to produce a flight crew member with the appropriate knowledge, experience and skill, commensurate with the normal cost considerations. An example of a training programme (simulator and aircraft) is at Attachment C to this chapter.

4.2.4 In specifying the contents of a flight training programme, it will be necessary to give details of the exercises to be practised at each stage. The State of the Operator is required to approve the ground and flight training programme established by the operator and it should be indicated which exercises are required and whether they should be completed in the simulator or in the aircraft (see Attachment C to this chapter). For simulator training, instructions should be given on the operational environment that is to be simulated and for airborne training, instructions should be given on how instrument flying conditions are to be simulated and how engine failure and other emergency conditions are to be simulated. It should be noted that a provision of Annex 6, Parts I and III, states that in-flight simulation of emergency or abnormal situations when passengers or cargo are being carried is forbidden.

4.2.5 The training manual should also specify what levels of skill and knowledge must be achieved at each stage of a training programme, and in the event that the student fails to achieve these standards, what procedures, e.g. decisions on extra training, review by the training manager, etc., are to be followed.

4.2.6 In establishing the training programmes for different aircraft types, it is good practice to achieve as high a degree of commonality between the types as is feasible. A standard approach to methods of presentation of information, to the format of emergency and normal checklists, to terminology and to the attitude and philosophy of training will all ease the transition from one aircraft type to another.

4.3 PILOT PROFICIENCY CHECKS

The requirement for pilot proficiency checks and their frequency and period of validity is given in Annex 6, Part I and III. Many of the considerations affecting these checks are the same as for any training detail. Information on the content and form of these checks should be given in the training manual. Where some or all of the checks may be accomplished in an approved flight simulator, the details of such approval, as granted by the State of the Operator, should be in the manual. It is necessary to specify which exercises and/or emergency drills should be satisfactorily accomplished on every proficiency check (engine failure between $V_1$ and $V_2$ is an example for a multi-engine aeroplane), and which exercises (such as manual extension of the landing gear) are optional. The training manual should be specific where different requirements apply to pilots-in-command and co-pilots. If a technical knowledge examination forms part of the recurrent check, the form and possible content of this examination should be described. It is necessary to describe how records of these checks are to be kept, and how they are to be annotated both for a satisfactory and an unsatisfactory check. Instructions should be given on the procedures to be followed in the
event of the pilot failing to satisfactorily complete a proficiency check. An example of a pilot proficiency check form is at Attachment D to this chapter.

### 4.4 INSTRUMENT RATINGS

The majority of pilots engaged in commercial air transport operations will require an instrument rating. The training manual should give instructions on how instrument rating tests are to be conducted, on who is qualified to carry out these tests and on the period of validity of the rating. The instrument rating check may be accomplished as part of the recurrent proficiency check. Records should be kept of the details of each check so as to ensure that over a period, the full range of instrument flight conditions and instrument approach procedures are either simulated or actually experienced.

### 4.5 OTHER TRAINING PROGRAMMES

An operator should establish a training programme outside the “minimum” statutory requirement. This programme could consist of technical refresher training and associated simulator exercises. Exercises similar to those performed during the proficiency check may be carried out, but in a training rather than a checking environment. It may be possible to establish a line-oriented flight training (LOFT) programme, but whatever is done, it is necessary to describe the form and contents of these exercises in the training manual. In designing these programmes, care should be taken to ensure that over an established period, as full a review as is possible is conducted of the total operating environment of a particular aeroplane type. An example of a LOFT scenario is at Attachment L to this chapter.

### 4.6 ROUTE AND AERODROME QUALIFICATIONS

#### 4.6.1 The requirement for route and aerodrome/heliport qualifications are detailed in Annex 6, Parts I and III. Although the requirements are only addressed to the pilot-in-command, it is common practice for operators to apply similar requirements to all pilots. The training manual must specify how these qualifications are to be gained and how they are to be kept valid. It is normal practice to give each pilot a “general” route or line check at least every 12 months. This check will qualify pilots into those aerodromes/heliports that form part of the normal operation. Certain aerodromes/heliports or areas may be designated as requiring a “briefing”. The contents of such a briefing should be specified in the training manual, as should the period of validity. To qualify to operate into certain aerodromes/heliports, it may be necessary, because of particular operational problems, that a simulator training exercise using the approach procedures of that aerodrome/heliport be completed. Again, this should be specified, as should the term of validity of any approval. Finally, certain aerodromes/heliports or areas may require that a pilot operate into them initially under the supervision of a designated line training pilot or as a supernumerary crew member. An example of an aerodrome briefing (information) sheet is at Attachment E to this chapter.

#### 4.6.2 Weather and its effects must be considered when developing a training programme. The training information and guidance (both ground and flight) that must be given will depend on the climate of the geographical areas over which operations take place. However, severe weather conditions which are rarely encountered are, by the nature of their unfamiliarity, all the more dangerous and the programme must go beyond the obvious and give the necessary information and details of the training required so that the flight crew are adequately prepared to cope with the full range of environmental conditions they might encounter.

#### 4.6.3 Some of the environmental training required could be integrated with other training exercises. For example, during a simulator training exercise, the weather conditions simulated would be those associated with icing problems, and the opportunity could be taken to review the correct procedural actions.

#### 4.6.4 Some training can be accomplished through crew notices or by the distribution to crew members of the required information extracted from other publications. Some training material of this nature may be distributed annually, as for example, the distribution of instructions on operations in snow and ice at the start of every winter, or the distribution of information on operations in severe weather associated with the inter-tropical convergence zone.

#### 4.6.5 When a flight is to be operated to an area unfamiliar to the crew, the climatology of the route and the aerodromes/heliports must form part of the route/aerodromes/heliports briefing.

#### 4.6.6 Information and, where possible, simulator training, should be given on the effects of severe weather on the aeroplane flight and handling characteristics. A very
good example is the simulator training for recovery actions on encountering severe low-level wind shear (e.g. microburst). If possible, flight crew should be exposed to the effects of wind shear in a sophisticated full-motion flight simulator. If this is not possible, the greatest amount of information and training that is possible should be given. (See ICAO Circular 186, *Wind Shear*.)

4.6.7 The manual should specify the training required for environmental factors on the operator’s normal route network, and the person responsible for deciding what extra training is required for flights to new areas or aerodromes. Normally the training manager would be given this responsibility. Co-ordination with other sections of the company is necessary to allow adequate notice to be given of the need for such training, and the manual should specify that records of those who have received the training for a particular route be kept and details given of the term of validity of any such training.

4.7 PILOT-IN-COMMAND TRAINING

The company policy on licences, ratings, flying hours and experience required prior to appointment as pilot-in-command should be detailed. The command training programme should be described. This programme will vary from operator to operator, but may include details of an initial check to determine suitability for command, a ground school command course that would instruct the new pilot-in-command on his duties and responsibilities, and a detailed programme for conversion (simulator and airborne) training, including information on the number of route sectors and flying hours to be flown under supervision before the actual command check. A detailed description of the form a command check will take should be included in the training manual. It should specify the number of sectors that must be flown and the number of different types of approaches and/or areas into which the trainee must operate to demonstrate his competence as pilot-in-command. An example of the training programme for pilot-in-command training is at Attachment F to this chapter.

4.8 EMERGENCY DUTIES TRAINING (FLIGHT CREW)

4.8.1 An operator is required to assign to each flight crew member the necessary functions to be performed in an emergency or in a situation requiring emergency evacuation. Annex 6, Parts I and III, requires that the training, which includes instruction in the use of all emergency and life-saving equipment and drills in the emergency evacuation of the aircraft, shall be performed on a yearly basis.

4.8.2 Certain aspects of the training specified should form part of the normal recurrent training programme; for example, the procedures to prepare a cockpit for ditching will be best practised in the simulator. However, certain other aspects of the required training, for example, how to launch life rafts or evacuate passengers after a ditching, can only be accomplished on the aeroplane or in a cabin mock-up. The training manual must give guidance on these aspects of the training. It is considered that the most effective flight crew training in this regard would be accomplished in conjunction with the cabin attendants’ training. An example of an emergency duties training programme is at Attachment G to this chapter.

4.9 FLIGHT ENGINEER

4.9.1 Flight engineers, where required as part of the crew complement, shall meet the same basic training requirements as other flight crew members, with the exception of those requirements which relate solely to manipulating the flight controls of the aeroplane.

4.9.2 The syllabus for flight engineer training programmes should be detailed in the training manual. The ground training should not differ significantly from that detailed for pilots, and the flight engineer should complete his training programme as part of a total crew under training. However, the training manual should require that a trainee flight engineer always be accompanied by an instructor flight engineer.

4.9.3 Flight engineers will require route training and an annual route check. They also require a biannual check to assess their ability to carry out their duties while performing emergency drills. The training manual should specify that these checks be performed while the flight engineer is operating as part of a crew in a “crew training” concept. Pilots and flight engineers should not be checked independently of each other. The flight engineer’s biannual check must be performed by a check flight engineer; however, the annual route (line) check may be carried out on an entire crew by a check pilot. An example of a flight engineer’s route training form is at Attachment H to this chapter.
4.10 FLIGHT NAVIGATOR

4.10.1 A flight navigator differs from other flight crew members in that his licence does not require the addition of a type rating or qualification to allow him to operate as part of a flight crew. Nevertheless, certain requirements in Annex 6, Part I, applicable to flight crew are relevant to the training of flight navigators. These relate to annual training for flight crew emergency duties, recurrent training (related to the function for which the flight navigator is responsible), the need for route training, and an annual route or line check. Details of these checks should be included in the training manual, as should the terms of validity of each approval.

4.10.2 In addition, the training manual should specify when training for polar “grid” navigation is required, how often astronavigation fixes must be accomplished, and what type of training is required for specialized navigation equipment, such as Loran, Decca, and Doppler. The manual should specify the term of validity of any check or approval, and how currency on specific equipment or in the use of specific navigation techniques may be renewed. An example of a flight navigator’s competency check form is at Attachment I to this chapter.

4.11 OPERATIONAL ASPECTS OF AIRBORNE TRAINING

4.11.1 The training manual should specify operational limitations for airborne flight training details. The actual and forecast weather conditions that are needed before a training detail may commence should be specified, as should the weather conditions required for an approved alternate aerodrome. Guidance should be provided with regard to the actual weather conditions that must exist before certain exercises are attempted. For example, for engine-out approach and landing exercises it may be required that the visibility and cloud base, respectively, be not less than 1.5 km and 180 m (600 ft) during the day, and 2.5 km and 300 m (1 000 ft) at night.

4.11.2 Certain exercises should have a minimum height specified. Stall recovery, for example, shall not be practised below 3 000 m (10 000 ft) above ground level. Also, a minimum height above ground level should be specified for demonstration of actual engine shut-down and relight.

4.11.3 The method of calculation of fuel load to be carried for training flights should be specified. In addition, a minimum fuel for landing should be specified. The need for training pilots to be aware of their fuel state at all times, and to monitor weather conditions both at the aerodrome of intended landing and at an alternate aerodrome, should be emphasized. This is very important, as airborne training produces a high workload for the training pilot and it is possible that a deteriorating weather situation may go unnoticed.

4.11.4 If pilots with limited experience are being trained, there should be a requirement in the training manual that for a specified period, or until clearance from the chief training pilot is given, a safety pilot be carried on all training flights. The safety pilot need not be an instructor, but should be experienced on that aircraft type. The purpose in specifying the carriage of a safety pilot is to ensure that in the event of a genuine aircraft emergency developing, or in the event of pilot incapacitation, there will be a fully trained pilot available.

4.12 APPROVAL OF FLIGHT SIMULATORS AND APPROVAL OF OTHER OPERATORS’ TRAINING FACILITIES

4.12.1 The extent to which an aeroplane flight simulator can substitute for airborne training depends, to a great extent, on the realism of the simulator’s duplication of the aeroplane performance, handling characteristics and flight control loads, as well as the simulation of the aeroplane’s systems and instrumentation. There are other factors that should be considered in deciding the breakdown between airborne and simulator training for any particular programme, e.g. the experience of the pilots being trained, the availability of a flight simulator with a visual attachment and the quality of that visual attachment, the sophistication of the flight simulator’s motion, etc. The training manual should address these questions and give instructions as to the use that can be made of any flight simulator (an example of a flight simulator lesson plan is at Attachment J to this chapter). The realism of a flight simulator’s duplication of an aeroplane must be maintained and guidance must be given on how this is to be checked, particularly after major maintenance. To do this, it will be necessary to nominate some instructor pilots as responsible for certifying that a simulator operates at the standard required for the training programme.

4.12.2 Guidance material on the performance and documentation requirements for the evaluation of aeroplane flight simulators used for training and checking of flight crew members is contained in the Manual of Criteria for the Qualification of Flight Simulators (Doc 9625). This
4.13 SECURITY TRAINING

4.13.1 Annex 6, Parts I and III, requires that an operator establish and maintain a training programme which enables crew members to act in the most appropriate manner to minimize the consequences of acts of unlawful interference. Annex 17 — Security — Safeguarding International Civil Aviation against Acts of Unlawful Interference — states that States shall require operators to establish security programmes and to apply them in proportion to the threat. It is advisable, when establishing a programme, to seek the advice and guidance of the national civil aviation security committee or the authority responsible for the national civil aviation security programme. The annex also recommends that States require operators to include in their security programmes measures and procedures to ensure safety on board an aeroplane when persons are being carried in the custody of law enforcement officers or other authorized persons. Annex 6, Parts I and III, requires that an operator establish and maintain a training programme which enables crew members to act in the most appropriate manner to minimize the consequences of acts of unlawful interference. Guidance is given in the ICAO Training Manual (Doc 7192), Part A-3.

4.13.2 Annex 6, Parts I and III, also requires that an operator ensure that there is on board a checklist of the procedures to be followed in searching for a bomb in case of a threat of sabotage, and that this checklist be supported by guidance on the course of action to be taken should a bomb or suspicious object be found.

Note.— Guidance on security training and related matters is given in the ICAO Security Manual.

4.14 DANGEROUS GOODS TRAINING PROGRAMME

The successful application of regulations concerning the transport of dangerous goods and the achievement of their objectives are greatly dependent on the appreciation by all individuals concerned of the risks involved and on a detailed understanding of the regulations. This can only be achieved by properly planned and maintained initial and recurrent training programmes for all persons concerned in the transport of dangerous goods. Annex 18 — The Safe Transport of Dangerous Goods by Air requires that dangerous goods training programmes be established. Part 6 of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284) gives further details. The ICAO Dangerous Goods Training Programme (Doc 9375), Book 2 — Load Planners and Flight Crew and Book 3 — Passenger Handling Staff and Flight Attendants provide guidance on the content of the training programme. Dangerous goods training programmes must be subject to review and approval by the State of the Operator.

4.15 CABIN ATTENDANT TRAINING

4.15.1 The training manual should provide details of the necessary functions to be performed by cabin attendants in an emergency or in a situation requiring emergency evacuation. These functions shall be assigned for each aircraft type and should form the basis of the cabin attendant’s initial and recurrent training. The basic subjects that should be addressed in the training programme are detailed in Annex 6, Parts I and III. An essential aspect of this training programme is that the crew be aware of other crew members’ assignments and functions in the event of...
an emergency. In this regard the training programme should specify that cabin crew and flight crew take part in joint training exercises to practise the drills and procedures used in emergency evacuations and to highlight how essential flight crew/cabin crew co-operation is in an emergency.

4.15.2 The training programme should also require that records be kept of the aircraft types on which a cabin attendant is trained and on the period of validity of recurrent training for each aircraft type. It may be considered practical for each cabin attendant to carry a document with these details, and if such is decided, instructions should be given on the form of such documentation.

4.15.3 As part of their training it should be specified, especially on aircraft with two-pilot crews, that cabin attendants be trained to assist the flight crew in the event of flight crew incapacitation. Such training should be detailed in the training manual and should at least require that cabin attendants be familiar with the operation of the pilot’s seat controls and with methods of restraining an incapacitated pilot. In addition, cabin attendants could be introduced to the philosophy of checklists and be given some experience of their use so that they could assist in the event of pilot incapacitation.

4.16 FLIGHT OPERATIONS OFFICER/FLIGHT DISPATCHER

4.16.1 Some States require that the operational personnel employed in conjunction with an approved method of flight supervision be licensed. Many other States do not require that operational staff be licensed, but their functions, duties and training necessarily form part of the approval by the State of the method of operating supervision. The requirements for age, skill, knowledge and experience for licensed flight operations officers/flight dispatchers are in Annex 1 — Personnel Licensing. Details of the requirements for initial appointment and the maintenance of competency are in Annex 6, Parts I and III, as are details of the duties of flight operations officers/flight dispatchers.

4.16.2 Where a licence is granted, the State of the Operator will detail the training and maintenance of competency requirements, and these will be directly reflected in the training manual. Where operational personnel are not licensed, but are employed as part of the approved method of operating supervision, the training will be appropriate to the duties that the operator has assigned to these officers. In either case the functions and duties of flight operations officers/flight dispatchers are broadly similar. Details should be given in the training manual, as should information on on-the-job training, maintenance of competency and route familiarization flights.

4.17 HUMAN FACTORS TRAINING

4.17.1 In implementing training programmes, operators seek to develop professional competence among operational personnel which will allow them to properly discharge their responsibilities and thus contribute to not only safe but also efficient operations. Traditionally, training programmes for operational personnel centred on the development of technical competence. Evidence from accident investigation, however, has clearly established that lapses in human performance underlie an overwhelming majority of accidents and incidents. Therefore, it is essential to broaden the scope of training programmes for operational personnel to develop new competence, including knowledge of human capabilities and limitations, in addition to technical competence.

4.17.2 The findings of a substantial body of research support the design of Human Factors training programmes that are operationally relevant and that avoid academic approaches. The most important application of Human Factors knowledge of human performance and limitations into a training programme is known as Crew Resource Management (CRM). CRM aims primarily at preventing accidents and incidents where ineffective crew performance as a team might be a major factor. It also contributes to the improved performance, both in terms of safety and effectiveness, of the aviation system through improved performance of the basic units: flight crew-aircraft; maintenance crew-aircraft; flight operations officer-flight crew; flight and cabin crew, etc. The objectives of CRM training are to develop the communications, management and teamwork skills and to create an understanding of how humans operate, particularly in difficult and stressful situations. CRM training typically includes an initial indoctrination following a classroom or seminar-type format. This first phase provides the framework for the acquisition of the basic concepts as well as a common language. Recurrent training is used thereafter to consolidate and update the newly acquired competency. An example of a CRM programme is at Attachment K to this chapter.

4.17.3 A third and essential component of Human Factors training for operational personnel is known as line-oriented flight training (LOFT). LOFT is the inseparable ally of CRM, since it provides an opportunity to apply CRM concepts in practice, in operational settings and in real time. LOFT consists of carefully structured scenarios
developed in flight simulators where flight crew are con-
fronted with operational situations where the application of
sound CRM principles is the key for a successful outcome.
An example of a LOFT scenario is at Attachment L to this
chapter.

4.17.4 The realization of the potential benefits CRM
and LOFT can bring into the safety and effectiveness of
flight operations depends on their integration into the
philosophies, policies, procedures and practices of oper-
ators. A piecemeal approach, such as the incorporation of a
CRM training module into the training curricula, may be a
beginning but it is not enough. CRM principles must be
slowly embedded into every aspect of the operator’s
standard operating procedures. Furthermore, CRM training
should not be limited to flight crews, but it should be
extended to include maintenance personnel, flight opera-
tions officers/flight dispatchers and cabin crews. On the
larger organizational scale, awareness packages are avail-
able for supervisory and managerial personnel. Such
packages foster the notion that operational personnel
practices during the course of operations will simply reflect
management and supervisory policies; therefore, it is a
precondition to the success of CRM that managers
(including senior executives) and supervisors demonstrate
and exercise appropriate CRM behaviours.

4.17.5 The Twenty-sixth Session of the Assembly of
ICAO adopted a resolution by which the ICAO Flight
Safety and Human Factors programme was started. As a
result, ICAO has produced a great deal of guidance material
which covers widely diverging fields of Human Factors and
which provides all information necessary for operators to
implement Human Factors training.

4.18 DE/ANTI-ICING
OPERATIONS TRAINING

To ensure a thorough understanding of all aspects of winter
operations, flight and ground crews must be trained and
qualified in procedures for safe de/anti-icing operations
during ground icing conditions. Guidance material on aero-
plane icing on the ground, de/anti-icing fluids, holdover
times, de/anti-icing check procedures, facilities and training
is contained in the Manual of Aircraft Ground De/Anti-icing
Operations (Doc 9640).
Attachment A to Chapter 4
Example of company initial ground school training familiarization

Participation
All newly hired flight crew members.

Duration
Two training days (13 hours). The subjects to be covered will include the following:

1. History and organization of company.
2. Duties and responsibilities.
3. Flight operations procedures.
4. Visit — all base facilities.
6. Dangerous goods, aeromedical and pilot incapacitation.
7. Flight crew member duties and responsibilities.
8. Weight and balance.
10. Flight records.
11. Examination.
Attachment B to Chapter 4

Example of the layout of a ground school training programme

FH-227 INITIAL GROUND SCHOOL TRAINING

Participation

Selected pilots whose licence is not endorsed for the FH-227.

Duration

46 hours — 7 training days.

Course content

Introduction

Dimensions, areas, loading
Doors, windows and emergency exits
Forward, pax and aft compartments
Equipment and configurations
Center of gravity
Servicing

Dart engine and APU

Characteristics
Controls and operations
Starting and ignition
Fuel and oil
Water methanol
APU description and operation
Shut-down
Warning devices
Capabilities and limitations

Propeller system

Design characteristics
Governing
Ground and flight fine pitch
Stops
### PILOT/ENGINEER TRAINING RECORD

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### Chapter 4. Training

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<td>12.4 Loss of essential power</td>
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<td>12.5 Loss of P2 panel power</td>
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<td>12.6 Hydraulic failures</td>
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<td>12.7 Gear malfunction</td>
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<td>12.8 Anti-skid failure</td>
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<td>12.9 Manual gear extension</td>
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<td>12.10 Flap malfunction</td>
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<td>12.11 Electric flap extension</td>
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<td>12.12 Fuel dumping</td>
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<td>12.13 Pilot incapacitation</td>
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<td>12.14 Wind shear</td>
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**PROGRESS REPORT SIMULATOR**

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14
15

**PROGRESS REPORT AIRCRAFT**

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2
3
4
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10
11
12
13
14
15

**NOTE:** Continuation sheets will be used if additional space is required for progress reports.
### TRAINING MANUAL

**Date of issue:**

<table>
<thead>
<tr>
<th><strong>Captain/First Officer:</strong></th>
<th><strong>DATE</strong></th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Licence No.:</strong></th>
<th><strong>Sim No.:</strong></th>
<th><strong>TIME P/F</strong></th>
<th><strong>TIME P/NF</strong></th>
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<tbody>
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<table>
<thead>
<tr>
<th><strong>Base Training Captain:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

### BRIEFING

- Emergency procedures.
- ATC departure & holding procedures.
- Flight manoeuvres.

### MANOEUVRES

- Wing engine failure on take-off between $V_1$ & $V_2$.
- Wing engine inoperative ILS to minima & missed approach.
- Wing engine inoperative ILS to minima & land.
- Normal take-off.
- **ATC departure**.
- **Airways**.
- **Holding**.
- **ATC arrival**.

Instrument failures & raw data ILS to minima.

### FLIGHT CONTROLS (at least one of a, b, c or d)

- a) Asymmetric slats or no slat landing with flaps.
- b) Asymmetric flaps or no flap landing with slats.
- c) No flap, no slat landing.
- d) Stabilizer inoperative landing.
- ADF approach.
- Stall (clean, take-off or landing configuration).
- Rejected take-off.
- Engine fire.
- Pressurization failure/Emergency descent, PF/PNF.
- Pilot or F/E incapacitation.

### MANOEUVRES (TRAINING)

- Two engines inoperative Approach & overshoot (Captain only).
- Two engines inoperative Approach & landing (Captain only).
- Coupled ILS to minima and go-around.
- Coupled ILS to minima and land.
- Dual hydraulic system failure (system Nos. & ).
- Single hydraulic system failure (system No.).
- VOR approach.
- Other exercises.
- Other exercises.
- Other exercises.
**ADDITIONAL RATING** (Captain only — from right seat)

| Wing engine failure on take-off after \( V_1 \), before \( V_2 \) |   |   |
| Wing engine inoperative landing |   |   |

**TRAINING MANUAL**

| Changes in equipment |   |   |
| Changes in operating procedures |   |   |
| FCOM/GWM revisions |   |   |
| Notices to Aircrew |   |   |

**EMERGENCY/ABNORMAL PROCEDURES**

| Engine fire |   |   |
| APU fire |   |   |
| Lower aft cargo fire |   |   |
| Controllability with all engine flame-out |   |   |
| Emergency re-start |   |   |
| Pneumatic manifold failure |   |   |
| Pneumatic temperature high |   |   |
| Inadvertent thrust reversal in flight |   |   |
| Loss of all generators |   |   |
| Engine failure (severe damage) |   |   |
| Operation using a single hydraulic system powered by a windmilling engine |   |   |
| Electrical smoke of unknown origin |   |   |
| Cockpit fire and smoke removal (unpressurized) |   |   |
| Air-conditioning smoke |   |   |
| Fuel dumping |   |   |

Note: All items of the emergency/abnormal procedures must be completed to a satisfactory standard either in the simulator, CPT, CST or by discussion.

** These items comprise Part II and sub-section "B" of the Instrument Rating Renewal and are required to be demonstrated to a satisfactory standard once in any thirteen-month period. Delete if not practised.

**I have tested the pilot as required by the ANO and in the procedures laid down in the Company's Operations Manual. I am/am not satisfied as to his competency to act as a Captain/Co-Pilot on DC-10 aircraft.**

| Licence checked and signed |   |   |
| Checked and recorded |   |   |

Original of this form to be retained in Training File.
Copy of this form to be retained in Pilot’s file.
Attachment E to Chapter 4
Example of aerodrome briefing sheet

1. Airfield

Avoid runway shoulders which have reduced bearing strength. Considerable rubber deposit in R/W 17 touchdown area. Approach and runway lighting is 5 stage controlled.

Taxiways L, N, O, Q, R and T not available to company aeroplane.

Warning: With the exception of R/W 17, various take-off and landing restrictions apply to all runways. For specific details refer to PERFORMANCE MANUAL.

2. Terrain and hazards

Aerodrome situated on north coast of Gulf of XXXX. High terrain extends round the airport from north, through east, to south. The highest peak stands 4072 ft asl 8 NM east north-east.

Beware of presence of ducks and seagulls in immediate vicinity of R/Ws 10 and 17 thresholds from December to February. Other hazards consist of military jet training aeroplanes operating from the aerodrome at ZZZZ, 2½ NM north-east of aerodrome. ZZZZ and XXXX aerodrome traffic co-ordinated and controlled by XXXX.

Danger area LG(D) south of aerodrome. Clearance to cross given by XXXX Approach.

3. ATC, aids, etc.

Initial descent clearance from centre with handover to XXXX Approach.

Speed limit in TMA of 240 kt IAS.

Warning: Tower English very limited, keep to standard phraseology as far as possible.

Aids

SRE — Call ZZZZ Control.

NDB — 4 NM north/north-west of field. Range 150 NM.

VORTAC — Utilized for R/W 35 approach when D92 is not active.

Note — A steep approach is necessary from overhead the VOR (1 200 ft QNH) to the runway. VORTAC is 3.2 NM from R/W 35 threshold (3.4°; 366 ft NM).

R/W 17 — ILS (3° G/P). (Use of ILS without G/P not permitted without DME). TVOR/DME. NDB.

R/W 10 — TVOR, SRE and PAR (Military) from 0500 — 1200Z and O/R, 30 min.

SIDs published using either the “TSL” NDB or VOR, and minimum climb gradients are specified.

“MKR” TVOR/DME operational — 4031N 2258E — 600 M SW of runway intersection.

4. Weather

Low stratus or fog drifts in from sea during early morning autumn and winter.

CB and CU build-ups during winter months over the mountains to the north and west.

Beware of high surface winds, 40-50 kt from the north, which may occur at any time of the year when a pronounced “High” exists over Europe and a “Low” over the Mediterranean.

MET information from Athens, Belgrade, Brindisi, Sofia.

5. General

AGENTS — ABC Airways and Company District Manager.

FUEL — Hydrants and Tanker — JP 1.

ENGINEERING — ABC for long-haul services. For short-haul services a company maintenance engineer accompanies each service.

If you find inaccuracies in this briefing or have any information which may be of assistance to other crews, please advise Superintendent, Route Clearance Unit.
This briefing sheet is not intended to supersede information provided in the relevant Operations Manuals and NOTAM. The content is correct at the date of issue and will be revised and reissued during or before the month shown.

1. AIRFIELD

<table>
<thead>
<tr>
<th>R/W</th>
<th>VASIS</th>
<th>APPROACH</th>
<th>THR</th>
<th>RUNWAY</th>
<th>L DIST</th>
<th>SLOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10(10°)</td>
<td>Nil</td>
<td>Nil</td>
<td>Gr</td>
<td>HRL</td>
<td>Full</td>
<td>0.15U</td>
</tr>
<tr>
<td>28(28°)</td>
<td>S3*</td>
<td>HCL-18</td>
<td></td>
<td></td>
<td>Full</td>
<td>0.15D</td>
</tr>
<tr>
<td>17(18°)</td>
<td>S3*</td>
<td>HCL-18</td>
<td></td>
<td>HRL TDZ</td>
<td>Full</td>
<td>0.22U</td>
</tr>
<tr>
<td>36(34°)</td>
<td>Nil</td>
<td>Nil</td>
<td>Gr</td>
<td></td>
<td>Fall</td>
<td>0.22D</td>
</tr>
</tbody>
</table>

OTHER LIGHTING: Emergency 17/35, obstruction, taxiway, apron, A/D beacon (WV/Gr), identifying beacon, wind indicator, landing indicator

TAXIWAYS
Taxiway widths variable

CIRCUITS
Circuits 10 & 17 right hand

1. Taxiways in poor condition.
2. First 200 m R/W 35 not visible from tower.
3. Taxiways B & E not suitable for B747.
Attachment F to Chapter 4
Example of qualifications, training and supervision procedures

Pilot-in-command

Qualification requirements

A pilot may commence training to pilot-in-command when he has been selected for this training by Flight Operations.

In order to be qualified for selection, he shall have served a minimum of four years as flight officer, whereof the last year as co-pilot and also fulfil licence requirements as specified by the CAA.

Ground training

A syllabus provided by flight crew training shall ensure that the student is adequately qualified to assume responsibility as pilot-in-command of the aeroplane type concerned. Particular emphasis shall be laid on captain's authority, company organization and policy, passenger relations and other points relating to the responsibility.

Flight training

Syllabi for simulator and aeroplane training provided by flight crew training shall ensure that the student is adequately qualified to assume responsibility as pilot-in-command of the aeroplane type concerned.

Licence check

A licence check will be given only if required by the authorities.

Route introduction

The pilot will receive a route introduction flight under the supervision of an instructor according to the syllabus provided by flight crew training. At the end of the route introduction he shall be given a school release flight by an instructor to deem if he is qualified for flight base training as captain candidate on the aeroplane type concerned.

Flight base training

After a satisfactory school release flight, the pilot shall be scheduled as captain candidate to carry out a minimum of 60 landings whereof at least 30 as pilot flying in the left-hand seat.

In the case of a captain candidate being promoted on the same aeroplane type, 30 landings as pilot flying in the left-hand seat shall be considered sufficient.

During this training, the captain candidate should be scheduled on such routes and aerodromes as he will later be required to fly.

The administration of this training is the responsibility of the flight base concerned. Upon completion, the flight base shall inform flight crew training that the captain candidate is ready for final training release.

The captain candidate's Pilot's Route and Aeroplane Experience Form shall, when completed, be signed by him and delivered to the chief pilot concerned.

Final training release

Upon completion of the flight base training, he shall be given a final training release flight at flight crew training and then released to his flight base for a base release flight.

Base release flight

After the final training release he shall be scheduled with a chief pilot or a supervisory pilot selected by the chief pilot for the base release flight.

Appointment

Upon satisfactory completion of the base release flight, he will be appointed captain to serve as pilot-in-command.

After appointment, the new captain shall make all take-offs and landings himself until he has accumulated at least 100 hours or 25 landings as pilot-in-command.
EMERGENCY TRAINING

1. General

All flight deck and cabin crew members shall complete emergency training and tests according to the rules laid down below.

2. Type of training

2.1 Initial emergency training, which is performed at the initial employment.

2.2 Transition emergency training, which is performed when qualifying on a new aeroplane type.

2.3 Periodic emergency training, which is performed as follows:

- for flight deck crew members, twice a year as periodic flight training and a specially composed emergency/technical brush-up training programme;
- for cabin crew members, once a year on the aeroplane type flown.

3. Tests and qualification requirements

3.1 Flight deck crew members will be given a test included in the periodic flight training examination.

3.2 Cabin crew members will be given a written test on knowledge of emergency procedures and equipment once a year on each aeroplane type flown.

3.3 The required standard for passing the written test is shown in the table below.

<table>
<thead>
<tr>
<th>Examination result</th>
<th>Action required</th>
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<tbody>
<tr>
<td>90% or more</td>
<td>None</td>
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<tr>
<td>70-90%</td>
<td>A new test with a grading of minimum 90% shall be passed within the next fourteen days.</td>
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<td>If at least 90% is not attained on this new test no line duty shall take place until a specially arranged test has been passed with a grading of minimum 90%.</td>
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<tr>
<td>Below 70%</td>
<td>No line duty shall take place until a specially arranged test has been passed with a grading of minimum 90%.</td>
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<td>Failure to attain 70% grading shall be reported to the flight base concerned.</td>
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</table>

4. Syllabi and training aids

Syllabi for emergency training shall be provided and included in flight crew training. These shall cover:

- emergency equipment;
- procedures for evacuation on land and on water and the post-evacuation procedures;
- training in the use of oxygen systems and fire fighting equipment;
- instruction and/or practical training in the use of exits, evacuation slides, slide rafts, life rafts and life vests (see Notes 1 and 2);
- training in first aid and medical assistance.

Note 1.—Wet drill. This training shall be performed in connection with the initial emergency training.

Note 2.—Evacuation slide training. The crew member shall be exposed to sliding down an evacuation slide at least once during the initial and transition training.
Attachment H to Chapter 4
Sample form for flight engineer’s route training

Name: ...................................................
Type of aeroplane: ..................................  Registration: .................................................
Place: ................................................. Date: ............................................................
Route: ..................................................
Take-off time: ................................. Landing time: ...................... Flight time: .............................
Instructor’s name: ..............................

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<thead>
<tr>
<th>1.</th>
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<tbody>
<tr>
<td>a) Flight notices and flight engineer briefing notices</td>
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<td>b) Pre-departure preparation</td>
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<td>c) Aircraft documentation</td>
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<tr>
<td>a) Refuelling to less than full tanks — tabulated method</td>
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<tr>
<td>b) Refuelling to full tanks — tabulated method</td>
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<td>c) Refuelling without fuel log</td>
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<tr>
<td>d) Fuel off-loading</td>
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<tr>
<td>e) Water drain check</td>
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<th>3.</th>
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<tbody>
<tr>
<td>a) General transit handling of aircraft</td>
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<tr>
<td>b) External inspection</td>
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<td>c) Internal inspection</td>
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<td>d) Checklist procedures</td>
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<th>4.</th>
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<tbody>
<tr>
<td>a) Fuel system operation and limitations</td>
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<tr>
<td>b) Electrical operation and limitation</td>
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<tr>
<td>c) Engine operation, performance and limitations</td>
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<tr>
<td>d) Pressurization control</td>
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<tr>
<td>e) Air-conditioning control</td>
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<td>f) Anti-icing operation — engines</td>
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<td>g) De-icing operation — aircraft</td>
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<td>h) Hydraulic operation</td>
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<tr>
<td>i) Oxygen system operation</td>
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<th>5.</th>
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<tbody>
<tr>
<td>a) Fuel and weight record</td>
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<tr>
<td>b) Instrument sheet</td>
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<td>c) General log sheets</td>
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<td>d) Appreciation of cruise procedures</td>
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<td>e) Trouble-shooting ability</td>
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<td>f) Correct recording of defects</td>
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<td>g) Ground handling procedures in extreme climates</td>
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</tbody>
</table>

Remarks: ________________________________________________________________________________
_______________________________________________________________________________________

Signature of Flight Engineer Instructor
Attachment 1 to Chapter 4

Example of navigator’s competency check

<table>
<thead>
<tr>
<th>FLIGHT NAVIGATOR’S COMPETENCY CHECK FORM</th>
</tr>
</thead>
</table>
| Rank .................................................. | Name. ..................................................
| Aircraft type  ..................................... | Registration  ...................................... | Date  .........................
| Examiner  .......................................... | Route ..................................................

This check is to be carried out annually.

<table>
<thead>
<tr>
<th>Part 1 Ground Check</th>
<th>Pass/Fail</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Navigation equipment</td>
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<tr>
<td>Meteorological forecast procedures</td>
<td></td>
<td></td>
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<tr>
<td>NOTAM procedures</td>
<td></td>
<td></td>
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<tr>
<td>Flight planning procedures/cruise control</td>
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<tr>
<td>Calculation of RTOW and V speeds</td>
<td></td>
<td></td>
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<tr>
<td>Knowledge of radio/navigation aids</td>
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<tr>
<td>Use of sextant</td>
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<tr>
<td>Position reporting procedures</td>
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<tr>
<td>Knowledge of safety heights</td>
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<tr>
<td>Use of Loran</td>
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<tr>
<td>Rating of gyros</td>
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<tr>
<td>Grid plotting</td>
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<tr>
<td>(INS procedures)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Part 2 Examination of Logs and Charts</th>
<th>Pass/Fail</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument recording</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of radio/navigation aids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of sextant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel state record keeping and calculating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of air plot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculation of CP and PNR</td>
<td></td>
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</tr>
</tbody>
</table>

I certify that I have checked the above-named navigator in accordance with the requirements of the ANO and the procedures laid down in the Company’s Operations Manuals and that I am satisfied as to his competency to act as a navigator on the Company’s aircraft in Area .................................

Name .................................................. | Rank ..................................................
Signed ............................................... | Date ..................................................
Attachment J to Chapter 4

Example of a simulator lesson plan

Flight crew briefing

Lesson objective

Reinforcement of previously accomplished manoeuvres and procedures
Selected normal, abnormal, supplementary and emergency procedures
Instrument approaches

Flight planning

Navigation and communications
Dispatch data and computations

Pre-flight

Cockpit safety inspection
Preliminary cockpit preparation
Cockpit preparation

Engine start

Normal start

Taxi-out and take-off

Normal procedures
Normal take-off
Noise abatement take-off
Wind shear on take-off

Climb

Normal procedures
Climb-in holding

Turbulence procedures
Electrical caution lights

Cruise

Normal procedures
Engine caution lights
Engine shut-down in flight
Drift-down procedure
One engine inoperative
Cruise

Descent approach

Flight director ILS approach
One engine inoperative VOR or NDB approach
One engine inoperative circling approach
System “A” and “B” failure
T.E. flaps-up approach
Standard call-outs
Missed approach procedure

Landing

Normal procedures
Normal two-engine landing
Manual reversion landing
T.E. flaps-up landing
VASI light approach
Landing roll procedure

Taxi-in and parking

Taxi-in procedure
Parking procedure
Shut-down procedure
Chapter 4. Training 4-23

Attachment K to Chapter 4
Example of a CRM programme

Essential curriculum elements

Introduction
Curriculum elements are divided into two major areas: concepts to be understood and skills to be acquired. There is a great value in enhancing “understanding” of certain topics that pertain to the interrelationships between crew members. It is of equal importance, however, to develop “skills”.

Concepts to be understood
These topics constitute the “language” and awareness that enable skills to be developed and, ultimately, used in an operational environment:

a) a common language or glossary of terms;

b) the concept of synergy (a combined effect that exceeds the sum of individual effects);

c) the need for individual commitment to CRM principles;

d) guidelines for continued self-improvement (continuation training);

e) individual attitudes and behaviour and how they affect the team effort;

f) complacency and its effect on team efforts;

g) fitness to fly: the concept that each individual is responsible for arriving at work “fit to fly” and the ramifications and refinements of this concept;

h) the impact of environment, such as company policy and culture, air traffic control and aircraft type;

i) resources available: identification and use;

j) identification and assignment of priorities;

k) human components and behavioural characteristics: awareness of the human being as a composite of many complex characteristics, often not controllable. Crew members must be aware of these characteristics in order to adjust their own actions and behaviour;

l) interpersonal relationships and their effect on team work: the way in which crew members approach or respond to each other has a critical effect on team-building and team results;

m) “team required” versus “individual” tasks: some problems require a team solution while others may be solved through individual effort;

n) identification of norms (i.e. tacitly accepted actions, procedures and expectations): whether consistent with or deviant from written policy, norms exert strong pressures upon individuals to conform;

o) pilot judgement: once all information is available to the pilot-in-command, the situation may be clear-cut or may require judgement. These judgement calls are the ones most likely to spark dissent, produce initial resistance and have a negative effect on the team;

p) the statutory and regulatory position of the pilot-in-command as team leader and commander: all decision-making must be done or funnelled through the pilot-in-command; and

q) ground rules; policies and procedures to be followed during the course of instruction, as well as subsequent operations. For example, management support for the programme and concepts taught; management support for those who attempt to act in accordance with learned principles; and absence of punitive action during the course and afterwards in actual flight operations.

Skills taught

There are six major areas to be taught:

a) Communication/Interpersonal skills

1) cultural influence
2) barriers, e.g. rank, age, crew position
3) polite assertiveness
4) participation
5) listening
6) feedback
7) legitimate avenues of dissent;

b) Situation awareness
1) total awareness of surrounding environment
2) reality versus perception of reality
3) fixation/distraction
4) monitoring (constant, regular)
5) incapacitation: partial/total, physical/mental, overt and subtle;

c) Problem-solving/decision-making/judgement
1) conflict management
2) review (immediate, ongoing);

d) Leadership/"followership"
1) team-building
2) managerial and supervisory skills: plan, organize, direct, control
3) authority
4) assertiveness
5) barriers
6) cultural influence
7) roles
8) professionalism
9) credibility
10) responsibility of all crew members
11) time/workload management;

e) Stress management
1) fitness to fly: mental and physical
2) fatigue
3) incapacitation in varying degrees; and

f) Critique (three basic types)
1) pre-mission analysis and planning
2) on-going review
3) post-mission.

Training techniques
Seminars or workshops
Panels
Group exercises
Videotaping of group exercises
Role playing
Case studies
LOFT
Classroom instruction
Computer-assisted training
Attachment L to Chapter 4
Example of a LOFT scenario

LOFT problems and/or situations menu

1. Engine potential hot start
2. Engine stall
   EGT exceeds 644 degrees
   Engine shut-down
3. Engine oil low pressure
   Engine shut-down
4. Green hydraulic system failed
5. Bravo Whiskey Direct
   “Clipper 594, New York, contact your company immediately on frequency ...” (Company frequency)
   (When contacted)
   “Clipper 594, flight control, we have just been notified by Security of a Bravo Whiskey Direct for your flight. Security has confirmed the threat to be valid. We advise you to land immediately at (Planned destination airport).”
   Provide assistance as requested.
   Provide priority ATC handling.
   Any runway available for landing.
6. Passenger threat
   Flight attendant reports that a passenger has barricaded himself in an aft lavatory; he claims to have a gasoline bomb device (or hand grenade) which he continually threatens to detonate; he is demanding that the flight divert to (wherever as appropriate).
7. Communication failure
   Crew loses all communications with air traffic control on normal VHF frequencies; also unable to establish contact on 121.5 or receive on VOR frequencies; maintain loss of communications as long as possible; attempted communications with approach control are successful; instructions are for the flight to “continue last assigned clearance”; give holding instructions if requested.

(Note.— Reason for loss of all radios is massive explosion in the air traffic control building.)

8. Passenger incapacitation (or intoxication)
   Flight attendant reports that certain individual has suffered massive seizure of unknown type (or is extremely unruly and is purposely obstructing cabin crew duties).
9. Brake explosion/green system hydraulic failure
   Brakes hot indication (any wheel) followed shortly thereafter by a green system hydraulic failure; flight attendant reports loud noise below floor; possible damage in the wheel well.
10. Suspicious object
    Flight attendant finds device in lavatory area which resembles a bomb; device looks like two sticks of dynamite with ticking object attached with tape.

LOFT scenario: CLIPPER 594 “HEAVY” IAD-JFK (A-310)

Problems 1, 5, 6, 7 (See problem menu)

1) SIM setup. Dulles runway 01R (# ), Gate #3, taxi weight 233 900 lb, fuel 22 500 lb, take-off CG 29.2%,
   ceiling 1 000 ft, cloud tops 3 000 ft, visibility 10 000 RVR,
   OAT 30 F (-2C), altimeter 29.59 Hg (1 002 mb), wind 020/8, QXI/OCI #1: Green-to-blue hydraulic PTU INOP.
   QXI/OCI #2: Left inner fuel tank pump 1 INOP.

Insert Problem 1.

2) Dep ATIS. 134.85 “This is Washington Dulles departure information ZULU. Ceiling measured 900 overcast,
   visibility 2 miles in light snow, temperature 30, dew point 28, wind 020 at 8, altimeter 29.59. Departures expect runway 01 right. Inform clearance or ground control on initial contact that you have received information ZULU.”

3) Clearance delivery. 127.35 “Clipper 594 “Heavy”, cleared to JFK capital two departure as filed, maintain 4 000 ft, expect 17 000 ft ten minutes after take-off,
   Departure control frequency is 125.05, squawk 0523, contact Dulles ramp control on 129.55 prior to taxi.”

4) Routing. Radar vectors direct Baltimore, V-44, V-229 MORTN, V-44 CAMRN, direct JFK.
5) Ground support. Clearance to pressurize hydraulics, remove external electric (as appropriate). Clearance to start engines when requested. Remove external connections when directed. "Standby for hand signals on your left."

6) Ramp control. 129.55 Receive push-back request. "Clipper 594 “Heavy”, cleared to push back, face east." Receive taxi request. "Clipper 594 “Heavy”, taxi eastbound to taxiway Echo-1, turn right and taxi south, then contact Dulles ground control frequency 121.9.”

7) Ground control. 121.9 “Clipper 594 “Heavy”, continue taxi and hold short of runway 01 right.”

8) Atlanta flight support. 130.9 Receive blocks departure message.

9) PANOPS. 129.7 Receive off blocks time and gallons of fuel added.

10) Load control. 129.7 “Clipper 594 “Heavy”, load control. Your zero fuel weight is 210.6 with a CG of 27.2; your take-off weight is 233.1 with a CG of 29.2. Passenger load is 12 first class, 21 clipper, and 103 coach. Stabilizer setting is 0.1 up.”

11) Ground control. 121.9 (Approaching runway 01R) “Clipper 594 “Heavy”, contact Dulles tower, frequency 120.1.”

12) Tower. 120.1 “Clipper 594 “Heavy”, wind 020/8, fly runway heading, cleared for take-off.”

13) Tower. 120.1 “Clipper 594 “Heavy”, contact departure control frequency 125.05.”

14) Departure control. 125.05 “Clipper 594 “Heavy”, radar contact, continue heading 080, vectors to Baltimore, climb to and maintain 6 000 ft, receiving Baltimore cleared direct.”

15) Departure control. 125.05 (Approximately 20 miles west of Baltimore VOR) “Clipper 594 “Heavy”, continue climb, maintain 17 000 ft, contact Washington Centre on 133.9.”

16) Washington Centre. 133.9 “Clipper 594 “Heavy”, radar contact, maintain 17 000 ft and cleared via flight plan route.”

17) Atlanta flight support. 131.25 Receive airborne message.

18) Washington Centre. 133.9 (Approximately 41 miles west of Sea Isle) “Clipper 594 “Heavy”, contact Washington Centre on 127.7.”

19) Washington Centre. 127.7 “Clipper 594 “Heavy”, radar contact, maintain 17 000 ft.

20) ARVL ATIS. 115.4 “This is Kennedy International Airport information WHISKEY. Sky condition 800 overcast, visibility 1 and 1/4 mile in snow. Temperature 29, dew point 27, wind 310 at 3 knots, altimeter 29.75. Arrivals expect VOR/DME approach runway 22L. Notice to airmen, ILS 22L out of service. Departures expect runway 22R. Inform New York approach control on initial contact that you have received Kennedy arrival information WHISKEY.”

21) Washington Centre. 127.7 (Overhead Atlantic City) “Clipper 594 “Heavy”, descend and maintain 10 000 ft, Kennedy altimeter 29.75 Hg (1 007.5 mb),”

22) Washington Centre. 127.7 (5 miles northeast of Atlantic City) “Clipper 594 “Heavy”, contact New York Centre on 128.3.”

23) New York Centre. 128.3 “Clipper 594 “Heavy”, radar contact, maintain 10 000 ft, cleared CAMRN one arrival JFK.”

24) SIM setup. JFK runway 22L ( ), ceiling 800 ft, cloud tops 8 000 ft, visibility 8 000 RVR, temperature 29F (-6C), altimeter 29.75 Hg (1 007.5 mb), wind 210/04.

25) Problem. (10 miles northeast of Atlantic City).

Insert Problem 5 or 6 or 7.

26) PANOPS. 131.37 (Receive in-range message) “Clipper 594 “Heavy”, you can expect gate number 3, enter via taxiway KILO.” Provide assistance as requested.

27) New York Centre. 128.3 (5 miles southwest of CAMRN) “Clipper 594 “Heavy”, contact New York approach control on frequency 127.4.”

28) New York approach control. 127.4 “Clipper 594 “Heavy”, radar contact, fly heading 040 and descend to 3 000 ft. Vectors for the VOR final approach course runway 22 left.” (on final vector)
“Clipper 594 ‘Heavy’, cleared for the approach, contact Kennedy tower on frequency 119.1.”

29) Kennedy tower. 119.1 “Clipper 594 ‘Heavy’, wind 210 at 4 knots, cleared to land on runway 22 left.”

30) Kennedy tower. 119.1 (During rollout) “Clipper 594 ‘Heavy’, turn right first available taxiway, hold short of runway 22 right, remain this frequency.”

31) PANOPS. 131.37 Provide assistance as requested.

32) Kennedy tower 119.1 (Approaching runway 04 left) “Clipper 594 ‘Heavy’, cross runway 22 right, left on the inner, contact Kennedy ground control on frequency 121.9.”

33) Kennedy ground. 121.9 “Clipper 594 ‘Heavy’, taxi via the inner to your gate.”

34) Atlanta flight support. 131.25 Receive blocks arrival message.

ALTERNATE WEATHER REPORTS (IF REQUESTED)

Newark: 300 obscured. Visibility 1/2 mile, snow, fog. Temperature 30, dew point 29, wind 350 at 5 knots, altimeter 29.72.

Philadelphia: 400 obscured. Visibility 1/2 mile, snow, fog. Temperature 31, dew point 29, wind 010 at 4 knots, altimeter 29.70.

Boston: Measured 800 overcast. Visibility 3 miles, snow. Temperature 15, dew point 11, wind 010 at 7 knots, altimeter 29.58.

Bradley: Measured 400 overcast. Visibility 3/4 mile, snow. Temperature 20, dew point 17, wind 020 at 5 knots, altimeter 29.68.

Baltimore: Estimated 400 overcast. Visibility 1 mile, snow, fog. Temperature 30, dew point 27, wind 020 at 7 knots, altimeter 29.59.

Andrews AFB: Measured 400 overcast. Visibility 1 mile, snow. Temperature 31, dew point 27, wind 020 at 5 knots, altimeter 29.60.
Chapter 5

FLIGHT CREW FATIGUE AND FLIGHT TIME LIMITATIONS

5.1 REQUIREMENT FOR RULES

5.1.1 Annex 6, Parts I and III, requires that the State of the Operator establish regulations specifying the limitations applicable to the flight time and flight duty periods for flight crew members. These regulations shall also make provision for adequate rest periods and shall be such as to ensure that fatigue, occurring either in flight or successive flights or accumulated over a period of time due to these and other tasks, does not endanger flight safety. A similar requirement is also established for cabin attendants. On the basis of these regulations an operator shall formulate rules limiting the flight time and flight duty periods of all crew members. These rules shall also make provision for adequate rest periods. The rules shall be approved by the State of the Operator and included in the operations manual.

5.1.2 It would appear, from the copies of regulations that have been deposited with ICAO and which are published in ICAO Circular 52, Flight Crew Fatigue and Flight Time Limitations, that many States have established national flight time regulations.

5.2 OPERATIONAL CONSIDERATIONS

5.2.1 The actual form the flight time limitations will take depends on the type of operation being considered. The limiting consideration for a single sector intercontinental operation may well be different to the limiting factor for a multi-sector short-haul operation. An operator may engage in both types of operations and may well have regulations for each. Other factors that may be relevant are the type of aeroplane (pressurized as against unpressurized); the number of flight crew (whether the minimum required by the flight manual or increased to allow longer flight duty times); the number of time zones crossed during a particular operation; the time of day that the operation commences and the time at which it finishes; the type of duty and rest that preceded a particular operation; etc. Ultimately, whatever method of limitation is chosen must ensure that the safety of the flight is not jeopardized by fatigue caused by the length or demands of a particular duty, or by an accumulation of fatigue from a series of duties.

5.2.2 Annex 6, Parts I and III, also states that an operator shall maintain current records of the flight times of each of his flight crew members. An attachment to Annex 6, Parts I and III, gives supplementary information on flight time and flight duty period limitations.

5.2.3 Because of the many variables involved and the lack of scientifically agreed methods of measuring the causes and effects of fatigue, it has not been possible to produce internationally agreed guidelines on flight time limitations. ICAO Circular 52, which is amended and re-issued on a regular basis, contains information supplied by States on their national flight crew fatigue and flight time limitations regulations. Operators who are permitted by national regulations to formulate rules to limit flight time and flight duty periods would be advised to study this circular before developing their own rules. The rules must cater for the operational environment and must be submitted to the State of the Operator for approval.

5.2.4 The rules must be published in the operations manual. Instructions on their application with reference, where possible, to known or foreseeable areas of difficulty should be included. Where pilots-in-command are allowed discretionary powers in extending duty periods, instructions and guidance on the use of this power should be given. Pilots-in-command are typically required to file reports when use is made of their discretionary power and guidance on this point should be given.

5.2.5 It should nevertheless be recognized that even where there are national regulations, operators will, on occasion, apply for limited exemptions from the regulations. Such requests normally arise because of particular operational circumstances that would preclude an operation...
from taking place unless an exemption were granted. Exemptions, when granted, are normally for very short periods and usually specify other conditions, such as extra rest periods, which will go towards alleviating any extra fatigue caused.

5.2.6 Finally, it should be stressed that the regulations address the maximum limits, and if flight crew members become fatigued and believe that the safe performance of their duties may be adversely affected, they have an obligation to remove themselves from duty.
Chapter 6

OPERATIONSSUPERVISION — GENERAL

6.1 GENERAL

6.1.1 Annex 6, Parts I and III, states that an operator shall establish and maintain a method of control and supervision of flight operations, as one of the prerequisites for the issue and continued validity of an air operator certificate.

6.1.2 To fulfil this requirement, it will be necessary for the operator to specify in the operations manual those rules and regulations which are pertinent to flight operations. The basic information should be drawn from the applicable national and/or international regulations, but an operator will typically include some of his own regulations which he considers necessary to ensure a safe and efficient operation. The operations manual is therefore the basic reference document for describing the authority and function of operational personnel and their relationship to each other. In addition, information is normally given in this section of the manual on other related, but non-regulatory subjects.

6.2 PILOT-IN-COMMAND

6.2.1 The pilot-in-command is responsible for operating an aircraft in accordance with the rules of the air and has final authority as to the disposition of the aircraft while in command. It is therefore essential that the manual have a statement on the authority of the pilot-in-command. The regulations of the State should be quoted, as should the ICAO annexes dealing with the authority of the pilot-in-command. Reference should be made to the relevant parts of The Hague, Tokyo, and Montreal Conventions. In particular, details of the Tokyo Convention should be included in the manual as this convention contains provisions on the powers of the pilot-in-command. It will also be useful to include a list of those States which are signatories to the Conventions.

6.2.2 The operations manual must detail the chain of command during a flight. This will depend on the number of crew and their functions and a typical example would be:

— pilot-in-command;
— co-pilot (second-in-command);
— flight navigator;
— flight engineer;
— senior cabin crew member;
— other cabin crew.

It should also be indicated who will be pilot-in-command in situations where the standard ranking system does not apply. An example is when two senior pilots, both qualified as aircraft commanders, are flying together, and in this case it is typically specified that airline seniority will determine command. It is normal, as well, to specify who is pilot-in-command when an instructor is in the cockpit. Instructions on this need to be quite specific, as for example when it is specified that the instructor pilot is pilot-in-command when occupying a handling pilot’s seat and conducting a training or checking assignment.

6.2.3 In addition to describing the basis and extent of the authority of the pilot-in-command, the operations manual shall contain information on his duties and responsibilities.

6.2.4 Annex 6, Parts I and III, details a number of responsibilities of the pilot-in-command, and these responsibilities shall be described in a company operations manual. The subjects specifically mentioned in the annex are:

a) the need to report violations of local regulations in an emergency;

b) the pilot-in-command’s responsibility for ensuring that the flight preparation is satisfactory; for approval of the operational flight plan; for the operation and safety of the aircraft and for the safety of
all persons on board; for ensuring that the checklists provided are used; for reporting an accident; for reporting aircraft technical defects; for the general declaration/journey log book; and

c) reporting acts of unlawful interference.

6.2.5 There are a number of other areas in Annex 6, Parts I and III, that fall within the area of the pilot-in-command’s responsibility, such as in-flight procedures. There is also the requirement in Annex 18 on the provision of information by the pilot-in-command to aerodrome authorities concerning the presence of dangerous goods on board in the event of an in-flight emergency. In Annex 12 — Search and Rescue, there are procedures to be followed by pilots-in-command at the scene of an accident or when intercepting a distress transmission. In Annex 2, there is information on interception of civil aircraft. Throughout the annexes there are many Standards and Recommended Practices that are, or can be, the responsibility of the pilot-in-command. A typical example is the requirement in Annex 9 — Facilitation — on the responsibilities of the pilot-in-command following a landing elsewhere than at international aerodromes. An operator must give appropriate guidance on all these aspects in the operations manual and on any additional requirements that may be prescribed in the regulations of the State of the Operator.

6.2.6 The operations manual should also give information on the duties and responsibilities of the pilot-in-command, which are not a requirement in the regulations, but are assigned by the operator. These duties or responsibilities will be a policy decision of the operators and will reflect their particular requirements.

6.3 CREW

6.3.1 The operations manual should give details on the number of flight crew required and on the applicable licence and rating requirements for each flight crew position. While the minimum crew will normally be that specified in the flight manual, it is possible that for certain operations extra crew members will be required. An example would be an extra or “relief” crew member for very long flight duties, or it could be specified that for certain flights a navigator shall be carried. Instructions should be given on which flights, if any, require extra or specialist crew and on the qualifications of such crew. When a navigator is required the selection of the crew member is obvious, but it is not so obvious that a relief pilot required for a two-pilot crew should be qualified to occupy both seats, and guidance on the qualifications of the extra crew member shall be given where necessary.

6.3.2 Annex 6, Parts I and III, also requires the operator to establish, to the satisfaction of the State, the number of cabin crew required for each type of aircraft. In the case of aeroplanes, the ratio is typically one cabin attendant to 50 passenger seats. However, it must be ensured that the number of cabin crew is adequate to ensure a safe and expeditious evacuation of the aeroplane. Detailed instructions and guidance to this effect should be given in the operations manual.

6.3.3 Some operators, rather than detailing in one list all the different duties of each crew member, make a general statement as to areas of responsibility and assign the different functions in the specifically related section of the manuals. An example of such a statement of responsibilities for crew members is given at Attachment A to this chapter.

6.3.4 Guidance should also be given on areas of responsibility of crew members as they affect other members of the operator’s staff. Specific guidance and direction should be given on the responsibilities and authority of the pilot-in-command and other crew members when at an aerodrome where the operator has no representative. It is quite common to specify the pilot-in-command’s authority to incur necessary expenses in this type of situation. However, since the operator will have nominated representatives at most aerodromes, it will normally only be necessary to specify the areas of responsibilities of the different parties and their need to consult and advise each other.

6.4 OPERATIONAL STAFF RESPONSIBILITIES

The operations manual should give information on the functions and responsibilities of other operational personnel, such as the responsibility for assigning crew duties, supervision of flight time/duty time limits and associated record-keeping and flight preparation forms record-keeping. The manual should specify the responsibilities and functions of flight operations officers/flight dispatchers. The actual responsibilities assigned will depend on whether licensed or unlicensed personnel are part of the approved method of supervision of flight operations. For licensed flight operations officers/flight dispatchers, Annex 6, Parts I and III, gives information on their duties; however, the duties assigned will be very similar for any flight operations officer/flight dispatcher, licensed or unlicensed. The
Chapter 6. Operations supervision — general

6.5 DOCUMENTS

6.5.1 The operations manual should list those documents that should be carried on each aircraft, in its library. The list should include, as appropriate, those documents listed in Article 29 to the Convention on International Civil Aviation and those required according to Annex 6, Parts I or III, but should also detail those extra documents necessary for operational reasons. An example of one operator’s requirements is given at Attachment B to this chapter. The operations manual should also specify who is responsible for ensuring that all the required documents, in usable condition and amended as required, are aboard the aircraft.

6.5.2 Flight crews are required to have their licences in their possession while operating. In addition, it may be necessary to specify that they have valid passports and visas and, for operations in some regions of the world, valid health certificates. In addition, crew members’ certificates may be issued to non-licensed crew members in accordance with the provisions of Annex 9. Guidance on necessary personal documentation should be given in the operations manual.

6.5.3 Copies of certain documents, such as the operational flight plan, the aircraft technical log, the mass and balance sheet, etc., must be filed with the operator or his agent before a flight. In addition, certain documents used during the flight should be returned after a flight and held for a specified period. Instructions should be given on copies of which documents shall be filed before flight, which documents shall be available on the flight, and which documents shall be returned after the flight.

6.6 HEALTH REQUIREMENTS

6.6.1 Detailed guidance on aviation medicine is contained in the ICAO Manual of Civil Aviation Medicine (Doc 8984). The operations manual shall include guidance and regulation on preventive measures to safeguard health.

6.6.2 Many of the subjects that should be addressed will be common to all operators, while the area of the world in which operations take place, or might take place, will, because of particular medical problems associated with those areas, decide the information that other operators include.

6.6.3 The only vaccination presently required is for yellow fever and, where necessary, the operating crew must carry a current health certificate. An operator may require crew members to have other vaccinations (immunizations) depending on the possible exposure of the crew member to disease. Throughout large areas of the world it will be necessary to take anti-malarial drugs and an operator should give guidance on where crew members may be exposed to being bitten by the anopheles mosquito. The advice given should specify the appropriate prophylactic, as in certain areas the mosquito has acquired immunity to some of the traditional anti-malarial drugs. The manual should not only contain information on where certain immunizations are required, but should give some basic guidance on precautionary measures.

6.6.4 Guidance is necessary on health precautions during flight. The operating crew has a responsibility to be fit, yet the nature of airline operations can make it difficult for a crew to comply with the advice given. An example is hypoglycaemia, or low blood sugar levels, which has been a factor in a number of accidents. The dangers of this condition should be explained and, if necessary, suitable measures to prevent its occurrence should be adopted.

6.6.5 Information should also be given on a number of activities which are incompatible with being part of an operating crew unless appropriate precautions are taken. For example, blood donations must be separated from flying by a number of days and, in the case of scuba-diving, at least one day must elapse before flying.

6.6.6 The dangers of food poisoning in airline operations are known and the manual must have regulations and guidance on crew meals. The advice given normally extends to the type of meals that should be eaten before a flight.

6.6.7 Certain commonly available drugs can affect a crew member’s ability to properly perform his duties. Crew members must be aware of this fact and of the dangers of self-medication, and the manual should contain appropriate guidance. As a minimum, crew members should seek information as to the possible deleterious effects of a drug before use. In seeking such information or advice, the crew member should be conscious of the need to consult someone with the appropriate knowledge of aviation
medicine, as certain drugs generally considered harmless may be inappropriate to aviation.

6.6.8 It is necessary for the manual to contain company regulations on the abuse of certain substances, such as alcohol, illegal drugs, etc. The abuse of these substances is completely incompatible with flight operations. In the case of alcohol, the regulations must specify an absolute minimum time between consumption and flight duty. Information should also be given on the dangers of smoking, both in the long term and also in the short term where, for example, a smoker in the cockpit has the effect of lowering the crew’s resistance to hypoxia. In all these cases ongoing education, and where necessary, organized mutual support groups are of considerably more benefit than the mere presence of regulations in the manual. An example of the type of medical advice an operator might give, and of guidance on immunization is at Attachments C and D to this chapter.

6.6.9 In the Manual of Civil Aviation Medicine (Doc 8984), aviation medical examiners have been provided with specific guidance regarding drug and alcohol use and the potential disqualifying conditions. Guidance may also be found in the Manual on Prevention of Problematic Use of Substances in the Aviation Workplace (Doc 9654).

6.7 MEDICAL SUPPLIES

6.7.1 Annex 6, Part I, requires that an aeroplane be equipped with accessible and adequate medical supplies appropriate to the number of passengers the aeroplane is authorized to carry. Annex 6, Part I, gives guidance as to the contents of these medical supplies. An example of operators’ guidance and specifications for first-aid and medical kits is at Attachment E to this chapter.

6.7.2 The manual should specify who is responsible for ensuring that the kits are maintained and serviced regularly. When any medical or first aid kit is opened on a flight, a report should be submitted so that the kit can be replenished and re-sealed.

6.7.3 If it is decided to place a "physician’s use only" kit on board, it must be securely stowed and the key placed in the possession of a designated crew member, normally the pilot-in-command.

6.8 COMMUNICATIONS

6.8.1 The nature of flight operations is such that an essential part of effective operational supervision is a reliable company communications network. The operations manual should list the operational offices with which it may be necessary to establish contact during operations, and the functions of these offices. The phone number (internal, external, long-distance codes, etc.), telex number, facsimile number and SITA code of each office should be listed, as should information on hours of work so as it can be seen who to contact outside normal hours.

6.8.2 Many operators use commercial communications agencies to provide telephone patch facilities on HF and on VHF to maintain contact between “operational control” and the aircraft. When this type of service is used, guidance should be given on frequencies and best time of use, SELCAL procedures and form of messages. Information on this type of facility, and also on the company’s own radio facilities and on the frequencies and use of commercial agencies’ radio facilities at other aerodromes, should also be included in the route guide.

6.8.3 In establishing and describing a company communications network, the operator should specify, as a matter of operational policy, that “company” calls from an operating aircraft be kept to a minimum and should never be allowed to interfere with the primary task of operating the aircraft safely and efficiently.
Attachment A to Chapter 6
Example of an operator’s description of crew composition and functions

1. General function description
   of the captain

1.1 Position in the organization

The pilot-in-command is directly subordinate to the chief pilot of the division to which he is assigned. It should be recognized, however, that he also has certain duties as described by law.

1.2 Responsibility and authority

1.2.1 According to the State regulations, the pilot-in-command is responsible for the execution of the flight and for the safety of the aeroplane and its occupants during the flight. He has authority to take such measures as necessary for the safety of the flight and in this connection he may take such reasonable measures as are necessary for order and discipline on board. These measures may include the restriction of freedom of one or more occupants until they are delivered to the competent authorities.

1.2.2 This general description of the pilot-in-command's legal responsibility requires elucidation on the following points:

   a) The legal text leaves many specific questions open to interpretation. It is, however, a basic philosophy of our legal system to leave room for judgement against the specific circumstances prevailing at the time.

   b) This legal philosophy implies that the law draws no strict lines as to the beginning and end of the pilot-in-command's responsibility and authority, and it does not exclude the responsibility of others at the same time as that of the pilot-in-command (for instance authorities on the ground, ATC).

   c) The term “flight” as used in the law may in general be assumed to represent the period between “doors closed” and “doors open” (ref. article 5.2 of the Tokyo Convention).

1.3 Function description

1.3.1 General. The pilot-in-command:

   a) maintains over-all responsibility for the flight execution;

   b) is the representative of the company when dealing with other crew members during flight duty time and at slip stations, and towards passengers in his capacity as commander of the aeroplane;

   c) promotes an atmosphere under which optimum crew cooperation may be expected;

   d) is responsible for flight preparation and execution in compliance with legal and company regulations;

   e) reports facts which may influence the quality of the general flight execution to his chief pilot;

   f) should have no doubts about his condition and proficiency when reporting for duty.

1.3.2 Flight preparation. The pilot-in-command will:

   a) acquaint himself with all relevant particulars and latest instructions concerning aeroplane type and flight to be flown;

   b) co-ordinate the flight preparation and ascertain that all aspects have been covered;

   c) convince himself of the airworthiness of the aeroplane and have no doubts as to the fitness and proficiency of his crew members.

1.3.3 Flight execution. The pilot-in-command will:

   a) co-ordinate all crew duties as described in company manuals;

   b) direct his flight management in such a manner that all cockpit crew members are constantly aware of his intentions (two-way communications rule);

   c) ensure that checklist and standard operating procedures are adhered to and thoroughly carried out;
d) take all actions which may improve the efficiency and comfort of the flight, without adverse effect on safety;

e) take all actions deemed necessary to ensure the safety of the flight; if these actions divert from prescribed procedures he will (if time permits) do so in consultation with the other crew members and submit a report about his action to his chief pilot.

2. General function description of the first and second officers

2.1 First officer

2.1.1 General. The first officer:

a) is subordinate to the chief pilot of the division to which he is assigned, and to the pilot-in-command during the flight execution;

b) is expected to report facts which may influence the quality of the general flight execution to the pilot-in-command and/or the chief pilot;

c) should have no doubts about his condition and proficiency before starting the flight execution.

2.1.2 Flight preparation. The first officer will:

a) acquaint himself with all relevant particulars and latest instructions concerning aeroplane type and flight to be flown;

b) advise the pilot-in-command if, in his opinion, any aspect of the flight preparation has been overlooked.

2.1.3 Flight execution. The first officer will:

a) perform all duties as described in the company manuals under the supervision of the pilot-in-command;

b) assist in promoting an atmosphere in which a good understanding and co-operation between the crew members may be expected;

c) be alert on developments which may endanger the safety of the flight; if he believes these developments exist he will:

1) advise the pilot-in-command;

2) ask the pilot-in-command to take appropriate action;

3) if, in his opinion, strong doubts exist as to the physical or mental fitness of the pilot-in-command (incapacitation) and/or immediate action is required to prevent a highly critical situation, he shall take such action (if possible in consultation and agreement with other crew members).

Note.— It is obvious that with the action described above a highly undesirable situation is created. All further initiatives should be aimed at the safe completion of the flight.

2.2 Second officer

2.2.1 General. The second officer:

a) is subordinate to the chief pilot of the division to which he is assigned, and to the pilot-in-command during the flight execution;

b) is expected to report facts which may influence the quality of the general flight execution to the pilot-in-command and/or the chief pilot;

c) should have no doubts about his condition and proficiency before starting the flight execution.

2.2.2 Flight preparation. The second officer will:

a) acquaint himself with all relevant particulars and latest instructions concerning aeroplane type and flight to be flown;

b) advise the pilot-in-command if, in his opinion, any aspect of the flight preparation has been overlooked.

2.2.3 Flight execution. The second officer will:

a) perform all duties as described in the company manuals under the supervision of the pilot-in-command and/or first officer. These duties may consist of:

1) the function as pilot flying or pilot not flying when occupying one of the pilot seats;

2) the function of observer when occupying the observer seat;

b) be alert on developments which may endanger the safety of the flight; if he believes these developments do exist, he will advise any other cockpit crew member, preferably the pilot not flying.
3. General function description of the flight engineer

3.1 General

The flight engineer:

a) is subordinate to the chief flight engineer of the aeroplane type to which he is assigned, and to the pilot-in-command during flight execution;

b) will have no doubts about his condition and proficiency when reporting for duty;

c) is responsible for checking the airworthiness and the technical condition of the aeroplane, when applicable in concert with the ground engineer;

d) is responsible for performing or supervising the maintenance, when a licensed ground engineer is not available;

e) will adhere to current regulations and instructions, including those of the engineering and maintenance division for en-route stations;

f) will perform such duties as may be ordered by the chief flight engineer;

g) will report facts which may influence, or may have influenced, the quality of the general flight execution to the chief flight engineer;

h) will assist in promoting an atmosphere in which a good understanding and co-operation between the crew members may be expected.

3.2 Flight preparation

The flight engineer will:

a) acquaint himself with all relevant particulars, complaints, repairs and latest changes concerning the aeroplane and the flight;

b) give the pilot-in-command required information;

c) perform the pre-flight check in order to ensure that the aeroplane and its equipment are in serviceable condition;

d) take care of refuelling the aeroplane when applicable and always ascertain that the required fuel quantity is on board.

3.3 Flight execution

The flight engineer will:

a) perform all duties as described in the operations manual and instructions;

b) be alert on developments which may endanger the safety and/or efficiency of the flight execution; if he believes these developments to exist, he will advise the pilot-in-command;

c) make the required entries in the prescribed documents;

d) prepare the maintenance message for early information of the next station;

e) contact the maintenance base according to the instructions via HF and/or VHF facilities about the technical condition of the aeroplane, if applicable.

3.4 After flight at en-route stations

The flight engineer will:

a) upon arrival, personally inform the ground engineer of any malfunctions observed, acquainting him with their nature and effect, offering such advice as may be necessary for safe and economic dispatch;

b) report serious malfunctions to the pilot-in-command and assist in such a way that optimum action can be taken;

c) give his full co-operation and assistance to the ground engineer, should repairs prove necessary, in order to expedite serviceability and avoid delay;

d) ensure that proper inspections are performed;

e) brief, if possible, the departing flight engineers at slip stations about the technical condition of the aeroplane;

f) ensure that the documents for which he is responsible are filed in the appropriate places.

3.5 After flight at base

The flight engineer will inform the engineering and maintenance division if the technical condition of the aeroplane makes this necessary.
3.6 Co-ordination between flight engineer/ground engineer at stations abroad

3.6.1 At stations abroad, the ground engineer (as authorized representative of the technical division) signs the Aeroplane Maintenance Log releasing the aeroplane for further flight, but only after he is satisfied that the flight engineer agrees with this release. If there are no flight engineer’s remarks in the log and no deficiencies are found during the inspection, he may assume, without further consultation, that this agreement is given. When, however, deficiencies are found, appropriate action may be taken before consultation.

3.6.2 If the ground engineer is not present or not qualified for the aeroplane type, the necessary action will be taken and the aeroplane maintenance log will be signed by the flight engineer having a supplementary qualification licence as aeroplane maintenance engineer.

4. General function description of the cabin crew

4.1 Cabin personnel are subordinate to the head of the cabin personnel division. During flight duty time and at slip stations, the “command” rules apply. The purser’s authority towards the cabin crew is then similar to the authority of the pilot-in-command towards the crew as a whole; the authority of the pilot-in-command is, however, overriding.

4.2 The cabin personnel are charged with the care of the passengers. Their duties are laid down in detail in the flight safety instructions, cabin personnel.

4.3 Cabin crew must inform the pilot-in-command whenever smoke, fire, unusual sounds or other abnormal conditions are observed. This information will be passed on as follows:

<table>
<thead>
<tr>
<th>Observation during</th>
<th>Warning to pilot-in-command</th>
</tr>
</thead>
<tbody>
<tr>
<td>taxiing, cruise or descent</td>
<td>immediately</td>
</tr>
<tr>
<td>take-off and climb-out</td>
<td>as soon as the “seat belt” sign is switched off</td>
</tr>
<tr>
<td>final approach and landing</td>
<td>as soon as the aeroplane has left the landing runway</td>
</tr>
</tbody>
</table>

4.4 During an emergency, the purser is in charge of cabin preparation and evacuation procedures.

4.5 If an evacuation is anticipated, he may request assistance from any additional and non-working crew members.
Attachment B to Chapter 6

Example of an operator’s guidance on the documentation to be carried on board the aircraft

The pilot-in-command will be responsible for ensuring that forms, charts, manuals and equipment, as well as the following equipment and operational forms, are on board the aeroplane: Flight Report Book — NOTAM — Weather and Forecast Folder — Technical Log Book — Passenger and Cargo Manifests.

MANDATORY DOCUMENTS — INTERNATIONAL OPERATIONS (carried as required)

1. flight manual;
2. certificate of airworthiness;
3. noise certificate (if any);
4. radio licence;
5. certificate of maintenance;
6. technical log;
7. one copy of the aircraft operating manual;
8. one copy of the company operations manual;
9. route guide (two copies, one for each pilot);
10. topographical maps for area of operation;
11. navigation charts for area of operation;
12. ICAO flight plan forms;
13. “AIREP” forms (sufficient number for anticipated routing);
14. one pad of mass and balance forms;
15. copies of general declaration (sufficient number for anticipated routing);
16. copies of passenger manifest (sufficient number for anticipated routing);
17. copies of cargo manifest (sufficient number for anticipated routing);
18. bills of lading (for cargo) (sufficient number for anticipated routing);
19. customs and immigration forms as required.
Attachment C to Chapter 6

Example of guidance on factors to be considered before inclusion of material on health matters in the operations manual

CARE OF FLYING PERSONNEL

1. General aspects

Flying personnel should lead a life which results in an excellent balance, physically and psychologically. It should be recognized that the lifestyle led by flying personnel can endanger their physiological and psychological balance, "off-duty activities" being of particular significance. Although studies have revealed that flying personnel do not age faster than in other professions, the aging process is an important factor and a good preventive medicine programme for flying personnel can be instrumental in slowing down this process in many instances.

2. Working conditions

2.1 Working conditions are, of course, one of the most important factors to be carefully studied. Everything related to the crew's professional activity must be taken into consideration, not only the schedule and the rhythm of work, but also the comfort of the flight deck, taking into consideration seats, dashboard, layout of the various instruments, oxygen masks, illumination, sound-levels, temperature, humidity, composition of the air on the flight deck, etc.

2.2 The airline medical director plays a very important part with respect to all of these items, both by determining basic standards and by ensuring periodically that these standards are complied with.

3. Medical examinations

3.1 The airline medical director should take advantage of any opportunity to exert careful supervision of flight crew either when called in for some pathological incident or during one of the periodical check-ups. The frequency of these check-ups with respect to the flight deck crew has been established by ICAO regulations for implementation by Contracting States. In general, all States follow the guidelines set forth by ICAO. However, in some instances these guidelines have been changed slightly by individual States and airlines to fit their own needs. For the cabin staff, a medical check-up is advisable once a year.

3.2 Not only should the present medical status be tested, but also all principles of preventive medicine and health education should be applied to conserve the health and prolong the flying career of the crew. Thus, special attention is to be given the examinees as they approach the age of forty.

3.3 These medical examinations also make it possible for the physician to maintain close contact with the pilots and to gather information about the physical condition of the crew members (appetite, digestion, physical activity, sleep, minor illnesses, accidents, endurance to fatigue) and also their psychological balance (private life troubles, worries, hobbies, professional adjustment, social contacts with the other members of the crew and with the staff).

4. Food

A poor diet will bring about digestive troubles which can alter professional abilities; in the long run it can damage a person's health and may shorten his career.

4.1 Diet as related to flight

4.1.1 General rules. All food which easily can be contaminated such as mayonnaise, oysters, salads and shrimps should be avoided. Pilots at the controls should have meals of different types and eaten at separate intervals. It is recommended that one hour elapse between the meal times of the two operating crew members.

4.1.2 Before flight. Crew members should not operate on an empty stomach. A meal should be taken one or two hours before take-off, preferably a light meal consisting of carbohydrate and protein, but poor in fat. Gaseous forming foods, condiments, gravy, fried dishes, cream, shellfish, fatty cheese and any foods not easy to digest should be avoided.

4.1.3 During flight. Crew members should drink plenty of fluids, preferably water which is as neutral as possible and fruit juices, but avoiding carbonated water; coffee and tea should be kept to a minimum. They should eat sparingly and avoid fermentable foods. On short- and middle-distance flights, meals on board are not advisable; they should be taken before flight. On long-distance flights, if and when passenger meals are served, they
should be eaten sparingly, avoiding certain dishes as mentioned previously, but light meals or snacks should also be available. At stops, snacks and fruit should be sufficient. The crew should take at least one hot meal per eight hours of flight.

4.1.4 After flight. The crew is advised to take one substantial meal, including an adequate amount of protein, after flight.

4.1.5 Everyday diet. In hot countries the food should be less rich in calories than in cold or temperate zones. On the other hand, it is necessary to drink plenty of water — three to four litres a day — in order to maintain a good hydromineral balance and a sufficient diuresis. To avoid dehydration, sodium chloride should be taken (three to five grams per day, and up to ten grams in particularly hot and dry countries) unless there is a sodium restriction imposed.

4.1.6 The everyday diet should not be too rich in calories to avoid obesity. Three thousand calories per day seems a fair amount. The proportion between main components of meals should be well-balanced, but large individual variations should be allowed. Protein, carbohydrate, and fats will be approximated as follows:

- protein — 15 per cent,
- carbohydrate — 60 per cent,
- fats — 25 per cent and preferably of vegetable origin.

5. Alcohol

Most airlines have company rules on alcohol consumption. It is usually forbidden to drink any form of alcohol during the flight or during the twelve to twenty-four preceding hours. The reason is that alcohol, oxidized by the liver at the rate of about seven grams abs. alcohol per hour, is eliminated slowly. Even a low alcohol blood level, between 0.03 and 0.05 per cent, disturbs the sensorimotor, visual and cortical reactions. Two ounces, or 55 grams, of whisky will raise the alcohol blood level to 0.05 per cent. Moreover, alcohol remains longer in the brain than in the blood. Alcohol interferes with the enzymatic cellular process of oxidation; consequently, it causes hypoxia and reduces the individual's tolerance to altitude. Chronic alcoholism is, of course, incompatible with the profession and is usually a cause for permanent grounding. However, in some countries a "rehabilitated" alcoholic may be allowed to return to flying.

6. Tobacco

6.1 Many crew members smoke and some are heavy smokers. Through the action of nicotine, which is a vasoconstrictor, smoking is believed to be a contributing factor to elevated blood pressure in hyperreactive cases. There is a greater affinity between carbon monoxide (CO) and haemoglobin than between oxygen and haemoglobin. Therefore, cigarette smoking, particularly on the flight deck, can cause a relative hypoxaemia. It has been proven that carbon monoxide in the blood can lower altitude tolerance by as much as 5 000 ft, and because of its affinity to haemoglobin, it is eliminated very slowly.

6.2 Consequently, if it is not possible to persuade crew members to stop smoking definitely, it would be desirable that they refrain from smoking when on duty and for at least eight hours preceding the flight.

7. Rest — sleep — leisure — physical activities

7.1 To some extent, air crew members lead an unbalanced life in that their hours of duty are not regular. It is essential that the air crew member make the necessary adjustment. In this connection, in travelling through several time zones the problem of physiological or circadian rhythm arises. For short stops abroad it is advisable to follow, as much as possible, the domestic circadian rhythm. Another recommendation is that east- and west-bound flights may be altered in a convenient way as regards the schedules of duty of the crews. The majority of flying personnel have learned to make the proper adjustment in their mode of living so that circadian rhythm does not make for a serious problem.

7.2 It is desirable to explain the above facts to crew members so that they can take the necessary steps to adjust themselves to their jobs. The following steps are advised:

a) On duty — A healthy and hygienic way of living is necessary with respect to meal hours and diet as well as the general condition of life during the stops (housing, sleeping time), avoiding unnecessary entertainment or strain. In the event that certain stops between flights involve a few hours’ stay at the aerodrome, it may be necessary to provide comfortable and peaceful rest areas where the crew members will be able to relax and recuperate and also perform some form of physical exercise.

b) Stopping in developing countries — This requires that special care be taken to select comfortable lodgings, including proper sanitary accommodations. In hot countries, air-conditioned rooms are advisable. Insecticides against mosquitoes and flies should be available in the crew quarters.

c) At home station — On return to their home base it is necessary that crews adjust themselves to routine family
and home life as quickly as possible. For some it might be a problem of having too many hours of leisure. However, idleness must be avoided. Proper “off-duty activities” are essential, which may take the form of hobbies or sports. The maintenance of physical fitness through exercise is essential. Studies have proved that physical fitness, as the result of physical activity, is conducive to longevity and is a protection against coronary disease. Mental activity is also necessary. Flight personnel must maintain a good psychological balance and avoid worries and emotional strain.

8. Prevention of communicable diseases

8.1 Flight personnel may be exposed to various diseases, the prevention of which can, to a great extent, be accomplished through preventive medical measures.

8.2 Malaria. In countries where malaria is endemic, it is necessary to take a weekly or daily dose of one of the approved prophylactic drugs such as chloroquine, amodiaquine, camoquine, pyrimidine, etc. Various ways of administration are equally commendable. The main thing is to take the medication — following exactly the medical prescription — not only during the actual stay in the infected area, but for one week before and six weeks after leaving an endemic area. It follows that members who fly periodically to an infected area will be taking the drug continuously until their flight schedule is changed. If the prescription is strictly obeyed neither drug intoxication nor intolerance is a matter of concern.

8.3 Gastrointestinal diseases. Some of these diseases are of bacterial origin (e.g. salmonellae infections, shigellosis, cholera, staphylococcus and clostridium food poisoning) and some are caused by protozoa (entamoeba, dientamoeba, giardia, etc.). In this connection, infectious hepatitis must also be mentioned. Contamination may occur through direct contact, but invariably these diseases are caused by the ingestion of contaminated food or drink. There are also certain parasitic diseases which are caused by the ingestion of contaminated food or drink. Among these diseases are ascariasis (roundworms), taeniasis (tapeworms) and enterobiasis (pinworms).

8.4 Protection against these infections can be obtained by thorough cleanliness of the quarters, disinfection of drinking as well as washing water, and careful supervision of sanitation in the handling of food, especially food to be eaten uncooked.

8.5 Crew members should be instructed against the risk of contracting bacterial and parasitic infection via the digestive tract. They should also be warned of the danger of drinking contaminated water and eating raw food and peeled fruits. The importance of hygienic measures such as washing one's hands before eating should be emphasized.

8.6 Food preparation. The quality and preparation of food, as well as kitchen sanitation, should be carefully and frequently inspected. Cleanliness of the facilities should be meticulously maintained; hygienic cooking, tidiness and personal hygiene of the cooks and their assistants should be checked.

8.7 Vaccination against diseases such as cholera is to be recommended, but it does not give complete protection nor exclude the possibility that a vaccinated person can be a carrier of cholera vibrio. Some new, long-acting chemoprophylactic preparations (Fanasil, Intertrix, etc.) seem very promising with respect to the effect on the vibrios in the bowel. For prevention of infectious hepatitis the use of gammaglobulin is important.

8.8 It should also be noted that certain parasitic metazoan diseases can be acquired by being infected through the skin. Examples of these are bilharziasis (schistosomiasis) caused by the schistoma or blood fluke, infection caused by the ancylostoma braziliense (creeping eruption) and ancylostoma duodenale (hook worm). These are usually acquired by swimming in polluted water or walking through polluted soil. To avoid them one should refrain from river bathing or crossing ponds barefoot. Other parasitic diseases are caught through insect bites (mosquitoes, flies, etc.). Dealing with the problem collectively or individually and taking the necessary preventive measures will limit the risk of contamination.

9. Drugs

9.1 It is the consensus of the majority of flight surgeons that, except for the use of the innocuous drugs, flight personnel should not fly if they are taking drugs and that they should be grounded for the illness for which the drug has been prescribed. A number of drugs have a noxious influence and are incompatible with flying.

9.1.1 A few of the most common drugs are as follows:

a) drugs affecting oxygen utilization — certain sulphamidimide, phenacetine and oral antidiabetic drugs;

b) drugs influencing the nervous system — some antibiotics such as streptomycin, neomycin, kanamycin and isoniazide; quinine; antihistamines; amphetamines (except in certain particular cases); narcotics; barbiturates; bromides; tranquilizers and stimulants;
c) other drugs — diuretics; hypotensive drugs; anti-arrhythmics; cardiac glycosides; antispasmodics and steroids. In some countries, diuretics such as the Xanthines are permitted for mild hypertension.

9.2 It is unfortunate that many doctors are not informed of the risk involved (particularly in the case of the pilot) regarding the taking of drugs and flying. It is, therefore, essential that crew members be advised of the danger of flying while under treatment with drugs. One should determine why the drug is indicated since the original indication may be disqualifying for flight status in itself.
Attachment D to Chapter 6
Example of guidance for air crew on quarantinable, tropical and other transmissible diseases

RECOMMENDED IMMUNIZATIONS FOR INTERNATIONAL TRAVEL

1. Typhus
Vaccination is recommended for persons going to areas known or suspected to be infected with louse-borne typhus (epidemic type). The disease exists in Afghanistan, Northern India and Pakistan, Myanmar, Korea, China, Ethiopia, countries of Eastern Europe, parts of Africa and South America. It should be kept in mind that freedom from louse infestation is the most valuable protection against typhus.

2. Typhoid and paratyphoid fever
Vaccination is recommended for foreign travel as a personal and public health precaution. However, it should be realized that any protection afforded by vaccination against these diseases is uncertain and limited. Vaccination will not prevent the disease if significant exposure is encountered, but its severity may be reduced, provided booster doses of vaccine are given every year. Vaccines produced locally in the country where exposure to infection takes place are more likely to be effective against the disease encountered in that country.

3. Tetanus
Immunization with toxoid is recommended as a routine procedure for all persons. A single booster dose of 0.5 cubic centimetre toxoid at seven- to ten-year intervals is sufficient to maintain good immunity.

4. Poliomyelitis
International travellers, particularly children and people under forty years of age, should make sure that they have been adequately immunized against poliomyelitis.

5. Influenza
Vaccination is recommended, particularly for children and the elderly, when travelling to areas where an epidemic of influenza is current or imminent.

6. Diphtheria, pertussis, measles, virus hepatitis
Children should be adequately immunized against these diseases as a routine precautionary measure.

Air crews on international flights, in addition to the immunizations required by international regulations, should be vaccinated against typhoid, paratyphoid, tetanus, poliomyelitis, and others as indicated. All airline personnel at international aerodromes who come in contact with the travelling public should be similarly immunized.

Note 1.— It is recommended that the crews and passengers obtain vaccinations.

Note 2.— It is recommended that the pilot-in-command of the aeroplane immediately notify the health authorities if there is on board a case of suspected quarantinable disease among the passengers.

7. Tropical diseases
The remarkable discoveries and advances which have taken place in tropical medicine have tended to foster the idea that tropical diseases predominate in tropical countries. The fact is that most of the illnesses occur nearly everywhere, but their incidence and frequency appear to be influenced by local circumstances. What is the zone which is normally called “tropical”? According to Supan’s classification, it is the zone of tropical or warm climates which extend from the Equator to the mean annual isotherm of 20°C. The northern limit is at 35° of north latitude; the southern at rather less than 30° southern latitude. The true tropical zone is divided from the sub-tropical zone by a purely arbitrary line which corresponds roughly to 23½ N and S latitudes. Because of this arbitrary division, we have to consider two groups of diseases.
7.1 Real tropical diseases are those transmitted by vectors (mosquitoes, flies, etc.) living only in very hot climates. These are mainly malaria, filariasis, yellow fever, tick typhus, trypanosomiasis, kala-azar, etc.

7.2 Some present-day tropical diseases were once almost world-wide. Because of better sanitation and hygienic measures in some parts of the world, these diseases are now mainly prevalent in the tropics. They are mainly smallpox, trachoma, plague, intestinal parasitosis, cholera, bilharziasis, exanthematic typhus, etc.

7.3 In view of the large number of tropical diseases, the more important and more frequent ones, only, are included and for ease of reading they are divided into causative categories. Treatment in most instances is not given and can be obtained in recognized authoritative medical books on tropical diseases.
Example of guidance on first-aid and medical kits

Medical kits

1. Each aeroplane shall be equipped with accessible and adequate medical kits appropriate to the passenger-carrying capacity of the aeroplane in question and the duration of the flight. Such medical equipment shall comprise:

   a) medical supplies for normal use;
   b) medical supplies for emergency use;
   c) medical supplies for physician’s use.

2. On each flight, the medical supplies for normal use presented in Table 1 shall be carried as a minimum, multiplied by the following factors in relation to the number of passengers:

<table>
<thead>
<tr>
<th>Number of passengers on board</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 — 200</td>
<td>1</td>
</tr>
<tr>
<td>201 — 300</td>
<td>2</td>
</tr>
<tr>
<td>above 300</td>
<td>3</td>
</tr>
</tbody>
</table>

3. In addition to the equipment specified under paragraph 2, the requirements which follow shall be met if no suitable airport is available within 60 minutes along the planned route.

   3.1 The medical supplies for emergency use presented in Table 2 multiplied by the following factors in relation to the number of passengers shall be carried as a minimum:

<table>
<thead>
<tr>
<th>Number of persons on board</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 — 300</td>
<td>1</td>
</tr>
<tr>
<td>above 300</td>
<td>2</td>
</tr>
</tbody>
</table>

   3.2 The medical supplies for physician’s use shall be in accordance with Table 3.

4. Each kit must be dust- and moisture-proof and shall be distributed as evenly as practicable throughout the cabin and be readily accessible to the cabin attendants.

5. Periodical inspections of the kits by authorized persons shall ensure that the medical supplies are in a condition necessary for their intended use; the contents shall be replenished as soon as possible.

Table 1. Medical supplies for normal use

<table>
<thead>
<tr>
<th>Item</th>
<th>Recommended kind</th>
<th>Recommended number</th>
</tr>
</thead>
<tbody>
<tr>
<td>antigastralgic drugs</td>
<td>pills</td>
<td>20</td>
</tr>
<tr>
<td>cardiovascular tonic</td>
<td>pills</td>
<td>20</td>
</tr>
<tr>
<td>antiseptics</td>
<td>bottle</td>
<td>1</td>
</tr>
<tr>
<td>decongestant nasal spray</td>
<td>disposable packs</td>
<td>20</td>
</tr>
<tr>
<td>analgesic drugs</td>
<td>pills</td>
<td>20</td>
</tr>
<tr>
<td>antidiarrhoeic medication</td>
<td>pills</td>
<td>40</td>
</tr>
<tr>
<td>sedative drugs</td>
<td>pills</td>
<td>20</td>
</tr>
<tr>
<td>bandages</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>burn remedies</td>
<td>gel</td>
<td>1</td>
</tr>
<tr>
<td>ophthalmic ointment</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>antispasmodic drugs</td>
<td>pills</td>
<td>20</td>
</tr>
<tr>
<td>inflatable splints</td>
<td>leg, calf, foot, arm</td>
<td>1 of each per aircraft</td>
</tr>
<tr>
<td>materials for treating minor injuries, including burns</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>handbook on first aid</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>ground-air visual signal code for use by survivors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(as contained in ICAO Annex 12), unless provided elsewhere</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 2. Medical supplies for emergency use

<table>
<thead>
<tr>
<th>Item</th>
<th>Recommended kind</th>
<th>Recommended number</th>
</tr>
</thead>
<tbody>
<tr>
<td>emollient eyedrops</td>
<td>bottle</td>
<td>1</td>
</tr>
<tr>
<td>water-miscible antiseptic skin cleanser</td>
<td>spray or bottle</td>
<td>1</td>
</tr>
<tr>
<td>materials for treatment of extensive burns</td>
<td>sheets 80 x 120 cm</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>sheets 50 x 80 cm</td>
<td>4</td>
</tr>
<tr>
<td>haemostatic forceps</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>haemostatic bandages or tourniquet</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>adhesive plaster</td>
<td>100 x 6 cm</td>
<td>1</td>
</tr>
<tr>
<td>standard dressings, medium and large</td>
<td>packs</td>
<td>6 of each</td>
</tr>
<tr>
<td>gauze dressings</td>
<td>20 x 20 cm</td>
<td>10</td>
</tr>
<tr>
<td>adhesive tape</td>
<td>rolls</td>
<td>2</td>
</tr>
<tr>
<td>safety pins</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>dressing clips</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>crepe bandages</td>
<td>6 cm, 8 cm</td>
<td>1 of each</td>
</tr>
<tr>
<td>head and finger dressings</td>
<td></td>
<td>3 of each</td>
</tr>
<tr>
<td>skin disinfectant</td>
<td>spray or bottle</td>
<td>1</td>
</tr>
<tr>
<td>scissors</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>umbilical clamps</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>triangular bandages</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>intravenous solution with administration set</td>
<td>pack</td>
<td>1</td>
</tr>
<tr>
<td>cotton</td>
<td>pack</td>
<td>1</td>
</tr>
<tr>
<td>artificial plastic airway</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 3. Medical supplies for physician’s use

<table>
<thead>
<tr>
<th>Item</th>
<th>Recommended kind</th>
<th>Recommended number</th>
</tr>
</thead>
<tbody>
<tr>
<td>sphygmomanometer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>stethoscope</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>disposable syringes</td>
<td>2 ml, 5 ml, 10 ml</td>
<td>2 of each</td>
</tr>
<tr>
<td>medical thermometer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>tourniquet</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>hard rubber wedge</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>adhesive tape</td>
<td>roll</td>
<td>1</td>
</tr>
<tr>
<td>injectable sympathomimetic</td>
<td>ampoules</td>
<td>6</td>
</tr>
<tr>
<td>respiratory resuscitation equipment</td>
<td>set</td>
<td>1</td>
</tr>
<tr>
<td>injectable calcium 10% 10 ml</td>
<td>ampoules</td>
<td>2</td>
</tr>
<tr>
<td>injectable digoxin</td>
<td>ampoules</td>
<td>6</td>
</tr>
<tr>
<td>injectable corticoid</td>
<td>ampoules</td>
<td>3</td>
</tr>
<tr>
<td>injectable furosemide</td>
<td>ampoules</td>
<td>1</td>
</tr>
<tr>
<td>injectable phenobarbital</td>
<td>ampoules</td>
<td>5</td>
</tr>
<tr>
<td>injectable methergine</td>
<td>ampoules</td>
<td>3</td>
</tr>
<tr>
<td>injectable valium</td>
<td>ampoules</td>
<td>6</td>
</tr>
<tr>
<td>oral valium</td>
<td>pills</td>
<td>40</td>
</tr>
<tr>
<td>oral glyceryl trinitrate</td>
<td>pack</td>
<td>1</td>
</tr>
<tr>
<td>coronary vasodilator</td>
<td>capsules</td>
<td>1</td>
</tr>
<tr>
<td>antalgic antispasmodic</td>
<td>ampoules</td>
<td>5</td>
</tr>
</tbody>
</table>
Chapter 7

OPERATIONS SUPERVISION — GROUND

7.1 GENERAL

7.1.1 An operator shall ensure that a flight will not commence unless it has been ascertained by every reasonable means available that the ground and/or water facilities available and directly required on such flight, for the safe operation of the aircraft and the protection of the passengers, are adequate for the type of operation under which the flight is to be conducted and are adequately operated for this purpose. Annex 6, Parts I and III, requires that before a flight commences the pilot-in-command certify that certain necessary preparations and checks have been completed. Among these is the need to complete an operational flight plan. To do this the pilot will need meteorological information, information on the status of facilities along the route to be flown and such other information as is required to ensure a safe and efficient operation.

7.1.2 The aerodrome meteorological office will supply the required weather information and the aeronautical information service will provide NOTAM and aeronautical information circulars (AIC). The provision of these services is the responsibility of the State. The operator will provide information, normally through notices to flight crew, regarding temporary operational information, internal company operational matters, amendments to the operations manual prior to their incorporation in the manual, matters affecting airworthiness of aircraft, etc. It is a common practice for operators to locate their crew briefing/planning offices in the same area as the AIS and MET offices for the convenience of the users and to facilitate exchange of information. Many operators also collect, or have supplied to them by the MET and AIS offices, the necessary documents which they display and provide to their flight crew in their own crew briefing/planning office.

Note.— For the purposes of this manual the situation discussed is one in which an operator provides all the required information in his own crew briefing/planning office.

7.2 OPERATIONS OFFICES

7.2.1 The information provided in a crew briefing/planning office will include:

a) The following pre-flight information listed in Chapter 8 of Annex 15 — Aeronautical Information Services:

1) aeronautical information publications (AIPs) including amendment service;
2) supplement to the AIP;
3) NOTAM, decoded where necessary, and pre-flight information bulletins (PIBs);
4) aeronautical information circulars (AICs);
5) checklists and summaries;
6) maps and charts;
7) additional current information relating to the aerodrome of departure, concerning the following:
   i) construction or maintenance work on or immediately adjacent to the manoeuvring area;
   ii) rough portions of any part of the manoeuvring area, whether marked or not, e.g. broken parts of the surface of runways and taxiways;
   iii) presence and depth of snow, ice or water on runways and taxiways, including their effect on braking action;
   iv) snow drifted or piled on or adjacent to runways or taxiways;
v) parked aircraft or other objects on or immediately adjacent to taxiways;
vi) presence of other temporary hazards including those created by birds;
vii) failure or irregular operation of part or all of the aerodrome lighting system including approach, threshold, runway, taxiway, obstruction and manoeuvring area unserviceability lights and aerodrome power supply;
viii) failure, irregular operation and changes in the operational status of ILS (including markers), SRE, PAR, DME, SSR, VOR, NDB, VHF aeronautical mobile channels, RVR observing system, and secondary power supply;
6) any other relevant matters.

b) As indicated in Annex 14, Volume I, information concerning the level of protection provided at an aerodrome for aircraft rescue and fire fighting purposes shall be made available. Significant changes in this level of protection normally available at an aerodrome shall be notified to the appropriate air traffic services units and aeronautical information units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly. NOTAM shall be originated and issued promptly whenever the information is of direct operational significance, such as significant changes in the level of protection normally available at an aerodrome for rescue and fire fighting purposes. NOTAM shall be originated only when a change of category is involved and such change of category shall be clearly stated as established in Annex 14, Volume I, Chapter 9.

c) The information, for pre-flight planning, listed in Annex 3 — Meteorological Service for International Air Navigation which includes any or all of the following information:

1) current and forecast upper winds, upper-air temperatures, tropopause heights and maximum wind information;
2) expected significant en-route weather phenomena and jet stream information;
3) a forecast for take-off;
4) aerodrome reports and aerodrome forecasts.

d) In addition to supplying the above information for display, the meteorological service will provide written or printed documentation for use during flight and appropriate to the duration of flight.

1) For flights of more than two hours’ duration this documentation should comprise:
   — upper winds and upper-air temperatures;
   — expected significant en-route weather phenomena and, if relevant, tropopause heights and jet streams;
   — aerodrome forecasts.

2) For flights of less than two hours’ duration, flight documentation should comprise information on:
   — upper winds and upper-air temperatures;
   — expected significant en-route weather phenomena and, if relevant, tropopause heights and jet streams;
   — aerodrome forecasts;
   — aerodrome reports, special reports, SIGMET information and appropriate special air-reports.

The upper-air and significant weather charts are normally provided through the world area forecast system (WAFS).

7.2.2 The format and extent of the services provided by the operator and the method of their provision will be the subject of consultation and agreement between the operator and the authority concerned. In the case of the MET service, the operator should provide a means of facilitating briefings and discussion between the flight crew and the meteorologist. This could be as simple as a dedicated telephone link, or as sophisticated as a direct video link with the MET office, with associated printer and facsimile facilities. (The contents of briefings and discussions are addressed in Annex 3 and include significant topics such as SIGMET information and air-reports.) Where an operator is supplying AIS and MET services documentation to flight crew, there must be a description in the operations manual of the administrative functions.
necessary to ensure that the service provided is adequate. In particular, it is essential to establish a method of ensuring that the latest information is being supplied. To do this it will be necessary to arrange a method of collection of data from AIS for each flight. In the case of the MET services, observations should be supplied, and amended if necessary, in accordance with the routine and special observation and reports schedule. In consultation with the operator, special observations and reports related to the operator’s particular requirements should also be made available. Applicable aerodrome forecast information should be supplied and amended as necessary. The documentation to be supplied for particular flights should be agreed upon between the operator and the authorities, one of the major considerations being the length of the flight (see 7.2.1 d) above).

7.2.3 The information supplied by the State services can be supplemented by the operator using his own resources. As an example, Class 2 NOTAM are normally transmitted through the mail. An operator can be made aware of the contents and effects of these notices earlier if flight crew members collect appropriate NOTAM at foreign aerodromes and return them to their home base. Flight crew should also make available air-reports (AIREP), especially those associated with a special aircraft observation, to their own operations staff so that the information is available to other flight crew members. The same procedure should be followed with reports to the AIS concerning the state and operation of air navigation facilities.

7.2.4 The information that will be supplied by the AIS and meteorological offices to the operator must be described in the operations manual. This guidance should include the contents of such information, means of ensuring that the latest information is supplied, means of notifying the operator of any significant change, method of collection of the information and responsibility for administering and overseeing these functions.

7.3 OPERATOR-PRODUCED INFORMATION

7.3.1 The operator will need to ensure that operationally significant information is made available to flight crew and other operational staff. Operationally significant information is information on the adequacy of the facilities available and directly required for a flight (see Annex 6, Parts I and III). A system of distributing this information must be established. Methods used could range from distributing the notices to individual crew members, to displaying the notices in the operations office and requiring crew to read them. In addition, copies of these notices must be carried on the aircraft until the information is withdrawn or incorporated in the operations manual. These notices must be numbered, have effective dates, and be signed by a senior operations official. Depending upon the size of the operation, it might be desirable to issue different notices for different aircraft types or fleets, or to divide the notices into “specific aircraft technical” and “general administrative/operational” categories. The purpose is to limit the amount of information that must be read prior to the flight to that which is actually required. However, such a system requires a proper indexing method as well as regular notification of which notices are still in force.

7.3.2 Examples of classes of information that might be promulgated by an operator are as follows:

a) Technical notices:

1) general technical or engineering notices, such as information on the type and qualities of the anti-icing and de-icing fluids being used;

2) specific technical notices, such as information on a modification being progressively carried out on an aircraft type;

3) airworthiness notices, notices usually originating with the manufacturer or an airworthiness authority concerning matters affecting the airworthiness of aircraft;

b) Administrative/operational notices:

1) administrative notices, such as a change in the terms of reference of the chief pilot, or a change in telephone number for an operations office;

2) operational notices, such as:

i) notice giving information on the aeroplane performance that will be available on a particular runway which has temporarily shortened declared distances because of maintenance work;

ii) notice giving information on the level of protection for fire fighting purposes provided at aerodromes used by an operator, when such level has significantly changed and may affect the commencement of a flight.

(Examples of different forms of notices to flight crew are at Attachment A to this chapter.)
7.3.3 The operator should also display information which the flight crew need while preparing operational flight plans. An example would be notices giving aeroplane basic mass and centre of gravity index. A system of notifying flight crew of defects which are operationally significant, but allowable for flight, must be organized so that such defects can be taken into consideration by the pilot during the flight planning stage. Safety information should be prominently displayed. Information of interest from other departments of the company should also be displayed. Typical examples would be operational notices for cabin crew members or relevant engineering notices for aircraft mechanics.

7.4 OPERATIONAL REPORTING FORMS

7.4.1 The operator should make available in the operations office a supply of forms and documents that might be required by the flight crew. Many of these forms are produced by the State and are used to notify or to make a report of specific occurrences. Examples of such forms would be:

- accident notification form;
- incident reporting form (especially where the State has established a mandatory incident reporting system);
- confidential safety report form (where the State has established a confidential safety reporting system);
- air traffic incident report form; and
- bird strike reporting form.

The format of these forms is the responsibility of the appropriate authority and guidance on when and how to fill out and return them is usually supplied with the forms. The operator would only be required to ensure that the forms are available, although in certain circumstances the operator may also collect completed forms for onward transmission to the appropriate authority.

7.4.2 The operator may also develop some reporting forms for his own use. These forms could include the following:

*Incident notification form.* This form should be modelled on the accident notification form. (The format of an accident notification form is described in Annex 13 — Aircraft Accident Investigation);

*Operator’s confidential safety report form.* (where the operator has established his own confidential reporting system);

*Ground proximity warning report form.* (this may be defined as requiring reporting under the mandatory incident report system in some States);

*Voyage or trip report forms.* These forms are normally used to report any unusual occurrence during a particular flight, or to report any deficiency observed in the facilities used. Some operators have special forms for some of these occurrences, such as airfield/ATS/operational deficiency report forms, or pilot-in-command’s discretion report for when flight time/duty time regulations have been exceeded. However, operators should be conscious of the need to ensure that in producing their own forms they are not merely duplicating information already available from the State forms. Requiring flight crews to repetitively fill in forms will not encourage reporting of occurrences, and an effort should be made to arrange a system whereby filling in one easily comprehensive form will suffice in supplying the information required to all the interested parties. For example, in a situation where mandatory reporting of incidents is a State requirement, the report to the operator by the pilot should be a carbon copy or photocopy of the State form.

7.4.3 The forms that should be available and the administrative responsibility for maintaining an adequate supply should be described in the operations manual. Examples of some operator reporting forms and a related extract from one operator’s manual are at Attachment B to this chapter.

7.5 OPERATIONAL FLIGHT PLAN FORMS

7.5.1 Annex 6, Parts I and III, states that an operational flight plan shall be completed for every intended flight; it also establishes that the operations manual must describe the content and use of the operational flight plan. The operator will provide operational flight plan forms for the use of flight crew. These forms may require that the flight crew fill in all the necessary details or be pre-prepared for specific aircraft types and/or for specific routings. When a pre-prepared operational flight plan contains operational information, it is necessary to ensure that only current forms are available. This requirement also means that an operations staff member must be charged with the responsibility of monitoring operational infor-
mation and amending and altering pre-prepared operational flight plan forms when required. It will be necessary to have an effective date on such forms and a notice in the operations office should detail the current effective dates of all pre-prepared operational flight plans.

7.5.2 The operator must provide the necessary information and facilities for flight crew preparing operational flight plans. This would include a display of the current aerodrome weather, a copy, or a means of listening to, the current aerodrome terminal information service broadcast, where applicable, and a copy of the current upper-winds chart. If the operator uses pre-prepared runway performance information, that information should be available at the place where operational flight plans are prepared. Appropriate aeronautical charts, the operator’s route guide, NOTAM and copies of the AIP(s) must also be available for flight planning purposes.

### 7.6 ATS FLIGHT PLANNING FORMS

7.6.1 A supply of ATS flight planning forms must be available in the operations office. Where required, a means of filing the flight plan with the ATS must be established. In many regions, repetitive flight plans (RPL) are used for frequently recurring pre-planned flight operations. Where this is the case, it will be necessary for the operator to provide information detailing which flights have repetitive flight plans stored and the details of the actual plan stored should be given. The ICAO Model Flight Plan poster (P656) gives a summary of the information contained in the ICAO Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services (PANS-RAC) (Doc 4444), on how to fill out an ATS flight plan, and should be on display in every crew briefing/planning office.

7.6.2 When, because of local requirements, an ATS non-repetitive flight plan must be submitted earlier than normal and the flight crew are not available to do this, either because they have not yet reported for duty or have not completed a previous flight, an operations officer must be nominated as being responsible for filing the plan.

### 7.7 AEROPLANE LOADING

7.7.1 The operations manual should include guidance and instructions on the calculation of aeroplane mass and balance, on the use of standard figures for passenger mass and baggage, and on any special loading instructions.

7.7.2 In some operations the flight crew will be responsible for the preparation, calculation and completion of the mass and balance documentation. In other cases there will be an office responsible for this task. Increasingly these documents are produced using computers. Whichever method is used, the operations manual must give instructions on the method of calculating aeroplane mass and balance. When a special office produces the mass and balance documentation, the operations manual must define its responsibility and the responsibility of the pilot-in-command in checking and accepting these calculations.

7.7.3 In calculation of aeroplane mass and balance, certain standard masses may be used. Initially, the actual aeroplane empty mass and centre of gravity index must of course be known. For many operations, standard masses are given for the equipment and catering that will be carried. Standard figures are typically used for fuel used in taxiing. Standard passenger mass is normally used as well. The figure used may apply to all passengers, or may differ for male and female passengers, children, infants, etc. Many operators use different standard mass figures for passengers in the winter and summer months, because of the extra mass of clothing in some of the harsher winter environments. Some operators also include hand baggage in the passenger mass, whereas other operators separate it and calculate, using a standard mass for each piece, the mass of hand baggage. Details of the standard mass permitted and when they may be used should be given in the operations manual. The standard figure used should be conservative and it must be recognized that on occasion it will be unrealistic to use standard masses, and actual figures must be used.

7.7.4 The operations manual should give information and instructions on any special loading requirements. The most obvious requirements are those related to the carriage of dangerous goods. The ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284) will be known to flight crew through the dangerous goods training programme. If an operator has more restrictive requirements or differences to the Technical Instructions, these should be clearly identified in the operations manual. Appropriate information and instructions must be given on the carriage of other special loads. Examples would be guidance on the carriage of livestock, valuable cargo, perishable cargo, diplomatic mail, etc. While the guidance given will not be as detailed as that given to the personnel engaged in the loading and handling of cargo, baggage, etc., it should be sufficiently detailed to allow crew to check that the regulations and company requirements have been complied with. In this respect, many of the messages or details about special cargo will be given in code. The code normally used for this purpose is the handling/load code
developed by the International Air Transport Association (IATA). The required codes should be explained in the operations manual.

7.8 CREW BRIEFING/PLANNING OFFICE

7.8.1 The documents and manuals used in pre-flight planning and on the aircraft must be administered and controlled (see also Chapter 6, 6.1) so as to ensure that the current information is always available. In many instances, technical manuals (e.g. the aircraft operating manual) and documents (e.g. the route guide) are distributed to each crew member. The upkeep and amendment of these documents then becomes the responsibility of the holder. However, it is necessary to organize a system of distribution of any amendments, and a system of numbering the amendments and of recording their incorporation in the manuals must be established. A notice giving the latest revision date or status of each document must be displayed in the operations office. Copies of each document will be available in the operations office for reference purposes and the task of amending these particular documents must be assigned to an operations staff member. The operations staff member charged with over-all control of documents and manuals should retain a master copy of each. In situations where the required documents are issued to the flight crew at the beginning of each flight duty, a method of ensuring that the documents are current must be established, and the amendment status of any manual or document must be readily identifiable. Some operators leave many of these documents, such as the route guides or the aeronautical charts, on board the aircraft as part of the ship’s library. This again requires that a member of the operations staff be charged with the responsibility of ensuring that the documents on board the aircraft are complete, amended and current. It is probable that the system established by an operator will be a combination of the above methods, so that some documents are issued to the flight crew individually while some are held in the operations office (either permanently or taken to the aircraft by the operating crew), and others are left on the aircraft permanently. In any case, what is essential is that a system of control, numbering and recording the incorporation of amendments be established so that the status of any document can be easily determined. The responsibility for, and method of operation of such a system, must be detailed in the operations manual.

7.8.2 As well as the documents mentioned above, many other documents and manuals must be retained in the operations office for reference purposes. Examples would be the training manual, flight manual, and company general staff manuals. These manuals must be amended and kept current and the responsibility for this must be indicated in the operations manual.

7.9 OPERATIONS ORIGINATING FROM OUTSTATIONS

7.9.1 When the aircraft and/or crew are based at outstations, it will be necessary to ensure that the documents and manuals on the aircraft are current and that the latest operational information is supplied to crews. When the number of operations and crews based either permanently or temporarily at an outstation becomes large enough to warrant it, it may be practicable to establish a crew briefing/planning office at the outstation. A crew briefing/planning office at an outstation can be responsible for the normal functions of the main office for the aircraft and crews based at the outstation. If this is done, however, a clear reporting line between the outstation(s) and the crew briefing/planning office at the main base must be established.

7.9.2 When the aircraft and/or crews are based at an outstation on an irregular basis or for very short periods, such as for a single overnight stop, it would not be reasonable to require that a crew briefing/planning office be established at that outstation. In these circumstances it is necessary for the crew briefing/planning office at the main base to retain control of this type of operation and to ensure that any relevant operational information or essential amendments to any operational document is made known to the operating crew prior to their completing their pre-flight preparations.

7.10 PRE-FLIGHT REPORTING AND DUTIES

7.10.1 The operations manual must specify the pre-flight reporting time and duties of flight crew. If an operator requires crew members to phone in ahead of reporting for duty, instructions on this must be given; or, if the operator has a system of standby or “on-call” flight crew, the method of operation of that system must be described. The operations manual will normally specify the procedure to follow in the event that a crew member is unable to report for duty.

7.10.2 For operations originating at outstations, the operations manual will normally give details of the
Chapter 7. Operations supervision — ground

reporting time for flight crew. The manual might also list the appropriate telephone numbers at outstations so that flight crew can contact local operational personnel when required.

7.10.3 The operations manual should specify the flight planning/briefing duties of flight crew members. These duties will vary from operator to operator. For example, the duties of a flight crew member where an operator uses computer-generated flight plans and keeps all the necessary documents and manuals on the flight deck of the aircraft will be different from the situation where the flight crew member completes his own flight plans and is also responsible for amending his own route guides, etc. An extract from one operator’s operations manual on pre-flight duties is shown at Attachment C to this chapter.

7.10.4 Many operators use flight operations officers/flight dispatchers to complete or to assist the flight crew in completing the pre-flight planning. The extent of the duties of the flight operations officer/flight dispatcher in pre-flight planning will vary, depending on the method of work or of supervision of operations that a particular operator chooses. Typical duties of flight operations officers/flight dispatchers would include the provision of assistance to the flight crew to complete the flight planning. An example would be where the officer gathers the necessary documentation for the flight crew and, when required, completes some of the operational flight plans or files the ATS flight plan. Another example would be where the preparation of all the necessary pre-flight documentation is the responsibility of the flight operations officer/flight dispatcher, who also briefs the flight crew, and in the light of the pilot’s operational decisions, completes the documentation. The operations manual will need to give instruction on the division of duties where flight operations officers are employed. An example of the pre-flight briefing duties of a flight operations officer/flight dispatcher is given at Attachment D to this chapter.

7.11 POST-FLIGHT DUTIES

Annex 6, Parts I and III, requires that completed flight preparation forms shall be kept by an operator for a period of three months. The State of the Operator may require that additional records be kept and/or that records be kept for longer periods. In addition, the operator may decide to keep other records for his own purposes. The operations manual should describe which records are to be kept, how and where they are to be stored, who may have access to them, and how long they are to be retained. The role of the flight crew in returning various documents to the main operations office should be emphasized. It will be necessary to detail which records the crew must return. An example of one State’s requirements on records to be kept and an operator’s instruction on records to be returned post-flight is shown at Attachment E to this chapter.

7.12 CONCLUSION

In summary, a system of disseminating information from AIS, MET, and from the company’s own internal system concerning matters relevant to the conduct of operations and to the pre-flight planning process should be established. This system must be described in the operations manual, as should the administrative responsibilities for overseeing the working of the system. An indication should be given of the information that should be made available, of the forms and documentation that should be supplied, and of the records, both pre-flight and post-flight, that should be retained. In addition, the operations manual should indicate the responsibility for administering the manuals retained in the operations office and, as appropriate, the documents that go to make up the aircraft library. The operations manual should specify the pre-flight duties of the flight crew and of the flight operations officers/flight dispatchers and, where appropriate, assign the different pre-flight functions among these groups.
INTENTIONALLY LEFT BLANK
(AIRLINE)

NOTICE TO FLIGHT CREW

ADMINISTRATIVE NOTICE:  NO. 01/81

APPLICABILITY:  ALL FLEETS

The summer flight schedule commences on 1 April. All personnel note the revised departure times.

Issued by:  Operations Director

Date issued:  1 March 1990

Valid until:  30 September 1990

Signed  . . . . . . . . . . . . . . . . . . . . . . . . . .

(Name)
A-2. Example of an operational notice

(AIRLINE)

NOTICE TO FLIGHT CREW

OPERATIONAL NOTICE: NO. 10/81
APPLICABILITY: B-707/B-747/DC-10

With reference to the newly introduced schedule from ABC to XYZ, will Captains please uplift maximum fuel out of ABC (preferably round-trip fuel) because of the high cost of fuel at XYZ.

Issued by: Chief pilot
Date issued: 1 January 1990
Valid until: Further notice

Signed . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
(Name)
A-3. Example of a technical notice

(AIRLINE)

NOTICE TO FLIGHT CREW

TECHNICAL NOTICE: NO. 02/81

APPLICABILITY: B-707 FLEET

225 mph tires are now fitted to all company B-707 aircraft. This will permit operations from all listed aerodromes without tire speed limitations.

Issued by: Fleet Manager, B-707 Fleet
Date issued: 12 January 1990
Valid until: The notice is incorporated in the operations manual.

Signed. ........................................
(Name)
B. Sample landing incident report form

<table>
<thead>
<tr>
<th>REPORT: Landing Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fit No</td>
</tr>
<tr>
<td>Nature of Incident</td>
</tr>
</tbody>
</table>

### Weather
- Current ATIS or official weather sequence at time of incident
- Pilot's observation
  - CEILING
  - VISIBILITY
  - PRECIPITATION
  - TURBULENCE
- Tower reported wind

### Approach
- Landing weight
- Airspeed
  - APPROACH
  - THRESHOLD
  - TOUCHDOWN
- Flap setting
- Height
  - OM
  - GS RELATIONSHIP
  - M
  - M
  - G/S RELATIONSHIP
- Height overthreshold

### Landing
- Type of landing
  - NORMAL
  - HARD
  - OVERWEIGHT
  - OTHER
- Aircraft altitude on touchdown (nose high, wing down, etc.)
- Distance of T/D from threshold ft.
- Landing roll ft.
- Runway remaining ft.
- Distance down runway reversing initiated ft.
- Visibility on runway after touchdown

### Braking
- Reversing symmetrical?
  - YES
  - NO
- Describe spoiler deployment
- How soon were brakes applied after T/D?
- Were brakes applied before reversing?
- Was braking intermittent or continuous?
- Was anti-skid action checked?
- What was flap position during landing roll?
- Was emergency braking used?
- What technique was used for maximum braking?
- Was all aircraft and ground equipment functioning normally prior to incident?
  - YES
  - NO

Follow-up info desired
  - YES
  - NO

Captain's Signature
B-2. Sample lightning strike report form

### REPORT: Lightning Strike / Static Discharge — Turbulence

~ Lightning Strike / Static Discharge ~ Turbulence

<table>
<thead>
<tr>
<th>Fit No. / Date</th>
<th>Date of encounter</th>
<th>A/C No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Captain</th>
<th>Time of event (Z)</th>
<th>Geographic location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aircraft

<table>
<thead>
<tr>
<th>OAT °C</th>
<th>IAS Kts</th>
<th>Weight Pounds</th>
<th>Power setting T/O CLIMB CRUISE IDLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Landing gear</th>
<th>Flaps / Leading edge devices</th>
<th>Flaps / Leading edge devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ UP ~ DOWN</td>
<td>~ RETRACTED OR % EXTENDED</td>
<td></td>
</tr>
</tbody>
</table>

### Flight Procedure / Precipitation

~ Take-off ~ Climbing ~ Level of cruising ~ Descending ~ Landing ~ Holding
~ On top ~ Below cloud ~ Between layers ~ Instruments ~ No cloud ~ Between buildups

~ Rain ~ Sleet ~ Hail ~ Snow ~ None

---

#### for LIGHTNING strike / STATIC discharge

Electrical activity noticed before discharge
~ St. Elmo's fire ~ Radio static ➤ ~ Audio ~ Visual ~ None

Remarks was turbulence present? ~ YES ~ NO

Effects on crew
~ Acoustical shock ~ Electrical shock ~ Flash blindness

Other / Explain: Effect on equipment – interference / other (to nav aids / communications / autopilot / etc.)

Explain:

#### for TURBULENCE encounter

Type of turbulence
~ Frontal / Weather related ~ Clear Air (CAT) ~ Wake

Describe – Weather – Relationship to / Speed of jet stream etc.

Duration of turbulence Intensity of turbulence
~ Moderate ~ Severe ~ Extreme

#### for BOTH

Aircraft damage

Passenger / Crew injuries – describe

First Officer’s Signature Captain’s Signature
### B-3. Sample breach of air regulations report form

**REPORT: Breach of Air Regulations / ATC Irregularity / Air Miss**

<table>
<thead>
<tr>
<th>~ Breach of Air Regulations</th>
<th>~ ATC Irregularity</th>
<th>~ Air Miss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captain</td>
<td>F/O</td>
<td>Fit No.</td>
</tr>
<tr>
<td>A/C type (reporting A/C)</td>
<td>Registration</td>
<td>A/C No.</td>
</tr>
</tbody>
</table>

**Location / Weather**

- Location (give miles & direction from radio fix or known geographical position)
- General weather at time of incident

**Flight Procedure of REPORTING Aircraft**

<table>
<thead>
<tr>
<th>~ Visual</th>
<th>~ Instruments</th>
<th>~ On Top</th>
<th>~ Between Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ Take-Off</td>
<td>~ Climb</td>
<td>~ Cruise</td>
<td>~ Descent</td>
</tr>
<tr>
<td>~ Cruise</td>
<td>~ Descent</td>
<td>~ Landing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Time of incident (L.S.T.)</th>
</tr>
</thead>
</table>

**Flight Procedure of OTHER Aircraft**

<table>
<thead>
<tr>
<th>~ Visual</th>
<th>~ Instruments</th>
<th>~ On Top</th>
<th>~ Between Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ Take-Off</td>
<td>~ Climb</td>
<td>~ Cruise</td>
<td>~ Descent</td>
</tr>
<tr>
<td>~ Cruise</td>
<td>~ Descent</td>
<td>~ Landing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Altitude of conflicting traffic or reported A/C</th>
<th>Type, markings and other available details of reported A/C</th>
</tr>
</thead>
</table>

**Details of Incident**

Give proximity, manoeuvre etc. if other A/C or traffic involved

**Follow-up information desired?**

- Yes
- No

**Was report made by radio to appropriate ATC Centre?**

- Yes
- No

If YES, via what facility?

---

Captain’s Signature
B-4. Sample post-flight report on inadequacies in the State and operation of air navigation facilities

Aircraft nationality or common mark and registration mark:

Owner/Flight No.:

Departure aerodrome: ATD (UTC):

Arrival aerodrome: ATA (UTC):

<table>
<thead>
<tr>
<th>Facility</th>
<th>Location</th>
<th>Details of inadequacy*</th>
<th>Time of observation</th>
</tr>
</thead>
</table>

Date: 

Signature of Pilot

* Includes flight altitude/level distance and bearing from the facility or facilities observed.
B-5. Example of airport deficiency reporting from an operations manual

Airport deficiency reporting

1.1 A system of deficiency and inadequacy reporting of safety-related facilities and services covering the route structure has been established in association with ground operations.

1.2 Ground operations, through company personnel and representatives at outstations, will deal with ground-related facilities, such as rescue and fire fighting facilities, security, snow removal, and ramp safety. As well as reporting on area, approach, landing and runway facilities, it is envisaged that other aspects, such as taxiways and ramp markings, although primarily associated with ground operations, are of immediate concern to flight crews.

1.3 This information, when collated, will form the brief for company representatives attending airline operations committee meetings held at each airport being served, where remedial action will be sought.

1.4 To enable an up-to-date record of operational deficiencies at airports served by the company to be maintained, flight crews are urged to report deficiencies in the following areas:

1.4.1 Runways, taxiways, ramp: surface condition, painted markings, lighting, cleanliness.

1.4.2 Obstacles: marking and lighting.

1.4.3 Approach lighting and VASIS.

1.4.4 Air traffic control, NOTAM, ADIs.

1.4.5 Navigation aids.

1.5 This listing is not comprehensive and should not be seen as such. Consequently, flight crews should advise on any deficiency which in their experience constitutes a hazard or inadequacy. Reports should be made by way of the captain’s special report and should be marked “airport deficiency report”.
Attachment C to Chapter 7

Example of flight crew pre-flight duties from an operations manual

PRE-FLIGHT DUTIES

1. Reporting for duty

1.1 Pilots will report for duty at the times shown in the pilots’ roster.

1.2 Long-haul pilots will also phone crew control one hour before reporting time, for all duties.

2. Punctuality

2.1 In order to meet the company’s standards of punctuality, the following criteria must be met:

2.1.1 Flight crew should check in immediately on arrival at the airport and not later than the reporting time specified on the roster.

2.1.2 Flight crew must be in operations, in uniform, at the reporting time specified on the roster.

2.1.3 Whenever, for any reason, a pilot is unable to report for duty, the earliest possible notification must be given. Only in the most exceptional circumstances should this be less than the reporting time, minus one hour.

2.1.4 Flight crew on airport reserve duties, when not available in the briefing/planning office, are personally responsible for ensuring that their whereabouts are known at all times.

2.1.5 Flight crew on reserve-on-call (ROC) must register a telephone number with crew control at commencement of ROC. They must be available at this number for the duration of the ROC.

2.1.6 Flight crew must report punctually for all other rostered duties, including company and State medicals, training, drills, briefings, etc.

2.2 Failure to meet these criteria will be regarded as a matter of discipline, in accordance with current staff regulations for all employees. Any deviation from the above standards must be explained in writing, without delay to the chief pilot.

3. Reporting for duty — outstations

3.1 Crews should depart from the hotel at the time indicated on their roster or, when no such time is indicated, in sufficient time to ensure adequate completion of all pre-flight duties. In no case should they report to the airport less than thirty minutes prior to stated departure time (SDT).

4. Pre-flight preparations

4.1 On arrival at operations, the captain and co-pilot pre-flight duties are as follows.

4.1.1 Captains

4.1.1.1 Collect the meteorological folder, study the forecasts and, after MET briefing, brief the co-pilot and inform him of the routing, alternates, fuel requirements and any other decision necessary for operation of the flight.

4.1.1.2 Collect and read the daily NOTAM and check the notice board for latest airport and ATC information.

4.1.1.3 Read relevant notices to crew, other relevant briefing material and cross-check route guides and Nav Bag contents.

4.1.1.4 Check and sign all flight plans and confirm ATC flight plans (including repetitive flight plans).

4.1.1.5 Ensure final fuel load is passed to load planning as early as possible.

4.1.2 Co-pilots

4.1.2.1 Collect the route bag.

4.1.2.2 Prepare and sign the operational flight plans and ATC flight plans (if not repetitive flight plans) and submit them together with those prepared by operations control to the captain for checking and signature, drawing attention to any pertinent factors.

4.1.2.3 Pass fuel and regulated take-off mass information to load control, together with any revisions, in sufficient time to allow fuelling to be completed by STD-20.

4.1.2.4 Read daily NOTAM, relevant notices to crew.
4.1.2.5 Cross-check contents of route guide for validity against checklist.

4.1.2.6 Check contents of route bag against current contents checklist.

4.1.2.7 Check notice board for latest ATC and airport information.

4.1.3 Flight engineers/second officers

4.1.3.1 Flight engineers and/or second officers will read the relevant flight crew instructions, receive the appropriate checklist and proceed to the aircraft. The flight engineers and/or second officers will then carry out the aircraft pre-flight check and will be responsible for checking that the correct amount of fuel is on board.
Attachment D to Chapter 7

Example of flight operations officer/flight dispatcher pre-flight duties from an operations manual

Pre-flight duties

The flight operations officer/flight dispatcher on duty shall, one hour before the scheduled departure of a company flight, have:

- thoroughly analysed the possible effects of the weather on the route to be flown in the light of meteorological reports and forecasts for the destination and alternate aerodromes; recent weather reports and forecasts for the route and areas adjacent to it; and current weather maps;

- decided, if empowered to do so, whether to delay, consolidate or cancel the flight or otherwise decide on a possible route or alternative routes which may be flown safely and in accordance with company procedures and standards, taking into account likely weather conditions at the destination and alternate aerodromes; en-route weather; and the maximum fuel load possible. This last factor will have been calculated by deducting from the regulated take-off weight of the aircraft the aggregate of all other weight elements;

- prepared an operational flight plan consistent with standard instrument departures, noise abatement operational procedures, ATC regulations and the regulations of all the States to be overflown, for the consideration of the pilot-in-command;

- collected the latest available data on standard instrument departures, en-route facilities, noise abatement operational procedures, navigation aids, aerodrome facilities, ATC and communications procedures, OTAM, runway conditions, search and rescue facilities and other information and regulations likely to affect the flight.

Note.— It is important for the flight operations officer/flight dispatcher and the pilot-in-command to keep in mind that a flight shall not commence unless the pilot-in-command is, by every reasonable means at his disposal, satisfied that the communication and navigation facilities essential to the route are in satisfactory condition and that the ground and/or water facilities available and directly required for the safe operation of the flight are adequate for the type of operation to be conducted.

On arrival of the pilot-in-command, the flight operations officer/flight dispatcher shall:

- attend the meteorological briefing with him;

- show him the route analysis and the operational flight plan he has prepared, bringing to his notice the factors that have influenced the choice of route;

- obtain his concurrence with the operational flight plan;

- countersign the operational flight plan after the pilot-in-command has signified approval by signing it;

- furnish the pilot with all latest available information on the route to be flown;

- prepare the ATC flight plan for the pilot-in-command's signature; and

- file the ATC flight plan.
FLIGHT RECORDS

Completion and disposition of flight records

Completing flight records. Pilots will complete the following records, en route and on termination of a flight:

a) All flights:
   1) aircraft and engine log books
   2) incident reports, if required
   3) fuel log record
   4) flight log;

b) Overseas flights:
   1) revised upper air contour chart
   2) flight progress chart.

Disposition of flight records. Flight records will be filed by the first or second officer on return to base in the following order.

Do not staple more than one date together and file separately for different captains.

When filing flight records that do not include a flight log/flight plan, the top form shall indicate all the flight numbers for which forms are attached. Also, if flight plan comments have been written on any attached form, include the notation “FPC” in bold letters.

File the flight records in the following order:

a) flight plan — log side up;

b) ATS flight plan;

c) route and terminal forecasts;

d) B-747, L-1011, DC-8 and B-727 — fuel log record;

e) DC-8 freighter, B-747, L-1011, and B-767 cargo load verification sheet;

f) nav data card and/or datalink clearance message;

g) B-747, L-1011, DC-8 and B-727 — completed fuel log book for forwarding to engineering.
### E-2. Example of retention of records from one State’s requirement

#### Retention of records

<table>
<thead>
<tr>
<th>Record Type</th>
<th>Retention Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commanders’ discretion reports</td>
<td>6 months</td>
</tr>
<tr>
<td>Flight briefs for commanders</td>
<td>3 months</td>
</tr>
<tr>
<td>Flight plans/navigation logs (PLOGS)</td>
<td>3 months</td>
</tr>
<tr>
<td>Flight times, duty and rest records</td>
<td>12 months</td>
</tr>
<tr>
<td>Fuel howgozit/in-flight records</td>
<td>3 months</td>
</tr>
<tr>
<td>Loadsheet</td>
<td>6 months</td>
</tr>
<tr>
<td>Telecommunications log, if any</td>
<td>6 months after last entry</td>
</tr>
<tr>
<td>Voyage report from captain</td>
<td>company’s discretion</td>
</tr>
</tbody>
</table>

#### Records to be kept — Technical

<table>
<thead>
<tr>
<th>Record Type</th>
<th>Retention Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft log book</td>
<td>2 years after aircraft destroyed or withdrawn from use</td>
</tr>
<tr>
<td>Certificate of compliance</td>
<td>2 years after expiry or after aircraft destroyed</td>
</tr>
<tr>
<td>Certificate of maintenance</td>
<td>2 years after expiry</td>
</tr>
<tr>
<td>Certificate of release</td>
<td>2 years after expiry</td>
</tr>
<tr>
<td>Engine log book</td>
<td>2 years after aircraft destroyed or withdrawn from use</td>
</tr>
<tr>
<td>Flight data recorder trace</td>
<td>the last 25 hours</td>
</tr>
<tr>
<td>Voice recorder</td>
<td>after incident as directed</td>
</tr>
<tr>
<td>Propeller log book</td>
<td>2 years after aircraft destroyed or withdrawn from use</td>
</tr>
</tbody>
</table>
Chapter 8

OPERATIONS SUPERVISION — FLIGHT

8.1 INTRODUCTION

An operator will need to specify the procedures and policies that will be adhered to during flight operations as part of the “method of supervision” of flight operations required by Annex 6, Parts I and III. Information on the piloting of the aircraft, the in-flight procedures, the normal, abnormal and emergency procedures, etc., is normally provided in the aircraft operating manuals, the checklists and the other documentation supplied by the manufacturer. These documents form part of the operations manual. However, an operator will need to give additional guidance in the operations manual on those procedures and methods of operation which are of a more general nature, such as policy on co-pilots flying the aircraft, or on the contents of passenger cabin briefings. This chapter attempts to identify those issues which would typically be addressed by the operator in the operations manual.

8.2 FUELLING

8.2.1 The operations manual should include details of the procedures and policies to be followed while refuelling aircraft. This would include instructions on the procedure to be followed to ensure that the planned fuel load is on board. This means that besides checking quantities on the aircraft’s gauges there must be an independent check, such as by dip-stick or by checking the fuel bowser quantities delivered, etc. The actual detail will vary from type to type but it is essential that there be two completely independent checks. There will inevitably be differences in the quantities recorded by the different means of measurement, and the operations manual must specify the acceptable limits for different aircraft types and for different fuel quantities. The operations manual must also give details of the other necessary checks, such as water contamination checks, and on when and where they are required. In addition to these specific directives the operations manual may also contain a list of general precautions to be observed during aircraft fuelling.

8.2.2 Annex 6, Parts I and III, has a number of requirements relating to the precautions that are necessary when refuelling takes place with passengers on board. Guidance on safe refuelling practices is given in the ICAO Airport Services Manual (Doc 9137), Part 1.— Rescue and Fire Fighting. Specific instructions based on this material must be given in the operations manual. In particular, the operations manual must clearly identify the “qualified personnel” required to man the aircraft during these operations. A note to the Standard in the Annex states that additional precautions are required when refuelling with fuels other than aviation kerosene, when refuelling results in a mixture of aviation kerosene with other aviation turbine fuels or when an open line is used. This is necessary because of the greater risk associated with the use of wide cut fuels, and with the mixture of these fuels with kerosene. An example of the information given by one operator on these topics is shown at Attachment A to this chapter. Another point that should be addressed is the action to take in the event of a significant fuel spillage. The instructions given by one operator with respect to this are included in Attachment B to this chapter.

8.3 RECORDS TO BE LEFT WITH GROUND PERSONNEL

In addition to the flight preparation forms that are retained by the operator, it is the practice in a number of States to require that copies of the records regarding the technical serviceability of the aircraft, of the amount of fuel on board, the pilot’s dangerous goods notification form, and of the final version (i.e. including any last-minute changes) of the load and trim sheet are left with ground personnel. If this is a requirement (whether as part of a State requirement or not), details must be given in the operations manual. As well as specifying which forms are to be left behind, it is necessary to state to whom they are to be given, where they are to be retained or how they are to be returned to the operator for retention.
8.4 USE OF MINIMUM EQUIPMENT LIST (MEL) AND CONFIGURATION DEVIATION LIST (CDL)

The operations manual must describe how the minimum equipment list (MEL) and the configuration deviation list (CDL) are to be promulgated and used. The actual status of the MEL/CDL, i.e., whether they are approved by the airworthiness authorities, whether they have extra items added by the operator, etc., must be described. Generally, the MEL relates to items or equipment which may be inoperative without affecting the airworthiness of the aircraft. The CDL defines the panels or parts which may be missing from the aircraft structure without affecting airworthiness, but which normally have an effect on the aircraft performance. In some instances the MEL and CDL are combined in one document, whereas in other cases they are published separately. The operations manual must detail the procedures that will be followed when an aircraft is being dispatched with items or equipment unserviceable. This is especially important with items from the CDL, as these, by definition, have performance effects which must be taken into account during the flight planning process. Items from the MEL can also affect planning decisions. Therefore, a system for early notification to the flight crew of MEL and CDL items must be established. When an aircraft has an MEL or CDL defect, the defective equipment or its controls or indicators must carry placards to alert the crew. In addition, it is normal practice to enter the details of the defect in the log book used for recording technical defects. While ultimately the pilot-in-command must decide as to whether to operate an aircraft with a defect, the operator should give some guidance where possible. This would be particularly important when considering different combinations of failures. MEL and CDL lists are normally designed for use before flight; however, they are often consulted during flight when the operational effects of a failure are being considered. Where it is feasible to do so, an operator should give guidance in this respect as well. Operators often list those preferred aerodromes to which aircraft should divert in the event of a failure in flight, so that the defect can be rectified before another flight is undertaken.

8.5 PASSENGER CABIN BRIEFINGS, INSTRUCTIONS AND COMMUNICATIONS

8.5.1 Annex 6, Parts I and III, requires that certain information and instructions be given to passengers. This will normally consist of a briefing on, and demonstration of the safety equipment, features and procedures of the aircraft. Normally this takes place before take-off. In addition, passenger emergency instruction cards should be available at each passenger seat. The operations manual should detail the contents of the passenger briefing and demonstration to be given by the cabin attendants. Typically this will include information on emergency exits; emergency equipment; use of seat belts (including advice on keeping seat belts fastened at all times); no-smoking areas and restrictions; observing seat belt/no-smoking signs and, when appropriate, information on, and a demonstration of passenger oxygen masks; and for flights where required, location of and instruction in use of life jackets. Although the requirement is to brief passengers when the equipment is required to be carried, many operators interpret this liberally and specify that a briefing should include instruction on use of all the safety equipment on board and not just that required for a particular flight.

8.5.2 In addition, the operations manual should give guidance to the pilot-in-command on when he should turn on and off the seat belt sign, and also on communicating with the cabin crew when he considers that they should also resume their seats and wear their safety belts or harnesses. The manual should specify standardized signals between the cockpit and cabin, such as a signal prior to commencing take-off, or prior to landing. A standardized report for the cabin crew to inform the pilot-in-command that the passenger cabin is prepared for take-off or landing. A standardized report for the passenger cabin and on the need to include instructions in the passenger briefing. Certainly the use of radios, radio-controlled toys, portable telephones and portable television sets should be forbidden as these may interfere with the aircraft navigation systems. Other electronic devices such as personal computers, calculators, etc., may also cause interference, but the range of possibilities is such that it is impracticable to give guidance here and operators will, depending on the type of aircraft and navigation equipment involved, have to develop their own instructions.

8.6 IN-FLIGHT PROCEDURES

8.6.1 General

The operations manual should spell out those policies and procedures of which the flight crew should be aware and which they should follow during flight operations. The list of topics that the operator should address will be related to the type of operation and its complexity, but typically would include at least those described in 8.6.2 to 8.6.13 below.
8.6.2 Standard operating procedures

Standard operating procedures consist of the procedures described in the operations manual (in-flight procedures), the flight profiles and patterns described in the aircraft operating manual, the standard call-outs, the standardized use of checklists (both normal, abnormal and emergency) and the allocation and division of duties among flight crew members. Adherence to these standard procedures is essential to a safe operation. The operations manual must specify that compliance with standard operating procedures is required at all times. Any deviation from standard operating procedures must be challenged immediately by the other flight crew members. If the deviation is not rectified or if there is no reaction, subtle incapacitation must be assumed and the appropriate action taken to restore the flight to correct operation.

8.6.3 Cockpit discipline

The avoidance of non-essential conversation during critical periods of flight should be emphasized, as should the need for the pilot-in-command to ensure that other activities, such as keeping log books, technical logs, etc., do not interfere with the primary duty of all flight crew members to monitor safe progress of flight. The need to keep a good look-out at all times, the proper use of radiotelephony techniques, the monitoring of radios, the wearing of head sets, seat belts, harnesses, etc., are all topics that should be addressed in the operations manual.

8.6.4 Use of checklists

The proper use of checklists, both normal and emergency, is essential to safety. The operations manual must contain instructions on the standard use of checklists. The actual method of using checklists will vary from one aircraft type to another. Some aircraft checklists are only read as a check or back-up when the actual required actions are complete. Other checklists are intended to be used as requiring an action in response to the item called out. The number of flight crew will also affect the form a checklist will take. In any event, it should be clearly specified in the operations manual who will read the checklist and who will carry out the required actions, or confirm that the required actions have been carried out and make the required response. It is usually specified as well that each item on the checklist must be responded to before the check can continue. It might also be specified that certain checks must be read by a specific crew member. For example, it might be specified that the pre-start check must be read by the co-pilot and answered by the pilot-in-command. Emergency checklists usually have a number of drills that contain “memory items” and the checklist will normally be used to confirm that these memory items have been accomplished. An example of the instructions on the use of checklists from an operator’s manual is shown at Attachment C to this chapter.

8.6.5 Aircraft ground-handling communications

The operations manual must detail standard methods of communication between the ground crew and the flight crew. This should cover both ground-to-cockpit intercom and hand signals. A set of standardized phrases must be described for use on intercom during engine-starting, push-back, towing and parking. For engine-starting, the phraseology should address both normal engine starts and non-normal starts, such as the use of external batteries or high-pressure bottles. A description must be given of the signals to be used when intercom is not available. Marshalling signals are described in Appendix I to Annex 2 — Rules of the Air. A copy of these signals should be made available in the operations manual, or be prominently displayed where both ground personnel and flight crew can see them. A poster entitled Marshalling Signals (P707) is available from ICAO. An example of the type of guidance one operator gives on standard intercom phraseology is given at Attachment D to this chapter.

8.6.6 Taxiing

The aircraft operating manuals usually give information on turning radii, propeller clearances, jet efflux, ingestion dangers and the effect of long taxiing distances and excessively harsh braking on tire temperatures. The operations manual should give general instructions on the need to exercise due care while taxiing an aircraft. An example of the information provided in one operator’s manual is shown at Attachment E to this chapter.

8.6.7 Take-off and landing data

The operations manual should describe how the operational figures, take-off speeds $V_1$, $V_r$, $V_2$, the landing reference speed $V_{ref}$, the engine power settings, etc., are to be derived and by whom. It should also be specified how these figures are to be cross-checked. If take-off and landing data cards are used, the manual should indicate what information is to be shown on the card, who should derive the data, and how it is to be cross-checked.

8.6.8 Briefings

Guidance should be given on standard briefings. The briefing for take-off would typically include actions in the event of an emergency before, at or after decision speed ($V_1$); identification of non-standard procedures such as
8.6.9 **Standard call-outs**

Guidance on standard call-outs should include the particular speeds to be called during take-off, standard calls after take-off, standard calls en route, standard calls changing altitude or flight level, standard instrument cross-check call after take-off and at top of descent. The standard call-outs during approach should include speed deviations, deviations from the glide slope/localizer and standard height calls. The points at which calls should be made during a precision approach should be identified, such as 1 500 ft/outer marker, 500 ft, 100 ft to "decision". Standard calls for the transition to landing phase should be established, such as runway in sight, airspeed, and rate of descent. Standard calls during the landing roll should be established, such as speeds and reverse power settings. Standard calls during the missed approach, the go-around call and configuration and power-setting calls, instrument cross-checks and height checks should also be established. An example of an operator's instructions on standard call-outs is shown at Attachment F to this chapter.

8.6.10 **Standard noise abatement procedures**

Standard noise abatement procedures should be described. This may include information on noise-sensitive aerodromes, on the use of preferential runways for take-off and landing, on the use of preferential routes during the take-off and approach phase, and the use of specific procedures during take-off and landing. Information on noise abatement procedures is given in Part V of the ICAO Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume I, and this document should be consulted when specifying particular procedures for the operations manual.

8.6.11 **Altimeter procedures**

Although there will be specific procedures relating to altimetry and allowable tolerances, etc., for each aircraft type in the aircraft operating manual, it is still necessary to detail over-all guidance and policy on this subject in the operations manual. Typically this would consist of information on accuracy checks to be carried out, both altimeter-to-altimeter and altimeter-to-true altitude, on the ground and during the flight. Instructions should be given on the procedures and cross-checks to use when changing from standard pressure to local pressure (QNH) and, where appropriate, from QNH to QFE and vice versa. A system of cockpit cross-checking should be detailed for each of these changes and guidance given on the procedures to follow in the event of a difference between the altimeter readings. Typically this would specify that in cruise, at higher levels, the level flown should be the average of the readings. During descent, or when terrain clearance is a factor, the lower reading should be used. Finally, during the approach a check can be made when crossing the outer marker or any other point with a known glide slope crossing altitude, bearing in mind that the glide slope, etc., can also be in error. Where radio altimeters are part of the aircraft’s equipment, instructions should be given on their use. This would normally indicate when and how they are to be used recognizing that these procedures would normally be different for the differing types of approaches that might be flown. For example, the operations manual could specify that the radio altimeter is to be set at 1 500 ft initially, and after passing that height the decision height is only to be set for Category II and Category III approaches. Useful information and guidance on altimeter setting procedures are provided in PANS-OPS (Doc 8168), Volume I, Part VI.

**Note 1.** QNH or “altimeter setting” is that value of the pressure for a particular aerodrome and time which, when set on the subscale of a standard altimeter, will cause the altimeter to indicate its elevation (above mean sea level).

**Note 2.** QFE is that value of the pressure for a particular aerodrome and time which, when set on the subscale of a standard altimeter, will cause the altimeter to indicate its height above aerodrome elevation or threshold elevation.
8.6.12 Fuel remaining — shortage of fuel

The operations manual should contain guidance on the actions the operator requires of pilots when the fuel remaining on board the aircraft is reducing towards the amount required to fly to the destination alternate and it is not possible to land at the intended destination. The operations manual should be specific in instructing pilots-in-command that they proceed to the destination alternate no later than when the fuel state reduces to that required for the diversion, which includes the holding fuel at the alternate. The operations manual should also state that when a pilot-in-command believes that the fuel state is problematical, in terms of time remaining airborne, or when it has reduced below the point at which a diversion should have been made, the pilot must declare an emergency with the reason for the emergency — shortage of fuel — and giving the flight time remaining in minutes, in order to obtain priority from the air traffic services. The manual should contain specific examples such as an unexpectedly long holding time due to bad weather and/or an adverse traffic situation.

8.6.13 Stabilized approaches

Each aircraft type will have recommended procedures, for airspeed and configuration changes, etc., during the approach and landing. In addition to these, the operations manual should detail over-all policy guidelines on the need for all aircraft, but especially for large turbine-powered aircraft, to use stabilized approach techniques. The operations manual should emphasize that stabilized approaches must be flown. Typically it is specified that the aircraft must be stabilized with reference to speed, configuration and power by a certain height or a go-around must be executed to recommence the approach. An example of guidance from an operator’s manual is shown at Attachment G to this chapter.

8.7 ADVERSE WEATHER OPERATIONS

8.7.1 General

The operations manual must contain information and guidance on flight operations in adverse weather conditions. This should consist of a statement of the operational policies related to flight in these conditions, and would normally give some information on the weather phenomena involved. A typical list of topics addressed would be operations from contaminated runways, ground operations in adverse weather, aircraft ground icing, thunderstorm avoidance, turbulence, in-flight icing conditions and wind shear.

8.7.2 Operations from contaminated runways

Information on the effect of runway contamination (snow, slush, ice, standing water, etc.) on aircraft performance is included in the performance information. In this section of the operations manual, additional information on runway contamination could be given. Examples would be information on methods of measuring runway coefficient of friction, on aquaplaning and on definitions of wet snow, slush, etc. An example of the information presented in an operations manual is at Attachment H to this chapter.

8.7.3 Ground operations in adverse weather

Of primary interest under this heading is the effect of ice on an aircraft. Normally, the operations manual would define what icing conditions are, i.e. those conditions during which it is necessary to begin taking precautions against the possible occurrence of ice on the aircraft’s surfaces. These conditions can prevail when the reported temperature is still well above freezing. It is normally stated that precautions must be taken any time the temperature is below 10°C and visible moisture is present. Obviously as the temperature decreases the possibility of icing increases and the type of icing that may be experienced will also change. The operations manual should give information and guidance on the different types of ice that may be experienced, on how icing conditions may be recognized and on the means of guarding against and removing the ice. Different types of anti-icing and de-icing fluid are usually approved, as are different methods of removing ice from the aircraft’s surfaces. Information and guidance must be given on these factors, as must information on the holdover times of the different fluids, of the different mixtures and of combinations of fluid. An example of the information given by an operator is at Attachment I to this chapter. In addition to information on anti-icing and de-icing, the operations manual should give guidance on the problems caused by ice- and snow-covered aprons and taxiways for aeroplane taxiing, push-backs and parking. The operations manual should also give the wind speed limits for operation of integral aeroplane airstairs, passenger and cargo doors, etc. Guidance on aircraft icing on the ground, de/anti-icing fluids, holdover times and de/anti-icing procedures and training is given in the Manual of Aircraft Ground De/Anti-icing Operations (Doc 9640).

8.7.4 Thunderstorms

8.7.4.1 The dangers that thunderstorms pose for aircraft are well known. The operations manual should give information on the different causes of, and forms that thunderstorms can take. Typically this would include information on thunderstorms associated with frontal
8.6 Preparation of an Operations Manual

regard is reproduced in Attachment J to this chapter.

the storm. The guidance provided by an operator in this

vary for aircraft type and height, and apparent severity of

margin by which the storm should be avoided. This may

navigate thunderstorms, advice should be given on the

should be established. Where it is possible to circum-

(even for large turbine-powered aeroplanes) that

turbulence airspeeds and power settings, on the correct

information should also be given on the recommended

turbulence activity cannot be avoided all the time and that, on occasion,

inadvertent penetration of thunderstorms will take place. Guidance should be given on the precautions that must be taken when flying in areas of thunderstorms. This guidance would include the need for passengers and crew to be seated and wearing safety belts, tidying and stowing away loose objects on the flight deck, switching on cockpit lights to minimize the blinding effects of lightning, etc. Information should also be given on the recommended turbulence airspeeds and power settings, on the correct aircraft handling techniques, and on the buffet margin (especially for large turbine-powered aeroplanes) that should be established. Where it is possible to circum-navigate thunderstorms, advice should be given on the margin by which the storm should be avoided. This may vary for aircraft type and height, and apparent severity of the storm. The guidance provided by an operator in this regard is reproduced in Attachment J to this chapter.

8.7.4.2 Weather radar. The operations manual should give information on the use and the limitations of weather radar. The aircraft operating manual may contain system description information and operating instructions for the radar system fitted. However, it is appropriate for the operations manual to expand on this material. Topics discussed might include radar return strength from different forms of precipitation (rain, ice, hail, etc.), interpretation of radar returns, and effect of radar controls (gain, antenna tilt, contour, etc.). The characteristics of the different types of radar that an operator might have on different aircraft in his fleet should be discussed. For example, an operator’s fleet might have both C band and X band radars and information on the different attenuation characteristics of these radars should be given. Another example would be the need, where necessary, to describe the differences between the “newer” flat plate and the “older” parabolic-type antenna and the need to interpret the returns differently.

8.7.5 Turbulence

Turbulence that is not associated with cloud conditions (i.e. clear air turbulence (CAT)) is difficult to detect. However, a knowledge of the conditions associated with the presence of turbulence, both CAT and turbulence associated with cloud, can aid in avoidance. The operations manual should give information on this subject, particularly on turbulence associated with the jet stream and on turbulence caused by mountain waves. Guidance should be given on avoiding turbulence and on the actions to take if an inadvertent encounter should occur. This should cover not only the appropriate flying technique, which is generally not different from the technique appropriate to thunderstorm encounters, but should also give advice on the quickest method of exiting from an area of clear air turbulence. An example would be that the jet stream should be crossed at right angles when turbulence is known or suspected to be present.

8.7.6 Flight in icing conditions

As well as discussing the effect of, and the appropriate precautions against, icing on the ground, the operations manual should discuss the problems associated with encountering icing conditions during flight. To an extent, the severity of the problems associated with this condition varies with different aircraft. Icing does not have as great an effect on the aerodynamics of large turbine-powered aeroplanes during cruise, as it does on smaller propeller-driven aeroplanes which normally operate at levels where exposure to icing conditions is much greater. Nevertheless, icing does present dangers for all aircraft, such as the danger to the correct functioning of pitot-static systems or the detrimental effect the icing can have on the power output of engines, both turbine and piston. The operations manual should give guidance on these topics appropriate to the aircraft being operated and to the environment in which it operates.

8.7.7 Wind shear

Although methods of recognizing the presence of wind shear and the appropriate piloting actions to take if shear is inadvertently encountered will be addressed in the training section of the operations manual, it is necessary to give additional information in this section. The different types of conditions where shear can be experienced such as thunderstorms, gust fronts, frontal shears, mountain waves, etc., should be discussed. The effect of shear on aeroplanes should be described and it should be emphasized that some shears (microbursts) can be of such intensity aeroplanes cannot successfully fly through them. Information should also be given on systems which are designed to detect the presence of shear, such as the low-level wind shear alert system (LLWAS), and of the limitations of these systems. The technology of wind shear detection and reporting and the recommended flight techniques are becoming available. Refined techniques will be recommended for flight in wind
Chapter 8. Operations supervision — flight

8.7.8 Pilot reports

All the above weather phenomena, if encountered when not forecast, should form the basis of a pilot report. A report may be a special aircraft observation, e.g. where the phenomenon is severe, or an observation during climb-out and approach. The latter report is especially important in the case of wind shear. The operations manual should give guidance on the form these reports should take and on the descriptive terms used. Except where regional supplementary procedures dictate otherwise, aircraft are required to make routine meteorological observations (AIREP). The operator must provide AIREP forms based on the form shown in the Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services (PANS-RAC) (Doc 4444) when his aircraft operate in areas or on routes where such reports are required. The operations manual should give instructions on the completion of this form.

8.8 WAKE TURBULENCE

The hazards associated with wake turbulence are well known. ATS apply the required longitudinal separation between aircraft. Guidance on the subject and on the separation minima that should be applied between different aircraft is given in the ICAO Air Traffic Services Planning Manual (Doc 9426), Part II, Section 5, Chapter 3. While this material was developed to assist States in establishing national procedures, it also provides a useful basis for the information that could be included in an operations manual. The actual advice given in the manual may be made more specific than that contained in the Air Traffic Services Planning Manual and may suggest distances and times that pilots of a particular aircraft type must endeavour to maintain.

8.9 VOLCANIC ASH

The operations manual should, where appropriate, contain information on the hazards to aircraft of flight in volcanic ash cloud. This should not only deal with the specific hazards of volcanic dust, but should also discuss recognition of an inadvertent encounter, as this can be very difficult at night or in cloud. The need to avoid flying in these areas and recommended recovery actions to restart engines should be discussed. An example of a procedure from one operator’s operations manual is shown at Attachment K to this chapter. Measures have been established to make information available on the possibility of a volcanic eruption affecting ATS routes. As part of the measures, the flight crew is requested to make a special air-report when a volcanic eruption is observed or when a volcanic ash cloud is observed or encountered. The form for the Special Air-report of Volcanic Activity is given in Appendix 1 to the PANS-RAC (Doc 4444). Information on volcanic activity affecting air routes is distributed through Class 1 NOTAM and through the use of SIGMET messages. The contents and forms of these messages and reports should be described in the manual.

8.10 NAVIGATION

8.10.1 General

Specific navigation procedures are dependent on the aircraft equipment, the route being flown and ATS requirements. Consequently, much of the guidance related to navigation procedures will be contained in the aircraft operating manuals or in the route training guidance. Nevertheless, overall policy and guidance on navigation procedures should be contained in the operations manual. General policy on the need to log, or record all clearances, for example, should be detailed, as should the need to keep a complete and accurate log of the navigation of the flight. The aim should be to keep a log such that the navigation of the flight could be accurately reconstructed subsequently.

8.10.2 Navigation log

The form that the navigation log will take may vary, not only from operator to operator, but also from flight to flight. For example, the log for a long-haul flight in minimum navigation performance specification (MNPS) airspace would be different to that required for a short-haul flight. However, all flight logs have a number of common features and instructions should be given in the operations manual on the need to properly log these basic details. These would typically include estimated arrival time at each reporting position, revised estimates, actual arrival time and altitude or flight level crossing each position. There should also be a requirement to log all ATS clearances. Fuel usage must also be logged, both as total quantity at a given time or position and as a measurement against planned usage or against fuel required at destination. These are the absolute minima and
an operations manual would normally go into considerably more detail based on the actual navigation log being used.

8.10.3 Airways navigation

Guidance on the proper methods of selecting, using, checking and monitoring the radio aids used for navigation should be given in the manual. This could include instructions on the need to always properly identify aids, to use all available aids to cross-check the primary aid being used for navigation, and to monitor aids continuously for the presence of warning flags, etc. The operations manual should stress that during approaches and landings, all available radio aids should be used, irrespective of the type of approach being flown, visual or instrument. The operations manual could also require that during departures the radio aids be set up in a standard manner so that, for example, the primary aids are set to show the initial track to the pilot flying and other aids are set to confirm this or to show necessary cross-tracks, etc. If there is an extra radio aid available, such as a standby VOR set or a second ADF, these could be set to give immediate return guidance to the take-off aerodrome.

8.10.4 Long-range navigation

8.10.4.1 Appropriate guidance must be given where long-range flights, requiring the presence of a navigator or the use of long-range navigation systems such as INS, OMEGA and GNSS, are undertaken. When a navigator is part of the crew, the operations manual will need to detail his responsibilities and duties. This could include responsibility for ensuring that the appropriate charts, navigation logs, manuals and serviceable navigation equipment are on board the aircraft. The primary method of navigation may be specified, e.g. Doppler or Loran. The actual details will depend on the equipment being used and the route being flown. The operations manual should detail the primary responsibility of the pilot-in-command for the safe navigation of the aircraft, and also give guidance on how the pilot and the navigator are to work together.

8.10.4.2 When long-range flights are undertaken and systems such as INS, Omega, Doppler, GNSS and Loran are used for navigation, but a flight navigator is not part of the crew, instructions for pilot navigation techniques and the associated procedures must be detailed in the manual. The operations manual must outline clearly who is responsible for navigation, how the navigation systems are to be set up (both pre-flight and during flight), how they are to be checked, and what record (log) is to be kept during flight. The need to continuously cross-check navigation systems against each other and against other sources of position information (such as off-track VORs, ADFs, etc.) must be emphasized. Information on and the limitations associated with using weather radar in the mapping mode to cross-check aircraft positions should be included. Typically, for long-range flights a chart is carried with the planned route plotted pre-flight. During the flight at each reporting point, or way-point, the pilots must check the navigation system present positions against the flight plan position, log the system position and verify that the track and distance for the next track are correct. In addition, the operations manual might specify that between way-points a check of the system position must be made at sector midpoint. Instructions could also be given on how the different systems are to be set up. For example, it could be specified that the pilot flying monitor cross-track, and the pilot not-flying monitor along track. The manufacturers of navigation systems normally supply pilots’ operating handbooks and it may be possible to incorporate these handbooks in the operations manual with very little alteration. However, it will probably be necessary to develop some additional procedures, reflecting the operator’s own methods of operation.

8.10.4.3 In addition to the above requirement, when flights are conducted in minimum navigation performance specifications (MNPS) airspace, the operations manual must give guidance on the procedures to be followed. These procedures should be based on ICAO Guidance and Information Material concerning Air Navigation in the NAT Region (T 13/5N) published by the European Office of ICAO. The North Atlantic MNPS Airspace Operations Manual issued by the United Kingdom Civil Aviation Authority, which is directed at flight crew, should also be consulted.

8.10.4.4 For the North Pacific Region the NOPAC manual published by the Federal Aviation Administration in the United States should be consulted. The procedures described in both the North Atlantic and North Pacific publications must be adhered to and the importance of such adherence in maintaining a safe and workable system must be emphasized, particularly as the great majority of track-keeping errors in these regions are attributable to errors in inserting and checking way-points. An example of instructions on long-range en-route navigation procedures is shown at Attachment L to this chapter.

8.11 EMERGENCY PROCEDURES

8.11.1 General

Although the actual drills and procedures to be followed in the event of an emergency are included in the aircraft
operating manuals and the associated checklists, it is necessary to provide some general guidance on the subject in the operations manual. This will consist of policy decisions, considerations and guidance which do not form part of the standard emergency drill but which still must be addressed. The following topics as a minimum should be addressed.

8.11.2 Rejected take-off decision

While the pilot-in-command is always responsible for this decision, there are a number of complicating factors. Primary among these is the decision process when the co-pilot is flying the aircraft. In any event the nature of the technical problem encountered, the speed of the aircraft and the length of runway remaining are all factors that must be considered in an extremely short period of time. The operations manual must give guidance and detail company policy on the subject. It goes without saying that after the take-off decision speed (V1) has been reached the take-off must be continued, but the policy on abandoning take-off at speeds below V1 must be detailed. Many operators specify that at high speed, for example, above 100 kt in a large transport aircraft, take-off shall only be abandoned for major failures, such as engine fire or failure, or the failure of a major system when continued flight would be hazardous. Some operators state that the “abandon” decision must always be made by the pilot-in-command. Other operators, at the pilot-in-command’s discretion, allow the decision to be delegated to experienced co-pilots. The responsibility for and the method of initiating a rejected take-off should be part of the briefing before a take-off. Because of possible areas of confusion that might arise when a problem which does not lend itself to simple analysis occurs during the take-off, many operators specify that the pilot-in-command clearly call out what his intentions are, so he will call “abandon take-off”, or, if a decision to continue is made, he will call out “continue”. The particular policy laid down in this regard by an operator will be dependent on a number of factors, such as aircraft type, number of flight crew, relative experience of flight crew members, etc. However, the operational policy must be clearly spelt out in the operations manual.

8.11.4 Overweight landings and fuel dumping

Many smaller aircraft have the same maximum mass limitation for both take-off and landing. Larger aircraft can have a considerable difference of mass between these two operational limits. On occasion, for emergency reasons, an aircraft may have to land immediately after take-off at a mass well in excess of the maximum permissible landing mass. Three- and four-engined aircraft normally have the facility to dump fuel and the procedures for this are given in the aircraft operating manual and in the appropriate checklists. However, many twin-engined aircraft do not have this facility and there will be occasions when they must land overweight. In addition, even for three- and four-engined aircraft there will be occasions when it is more prudent to land immediately, although overweight, than to attempt to dump fuel. The operations manual must give guidance and advice on the many factors that will need to be considered before a pilot-in-command decides whether to burn off fuel, to dump fuel or to land overweight. Factors that may need to be considered are the length of runway available, the runway condition (wet or dry, etc.) and the malfunction or failure that is the reason for the emergency landing, as for example, a hydraulic failure might mean that the braking capability of the aircraft is adversely affected.

8.11.5 Dangerous goods incidents

Training in dealing with dangerous goods incidents will be given to both flight crew and cabin crew as part of the dangerous goods training programme. In addition, the ICAO manual on Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481) gives guidelines to assist in developing emergency response procedures for dangerous goods incidents on board aircraft. This document may be incorporated in the operations manual or an operator may choose to develop procedures based on the material. In either case, the alphabetical and numerical list of dangerous goods and the associated emergency response drill chart should form part of the operations manual. An operator may specify the appropriate drill number for each dangerous goods item carried on the dangerous goods notification form.
8.11.6 Incapacitation

The operations manual should give guidance on the recognition of pilot incapacitation. Complete and sudden incapacitation is easily recognized, and the need for other flight crew members to take immediate and positive action to maintain a safe flight profile is obvious. The more insidious case is when the incapacitation is subtle or partial, and guidance should be given on recognizing these events at an early stage. This would typically consist of advice as to the type of deviation from normal, or standard, operating procedure that should alert other crew members to the possibility of incapacitation. Such incidents normally require that assistance be given by the cabin crew in handling the incapacitated pilot. The procedures involved normally form part of the recurrent training programme. An example of an operations manual guidance on pilot incapacitation is shown at Attachment N to this chapter.

8.11.7 Distress and urgency radiotelephony communications procedures

The procedures for distress and urgency communications are fully detailed in Annex 10 — Aeronautical Telecommunications, Volume II. Additional guidance on these procedures is given in the ICAO Manual of Radiotelephony (Doc 9432). An operations manual should give guidance on these procedures based on the Standards, Recommended Practices and guidance in these documents. The operations manual should, as a minimum, specify the elements that should be contained in a distress or urgency message.

8.11.8 Unlawful interference

The procedures to be followed by a crew in the event of an act of unlawful interference taking place should be detailed in the operations manual. This should include information on procedures to be followed during such an event, and particularly information on any procedures specific to a particular State or region over which flights may be conducted. Information should also be included on actions to follow after receipt of a bomb threat. The information given should include details on the method of classification of threats used by the operator, and should describe, for the information of the flight crew, how such a system will operate and what action will be taken on the ground to support the crew in the event of any act of unlawful interference. Guidance must also be given to assist the pilot-in-command in the assessment of a threat when he is unable to communicate with ground services. Annex 6, Parts I and III, also requires that an aircraft search procedure checklist be provided, together with information on the procedures to follow if an explosive device or suspicious object is found on an aeroplane, including advice on the suggested methods for minimizing the damage that such a device could cause.

8.11.9 Interception procedures

The operations manual must contain information on the signals used by intercepting and intercepted aircraft. Annex 2 contains information on the procedures to be followed and on the signals that are to be used by the aircraft involved. Typically, operators provide a graphical chart of these signals for the use of the flight crew. In addition, information is usually given on any differences to the standard procedures or signals, notified by any State over which operations may be conducted. Guidance is also provided in the Manual concerning Interception of Civil Aircraft (Doc 9433).

8.11.10 Emergency signal for cabin attendants

A system of alerting the senior cabin crew member to report immediately to the flight deck for briefing on a possible emergency situation must be described in the operations manual. This could be by pre-arranged standard signal, or by a suitably worded request on the PA system. The signal used should be appropriate to the aircraft type and should be clearly understood by all crew members.

8.11.11 Passenger cabin emergency procedures

The procedures for many of the emergencies that might arise in a passenger cabin will be detailed in different volumes of the operations manual. Procedures for smoke clearance, for example, will be contained in the aircraft operating manual, while the standard emergency evacuation procedures will be contained in the emergency evacuation procedures manual. These emergency procedures will also be addressed in the training programme. In addition to these sources of information and guidance, operators often produce guidance of a more general nature. This would typically involve a discussion of those issues which are not directly addressed in the procedures themselves. An example would be guidance on the use and effectiveness of different extinguisher types on different types of fires. Other points of discussion could be the selection of passengers to aid in an emergency evacuation, the briefing of passengers, the use of the public address system in preparing for evacuation, etc. In developing this material it should be borne in mind that the advice given is intended for both cabin attendants and flight crew members. The guidance given could be included in the emergency evacuation procedures manual.
8.12 GENERAL OPERATIONAL POLICIES

8.12.1 General

As well as the specific policy and guidance on matters relating to the actual operation of the aircraft, the operations manual will need to state policy and give guidance on a number of related issues. The items addressed would include use of cockpit jump seats, flight inspectors, cockpit visitors, co-pilots flying the aircraft, weather minima for newly-promoted pilots-in-command, ferry flights, test flights, etc.

8.12.2 Cockpit jump seats

The operations manual should specify who is entitled to occupy cockpit jump seats. Normally this would include crew members and other technical staff as well as authorized flight inspectors. The operations manual should detail the procedures to follow to get approval to occupy the jump seats. The pilot-in-command’s authority to grant or refuse admission to the cockpit should be emphasized. An example of an operator’s policy is shown at Attachment O to this chapter.

8.12.3 Flight inspectors

Civil aviation authority flight inspectors are normally entitled to occupy the cockpit jump seat. A system of identifying such inspectors, whether by the issuing of government identification cards or airline identification cards, must be established and described. The authority of the flight inspector should be described as detailed in the relevant legislation or regulations. It is normal practice to specify that the greatest possible co-operation be extended to these inspectors. Annex 9 — Facilitation recommends that Contracting States ensure that flight operations and cabin safety inspectors of another Contracting State, when engaged in inspection duties, are treated in the same manner as crew members. It also recommends that flight operations and cabin safety inspectors be provided with a certificate similar to those granted to crew members and that similar privileges of temporary admission also be extended to them.

8.12.4 Cockpit visitors

The operations manual should specify the company policy on visits to the cockpit. The manual should also specify the company policy on the security of the flight deck and the locking of the cockpit door, should this be a requirement during normal operations, and the action to be taken in this respect when an increased level of security risk has been notified to the company.

8.12.5 Co-pilot flying

The over-all objective should be to divide piloting time equally between pilots-in-command and co-pilots. This ensures an integrated and effective crew operation since both pilots will be familiar and practised in the duties of the pilot flying (PF) and the pilot not-flying (PNF). This policy also ensures that when a pilot is promoted to pilot-in-command he has the greatest possible experience, including aircraft handling experience, to enable him to best carry out his new function. This policy of equally sharing the duties must be modified in some circumstances. Many operators specify that a newly-promoted pilot-in-command must fly the aircraft himself and not hand over sectors to the co-pilot, until he has achieved at least 100 hours as pilot-in-command. Some operators also specify that the pilot-in-command should fly the aircraft when in his opinion the conditions may be outside the experience of the co-pilot. The pilot-in-command’s authority must be recognized and whilst the aim should be to share the duties equally, the pilot-in-command must be encouraged to exercise his judgement and ensure that co-pilots do not fly the aircraft in conditions beyond their experience.

8.12.6 Minima for use by newly promoted pilots-in-command

Until a pilot-in-command has gained a certain amount of experience, many operators specify that an increment be added to all aerodrome operating minima for take-off and landing. For example, the operations manual might specify that until the pilot has 100 hours’ experience on type as pilot-in-command, an increment of 300 m must be added to all landing visibility minima, 30 m (100 ft) must be added to all minimum approach heights or altitudes, and 100 m must be added to all take-off visibility minima. The increment used by an operator will depend on the type of aircraft being flown and the normal aerodrome operating minima being used. The operations manual should give the appropriate guidance.

8.12.7 Ferry flights

On occasion it will be necessary to operate an aeroplane with unserviceable equipment or systems to a maintenance base, e.g. operating an aeroplane unpressurized, or with the gear extended, or in the case of three- or four-engined aeroplanes...
with one engine inoperative. These flights normally require approval by a senior company official. For approval of such flights, factors which must be considered and for which special data may need to be produced are take-off performance, en-route performance, fuel required, landing and take-off weather minima, alternate minima, routing restrictions, effects on other aeroplane systems of failed system or engine, etc. Some ferry operations, most notably those where an aeroplane is being ferried with an engine inoperative, will require that the flight crew is trained and authorized for such an operation. Flights with an engine inoperative must only carry the required flight crew. Some national authorities require that specific approval be granted for such operations, and in the case where different States are being overflown it may be necessary to seek their approval as well. All these considerations should be addressed in the operations manual. It should be borne in mind that when permission to conduct such an operation is being sought, the aeroplane may well be at a remote aerodrome from where communication is difficult. It is therefore essential that the guidance given be as clear and detailed as possible and, where appropriate, contain contact phone and telex/SITA addresses. When certain types of ferry flights must be operated by specifically approved flight crew members, the names or required qualifications of those crew members should be listed in the operations manual.

8.12.8 Test flights

Test flights are required after certain maintenance procedures to test certain components or to investigate reported defects which cannot be reproduced on the ground. The operations manual must specify who is authorized to require or approve such flights. Certain test flights may only be operated by suitably qualified pilots, e.g. it could be specified that certain manoeuvres may only be flown by instructor pilots. For certain tests it may be specified that daytime VFR conditions must exist or other special limits will apply. An essential feature of such flights is that the flight crew is properly briefed as to what tests are required and what readings or data are to be recorded. An example from one operator’s operations manual addressing these points is shown at Attachment P to this chapter.

8.12.9 Aerodrome rescue and fire fighting facilities

Annex 14 — Aerodromes, Volume I, requires that rescue and fire fighting services be provided at aerodromes. It is also required that significant changes in the level of protection normally available at an aerodrome be notified to the appropriate ATS and AIS units to enable those units to provide the necessary information to arriving and departing aircraft. Aerodromes provide these services on a scale which is related to the size of aircraft using the aerodrome and the number of movements in the busiest three months of the year. The operations manual must give guidance on the rescue and fire fighting category appropriate to the aircraft operated and the operator’s policy on operating into aerodromes with less than that category. Annex 6, Parts I and III, states that in determining that adequate facilities exist for a flight, an operator needs to consider the adequacy of emergency facilities such as those for fire fighting and search and rescue. The majority of operators do establish policy on the minimum categories acceptable for each aircraft type. In deciding what category is acceptable, an operator might wish to give some guidance on the acceptability of lower categories in certain circumstances, such as when the aircraft is carrying some technical defects or when there is a special passenger load, such as invalids or elderly passengers.

8.13 VISUAL ILLUSIONS

Pilots should understand the causes and effects of the visual illusions that may be encountered during flight operations. Understanding these illusions will enable the pilot to recognize and compensate for them and thus reduce the risk of their causing an accident. Common factors in illusions which should be discussed in the operations manual include sloping approach terrain, runway slope, non-standard runway width, featureless approach terrain, rain showers, rain on the windscreen, white-out in snow, shallow fog, fascination, auto-kinesis and empty visual field myopia. The standard textbooks provide information suitable for inclusion in the operations manual.

8.14 REPORTING AND CLASSIFICATION OF AIRCRAFT DEFECTS

8.14.1 According to Annex 6, Parts I and III, the pilot-in-command is responsible for reporting all known or suspected defects. The method of reporting and, where appropriate, classifying defects will need to be explained, and the necessary guidance given. This will depend to a great extent on the method of recording defects used. For example, on some aircraft a coded system developed by the aircraft manufacturer to record defects is used, while some operators have developed their own coded systems. Use of these coded systems normally means that instructions for deriving and recording codes must be included in the operations manual. In many cases defects are still recorded in
plain language. Many of the code systems also allow for plain language explanations to be added to the text when judged necessary by the reporting pilot. Some systems also require the pilot to classify the defect; for example, a defect might need to be classified as to its effect on aircraft airworthiness. Where this is the case, guidance should be given in the operations manual. Defects which are not airworthiness items may be deferred to a later date for rectification. When this is done, there must be a method of recording such a deferral, and normally the aircraft technical log has a section solely for this purpose. Some operators have a system of classifying deferred defects so as to allow different lengths of time, either in hours flown, number of sectors, or on return to a maintenance base, until a defect must be rectified before further flight. Again, such a system must be explained and the required guidance given. The final authority of the pilot-in-command to accept or refuse to operate an aircraft carrying deferred defects must be emphasized. One factor in allowing proper assessments to be made in such instances is an awareness of the aircraft’s recent technical history. To achieve this, many operators specify that a number of sheets or entries covering the aircraft’s most recent history be retained in the technical log.

8.14.2 Some operators keep a separate technical log for aircraft passenger cabin defects, and the senior cabin crew member is responsible for making entries in this log. However, it is necessary to ensure that defects in the passenger cabin of an “airworthiness” nature are brought to the attention of the pilot-in-command. Typically, this is achieved by requiring the flight engineer or the pilot-in-command to countersign the cabin technical log. Where such a system is in existence, details must be given in the operations manual.
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Attachment A to Chapter 8

Example from an operator’s guidance on refuelling with passengers on board

1. Refuelling with passengers on board

1.1 Refuelling is permitted with passengers boarding, on board or disembarking. Refuelling of aircraft is a routine procedure. Precautions are always taken to preclude the possibility of fire. Fuelling fires have not been a feature of the airline industry. The risk of fire is just as low when refuelling with passengers on board, boarding, or disembarking, as when there are no passengers on the aircraft. However, when passengers are involved, precautions must be taken to ensure that they can be evacuated in the unlikely event that fire does occur. These precautions involve the ramp agent, the engineer, the cabin crew and the pilots.

1.1.1 The ramp agent must ensure that pilots, cabin crew and engineer are at their stations, that the area around emergency exits is kept clear, that the fire service is alerted and that passenger boarding and/or disembarkation is carried out in a controlled manner.

1.1.2 The engineer must establish communications with the pilots, inform the pilots of the beginning and ending of refuelling, and alert the pilots if fire occurs. He must stop refuelling if the pilot turns on the anti-collision light. He must have a headset plugged in ready for use in the event of fire, but need not wear it except in emergency. On SD 3-60 aircraft, no headset is needed.

1.1.3 The cabin crew must prepare the emergency exits as appropriate to type, warn passengers not to smoke, etc., and be alert for aisles or exits blocked or for build-up of fumes.

1.1.4 The pilots must establish communications with the engineer, inform cabin crew of the beginning and ending of refuelling, listen for fire warning from the engineer and be prepared to initiate passenger evacuation if necessary. He can signal refuelling to be stopped by switching on the anti-collision beacon.

1.2 Detailed refuelling procedures are issued separately for each aircraft type. These procedures meet all international standards.

1.3 Extra precautions are taken when refuelling with, or within, 20 flying hours of fuelling with JP-4/Jet B. These precautions are included in the detailed procedures for each type.

Note.—Passengers may be on board but may not join or leave the aircraft during refuelling with JP-4/Jet B, except in an emergency.

2. Precautions during use of alternative and mixed fuels — all aircraft

2.1 The following requirements concern the types of fuel permitted for use on all aircraft and advise on the stringent precautions which must always be observed when refuelling JP-4 or when refuelling an aircraft with JP-1 where the fuel tanks already contain JP-4 or a mixture of JP-4 and JP-1.

2.2 Fuel specifications

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP-1</td>
<td>Jet A-1 fuel, kerosene-type fuel</td>
</tr>
<tr>
<td>JP-4</td>
<td>Jet B fuel, wide cut gasoline-type fuel</td>
</tr>
</tbody>
</table>

2.3 A major consideration when mixing fuels at normal temperatures is the fuel-air mixture that develops in the space above the fuel inside the tank. JP-4 develops an ignitable fuel-air mixture at frequently encountered ambient air temperatures and when JP-4 and JP-1 are being mixed, the fuel vapour mixture is in the explosive or ignitable envelope throughout an even broader range of ground temperatures common at the majority of airports during all or part of the year.

2.4 Ordinarily the vapour pressure of JP-1 is too low to develop an ignitable mixture. Gasoline usually develops an over-rich mixture that will not ignite. It is the mixture of these two fuels that can develop the ignitable fuel-air combination.

2.5 It is important to remember that any fuel should be handled as though it develops an ignitable fuel-air mixture, which it will do under the right conditions.

2.6 These precautions are in addition to the normal precautions contained in the relevant maintenance and engineering manuals, and are issued for the advice and action of all concerned.

3. Approved fuels

3.1 Normally JP-1 is the only fuel approved for use on company aircraft, but in exceptional circumstances JP-4 may be uplifted when JP-1 is not available.

3.2 JP-4 is a "wide cut" fuel, i.e. it is a varying mixture of gasoline- and kerosene-type hydrocarbon fractions.
3.3 JP-4 or JP-1 can be used interchangeably in the turbo-jet and turbofan engines installed on aircraft. The manufacturers have determined that no trim adjustments on the jet engine fuel control unit are required when changing from one fuel to another.

4. Precautions and restrictions when using JP-4 fuel

4.1 The use of JP-4 necessitates stringent precautions because of the lower flash point of the JP-1/JP-4 mixture. Because of the extra hazard associated with an ignitable mixture in the tank, underwing refuelling only is permitted and then only at reduced flow rates when JP-4 is being added to a tank containing JP-1 or vice versa.

4.2 Tests and experience indicate that a static charge potential can develop between the fuel surface and some point inside the tank structure, even though all structural parts are bonded together. Velocity and turbulence within the fuel itself tend to increase the static charge, and the charge dissipates slowly because of the electrical insulative qualities of the fuel.

4.3 The following precautions and restrictions must be strictly adhered to when using JP-4 or a mixture of JP-4 and JP-1.

4.3.1 Bonding

Strict adherence to the bonding and grounding precautions must be observed because of the lower flash point of the mixture, i.e. aircraft and refuelling vehicles must be securely connected to adequate ground earthing points. The refuelling vehicles must be bonded to the aircraft prior to connecting the nozzle to the aircraft fuelling adaptor.

4.3.2 Refuelling

4.3.2.1 Overwing refuelling is not permitted when loading JP-4 into an aircraft with JP-1 already on board or when loading JP-1 into an aircraft which was refuelled with JP-4 during the preceding 20 flight hours.

4.3.2.2 Underwing refuelling must be carried out at a reduced flow rate. This is achieved on 747 aircraft by using only one fuel supply hose on each side attached to the underwing fuel manifold and ensuring at least two tank inlet valves are open to keep the flow rate to each tank low, even though fuel enters the manifold through only one hose. This procedure is aimed at reducing the electrostatic charge build-up inside the fuel.

4.3.2.3 Normal refuelling calculations as appropriate for each aircraft type should be carried out.

4.3.2.4 On completion of refuelling with JP-4, a placard will be placed adjacent to the relevant cockpit fuel contents gauges (and refuelling panel on applicable aircraft) stating that overwing refuelling must not be carried out until 20 flying hours from that aircraft time at which refuelling was carried out (current time from aircraft technical log) and an entry will be made in the Captain's Technical Report to the effect that JP-4 was uplifted.

5. Defuelling

Defuelling within the 20 flying hours previously referred to should be avoided. If considered absolutely necessary to defuel within this time limit, then the fuel company concerned must take the necessary precautions to ensure that the mixed fuel is segregated from unmixed fuel and if reloaded, the same precautions will apply as when loading pure JP-4 into a tank containing JP-1.
Example from an operator’s guidance on fuel spillage

**Actions required for fuel spillage**

When significant spillage of fuel occurs, the following safety measures have to be taken:

- Fuelling operations must be stopped at once.
- Any persons on board must be warned immediately.
- Ground power-units and other engines or electrical motors of equipment in the fuelling zone must be shut down and all further electrical switching avoided.
- Handling personnel must leave the fuelling zone.
- The airport fire brigade must be warned.
- Station management must be informed.
- If fuelling operation was done with one engine running, that engine must be shut down.
- If considered necessary, the aircraft must be towed to a safer place.
Cockpit checklist

1. The use of an up-to-date cockpit checklist for normal and emergency operations is compulsory. One checklist must be within immediate reach at each pilot's station and one at the flight engineer's station. Normally, the pilot not flying will read the checklist, except if, in accordance with the specific aircraft procedures, certain parts of the checklist are read by the flight engineer.

2. The items on the checklist shall be called out separately in a loud voice, except where the instructions for a given aircraft type specify that certain parts of the checklist are performed silently. The next item is not to be called until this item is properly checked. The exact terminology of the cockpit checklist shall be adhered to.

3. If during or after reading of the pilots' Pre-flight — or Before Starting checklist, both pilots simultaneously vacate the cockpit, these checks are invalidated. This also applies when two members of a basic three-man crew simultaneously vacate the cockpit.

Notes.

— Proper use of the checklist is essential to safety and requires that good discipline be maintained by the cockpit crew.

— Interruptions by other crew members or ground engineers should be avoided whenever possible.

— When interrupted by radio communication, reading of the checklist should be suspended until the radio communication has been finished.
Attachment D to Chapter 8

Example from an operator’s guidance on engine-starting procedures

Engine-starting procedures using intercom

1.1 Engine start using APU

1.1.1 Obtain start clearance from ATS and complete Before Start check:

CAPTAIN: “COCKPIT TO GROUND, READY TO START NO. 2”

GROUND: “CLEAR NO. 2” or “STAND BY”

CAPTAIN: “READY TO START NO. 1”

GROUND: “CLEAR NO. 1” or “STAND BY”.

1.1.2 When all engines are stabilized and the After Start check is complete:

CAPTAIN: “ENGINES STABILIZED, CHOCKS AWAY, HAND SIGNALS FROM LEFT (OR RIGHT)”

GROUND: “CLEARING CHOCKS, HAND SIGNALS FROM LEFT (OR RIGHT)”.

1.1.3 The captain must not release brakes until the mechanic has given Thumbs Up signal.

1.2 Engine start, using air start cart and/or ground power-unit

1.2.1 Obtain start clearance from ATS, alert ground crew and complete Before Start check:

CAPTAIN: “COCKPIT TO GROUND, READY TO START NO. 2” (OR APPLICABLE ENGINE)

GROUND: “AIR SUPPLY ON, CLEAR 2” or “STAND BY”

CAPTAIN: “READY TO START NO. 1”

GROUND: “CLEAR NO. 1” or “STAND BY”.

1.2.2 When all engines are started and engines are stabilized:

CAPTAIN: “CLEAR GROUND UNITS”

GROUND: “CLEARING GROUND UNITS” then “UNITS CLEARED”

CAPTAIN: “CHOCKS AWAY, HAND SIGNALS FROM LEFT (OR RIGHT)”

GROUND: “CLEARING CHOCKS, HAND SIGNALS FROM LEFT (OR RIGHT)”.

1.2.3 Captains must not release brakes until the mechanic has given the Thumbs Up signal.
Attachment E to Chapter 8

Example from an operator’s guidance on taxiing an aeroplane

Taxiing

Taxi speed should be adjusted to suit conditions and must not be excessive at any time. Avoid coarse use of nosewheel steering and brakes in order to provide passengers a comfortable ride. Ensure that aircraft and ramp personnel are not exposed to jet blast hazards by observing the following:

1) Do not “blast” away from the ramp; possible injury to ramp personnel and damage to equipment and buildings could result.

2) Do not taxi between a terminal building and another aircraft which has been pushed back.

3) Do not carry out engine run-up unless the area to the rear of aircraft is clear and ground control or tower is advised of your intentions.

4) Do not taxi into an assigned position before the departing aircraft has completed its push-back procedure and commenced taxiing, and ground personnel have moved clear of fumes and blast.

Taxiing with engine(s) shut down

Taxiing with engine(s) shut down in compliance with operations manual limitations is encouraged. Consider variables such as ramp blasting when aircraft is very heavy; shutting all engines down (APU-equipped aircraft), or shutting two engines down on DC-8s during lengthy delays; ramp and taxi slope; wind direction and speed; and type of parking manoeuvres required.
Attachment F to Chapter 8

Example from an operator’s guidance on standard call-out procedures

Call-out procedures

It is of utmost importance that standard procedures be followed. Any intentional deviation from a standard procedure shall be clearly announced by the pilot flying (PF) in order to facilitate the monitoring function of the pilot not-flying (PNF). In general, internal pilot-to-pilot communications shall ascertain that the pilots are in full agreement regarding the progress of the flight. It is important, however, to avoid any unnecessary conversation which can distract attention.

Call-outs made by a PNF or second officer (S/O) that require correcting action by the PF shall be answered and/or reacted upon by him, indicating that he is aware of the situation.

Failure to respond and continued failure to react shall be treated as pilot incapacitation.

The following call-outs are mandatory and shall be made by the pilot specified. Call-outs marked PF shall normally be made by the pilot flying. If for some reason the call-out is not made by the PF, the call-out shall be made by the PNF or S/O.

Call-outs in a normal approach

<table>
<thead>
<tr>
<th>Call-out</th>
<th>By</th>
<th>Call-out indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>“RADIO HEIGHT”</td>
<td>PF</td>
<td>Radio altimeter passing 2 500 ft during letdown.</td>
</tr>
<tr>
<td>“LOCALIZER COMING”</td>
<td>PF</td>
<td>Localizer bar moving from full deflection.</td>
</tr>
<tr>
<td>“LOCALIZER CAPTURE”</td>
<td>PF</td>
<td>A/P or F/D has captured localizer.</td>
</tr>
<tr>
<td>“GLIDE PATH COMING”</td>
<td>PF</td>
<td>Glide path bar moving from full deflection.</td>
</tr>
<tr>
<td>“GLIDE PATH CAPTURE”</td>
<td>PF</td>
<td>A/P or F/D has captured glide path.</td>
</tr>
<tr>
<td>“OUTER MARKER, . . . ” or “OSCAR ALFA, . . . ” or “FIVE MILES, . . . ”</td>
<td>PF</td>
<td>Outer marker or equivalent position plus actual crossing altitude.</td>
</tr>
<tr>
<td>“SINK RATE, ...”</td>
<td>PNF</td>
<td>Actual sink rate at approximately 1 000 ft radio height after landing flaps have been set and final letdown started.</td>
</tr>
<tr>
<td>“PLUS HUNDRED”</td>
<td>PNF</td>
<td>Passing minimum plus 100 ft and “Contact” not yet called by PF.</td>
</tr>
<tr>
<td>“APPROACH LIGHTS” or “RUNWAY” plus direction</td>
<td>PNF</td>
<td>Approach lights — or runway — in sight and “Contact” not yet called by PF.</td>
</tr>
<tr>
<td>“CONTACT”</td>
<td>PF</td>
<td>Able to continue approach by visual reference.</td>
</tr>
<tr>
<td>Actual radio heights</td>
<td>PNF</td>
<td>Actual radio heights as required according to respective operations manuals in order to assist in assessment of safe threshold crossing and flare.</td>
</tr>
<tr>
<td>or S/O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“SPEED HIGH, . . . KNOTS”</td>
<td>PF</td>
<td>Desired indicated airspeed exceeded by more than 10 kt, or final approach and threshold speed by more than 5 kt plus actual speed deviation.</td>
</tr>
<tr>
<td>Call-out</td>
<td>By</td>
<td>Call-out indicates</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>“SPEED LOW, . . . KNOTS”</td>
<td>PF</td>
<td>Indicated airspeed below:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— pattern speed minus 10 kt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— approach speed minus 5 kt or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— threshold speed minus 0 kt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plus actual speed deviation.</td>
</tr>
<tr>
<td>“SINK RATE”</td>
<td>PF</td>
<td>Rate of descent more than 1 000 ft/min below 2 500 ft radio height.</td>
</tr>
<tr>
<td>“GLIDE PATH”</td>
<td>PF</td>
<td>Flight path deviates from ILS glide path by more than one dot.</td>
</tr>
<tr>
<td>“NOT STABILIZED”</td>
<td>PNF</td>
<td>Aircraft not stabilized according to definition in the operations manual at or below 1 000 ft radio height.</td>
</tr>
<tr>
<td>“NOT STABILIZED, GO-AROUND”</td>
<td>PNF</td>
<td>Aircraft not stabilized according to definition in the operations manual at or below 500 ft radio height.</td>
</tr>
<tr>
<td>“MINIMUM, GO-AROUND”</td>
<td>PNF</td>
<td>Reaching decision altitude/height in a precision approach and “Contact” or “Going-around” not yet called by PF.</td>
</tr>
<tr>
<td>“MINIMUM”</td>
<td>PNF</td>
<td>Reaching minimum altitude/height in a non-precision approach and “Contact” or “Going-around” not yet called by PF.</td>
</tr>
<tr>
<td>“DECISION POINT, GO-AROUND”</td>
<td>PNF</td>
<td>Reaching decision point in a non-precision approach and “Contact” or “Going-around” not yet called by PF.</td>
</tr>
<tr>
<td>“GOING-AROUND”</td>
<td>PF</td>
<td>Starting a go-around.</td>
</tr>
</tbody>
</table>
Example from an operator's guidance on stabilized approaches

Stabilized approach

1. The approach is considered to be stabilized when the aircraft is tracking on the approach path (i.e. LLZ and GP for ILS approach) with the required configuration, attitude, speed and corresponding power.

2. It is essential that every approach be stabilized early enough for the pilots to be able to detect wind shear or other unacceptable deviations from the correct flight profile. For this reason, the following limitations apply to all approaches.

2.1 IMC: Approaches must be fully stabilized at the final approach speed and in the final landing configuration when leaving 1 500 ft AAL or the outer marker, whichever occurs later.

2.2 VMC: Approaches must be fully stabilized at the final approach speed and in the final landing configuration not later than 800 ft AAL (B-737 and 1-11), 1 000 ft AAL (B-747).

3. Deceleration to final approach speed shall be started in due time so that stabilization is achieved at the prescribed point.

4. In gusty weather, special attention is required to maintain proper speed control.

Note 1.— During all approaches, it is mandatory to use the radio facilities for the runway, including ILS when available, even during visual contact approach in good weather conditions.

Note 2.— When an aircraft is landing in a non-standard/abnormal configuration, consideration should be given to aircraft preparation and stabilization at an earlier than normal position in the approach pattern.
Example from an operator’s guidance on contaminated runways

1. Snow, slush, water, etc. on the runway

1.1 Take-offs and landings on runways covered by snow, slush, water or ice must not be made unless the conditions which follow are fulfilled.

1.2 The depth of snow or slush on the minimum required runway length must not exceed the maximum specified for the aircraft type. The cleared width of this runway shall as a general rule be 40 m (45 m for B-747). However, on runways where 40 m (45 m) cleared width cannot be achieved within reasonable time, the following requirements apply:

F-27: min 30 m  
DC-9: min 30 m  
DC-8/A-300/DC-10: min 35 m  
B-747: min 40 m

provided applicable cross-wind limit is reduced by 10 kt.

1.3 Snow must be removed on either side of the minimum runway length and width, to ensure clearance for the aircraft type with the outer wheel on the runway edge with flaps extended.

1.4 The usable part of the runway shall be clearly discernible.

1.5 The runway centre line shall be defined if deemed necessary during prevailing conditions.

1.6 With loose or wet snow, slush or pools of water on the runway, extreme caution must be exercised, particularly in cross-wind conditions.

Note.— Correction for deposits in patches is equal to depth of deposits multiplied by the area covered by patches, i.e. 10 mm slush covering 25 per cent of the runway: use 2.5 mm for correction.

1.7 Acceleration and stop distances may be increased considerably. The take-off should be abandoned immediately if the aircraft does not seem to accelerate normally.

1.8 The nosewheel steering should be handled with care to avoid excessive corrections causing the nosewheel to skid and increase resistance. Directional control shall be maintained by rudder pedals alone.

Note.— For corrections and limitations regarding snow depth, braking action, etc., see runway gross weight chart for the aircraft type concerned.

2. Stopping capability

2.1 Friction between the tires and the ground is still the primary means of retardation in all aircraft. It is therefore important to attain the best braking conditions possible before commencing a take-off or landing.

2.2 Friction coefficients can be measured on ice- or snow-covered runways, but results sometimes differ from the actually experienced braking conditions due to uneven distribution of ice or snow coverage, and to the method employed when measuring the coefficient.

2.3 For runways covered by deposits such as standing water, slush and wet snow the following rules are valid:

— A dry runway with water puddles covering more than 10 per cent of the runway must be considered wet and the corrections and limitations for wet runways must be used.

— When airport temperatures are close to zero and there is standing water, slush or wet snow on the runway, the following braking action should be used unless reported friction coefficients, if given, give larger restrictions.

— Deposits in patches covering 10 per cent or less of the runway: use figures for wet runways.

— Deposits in patches covering 11 to 25 per cent of the runway: MEDIUM.

— Deposits in patches covering 26 to 50 per cent of the runway: MEDIUM to POOR.

— Deposits in patches covering more than 50 per cent of the runway: POOR.

Pilots’ reports may be used as guidance only.

Exception: Friction coefficients reported under the above conditions are acceptable and may be used for corrections and limitations, provided the measuring is made by a BV11 or SAAB Friction Tester (SFT), both equipped with high pressure tire, and the test run is made at 95 km/h.
2.4 When variable braking action is reported along a runway, the reported values should be applied as follows:

— for take-off and landing weight calculations: use the average value of the far two-thirds.

— for determination of maximum cross-wind: use the lowest value for the whole runway. However, if this value is valid for the far third of the runway, but the aircraft weight permits take-off or landing on the first two-thirds of the runway according to normal calculation rules, the far third of available runway may be disregarded, i.e. as a runway shortening. The cross-wind limitation may then be based on the lowest reported value for the first two-thirds of the runway.

2.5 Methods for improving braking action are normally carried out along the complete minimum required runway length and width.

At certain airports special sanding methods are employed. Such methods are described in the route guide.

When chemicals are used to improve braking action, the resulting deposit on a runway, being a slippery substance, should be removed prior to take-off or landing.

Where improvement of braking action is possible, such action should be considered even if this might cause a delay.

Reverse thrust, spoilers, speed brakes, etc., should be serviceable before taking off or landing on a wet or slippery runway, unless runway length margins are available according to the route guide, or requirements in gross weight chart are fulfilled.

2.6 The condition of tires with regard to tread greatly affects braking action. Heavily worn tires are not suitable for operations on wet or slippery runways.
Attachment 1 to Chapter 8

Example from an operator’s guidance on de/anti-icing operations

**Holdover times — anti-icing/de-icing fluids**

**Guideline to holdover time**

After a de/anti-icing treatment a take-off is permitted provided the time between end of the treatment and take-off does not exceed the times mentioned in the following tables for the mentioned weather conditions.

Although the holdover times mentioned have been determined in a very conservative way, it should be appreciated that detrimental factors, especially when accumulating, can shorten such a time considerably. See also the following remarks which refer to the tables.

**Remarks**

1. HEAVY SNOW and HEAVY FREEZING RAIN conditions are not incorporated in these tables; thus, a take-off under these conditions is prohibited.

2. High wind velocity and jet blast may cause a degradation of the protective film; as a result the holdover time will be shortened.

3. The anti-icing code for a two-step de-icing treatment consists of the fluid type plus an indication of the mixture that was used, e.g. AEA type 2/100.

### Type 1. Guideline to holdover times (hr/min)

**Anti-icing code: AEA type 1**

<table>
<thead>
<tr>
<th>Actual weather conditions</th>
<th>OAT °C</th>
<th>Frost</th>
<th>Freezing fog</th>
<th>Snow</th>
<th>Freezing rain</th>
<th>Rain on cold soaked wings</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0 and above</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
<td>NIL</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>-0 to -7</td>
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<td>0.15</td>
<td>0.15</td>
<td>NIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-8 and below</td>
<td>0.30</td>
<td>0.15</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Type 2. Guideline to holdover times (hr/min)

**Anti-icing code: AEA type 2/100/75/50**

<table>
<thead>
<tr>
<th>Actual weather conditions</th>
<th>OAC °C</th>
<th>Frost</th>
<th>Freezing fog</th>
<th>Snow</th>
<th>Freezing rain</th>
<th>Rain on cold soaked wings</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0 and above</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>12.00 6.00 4.00 3.00 2.00 1.30 0.45 0.30 0.20 NIL</td>
</tr>
<tr>
<td>-0 to -7</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td>8.00 5.00 3.00 1.30 1.00 0.45 0.30 0.15 0.20 NIL</td>
</tr>
<tr>
<td>-8 and below</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Actual weather conditions

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<tr>
<th>OAC °C</th>
<th>Frost</th>
<th>Freezing</th>
<th>Snow</th>
<th>Freezing</th>
<th>Rain on cold soaked wings</th>
<th>Anti-icing code: AEA type 2/100/75/50</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>fog</td>
<td></td>
<td>rain</td>
<td></td>
<td>100</td>
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<td>–8 to –14</td>
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<td></td>
<td></td>
<td></td>
<td>0.45</td>
</tr>
</tbody>
</table>

*Note.— The asterisks correspond to the figures in the right-hand columns for each fluid type.*
OPERATION IN THUNDERSTORM AREAS

1. Policy

1.1 Flights through known or forecast thunderstorm areas should be avoided whenever possible because of the various hazards involved, such as turbulence, wind shear, hail, and lightning strikes.

1.2 Do not take off during heavy thunderstorm activity over the departure aerodrome.

1.3 Delay the approach or divert to an alternate aerodrome rather than attempting to penetrate a severe thunderstorm in a let-down area.

2. General guidelines

2.1 Avoidance

2.1.1 Mutual information on development and position of thunderstorms by pilots and ATS as well as careful weather watch are of great importance for the early and adequate avoidance of such severe weather areas.

2.1.2 With thunderstorms in the vicinity of the aerodrome, request radar vectoring through thunderstorm-free areas and arrange the climb-out to provide ample safety distance from active Cb-clouds. Use all available information such as airborne weather radar, pilot reports, etc.

It should be noted that ATS cannot always approve detours in congested areas because of other traffic and technical limitations of the ground radar.

2.1.3 During cruise, thunderstorms shall be avoided:

— visually by staying well clear of Cb-clouds;
— by using the airborne weather radar; and
— by requesting vectors from ATS radar.

2.1.4 Whenever possible the following should be avoided:

— flight in cirrus clouds if thunderstorm activity is reported along the route, as they may be hiding anvil tops and reducing the effectiveness of the airborne weather radar;
— flight at or near the freezing level where heaviest icing and hail must be expected;
— altitudes between 10 000 ft and 25 000 ft as they will provide the roughest ride even outside active storm centres;
— flying below the overhang of Cb-clouds. This is the area where heavy hail fall must be expected.

2.1.5 Strong echoes shall be avoided by 40 km (20 NM) or more. This is most important at FL 200 and above and for circumnavigation of echoes which have prominent scallops or other protrusions.

2.2 Preparation

When flying in a thunderstorm area is anticipated or unavoidable, the following preparations should be made:

— monitor airborne weather radar closely;
— advise flight attendants about the presence of adverse weather conditions and switch on cabin signs;
— switch on cockpit lighting to high intensity to avoid dazzling by lightning;
— reduce to turbulence speed according to aircraft operations manual;
— operate anti-icing equipment as required.

2.3 Crossing

2.3.1 Use the airborne weather radar to find the most suitable corridor.

2.3.2 Follow the instructions for flight in turbulence.

2.4 Assessment after crossing

After crossing of a thunderstorm area, the following aircraft systems should be checked functionally as far as possible:

— flight and engine instruments;
— pitot and static heating;
— radio and navigation equipment;
— readings of compasses;
— electrical system including circuit breakers.

2.5 Reporting

In order to ensure that the technical inspection for damage is carried out when the aircraft structure has been exposed to abnormal stresses, such as severe turbulence, lightning strikes, or static discharges, an appropriate entry must be made in the aircraft technical log.
Attachment K to Chapter 8

Example from an operator’s guidance on flight into volcanic ash cloud

**Inadvertent flight into a volcanic ash cloud**

This procedure is intended to maximize engine stall protection and to decrease engine EGT. The lower EGT will minimize accumulation of volcanic material on the turbine blades.

Initial engine indications will be a decrease of $N_1$, $N_2$, fuel flow and an increase in EGT. Engine stalls, torching from tailpipe and flame-out may also occur.

Physical indications may appear as smoke or dust in the cockpit or an acrid odour similar to electric smoke.

The use of oxygen should be considered in dense clouds, evident by odour from the air conditioning system.

Communication may be impaired due to electrostatic conditions.

- Autothrottles OFF

- Throttles (terrain permitting) to provide additional stall margin and EGT reduction. IDLE

- Ignition CONT A/B

- Exit volcanic ash cloud as rapidly as possible.

- EGTs MONITOR

- If EGTs continue to rise SHUT DOWN ENGINE

Engines may be restarted if required for safety (refer to AOM 2.17.3 ENGINE RESTART IN FLIGHT). This may be impossible until clear of ash cloud and airspeed and altitude are within the Air Start Envelope.

When clear of ash cloud and engine(s) restarted, evaluate situation.

Procedure completed.
Attachment L to Chapter 8

Example from an operator’s guidance on flight procedures

**Flight procedures/en-route procedures**

- **Note.** — PF = Pilot flying
- **PNF** = Pilot not-flying
- **WPT** = Way-point.

**Clearances and flight deck records:**

- **a)** Airways clearances: initial and en-route ATS clearances will be copied by the Captain or the First Officer as appropriate. On three-pilot aircraft, the Second Officer also will copy the clearances.

- **b)** Oceanic boundary estimates: estimates for the oceanic boundary may be prepared by the Second Officer. They must be confirmed for accuracy by the PNF before being transmitted to ATS.

**Off-airways clearances:**

- **a)** When the off-airways (domestic or oceanic) clearance is about to be issued by ATS, the PNF will alert the Second Officer.

- **b)** The PNF will copy the clearance directly into the space provided in the flight log. Time (UTC) of receipt will be recorded.

- **c)** The Second Officer will copy the clearance directly onto the fuel log. Time (UTC) of receipt will be recorded.

- **d)** The PNF will read back the clearance to ATS. The Second Officer and/or the PF will monitor the readback. Coordinates will be included in the readback, whether or not they were specified by ATS, unless a track broadcast or a charted route is available for verification.

- **e)** The Second Officer and/or the PF will compare the clearance to the computer flight plan. Coincident waypoints will be underlined.

- **f)** Coordinates of cleared track from track message/broadcast or strip chart will be confirmed.

- **g)** The Second Officer or PF will complete a navigation data card for all way-points not covered by the computer flight plan or charted.

- **h)** The underlined computer flight plan or a completed navigation data card will be used for confirmation of correct INS loading and subsequent navigation.

- **i)** The flight progress chart will be used for all transatlantic route segments.

- **j)** The way-points designated on the forms are to be checked by each pilot, as are those inserted in the INS.

**Oceanic sectors — log procedures:**

**Computer flight plan:** The computer flight plan is used for all flights, and is the master document. Handling instructions are as follows:

- **Note.** — Sectors that do not coincide with the computer flight plan will be recorded on the flight log.

- **a)** Way-point numbers will be recorded when applicable. When way-point coordinates are checked, the way-point number is circled. Navigation data will normally be entered from the computer flight plan with the PNF half-circling the way-point number. After loading is completed, the PF will confirm that the correct data has been entered in the INS. At that time he will complete the circle, as appropriate.

  **Note 1.** — If the aircraft is airborne, the PNF will load the INS, half-circling each way-point as he does so. The PF will then confirm correct coordinates in his INS and only then completely circle the WPT number on the flight log.

  **Note 2.** — For aircraft fitted with a third INS, the Second Officer is responsible for confirmation of data used by this INS for off-airways navigation.

- **b)** The distance is checked-off (_) as each pilot confirms the correct sector distance.

**Computer flight plan:** The computer flight plan is used to check INS tracks and distances for those sectors where the computer flight plan and clearance coincide.

**Flight progress chart — transocean (Atlantic):**

- **a)** Three-pilot aircraft:
The Second Officer will prepare a flight progress chart for all off-airway sectors.

The PF will compare the present position at each way-point with the position plotted on the flight progress chart.

The PF will then compare the position of the next way-point to that plotted on the flight progress chart.

Requests for clearances to shorten route sectors should be reviewed by comparison of the planned flight sector on the flight progress chart vs possible time/fuel savings due to rerouting.

### Upper-air chart:

- The cleared track will be plotted on the upper-air chart closest to the computer flight plan level.
- The Second Officer will record winds and temperatures at selected way-points.
- The PF will review this chart to assess the desirability of route and altitude changes.
- This chart should be used in the event of INS failures to derive required headings, drift angles, etc.
- The completed chart should be either left on board for the next crew or delivered to the flight planning area.

### Navigation data card:

This card is used on routes beyond radio navigation coverage. It is handled as follows:

- The Second Officer will complete a navigation data card for all sectors not covered by the computer flight plan, or charted.
- The PF will confirm correct loading of INS by reference to the navigation data card.
- At each way-point, the PF confirms POS, next WPT and sector track and distance from the navigation data card.

### Normal INS operations

#### Off-airways navigation:

a) Before using the INS for navigational guidance, each pilot will first verify that the way-points loaded are coincident with the clearance, and confirm both track and distance for each leg segment. This will be indicated by the PNF circling the computer flight plan way-point number and checking off the track and distance on either the computer flight plan or the INS navigation data card.

b) When the alert light illuminates, both pilots will select POS. PF compares POS to desired position as indicated on flight progress chart. Compares next WPT, e.g. light on for WPT #4; compares WPT #5 to WPT indicated on flight progress chart. PNF compares POS to desired position as indicated on computer flight plan and then compares next WPT to WPT coordinates from computer flight plan.

c) The PF will determine WPT passage by comparison of INS readouts and/or radio aids.

d) WPT passage time, wind and temperature will be recorded at each oceanic WPT and selected domestic WPTs.

e) At way-point passage, both PF and PNF will compare the new leg distance and track with the computer flight plan or INS navigation data card.

f) On aircraft so equipped, steering/altitude hold on the flight director system will be selected. The track arrow will be set to the desired magnetic/true track. The heading bug will be set to the desired magnetic/true heading. Resolution of desired heading is from flight plan track and INS drift angle.

### Accuracy monitoring:

Accuracy of the INS should be checked at frequent intervals. In particular, accuracy should be confirmed prior to extended flight under INS guidance.

Radio aids, NDBs, VORs, DMEs may be used to establish INS accuracy. Co-located VOR/DME provide rapid and accurate determination of both latitude and longitude. (See Table 1 on slant range correction to DME readings.)

**Caution:** Particular care must be exercised when decoupling the aeroplane from the automatic guidance during weather avoidance, etc., that the track is regained and automatic guidance is re-established upon completion of the manoeuvre. Similar decoupling may occur when autopilot transfer, compass transfer, etc., are selected.

Navigation accuracy is considered suspect when a system has a large observed error or shows rapid error accumulation. When two systems show divergency from each other by more than 15 miles, one may be deemed the better, either as the result of previous observations with a facility, or if, after rapid divergence of two systems, one presents very illogical drift, ground speed, true heading, etc. If unable to determine, with reasonable certainty, which is the
better, the autopilot should be uncoupled from the INS and headings steered for equal and opposite cross-track indications. Mean indications will be used to determine flight accuracy.

Longitudinal accuracy is as important for separation as lateral deviation. Accurate determination of WPT passage time may require use of a mean indication of passage.

**Updating:** The INS may be updated any time a sufficiently accurate fix is available and a significant error is observed. See INS operating guide for suggested limits.

**Single INS operations:** INS may be used to improve tracking accuracy in areas of sparse radio navigation coverage. In addition, track offsets, etc., may be used to permit greater flexibility to ATS in the assignment of flight altitudes, etc. The aircraft position must be confirmed at least once per hour when operating under single INS guidance.

**INS operating guide:** Initial position — Position error is unacceptable during initial alignment.

### Able to fix position

**Error observed** | **Suggested actions**
--- | ---
Less than 5 miles | — Normal monitoring.

5 to 10 miles | — Consider ramp position error, if any, at an en-route stop.
— Consider validity of fix.
— Updating is probably desirable.
— Use INS with smaller error rate for guidance.

10 to 25 miles | — Zero any error in excess of 10 miles by updating.
— Use INS with smaller error rate for guidance.

Greater than 25 miles | — INS failure.
— See abnormal INS operations.

### Unable to fix position

**Divergence** | **Suggested actions**
--- | ---
Less than 15 miles | — Normal monitoring.

15 to 25 miles | — Split the difference in position.

Greater than 25 miles | — See abnormal INS operations.

---

### INS failure procedures

**Definition of failure:**

a) INS indicates more than 25 NM in error relative to known position.

Note.— When two INS give indications which are more than 25 miles apart and it is not apparent whether one INS has failed, consider obtaining a clearance which will enable a positive check on position to be made.

b) Red WARN light illuminates on control and display unit (CDU).

**Single INS operations:**

a) *Prior to entering oceanic airspace:* remain within radio navigation facility coverage requesting clearance as necessary and consider:

— Additional time/distance/fuel involved in diverting from original flight plan track.

Note.— *In-flight time/distance/fuel calculations are available on many alternate company routes from flight dispatch via the appropriate VHF/SSB communication facility.*

— Requesting a clearance via single INS routes through the MNPS. Obtaining a reclearance below the MNPS airspace.

— Requesting alternative single/no INS routing to destination or airport short of destination.

— Landing at an appropriate station before the boundary where a replacement INS is available.

b) *Within oceanic airspace:* The flight should normally continue in accordance with its oceanic clearance; however, the captain should assess prevailing circumstances, such as the performance of the serviceable INS and distance to go within oceanic airspace, and exercise judgement with respect to continuing, requesting a reclearance to the special routes, returning, diverting, descending below the MNPS airspace, etc.

When the flight continues in accordance with its original oceanic clearance, the pilots should begin a special
monitoring programme taking into account the fact that the routine method of cross-checking against the second INS is no longer available. Considerations include:

— Immediately advising ATS that flight is proceeding with reduced navigational capabilities.

— Special care with respect to the operations of the remaining INS and a check on its performance record.

— Deviation check on the main and standby compasses if not already accomplished so that the flight can proceed with greater accuracy, should the remaining INS fail.

— If doubt arises regarding performance of the remaining INS, calling ATS and obtaining information on adjacent aircraft, then contacting these for information on factors such as drift and wind velocity. Visual sightings of other aircraft or their contrails may also provide a track indication.

NIL INS operations — transocean services/MNPS:

Within oceanic airspace:

— Disconnect autopilot from INS.

— Estimate drift and fly headings as necessary to maintain track as accurately as possible until radio navigation is possible.

— Immediately advise ATS that flight is proceeding with reduced navigational capabilities.

— Keep a special look-out for possible conflicting aircraft and make maximum use of outside lights.

— If unable to contact ATS within a reasonable period and traffic is probable on adjacent tracks, consider climbing or descending 500 ft, broadcasting such intentions on 121.5 MHz, and advise ATS as soon as possible.

— Submit a written report to flight operations manager after arrival.

Table 1. Slant range correction
(to nearest 0.5 NM)

<table>
<thead>
<tr>
<th>HT above DME</th>
<th>29 000’</th>
<th>31 000’</th>
<th>33 000’</th>
<th>35 000’</th>
<th>37 000’</th>
<th>39 000’</th>
<th>CORR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DME more than 23.0 NM</td>
<td>26.0 NM</td>
<td>29.7 NM</td>
<td>33.4 NM</td>
<td>37.3 NM</td>
<td>41.4 NM</td>
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<tr>
<td>Between 8.3-23.0</td>
<td>9.4-26.0</td>
<td>10.6-29.7</td>
<td>11.8-33.4</td>
<td>13.1-37.3</td>
<td>14.5-41.4</td>
<td>–1 NM</td>
<td></td>
</tr>
<tr>
<td>Between 6.0-8.3</td>
<td>6.4-9.4</td>
<td>7.1-10.6</td>
<td>7.9-11.6</td>
<td>8.7-13.1</td>
<td>9.5-14.5</td>
<td>–2 NM</td>
<td></td>
</tr>
<tr>
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<td>5.5-6.4</td>
<td>6.0-7.1</td>
<td>6.5-7.9</td>
<td>7.0-8.7</td>
<td>7.6-9.5</td>
<td>–3 NM</td>
<td></td>
</tr>
</tbody>
</table>
Attachment M to Chapter 8

Example from an operator’s guidance on in-flight engine failure or shut-down

Engine failure or precautionary shut-down procedures

When an engine fails or is shut down as a precautionary measure, the captain will:

a) Land at the nearest suitable airport, in point of time, where a safe landing can be effected. On three- and four-engine aircraft, if not more than one engine is shut down, the captain may proceed to an airport of his selection, if he considers such action as safe a course as that above, after considering the following factors:

— the nature of the malfunction and the possible mechanical difficulties which may be encountered if flight is continued;
— the availability of the inoperative engine for further use;
— the altitude, aircraft weight and usable fuel at the time of engine shut-down;
— the weather conditions en route and at possible landing points;
— the air traffic congestion;
— the type of terrain;
— the pilot’s familiarity with the airport to be used; and
— the selected destination should be forecast to have alternate limits, or better, for arrival.

b) Immediately notify ATS and company, and keep them fully informed regarding progress of the flight. It is important that ATS be aware that a flight is operating "engine out". When such information is not available to controllers, a hazardous condition may be created, wherein the controller may anticipate greater performance from the aircraft than it is capable of producing.
Attachment N to Chapter 8

Example from an operator’s guidance on pilot incapacitation

Pilot incapacitation in flight

1. Alert conditions exist if:
   a) the pilot flying does not respond intelligently to two communications; or
   b) does not respond to a single verbal challenge, and a significant deviation from the standard flight profile exists.

2. Partial incapacitation. On recognition that a partial incapacitation exists, the following actions are to be taken as required:
   a) assume control and ensure a safe flight profile is maintained;
   b) engage autopilot;
   c) request cabin crew assistance. If the PA system is required to alert cabin crew, ensure that the URGENT COMMUNICATION PROCEDURE is employed;
   d) with assistance:
      — tilt seat back
      — move seat full aft
      — put subject’s head back
      — use the shoulder harness as a restraint;
   e) when and if practicable, remove affected crew member from seat and replace, if possible, with another crew member.
Attachment O to Chapter 8

Example from an operator’s guidance on flight deck authority

Flight deck authority

1. In addition to the operating flight crew, the following persons may be admitted to the flight deck, when authorized by the Vice-President of Flight Operations or his designate and the captain of the aircraft:

a) officers and employees of the government or of other air carriers, and persons in related industries, whose presence on the flight deck is necessary or advantageous to the company from a technical point of view;

b) company pilots;

c) engineering or maintenance staff on special duties pertaining to aircraft or flight;

d) flight operations staff whose functions are directly related to the conduct of flight operations;

e) cabin attendants for take-off and landing when all main cabin seats are occupied, provided that the minimum number of cabin attendants are occupying cabin attendant seats in the main cabin, as required in the operations manual;

f) pilots of other companies travelling on duty, who are in possession of a valid ticket or pass.

2. Flight deck authority form

This form will be signed by the Vice-President of Flight Operations or his designate.

3. In the interests of safety, the captain, at all times, retains the authority to exclude any person from the flight deck.

4. Flight deck authority cards

A flight deck authority card is issued to all pilots as a privilege and not a right. The use of the card is subject to the following conditions:

The pilot must:

a) have a valid ticket or pass (when deadheading on duty, confirmed space reservations must still be made);

b) follow all the normal airport check-in and security procedures involved for passengers;

c) not displace supervisory pilots or other persons issued flight deck authority under Section 1;

d) wear his I.D. card on entering and leaving the cockpit; and

e) recognize that cockpit discipline and standard operating procedures are paramount to flight safety and any abuse of flight deck privileges will be cause for withdrawal of the card.
Attachment P to Chapter 8

Example from an operator’s guidance on test flights

TEST FLIGHTS

1. Definition
Flights carried out for the following purposes:
   a) to meet airworthiness requirements;
   b) to meet special requirements;
   c) for special research;
   d) for testing installation of components; and
   e) to study performance of aircraft.

The conditions under which test flights are mandatory to meet airworthiness requirements are outlined in the maintenance manuals for each type of aircraft.

Captains conducting test flights will ensure that they are in possession of a “Test Flight Inspection Form” outlining the checking to be carried out. Generally, a maintenance branch inspector accompanies test flights and is in possession of this form.

Test flights are not necessarily confined to local flying and may be made on a point-to-point basis depending on the nature of the check.

2. Authority
Maintenance Branch or Flight Operations Engineering and Flight Operations Manager.

3. Operating minima
   a) 1 500 ft/5 miles or as otherwise specifically authorized by the flight operations director, or by headquarters supervisory flight staff when the flight is to be conducted by the supervisor concerned.
   b) Night operation: Test flights will normally be planned for daylight operation. In extenuating circumstances, specific authority for night operation can be obtained.
   c) Test flights: Test flights evaluating equipment which might affect the safety of flight will be carried out only under day VFR conditions. Any test manoeuvres following major maintenance or overhaul should be conducted well clear of cloud and in daylight.

4. Engine-out procedures
Under no circumstances will engine-out procedures be conducted below 1 000 ft during test flights.

5. Crew competency
Each test flight must be conducted by a qualified flight crew competent on the type of aircraft being tested.

6. Carriage of personnel
Additional crew and other authorized observers may be carried on any test flight. Additional personnel carried on test flights must be authorized by the Flight Operations Manager, or his delegate. Additional crew will sign the flight plan.
Chapter 9

FLIGHT PREPARATION

9.1 FUEL, OIL AND OXYGEN SUPPLY REQUIREMENTS

9.1.1 As part of the flight preparation, Annex 6, Parts I and III, requires that an operational flight plan be completed for every intended flight. The plan must be approved and signed by the pilot-in-command, and where applicable, signed by the flight operations officer/flight dispatcher. A copy of the operational flight plan must be left at the aerodrome of departure.

9.1.2 In preparing the operational flight plan, there are a number of factors that must be addressed and which are detailed in Annex 6, Parts I and III. These are the standards relating to alternate aerodromes, weather conditions, fuel and oil supply and, where applicable, oxygen supply. In addition, the performance operating limitations requirements of Annex 6, Parts I and III, must be considered. They are applicable to aeroplanes of over 5 700 kg maximum certificated take-off mass type certificated since 1960 in accordance with the provisions of Annex 8 — Airworthiness of Aircraft as well as to helicopters with different performance classes. For aeroplanes, these operating limitations require that, following one power-unit becoming inoperative in the case of a twin-engined aeroplane, or, in the case of three- or four-engined aeroplanes, two power-units becoming inoperative, the aeroplane must be able to continue the flight to an aerodrome and make a landing thereat. Furthermore, in the case of extended range operations by aeroplanes with two turbine power-units, the availability of a suitable aerodrome to which the aeroplane can divert following failure of a power-unit, or of failure of essential aeroplane systems, must be considered. Guidance on extended range operations is given in Annex 6, Part I.

9.1.3 Operational flight planning can be considered under two broad headings; firstly, alternate aerodromes and their operational suitability, and secondly, the required fuel and oil supply, which will probably be directly affected by the availability of suitable alternates.

9.2 ALTERNATE AERODROMES

9.2.1 The basic requirement for an alternate aerodrome is stated in Annex 6, Parts I and III. The Standard requires that flights conducted under instrument flight rules specify a destination alternate aerodrome, unless there is reasonable certainty that the flight can approach and land at a destination under visual meteorological conditions. An alternate aerodrome is not required when the destination is isolated and no aerodrome is available as an alternate. The performance requirements of Annex 6, Part I, must also be considered. The alternate aerodrome requirements following single- or double-engine failure are rarely restrictive, except for longer-range flights or flights in oceanic airspace or over remote areas. The requirement is that following one power-unit becoming inoperative, the aeroplane shall be able, without flying below the minimum flight altitude at any point, to continue to an aerodrome at which the same performance standard as at the aerodrome of intended landing can be met. In the case of two power-units becoming inoperative on aeroplanes having three or more power-units, the requirement is that the aeroplane be able to continue the flight to a suitable aerodrome at which a landing can be made. Annex 6, Part I, illustrates these requirements in more detail and should be consulted in developing policy. In the case of extended range operations by aeroplanes with two turbine power-units, guidance is also given in Annex 6, Part I. The requirement is that if the aeroplane is operating beyond the threshold time approved by the State of the Operator, then following a power-unit failure or the failure of an essential system(s), the aeroplane must be able to divert to a suitable aerodrome.

9.2.2 The operations manual must include guidance on which aerodromes are usable as alternate aerodromes. Any aerodrome which is a destination aerodrome can be used as a destination alternate for any other aerodrome. Other aerodromes must be examined as to their adequacy and a list of any such aerodromes must be available for consultation. Operators often list for each destination the “preferred” alternate. This alternate may be the most preferable in terms of passenger handling, or may be the closest so that the minimum fuel for diversion may be carried. It is obvious that
the actual destination alternate used for a flight must be related to the conditions on a given day, and operators often specify that the closest alternate can only be used when the weather forecast at the destination aerodrome makes the possibility of an actual diversion occurring extremely unlikely. An example of the guidance in one operations manual on this point is at Attachment A to this chapter.

9.2.3 A further consideration is the availability of an en-route alternate aerodrome in the event of failure of the aeroplane pressurization system. This is usually only critical on longer-range flights over oceanic or remote areas where the fuel required to cruise for long periods at lower altitudes may be limiting.

9.2.4 All the above alternates may have to be considered for some operations, whereas for shorter flights or for flights in areas where a large number of suitable en-route alternates are available the requirements may not be limiting. The appropriate guidance must be included in the operations manual.

9.2.5 The operations manual should specify the conditions for the selection of take-off alternate aerodromes when conditions at the aerodrome of departure preclude an immediate return to land in the event of an emergency.

9.3 WEATHER REQUIREMENTS FOR FLIGHT PLANNING AND IN-FLIGHT OPERATION

9.3.1 In the preceding paragraphs, alternate aerodromes are discussed without fully considering the effects of weather. In fact, the selection of alternates and factors related to weather are inextricably intertwined, as no matter what the basis of the requirement, e.g. engine failure or pressurization system failure, the specified alternate is of no operational value if the aeroplane cannot land there because of weather.

9.3.2 There is no ICAO requirement to have a destination alternate aerodrome specified if the weather at the destination aerodrome is forecast to be such that a landing can be made in visual meteorological conditions. Although the requirement to specify an alternate is related solely to the expected weather, operators normally specify some extra conditions related to the aerodrome facilities. These include number of runways, length of runways, etc. An example of one operator’s guidance is shown at Attachment B to this chapter. For flights conducted solely under visual flight rules it is reasonable to apply similar conditions.

9.3.3 The other occasion when an alternate is not required is when the destination is so isolated as to make it impossible to specify one. In this case, similar provisions requiring visual meteorological conditions and appropriate ground facilities should apply. Normally in these cases a pre-determined point is specified at which the aeroplane can turn back or divert to another alternate. Appropriate guidance must be given in the operations manual. An example of one operator’s guidance is shown at Attachment C to this chapter.

9.3.4 Annex 6, Part I, includes a note stating that it is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as an alternate than for the same aerodrome when planned as that of intended landing. In fact, even in those States where this is not the requirement, operators normally specify such a policy. The note to the Standard emphasizes that this is “for flight planning purposes” and the operations manual should make it clear that the normal aerodrome operating minima apply if it is necessary to divert to that alternate. Where States have regulations regarding alternate minima, guidance must be given in the operations manual. If the operator has developed his own policy in this respect, relevant information must be included in the operations manual. Some States and some operators require that if the forecast weather at destination is at, or below, the aerodrome operating minima, two destination alternate aerodromes must be specified. An example of guidance from one operations manual is at Attachment D to this chapter.

9.4 FUEL AND OIL SUPPLY

9.4.1 The fuel and oil requirements are contained in Annex 6, Parts I and III. The requirement is that, taking the weather into account and allowing for possible delays and any other contingencies, sufficient fuel and oil must be carried to safely complete the flight.

9.4.2 The annex then goes on to further describe this requirement both for propeller-driven aeroplanes and for aeroplanes equipped with turbo-jet engines and in Part III for helicopters engaged in commercial operations. In each case the requirement is described where a destination alternate is required, and where a destination alternate is not required, and where no suitable alternate aerodrome is available.

9.4.3 The typical international commercial air transport operator will have a policy that all flights will, where possible, be operated with a nominated destination alternate. It will be necessary to describe in the operations manual how the required minimum fuel figure is determined. Information
would normally be given on how trip fuel is calculated and what portions of the flight it includes, for example, taxi, take-off, climb, cruise, descent, and one full instrument approach. Information should also be given on standard allowances for taxing, for approach and for missed approach, on contingency fuel, and on holding fuel. The information in the operations manual may be presented as information on the operator’s general policy followed by specific information for different aircraft types. An example of an operator’s guidance for a specific aircraft type is shown at Attachment E to this chapter.

9.4.4 In addition to specifying the minimum requirements for fuel and oil supply, Annex 6, Parts I and III, requires that a number of other points be considered. These are as follows:

a) **Meteorological conditions**

This is an obvious requirement as regards head wind, tail wind, etc., but for a given flight allowance should be made for possible variations to the planned route due to thunderstorms, icing conditions, turbulence, etc. The meteorological conditions may also have a bearing on the selection of en-route and destination alternates.

b) **Air traffic re-routings and delays**

This can be a matter of judgement. However, in most cases it will be possible to assess on the basis of past experience the possibility of these delays occurring. Many operators add an extra fuel allowance for aerodromes and areas where delays are common. In fact, some operators keep records of the extra fuel used on some routes because of delays, re-routings, etc., and use this information to develop a figure for extra fuel that should be carried on flights on those routes.

c) **One instrument approach and a missed approach at the destination**

This is easily understood and is already included in the fuel requirement for turbo-jet aeroplanes in Annex 6, Part I.

d) **Loss of a power-unit or pressurization system failure during the flight**

The carriage of fuel to meet the performance requirements of Annex 6, Part I, dealing with aeroplane performance operating limitations and in the case of extended range operations with aeroplanes fitted with two turbine engines, the additional requirements of that type of operation, will meet the need to consider the fuel required following failure of one power-unit en route. In the case of pressurization failure the fuel required is that needed to cruise at low level, following failure of the pressurization system at the most critical point, to a suitable aerodrome.

e) **Any other conditions that could delay the flight and/or increase fuel and oil consumption**

This is a matter of judgement based on the actual operation planned. However, among the factors that could increase the fuel and/or oil consumption are the use of anti-icing or de-icing systems, the use of auxiliary power-units or engine bleeds, etc. The operations manual must give guidance and specify rates of fuel and oil consumption for systems or conditions that increase the basic rate.

9.4.5 In calculating the fuel required for turbo-jet aeroplanes, a factor that is always included is “an additional amount of fuel, sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator”; in fact, all aeroplanes are required to carry a reserve to provide for contingencies. This contingency fuel is carried to account for errors in forecast wind or temperature, unforeseen ATS delays or re-routings due to weather en route, or the planned cruising level being unavailable. It seems to be generally agreed that the total extra fuel carried for unforeseen contingencies should be about 5 per cent of the trip fuel required. Some operators specify the minimum and maximum limits for the amount of fuel to be carried as contingency fuel. An example of a State’s requirements and an operator’s guidance is shown at Attachment F to this chapter. The operator must give guidance on contingency fuel and on the other considerations raised in Annex 6, Part I, as they affect the minimum fuel required for a flight.

9.4.6 In many parts of the world ATS prescribe preferred routings, or international transit routes for IFR flights. In addition, operators may have their own preferred routings if, for example, experience shows that there are fewer delays using a particular routing. If there are preferred routings, the fuel required will be based on that routing and the appropriate information and guidance must be given in the operations manual. Another factor that would affect the fuel required is if it were known that a particular aeroplane’s performance is below the performance used for flight planning. If this is the case, appropriate allowances must be made at the planning stage. Below-datum performance can
be recognized by studying the records of fuel burned over a period. An aeroplane that is consistently using more fuel will stand out. The other method of identifying higher fuel usage is to examine the data stored in a flight management system or performance computer system, where normally a measurement of actual aeroplane performance against datum is stored. The operations manual should also include information on the minimum usable fuel and the range of fuel calibration error for each aeroplane type. This information should refer to aeroplane body angle as in many aeroplane types, with minimum fuel, over-rotation can uncover some fuel pumps. In this context, many operators specify a minimum fuel quantity that must be on board before a take-off. One other factor on which operators often give information, in an easily used format, is for “off-altitude” correction. This is the amount of extra fuel that will be used if the aeroplane does not operate at the planned cruising level. The figure is usually given as extra fuel burned, depending on cruise distance and aeroplane mass, for 600 m (2 000 ft) and 1 200 m (4 000 ft) off the planned flight level.

9.5 IN-FLIGHT PROCEDURES

9.5.1 Annex 6, Part I, has a Standard that requires that a flight not be continued towards the destination aerodrome unless it is believed that, at arrival time, a landing can be made there, or at an alternate, in compliance with the approved aerodrome operating minima. The operations manual must give guidance on the procedures to follow in order to comply with this Standard. In general, the requirements specified are similar to those of the planning stage. In other words, if it is necessary to divert to another aerodrome because both the intended destination and the nominated alternate(s) are unusable, the policy should be to have sufficient fuel at the reclearance point to fly to a suitable aerodrome and to land there plus 30 minutes’ holding fuel at 450 m (1 500 ft) and the contingency reserve. In a situation where the weather at destination and alternate is such that the possibility of in-flight diversion could occur, it is essential that the conditions be carefully monitored during the flight so that an early decision to divert can be made before the safety of the flight is in any way jeopardized.

9.5.2 Reclearance procedures are also used when a flight is deliberately planned with an intention to reclear en route from the planned destination to the final destination. This is usually done when it is not possible to carry enough fuel to plan the flight to the final destination. The advantage of nominating an intermediate destination is that if, at the time of arriving at a predetermined point en route, the contingency reserve has not been used, it is then available for onward flight planning purposes. A relatively lower quantity of fuel, including contingency fuel, will be required for the flight to the final destination so that a portion of the contingency fuel carried for the initial flight plan can now be utilized as trip fuel while still meeting all the normal fuel requirements. An example from an operator’s guidance on this subject is shown at Attachment G to this chapter.

9.6 PRESENTATION OF INFORMATION AND DOCUMENTATION

9.6.1 All the information required for fuel pre-flight planning purposes should be available from the aircraft operating manual. However, many operators develop their own quick reference tables or graphs for fuel requirements on the basis of that information. These charts present the fuel required for a specific flight or sector length, including fuel for taxi, take-off, climb, cruise, descent and approach. The fuel figure is presented for aeroplane mass against wind component. This figure is normally for optimum cruising level so a correction can be given for flight at other altitudes when this is significant. Also, if significant, a correction can be given for non-standard temperatures. As the operator normally plans to use certain alternates for each destination, he can, on the same chart, present information on the fuel required for diversion to each alternate. This figure includes fuel for a missed approach at destination, climb, cruise, descent, approach and landing, and holding fuel. This figure is also presented for aeroplane mass against head wind or tail wind. The operations manual will need to give the appropriate information on these points if such a system is used. An example from an operator’s operations manual is at Attachment H to this chapter.

9.6.2 During the flight it will be necessary to monitor fuel usage and to record the fuel on board at stated intervals. The fuel remaining is compared against planned usage or against the amount of fuel required at destination as diversion fuel. This form is often combined in the operational flight plan, but it can be a separate form. An example from one operator’s guidance combining both the fuel planning and fuel usage form is at Attachment I to this chapter.

9.7 FUEL CONSERVATION AND ECONOMY

Fuel conservation, i.e. the carriage and use of as little fuel as possible, and fuel economy, i.e. making sure that the fuel used is the cheapest available, are topics addressed as matters of policy by most operators. In addressing these
Chapter 9. Flight preparation

9.8 COMPUTER FLIGHT PLANS

When computer-generated flight planning is used, it is mandatory that the operations manual include the necessary information on the make-up of such a plan and the factors considered. The requirements as to what must be considered in determining the required fuel are exactly the same as for a manually prepared operational flight plan. However, the operations manual must give guidance on the sources of data used in the operational flight plan. For example, information should be given on the make-up and source of the navigation data, the performance data and the weather data. It will be necessary to explain, in detail, how these data are used in the generation of the operational flight plan. Normally, certain parts of the data can be overridden, while certain other parts of the data must be entered by the flight operations officer/flight dispatcher or the pilot who is preparing the plan. Details and guidance must be given on these procedures in the operations manual. The normal requirements for operational flight plans, such as who is responsible for producing the plan and how records are to be kept, etc., are all equally applicable to computer-generated flight plans.

9.9 OXYGEN REQUIREMENTS

During flight preparation, one of the items to be checked is the availability of an adequate oxygen supply for flights operated above 3 000 m (10 000 ft) in the standard atmosphere. For most large modern aeroplanes this is rarely a limiting requirement; however, it can be operationally significant when the normal full oxygen supply is not available. This can occur, for example, where the passenger oxygen supply is limited, or when normal flight deck usage has depleted the crew supply. In these circumstances it will be necessary to check that an adequate supply is available. Appropriate graphs and tables are included in the aircraft operating manual, but many operators produce simpler graphs for their own route network. This information is presented for both flight crew and passenger systems. The information is usually given as oxygen supply required for a given number of passengers or crew for specified flight times. On occasion it will be necessary to produce extra tables for flight sectors with minimum flight altitudes greater than that altitude to which the aeroplane must descend following failure of the pressurization system. Some operators identify those specific routes in their route network on which such a limitation would apply. When an operator produces graphs or tables providing information on oxygen supply requirements, appropriate guidance and information must be included in the operations manual.
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Attachment A to Chapter 9

Example from an operator’s guidance on selection of aerodrome alternates

Selection of alternates

Alternates will normally be selected from those listed in the route guide for each destination aerodrome. If none of these alternates can be used, any other suitable aerodrome may be selected. Alternates listed in the route guide may be indexed by the letters “C” and/or “R”, as follows:

— “C” for commercial alternate (commercially preferable in case of actual diversion);

— “R” for restriction, i.e. operational limitation(s), such as closing hours — noise ban — no fuel or ground equipment; the nature of the limitation(s) to be found in Aerodrome Information.

In view of high fuel prices, carriage of unnecessary fuel should be avoided. It is therefore recommended to plan an alternate as close to destination as is justified under existing and/or forecast conditions. Selection of a nearby alternate with limited facilities is permitted and even recommended, in the case of a very good weather forecast for the destination, as the possibility of an actual diversion is in such a case remote.

If the conditions at destination are such that the possibility of diversions cannot be disregarded, the following considerations should be taken into account when selecting an alternate:

a) operational requirements:

1) limitations as indicated in the route guide and/or aerodrome information;
2) weather conditions and weather minima;
3) number of usable runways;
4) runway condition and length;
5) approach facilities;
6) availability of fuel and starting equipment;
7) aircraft handling facilities;

b) commercial considerations:

1) commercial preference as may be indicated in the route guide;
2) distance from destination;
3) passenger-handling facilities;
4) final destination of disembarking passengers;
5) ground connections and/or hotel accommodation;
6) schedule regularity;
7) political aspects.
Attachment B to Chapter 9
Example from an operator’s guidance on lack of alternate aerodromes

No alternate IFR operation

b) no risk of thunderstorm, isolated or otherwise.

The terminal forecast and weather reports for at least two hours before, and the forecast for at least two hours after the expected time of arrival at the destination airport must indicate for that airport:

a) no risk of freezing precipitation;

The airport must have more than one usable runway, provided one runway meets the approved wet landing distance requirement and one other runway meets the approved wet or dry distance as required by the weather forecast. A two-runway destination airport need not be classified as a single runway airport should the second runway be temporarily closed, provided that the closed runway is made available, on request, for operational use on arrival.
Attachment C to Chapter 9

Example from an operator’s guidance on in-flight dispatch

Predetermined point procedure

If required, a flight may be planned to the intended destination aerodrome, via a suitable predetermined way-point, with an en-route alternate aerodrome.

On reaching the predetermined way-point, the flight shall proceed to the intended destination aerodrome only when the latest meteorological forecast and the current reports are at or above the conditions specified. If these conditions are not fulfilled, the flight must proceed to the en-route alternate aerodrome. However, if conditions forecast for the en-route alternate are more marginal than those for the aerodrome of intended landing and if no other suitable aerodrome is available within the range as stated below, the flight may proceed to the aerodrome of intended landing.

When applying the “predetermined point procedure”, the minimum brake release fuel must be the highest quantity of:

a) the fuel required to fly to the aerodrome of intended landing, plus fuel for two hours’ flight time based on aircraft weight and altitude overhead the aerodrome of intended landing, using the planned cruise regime;

OR

b) the fuel required to fly to the en-route alternate aerodrome via the predetermined way-point, plus “contingency fuel” (5 per cent of this fuel), plus “holding fuel”.

________________________
Attachment D to Chapter 9

Example from an operator’s guidance on alternate minima

PLANNING MINIMA FOR ALTERNATES
(including en-route alternates)

1. General

It should be realized that alternate minima apply only in the flight-planning phase. When a flight actually diverts to an alternate airport, that airport becomes the new destination, and consequently, published or prescribed minima apply. Alternate minima are established to provide an extra margin for weather deterioration during the flight.

2. Minima for flight planning

Criteria: ceiling and visibility. Alternate minima are normally not published on the approach charts, but are determined by adding the following values to the prescribed minima for the applicable category of operation.

<table>
<thead>
<tr>
<th>Category of operation</th>
<th>Forecast for the period up to ETA alternate</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILS Cat II</td>
<td>Add 300 ft to published DH/A</td>
<td></td>
</tr>
<tr>
<td>ILS Cat I and non-precision</td>
<td>Add 300 ft to prescribed DH/A or MDH/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>to prescribed visibility</td>
<td></td>
</tr>
</tbody>
</table>

Notes.

— Calculation may not be based on Cat IIIA limits.
— Calculated ceiling values should be rounded off to the nearest multiple of 100 ft (50 ft to the next higher multiple of 100 ft).
— To obtain the prescribed minima in case of inoperative “visual” or “non-visual” aids, see components-out table.

If the following conditions can be met, lower aerodrome minima of 200 ft ceiling/1 000 m visibility may be used:

a) duration of flight to destination is less than two hours;

b) Cat II or Cat IIIA operation is possible at destination and at the alternate airports concerned; and

c) forecast destination for the period of one hour before, until one hour after, ETA must be 300 ft ceiling/1 200 m visibility or better.

If a certain aerodrome presents unusual problems because of geographic location, local phenomena or local regulations, values not in accordance with the above-mentioned rule will be published on the approach chart. A note to that effect can be found in the “selection of alternates” of the route guide.

If no instrument approach procedure has been published for the alternate airport or the approach aid concerned is reported unserviceable, the forecast for the alternate airport must be at least:

a) visibility 10 km or more;

b) ceiling not below the lowest applicable minimum safe altitude (MSA, MORA, MOCA, etc.) and in mountainous terrain or near airports with other high obstacles, no significant clouds; and

c) no precipitation, thunderstorm, shallow fog or drifting snow.

Selection of alternates

Normally, one alternate must be available.

A second alternate airport is required if no weather forecast for the destination airport is available, or if the weather forecast destination for the period up to ETA gives:

a) visibility less than the lowest applicable prescribed visibility minimum, excluding ILS Cat II and ILS Cat IIIA; or

b) ceiling below the prescribed HAT for the approach system selected; or

c) surface wind in excess of tail and cross-wind limitations.
Attachment E to Chapter 9

Example from an operator’s guidance on fuel policy

Introductory notes

The following dispatch fuel policy is intended to be used for flight planning:

either before the flight is commenced (pre-flight dispatch);
or during flight in order to replan the flight (in-flight dispatch).

The “planned operating conditions” to which the text of this policy refers, means among other things: anticipated meteorological conditions, weights, routings, delays, and ATS procedures as specified in the operating documents.

1. General

A flight shall not be commenced unless, taking into account the “planned operating conditions”, the aeroplane carries sufficient fuel to ensure that it can safely complete the flight.

In addition, a reserve fuel shall be carried:

a) to provide for contingencies, when applicable;

b) to enable the aeroplane to reach the alternate aerodrome, when such is included in the operational flight plan.

2. Definitions and specifications

2.1 Taxi fuel. A standard quantity of 500 kg to cover ground manoeuvres from engine start to brake release, and APU consumption. This amount may be varied when required by local conditions.

2.2 Trip fuel. Fuel required to fly from the aerodrome of departure to the aerodrome to which the flight is planned, based on “planned operating conditions”. This amount shall include:

a) take-off, acceleration and climb fuel: fuel required to take-off, accelerate and climb from sea level to initial cruising level;

   Note.— A correction for the aerodrome elevation may be applied.

b) cruise fuel: fuel required to fly from top-of-climb to start-of-descent;

   Note.— Step climb, if required, will be taken into account.

c) descent fuel: fuel required to descend from last cruising level to sea level at the aerodrome reference point;

   Note.— A correction for the aerodrome elevation may be applied.

d) approach procedure fuel: a standard amount of 1200 kg available to execute an instrument approach procedure.

   Note.— This quantity corresponds to eight minutes’ flying time in approach configuration, in level flight, at 1500 ft above sea level in standard conditions.

2.3 Reserve fuel. Shall include:

a) contingency fuel: a quantity of fuel to cover deviations from the “planned operating conditions”;

   Note.— This is fixed at 5 per cent of the trip fuel (paragraph 2.2 a) + b) + c) + d)).

b) alternate fuel: fuel required to fly from the aerodrome to which the flight is planned, to the alternate aerodrome specified in the operational flight plan, based on “planned operating conditions”, but calculated assuming standard temperatures. The “alternate fuel” will include:

   1) missed approach, acceleration and climb fuel: fuel required to accelerate from DA/H to the normal climb-out speed, and to climb from sea level to the selected cruising level;

   Note.— A correction for the aerodrome elevation may be applied.

   2) cruise fuel: fuel required to fly from top of climb to start of descent, using long range settings. The flight levels adopted for the calculations will be:

For ground distances:

— equal to or less than 200 NM: FL 200,
— more than 200 NM and equal to or less than 300 NM: FL 300,
— more than 300 NM: FL 350;
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3) **descent fuel**: fuel required to descend from cruising level to the alternate aerodrome reference point at sea level;

   Note.— A correction for the aerodrome elevation may be applied.

4) **approach and landing fuel**: a standard amount of 600 kg available to execute an approach procedure and to land;

   Note.— This quantity corresponds to four minutes’ flying time in approach configuration in level flight, at 1 500 ft above sea level, in standard conditions.

If an instrument approach is assumed to be executed at the alternate aerodrome, add 600 kg to the “approach and landing fuel”;

c) **holding**: fuel required to fly for 30 minutes at holding speed at 1 500 ft above the alternate aerodrome under standard temperature conditions. For pre-flight dispatching, a standard quantity of 3 200 kg can be considered.

The sum of 2.3 b) + c) (alternate fuel plus holding) will never be less than 7 000 kg.

### 3. Policies

#### 3.1 Dispatch to a destination with at least one alternate

The minimum brake release fuel is the sum of “trip fuel” (paragraph 2.2) and “reserve fuel” (paragraph 2.3).

#### 3.2 In-flight reclearance to a new destination with at least one alternate

A flight may be replanned en route from any point along the route to a suitable aerodrome. The minimum fuel required at the reclearance point shall consist of:

a) **fuel required to fly from this point to the recleared destination aerodrome (paragraph 2.2 b), c), and d);** plus

b) **reserve fuel consisting of:**

1) “contingency fuel” (paragraph 2.3 a)) between reclearance point and recleared destination aerodrome; plus 2) “alternate fuel” (paragraph 2.3 b)); plus 3) “holding fuel” (paragraph 2.3 c)).

#### 3.3 Predetermined point procedure

3.3.1 If required, a flight may be planned to the intended destination aerodrome, via a suitable predetermined way-point, with an en-route alternate aerodrome.

3.3.2 On reaching the predetermined way-point, the flight shall proceed to the intended destination aerodrome only when the latest meteorological forecast and the current reports are at or above the conditions specified in the notes at the end of paragraph 3.4. If these conditions are not fulfilled, the flight must proceed to the en-route alternate aerodrome. However, if conditions forecast for the en-route alternate are more marginal than those for the aerodrome of intended landing, and if no other suitable aerodrome is available within the range as stated below, the flight may proceed to the aerodrome of intended landing.

3.3.3 When applying the “predetermined point procedure”, the minimum brake release fuel must be the highest quantity of:

a) the fuel required to fly to the aerodrome of intended landing (paragraph 2.2 a), b) and c)), plus fuel for two hours’ flight time based on aircraft weight and altitude overhead the aerodrome of intended landing, using the planned cruise regime;

OR

b) the fuel required to fly to the en-route alternate aerodrome via the predetermined way-point (paragraph 2.2 a), b) and c)), plus “contingency fuel” (5 per cent of this fuel), plus “holding fuel” (paragraph 2.3 c)).

#### 3.4 Isolated airport procedure

3.4.1 Where the aerodrome of intended landing is isolated and no suitable alternate is available, a flight may be planned without an alternate, provided this has been specifically authorized by the Directorate of Civil Aviation for the aerodrome concerned and the route to be flown.

3.4.2 This procedure may be applied for flights planned under the conditions specified in the note hereunder.

3.4.3 When applying the “isolated airport procedure”, the minimum brake release fuel shall consist of at least the fuel required to fly to the aerodrome of intended landing (paragraph 2.2 a), b) and c)) plus fuel for two hours’ flight time based on estimated
aircraft weight and altitude overhead the aerodrome of intended landing, using the planned cruise regime.

**Notes applicable to paragraphs 3.3 and 3.4**

**Note 1.**— The meteorological conditions referred to in paragraphs 3.3 and 3.4 must be at least equal to the landing minima prescribed by the company, increased by 100 per cent (horizontal visibility and ceiling), except for conditions of a temporary nature, such as TEMPO or INTER caused by showers or thunderstorms.

**Note 2.**— For paragraphs 3.3 and 3.4, the forecast landing conditions shall not exceed the prescribed limitations. By landing conditions are understood cross-wind, ice, slush or standing water on runways, etc.

**Note applicable to paragraph 3 (Policies)**

**Note.**— The minimum fuel at brake release must be sufficient to cope with any of the following events:

a) loss of pressurization;

b) one power-unit becoming inoperative.

In the case of one power-unit becoming inoperative, the fuel aboard must be sufficient to fly to any suitable aerodrome and hold for 30 minutes at 1 500 ft above the landing aerodrome. For flights on all regular routes, compliance with these requirements has been checked by the company.

4. **Continuance of flight**

4.1 When operating a flight to a destination or recleared destination in accordance with paragraph 3 “Policies”, paragraphs 3.1 and 3.2, continuance of flight is only permitted if the fuel quantity calculated to remain on board, over the runway threshold at destination or recleared destination, is at least the amount required for diversion to a suitable aerodrome (paragraph 2.3 b)) plus “holding fuel” (paragraph 2.3 c)).

4.2 This quantity shall not be less than 7 000 kg. It is, however, the captain’s prerogative to continue the flight when the reserve fuel calculated to remain on board over the runway threshold at destination or recleared destination is less than the amount listed above, but not less than 6 000 kg, provided the weather conditions at destination are forecast to remain equal to or better than 3 000 ft and 8 km (5 NM) up to at least one hour after ETA, and provided the conditions in paragraph 1 are complied with.
Paragraph in fuel policy

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<th>(2.1)</th>
<th>(2.2.a)</th>
<th>(2.2.b)</th>
<th>(2.2.c)</th>
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</table>

A flight may be replanned en route from any point along the route to a suitable aerodrome. The minimum fuel required at the reclearance point shall consist of:

- Fuel required to fly from this point to the recleared destination aerodrome (para. 2.2.b, c, d), plus

- Reserve fuel consisting of:
  - “Contingency fuel” (para. 2.3.a) between reclearance point and recleared destination aerodrome, plus
  - “Alternate fuel” (para. 2.3.b), plus
  - “Holding fuel” (para. 2.3.c).

Minimum brake release fuel is highest of:

- TRIP FUEL DEP-WP-DEST (as calculated above, but without 1 200 kg instrument approach fuel) + 2 hours (use Cruise Control tables, Chapter 11, at last flight level and weight).

- TRIP FUEL DEP-WP-ALT (as calculated above, but without 1 200 kg instrument approach fuel) + 5% + 30 minutes holding (3 200 kg or page 10.50.01).

Minimum brake release fuel is:

TRIP FUEL DEP-DEST (as calculated above, but without 1 200 kg instrument approach fuel) + 2 hours (use Cruise Control tables, Chapter 11, at last flight level and weight).

Figure 1. Fuel policy — graphical presentation (trip fuel)
Figure 2. Fuel policy — graphical presentation (reserve fuel)
Attachment F to Chapter 9

Example of a State’s requirements and an operator’s requirements on contingency fuel

A State’s requirements

A reasonable percentage of the departure/destination/alternate fuel should be allowed for contingencies such as errors in forecast winds and temperatures, navigational errors, and ATC restrictions on altitude and route. This allowance need not be specified as a separate item if adequate allowances are made in tabulated fuel figures. If this procedure is followed, a statement indicating the percentage allowance in the tabulated figures should be included. This allowance should be about 5 per cent.

An operator’s guidance

Route reserve fuel (RR)

A quantity of fuel to cover deviations from the “planned operating conditions” as well as to provide operational flexibility in case of loss of cabin pressurization or failure of one engine en route.

This quantity of fuel is defined as follows:

a) B-747, DC10, DC8, A310: 5 per cent of trip fuel but not less than the minimum or more than the maximum amount below.

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b) Standard amounts of route reserve fuel for DC9:

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Attachment G to Chapter 9

Example from an operator’s guidance on in-flight planning

In-flight planning

**Fuel policy — in-flight dispatch**

When calculating the required trip fuel quantities for a reclearance to a new destination airfield, the company fuel policy specifies the following quantities as shown in the figure below.

**Introduction**

Required fuel and time between the cruise point and landing are given as a function of:

a) remaining ground distance;

b) mean wind component;

c) flight level;

d) speed regime (long range, MT = .82, MT = .84).

The fuel figures include:

a) level cruise to top of descent;

b) descent fuel;

c) 1 200 kg approach fuel.

The values in the tables have been calculated for an actual cruise weight of 210 T at the decision point. The last column on the right of each table gives a correction in kg per ton for cruise weight different from 210 T.

---

**Graphical representation**

- **TRIP FUEL**
- **Recclearance point**
- **Top of descent**
- **New destination**
- **Landing weight**
- **Remaining cruise**
- **Descent**
- **Instrument approach**

---

**Table**

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<th>(2.2.c)</th>
<th>(2.2.d)</th>
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### Example from an operator's guidance on diversion fuel requirements

#### DCIO

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#### DCIOE

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#### 67478

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#### FUEL CODES

- DCIO
- DCIOE
- 67478
### Example from an operator's guidance on fuel planning / fuel usage

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Fuel calculations are based on the following assumptions:

- Fuel used at each stage of the flight.
- Fuel remaining at the end of each stage.

**Fuel Requirement**

- Departure fuel: 1,200 lbs.
- Enroute fuel: 4,000 lbs.
- Reserve fuel: 1,500 lbs.

**Fuel Usage**

- Fuel used: 7,700 lbs.
- Fuel remaining: 3,300 lbs.

**Fuel Calculations**

- Fuel Required: 3,000 lbs.
- Fuel Remaining: 2,900 lbs.

**Fuel Corrected**

- Actual fuel used: 3,100 lbs.
- Corrected fuel remaining: 2,800 lbs.

**Fuel Usage**

- Fuel used: 7,600 lbs.
- Fuel remaining: 3,400 lbs.

**Fuel Calculations**

- Fuel Required: 3,000 lbs.
- Fuel Remaining: 2,900 lbs.

**Fuel Corrected**

- Actual fuel used: 3,100 lbs.
- Corrected fuel remaining: 2,800 lbs.

**Fuel Usage**

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- Corrected fuel remaining: 2,800 lbs.
Chapter 10

AEROPLANE PERFORMANCE

10.1 GENERAL

Annex 6, Part I, states that aeroplanes shall be operated in accordance with a comprehensive and detailed code of performance established by the State of Registry. The performance information required is presented in the flight manual; however, the method of presentation used in flight manuals often makes it unsuitable for day-to-day use. Operators should therefore provide simplified information from which flight crew and other operational personnel can easily extract the needed performance information. Annex 6, Part I, requires that the State of Registry ensure the general level of safety assumed in the performance standards is maintained. To satisfy the requirement, it is essential that the method of presentation of performance data be approved by the appropriate State authority.

10.2 METHOD OF PRESENTATION

10.2.1 The “simplified” data, as presented, must always produce results at least as limiting as would be obtained by using the equivalent flight manual performance data; must be comprehensive enough to provide all the necessary information; and must be capable of being easily used and interpreted in the aeroplane cockpit. Performance data may be presented in a separate volume or volumes of the operations manual, but must always be accompanied by an explanation of the certification criteria used in determining the performance presented and of the terms and symbols used, and examples should be given of the proper use of the charts, tables, etc.

10.2.2 General limitations should be tabulated at the front of the volume, such as the maximum certificated mass for taxi, take-off and landing, etc., maximum tail winds, runway slope, maximum cross-winds (wet and dry), pavement bearing strength limits, etc.

10.2.3 The method of presentation will vary depending on the particular requirement, but a common practice among operators is to present the take-off and landing data in a separate volume (Runway Performance Manual). The data are usually specific to the operator’s own particular route structure, covering the aerodromes used in normal operation and the approved alternates. Cruise performance is usually provided in a simplified form and quick reference tables or charts for take-off and landing speeds are also often provided.

10.2.4 Specific runway data are derived by the operator from the flight manual data and are presented for each runway normally used. In general, the aim should be to present the runway data in easily used and understandable form, with particular emphasis on the need to make the charts or tables used in the cockpit during flight as simple as possible.

10.3 TAKE-OFF PERFORMANCE

10.3.1 Runway performance information should be given for each runway permitted for use at normal and alternate aerodromes. Runways from which take-off is forbidden must be clearly identified. For each runway from which take-off is allowed, a table or graph giving the maximum permitted mass as a function of wind and temperature, and the associated take-off speeds should be provided. A reference pressure altitude must be specified, and a method of correction for low pressure given. Where appropriate, the data should be presented for a range of allowable take-off flap settings. The individual runway performance sheets should also include details of the runway’s declared distances (accelerate/stop distance available (ASDA), take-off distance available (TODA), take-off run available (TORA)), the runway slope and the presence of any obstacles. Information on obstacles is normally found on ICAO Type A charts. When these are not available, the operator is not excused from the responsibility of checking for the presence of limiting obstacles, not only within the area of the ICAO Type A chart coverage, but also distant obstacles which might be limiting throughout the climb (Annex 6, Part I). Where obstacles reduce the allowable take-off mass, the position and height of the critical obstacles must be stated, particularly in those cases where
10.3.2 Other factors for which appropriate performance corrections are necessary must be considered, such as the use of engine bleeds for air conditioning or for engine anti-icing, the effects of snow, slush, ice and water on the runway, and poor braking action. If certain runway contamination conditions prohibit take-off altogether or cause performance restrictions, precise details of these conditions must be given. In addition, information must be given on the adverse effects that snow and ice on the airplane’s wings and other surfaces can have on aerodynamic performance, and of the necessity of ensuring that engine thrust output is not affected by these phenomena either. Details of the necessary preventative actions must be given.

10.3.3 Another factor which may affect the performance of certain airplane types is a marked temperature inversion, resulting in a rise in temperature along the take-off flight path. Operators should provide information on the effect which deviations from the standard temperature lapse rate and/or temperature inversions can have on airplane performance. Guidance on this problem and details of the performance penalty must be given when the airplanes being operated are WAT (weight, altitude and temperature) and obstacle limited and/or when operations take place in those areas where marked temperature deviations are liable to occur, as in arctic or desert areas. An example of the use of masts for the observation of low-level temperature inversions is given in Appendix L to the Manual of Aeronautical Meteorological Practice (Doc 8896).

10.3.4 Certain airplane types have allowable system and structural unserviceabilities which have performance penalties, e.g. anti-skid system unserviceable. Where this is the case, details of the performance penalty must be given, and it is important that the operational effect of these unserviceabilities be understood by the different personnel involved, e.g. maintenance, so that the details of such unserviceabilities can be passed to the operations section before the flight and load planning calculations are completed for a flight.

10.3.5 The maximum airplane mass for the ambient conditions given on a runway performance chart is normally accompanied by the associated take-off speeds (V\(_1\), V\(_r\), V\(_2\)). When the actual airplane mass is less than the maximum allowed, an alternative method of determining take-off speeds should be provided. This is typically done by the use of quick reference tables or charts with the speeds shown as a function of airplane mass, flap setting, temperature and pressure altitude. However, the limitations on the use of these speeds, which are normally based on the use of the balanced field length concept, should be detailed. When this method of determining take-off speeds is used, the assumption is that the take-off distance and accelerate-stop distance required are equal and are only sufficient for the take-off mass being used, i.e. equal to or less than the distance actually available. While this method has advantages, particularly in its simplicity, it cannot be used in all circumstances. In cases where stopway or clearway has been used in deriving the maximum take-off mass, or where maximum tire speed or brake-energy are limiting (in the event of a high speed abandoned take-off), means of deriving the appropriate speeds must be provided. When the use of a wet V\(_1\) is required or permitted, the method of calculating this speed must be detailed. If a reduction from the 10.7 m (35 ft) clearance specified for the first segment of the net take-off flight path is associated with the use of the wet V\(_1\) procedure, details of the reduction and its effect on the other segments must be given.

10.3.6 On some airplanes, when the maximum take-off mass is limited by climb gradient limitations and therefore excess runway length beyond that required for that mass exists, an increase in the maximum take-off mass can be achieved by using the extra runway length to accelerate the airplane to a higher V\(_2\) speed, resulting in an improved climb performance. For certain airplane types, a maximum increase in speeds may be specified while using the technique. If this “improved climb performance” technique is available, appropriate instructions and limits must be given.

10.3.7 When reduced thrust take-off techniques (RTOT) are permitted, instructions on their use, as well as any associated limitations, must be given. Normally, the use of RTOT on contaminated or slippery runways is prohibited.

10.3.8 An operator may wish to include a simplified method of deriving take-off and landing data for runways
other than those where operations normally take place and for which specific charts are provided. While such a practice is acceptable, it should be borne in mind that it places a great onus on the user, usually the operating crew, to check that the information used on runway distances, presence of obstacles, etc., is correct.

10.3.9 Annex 6, Part I, recommends that the operator should provide information on the all-engines-operating performance of the aeroplane. This information is necessary, as a number of departure procedures specify a minimum climb gradient. The pilot-in-command needs to know, in these circumstances, if the specified climb gradient can be achieved for the existing conditions. Examination of this requirement, for a particular published departure, may show that for any foreseeable combination of aeroplane mass and take-off and climb conditions, the required all-engine climb gradient will be achieved. If this is the case, a simple statement to that effect attached to the performance data for that aerodrome or included in the route guide will suffice. If the aeroplane cannot always achieve the required gradient, information and guidance on determining what gradient can be achieved or on an appropriate alternative procedure, such as selecting a different routing, should be included in the operations manual, preferably with the runway performance data.

10.4 EN-ROUTE OBSTACLE CLEARANCE

10.4.1 Runway performance data include consideration of continued take-off following critical engine failure, and should include consideration of the all-engines net flight path. The en-route phase commences at the end of the net take-off flight path and ends at the commencement of the approach and landing. It is necessary to consider critical engine failure in the case of twin-engined aeroplanes and double engine failure in the case of three- and four-engined aeroplanes, to ensure that adequate clearance from terrain and obstructions exists during the climb and cruise portions of the en-route phase. If adequate clearance cannot be assured, it is necessary to restrict the mass of the aeroplanes so that clearance can be achieved. Otherwise an alternative routing must be used. It is necessary to establish critical points on routes to allow the aeroplane to make use of drift-down performance capabilities to avoid terrain or obstructions infringing the net flight path following engine failure. In the event of engine failure before the critical point, the aeroplane must turn back, while after the critical point the aeroplane must continue. In either case, the drift-down capabilities of the aeroplane, following engine failure, must be such that adequate clearance from the terrain or obstruction can be maintained.

10.4.2 Drift-down charts show the optimum speed at which to descend after engine failure. Data on distance travelled and time taken to descend to the engine-inoperative stabilized cruise level is included. This information must be readily available to the flight crew, since decisions on terrain clearance following an engine failure can be critical. Cruise control data following engine failure (typically long-range cruise) should be provided.

10.5 CRUISE CONTROL

10.5.1 Information supplied by the manufacturer covers the differing cruise regimes which may be used and from which an operator will select one or more to suit his specific requirements. For example, it may be specified that long-range cruise speeds normally be flown, but where flights are seriously delayed, high speed cruise may be used, other performance/flight planning considerations permitting.

10.5.2 For each permitted cruise technique, a cruise control chart should be provided for use in the cockpit. Typically this chart will show the engine setting required for a particular flight level and aeroplane mass, and give fuel flow and the cruise IAS/Mach number.

10.5.3 Information on buffet margins may also be presented on the cruise chart. The operator should give details of the particular buffet margins that should be maintained both in “normal” cruise flight and in areas of turbulence, and the recommended airspeed for flight in turbulent conditions should be given.

10.5.4 A chart that is often provided is a “wind-altitude trade” chart. This chart shows what increase in head wind, or decrease in tail wind can be accepted in climbing to a higher cruising level to make use of the resultant lower fuel consumption rate. Conversely, the chart shows what decrease in head wind, or increase in tail wind must be experienced at a lower level to make it worthwhile descending to that lower level and accepting the resultant higher fuel consumption rate.

10.5.5 Many other performance charts related to the climb, cruise, holding and descent are provided for use in flight planning. Discussion on their content and use is addressed in the chapters on flight planning.

10.6 LANDING PERFORMANCE

10.6.1 Information on landing performance should be published for each runway, both for destination and alternate
10.4 Preparation of an Operations Manual

aerodromes. The factors to be considered in determining whether a runway is suitable for landing, and the maximum mass at which an aeroplane can land on a specific runway are governed by the State certification requirements, but in general include the following:

a) landing distance available (LDA);

b) obstacles (both on the approach and in the missed approach);

c) landing climb gradient requirements (WAT limits);

d) ambient conditions (head wind/tail wind, temperature, pressure altitude);

e) aeroplane mass (structural limits);

f) different flap settings available for landing; and

g) runway surface condition (wet, dry, contaminated with snow/slush/ice, braking action, coefficient of friction).

10.6.2 The operator must describe in the manual how landing data are to be used and specifically what factors have been taken into consideration. It is essential that information on landing data be presented in an easily usable format, as this material must be used in the cockpit during flight. It is common practice for operators to present information on each runway authorized by the company for landing. Runways can be described as “unrestricted”, i.e. for a specified range of wind, temperature and pressure altitude conditions the aeroplane can land at maximum structural landing mass; “restricted”, i.e. the allowable landing mass must be calculated in the light of the prevailing conditions; and “forbidden”, i.e. runways on which landings are not authorized.

10.6.3 Although landing data are presented for wet and dry runway surface conditions, guidance should also be given on corrections to be applied to the allowable landing mass to account for the runways being slippery when wet, or covered with snow, ice, or slush. These corrections are often applied through the use of the coefficient of friction of the runway or the description of the braking action, good/medium/poor, etc. The presence of these conditions normally requires that the maximum permitted cross-wind be reduced to take account of the difficulty associated with maintaining directional control on the runway.

10.6.4 Landing data should also be presented for landings with technical malfunctions, such as flap malfunc-

tions, when these malfunctions can cause an increase in the required landing distance. Equally, engine failure can mean that the aeroplane needs to land with a lower than normal flap setting, requiring a longer landing run.

10.6.5 In determining maximum landing mass, one of the considerations is the presence of obstacles in the missed-approach phase. The aerodrome authority declares an OCH or OCA for each instrument runway and one of the criteria, according to the PANS-OPS (Doc 8168), is that a 2.5 per cent missed-approach gradient be established which will clear all obstacles in the missed-approach path. While normally all aeroplanes can achieve this gradient, it is possible that some, particularly twin-engined aeroplane types, may not be capable of achieving it following an engine failure. This problem can be overcome by raising the OCA/H to allow the aeroplane to clear the obstacle, using a missed-approach gradient that reflects the performance capabilities of the aeroplane, as is permitted in the PANS-OPS. Some operators examine the missed-approach flight path and, where necessary, either restrict the landing mass or specify a higher OCA/H so as to ensure obstacle clearance.

10.7 HOLDING AND DIVERSION

10.7.1 Data on holding, preferably in a simple form, should be provided. These data normally present fuel flow and airspeed as a function of mass, altitude and temperature.

10.7.2 Many operators present charts or graphs showing the amount of fuel required to divert to an alternate airfield. These data are normally presented as a function of aeroplane mass and distance to the alternate with corrections for wind and temperature. Allowances for holding and approach at the alternate may be included in the diversion fuel or presented separately.

10.8 CONCLUSION

10.8.1 In conclusion, the performance information required in modern air transport operations and the amount of research and calculation needed to develop the data usually make it necessary for operators to establish units whose sole function is to monitor all the appropriate factors and produce and update the required information. As there is an obvious requirement to guarantee the quality of data produced, most operators have established operational engineering units staffed by qualified performance engineers. If it is not practical for an operator to establish such
an office, it may be possible to purchase the service from another operator, commercial firms, or the aeroplane manufacturer.

10.8.2 For guidance, examples of methods of presentation of performance information and data are given in Attachments A to J to this chapter. Some examples of information on the use of these data from individual operations manuals are also given. It should be noted, however, that this material does not always use standard ICAO terminology; for example, the term “weight” is used instead of “mass”.
Regulated take-off weight (RTOW)

Tabulated weights

The regulated take-off weight tables (RTOW), which are based on the “take-off procedure — engine failure recognition at \( V_1 \)”, give the allowable take-off weights for a range of winds and temperatures. The tabulated weights are the lowest of the weights determined by:

1. field length (stopway and clearway taken into account);
2. second segment climb;
3. obstacle clearance;
4. brake energy; and
5. tire speed.

The tables are computed for the reference pressure altitude (feet)/pressure (millibars) shown at the top of each table. Engine air conditioning bleeds are assumed OFF in order to achieve the best possible RTOW.

Note.— Take-off will normally be with engine air conditioning bleeds ON, unless the payload or range is restricted. If payload or range is restricted, the take-off should be with air conditioning from the APU, or with no air conditioning until obstacle clearance is assured.

Where there are obstacles in the take-off flight path, their heights and distances from the end of the take-off run are shown below the RTOW table. The minimum flap retraction height is also shown.

To allow for corrections for pressure altitude and engine bleeds, weights in excess of maximum structural limited take-off weight are given in the tables. However, the final RTOW calculated must never exceed the structural limit.

Take-off flap settings

The take-off flap settings used are:

FLAP POS 1
FLAP POS 5
FLAP POS 15

For some runways RTOW tables for two flap settings are provided to obtain the optimum take-off weight for the range of temperatures and winds. On the other runways one flap setting is sufficient.

Improved climb performance (ICP)

On runways where the field length limited weight is higher than the climb limit, it is allowable to increase the \( V_2 \) speed in order to improve climb performance. The improvement in climb performance permits an increase in the permitted runway take-off weight.

Turn procedures

Turn procedures are used to avoid restrictions on take-off weight due to:

1. limiting obstacles in the one-engine-inoperative take-off flight path;
2. limiting obstacles in the all-engines-operating take-off flight path.

Case 1 (see Figure 1-A) requires an emergency turn procedure and must be carried out in the event of an engine failure during or after take-off and in the event of an engine-inoperative overshoot.

Note.— On an engine-inoperative overshoot, the missed-approach procedure (engine inoperative) on the turn procedure page of the route manual must be adhered to.

Case 2 (see Figure 1-B) requires a compulsory turn procedure and must be carried out on all take-offs.

Note.— On a normal overshoot with all-engines operating, the overshoot procedure specified in the route manual must be adhered to.

In each case it is imperative that the turn be commenced at the proper time or location, as specified in the instructions for each turn procedure (see Figure 1-C). A premature turn, with the subsequent reduction in the climb gradient, may well leave no clearance over close-in obstacles in the vicinity of the airfield and a late turn may take the aeroplane outside the area over which the terrain clearance performance has been calculated.

Turn procedures are based on the “take-off procedure — engine failure recognition at \( V_2 \)”. 

10-7
Use of turn procedures

Where a turn procedure is necessary, a note to that effect is included below the RTOW tables. Refer to the route manual to determine whether the procedure is compulsory or emergency and to follow the procedure instructions.

Note.— A compulsory turn procedure becomes an emergency turn procedure in the event of an engine failure on take-off. In that event, the procedure specified for “engine failure on take-off” must be adhered to.

If the procedure is compulsory (i.e. all-engines operating) the aeroplane is climbed on the runway heading at \( V_2 + 15 \text{ kt IAS} \) until the time or location specified from the start of the turn is reached. At this point, a turn is initiated with the speed being held at \( V_2 + 15 \text{ kt IAS} \). Maintain bank angle and speed as accurately as possible during the turn until the aeroplane is on the new heading specified in the procedure instructions. Continue climbing at \( V_2 + 15 \text{ kt IAS} \) until obstacle clearance is assured. Once obstacle clearance is assured, continue climbing and accelerating and retract flaps as per schedule. Then set climb thrust and climb at the recommended speed to cruising altitude.

If the procedure is emergency (i.e. engine failure on take-off) the aeroplane is climbed on the runway heading at \( V_2 \) or at a higher speed \( (V_2 + 15 \text{ max}) \) if this has been achieved before engine failure until the time or location specified for the start of the turn is reached. At this point a 15° bank turn is initiated, the speed being held at \( V_2 \) or higher as stated above. Maintain this bank angle and speed as accurately as possible during the turn, until the aeroplane is on the new heading specified in the procedure instructions. At 400 ft, or at the minimum flap retraction height specified in the procedure instructions, or at the height achieved on completion of...
the turn, whichever is greater, the aeroplane is flown level and accelerated to the final segment climb speed. During acceleration, the flaps are retracted as per schedule. Thrust is reduced to maximum continuous at the end of the acceleration segment. The climb is continued on the new heading at the final segment speed and maximum continuous thrust.

Note 1.— In an emergency turn procedure, no attempt should be made to accelerate the aeroplane during the turn as the acceleration time in a turn is excessively long.

Note 2.— The performance used in determining turn procedures is based on the \( V_2 \) applicable to the aeroplane maximum take-off weight or the maximum take-off weight available on the runway for the flap setting.

Note 3.— In the emergency turn procedure, thrust should be reduced to maximum continuous at the end of the acceleration segment or at five minutes from start of take-off, whichever occurs first. (See Figure 2.)

Normal take-off — obstacle clearance

On a normal take-off (all-engines operating) where there are obstacles in the take-off flight path, the take-off procedure must be such that obstacle clearance is assured. Consequently, the initial climb-out speed should ensure adequate climb gradient until obstacles in the take-off flight path have been cleared.

The initial climb-out speed should be held to \( V_2 + 15 \) kt. Once obstacle clearance is assured, accelerate and retract the flaps as per schedule.

Note — The minimum level-off height for acceleration to climb speed is 400 ft or the minimum flap retraction height as specified below each RTOW table, whichever is the greater.

---

**Figure 2. Take-off flight path**

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<tr>
<th>1st segment</th>
<th>2nd segment</th>
<th>3rd Accel. segment</th>
<th>Final segment</th>
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<td>( V_2 )</td>
<td>( V_2 \rightarrow 210 ) kt</td>
<td>( V_2 \rightarrow 210 ) kt</td>
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<tr>
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<td>Maximum cont. thrust (one engine)</td>
<td>Maximum cont. thrust (one engine)</td>
<td>Maximum cont. thrust (one engine)</td>
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</table>
AN EXAMPLE OF AN OPERATOR’S FLOWCHART FOR CALCULATION OF ALLOWABLE TAKE-OFF WEIGHT

TABULATED RTOW
1. Obtained from section 1-4 for actual temperature and wind.
2. Based on reference pressure.
3. All bleeds OFF.

PRESSURE CORRECTION
Reduction (per millibar below reference)
Flap 1 67 kg
Flap 5 63 kg
Flap 15 57 kg

ENGINE AIR CONDITIONING BLEED ON
1. Reduce weight by 1 000 kg.

ENGINE ANTI-ICING ON
1. No correction required.

WING ANTI-ICING ON
REDUCTIONS:
Flap 1: 2 000 kg
Flap 5: 1 800 kg
Flap 15: 1 700 kg

ANTI-SKID INOPERATIVE
1. Reduce weight as per section 1-2, page 4.

SLUSH/STANDING WATER
1. Reduce weight as per section 1-2, page 5.

ALLOWABLE TAKE-OFF WEIGHT
(PERFORMANCE LIMIT)
Compare weights from A, B above and structural limit (section 1-0, page 1). Use lower weight.
Attachment B to Chapter 10

Example from an operator's guidance on non-standard heights for acceleration (third segment) and on "contingency procedures both on take-off and for missed approaches"

Applicable to B-737 and BAC 1-11 aeroplanes

XXXXX — AERODROME — R/W 08

TAKE-OFF

Emergency turn procedure

Seventy-five seconds after start of take-off, initiate a 15° bank turn to the LEFT onto heading 337°M to home on the “MN” locator. Declare an emergency. Continue climb-out procedure en route to the locator and await ATC instructions for landing or divert as required.

LANDING

Missed approach procedure (engine inoperative)

Use emergency turn procedure

XXXXX — AERODROME — R/W 26

TAKE-OFF

Emergency turn procedure

Seventy-five seconds after start of take-off, initiate a 15° bank turn to the RIGHT onto heading 340°M. Declare an emergency. Continue climb-out procedure on this heading and await ATC instructions for landing or divert as required.

LANDING

Missed approach procedure (engine inoperative)

Use emergency turn procedure

NON STANDARD MINIMUM FLAP RETRACTION

The MFRH for Boeing 737 and BAC 1-11 aeroplanes is:

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### Example from an operator's guidance on combined arrival, departure and AOM data for an aerodrome

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#### Power Cut Back

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#### SPECIAL PROCEDURES AND NOTES

1. EMERGENCY TURN PROCEDURE R/W 06L/R: Alter heading 10° right at the end of the runway.
2. Procedure to Alleviate Noise Nuisance: Avoid overflying the centre of XXX town. See SIDS.
3. R/W 06R/24L is a new runway under construction, not yet in use.

---

**Operators' Guidance**

**R/W 06L/06R:**
- Alter heading 10° right at the end of the runway.

**R/W 24L/24R:**
- Avoid overflying the centre of XXX town. See SIDS.

**R/W 06R/24L:**
- New runway under construction, not yet in use.
## Example of a tabular RTOW chart

### TAKE-OFF WEIGHTS AND SPEEDS V1 FOR DRY RUNWAY INCREASED V2

| IAS (KIAS) | V1 (KIAS) | V2 (KIAS) | C | Cat | KG | KT | FLAP | Still Air | 08 Degrees Flap | 10 KT Head | 15 KT Head | 10 KT TAIL | 5 KT TAIL | 5 KT TAIL | MCG | TK | TK | TK | TK |
|------------|-----------|-----------|---|-----|----|----|------|-----------|---------------|------------|------------|------------|------------|------------|-----------|----|---|---|---|---|
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |
| 140        | 104       | 104       | 7 |     | 38 | 40 |      | 42        |               | 40          | 39          | 38          | 37          | 36          | 35        | 34 | 33 | 32 | 31 | 30 |

### AIRPORT RUNWAY 29

- **Elevation:** 44.1 ft
- **Obstacle Slope:** 0.08 percent
- **EOD (ft):**
  - **Category:** 1
  - **Runway:** 10171
  - **Feet:** 4112
  - **Feet:** 11122
  - **Distance:** 123.7
  - **Height:** 128.7

### WATER INJECTION FLAP ANGLE

- **V2:** 140°
- **MCG:** 130°
Attachment E to Chapter 10

Example of guidance on drift-down critical points as used by an operator

Drift-down procedures

Drift-down flight path, critical point

The drift-down procedures require the aeroplane to cross mountainous terrain at a true altitude which is high enough to permit, in case of an engine failure, a descent to the one-engine service ceiling observing a terrain clearance of 2,000 ft. The drift-down flight paths are calculated for various gross weights (GWs) and cover adverse temperatures and winds anticipated in operation. For legs where the critical point lies within the distance of the normal climb, take-off weights (TOWs) are also given. For interpolation, TOWs may be higher than the “maximum take-off weight”. The calculations are based on head winds for both directions that a drift-down flight path might take. The drift-down path is also in each point based on a gradient that is worse (by 1.1 per cent) than the one actually available. Additional distance is gained by slowing down to the drift-down speed horizontally, before starting the descent. For each routing considered, a point is established beyond which, in case of engine failure, the aeroplane will drift down on its course, but will turn back if the failure occurs before that point. To cover navigational errors, a margin of ±10 NM has been allowed for locating the critical point.

Minimum altitude overhead critical point and checkpoint

The minimum altitude over the critical point (true altitude) has to be corrected for non-standard temperature and QNH before selecting the cruise flight level.

It is also necessary that a given checkpoint at the entrance to the critical leg be overflown at a minimum altitude. These altitudes make certain that:

a) The aeroplane reaches the “minimum altitude over the critical point” at least 10 NM before the point. Conditions assumed: 290 kt IAS climb speed (250 kt IAS ¾ FL 100), GWs over critical point as listed, STD temperature +15°, 40 kt tail wind component during climb.

b) There is no violation of the minimum terrain clearance in case of engine failure in climb.

c) The MOCA according to the routing is not higher.

Minimum altitudes over both the critical point and the checkpoint have to be increased when engine and airfoil ice protection is in use.
Attachment F to Chapter 10

Example from an operator’s guidance on the use of the prepared landing weight data

Airfield performance — landing

Definitions

Landing threshold. The point on the runway at which the landing runway length available commences.

$V_s$ (stalling speed). The stalling speed in the landing configuration (Flap Pos 40 or 30).

$V_{ref}$ (target threshold speed). The speed at a height of 50 ft above the landing threshold.

$V_{ref} = 1.3 \ V_s$. Basis of landing weight data.

The certification rules which determine the landing procedures for the aeroplane require that the landing weight must not exceed:

1. The landing weight determined by field length requirements. This is referred to as the landing weight (field length limit).

2. The landing weight determined by the climb gradient requirements in the approach and landing configurations. This is referred to as the landing weight (climb limit).

Landing weight (field length limit)

The certification rules specify that the landing distance (i.e. actual distance to stop from a point 50 ft above the landing threshold and a speed $V_{ref}$) must not exceed 60 per cent of the landing runway length required. Alternatively, this requirement may be expressed as: landing runway length required = landing distance x 1.67 (= 1/0.6). The factor of safety (.67 of the landing distance) is included to cater for deviations from the specified approach/landing procedure as well as for runway characteristics being different to expectations. This factor of safety is included in the landing weight data for both destination and alternate airfields.

Landing runway lengths required are based on:

1. ISA temperatures.


3. Use of wheel brakes and speed brakes only. Reverse thrust not taken into account.

Wet landing field length has been determined by multiplying the dry landing field length by a factor of 1.15.

Landing weight (climb limit)

The certification rules specify that the aeroplane must meet the specified climb gradient requirements in the approach and landing configurations.

The landing weight (climb limit) is the weight applicable to the more limiting of the two requirements.

Operating limit

The operating rules, which are the basis of landing weight calculations, require that the landing weight used for flight planning purposes do not exceed:

1. the still-air landing weight on the longest runway;

2. the landing weight taking the effect of forecast wind into account on other shorter runways. The allowable landing weight on the shorter runway is limited to the still-air landing weight on the longest runway.

This is referred to as the operating limit (OL).

Bearing strength limit

The allowable landing weight on some runways is limited because of the bearing strength being inadequate.

This is referred to as the bearing strength limit (BSL).

The bearing strength limit is based on the officially published bearing strength data for the runway. In the event of a bearing strength limit imposing a restriction on a particular operation, application should be made to the airport authority for permission to operate at a higher weight.
10-16 Preparation of an Operations Manual

Aircraft brought to rest

Safety factor

Landing distance (L.D.)

Landing runway length required (1.67 L.D.)

V_{ref} 50 ft
# Calculation of Allowable Landing Weight

## Restricted Runways

1. Zero wind landing (ZWLW) obtained from Section 1-3, pages 13 and 14.
2. Based on reference pressure altitude/pressure.
3. Use dry runway or wet runway data as applicable.

## Unrestricted Runways

1. Obtained from Section 1-3, pages 1 and 12.
2. Based on reference pressure altitude plus 1000 ft. No correction for pressure altitude necessary.
3. Use dry runway or wet runway data as applicable.

## Wind Correction

1. Increase ZWLW by 300 kg per knot of head wind.
2. Reduce ZWLW by 800 kg per knot of tail wind.

## Pressure Correction

1. Reduce ZWLW by 30 kg per hectoPascal below reference pressure.

## Landing Weight (Field Length Limit)

- **Restricted Runways**
  - Zero wind landing (ZWLW) obtained from Section 1-3, pages 13 and 14.
  - Based on reference pressure altitude/pressure.
  - Use dry runway or wet runway data as applicable.

## Landing Weight (Climb Limit)

1. Obtained from Section 1-3, page 15 for prevailing pressure altitude/pressure temperature conditions.
2. All bleeds OFF.

## Engine Air Conditioning

1. Reduce weight by 1,134 kg.

## Engine Anti-Icing

1. No correction required.

## Wing Anti-Icing

1. Reduce weight by 2,500 kg. Wing anti-icing should not be used above 10°C (50°F) ambient temperature.

## Ice Correction

1. Reduce weight by 4,000 kg. Required when operating in icing conditions during any part of the flight with forecast landing temperature below 8°C (46°F).

**Note:** If resultant weight for Flap Pos 40 is too restrictive, repeat exercise using Flap Pos 30.

## Comparison

Compare landing weight (climb limit) for the least restrictive flap setting with the landing weight (field length limit) for the same flap setting. Use the lower weight.
Attachment G to Chapter 10

Example from an operator’s guidance on quick reference data for non-standard flap configuration landings

### All flaps-up landing

<table>
<thead>
<tr>
<th>Sea level</th>
<th>Zero wind $V_{ref}$ 40 + 55</th>
<th>Approach speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry runway lengths (ft)</td>
<td>Wet runway lengths (ft)</td>
</tr>
<tr>
<td>Landing weight (kg)</td>
<td>Brakes only</td>
<td>Brakes Spoilers</td>
</tr>
<tr>
<td>32 000</td>
<td>7 550</td>
<td>6 300</td>
</tr>
<tr>
<td>34 000</td>
<td>7 900</td>
<td>6 570</td>
</tr>
<tr>
<td>36 000</td>
<td>8 200</td>
<td>6 850</td>
</tr>
<tr>
<td>38 000</td>
<td>8 600</td>
<td>7 200</td>
</tr>
<tr>
<td>40 000</td>
<td>8 950</td>
<td>7 400</td>
</tr>
<tr>
<td>42 000</td>
<td>9 400</td>
<td>7 720</td>
</tr>
<tr>
<td>44 000</td>
<td>9 920</td>
<td>8 070</td>
</tr>
<tr>
<td>46 000</td>
<td>10 450</td>
<td>8 450</td>
</tr>
<tr>
<td>46 720</td>
<td>10 650</td>
<td>8 600</td>
</tr>
<tr>
<td>Head wind* effect/kt</td>
<td>36 ft</td>
<td>26 ft</td>
</tr>
</tbody>
</table>

### Flaps-up landing — Leading edges extended

<table>
<thead>
<tr>
<th>Sea level</th>
<th>Zero wind $V_{ref}$ 40 + 40</th>
<th>Approach speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry runway lengths (ft)</td>
<td>Wet runway lengths (ft)</td>
</tr>
<tr>
<td>Landing weight (kg)</td>
<td>Brakes only</td>
<td>Brakes Spoilers</td>
</tr>
<tr>
<td>32 000</td>
<td>6 800</td>
<td>5 770</td>
</tr>
<tr>
<td>34 000</td>
<td>7 100</td>
<td>6 000</td>
</tr>
<tr>
<td>36 000</td>
<td>7 370</td>
<td>6 250</td>
</tr>
<tr>
<td>38 000</td>
<td>7 710</td>
<td>6 550</td>
</tr>
<tr>
<td>40 000</td>
<td>8 020</td>
<td>6 720</td>
</tr>
<tr>
<td>42 000</td>
<td>8 410</td>
<td>7 000</td>
</tr>
<tr>
<td>44 000</td>
<td>8 870</td>
<td>7 310</td>
</tr>
<tr>
<td>46 000</td>
<td>9 330</td>
<td>7 640</td>
</tr>
<tr>
<td>46 720</td>
<td>9 510</td>
<td>7 780</td>
</tr>
<tr>
<td>Head wind* effect/kt</td>
<td>32 ft</td>
<td>23 ft</td>
</tr>
</tbody>
</table>

* For each knot of head wind, decrease above lengths by listed value.
1.1.2 Wind limits

a) Tail wind: The maximum allowable tail wind component is 10 kt.

b) Cross-wind: For take-off authorization ref. FOM.

### CONDITIONS

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>MAX. CROSS-WIND</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRY / WET / DAMP</td>
<td>30 kt</td>
</tr>
<tr>
<td>AQUAPLANING CONDITIONS:</td>
<td></td>
</tr>
<tr>
<td>— WET in connection with sand or dust</td>
<td>Grooved runway 10 kt</td>
</tr>
<tr>
<td>— STANDING WATER, SLUSH, WET SNOW</td>
<td>Ungrooved runway 5 kt</td>
</tr>
<tr>
<td>(measured depth &gt; 1 mm)</td>
<td></td>
</tr>
<tr>
<td>COMPACTED SNOW, ICE / DRY SNOW</td>
<td></td>
</tr>
<tr>
<td>Reported braking action</td>
<td>Reported friction coefficient</td>
</tr>
<tr>
<td>Good</td>
<td>0.40 and above 25 kt</td>
</tr>
<tr>
<td>Medium to good</td>
<td>0.39 to 0.36 20 kt</td>
</tr>
<tr>
<td>Medium</td>
<td>0.35 to 0.30 15 kt</td>
</tr>
<tr>
<td>Medium to poor</td>
<td>0.29 to 0.26 10 kt</td>
</tr>
<tr>
<td>Poor</td>
<td>0.25 to 0.20 5 kt</td>
</tr>
</tbody>
</table>

◫ DRY SNOW: For friction coefficient below 0.20, refer to FOM.

Note 1.— 30 kt is a compulsory limit without tolerances.

The reduced values of 25 to 5 kt are recommended restrictions based on Company calculations and experience, and shall therefore be adhered to within small tolerances.
Attachment I to Chapter 10

Example of a wind-altitude trade chart

For climb: Wind difference indicates disadvantage that can be tolerated for same range, i.e. more head wind or less tail wind.

For descent: Wind difference is advantage necessary for same range, i.e. less head wind or more tail wind.

Example: LRC at FL 290, weight of 46 000 kg. What are the winds for:

a) climb to FL 330?
b) descent to FL 230?

a) Enter LRC table at 46 000 kg and read off wind factors for FL 330 and FL 290, these are 0 and 12. The difference, 12 kt, is the wind disadvantage that can be tolerated without loss of range capability compared to FL 290.

b) Enter LRC table at 46 000 kg and read off wind factors for FL 290 and FL 230, these are 12 and 50. The difference, 38 kt, is advantage that must be picked up to maintain same range at FL 230 as compared to FL 290.

Long-range cruise

<table>
<thead>
<tr>
<th>Flight level</th>
<th>Cruise weight 1 000 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>52</td>
</tr>
<tr>
<td>370</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td></td>
</tr>
<tr>
<td>330</td>
<td></td>
</tr>
<tr>
<td>310</td>
<td></td>
</tr>
<tr>
<td>290</td>
<td></td>
</tr>
<tr>
<td>270</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td></td>
</tr>
<tr>
<td>230</td>
<td></td>
</tr>
</tbody>
</table>

.72-.74 m cruise

<table>
<thead>
<tr>
<th>Flight level</th>
<th>Cruise weight 1 000 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>52</td>
</tr>
<tr>
<td>370</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td></td>
</tr>
<tr>
<td>330</td>
<td></td>
</tr>
<tr>
<td>310</td>
<td></td>
</tr>
<tr>
<td>290</td>
<td></td>
</tr>
<tr>
<td>270</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td></td>
</tr>
<tr>
<td>230</td>
<td></td>
</tr>
</tbody>
</table>
### Example of a simplified cruise control chart

#### Long-range cruise Mach IAS & thrust settings

<table>
<thead>
<tr>
<th>Pressure altitude (ft)</th>
<th>50</th>
<th>48</th>
<th>46</th>
<th>44</th>
<th>42</th>
<th>40</th>
<th>38</th>
<th>36</th>
<th>34</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 000</td>
<td>.720/264</td>
<td>.717/263</td>
<td>.714/262</td>
<td>.709/260</td>
<td>.703/258</td>
<td>.695/255</td>
<td>.687/251</td>
<td>.677/247</td>
<td>.666/243</td>
<td>.653/238</td>
</tr>
<tr>
<td>26 000</td>
<td>.695/284</td>
<td>.688/281</td>
<td>.681/277</td>
<td>.672/274</td>
<td>.663/270</td>
<td>.653/265</td>
<td>.642/261</td>
<td>.631/256</td>
<td>.618/251</td>
<td>.605/245</td>
</tr>
<tr>
<td>22 000</td>
<td>.663/293</td>
<td>.655/289</td>
<td>.646/285</td>
<td>.637/281</td>
<td>.627/276</td>
<td>.616/271</td>
<td>.605/266</td>
<td>.593/261</td>
<td>.581/255</td>
<td>.568/249</td>
</tr>
<tr>
<td>18 000</td>
<td>.628/300</td>
<td>.619/296</td>
<td>.610/291</td>
<td>.600/286</td>
<td>.590/281</td>
<td>.580/276</td>
<td>.569/271</td>
<td>.558/265</td>
<td>.547/259</td>
<td>.534/253</td>
</tr>
</tbody>
</table>

Notes:— Maneuver capability margin less than 1.5 g in shaded area.
— An increase of up to 0.03 EPR may be required to achieve Mach/IAS.
Chapter 11

ROUTE GUIDES AND CHARTS

11.1 ROUTE GUIDES

11.1.1 Annex 6, Parts I and III, states that the operations manual shall contain a route guide for each route flown, containing information relating to communication facilities, navigation aids, aerodromes and such other information as the operator may deem necessary for the proper conduct of flight operations for such route.

11.1.2 In addition to the items specified above, route guides typically contain other information which either falls naturally within the contents of a route guide or is placed there for ease of access and use. Subjects which normally form part of a route guide and for which requirements exist in ICAO documentation include:

a) information on the regulations and procedures of the areas to be traversed, on the aerodromes/heliports to be used and the associated air navigation facilities (reference Annex 6, Parts I and III);

b) information on the search and rescue facilities in the area over which the aircraft will be flown (reference Annex 6, Parts I and III);

c) information on the procedures to be followed in the event of radio communications failure (reference Annex 2 and Annex 6, Parts I and III) and on applicable national differences;

d) the circumstances in which a radio listening watch is to be maintained (reference Annex 6, Parts I and III);

e) procedures for pilots observing an accident or intercepting a distress communication (reference Annex 12);

f) the ground-air visual signal code for use by survivors (reference Annex 2 and Annex 6, Parts I and III, and ICAO poster P636);

g) interception procedures (reference Annex 2 and Annex 6, Parts I and III) and applicable national differences;

h) ATS flight plan requirements (reference Annex 2) and applicable national differences;

i) security, aircraft search procedure checklist (reference Annex 6, Parts I and III);

j) information on meteorological facilities and services, aircraft observations and air-reports (reference Annex 3);

k) appropriate regional supplementary procedures (Doc 7030);

and in addition:

l) information on the operator’s own organization, e.g. company communication frequencies, handling agents at aerodromes, etc.; and

m) conversion tables, legends and abbreviations.

11.1.3 An operator may wish to include other information in the guide or may find that the information listed above is better placed in some other volume of the operations manual. These decisions will depend on local circumstances and are best left to the operator within the context of overall approval by the appropriate State of the Operator.

11.1.4 Most of the information that goes to make up the contents of a route guide is obtained from ICAO annexes and manuals and from aeronautical information publications (AIPs). It is essential that the information be kept current and that ICAO documents, AIPs, NOTAM, aeronautical information circulars, etc., be monitored so as to ensure that the route guide is amended and kept current.

11.1.5 If an operation is conducted within a relatively small geographical area or within the borders of one or two States, it is possible to produce a route guide using ICAO documents and the relevant AIP(s). When, however, an operation covers a wider area, possibly crossing a number of international boundaries, the large number of information...
Preparation of an Operations Manual

11.2 CHARTS

11.2.1 Annex 6, Parts I and III, states that an aircraft shall carry current and suitable charts to cover the route of the proposed flight and any route along which it is reasonable to expect that the flight may be diverted. The required charts are normally carried as part of the route guide. The actual charts carried on a particular flight will depend on the type and extent of the operation. Typically this would include, for flight under instrument flight rules, the necessary en-route charts and all the charts published for the aerodromes of departure and arrival; for the destination alternate and the take-off alternate; and for any necessary en-route alternate. For flight under visual flight rules the charts that would be carried would include the topographical charts for the area of operation and the required visual approach charts. Some States require that all flights carry topographical charts, but even where this is not the case, operators should carry topographical charts for operations over land areas where radio navigation facilities are not well developed.

11.2.2 Detailed specifications for aeronautical charts are contained in Annex 4 — Aeronautical Charts. Further guidance on charts is available in the ICAO Aeronautical Chart Manual (Doc 8697) and a list of the aeronautical charts available to international civil aviation is provided in the ICAO Aeronautical Chart Catalogue (Doc 7101). The catalogue also lists aeronautical charts produced by State recognized agencies.

11.2.3 The operations manual must describe what charts must be carried on board, and how their validity is to be checked. Charts are subject to frequent amendment and it is necessary to have a system of ensuring that current charts are available. To achieve this, either an operations staff member is appointed to keep the charts in the route guide current, or a list of current charts is displayed so that the flight crew members can determine whether they have the appropriate charts. Normally such lists also serve as a checklist to ensure that all the required charts are carried in the route guide.
Chapter 12

MINIMUM FLIGHT ALTITUDES AND AERODROME OPERATING MINIMA

12.1 MINIMUM FLIGHT ALTITUDES

12.1.1 Annex 6, Parts I and III, states that an operator shall be permitted to establish minimum flight altitudes for those routes flown for which minimum flight altitudes have been established by the State flown over, provided that they shall not be less than those established by that State, unless specifically approved by that State. An operator may therefore use the minimum flight altitudes determined by the State, or he may use higher minimum altitudes. However, the specific approval of the State must be obtained for the use of lower minimum altitudes than those established.

12.1.2 The requirement for States to establish minimum flight altitudes is contained in Annex 11 — Air Traffic Services, where it is stated that minimum flight altitudes shall be determined by each Contracting State for each ATS route over its territory. The minimum flight altitude shall be at least 300 m (1 000 ft) above the highest obstacle within the area concerned.

12.1.3 Where a State does not establish minimum flight altitudes, Annex 6, Parts I and III, requires the operator to do so. In all cases the approval of the State of the Operator is required.

12.1.4 Specifically, Annex 6, Parts I and III, requires that an operator establish minimum flight altitudes for those routes flown for which minimum flight altitudes have not been established by the State flown over. An operator is also required to specify the method by which he intends to determine minimum flight altitudes for operations conducted over routes for which minimum flight altitudes have not been established by the State flown over and shall include this method in the operations manual. It is further specified that the resultant minimum flight altitudes shall not be at a level lower than the minimum level for IFR flights as specified in Annex 2. The minimum levels according to Annex 2 are:

a) over high terrain or in mountainous areas, at a level which is at least 600 m (2 000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft; and

b) elsewhere than as specified in a), at a level which is at least 300 m (1 000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft.

Annex 2 also notes that the estimated position of the aircraft will take account of the navigational accuracy which can be achieved on the relevant route segment, having regard to the navigational facilities available on the ground and in the aircraft.

12.1.5 Where the State has established minimum flight altitudes, an operations manual will contain information on how these minimum flight altitudes are established. Where the State has not established minimum flight altitudes, the operations manual will give the method used to determine minimum flight altitudes. Minimum flight altitudes should be shown on the operational flight plan.

12.1.6 Annex 6, Parts I and III, recommends further that all such minimum flight altitudes and the method of establishing such altitudes be approved by the State of the Operator. It also recommends that in considering such approval, certain factors must be considered. Specifically, the State of the Operator should approve such minimum flight altitudes only after careful consideration of the probable effects of the following factors on the safety of the operation in question:

a) the accuracy and reliability with which the position of the aircraft can be determined;

b) the inaccuracies in the indications of the altimeters used;

c) the characteristics of the terrain along the route (e.g. sudden changes in elevations);
d) the probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents);

e) possible inaccuracies in aeronautical charts; and

f) airspace restrictions.

12.1.7 The requirements listed above are the minimum requirements and in practice operators normally go beyond these and provide more comprehensive information to their flight crews. For example, although there is no applicable ICAO requirement, many operators provide information on the minimum flight altitude at which both obstacle clearance and radio navigation and communication reception is guaranteed. In fact, a number of States require this, and the charts used by operators normally show both the minimum flight altitude and also the minimum en-route altitude which ensures acceptable navigational signal coverage and meets obstacle clearance requirements between radio fixes.

12.1.8 In addition, operators often show the minimum flight altitude on the operational flight plan for each sector (sector meaning the intended track from one reporting or turning point to the next). For each of these minimum flight altitudes, whether shown on the aeronautical charts or on the operational flight plan, the operations manual must explain how they are derived, and exactly what terrain clearance they assure. In the case of altitudes determined by the State this is simple, but where the operator is "establishing" and "specifying a method" of determining the minimum flight altitude, it is possible that a considerably more detailed explanation will be required. In many cases, the minimum flight altitude for operations off airways or where the State has not determined minimum flight altitudes will be the "grid" or area minimum altitude. The specification for the "En-route Chart — ICAO" requires that this altitude be shown. (An example of the information provided by an operator on minimum flight altitudes, and the requirements of one State on the presentation and derivation of these altitudes, is shown at Attachment A to this chapter.)

12.1.9 In addition to the description of the method of derivation of minimum flight altitudes used, many operators include additional guidance in the operations manual. Points normally addressed are the effect of lower-than-standard atmospheric pressure, the effect of wind, especially in mountainous terrain (this subject is also addressed in the State requirements shown at Attachment A to this chapter), and the effect of non-standard temperatures. All of these factors can significantly affect the minimum flight altitude. This is especially true when the aircraft altimeter is set to standard pressure. The guidance given by an operator on factors to be considered during actual flight operations is shown at Attachment B to this chapter.

### 12.2 AERODROME/HELIPORT OPERATING MINIMA

12.2.1 Annex 6, Parts I and III, requires that an operator establish aerodrome/heliport operating minima for each aerodrome/heliport that the operator will use and that the State of the Operator approve the method of determination of such minima. It is further stated that minima may not be lower than any minima established for an aerodrome/heliport by the State of that aerodrome/heliport, unless specific approval is granted. It must be emphasized that, while a number of States have established minima for aerodromes/heliports under their jurisdiction, there is no ICAO requirement for States to do so. It is, however, a fact that in attempting to make use of the lowest operating minima, an operator will not only need the approval of his own State authority, but will often need the approval of the appropriate authority in other States. As the experience and operational background of an operator would need to be considered in the granting of any permission to operate to "lower" minima (i.e. to minima lower than the published State minima), the relevant State authorities will need to consult each other. In this context, attention is drawn to European Civil Aviation Conference Doc No. 17, Common European Procedures for: the authorization of Category II and III operations (Part A); ground operations under limited visibility (Part B) and Mutual acceptance of recurrent Inspections of flight simulators within ECAC Member States (Part C).

12.2.2 Annex 6, Parts I and III, also lists a number of criteria which the State of the Operator needs to consider before approving the aerodrome operating minima established by an operator. Further guidance on these "factors" and on the whole subject of establishing aerodrome operating minima is given in the ICAO Manual of All-Weather Operations (Doc 9365) and in the PANS-OPS (Doc 8168), Volume I — Flight Procedures.

12.2.3 In the foreword to the ICAO Manual of All-Weather Operations it is stated:

"This Manual of All-Weather Operations describes the technical and operational factors associated with methods of determining, monitoring and controlling aerodrome operating minima for take-off, non-precision and precision approaches, including ILS operations and MLS operations equivalent to ILS..."
Category I, and can be applied by the State of the Operator to its operators in respect of international commercial air transport operations.”

12.2.4 PANS-OPS, Volume I, describes operational procedures recommended for the guidance of flight operations personnel. Part III of this volume deals with approach procedures and in the introduction to Part III it is explained:

“The specifications in this Part are designed to provide flight crews and other flight operations personnel with:

a) an appreciation, from the operational point of view, of the parameters and criteria used in the standardized development of precision and non-precision instrument approach procedures; and

b) the procedures to be followed and the limitations to be observed in order to achieve an acceptable level of safety in the conduct of instrument approach procedures.”

12.2.5 Practically all the required information and guidance on the development and operational use of aerodrome operating minima can be found in these two documents. It is not necessary to reproduce the documents in an operations manual, yet any guidance given will necessarily be based upon their contents. Reference should be made to the two documents in the operations manual as being the basic reference material.

12.2.6 The operations manual should contain guidance and information on those terms and expressions used in describing aerodrome operating minima. This would include at least the following:

— aerodrome operating minima
— heliport operating minima
— alternate aerodrome
— take-off alternate
— en-route alternate
— destination alternate
— categories of aircraft
— circling approach
— ceiling
— decision altitude/height (DA/H)
— instrument approach and landing operations:
  — non-precision approach and landing operations
  — precision approach and landing operations
  — categories of precision approach and landing operations
— instrument approach procedure
— minimum descent altitude/height (MDA/H)
— minimum sector altitude (MSA)
— missed approach point (MAPt)
— obstacle clearance altitude/height (OCA/H)
— runway visual range (RVR)
— straight-in approach
— visibility.

All the above terms are defined and used in either Annex 6, Part I or III, the ICAO Manual of All-Weather Operations or the PANS-OPS, Volume I.

12.2.7 In addition, the operations manual must include guidance where regulations exist on the authority of the pilot-in-command to commence or continue an approach depending on the actual visibility conditions existing at that time. Such regulations may be imposed by the State of the Operator, or may be “operator regulations” approved by the State. In addition, a number of States which establish operating minima for their own aerodromes also “ban” approaches to, or take-offs from, a runway when the reported conditions are worse than the minima specified. Other States “approve” operators, both their own and foreign, to operate to particular minima. The different regulations of the States in which operations are conducted must be detailed, and clear instructions must be given for the pilot-in-command.

12.2.8 Information and guidance must be given on those aerodrome ground facilities and services which can have an effect on the aerodrome/heliport operating minima, or which are necessary for a particular type of approach or
take-off. Included in these would be information on the use of multiple transmissometer RVR reports. While the touchdown RVR is always the limiting RVR when landing, minima for the other RVR positions, when provided, are normally specified. Some operators specify that the midpoint and roll-out RVR must be higher than the applicable take-off RVR for that runway. Other operators specify a standard minimum RVR for transmissometer positions other than the touchdown zone. An example of the guidance given in one operator’s manual is shown at Attachment C to this chapter.

12.2.9 Annex 6, Part I, recommends that aerodrome operating minima below 800 m visibility not be authorized unless RVR information is provided. When visibility is reported as meteorological visibility only, and the approved aerodrome operating minima are expressed in terms of RVR, it is common practice to provide guidance on the factoring of visibility to achieve equivalent RVR. This is necessary, as RVR and meteorological visibility are not the same. An example of one State’s guidance, in this respect, for large aeroplanes is shown at Attachment D to this chapter.

12.2.10 Operations manuals also normally provide guidance on the visual segment that a pilot should expect to see upon reaching minima and on the use of the established minima in actual operations. An example from one operator’s manual is shown at Attachment E to this chapter. In addition, the effect of unserviceability of different components of the ground aids, such as approach lights, touchdown zone lights, and runway lights, should be considered. Some operators advise their flight crews of corrections to be made to the published minima to account for these outages. An example of one operator’s guidance is shown at Attachment F to this chapter. However, for Category I and non-precision approaches, whenever decision altitudes or heights are raised, it is necessary to increase the RVR to allow the flight crew to assess their ability to land at the higher decision altitude/height. An example of a table showing RVR against decision heights is shown at Attachment G to this chapter.

12.2.11 The operations manual should emphasize that a flight never continue below the applicable operating minima or take off with less than the required visual reference. The operations manual should also state that the pilot-in-command is entitled to raise the operating minima any time he considers it necessary to do so. (Note that Annex 6, Part I, states that an aeroplane may not infringe aerodrome operating minima.) A topic that should be addressed in the operations manual is the need to raise the minima for engine-out or emergency conditions. There is no ICAO requirement to do this, but operators often advise that the operating minima be increased in these conditions when it is reasonable and practicable to do so. Another factor which should be considered is the effect of cross-winds on minima, both for take-off and landing, and the appropriate guidance relating to aircraft type must be given. An example from an operations manual is at Attachment H to this chapter. It should also be pointed out in the operations manual that it may on occasion be necessary to carry out a go-around after descending below decision altitude/height, because of some unforeseen problem, such as the runway being occupied, or unexpected loss of visual reference, etc. While aircraft are quite capable of going around from any point in the approach, there are occasions on which the operating minima are determined by the presence of obstacles in the missed approach path. In such circumstances, a go-around from below decision height may carry certain risks with failure of the critical engine, and the flight crew should be made aware of this consideration. Equally, for non-precision approaches, the operations manual must state the requirement to commence a go-around at the missed approach point (MAPt) in order to obtain suitable protection from obstacles. One operator’s advice on how to conduct non-precision approaches is shown at Attachment I to this chapter.

12.3 PRESENTATION OF AERODROME/HELIPORT OPERATING MINIMA

12.3.1 When a State establishes aerodrome/ heliport operating minima, those minima must be promulgated on the “Instrument Approach Chart — ICAO” produced by that State in accordance with the requirements of Annex 4. If the operator produces his own charts, he should show his own operating minima which may be the same or higher than any State minima. Lower minima must not be shown unless specific approval of the State has been obtained. Most of the commercial chart-producing agencies also show aerodrome/ heliport operating minima on the instrument approach chart. When an operator is using commercially produced charts, the method used to determine the minima shown must form part of the guidance in the operations manual.

12.3.2 If an operator produces his own operating minima while using charts produced by other agencies, the method of presentation of the aerodrome/ heliport operating minima must be explained in the operations manual. This could be in a small amendable volume of the manual, or an insert in the route guide. The minima could also be shown on the operational flight plan. There may be occasions, particularly in the case where the operator is determining his own operating minima, where it will be necessary for a flight to carry out an instrument approach procedure to a
runway for which the operator (or State) has declared no minima. In these circumstances some operators have determined, for each aircraft type and type of approach, a figure that must be added to the obstacle clearance altitude/height to determine the applicable operating minima. (A State must determine the obstacle clearance altitude/height as appropriate, and if not published on the instrument approach chart, the information should be readily available from the ATS at the aerodrome/heliport.) If an operator should determine such figures for the aircraft types operated, the guidance in the operations manual should make it clear that the resulting aerodrome/heliport operating minima are based on all the normal ground facilities being available. If necessary, the aerodrome/heliport operating minima derived by this method should be adjusted, as is the case with pre-determined aerodrome/heliport operating minima, by reference to components-out tables, etc.
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Attachment A to Chapter 12

A-1. Example of minimum flight altitudes from an operations manual

MINIMUM FLIGHT ALTITUDES

1. General

It is of the utmost importance that the pilot-in-command/flight operations officer ensure that the flight is planned and performed with adequate terrain clearance. The following minimum tolerances have been established.

2. Minimum sector altitude (MSA)

A minimum sector altitude is given on the instrument approach chart and is based on a tolerance of 1 000 ft above terrain and obstructions within the sector distance (25 NM), rounded up to the nearest 100 ft.

3. Minimum flight altitude (MFA)

Minimum flight altitude may be issued by States to define the lowest permissible altitude in airways within their territory. When issued, the MFA shall be given in the en-route chart.

4. Minimum obstacle clearance altitude (MOCA)

Minimum obstacle clearance altitude is based on a tolerance of 1 000 ft above terrain and obstacles up to 6 000 ft, and 2 000 ft above terrain and obstacles over 6 000 ft, rounded up to nearest 100 ft. MOCA, in hundreds of feet, is given in the en-route, SID and STAR charts.

MOCA is valid for a corridor of variable width as shown below.

5. Minimum off-route altitude (MORA)

Minimum off-route altitude is based on a tolerance of 1 000 ft above terrain and obstacles up to 6 000 ft, and 2 000 ft above terrain and obstacles over 6 000 ft for one or more LAT/LONG squares in the en-route chart rounded up to the nearest 100 ft.

6. Corrections for wind, temperature and QNH

All minimum altitudes above shall be corrected for wind and temperature when altimeter is set to QNH and for wind, temperature and QNH when altimeter is set to standard.

— for wind, add 500 ft per 10 kt above 30 kt, up to a maximum 2 000 ft;
— for temperature, calculate correction on computer or add 4 per cent per 10°C below standard;
— for QNH below 1 013 mb add 30 ft per mb.

Note.— For convenience the above corrections are given in the flight level correction graphs and as a correction table in the respective checklist.
A-2. Example of minimum flight altitudes from a State’s requirements

MINIMUM FLIGHT ALTITUDES

1. Minimum safe altitudes

1.1 Minimum safe altitudes are to be prescribed by the operator for each sector of each route to be flown — including routes to alternate aerodromes. For this purpose “sector” means the intended track from one reporting or turning point to the next, until the aircraft starts the instrument approach procedure (or joins the traffic pattern) at the aerodrome to be used for landing. Except as provided in paragraph 1.2 below, these figures should be specified by the operator prior to flight in the appropriate volume of the manual, in a prepared navigation flight plan, or in the commander’s flight brief.

1.2 To meet the needs of the commander when he is obliged to depart from the planned or normal route, operators should include in the manual a formula from which the minimum safe altitude can readily be calculated. The formula should be adequate to secure at least the normal terrain clearance standards observed by the operator, but should be expressed as simply as possible.

1.3 In specifying minimum safe altitudes, operators should take account of local regulations.

1.4 The criteria upon which minimum safe altitudes are based will necessarily be determined to some extent by the track guidance facilities available to the commander, and by the extent to which commanders and operators are able in particular circumstances to accept the directions of radar controllers. The minimum acceptable standards will normally be as follows, but see also paragraph 1.5.

1.4.1 For general application: 1 500 ft above the highest terrain or obstacle within 20 NM of the intended track, with additional provision where necessary for terrain or obstacles within 10 degrees of intended track from the last known position.

1.4.2 For flight in controlled airspace where the track is well defined by two separate aids: 1 500 ft above the highest terrain or obstacle within 10 NM of the intended track.

1.4.3 For radar-controlled flight within 25 NM of the aerodrome of departure or intended landing: 1 000 ft above the highest terrain or obstacle within 5 NM of the intended track. Commanders should be instructed to monitor all radar instructions by reference to other aids, and should be reminded that radar control does not relieve them of their responsibility to ensure adequate terrain clearance.

1.4.4. If the specified minimum altitude for a sector is related only to terrain or obstacles within less than 20 NM of the intended track, this should be made quite clear in manuals and on prepared navigational flight plans supplied to flight crews.

1.5 For flights within 20 NM of terrain having a maximum elevation exceeding 2 000 ft, operations manuals should provide for minimum altitudes to be increased by at least the following amounts according to the wind speed at flight level:

```
Wind speed in knots
Elevation of terrain      0-30  31-50  51-70   Over 70
2-8 000 ft               500 ft 1 000 ft 1 500 ft 2 000 ft
Above 8 000 ft           1 000 ft 1 500 ft 2 000 ft 2 500 ft
```

1.6 Manuals should also include a reference to the effect of mountain waves and instruct commanders to take suitable precautions when such conditions are reported or forecast.

1.7 Minimum altitudes should be related where necessary to the ability of the aircraft to comply with the weight and performance regulations.

---

Chapter 12. Minimum flight altitudes and aerodrome operating minima
In-flight use of minimum flight altitudes

1. In the matter of flight levels (1 013.2 mb altimeter setting) pilots should be ever on the alert that any clearances received, or rapid descents initiated, do not take them below the safety altitude for the area in which they are flying.

2. The significance of the foregoing is the fact that the safety altitudes or lowest flight levels only pertain to the ADR, or track, or the narrow, 10 miles, confine of the airway to which they are designated. This means that if the navigation aid or the navigation of the aircraft is not up to standard, there is no guarantee that safe clearance is being maintained between the aircraft and the ground. The topographical information provided on radio navigational charts is inadequate. Pilots have accepted a spot height which is regarded as the highest obstacle in the area, without taking into account the obvious contours of high ground in which many areas abound.

3. General guidance

3.1 One of the main reasons for collision with terrain would appear to be complacency or lack of a sense of immediate danger in the cockpit. It is suggested that the best remedy lies in the area of cockpit procedures, particularly during initial approach. It is imperative, during descent and approach, that captain, co-pilot and third pilot independently monitor the navigation of the aircraft and thus eliminate the possibility of gross navigational errors.

3.2 Navigation, of course, is three-dimensional and height should be monitored as well as geographical position. It is important, therefore, that non-flying pilots particularly do not allow supplementary activities to reach a pitch such that they lose orientation of aircraft position or altitude. Particular attention should be paid to safety heights in the following circumstances:

   a) if emergency descents have to be made;
   b) if steep rates of descent are requested by ATC, en route;
   c) if any deviation from standard tracks occurs;
   d) when using radar positioning at airports situated near high ground;
   e) when using navigation aids in mountainous terrain (aids can be quite unreliable and misleading, particularly at low altitudes);
   f) if ATC clearances conflict with company safety altitudes.
Attachment C to Chapter 12

Example of application of RVR reports from an operations manual

Application of RVR reports

The reported RVR prevails over the reported visibility. If for a particular runway more than one RVR is reported, the usability of that runway for landing must be based on the touchdown zone (TDZ) RVR.

Reported RVRs along other portions of the runway control the roll-out manoeuvre and 175 m is considered to be the minimum for adequate roll-out guidance.

In the event the TDZ RVR is not available, pilots must revert to the reported general visibility.

Note 1.— Some transmissometers have a limited minimum measuring capacity, depending on the distance between equipment components. An RVR reading reported as “below 250 m” may reflect any value between 0 and 250 m.

Note 2.— Transmissometer locations along a runway are sometimes being identified in national AIPs by letters of the alphabet. Same may be used in R/T to aircraft; not necessarily, however, in the sequence of the alphabet. Whatever the method used to identify multiple RVRs, the TDZ RVR is always given first, followed by subsequent RVRs along the runway. Although practices vary, the report may accordingly take the sequence C.B.A., implying that C is the touchdown RVR, and for the opposite runway the sequence would be A.B.C.

Note 3.— Subsequent or additional RVRs are in some countries referred to as midpoint and roll-out RVRs. Use of these terms should be avoided, as the exact locations of the associated transmissometers are not indicated on the aerodrome chart and the roll-out length varies with aircraft category.

Note 4.— Subsequent or additional RVR values are normally not published on the approach chart, unless values in excess of 175 m are locally required.
Attachment D to Chapter 12

Example of conversion of visibility to RVR from a State’s requirements

Conversion of reported meteorological visibility to RVR

Table 3 provides factors that should be applied when converting meteorological visibility to equivalent RVR.

Table 3

<table>
<thead>
<tr>
<th>Lighting elements available</th>
<th>RVR = reported MET visibility x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>Night</td>
</tr>
<tr>
<td>High-intensity approach and runway lighting</td>
<td>1.5</td>
</tr>
<tr>
<td>Any type of lighting installation other than above</td>
<td>1.0</td>
</tr>
<tr>
<td>No lighting</td>
<td>1.0</td>
</tr>
</tbody>
</table>


Attachment E to Chapter 12

Example of application of established minima from an operations manual

APPLICATION OF ESTABLISHED MINIMA

1. General policy

General guidance is set out below.

1.1 Minima figures of MDH/MDA and visibility are the lowest value for which landing or take-off should be attempted and, except in the case of circling minima, these figures assume the serviceability of the ground and airborne equipment. If, for any reason, the captain considers that the weather minima are too low for safe operation in a particular set of conditions, he is authorized to raise the minima accordingly.

1.2 The ICAO definition of decision height/altitude (DH/DA) means, in effect, that the pilot — by reference to the visual cues available to him — must have satisfied himself by the decision height that:

a) the aircraft is in the correct position;

b) the aircraft flight path is correct; and

c) there is sufficient visual reference to control the aircraft for the remainder of the approach and landing.

1.3 If he is not satisfied that these conditions are fulfilled, he must initiate a missed approach and it is emphasized that the decision must be made by the time the aircraft arrives at decision height/altitude. It may happen that a pilot, having decided to land, must subsequently revise this decision because of loss or fore-shortening of the visual segment, for example, in shallow fog conditions where the fog top is below the decision height/altitude.

2. Pitch/roll guidance

2.1 It must be stressed that whereas roll guidance is sufficient, provided one or more crossbars can be seen, the pilot’s ability to control the aircraft in pitch and maintain the correct glide path by visual reference is very limited until the runway is in view. In limiting conditions, therefore, pilots are cautioned against making other than minor corrections in pitch, during the visual phase, until the runway is positively in view.

2.2 Similarly, during an automatic approach in limiting conditions, the autopilot should not be disconnected above DH/DA and may be used down to the limiting height specified for the aircraft. The great danger is touching down before reaching the runway. Conversely, if the pilot finds that he has not touched down by the end of the touchdown zone lights or markings, he should consider making a missed approach.

3. Visibility

3.1 The minimum visibility must be such that at DH/DA or MDH/MDA there is:

a) sufficient visual guidance to assess whether the aircraft is properly positioned for a landing; and

b) adequate visual reference for control during the remainder of the approach.

3.2 To meet requirements a) and b) above for Category I and non-precision approaches, it is considered that at least 200 m of approach lights, including two crossbars, should be visible at DH/DA or MDH/MDA. In the absence of a multi-crossbar high-intensity system, the runway threshold should be visible at and below 200 ft. In the absence of any type of approach light system, the threshold should be visible at the DH/DA or MDH/MDA. The minimum visibility to satisfy these criteria is therefore related to the DH/DA or MDH/MDA and approach light system, and in the case of a non-precision aid, it may also be limited by the landing distance available.
Attachment F to Chapter 12

Example of variation of RVR or visibility minima from an operations manual

Components-out table

If one or more components or visual aids are inoperative or not used, the published descent limits and RVR or visibility minima must be increased by, or to, the values listed below in order to obtain the prescribed minima.

<table>
<thead>
<tr>
<th>AIRCRAFT CATEGORY C &amp; D</th>
<th>PROCEDURE</th>
<th>PRESCRIBED MINIMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inoperative aid</td>
<td>DA/MDA = published DA/MDA increased with:</td>
<td>VIS/RVR = not lower than:</td>
</tr>
<tr>
<td>ILS CAT I</td>
<td>Localizer</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td></td>
<td>GP</td>
<td>ILS no GP minima apply.</td>
</tr>
<tr>
<td></td>
<td>OM</td>
<td>50 ft. 1200 m.</td>
</tr>
<tr>
<td></td>
<td>MM (applicable in USA only)</td>
<td>50 ft. 2400 ft.</td>
</tr>
<tr>
<td></td>
<td>Appr lights **</td>
<td>0 ft. 1200 m.</td>
</tr>
<tr>
<td></td>
<td>HIRL</td>
<td>0 ft. 800 m (Group D), 600 m (Group C).</td>
</tr>
<tr>
<td></td>
<td>RCLL*</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td></td>
<td>TDZL</td>
<td>published + 600 m.</td>
</tr>
<tr>
<td></td>
<td>GP ground checked only</td>
<td>ILS no GP minima apply.</td>
</tr>
<tr>
<td></td>
<td>LLZ ground checked only</td>
<td>ILS no GP minima apply, but add 400 m to published VIS.</td>
</tr>
<tr>
<td></td>
<td>ILS on test</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td>PAR</td>
<td>Appr lights</td>
<td>0 ft. 1600 m.</td>
</tr>
<tr>
<td>ILS no GP</td>
<td>No FAF</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td></td>
<td>Appr lights</td>
<td>0 ft. published + 600 m.</td>
</tr>
<tr>
<td></td>
<td>LLZ ground checked only</td>
<td>0 ft. published + 400 m.</td>
</tr>
<tr>
<td></td>
<td>LLZ on test</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td>VOR + FAF</td>
<td>No FAF</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td></td>
<td>Appr lights</td>
<td>0 ft. published + 600 m.</td>
</tr>
<tr>
<td></td>
<td>VOR/NDB ground checked only</td>
<td>0 ft. published + 400 m.</td>
</tr>
<tr>
<td></td>
<td>VOR/NDB on test</td>
<td>Procedure not authorized.</td>
</tr>
<tr>
<td>SRE VOR NDB</td>
<td>Appr lights</td>
<td>0 ft. published + 600 m.</td>
</tr>
<tr>
<td></td>
<td>VOR/NDB ground check</td>
<td>0 ft. published + 400 m.</td>
</tr>
<tr>
<td></td>
<td>VOR/NDB on test</td>
<td>Procedure not authorized.</td>
</tr>
</tbody>
</table>
**Attachment G to Chapter 12**

**Example from a State’s requirements on RVR-DH relationship**

RVR values (metres) — related to decision height and approach lighting available — aeroplanes exceeding 5 700 kg MTWA

<table>
<thead>
<tr>
<th>DH (feet)</th>
<th>Over 850</th>
<th>−750</th>
<th>−650</th>
<th>−550</th>
<th>−450</th>
<th>−350</th>
<th>−250</th>
<th>−150</th>
<th>−0</th>
<th>Over 600</th>
<th>−599</th>
<th>−299</th>
<th>All lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 — 212</td>
<td>600</td>
<td>600</td>
<td>700</td>
<td>700</td>
<td>800</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
<td>1 000</td>
<td>1 100</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
</tr>
<tr>
<td>213 — 237</td>
<td>600</td>
<td>700</td>
<td>700</td>
<td>800</td>
<td>800</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
<td>1 200</td>
<td>1 200</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
</tr>
<tr>
<td>238 — 262</td>
<td>700</td>
<td>700</td>
<td>800</td>
<td>900</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
<td>1 200</td>
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<td>1 000</td>
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<td>1 300</td>
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<tr>
<td>263 — 287</td>
<td>700</td>
<td>800</td>
<td>900</td>
<td>1 000</td>
<td>1 000</td>
<td>1 100</td>
<td>1 200</td>
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<td>1 400</td>
<td>1 100</td>
<td>1 300</td>
<td>1 400</td>
</tr>
<tr>
<td>288 — 325</td>
<td>800</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
<td>1 100</td>
<td>1 200</td>
<td>1 300</td>
<td>1 400</td>
<td>1 500</td>
<td>1 500</td>
<td>1 200</td>
<td>1 400</td>
<td>1 500</td>
</tr>
<tr>
<td>326 — 375</td>
<td>900</td>
<td>1 000</td>
<td>1 100</td>
<td>1 200</td>
<td>1 200</td>
<td>1 300</td>
<td>1 400</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 200</td>
<td>1 400</td>
<td>1 500</td>
</tr>
<tr>
<td>376 — 425</td>
<td>1 000</td>
<td>1 100</td>
<td>1 200</td>
<td>1 300</td>
<td>1 300</td>
<td>1 400</td>
<td>1 500</td>
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<td>1 200</td>
<td>1 400</td>
<td>1 500</td>
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<tr>
<td>426 — 475</td>
<td>1 200</td>
<td>1 300</td>
<td>1 400</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
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<td>1 500</td>
<td>1 200</td>
<td>1 500</td>
<td>1 500</td>
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<tr>
<td>476 — 525</td>
<td>1 400</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
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<td>1 500</td>
<td>1 500</td>
</tr>
<tr>
<td>526 — 575</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
</tr>
<tr>
<td>576 — 625</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
</tr>
<tr>
<td>626 or higher</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
<td>1 500</td>
</tr>
</tbody>
</table>
EFFECT OF OPERATIONAL CONDITIONS
ON OPERATING MINIMA

1. Cross-wind/landing

A cross-wind increases the difficulty of making an accurate let-down and the raising of minima, because of cross-winds, is left to the discretion of the captain except in the case of four-engine jet aircraft. For these, aircraft decision heights/altitudes of less than 300 ft will not be used when the cross-wind exceeds 15 kt. For guidance on other types, DH/DA or MDH/MDA should be increased by 50 ft for each 10 kt cross-wind component in excess of 10 kt.

2. Cross-winds and braking action/take-off

2.1 When RVR is greater than 400 m (Cat B and C) or 800 m (Cat D) the normal cross-wind limit will apply, providing braking action is reported moderate or better.

2.2 When RVR is greater than 200 m (Cat B and C) or 300 m (Cat D), the maximum cross-wind limit allowed will be 50 per cent of that normally applied. Braking action must be reported as “good”.

2.3 When RVR is less than 200 m (Cat B and C) or 300 m (Cat D), the maximum cross-wind limit will be 10 kt. Braking action must be reported as “good”.

2.4 In the case of b) and c) above, when braking action is reported as other than “good”, the higher minima will apply.

3. Aircraft condition

When the aircraft is being operated with performance restrictions, such as reverse thrust, anti-skid, or speed brakes, which are unserviceable, RVR of less than 300 m (Cat B, C and D) will not be used.
Attachment I to Chapter 12

Example of non-precision approach procedure policy from an operations manual

Non-precision approach procedure

Taking runway length and conditions into account, decide on flap configuration to be used for landing. If runway conditions permit, flap 30 is the more desirable setting as this will minimize speed, pitch and trim changes when final flap selection is made.

Approach the final fix, gear down, flap 15 at 150 kt. Immediately upon passing the fix, select flap 25 and establish a rate of descent in order to maintain a 3° glide slope at either \( V_{ref} \) flap 40 + 20 kt or \( V_{ref} \) flap 30 + 15 kt, depending on final configuration decided for landing. Using \( V_{ref} \) (landing configuration) as a basis, approach speed will obviously vary according to landing weight; thus, adequate margin over \( V_{ref} \) flap 25 (approach configuration) will be assured irrespective of weight.

Plan to arrive at the MDA slightly early to achieve a timely and smooth transition to a fully stabilized landing configuration in the slot. If at MDA visual ground contact has not been established, an immediate go-around must be carried out.

If at the calculated time with the runway in sight and within the landing slot, select final flap and continue descent for a landing. If slightly early but with visual ground contact established, it is permissible to maintain altitude and 25° flap configuration until (1) runway is sighted with sufficient visual cues for landing, or (2) missed approach point (MAPt) is reached.

In the case of (1) above, expect to be low in visual slot when runway is sighted, select landing flap and fly into the slot from below and land.

In the case of (2) above, if sufficient visual cues for landing have not been achieved, carry out a go-around. Once go-around has been initiated, it must be completed.
Chapter 13

ACCIDENT PREVENTION AND
POST-ACCIDENT ADMINISTRATION

13.1 ACCIDENT PREVENTION

13.1.1 Accident prevention requires that an awareness of flight safety be fostered among all of the operator’s personnel, but particularly among the flight crew. The role of the accident prevention adviser (APA) has been addressed in Chapter 3. In addition to the information on the role of the APA, it is normal practice to include information in the operations manual on the methods used to promote accident prevention activities. In developing an accident prevention awareness programme, reference should be made to the ICAO Accident Prevention Manual (Doc 9422). The aim of this manual is to enunciate accepted principles in accident prevention, to describe proven methodologies and management techniques, and to provide references and examples of practical applications and solutions. The manual addresses accident prevention as an activity which complements the existing regulatory procedures and provisions. This activity has the purpose of discovering and eliminating or avoiding any condition, event or circumstance which could induce an accident. Some topics which are addressed in the ICAO Accident Prevention Manual and which should form part of the information and guidance given in the operations manual are:

a) the role of management, since the policies of management and its allocation of resources directly influence the safety of operations;

b) voluntary and confidential reporting systems (within the airline);

c) confidential safety surveys; and

d) safety promotion, i.e. the dissemination of accident prevention material.

13.1.2 The operations manual must also give instructions and guidance for the investigation and management of incidents and accidents. Serious incidents should be treated, for investigative purposes, as if they were accidents. This has the advantage of providing hazard information to the same standard as an accident investigation. Another benefit is that it allows the operator to analyse how the organization coped with the incident and to make any required changes. The operations manual must include instruction on accident and incident categorization, and guidance on how an accident or incident will be investigated and how it will be reported. Any effective accident prevention organization will include at least one, and preferably a number of, trained accident investigators. These investigators will be responsible for investigating incidents and will be the operator’s representatives at official investigations of accidents. Their terms of reference should be included in the operations manual.

13.2 POST-ACCIDENT ADMINISTRATION

13.2.1 The operations manual should give instruction and guidance on the duties and obligations of personnel following an accident. This material falls under two basic headings, the duties and responsibilities of the pilot-in-command and other crew members at an accident site and the duties and responsibilities of the operator.

13.2.2 In giving guidance on the duties of the crew at an accident site, it must be borne in mind that the site may be remote from any of the company’s facilities and that, for a period, the most senior official present will be the pilot-in-command. The guidance must be sufficient to aid the crew in this event. An example of the guidance given by an operator is shown in Attachment A to this chapter.

13.2.3 The operations manual must also give information and appropriate guidance on the accident and emergency procedures established by an operator to deal with the aftermath of an accident. The ICAO Airport Services Manual (Doc 9137), Part 7 — Airport Emergency Planning, gives detailed guidance on pre-planning for airport emergencies, as well as on co-ordination between
the different airport agencies (or services). One of the agencies concerned is the operator and the manual gives detailed guidance on his role. The manual states:

“3.8 AIRCRAFT OPERATORS

3.8.1 It is important that arrangements be made in the plan so that full details of aircraft related information, such as number of persons aboard, fuel and carriage of any dangerous goods is available. Aircraft operators are expected to be responsible for providing this information. They are also responsible for first arrangements for any uninjured survivors who may require to continue their journey, or need accommodation or other assistance. They may also be responsible for contacting deceased passengers’ next of kin. The police and/or international relief agencies (Red Cross, etc.) will normally assist in the accomplishment of this task. Information on services provided by aircraft operators following an aircraft accident is contained in Appendix 6.”

13.2.4 Appendix 6 of the ICAO Airport Services Manual (Doc 9137), Part 7 — Airport Emergency Planning, describes the action which is to be taken and the services which are expected to be provided by the aircraft operator involved following an aircraft accident. While the material in the operations manual will be addressing an accident to a company aircraft, the emergency procedures described will also be used in the case of another company’s aircraft having an accident at an aerodrome at which the operator is the principal operator or acts as the agent for the other company.

13.2.5 While the material in the ICAO Airport Services Manual (Doc 9137), Part 7 — Airport Emergency Planning, is detailed on the role of the operator in emergency planning, it does not give sufficient guidance on the internal company organization that an operator will need to establish to deal with the aftermath of aircraft accidents. Operators normally establish a central accident/emergency centre for the administration of post-accident activities. The operations manual should give guidance on the establishment of such a central accident/emergency centre. This guidance would, typically, contain information on:

a) duties and responsibilities of a central accident/emergency centre;

b) organization chart/reporting lines for such a centre;

c) facilities (space allocated, communication facilities, stationery supplies, etc.);

d) action on receiving notice of accident or alarm message;

e) checklists of procedures;

f) checklist of telephone numbers and addresses;

g) procedures for dealing with survivors; and

h) procedures for dealing with dead passengers and crew.

13.2.6 The Airport Handling Manual of the International Air Transport Association gives detailed guidance on emergency procedures and accident/emergency control centres. An operator may prefer to include information on this subject in a separate volume of the operations manual. Whether as a separate volume or incorporated in a single volume of the operations manual, it is vital that the information on accident procedures be regularly reviewed and brought up to date to ensure that the names, addresses, and telephone numbers are correct. During the annual testing of the airport emergency plan, the operator should take the opportunity to test the effectiveness of the procedures and functioning of the central accident/emergency centre.
Chapter 13. Accident prevention and post-accident administration

Attachment A to Chapter 13

Extract of pilot procedures from an operations manual

Pilot procedures

The captain or senior crew member is responsible for the following:

a) ensuring that emergency evacuation procedures are carried out;

b) taking necessary steps to safeguard life and property, bearing in mind the comfort of surviving passengers;

c) notifying the nearest company station, and establishing and maintaining a line of communication with that station;

d) keeping crew members available, near the scene of the accident or at a nearby hotel, to assist in the investigation. Crew members must not work a flight until they are released by the flight safety official in charge or the flight operations representative assigned to the investigation;

e) until relieved by the airport manager:

— ensuring that the aircraft is not moved more than necessary,

— keeping spectators at a reasonable distance, and

— dealing with the press, radio and television in as tactful and non-committal a manner as possible, and expressing no opinion as to the causes of the accident;

f) ensuring that any crew member who has been injured, or who is suspected of being injured, is medically examined and assessed as fit prior to giving any verbal or written statement; and

g) ensuring that each flight crew member writes a separate statement as soon as possible. This statement should include a history of the flight, a full account of the accident, and any follow-up action taken. This statement should be given to the flight safety official in charge or the supervisory flight operations representative.

— END —