



AIR LAW

ATPL GROUND TRAINING SERIES

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Introduction

The content of the CAE Oxford Aviation Law Course meets the requirements of the EASA FCL syllabus (Subject 010 – Air Law) and the associated Learning Objectives (LOs). The main reference documents are the Annexes to the Convention on International Aviation (The Chicago Convention) and the associated PAN documents. Additional references are taken from EASA Part-FCL and EASA Part-MED.

Air Law

The subject of Air Law is a misnomer. The content of the subject is effectively airmanship with the addition of information concerning some of the international conventions that have been adopted to regularize the administration of aviation and the aviation industry. The subject matter is diverse ranging from international agreements through the rules of the air, flight crew licensing, instrument procedures, ATC and the physical characteristics of aerodromes. A student does not need to be a lawyer to pass this subject. Most of the requirements are common sense, the majority of which will be familiar to a PPL holder. The ab initio student should approach the subject from the ‘need to know’ principle and be guided by the examination feedback as well as the syllabus. The end of chapter questions are based on examination questions and should give the student a feel for the level of knowledge required on completion of the course.

Abbreviations

Air Law, perhaps more than any other subject, is inundated with abbreviations, some of which are examinable. Where this is the case, the abbreviations are specified in the appropriate chapter and ‘decoded.’ The following is a list (not exhaustive) of abbreviations commonly used in aviation.

AAIB	Air Accident Investigation Board
AAL	Above Aerodrome Level
ABIP	Advisory Body of Interested Parties
ABN	Aerodrome Beacon
a/c	Aircraft
ACC	Area Control Centre
AD	Airworthiness Directive
ADA	Advisory Airspace
ADF	Automatic Direction Finding
ADO	Approved Design Organization
ADR	Advisory Route
ADT	Approved Departure Time
AFI	Assistant Flying Instructor
AFIS	Aerodrome Flight Information Service
AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunications Network
AGL	Above Ground Level
AGNA	Advisory Group of National Authorities
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIREP	Air Report
AIS	Aeronautical Information Service
a/l	Airline
ALT	Altitude

AMC	Acceptable Means of Compliance
AME	Aero Medical Examiner
AMO	Approved Maintenance Organization
AMOSS	Airline Maintenance and Operation Support System
AMSL	Above Mean Sea Level
AMT	Approved Maintenance Training
ANO	Air Navigation Order
A-NPA	Advance Notice of Proposed Amendment
AOC	Air Operator's Certificate
A/P	Autopilot
APO	Approved Production Organization
APU	Auxiliary Power Unit
ARC	Airworthiness Review Certificate
ARP	Aerodrome Reference Point
ARN	ATS Route Network
ASDA	Accelerate-Stop Distance Available
ASL	Above Sea Level
ASR	Altimeter Setting Region
ATAS	Air Traffic Advisory Service
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATCU	Air Traffic Control Unit
ATCRU	Air Traffic Control Radar Unit
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATO	Approved Training Organization
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
ATTCS	Automatic Take-off Thrust Control System
ATZ	Air Traffic Zone
AUW	All Up Weight
AWD	Airworthiness Division
AWO	All Weather Operations
AWY	Airway
BEA	Bureau d'Enquêtes Accidents (French equivalent of NTSB)
BR	Basic Regulation
CAA	Civil Aviation Authority
CAME	Continuous Airworthiness Maintenance Exposition
CANP	Civil Aviation Notification Procedure
CAS	Controlled Airspace
CAT	Commercial Air Transport
CDFA	Constant Descent Final Approach
CF	Certification
CJAA	Central Joint Aviation Authorities
C of A	Certificate of Airworthiness
COM	(European) Commission
CRD	Comment Response Document
CRI	Certification Review Item
CRS	Certificate of Release to Service
CS	Certification Specification
CSP	Certification Standardization Panel

CTR	Control Zone
DA	Decision Altitude
db	Decibel (acoustic measurement unit)
DF	Direction Finding
DG TREN	Directorate-General for Transport and Energy (European Commission)
DH	Decision Height
DME	Distance Measuring Equipment
DOA	Design Organization Approval
DOE	Design Organization Exposition
DR	Dead Reckoning
E	Engine
EASA	European Aviation Safety Agency
EAT	Expected Approach Time
EC	European Commission
ECAC	European Civil Aviation Conference
ED	Emergency Distance
EET	Estimated Elapsed Time
ELT	Emergency Location Transmitter
EPA	European Part Approval
EPIRB	Emergency Position Indicating Radio Beacon
EPR	Environmental Protection Requirements
ER	Essential Requirements
ETA	Estimated Time of Arrival
ETSO	European Technical Standard Order
ETSOa	European Technical Standard Order authorization
ETOPS	Extended Twin Jet Operations
EU	European Union
FAA	Federal Aviation Administration
FAL	Facilitation of Air Transport
FAT	Final Approach Track
FCL	Flight Crew Licensing
FFS	Full Flight Simulator
FI	Flying Instructor
FIR	Flight Information Region
FIS	Flight Information Service
FL	Flight Level
FLPFM	Foot Launched Powered Flying Machine
FTD	Flight Training Device
FTL	Flight Time Limitations
GA	General Aviation
GASIL	General Aviation Safety Information Leaflet
GCA	Ground Controlled Approach
GM	Guidance Material
GMT	Greenwich Mean Time
GPS	Global Positioning System
H24	Day and Night Operating Hours
HF	High Frequency
Hz	Hertz Radio Frequency
IAS	Indicated Air Speed
Ibn	Identification Beacon
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules

ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IPC	Illustrated Parts Catalogue
IR	Implementing Rules
IR	Instrument Rating
IRE	Instrument Rating Examiner
IRVR	Instrument Runway Visual Range
ISA	International Standard Atmosphere
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements
k	thousand
kHz	Kilohertz
KIAS	Indicated Airspeed in Knots
kt	Knots (nautical miles/ hour)
LAPL(A)	Light Aircraft Pilot Licence (Aeroplanes)
LARS	Lower Airspace Radar Service
LATCC	London Air Traffic Control Centre
LDA	Landing Distance Available
LHA	Lowest Holding Altitude
LF	Low Frequency
LHA	Lowest holding altitude
LoA	Letter of Agreement
MATZ	Military Air Traffic Zone
MB	Management Board (EASA)
MCC	Multi-crew Co-operation
MDH	Minimum Descent Height
MEHT	Minimum Eye Height (PAPIs)
MEL	Minimum Equipment List
METAR	Aviation Routine Weather Report
MF	Medium Frequency
MHz	Megahertz
MMEL	Master Minimum Equipment List
MNPS	Minimum Navigation Performance Specification
MOA	Maintenance Organization Approval
MoC	Means of Compliance
MoD	Ministry of Defence
MOE	Maintenance Organization Exposition
MOM	Maintenance Organization Manual (Subpart F)
MOTNE	Meteorological Operational Telecommunications Network
MRSA	Mandatory Radar Service Area
MSA	Member States Administration
MS	Member State (of the European Community)
MTOA	Maintenance Training Organization Approval
MTOE	Maintenance Training Organization Exposition
MTOM	Maximum Take-off Mass
MTOP	Maximum Take-off Power
MTWA	Maximum Take-off Weight Authorized
NAA	National Aviation Authority
NAPs	Noise Abatement Procedures
NAV	Navigation
NATS	National Air Traffic Services
NDB	Non-directional Beacon

NDB(L)	Locator (a low-powered NDB serving approaches)
NOH	Notified Operating Hours
NOSIG	No Significant Change
NOTAM	Notice to Airmen
NPA	Notice of Proposed Amendment
OCA	Oceanic Control Area
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OCL	Obstacle Clearance Limit
OCP	Organizations Certification Procedure
OEM	Original Equipment Manufacturer
OIS	Obstacle Identification Surface
Ops	Operations
P	Propeller
PAD	Proposed Airworthiness Directive
	Part 145
	Part 21
	Part 22
PANS	Procedures for Air Navigation
PAR	Precision Approach Radar
PAPI	Precision Approach Path Indicator
Pax	Passengers
PCM	Project Certification Manager
PCP	Products Certification Procedure
PIC	Pilot-in-command
PICUS	Pilot-in-command Under Supervision
POA	Production Organization Approval
POE	Production Organization Exposition
PPA	Products, Parts and Appliances
PT	Public Transport
RCC	Rescue Co-ordination Centre
RG	Rulemaking
RIA	Regulatory Impact Assessment
RIS	Radar Information Service
RLCE	Request Level Change En route
RNOTAM	Royal NOTAM
RP	Responsible Party
RTA	Request for Technical Advice
RTF	Radio Telephony
RTOW	Regulated Take-off Weight
RTG	Radio Telegraphy
RTR	Radar Termination Range
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minima
Rwy	Runway
SAR	Search and Rescue
SARP	ICAO Standards and Recommended Practices
SARSAT	Search and Rescue Satellite Tracking System
SDF	Step-down Fix
SELCAL	Selective Calling
Sfc	Surface
SID	Standard Instrument Departure

SIGMET	Significant Meteorological Warning
SNOCLO	Closed by Snow
SoD	State of Design
SoR	State of Registry
SPECI	Special Met Report
SPIC	Student Pilot-in-command
SPL	Supplementary Flight Plan
SSCC	Safety Standards Consultative Committee
SSR	Secondary Surveillance Radar
STAR	Standard Instrument Arrival
STC	Supplemental Type Certificate
STD	Synthetic Training Device
STCH	STC Holder
SVFR	Special Visual Flight Rules
TAF	Aerodrome Meteorological Forecast
TAS	True Airspeed
TC	Type Certificate
TCA	Terminal Control Area
TCDS	Type Certificate Data Sheet
TCH	Type Certificate Holder
TMA	Terminal Manoeuvring Area
TMG	Touring Motor Glider
ToA	Terms of Approval
TODA	Take-off Distance Available
TOM	Take-off Minima
ToR	Terms of Reference
TORA	Take-off Run Available
TP	Turning Point
TR	Type Rating
TRE	Type Rating Examiner
TL	Transition Level
TVOR	Terminal VHF Omni-ranging
TVP	Type Validation Principles
Twr	Tower (Aerodrome Control)
UAV	Unmanned Aerial Vehicle
UHF	Ultra High Frequency
UIR	Upper Information Region
U/s	Unserviceable
UTC	Co-ordinated Universal Time
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VLA	Very Light Aeroplane
VLR	Very Light Rotorcraft
VMC	Visual Meteorological Conditions
VOR	VHF Omni-ranging
VSTOL	Very Short Take-off and Landing
WA	Working Arrangement
WEF	With Effect From
WG	Working Group
WIP	Work in Progress
Wpt	Waypoint

Chapter 2

International Agreements and Organizations

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The Chicago Convention

2.1 Historical Background. As far as modes of transport are concerned, civil aviation has been the fastest growing and the most technically innovative of any. From the first attempts at powered manned flight to regular space flight we have only just exceeded 100 years of aviation and we have had scheduled commercial air services since 1919. **The first International Conference on Civil Aviation also took place in 1919 at Paris.** Since then, the field of our chosen profession has been subjected to far more international legislation and regulation, than any other. The overriding need, which is recognized by all, regardless of political inclination, is for higher and higher safety standards. The degree of international co-operation in this respect is outstanding and shows that where there is a genuine desire to achieve international agreement, it is forthcoming.

2.2 The Second World War. The Second World War had a major effect upon technical development of the aeroplane condensing a quarter of a century of normal peacetime development into just six years. The strategic use of aeroplanes for the movement of men and materiel to and from theatres of war laid the foundation for the air transport industry we have today. It was foreseen that a vast network of passenger and freight services would be set up but also many problems were foreseen to which solutions had to be found to benefit and support a world subsequently at peace. There was the question of commercial rights - what arrangements would be made for the airlines of one country to fly into and through the territories of another? There were other concerns with regard to the legal and economic conflicts that might come with peace-time flying across national borders such as how to maintain existing air navigation facilities, many of which were located in sparsely populated areas. However, international commercial aviation was considered to be of such importance and a priority issue, that the government of the United States conducted exploratory discussions with other allied (friendly) nations during the early months of 1944. Subsequently, invitations were sent to 55 states to meet in Chicago in November 1944.

2.3 The Meeting at Chicago. For five weeks the delegates of the **52 nations who attended,** considered the problems of international civil aviation. The outcome was **the Convention on International Civil Aviation,** the purpose of which was "... **to foster the future development of International Civil Aviation, to help to create and preserve friendship and understanding among peoples of the world, so as to prevent its abuse becoming a threat to the general security thus promoting co-operation between peoples**". The 52 States agreed on policy and arrangements so that civil aviation may be developed in a safe and orderly manner and that international air transport services might be established on the basis of equality of opportunity and economically sound operation. **A permanent body was subsequently charged with the administration of the principles, the International Civil Aviation Organization** (known throughout the world by the acronym ICAO pronounced eye-kay-oh).

2.4 The "Chicago" Convention. The Chicago Convention, consisting of **ninety-six articles** (legislative items of agreement), accepts the principle that every State has complete and exclusive sovereignty over the airspace above its territory and provides that no scheduled international air service may operate over or into the territory of a Contracting State without that State's previous consent. It established the privileges and restrictions of all Contracting States, to provide for the adoption of International Standards and Recommended Practices for:

- Regulating air navigation
- The installation of navigation facilities by Contracting States
- The facilitation of air transport by the reduction of customs and immigration formalities

Commercial Considerations

2.11 International Civil Aviation. A matter to which the Chicago Conference attached great importance was the question of exchange of commercial rights in international civil aviation. The States addressed the subject, resulting in Contracting States agreeing, bilaterally, to grant each other certain rights regarding the commercial exploitation of civil aviation. These rights are now known as the Freedoms of the Air. The freedoms give rights to transit the airspace of Contracting States to scheduled flights.

2.12 Bilateral Agreements. Due to political and national rivalries, it was not found possible to reach a single agreement satisfactory to all 52 States, therefore two supplementary bilateral agreements were set up which gave each State the opportunity to enter into agreements with other States on a 'one-to-one' basis if considered desirable between those States:

2.13 The International Air Services Transit Agreement permits aircraft of a signatory State to fly over, or land for technical reasons in, the territory of another signatory State;

2.14 The International Air Transport Agreement allows the carriage of traffic between the State of Registration and another signatory State. (Traffic: the carriage of mail, cargo or passengers).

2.15 Definitions. The following definitions are required knowledge.

2.16 Scheduled flight is a flight, for which agreement has been reached between States (at government level), concerning the schedule. For instance, how many flights would be allowed in any period, what aerodromes could be used, what time of day the flights would be allowed, and what reciprocal arrangements would be required. A State is not obliged to grant permission for an operator to operate a schedule.

2.17 Non-scheduled flights are those to which a schedule is not attached. i.e. one-off flights or charter flights that are not flown on a regular basis. It is an embodiment of the freedoms that a State cannot refuse, on political or economic grounds, to accept a non-scheduled flight.

2.18 Cabotage. Cabotage is defined as the transport of goods or passengers between two points in the same country by a vessel or aircraft registered in another country or State. Most countries refuse cabotage. However, an EU State may not refuse cabotage by another EU State.

Customs and Excise, and Immigration

2.19 Facilitation. Under international law the imposition of customs tariffs and the prohibition of the importation of proscribed items, is allowed. In order to allow Contracting States to maintain national Customs and Excise regulations, international flights are required to make the first point of landing in a Contracting State at a recognized international airport which provides customs, health and immigration facilities. (In the UK these are known as customs airports). Within the EU the removal of restrictions to free trade now allows flights from one EU State to another to make the first point of landing at a non-customs aerodrome providing certain rules are observed. These rules are explored in the section of this manual concerning Facilitation. Other rules apply to immigration.

International Obligations of Contracted States

2.20 National and 'International' Law. In becoming an ICAO Contracting State, states agree to observe the International Standards specified by ICAO. From the standards, the international rules and regulations governing civil aviation are drawn. By accepting contracted status, each state accepts the responsibility for enforcement of the rules and regulations within its sovereign territory and airspace (through national law). **Article 38 of the Chicago Convention requires each Sovereign State to notify ICAO of any differences between their national regulations and the International Standards adopted.** Furthermore States are to publish these differences in their national Aeronautical Information Publication (AIP). Thus a situation is recognized where national legislation and regulations have precedent over international rules within the territorial airspace of that State. Where flights are conducted over the high seas, the international rules apply without exception. **The International (ICAO) Rules of the Air are promulgated (Annex 2) to standardize the procedures for civil aviation specifically for the safety of aircrew and passengers. Other regulations are established to facilitate the smooth and expeditious flow of air traffic by the adoption of Standards and Recommended Practices (SARPs).**

2.21 Right to Prosecute Offenders. Where an offence is committed in an aeroplane contrary to the 'international' law, the state, in whose airspace the offence occurs, has the right to try and punish offenders. If the offence occurs over 'the high seas' the state of registration of the aircraft has the right to prosecute the offender(s). Note: The international agreements oblige states to prosecute. If a state does not want to (for political reasons) another state may do so. For instance: A bomb is placed on an American aeroplane (contrary to the Montreal Convention and Protocols) by 2 Libyans, in Frankfurt or Rome. The aeroplane explodes over Scotland. Who has the power to prosecute? The order is as follows:

- The UK (under Scottish law) – the offence happened over Scotland
- The United States – the aeroplane was registered in the USA
- The Italians – because the bomb was placed on board in Rome
- The Germans – because the aeroplane made an intermediate stop in Frankfurt
- Any other state, the citizens of which were killed or injured
- Libya – because the suspects are Libyan

Note: If the UK had not prosecuted, the US most certainly would have.

2.22 Search and Rescue. In accepting Contracted State status, each State specifically undertakes to provide procedures and facilities for Search and Rescue (SAR) within the territory of that State. The provision of SAR services in areas of high seas, and areas of undetermined sovereignty, will be established on the basis of Regional Air Navigation (RAN) agreements. The standards governing the provision of SAR services oblige the State to provide at least the minimum service compatible with the type and frequency of the air traffic using the airspace for which the State is responsible, and that service is to be available 24 hours per day. The requirement also imposes upon the State the need to maintain a degree of co-operation with adjacent States and the readiness to assist with SAR operations if requested.

2.23 Conditions to be fulfilled with respect to aircraft as stipulated by the Chicago Convention.

- a. **Documents to be carried in aircraft.** Every aircraft engaged in international navigation shall carry the following documents :
1. Certificate of Registration
 2. Certificate of Airworthiness
 3. Crew member licences
 4. Journey Logbook

5. Aircraft radio station licence - if equipped with a radio
 6. If passengers are carried, a list of names and place of both embarkation and destination
 7. If cargo is carried, a manifest and detailed declaration of the cargo
- b. **Cargo restrictions.** No munitions of war may be carried in or above the territory of a State without the permission of that State
- c. **Photographic apparatus.** Each Contracting State may prohibit or regulate the use of photographic apparatus in an aircraft over its territory.

Duties of ICAO Member States

2.24 Standards and Recommended Practices (SARPs). The stated aim of the Convention on International Civil Aviation and subsequently the aims of ICAO are to ensure safety, regularity and efficiency of international civil aviation operations. In order to achieve this, the Contracting States are required to comply with the Standards and Recommended Practices (SARPs). There are 18 annexes to the Convention. The SARPs are established after consultation with the Contracting States and interested international organizations, finalized by the ICAO Air Navigation Commission and submitted to the Council where a two-thirds majority is required for adoption. The SARPs are considered binding on Contracting States but if a State finds it impossible to implement the SARPs, it must inform ICAO under the terms of Article 38 of any differences that will exist on the applicability date of the amendment. Such differences will be detailed in the national aeronautical information publication (AIP) and summarized in a supplement to each annex of the Chicago Convention.

2.25 Customs Duty and Excise. ICAO has addressed taxation in the field of international aviation and Member States are required to follow the resolutions and recommendation of the Council in this respect. States are asked to exempt fuel, lubricants, and other technical consumables taken on an aircraft in a State other than the State of registry, providing such supplies are for consumption in flight. Also to reduce or eliminate taxes on international air transport (fares) and to grant, reciprocally to air transport enterprises of other States, exemption from taxation on income and profits. Within the area of customs duty and excise charges, Annex 9 (Facilitation) requires states to apply procedures, which allow expeditious handling of goods and cargo intended for import or which are passing through. The establishment of 'free zones' is encouraged.

2.26 Aircraft Certificates, Registration and Licences. Annex 7 (Aircraft Nationality and Registration Markings) requires Contracting States to apply standard procedures for registration. It includes the format of registration marks and nationality symbols, including the size and where these are to be displayed on aircraft. The annex also calls for the registration of all aircraft and provides a sample of a certificate of registration for use by States. Annex 8 (Airworthiness of Aircraft) requires States to provide a Certificate of Airworthiness, for each registered aircraft, declaring that the aircraft is fit to fly. Under the terms of Annex 1 (Personnel Licensing), SARPs are established requiring each State to apply standardization in the licensing of personnel involved in international aviation including flight crew members (pilots, flight engineers), air traffic controllers and maintenance technicians. The overriding purpose of such standardization is to ensure that all involved in air transport operations are licensed to common standards and able to operate throughout the world, thus generating greater trust in aviation on the part of the traveller. A licence issued by the authority in one State is not automatically valid in another State. In this instance, the annex requires States to establish procedures for the validation of licences issued in other States and defines the method by which such validation shall be annotated.

2.43 Financial Assistance. Through the regional offices, financial assistance is provided to assist states in specific circumstances. The provision of air traffic control, navigation aids and meteorological services in Greenland and Iceland are examples of this specific aid, where due to the intense air traffic using the airspace of those states such expenditure is disproportionate to the gross national product of those states.

ICAO Publications

2.44 The Annexes. One of the major duties of the ICAO Council is to adopt International Standards and Recommended Practices (SARPs) and incorporate these as annexes to the Convention on International Civil Aviation. There are now 18 annexes to the 1944 convention which are constantly under review to ensure that the content realistically meets the requirements of civil aviation now. You are required to be able to identify the annex and content. The 18 annexes are:

Annex 1.	Personnel Licensing
Annex 2.	Rules of the Air
Annex 3.	Meteorological Services for International Air Navigation
Annex 4.	Aeronautical Charts
Annex 5.	Units of Measurement to be used in Air and Ground Operations
Annex 6.	Operation of Aircraft
Annex 7.	Aircraft Nationality and Registration Marks
Annex 8.	Airworthiness of Aircraft
Annex 9.	Facilitation
Annex 10.	Aeronautical Telecommunications
Annex 11.	Air Traffic Services
Annex 12.	Search and Rescue
Annex 13.	Aircraft Accident Investigations
Annex 14.	Aerodromes
Annex 15.	Aeronautical Information Services
Annex 16.	Environmental Protection
Annex 17.	Security - Safeguarding International Civil Aviation against Acts of Unlawful Interference
Annex 18.	The Safe Transport of Dangerous Goods by Air

2.45 PANS. Where the content of the SARPs is somewhat technical and requires further explanation or discussion, Procedures for Air Navigation Services (PANS) are published by ICAO. PANS are approved by the Council, unlike SARPs which are adopted by the Council.

2.46 PANS OPS (Doc 8168) Procedures for Air Navigation Services - Aircraft Operations. This publication (in two parts) describes the Operational Procedures recommended for the guidance of flight operations personnel (Vol. 1) and procedures for specialists in the essential areas of obstacle clearance requirements for the production of instrument flight charts (Vol. 2).

2.47 PANS ATM (Doc 4444) Procedures for Air Navigation Services – Air Traffic Management. This document specifies the requirements for the establishment of an Air Traffic Control Service.

2.48 PANS - RAC Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services. This contains certain procedures applicable to pilots, for the provision of flight information, the alerting service and the operation of ATC.

2.49 Regional Supplementary Procedures (Doc 7030/4). Where navigational procedures, which differ from the worldwide procedures, are deemed necessary for a specific geographic region by the appropriate Regional Air Navigation Meeting, such procedures are recorded in the relevant region section of Doc 7030/4, and are known as Regional Supplementary Procedures (SUPPS). As in the case of PANS, SUPPS are approved by the Council, but only for regional use.

Other International Agreements

2.50 The International Air Services Transit Agreement and the International Air Transport Agreement. The Chicago Convention attached great importance to the question of the exchange of commercial rights in international civil aviation. It was not found possible to reach an agreement satisfactory to all the original 52 states, but the conference set up two supplementary agreements - the International Air Services Transit Agreement, and the International Air Transport Agreement. The first agreement made provision for aircraft of any participating state to fly over, or to land for technical reasons in, the territory of any other participating state. The second provided, among other things, for the carriage of traffic (passengers, mail and cargo) between the State of Registration of the aircraft and any other signatory state.

2.51 The Freedoms of the Air. The International Air Services Transit Agreement established two technical freedoms of the air (known as the first and second freedoms). In this context the word 'freedom' refers to the privilege conferred by virtue of signatory status to a bilateral agreement. Because the two agreements require bilateral understandings between the parties, ICAO has produced the 'Chicago Standard Form for Bilateral Agreement for Regular Air Transport' based on the definitions for the Freedoms of the Air, as defined in the International Air Services Transit and the International Air Transport Agreements. For general aviation and non-scheduled commercial operations, the filing of an international flight plan is the method by which a flight gives notification to exercise the privileges of the appropriate freedoms.

2.52 The Technical Freedoms: These comprise the first two freedoms and were established through the International Air Services Transit Agreement:

2.53 First Freedom: The privilege to fly across the territory of another participating state without landing.

2.54 Second Freedom: The privilege to land in another participating state for non-traffic purposes (i.e. refuelling or repair, but not for uplift or discharge of traffic passengers, cargo or mail).

2.55 The Commercial Freedoms. The International Air Transport Agreement established three further freedoms. These are defined as commercial and whilst still bilateral, are subject to inter-government negotiation.

2.56 Third Freedom: The privilege to put down in another state (e.g. the USA) traffic taken on in the state of registration (e.g. the UK).

2.57 Fourth Freedom: The privilege to take on in another state (e.g. the USA), traffic destined for the state of airline registration (e.g. the UK).

2.58 Fifth Freedom: The privilege for an airline registered in one state (e.g. the UK) and en route to or from that state, to take on traffic in a second state (e.g. Greece) and put them down in a third state (e.g. Italy).

2.59 Modern Freedoms. Due to the process of growth in air transport and the evolution of airlines operating on a global basis, further commercial freedoms have evolved. However, these are not covered by the LOs for Air Law.

2.60 Bermuda Agreement. The first bilateral Air Transport Agreement (ATA) was signed at Bermuda in 1946 between the UK government and the US government and set an example for other states to follow. Currently there are some 3000 ATAs in force globally.

The Conventions of Tokyo, the Hague and Montreal

2.61 Unlawful acts against the safety of Civil Aviation. The fact that unlawful acts of violence endanger the safety of persons and jeopardize the safe operation of airports and the fact this undermines the confidence of the peoples of the world in the safety of civil aviation, led to the signing of the Conventions of Tokyo, Hague and Montreal.

2.62 The Tokyo Convention of 1963. This convention provides that the State of Registration of an aircraft is competent to exercise jurisdiction over offences and acts committed on board. Its object is to ensure that offences, wherever committed should not go unpunished. As certain acts committed on board an aircraft may jeopardize the safety of the aircraft or persons and property on board or may prejudice good order and discipline on board, the aircraft commander and others are empowered to prevent such acts being committed and to deliver the person concerned to the appropriate authority. In the case of an anticipated or actual unlawful or forcible seizure of an aircraft in flight by a person on board, the States party to the Convention are obliged to take all appropriate measures to restore and preserve control of the aircraft to its lawful commander.

2.63 The Hague Convention of 1970. After a spate of politically motivated terrorist hijackings of aircraft in the 1960s, the international community, under the auspices of ICAO, resolved to work together to prevent or deter (suppress) such acts. Otherwise known as the Convention for the Suppression of Unlawful Seizure of Aircraft, signed at The Hague in December 1970, the convention defines the act of unlawful seizure of aircraft (hijacking), and lists which contracting states have undertaken to make such offences punishable by severe penalties. The convention contains detailed provisions on the establishment of jurisdiction by states over the offence; on the taking of the offender into custody; and on the prosecution or extradition of the offender. This convention came into effect on 14 October 1971.

2.64 The Montreal Convention of 1971. This Convention is correctly titled the Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation. It makes it an offence to attempt any of the unlawful acts specified or to be an accomplice to such acts. The contracting states have undertaken to make these offences punishable by severe penalties. The convention contains similar detailed provisions regarding jurisdiction, custody, prosecution and extradition of the alleged offender as the Hague Convention of 1970. This convention came into force on 26 January 1973. It is mainly concerned with acts other than those pertaining to the unlawful seizure i.e.:

- Acts of violence on board which endanger people and property and the safety of the aeroplane
- The destruction of an aircraft in service or causing damage which renders it incapable of flight or which is likely to endanger its safety in flight
- Placing in an aircraft any device likely to destroy, damage or render unfit for flight any aircraft

- Destroying or damaging any air navigation facility or interference with its correct operation
- The communication of information known to be false which endangers the safety of an aeroplane in flight

2.65 The Protocol Supplementary to the Montreal Convention of 1971. This protocol was adopted by a conference, which met at Montreal in 1988. It extends the definition of offence given in the 1971 Convention to include specified acts of violence at airports serving international civil aviation. Such acts include:

- The intentional and unlawful use of any device, substance or weapon in performing an act of violence against a person at an airport serving international civil aviation, which causes or is likely to cause serious injury or death
- The intentional and unlawful use of any device, substance or weapon to:
 - Destroy or seriously damage the facilities of an airport
 - Destroy or seriously damage aircraft not in service at the airport
 - Disrupt the services at an airport

2.66 Enforcement. Contracting States have undertaken to make these offences punishable by severe penalties. The protocol also contains provisions on jurisdiction.

2.67 Annex 17. The measures taken by ICAO have resulted in the adoption of the SARPs detailed in Annex 17 - Security. The provisions of the SARPs are applicable to all Contracting States. The annex requires all Contracting States to:

- Establish national civil aviation security programmes
- designate an authority responsible for security
- keep the level of threat under constant review
- co-ordinate activities with other relevant national agencies and liaise with the corresponding authority in other States

2.68 Programmes and Plans. In order to make such activities workable and efficient, States are also required to set up training programmes, establish airport security committees and to have contingency plans drawn up.

2.69 International Co-operation. As an on-going commitment to security, each State is required to co-operate with other States in research and development of security systems and equipment which will better satisfy civil aviation security objectives.

2.70 The Authority of the Commander. The aircraft commander may order or authorize the assistance of other crew members and may request and authorize, but not order, the assistance of passengers to restrain any person he is required to restrain. The aircraft commander may, when he has reasonable ground to believe that a person has committed, or is about to commit, an act which may or does jeopardize the safety of the aircraft or persons or property on board or which jeopardize good order and discipline on board, impose reasonable measures, which may include restraint, necessary:

- To protect the safety of the aircraft, or of persons or property on board
- To maintain good order and discipline on board
- To enable him to deliver such a person to competent authorities or to disembark him in accordance with provision of the Convention

Note: The PIC may request - **but not require** - the assistance of passengers in the restraint of an unruly passenger.

The Warsaw Convention

2.71 Liability of the Carrier. The Warsaw Convention of 1929 concerned itself with responsibilities and liabilities of the Carrier and the Agents of aircraft together with matters of compensation for loss of life or injury to passengers, delays and loss of baggage. This limited the liability, except in cases of gross negligence, to roughly the equivalent of US\$10 000 in International Bank Special Drawing Rights (SDRs). In 1955 an amendment to the Convention was adopted by a diplomatic conference at The Hague (known as The Hague Protocol) which doubled the existing limits of liability and the present limit is a maximum amount of US\$100 000 per person. By agreeing to the terms of the Warsaw agreement, an airline agrees to pay compensation without further process of law however, the amounts payable are nowadays relatively small in litigation circumstances. Some airlines state that they will not be bound by the Warsaw agreement and will pay higher amounts of compensation if awarded by a Court.

2.72 Issue of a Ticket. The issuing of a passenger ticket, luggage ticket or cargo consignment note, forms a contract between the carrier and the person receiving the ticket/note. The contract is defined by the Warsaw Convention including the previously mentioned exclusion or limitation of liabilities. If a carrier accepts a passenger, luggage or cargo on board an aeroplane without a ticket/note, then the carrier is liable for any loss which is occasioned without the protection of the limits set by the Warsaw Convention. The loss, irregularity or absence of a ticket/note does not affect the existence or the validity of the contract. If applicable, the Operator is required to draw the passenger's attention to the Warsaw Convention limits of liability where 'electronic' tickets are issued.

2.73 Delay. The carrier is liable for damage occasioned by delay in the carriage by air of passengers, baggage or cargo. Nevertheless, the carrier shall not be liable for damage occasioned by delay if it proves that it and its servants and agents took all measures that could reasonably be required to avoid the damage or that it was impossible for it or them to take such measures.

2.74 Limits of Liability in Relation to Delay, Baggage and Cargo. In the case of damage caused by delay as specified in Article 19 in the carriage of persons, the liability of the carrier for each passenger is limited to 4150 Special Drawing Rights.

In the carriage of baggage, the liability of the carrier in the case of destruction, loss, damage or delay is limited to 1000 Special Drawing Rights for each passenger unless the passenger has made, at the time when the checked baggage was handed over to the carrier, a special declaration of interest in delivery at destination and has paid a supplementary sum if the case so requires. In that case the carrier will be liable to pay a sum not exceeding the declared sum, unless it proves that the sum is greater than the passenger's actual interest in delivery at destination.

In the carriage of cargo, the liability of the carrier in the case of destruction, loss, damage or delay is limited to a sum of 17 Special Drawing Rights per kilogram, unless the consignor has made, at the time when the package was handed over to the carrier, a special declaration of interest in delivery at destination and has paid a supplementary sum if the case so requires. In that case the carrier will be liable to pay a sum not exceeding the declared sum, unless it proves that the sum is greater than the consignor's actual interest in delivery at destination.

In the case of destruction, loss, damage or delay of part of the cargo, or of any object contained therein, the weight to be taken into consideration in determining the amount to which the carrier's liability is limited shall be only the total weight of the package or packages concerned. Nevertheless, when the destruction, loss, damage or delay of a part of the cargo, or of an object contained therein, affects the value of other packages covered by the same airway bill, or the same receipt, or if they were not issued, by the same record preserved by the other means referred to in paragraph 2 of Article 4, the total weight of such package or packages shall also be taken into consideration in determining the limit of liability.

The foregoing provisions of paragraphs 1 and 2 of the Article shall not apply if it is proved that the damage resulted from an act or omission of the carrier, its servants or agents, done with intent to cause damage or recklessly and with knowledge that damage would probably result; provided that, in the case of such an act or omission of a servant or agent, it is also proved that such servant or agent was acting within the scope of its employment.

The limits prescribed in Article 21 and in this Article shall not prevent the court from awarding, in accordance with its own law, in addition, the whole or part of the court costs and of the other expenses of the litigation incurred by the plaintiff, including interest. The foregoing provision shall not apply if the amount of the damages awarded, excluding court costs and other expenses of the litigation, does not exceed the sum which the carrier has offered in writing to the plaintiff within a period of six months from the date of the occurrence causing the damage, or before the commencement of the action, if that is later.

2.75 Compensation in Case of Death or Injury of Passengers. (The Warsaw Convention as amended by the Montreal Convention in 1999.) For damages arising under paragraph 1 of Article 17 not exceeding 100 000 Special Drawing Rights for each passenger, the carrier shall not be able to exclude or limit its liability.

The carrier shall not be liable for damages arising under paragraph 1 of Article 17 to the extent that they exceed for each passenger 100000 Special Drawing Rights if the carrier proves that:

- a. such damage was not due to the negligence or other wrongful act or omission of the carrier or its servants or agents; or
- b. such damage was solely due to the negligence or other wrongful act or omission of a third party.

The Rome Convention

2.76 The Rome Convention of 1952 dealt with damage caused by foreign aircraft to third parties on the ground. It permits a claimant to pursue a claim against a foreign operator through the Court in the state of residence. Any resulting judgement would then be enforceable in the state of the Operator.

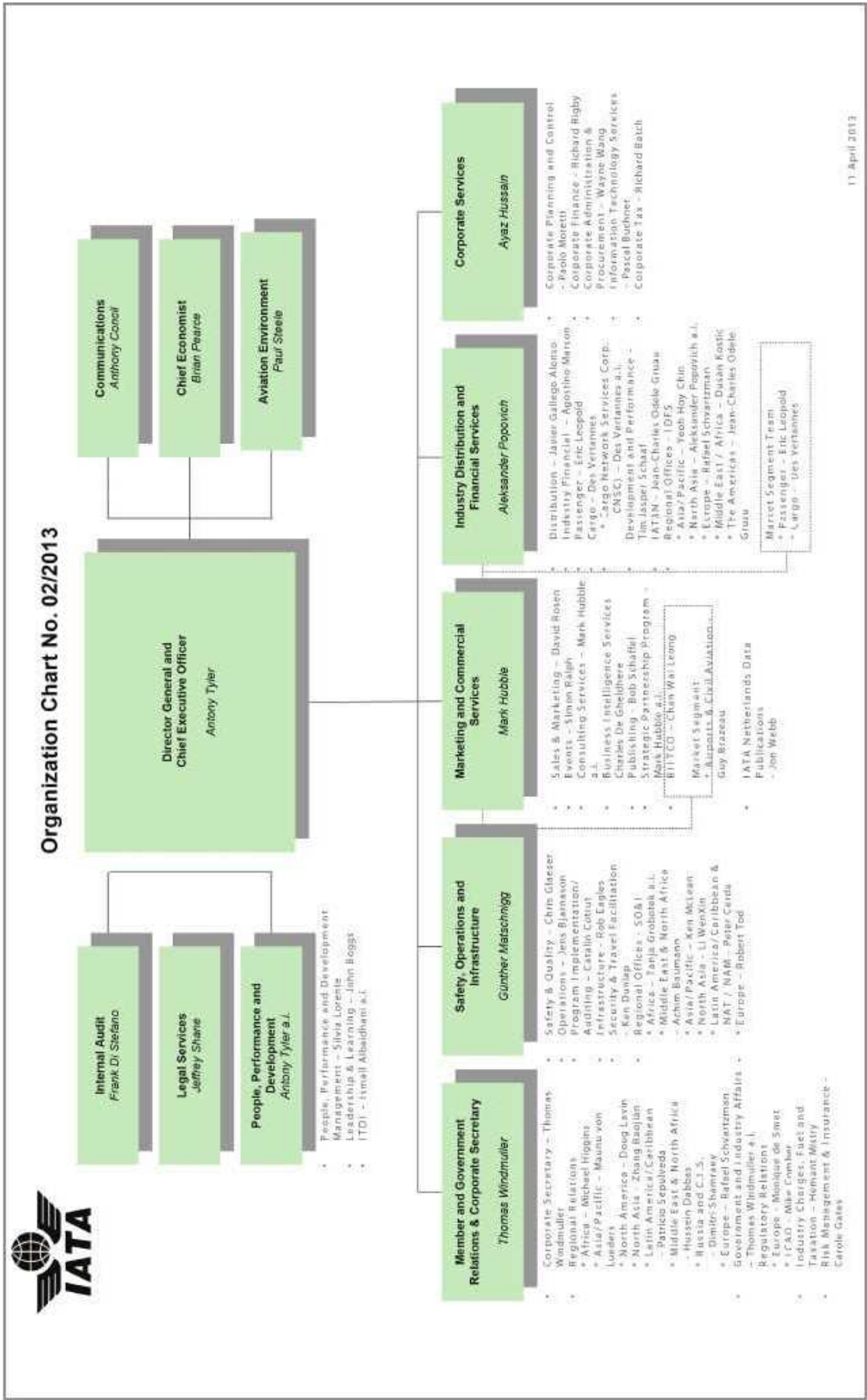


Figure 2.1 IATA organization chart

IATA



2.77 The International Air Transport Association (IATA) is the air transport industry global trade organization. Over 60 years, IATA has developed the commercial standards that have built a global industry. Today, IATA's mission is to represent, lead and serve the airline industry. Its members comprise some 260 airlines - the world's leading passenger and cargo airlines among them - representing 94 percent of international scheduled air traffic. IATA seeks to improve understanding of the industry among decision makers and increase awareness of the benefits that

aviation brings to national and global economies. It fights for the interests of airlines across the globe, challenging unreasonable rules and charges, holding regulators and governments to account, and striving for sensible regulation.

ECAC

2.78 European Civil Aviation Conference (ECAC) is the driving force for a common civil aviation policy in Europe. It was set up under the auspices of the Council for Europe and ICAO. Membership now extends from Iceland to Turkey (all the European Commission countries are members of ECAC). ECAC is an inter-governmental organization founded in 1955 from the Conference on the Co-ordination of Air Transport in Europe (CATE), with the aim of promoting the continued development of a safe, efficient and sustainable European air transport system. ECAC seeks to:



- Harmonize civil aviation policies and practices amongst its member states
- Promote understanding on policy matters between member states and other parts of the world

2.79 Aims. Within Europe, because of its established position, ECAC is the only forum for consideration of major civil aviation topics relevant to all European states. The strength of ECAC is derived from:

- Membership across Europe
- Active co-operation with institutions of the EU, including the EC and the European Parliament
- Close liaison with ICAO
- Established relationships with organizations representing all parts of the air transport industry including consumer and airline interests

EASA



2.80 European Aviation Safety Agency (EASA). The European Aviation Safety Agency is the centrepiece of the European Union's strategy for aviation safety. Its mission is to promote the highest common standards of safety and environmental protection in civil aviation. While national authorities continue to carry out the majority of operational tasks - such as certification of individual aircraft or licensing of pilots - the Agency ensures common safety and environmental standards at the European level. The agency's current responsibilities include:

- Rulemaking: drafting safety legislation and providing technical advice to the European institutions and the member states
- Inspections, training and standardization programmes to ensure uniform implementation of European aviation safety legislation in all member states
- Safety and environmental type-certification of aircraft, engines and parts
- Approval and oversight of aircraft design organizations world-wide and of production and maintenance organizations outside the EU
- Data collection, analysis and research to improve aviation safety

JAA



2.81 The Joint Aviation Authorities. The Joint Aviation Authorities (JAA) are an associated body of ECAC representing the civil aviation regulatory authorities of a number of European States who have agreed to co-operate in developing and implementing common safety regulatory standards and procedures. This co-operation is intended to provide high and consistent standards of safety and a 'level playing field' for competition in Europe. The JAA Membership is based on signing the "JAA Arrangements" document originally signed by the then current member states in Cyprus in 1990. At the time of publishing EASA has taken over the role of JAA; however, JAA remains as an integral organization to administer those

countries outside the EU Member States which have adopted JAA rules and regulations.

2.82 Objectives. The JAA objectives and functions may be summarized as follows:

- To ensure, through co-operation, common high levels of aviation safety within Member States
- Through the application of uniform safety standards, to contribute to fair and equal competition within Member States
- To aim for cost-effective safety and minimum regulatory burden so as to contribute to European industry's international competitiveness

2.83 JAA Organization. The JAA is controlled by a Committee, which works under the authority of the Plenary Conference of ECAC and reports to the JAA Board of Directors General. The Board is responsible for review of general policy and long term objectives of the JAA. The JAA Committee is composed of one member from each Authority and is responsible for the administrative and technical implementation of the Arrangement. The Committee and the Board are supported by a Secretariat.

2.84 JAA Documentation. The Authorities agreed to co-operate to produce common comprehensive and detailed requirements and where necessary acceptable means of compliance with and interpretations of them (the Joint Aviation Requirements - JARs). JARs encompass both technical and administrative functions. In developing JARs, the JAA takes into account the duties and obligations under the Chicago Convention; consults the parties to whom the requirements apply and takes into account other aviation codes so as to facilitate exchange of products, services or persons or reliance on organizations, between the JAA countries and other countries in the world.

Eurocontrol

2.85 History and Role. Eurocontrol was founded in 1960 with the objective of providing common ATC services in the upper airspace of Member States and strengthening co-operation between Member States in matters of air navigation. Eurocontrol was established under the International Convention Relating to Co-operation for the Safety of Air Navigation signed at Brussels on 13 December 1960. Initially, six countries signed the agreement: Germany (FDR); Belgium; France; United Kingdom; Luxembourg and the Netherlands. The Eurocontrol ATCC is at Maastricht, Holland. The role of Eurocontrol is now much wider than originally envisaged. The limit of operations, to just the upper airspace, was abandoned in 1986 and Eurocontrol now has a much wider remit, placed on the Organization by ECAC, most notably in the area of Air Traffic Flow Management (ATFM) which led to the establishment of the Eurocontrol Central Flow Management Unit (CFMU) in 1988. Eurocontrol has a training centre in Luxembourg and an experimental research centre at Brétigny, France, with a new ATCC in Vienna (CEATS).



World Trade Organization



2.86 World Trade Organization and the General Agreement on Trade in Services for Aviation (WTO/GATS). In recognition of the need to establish a world order to promote international trade on a fair basis by the removal of unfair barriers to international trade, the World Trade Organization was set up and through the negotiated General Agreement on Tariffs and Trade (GATT) leading to General Agreement on Trade in Services (GATS), international arrangements have been established to abolish unfair practices and to encourage growth, and thus prosperity, in the global economy. See [Figure 2.2](#) for the WTO organization structure.

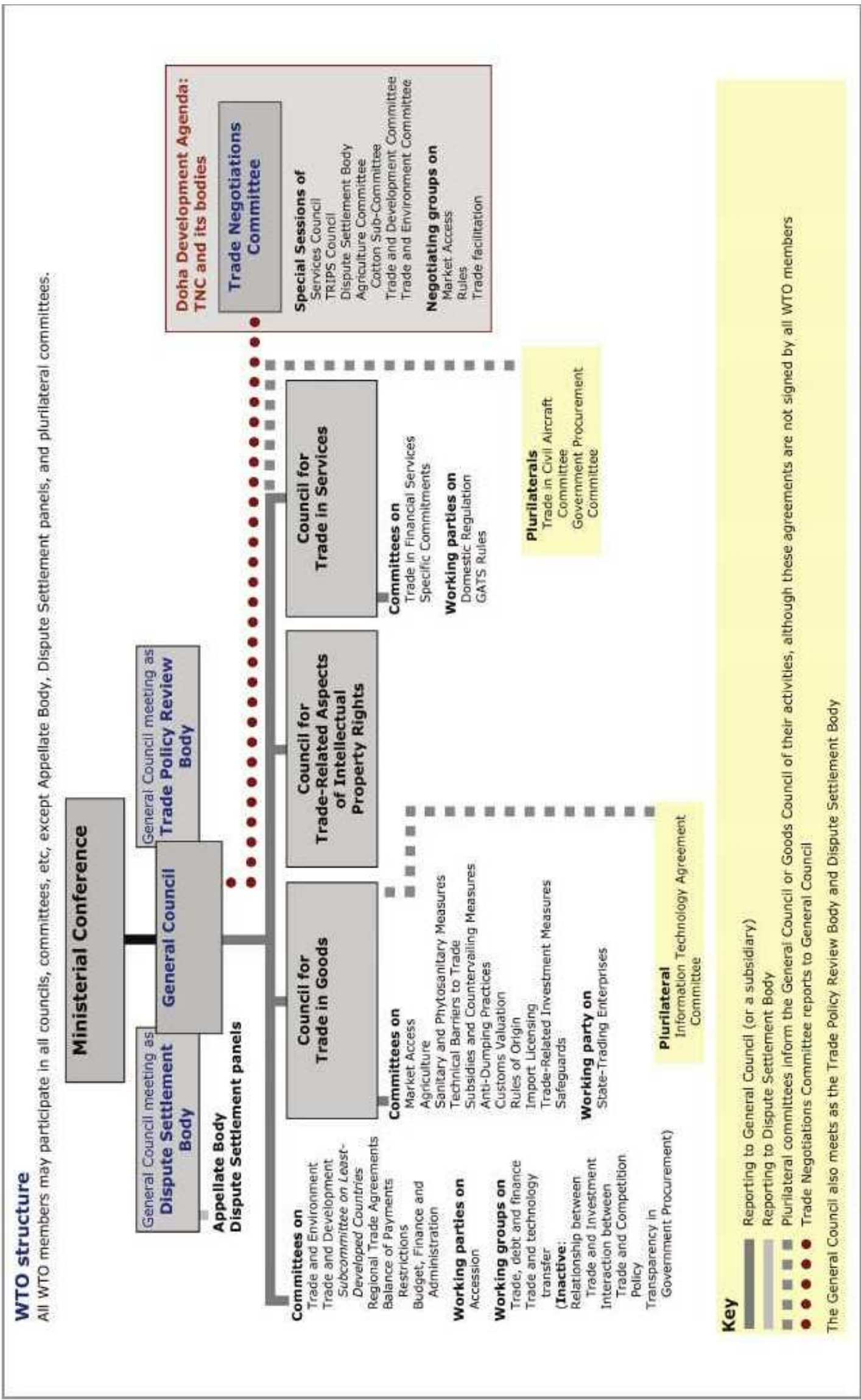


Figure 2.2 WTO structure

2.87 Single European Sky (SES). This agreement between European States was published in a document EC 550/2004. Its objectives are:

- a. The provision of air navigation services in the single European sky.
- b. To establish common requirements for the safe and efficient provision of air navigation services in the Community. These requirements include:
 - (i) technical and operational competence and suitability
 - (ii) systems and processes for safety and quality management
 - (iii) reporting systems
 - (iv) quality of services
 - (v) financial strength
 - (vi) liability and insurance cover
 - (vii) ownership and organizational structure, including the prevention of conflicts of interest
 - (viii) human resources, including adequate staffing plans
 - (ix) security

Geneva Convention

2.88 The Convention on International Recognition of Rights in Aircraft (Geneva 1947) established the right of the seller of an aircraft to secure any lending (mortgage) granted to the buyer, by a mortgage against the aircraft. Specifically the convention:

- Outlawed double registration
- Made it a requirement that the registering authority address appeared on the certificate of registration
- Contained requirements regarding salvage of aircraft
- Stipulated that an aircraft could not be transferred from one register to another unless all interested parties had been informed
- Stipulated that the articles of the Convention would not prevent a State imposing its laws relating to immigration, customs or air navigation

EU Regulation 261/2004

2.89 The regulation applies to any passenger:

- departing from an airport located in the territory of a Member State

The protection accorded to passengers departing from or to an airport located in a Member State should be extended to those leaving an airport located in a third country for one situated in a Member State, when a Community carrier operates the flight.

- departing from an EU member state, or
- travelling to an EU member state on an airline based in an EU member state

if that person has:

- a confirmed reservation on the flight, and
- arrived in time for check-in as indicated on the ticket or communication from the airline, or, if no time is so indicated, no less than 45 minutes prior to the scheduled departure time of the flight

or

- has been transferred from the flight for which he/she held a reservation to some other flight

unless

- the passenger is travelling on a free or discounted ticket not available to the general public, other than a ticket obtained from a frequent flyer programme.

2.90 Denied boarding. Before denying passengers boarding involuntarily, the airline is required to first seek volunteers to give up their reservation in return for whatever benefit is negotiated between the airline and the volunteers. Irrespective of such negotiation, such volunteers are also entitled to reimbursement or re-routing as described below.

If insufficient volunteers are obtained, the airline may then proceed to involuntarily deny passengers the right to board their flight. All passengers so denied must be offered all three types of compensation and assistance described below.

2.91 Cancellation. If a flight is cancelled, passengers are automatically entitled to their choice of (a.) re-routing to the same destination at the earliest opportunity; (b.) later re-routing, at the passenger's convenience, to the same destination under comparable conditions; or (c.) a refund of the ticket as well as a return flight to the point of first departure. Any ticket refund is the price paid for the flight(s) not used, plus the cost of flights already flown in cases where the cancellation has made those flights of no purpose. Where applicable, passengers are also entitled to refreshments, communication and accommodation as described below. Where re-routing is to another airport serving the same destination, the airline must pay for onward transport to the original airport or to a close-by destination agreed with the passenger. These choices, and the entitlement to refreshments, etc., apply to all cancellations, regardless of whether the circumstances are extraordinary or not.

The airline is also required to pay cash compensation as described below, unless one of the following conditions applies:

- the airline notifies the passengers at least two weeks prior to departure
- the airline notifies the passengers between one and two weeks prior to departure, and re-routes passengers so that they can:
 - depart no more than two hours earlier than scheduled, and
 - arrive no more than four hours later than scheduled
- the airline notifies the passengers less than one week prior to departure, and re-routes passengers so that they can:
 - depart no more than one hour earlier than scheduled, and
 - arrive no more than two hours later than scheduled
- the cancellation was caused by extraordinary circumstances that could not have been avoided by any reasonable measure.

The airline must also provide an explanation to passengers of alternative transport.

2.92 Delays. If an airline expects a flight to be delayed, passengers are entitled to refreshments and communication if the expected delay is more than:

- two hours, in the case of a type 1 flight
- three hours, in the case of a type 2 flight
- four hours, in the case of a type 3 flight

Additionally, if the flight is expected to depart on the day after the original scheduled departure time, passengers are entitled to accommodation.

If a flight is delayed by five hours, passengers are additionally entitled to abandon their journey and receive a refund for all unused tickets, a refund on tickets used already if the flight no longer serves any purpose in relation to their original travel plan, and, if relevant, a flight back to their original point of departure at the earliest opportunity.

2.93 Compensation and assistance. There are three broad categories of compensation and assistance that may be required in the case of cancellations or denied boarding.

2.94 Cash compensation. Cash compensation is a payment of:

1. €250/400/600 for flights type 1/2/3 respectively.

Where re-routing is offered and results in the passenger arriving within two/three/four hours of the scheduled arrival time for a type 1/2/3 flight, the compensation payable is halved.

The Airline is not obliged to provide Cash compensation in the case of "Extraordinary Circumstances".

2.95 Re-routing or refunding. Re-routing or refunding is, at the passenger's choice, one of the following three compensations:

1. Repayment of the cost of unused flight tickets, and for used tickets where the flight(s) taken no longer serve(s) any purpose in relation to the passenger's original travel plan, and where applicable, a flight back to the original point of departure at the earliest opportunity
2. Re-routing under similar conditions to the intended final destination at the earliest opportunity
3. Re-routing under similar conditions to the intended final destination at the passenger's leisure, subject to the availability of seats.

If a passenger's destination is an airport at a city with multiple airports and re-routing results in the passenger being taken to another of those airports, the airline must also pay for transport for the passenger to the original intended airport or an agreed nearby destination.

2.96 Refreshments, communication and accommodation. When passengers become entitled to these assistances, they must be offered, free of charge:

- Meals and refreshments in proportion to the waiting time
- Two telephone calls, fax or telex messages, or emails
- Hotel accommodation and transport between the airport and the hotel, if a stay of one or more nights, or a stay additional to that intended by the passenger becomes necessary

In the case of a delay, the airline may withdraw these entitlements if offering them would delay the flight further.

2.98 Upgrades and downgrades. If a passenger is placed in a higher class than that for which a ticket was purchased, the airline may not request any additional payment.

If a passenger is placed in a lower class than that for which a ticket was purchased, the airline must refund 30/50/75% of the cost of the ticket for type 1/2/3 flights.

2.99 Method of refund. Refunds payable under this regulation may be paid in cash, by electronic bank transfer, bank draft, or cheque. With the signed agreement of a passenger, they may also be paid in travel vouchers or other services.

2.100 Obligation to notify passengers. Airlines are obliged to display a notice at their check-in counters stating:

“If you are denied boarding or if your flight is cancelled or delayed for at least two hours, ask at the check-in counter or boarding gate for the text stating your rights, particularly with regard to compensation and assistance.”

Additionally, when an airline cancels a flight, denies a person boarding, or incurs a delay exceeding two hours to a flight, it is obliged to provide each passenger affected with a written notice setting out their rights under the regulation, and the contact details of the national body tasked with enforcing the regulation.

Flight types are as follows:

- Type 1 : A flight of less than 1500 km in distance
- Type 2 : A flight within the EU of greater than 1500 km in distance, or any other flight of greater than 1500 km but less than 3500 km in distance
- Type 3 : A flight not within EU of greater than 3500 km in distance

Summary

Relevant International Conventions and Agreements

DATE	PLACE	TITLE	CONTENT
October 1919	Paris	Convention Relating to the Regulation of Air Navigation	Sovereignty over airspace. Standards for airworthiness. Certificates of competency for crews. Definition of 'aircraft'.
October 1929	Warsaw	Convention for the Unification of Certain Rules Relating to International Carriage by Air	Carrier's liability for damage caused to passengers, baggage and goods. Damage caused by delay.
May 1933	Rome	Convention for the Unification of Certain Rules Relating to Damage Caused by Aircraft to Third Parties on the Surface	Recognized the liability of carrier for damage caused on the ground. Led to the Brussels Insurance Protocol of 1938. Replaced by the Rome Convention of 1952 (drafted by ICAO)
May 1933	Rome	Convention for the Unification of Certain Rules Relating to Precautionary Arrest of Aircraft	Specified which aircraft can be arrested or 'attached'. Excludes government aircraft (incl postal transport), aircraft in service on public transport (and back-up aircraft), aircraft apportioned for the carriage of persons or goods for reward.
September 1938	Brussels	Protocol Supplementing the Convention for the Unification of Certain Rules Relating to Damage Caused by Aircraft to Third Parties on the Surface	Obligation of carrier to arrange third party insurance. This is what eventually killed off Pan Am!
December 1944	Chicago	Convention on International Civil Aviation	Regulation of Civil Aviation. Led to the creation of ICAO. 18 Annexes to the Chicago Convention
December 1944	Chicago	International Air Services Transit Agreement	The two technical freedoms of the air
December 1944	Chicago	International Air Transport Agreement	The three commercial freedoms of the Air (Known as the 5 freedoms agreement ; 2 + 3 = 5) Note: The other freedoms 6, 7 and 8 are really no more than minor variations of these 5.

June 1948	Geneva	Convention on the International Recognition of Rights in Aircraft	To protect the rights of the seller where aircraft are bought on HP, mortgage or lease.
October 1952	Rome	Convention on Damage by Foreign Aircraft to Third Parties on the Surface	Replaced the 1933 Convention. Poor ratification. USA, UK, Canada, Germany and many other major players refused to ratify because compensation too low; National Law more powerful. El Al crash in Holland, neither states contracting.
September 1955	The Hague	Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air	a. Removed exemptions for all except military aircraft b. Raised compensation limit to 250 000 gold francs c. Simplified the requirements for tickets and baggage checks d. Made carrier liable for 'pilot error'
April 1956	Paris	Multilateral Agreement on Commercial Rights of Non-Scheduled Air Services in Europe	An ECAC convention. Covers international flights within Europe of a non-scheduled nature: Humanitarian and emergency; taxi class services (seating limited to 6 and not to be re-sold); hiring by a single person (or company); single flights.
April 1960	Paris	Multilateral Agreement relating to Certificates of Airworthiness for Imported Aircraft	ECAC agreement. Allows states to render valid an existing C of A or issue a new one.
September 1961	Guadalajara	Convention Supplementary to the Convention for the Unification of Certain Rules Relating to International Carriage by Air Performed by a Person Other than the Contracting Carrier	Covers charter services and 'wet-leasing'. Defines who the contracting carrier and the actual carrier is in a charter or wet-lease situation. Defines the liability of the carrier(s).

International Agreements and Organizations

September 1963	Tokyo	Convention on Offences and Certain Other Acts Committed on Board Aircraft	Determines whose penal law is applicable Defines the rights and obligations of the aircraft Commander Defines the rights and obligations of the authorities of the state in which the aircraft lands Defines unlawful seizure of aircraft
December 1970	The Hague	Convention for the Suppression of Unlawful Seizure of Aircraft	Applicable to domestic and international flights. Defines 'in flight'. Allocates jurisdiction after offence committed: a. State of Registration b. State of landing if offender still on board c. State of Operator d. State in which offender is apprehended if that state does not wish to extradite
March 1971	Guatemala City	Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air	Makes the carrier absolutely liable. Replaces 'fault' liability with 'risk' liability i.e. in the case of death or injury caused by sabotage or hijacking. Limits liability to \$100 000 for passengers and baggage including negligence. Exceptions: a. self inflicted or wilful damage by the claimant b. death or injury resulting from ill health of passenger
September 1971	Montreal	Convention for the Suppression of Unlawful Acts Against the Safety of Civil Aviation	Deals with a person who: a. acts violently on board an aircraft b. destroys or damages an aircraft in service c. places a bomb or similar device on board an aircraft d. destroys or damages a nav aid or interferes with operation e. passes false information thus endangering an aircraft
September 1971	Montreal	Supplementary to the Convention for the Suppression of Unlawful Acts Against the Safety of Civil Aviation	Deals with offences committed at an airport serving international aviation

September 1975	Montreal	Additional Protocols (1 - 4) to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air	Allows payment to be made in IMF Special Drawing Rights (SDR) Replaces limits in Hague Protocol with SDRs Replaces limits in Guatemala Protocol with SDRs Changes liability regarding goods - applies SDRs
September 1978	Montreal	Protocol to Amend the Convention on Damage by Foreign Aircraft to Third Parties on the Surface	Extended Rome 1952 to include damage caused by an aircraft registered to an Operator of another contracting state.
December 1982	Montego Bay	UN Convention of the High Seas	Air Piracy an offence Hot pursuit permitted Territorial waters extended to 12 NM 200 NM economic zone respected - freedom to overfly Right to transit straits without permission no longer allowed - freedom to transit straits under 1st freedom reinforced Established the authority of the Hamburg Court regarding disputes of overflying rights in territorial waters, contiguous zones, etc..
September 1990	Cyprus	The Convention of Cyprus	Established the JAA
October 1995	Kuala Lumpur	IATA Intercarrier Agreement on Passenger Liability	Agreement by IATA members to waive limitations of liability and recoverable damages established by the Warsaw Convention. Damages to be awarded by reference to the law of domicile of the passenger.

Questions

1. **What does cabotage refer to?**
 - a. Domestic air services within a state
 - b. An international air carrier
 - c. A flight above territorial waters
 - d. Crop spraying
2. **The Convention signed by the states relating to damage caused by foreign aircraft to persons and property on the ground is:**
 - a. the Tokyo convention
 - b. the Rome convention
 - c. the Warsaw convention
 - d. the Paris convention.
3. **The Convention on offences and other acts committed on board an aeroplane is:**
 - a. the Tokyo convention
 - b. the Paris convention
 - c. the Rome convention
 - d. the Chicago convention
4. **Which of the following is an obligation of being an ICAO contracting state?**
 - a. ICAO must be informed about all new flight crew licences and any suspended validity of such licences
 - b. ICAO must be informed about differences from the standards detailed in any of the annexes to the Chicago Convention
 - c. ICAO must approve the pricing of tickets on international airline connections
 - d. ICAO must be informed about changes to national regulations
5. **Which of the following annexes to the Chicago Convention contains the minimum specifications for the construction of aerodromes?**
 - a. Annex 6
 - b. Annex 11
 - c. Annex 10
 - d. Annex 14
6. **The ICAO annex containing the standards and recommended practices for Personnel Licensing is:**
 - a. Annex 1
 - b. Annex 2
 - c. Annex 11
 - d. Annex 12
7. **The aircraft commander may, when he/she has reasonable grounds to believe that a person has committed or is about to commit an offence against penal law on board the aircraft:**
 - a. ask the person to disembark
 - b. ask the crew to assist in restraining the person
 - c. order the passengers to assist the crew in restraining the person
 - d. deliver the person to the competent authority

8. **The international convention concerning the responsibilities of international air carriers (operators), for the carriage of passengers, baggage and freight is the:**
 - a. Tokyo convention
 - b. Hague convention
 - c. Montreal convention
 - d. Warsaw convention
9. **The Rome convention and its later amendments deals with:**
 - a. offences and other acts committed on board an aeroplane
 - b. damage caused by foreign aircraft to third parties on the ground
 - c. regulation of the transportation of dangerous goods
 - d. damage caused by any aircraft to third parties on the ground
10. **The Warsaw convention and its later amendments deals with:**
 - a. regulation of the transportation of dangerous goods
 - b. operator's licence for international scheduled operations
 - c. security systems at airports
 - d. limitation of the Operator's liability concerning passengers and goods transported
11. **The objectives of ICAO were defined by:**
 - a. the Geneva Convention of 1936
 - b. the Chicago Convention of 1944
 - c. the Warsaw Convention of 1929
 - d. the Geneva Convention of 1948
12. **The annex to the Chicago convention which deals with the entry and departure of cargo and other articles on international flights is:**
 - a. Annex 15
 - b. Annex 16
 - c. Annex 9
 - d. Annex 8
13. **Which freedom of the air is applicable to a flight which wishes to land in a foreign state for technical reasons?**
 - a. 1st freedom
 - b. 3rd freedom
 - c. 4th freedom
 - d. 2nd freedom
14. **ICAO establishes:**
 - a. aeronautical standards adopted by all states
 - b. proposals for aeronautical regulations in the form of 18 annexes
 - c. standards and recommended practices applied without exception by all states which are signatory to the Chicago Convention of 1944
 - d. standards and recommended practices for contracting states

15. **The first freedom of the air is:**
- a. The right to board passengers from the state where the aircraft is registered and fly to any other state
 - b. The right to over fly without landing
 - c. The right to land for a technical stop
 - d. The right to operate a commercial flight with passengers on board between two states
16. **The Convention which deals with offences against penal law is:**
- a. the convention of Rome
 - b. the convention of Madrid
 - c. the convention of Tokyo
 - d. the convention of Warsaw
17. **One of the main objectives of ICAO is to:**
- a. develop principles and techniques for international aviation
 - b. approve the ticket prices set by international airlines
 - c. approve new airlines operating turbine engine powered aircraft
 - d. approve new international airlines
18. **Which international convention established ICAO?**
- a. Chicago
 - b. The Hague
 - c. Warsaw
 - d. Montreal
19. **The standards contained in the annexes to the Chicago convention are to be considered:**
- a. binding upon all airlines operating international routes
 - b. binding for contracting states that have not notified ICAO about national differences
 - c. advice and guidance for the aviation legislation within contracting states
 - d. binding for all contracting states
20. **Which body of ICAO finalizes the SARPs to be submitted for adoption?**
- a. The Council
 - b. The Regional Air Navigation Committee
 - c. The Air Navigation Commission
 - d. The Assembly
21. **The second freedom of the air is the:**
- a. right to cabotage traffic
 - b. right to operate a commercial passenger flight with passengers on board between two states
 - c. right to land in a foreign state for a technical stop
 - d. right to over fly a foreign state without landing

22. Which annex contains information concerning Air Traffic Services?
- a. Annex 11
 - b. Annex 10
 - c. Annex 14
 - d. Annex 15
23. To which passengers does EU Regulation 261/2004 apply?
- a. To all passengers travelling on an EU registered aircraft wherever it may be operating
 - b. Those departing from an EU member state or travelling to an EU member state on an airline based in an EU member state
 - c. Only to those departing from an EU member state or travelling on an airline based in an EU member state
 - d. To all passengers who are citizens of an EU member state
24. To which passengers does EU Regulation 261/2004 apply? Those who
- a. arrived in time for check-in as indicated on the ticket or communication from the airline, or, if no time is so indicated, no less than 30 minutes prior to the scheduled departure time of the flight
 - b. arrived in time for check-in as indicated on the ticket or communication from the airline, or, if no time is so indicated, no less than 45 minutes prior to the scheduled departure time of the flight
 - c. arrived in time for check-in as indicated on the ticket or communication from the airline, or, if no time is so indicated, no less than 1 hour prior to the scheduled departure time of the flight
 - d. arrived in time for check-in as indicated on the ticket or communication from the airline, or, if no time is so indicated, no less than 2 hours prior to the scheduled departure time of the flight
25. How much is the cash compensation given to a passenger under the EU Regulation 261/2004 travelling on a flight not within the EU of greater than 3500 km if the flight is cancelled?
- a. €250
 - b. €400
 - c. €600
 - d. €800
26. How or where are airlines obliged to inform passengers stating that : "If you are denied boarding or if your flight is cancelled or delayed for at least two hours, ask at the check-in counter or boarding gate for the text stating your rights, particularly with regard to compensation and assistance."
- a. This is given verbally to individual passengers by airline staff at check-in
 - b. Printed on the airline ticket or the on-line receipt
 - c. Printed on a leaflet attached to the boarding pass
 - d. On a notice and on display at the passenger check-in counter

5.42 Variants. Within a type rating, difference training may be required for variants of the basic type. If the specific variant has not been flown during a period of 2 years, further difference training is required.

5.43 Multi-pilot Conditions. According to JAR-FCL, an applicant for a multi-pilot type rating must have:

- Not less than 100 hours as PIC of aeroplanes
- A valid multi-engine IR(A)
- A certificate of MCC
- Completed the theoretical knowledge course and passed the examinations for ATPL(A)

Note: This requirement is regardless of the type of licence held

5.44 Use of Synthetic Trainers. The licensing authority may approve the use of a synthetic flight trainer for performing any manoeuvre required for the demonstration of skill for the issue of a licence or rating, after it has ensured that the trainer is appropriate for the task.

5.45 When an Instrument Rating (IR) is Required. The State of Licence Issue is not to permit a licence holder to act as pilot or co-pilot under Instrument Flight Rules (IFR) unless the holder also holds an Instrument Rating (IR) appropriate to the aircraft category. JAR-FCL permits member states to specify national rules for flight under IFR without an IR(A) e.g. the UK IMC rating, however, such authority is limited to the airspace of that state only.

5.46 Instructor Rating. A Contracting State, having issued a pilot licence, is not to permit the holder to carry out flight instruction for the issue of any licence or rating, unless the holder has received the proper authorization.

5.47 Credit of Flight Time. A student pilot (or the holder of a licence) is entitled to be credited in full with all solo, dual instruction and PIC flight time towards the total flight time required for the initial issue of a pilot licence or a higher-grade pilot licence. When acting as co-pilot of an aeroplane in which a co-pilot is required the pilot is entitled to count not more than 100% of the co-pilot time towards the total flight time required for a higher-grade licence. A pilot acting as co-pilot performing as PIC under supervision, can count the full hours towards the total flight time required for a higher-grade licence.

5.48 Student Pilot. Licence Issuing States are to ensure that student pilots do not pose a hazard to navigation. Student pilots are only permitted to fly solo under the supervision of, or with the authorization of, an authorized flight instructor. Student pilots are not permitted to fly solo on international flights unless in accordance with an agreement between the contracting states concerned. A student pilot is not permitted to fly solo unless he/she holds at least a class 2 medical assessment and has attained the age of 16 years.

Private Pilot Licence (Aeroplane) - PPL(A)

5.49 Age. An applicant for a PPL is to be not less than 17 years of age. Training can be started at any age, but a solo flight is not permitted until the student is 16.

5.50 Knowledge. An applicant for a PPL is required to demonstrate by examination a required level of theoretical knowledge.

5.51 Experience. An applicant for a PPL is to complete not less than 45 hours flight time. Where time in a synthetic trainer is permitted, it is limited to a maximum of 5 hours as part of

the required 45 hours. Flight time as pilot in other categories of aircraft may (with authority authorization) be credited. The applicant is required to have completed not less than 10 hours solo which is to include 5 hours of solo cross-country flight time with at least one flight of not less than 270 km (150 NM) which must include a full stop landing at two different aerodromes.

5.52 Medical Fitness. A PPL(A) holder must hold a current class 2 medical assessment.

5.53 Privileges. The holder of a PPL(A) may act as PIC or co-pilot of any aeroplane engaged in non-revenue (non-commercial) flights. If the privilege is to be exercised at night, the holder is to have received dual instruction in aeroplanes flying at night, including take-offs, landings and navigation.

Commercial Pilot Licence (Aeroplane) - CPL(A)

5.54 Age. An applicant for a CPL(A) is to be not less than 18 years of age.

5.55 Theoretical Knowledge. An applicant for a CPL(A) must have a required level of knowledge, demonstrated by successful passing of examinations, of the following subjects:

- Air Law
- Aircraft general knowledge
- Flight performance and planning
- Human performance and limitations
- Meteorology
- Navigation
- Operational Procedures
- Principles of flight
- Radiotelephony

5.56 Experience. An applicant for a CPL(A) is to complete not less than 200 hours flight time. Where time in a synthetic trainer is permitted, it is limited to a maximum of 10 hours as part of the required hours. For a student completing an integrated CPL(A) course, at least 150 hours including all progress tests is to be completed within which up to 5 hours may be instrument ground time. Flight time as pilot in other categories of aircraft may (with authority authorization) be credited. The applicant is required to have completed not less than:

- 100 hours as PIC (70 in the case of approved course)
- 20 hours cross-country flight time with at least one flight of not less than 540 km (300 NM) which must include a full stop landing at two different aerodromes.
- 10 hours of instrument instruction time of which not more than 5 hours may be instrument ground time.
- If the privilege is to be exercised at night, 5 hours night flight time including 5 take-offs and landings as PIC.

5.57 Medical Fitness. A CPL(A) holder must hold a current class 1 medical assessment.

5.58 Privileges. The holder of a CPL(A) is permitted to exercise all the privileges of a PPL(A); to act as PIC of any aeroplane engaged in operations other than commercial air transport; to act as PIC in commercial air transport in aeroplanes certificated for single-pilot operation; to act as co-pilot in commercial air transport in aeroplanes that require a co-pilot (JAR-FCL requires

a CPL(A) holder to have passed the theoretical knowledge for ATPL(A) prior to starting type rating training for multi-pilot aeroplanes engaged in commercial air transportation). If the privilege is to be exercised at night, the holder is to have received dual instruction in aeroplanes flying at night, including take-offs, landings and navigation.

Airline Transport Pilot Licence (Aeroplane) - ATPL(A)

5.59 Age. An applicant for an ATPL(A) is to be not less than 21 years of age.

5.60 Theoretical Knowledge. An applicant for an ATPL(A) must have knowledge of the same subjects detailed in paragraph 5.55 but to a more demanding level determined by examination.

5.61 Experience. An applicant for an ATPL(A) is to complete not less than 1500 hours flight time and to demonstrate the ability to pilot multi-crew aeroplanes under IFR. Where synthetic trainer time is permitted, it is limited to a maximum of 100 hours as part of the required hours provided that not more than 25 hours have been acquired in a flight procedure trainer or a basic instrument trainer. Flight time as pilot in other categories of aircraft may (with authority authorization) be credited. The applicant is required to have completed not less than:

- 500 hours as PIC under supervision or 250 hours, either as PIC or made up by not less than 70 hours as PIC and the additional flight time as PIC under supervision.
- 200 hours cross-country flight time with not less than 100 hours PIC or co-pilot acting as PIC under supervision provided that the method is approved by the authority.
- 75 hours instrument time of which not more than 30 hours may be instrument ground time.
- 100 hours night flight time as PIC or co-pilot.
- JAR-FCL additionally requires 500 hours multi-pilot operations in transport, commuter category aeroplanes (or equivalent code).

5.62 Medical Fitness. An ATPL(A) holder must hold a current class 1 medical assessment.

5.63 Privileges. The holder of an ATPL(A) is permitted to exercise all the privileges granted to the holder of a PPL(A) and CPL(A) and of an IR(A); and to act as PIC and co-pilot of any aeroplane engaged in commercial air transport.

Multi-crew Pilot Licence (MPL)

5.64 Concept. ICAO PANS Training defines the MPL as a licence that permits the holder to exercise the privileges of a co-pilot in commercial air transport on multi-crew aeroplanes (aeroplanes which require a flight crew of at least two pilots). It permits pilots to be trained directly as co-pilots rather than under the CPL or ATPL system that trains PICs.

5.65 Limitations. As the licence is designed for co-pilots of multi-crew aeroplanes, the holder of an MPL will not be able to exercise the privilege of the licence on single-pilot operation aeroplanes.

5.66 Licence Specification. The specification for the MPL broadly follows the example of the JAA 'frozen' ATPL(A)

Instrument Rating (Aeroplane) (IR(A))

5.67 Requirements for Issue. The knowledge requirements for an IR(A) are related to the privilege of the rating, specifically, to operations under IFR. The skill requirement also specifically requires the applicant to demonstrate the ability to operate multi-engine aeroplanes solely with reference to instruments with one engine inoperative, if a pilot is to fly IFR in such aeroplanes. The regulations permit the use of synthetic trainers to demonstrate skills.

5.68 Experience. The applicant is to hold a PPL(A) with a night qualification, or a CPL(A), and have completed 50 hours of cross-country flight time as PIC in aeroplanes or helicopters, of which not less than 10 hours shall be in aeroplanes.

5.69 Medical. Holders of PPL(A) are required to comply with the hearing requirements for class 1 certification and contracting states should consider requiring the PPL holder to pass the physical, mental and visual requirements of class 1.

5.70 Privileges of an IR(A). Providing the holder of an IR(A) is also the holder of the appropriate licence and is medically fit (certificated), the holder is permitted to fly aeroplanes under IFR. If a pilot holds both an aeroplane and a helicopter licence, the privilege to fly both types under IFR may be conferred by a single instrument rating.

5.71 Conditions. In states where flight in VMC at night is not permitted, holders of a PPL(A) or a CPL(A) without an IR(A) may (under national rules) be granted a night rating permitting flight at night in VMC under IFR. Additionally, states may (under national rules) grant an IMC rating permitting flight outside controlled airspace (which may include exemptions for flight in some CTRs) in meteorological conditions less than VMC during daytime, to pilots without an IR(A).

Instructor and Examiner Rating

5.72 Instructor Categories. There are six categories of aeroplane instructor ratings:

- Flight Instructor – Aeroplane (FI(A))
- Type Rating Instructor – Aeroplane (TRI(A))
- Class Rating Instructor – Aeroplane (CRI(A))
- Instrument Rating Instructor – Aeroplane (IRI(A))
- Synthetic Flight Instructor – Aeroplane (SFI(A))
- Multi-crew Co-operation Course Instructor - Aeroplane (MCCI(A))

5.73 Prerequisites. All instructors are required to hold at least the licence, rating or qualification for which instruction is given and shall be entitled to act as PIC of the aeroplane during such instruction.

5.74 Period of Validity. Instructor ratings are valid for 3 years.

5.75 Flight Instructor Rating - Aeroplane (FI(A)). The following are the conditions which apply to the granting of an FI(A) rating:

- Minimum age 18
- Must be supervised until:
 - Completed 100 hours of instruction
 - Supervised 25 student solo flights

5.76 Prerequisites. Before beginning the course of training for an FI(A) rating the applicant is to have:

- A CPL(A) or 200 hours flight time of which 150 as PIC if holding a PPL(A)
- The theoretical knowledge of a CPL(A) holder
- Completed 30 hours in single-engine piston powered aeroplanes with at least 5 hours in the last six months
- Received at least 10 hours of instruction (of which not more than 5 is instrument ground time)
- Completed at least 20 hours of cross-country as PIC (distance and landings as per CPL(A))
- Passed a pre-entry flight test

5.77 Unrestricted Privileges. The following are the unrestricted privileges of an FI(A) (with specific experience conditions as per JAR-FCL 1.330). To conduct flight instruction for:

- The issue of a PPL(A)
- The issue of class and type ratings for single-engine aeroplanes
- The issue of a CPL(A) - 500 hours flight time, 200 hours instructional are necessary
- Instruction at night providing a night qualification is held
- The issue of an IR(A) for single-engine aeroplanes
- The issue of an IR(A) for multi-engine aeroplanes
- The issue of single-pilot multi-engine type or class ratings
- The issue of an FI(A) rating

5.78 Examiners. Five roles of an examiner are recognized:

- Flight examiner (FE(A)).
- Type rating examiner (TRE(A))/Synthetic flight examiner (SFE(A)).
- Class rating examiner (CRE(A)).
- Instrument rating examiner (IRE(A)).
- Flight instructor examiner (FIE(A)).

5.79 Requirement. Examiners shall hold a licence and rating at least equal to the licence or rating for which they are authorized to conduct skills tests or proficiency checks and, unless specified otherwise, the privilege to instruct for this licence or rating.

5.80 Period of Validity. An examiner's authorization is valid for not more than three years. Examiners are re-authorized at the discretion of the Authority.

JAR-FCL 3 Medical Requirements

5.81 Requirement. In order to apply for, or to exercise the privileges of, a licence, the applicant or the holder shall hold a medical certificate issued in accordance with the provisions of JAR-FCL 3 (Medical) and appropriate to the privileges of the licence. The holder of a medical certificate shall be mentally and physically fit to safely exercise the privileges of the applicable licence.

5.82 JAR-FCL Medical Certificates. JAR-FCL defines two classes of medical assessment certificates for pilots:

- Class 1 for commercial pilots (CPL and ATPL)
- Class 2 for private pilots (PPL)

5.83 ICAO Medical Certificates. ICAO defines three medical assessment classes:

- Class 1 for commercial pilot licence and flight engineer and navigator licences
- Class 2 for private pilot licences (including glider and free balloon)
- Class 3 for Air Traffic Controllers

5.84 Aeromedical Disposition. After completion of the examination the applicant shall be advised whether fit, unfit or referred to the Authority. The authorized medical examiner (AME) shall inform the applicant of any condition(s) (medical, operational or otherwise) that may restrict flying training and/or the privileges of any licence issued. In the event that a restricted medical certificate is issued which limits the holder to exercise pilot-in-command privileges only when a safety pilot is carried, the authority will give advisory information for use by the safety pilot in determining the function and responsibilities.

5.85 Periodic Medical Examination. The annual medical examination is effectively a health check and takes into account the aging process since the issue of the original certificate. Providing the pilot has medical examinations at the required intervals, the aging process will be taken into account. Under the JAA regulations, extensions (deferment of medical examination) of medical certificate validity are not permitted.

5.86 Decrease in Medical Fitness. Licence holders are not to exercise the privileges of their licences if they are aware that they are unwell. In such circumstances they are to seek the advice of the Authority or AME. Such circumstances are:

- Hospital or clinic admission for more than 12 hours
- Surgical operation or invasive procedure
- The regular use of medication
- The need for regular use of correcting lenses

5.87 Operational Multi-crew Limitation (OML). In the circumstance where a commercial pilot does not fully meet the requirements for the issue of a class 1 certificate, the certificate may be annotated with the limitation 'valid only as or with qualified co-pilot'. In such a case, the other pilot must be qualified on type, not be over 60 and not be subject to an OML.

5.88 Medical Conditions. Every licence holder who is aware of:

- Any significant personal injury involving incapacity to function as flight crew
- Any illness involving incapacity to act as flight crew throughout a period of 21 days or more
- Being pregnant

Shall inform the authority in writing of such injury or pregnancy, and as soon as the period of 21 days has elapsed in the case of illness. The medical certificate shall be deemed to be suspended upon the occurrence of one of the above. In the case of injury or illness, the suspension shall be lifted on being pronounced fit after a medical examination. The authority may exempt the holder from such an examination. In the case of pregnancy, the suspension may be lifted for such period by the Authority and subject to such conditions as it thinks fit and shall cease upon the holder being medically examined after the pregnancy has ended and being pronounced fit. If this procedure is complied with, the medical certificate shall be suspended (cannot expire) during the period of illness or injury and will be reinstated once the crew member becomes fit.

5.89 Suspension of Medical Certificate. Provided the authority is notified immediately in the event of injury or when pregnancy is diagnosed, or on the 21st day of prolonged illness, the medical certificate of the holder will be suspended until the holder is passed as fit to resume aircrew duty. At this point the certificate will be reinstated with a remaining validity period equal to that extant at the time that it was suspended. After a female pilot has been diagnosed as pregnant, she may be permitted to continue flying duty until such a date as the medical authority deems that it is no longer prudent for the health of the embryonic baby or the mother to continue to be engaged in flying duty. After delivery and after a medical examination, she will then be declared fit to resume duty at which point the certificate will be reinstated.

5.90 Validity of Medical Certificates. A medical certificate is valid from the date of the initial general medical examination. It may be renewed during the period of validity or as below. If a licence holder allows the certificate to expire by more than 5 years, renewal will require initial or extended aeromedical examination (at AME's discretion). Such an examination shall be carried out at an AMC which has obtained the certificate holder's medical records. If the certificate has expired by more than 2 years but less than 5 years, a standard or extended examination will be required at an AMC or by an AME (if approved by the AMS) subject to the records of medical examinations being made available. If the certificate expires by more than 90 days but less than 2 years, a standard or extended examination performed at an AMC or by an AME (if approved by the AMS) will be required. If a certificate has expired by less than 90 days, renewal shall be possible by standard or extended examination as prescribed.

5.91 45-Day rule. If the medical revalidation is taken up to 45 days prior to the expiry date, the validity of the new certificate extends from the previous certificate expiry date. In other words, if your certificate expires on 31st December and you have your annual medical no earlier than 15th November, the new certificate will be valid from 1st January until the next 31st December. However, if you have a medical on 1 November, the certificate will be valid from 1st November until the following 31st October.

Pilot Proficiency

5.92 Pilot Proficiency Checks. Pilots are required to demonstrate piloting technique and the ability to execute emergency procedures and these skills shall be checked. Where flight under IFR is required, the checks required are to be carried out twice a year with any two similar checks not conducted within four months.

5.93 Base and Line Checks. According to both ICAO and JARs, operators are required to carry out checks of pilot proficiency at regular intervals. They are known as base and line checks and are usually coincident with other proficiency checks carried out for validation of type ratings and instrument ratings.

EASA Theoretical Knowledge Examinations

5.94 Requirement. Applicants for a JAA professional pilot licence or an instrument rating are required to demonstrate a level of knowledge appropriate to the privileges of the licence or rating by means of success in passing examinations. The examination is to be set in a language considered appropriate by the authority. The format of the examination is to be by multiple choice answer format set by computer from a central question bank (CQB).

5.95 Pass Standards. The pass mark is 75%. All the examinations must be passed within a period of 18 months from the end of the calendar month in which the first examination was attempted. All previous examination passes will be rendered invalid if a candidate fails one particular subject at the fourth attempt. All previous examination passes will be rendered invalid if a candidate fails to record a pass in all subjects within either 6 sittings or the above mentioned 18 month period.

5.96 Acceptance Period. A pass in the theoretical knowledge examinations will be accepted for the granting of a CPL(A) or IR(A) during the 36 months from the date of gaining a pass in all the required subjects. Providing that an IR(A) is obtained within the 36 months stated above, a pass in the ATPL(A) theoretical knowledge examinations will remain valid for a period of 7 years from the last validity date of the IR(A) entered in the CPL(A) for the issue of an ATPL(A).

Questions

1. **According to JAR-FCL class ratings shall be established for single-pilot aeroplanes not requiring a type rating including:**
 - a. all touring motor gliders.
 - b. all types of single-pilot, single-engine aeroplanes fitted with a turbojet engine.
 - c. microlights having fixed wings and moveable aerodynamic control surfaces acting in all three dimensions.
 - d. any other type of aeroplane if considered necessary.
2. **Which of the following is the privilege of the holder of a CPL(A)?**
 - a. To act as PIC of any aeroplane engaged in operations other than commercial air transportation.
 - b. To act as PIC of any aeroplane engaged in commercial air transportation.
 - c. To act as PIC of any aircraft certificated for single-pilot operation other than commercial air transportation.
 - d. To act as co-pilot of any aircraft engaged in commercial air transport operations.
3. **What age do you need to be to exercise the privileges of a CPL licence?**
 - a. 18
 - b. 21
 - c. 16
 - d. 23
4. **When you are over 60 and the holder of an ATPL(A), how often are you required to have a medical examination?**
 - a. The 12 month period reduces to 6 months.
 - b. The 24 month period reduces to 12 months.
 - c. The 6 month period reduces to 3 months.
 - d. The 9 month period reduces to 3 months.
5. **You can use simulator hours towards the 1500 hours required for an ATPL. How are simulator hours limited?**
 - a. Maximum of 100, not more than 15 in a procedural flight trainer.
 - b. Maximum of 100, not more than 30 in a procedural flight trainer.
 - c. Maximum of 100, not more than 25 in a procedural flight trainer.
 - d. Maximum of 100, not more than 50 in a procedural flight trainer.
6. **What is the night flying hours requirement for an ATPL(A) licence?**
 - a. 75 hours PIC.
 - b. 100 hours PIC or co-pilot.
 - c. 100 hours PIC.
 - d. 75 hours PIC or co-pilot.

7. **One of the privileges of the holder of a CPL(A) is to:**
 - a. act as co-pilot of aircraft in commercial air transport operations.
 - b. act as PIC of single engine aeroplanes in commercial air transport operations.
 - c. act as a flying instructor.
 - d. act as PIC of aeroplanes involved in operations other than commercial air transportation.
8. **Included in the requirements for 1500 hours, an ATPL(A) holder must have:**
 - a. 500 hours multi-pilot operations in transport, commuter or equivalent category aircraft.
 - b. 500 hours multi-pilot operations and 250 hours as PIC.
 - c. 500 hours multi-pilot operations including up to 150 hours flight engineering time.
 - d. 500 hours multi-pilot operations including 200 hours night time.
9. **When are you required to tell the authorities of an illness?**
 - a. After the period of 21 days of illness has elapsed.
 - b. On the 21st day of the illness.
 - c. After a month.
 - d. After medical has expired.
10. **To obtain a CPL(A), how many hours of cross-country flying are required?**
 - a. 15 hrs.
 - b. 20 hrs.
 - c. 25 hrs.
 - d. 35 hrs.
11. **What medical is required for the issue of a CPL(A)?**
 - a. Class 2.
 - b. As required by particular state.
 - c. Class 1.
 - d. JAR Class A (as from 1 Jan 2001).
12. **The holder of a pilot licence when acting as co-pilot under supervision of the PIC and performing the functions and duties of the PIC shall be entitled to be credited:**
 - a. with 50% of the flight time towards the total time required for a higher grade of licence.
 - b. in full, but not more than 300 hrs towards the total time required for a higher grade of licence.
 - c. the flight time in full towards the total time required for a higher grade of licence.
 - d. the flight time in full towards the total time required for a higher grade of pilot licence according to the requirements of the licensing authority.
13. **For an ATPL(A), how many night hours are required?**
 - a. 30
 - b. 75
 - c. 100
 - d. 150

14. For an ATPL, how many cross-country hours are required, and how many of these must be as pilot-in-command?
- a. 200/100
 - b. 200/75
 - c. 150/75
 - d. 250/75
15. How long would you have to spend in a clinic or hospital before you would have to inform the authorities?
- a. 24 hrs or more.
 - b. Not less than 20 days.
 - c. More than 12 hours.
 - d. 12 days or more.
16. When you are a newly qualified flying instructor you have to be supervised by a qualified flying instructor. When will the period of supervision cease?
- a. Once you have passed a competency check.
 - b. When you have completed 100 hours instruction and sent 25 students solo.
 - c. When you have completed 25 hours instruction and sent 100 students solo.
 - d. When you have completed 100 hours solo.
17. Between what ages can you exercise the privileges of an ATPL(A) on an unrestricted basis?
- a. 21 - 60
 - b. 21 - 59
 - c. 18 - 59
 - d. 18 - 60
18. How long would a non-JAA licence be valid for if validated for use in a JAA state?
- a. Not less than 6 months.
 - b. 12 months from the date of validation.
 - c. 12 months providing the licence is still valid in the State of Issue.
 - d. Not more than 3 months.
19. Which of the following correctly identifies the cross-country hours requirement for a CPL(A)?
- a. 100 hours PIC or SPIC.
 - b. 20 hours cross-country as PIC including a cross-country flight not less than 540 km (300 NM) in the course of which full stop landings are made at two different aerodromes.
 - c. 25 hours including at least one flight of 2 hours duration covering at least 300 NM and to include 2 full stop landings.
 - d. 10 hours solo with at least one flight over 300 NM with at least two full stop landings.
20. What is the minimum age for a holder of a PPL?
- a. 16
 - b. 17
 - c. 18
 - d. 21

21. What is the period of validity of a JAR-FCL class 2 medical?
- a. 24 months until age 30, then 24 months until 50, then 12 months thereafter.
 - b. 24 months until age 30, then 12 months until 50, then 6 months thereafter.
 - c. 60 months until age 40, then 24 months until 50, then 12 months thereafter.
 - d. 60 months until age 30, then 24 months until 50, then 12 months thereafter.
22. A PPL(A) or Commercial licence holder, before taking his/her Instrument Rating, must have completed hours of cross-country of which hours must be in an aeroplane ?
- a. 50 15
 - b. 50 10
 - c. 40 15
 - d. 40 10
23. A PPL(A) holder shall demonstrate competence for an IR(A) in a..... aircraft type with ?
- a. Amphibian all engines running only
 - b. Seaplane one engine inoperative
 - c. Multi-engine one engine inoperative
 - d. Multi-engine all engines running
24. Of the 1500 hours required experience for an ATPL(A). hours may be in a simulator but not more than hours may be in a basic instrument trainer or basic procedure trainer.
- a. 100 15
 - b. 100 20
 - c. 100 25
 - d. 75 25
25. Which of the following types of aircraft requires a type rating?
- a. Each type of multi-engine aircraft.
 - b. Each type of single-pilot multi-engine turbine.
 - c. Each type of micro-light with fixed wings and able to move its surfaces in three dimensions.
 - d. Each type of touring motor glider.
26. To have an unrestricted FI(A) rating and to instruct for the issue of a CPL(A) or a PPL(A), you must have a CPL(A) or:
- a. at least 250 hours as a pilot.
 - b. not less than 15 hours in the last 12 months on the relevant type.
 - c. at least 200 hours of flight instruction.
 - d. 200 hours flight time of which not less than 150 hours is PIC.
27. According to JAR-FCL, what classes of medical exist?
- a. Class 1 only.
 - b. Classes 1 and 2.
 - c. Classes 1, 2 and 3.
 - d. Classes 1, 2, 3 and 4.

6.57 Signals by Intercepting Aircraft and Responses by Intercepted Aircraft

INTERCEPTING Aircraft Signals	Meaning	INTERCEPTED Aircraft Responds	Meaning
DAY - Rocking wings from a position slightly above and ahead of, and normally to the left of the intercepted aircraft and, after acknowledgement, a slow level turn, normally to the left, on the desired heading. NIGHT - Same and, in addition, flashing navigational lights at irregular intervals. Note 1: Meteorological conditions or terrain may require the intercepting aircraft to take up a position slightly above and ahead of, and to the right of the intercepted aircraft and to make the subsequent turn to the right. Note 2: If the intercepted aircraft is not able to keep pace with the intercepting aircraft, the latter is expected to fly a series of racetrack patterns and to rock its wings each time it passes the intercepted aircraft	You have been intercepted follow me	AEROPLANES: DAY - Rocking wings and following. NIGHT - Same and, in addition, flashing navigational lights at irregular intervals. HELICOPTERS: DAY or NIGHT - Rocking aircraft, flashing navigational lights at irregular intervals and following. Note: Additional action required to be taken by intercepted aircraft is prescribed in RAC section.	Understood will comply
DAY or NIGHT - An abrupt breakaway manoeuvre from the intercepted aircraft consisting of a climbing turn of 90 degrees or more without crossing the line of flight of the intercepted aircraft.	You may proceed	AEROPLANES: DAY or NIGHT-Rocking wings. HELICOPTERS: DAY or NIGHT- Rocking aircraft	Understood will comply
DAY - Circling aerodrome, lowering landing gear and over flying runway in the direction of landing or, if the intercepted aircraft is a helicopter, over flying the helicopter landing area. NIGHT - Same and, in addition, showing steady landing lights.	Land at this aerodrome	AEROPLANES: DAY - Lowering landing gear, following the intercepting aircraft and, if after over-flying the runway landing is considered safe, proceeding to land. NIGHT - Same and, in addition, showing steady landing lights (if carried). HELICOPTERS: DAY or NIGHT-Following the intercepting aircraft and proceeding to land, showing a steady landing light (if carried)	Understood will comply

6.58 Signals Initiated by Intercepted Aircraft and Responses by Intercepting Aircraft

INTERCEPTED Aircraft Signals	Meaning	INTERCEPTING Aircraft Responds	Meaning
AEROPLANES: DAY -Raising landing gear while passing over landing runway at a height exceeding 300 m (1000 ft) but not exceeding 600 m (2000 ft) above the aerodrome level, and continuing to circle the aerodrome. NIGHT -Flashing landing lights while passing over landing runway at a height exceeding 300 m (1000 ft) but not exceeding 600 m (2000 ft) above the aerodrome level, and continuing to circle the aerodrome. If unable to flash landing lights, flash any other lights available.	Aerodrome you have designated is inadequate	DAY or NIGHT -if it is desired that the intercepted aircraft follow the intercepting aircraft to an alternate aerodrome, the intercepting aircraft raises its landing gear and uses the Series 1 signals prescribed for intercepting aircraft.	Understood follow me
		If it is decided to release the intercepted aircraft, the intercepting aircraft uses the Series 2 signals prescribed for intercepting aircraft.	Understood you may proceed
AEROPLANES: DAY or NIGHT -Regular switching on and off of all available lights but in such a manner as to be distinct from flashing lights.	Cannot comply	DAY or NIGHT - Use Series 2 signals prescribed for intercepting aircraft	Understood
AEROPLANES: DAY or NIGHT -Irregular flashing of all available lights HELICOPTERS: DAY or NIGHT - Irregular flashing of all available lights.	In distress	DAY or NIGHT - Use Series 2 signals prescribed for intercepting aircraft	Understood

Visual Flight Rules

6.59 Visual Meteorological Conditions (VMC). With the exception of special VFR (SVFR - see paragraph 6.77), VFR is only permitted in VMC (see 6.5). If a flight is operated under VFR and the meteorological conditions deteriorate such that it becomes impossible to continue in VMC the pilot must either:

- Land whilst able to maintain flight in VMC; or
- Change the route of the flight to maintain flight in VMC; or
- File an IFR flight plan and continue under IFR; or
- If within a CTR, request a SVFR clearance.

6.60 Take-off/Landing Conditions. Unless authorized by ATC, VFR flights are not to take off or land at an aerodrome in a CTR, or enter the ATZ or traffic pattern:

- When the cloud ceiling (see definition) is less than 450 m (1500 ft) or
- When ground visibility (see definition) is less than 5 km

6.61 Prohibition of VFR flight. Between sunset and sunrise, or during any other period as may be specified by the ATS authority, VFR flights are to be operated in accordance with the conditions required by such authority.

- VFR flights require an ATC clearance to operate:
 - Above FL200.
 - At transonic or supersonic speeds.
- VFR flight is not permitted above FL285 where RVSM is applied.
- Except when taking off and landing (or when specially approved by the authority e.g. air displays etc...), VFR flight is not allowed:
 - Over the congested areas of cities, towns or settlements, or over an open air assembly of persons, at a height less than 300 m (1000 ft) above the highest obstacle within a radius of 600 m from the aircraft.
 - At a height not less than 150 m (500 ft) above the surface (ground or water).

6.62 VFR Flight Levels. In level cruising flight above the transition altitude (normally 3000 ft AGL), VFR flight is to be conducted at a VFR flight level appropriate to the magnetic track of the aircraft in accordance with the semi-circular rule defined in paragraph 6.74. When operating as a controlled VFR flight within controlled airspace (CAS), the FL or altitude will be specified by ATC in the ATC clearance for that flight. VFR flights are to comply with ATC instructions:

- When operating in class B, C or D airspace (in class A, VFR flight is not permitted)
- When forming part of aerodrome traffic at controlled aerodromes, or
- When operating as special VFR flights

6.63 VFR Flight Plan. A VFR flight plan is to be filed before operating a VFR flight as a controlled flight. To indicate that the flight will be operated under VFR, the letter “V” is placed in item 8 of the flight plan form. If a flight is to commence under VFR and at some point en route change to IFR, the letter “Z” is placed in field 8 (V → I = Z). Where the PIC of a VFR flight wishes to change to IFR:

- If a VFR flight plan was submitted, the PIC is to communicate the necessary changes to be effected to the current flight plan, or
- He/she is to submit an IFR flight plan and obtain a clearance prior to proceeding under IFR when in controlled airspace.

6.64 EET. The time put in field 16 of a VFR flight plan is the time from take-off until overhead the destination aerodrome.

6.65 Communications. Controlled VFR flights and VFR flights into airspace where the ATS authority considers it advisable are to maintain 2-way RTF communication with a controlling or monitoring ATSU and make position reports as necessary. In airspace classified as class E, F or G, VFR flights may operate without two-way communications (non-radio).

Instrument Flight Rules

6.66 IFR. For aircraft to be operated in IMC, (IMC exists when VMC does not!), the following rules are applicable. The rules are collectively known as the Instrument Flight rules (IFR). Annex 1 (Personnel Licensing - 2.1.7) states that where a licence is issued by a contracting state, it shall not permit the holder to act as PIC or co-pilot of an aeroplane under IFR unless the holder also holds a valid instrument rating (IR) appropriate to the aircraft category.

6.67 Aircraft Equipment. Aircraft are to be equipped with suitable instruments and with navigation equipment appropriate to the route to be flown. The necessary equipment is detailed in JAR OPS-1 and is covered in Operational Procedures lectures.

6.68 Minimum Levels. Except when necessary for take-off and landing, or where specially authorized by the appropriate ATS authority, an IFR flight shall be flown at a level which is not below the minimum flight altitude established by the state whose territory is being overflown, or where no such minimum altitude is specified:

- Over high terrain or mountainous areas (not defined further), the minimum level must be at least 600 m (2000 ft) above the highest obstacle located within 8 km (5 NM) of the estimated position of the aircraft
- In areas other than in the above, minimum level is to be 300 m (1000 ft) above the highest obstacle within 8 km (5 NM) of the estimated position of the aircraft.

6.69 IFR Flight Plans. An IFR flight plan is to include the letter I in item 8 of the flight plan form. If the intention is to change from IFR to VFR at some point during the flight the letter Y is to be inserted in item 8 (I → V = Y).

6.70 Changing from IFR to VFR. Where a pilot elects to change from IFR to VFR and the flight plan was not annotated Y in field 8, the pilot is to notify the ATS authority that flight under IFR is cancelled using the phrase “cancelling my IFR flight” and then the necessary changes to the current flight plan are to be passed. ATC will respond, “IFR cancelled at (time)”. When an IFR flight encounters VMC it shall not cancel IFR unless it is anticipated and intended that the

flight will be continued for 'a reasonable period' of time in uninterrupted VMC. In any event, a change of flight rules must only be at the request of the pilot.

6.71 EET. The time put in field 16 of an IFR flight plan is the time from take-off until over the initial approach fix (IAF) for the instrument procedure at the destination aerodrome.

6.72 IFR within Controlled Airspace (CAS). IFR flights within CAS are to comply with instructions issued by the appropriate ATC unit. IFR flights in cruising flight shall be flown at a cruising level, or when authorized to employ cruise climb techniques, between two levels or above a level, selected from:

- The table of cruising levels (see below)
- A modified table of cruising levels, if applicable, for flight above FL410 (see below).

6.73 IFR outside Controlled Airspace (CAS). The following rules apply to IFR flights outside CAS:

- **Cruising Levels.** IFR flights outside CAS are to be flown at cruising level appropriate to the magnetic track of the aircraft (see below).
- **Communications.** IFR flights operating outside CAS but within or into areas or along routes designated by the authority as those where the filing of a flight plan is required, are to establish communication and maintain a continuous listening watch with the ATS unit providing a flight information service (FIS).
- **Position Reports.** An IFR flight outside CAS and required to either submit a flight plan or maintain a listening watch with the unit providing an FIS, is to make position reports. For flights operating off ATS routes (airways) or in a defined operating area, position reports are to be made at intervals of 1 hour after an initial report has been made 30 minutes after leaving CAS or after commencing the controlled flight. Where a position report is meaningless (prolonged controlled flight operations in a confined area) an 'operations normal' call is to be made at hourly intervals to prevent unnecessary activation of the alerting service. An example of an 'operations normal' call is:

"London Control this is GADRF operations normal at 1020, 2000 ft and below. Will call again at 1120"

Semi-circular Flight Level Rules and RVSM

6.74 Introduction. In order to apply vertical separation inside CAS, ATC will allocate specific FLs to individual aircraft which may, or may not, comply with the semi-circular rule. However, for planning purposes and outside of CAS, pilots should select the required cruising level (IFR or VFR) from the ICAO table of FLs. From the tables, the semi-circular rules can be derived, which permit the selection of FLs in accordance with aircraft magnetic track. Tracks are specified as being either 'eastbound' or 'westbound'. Eastbound tracks are 000°M - 179°M inclusive, and westbound, 180°M - 359°M inclusive. Specific FLs are allocated to VFR and IFR traffic. IFR FLs are whole thousands of feet whereas VFR levels are whole thousands plus 500 ft up to FL285. Eastbound levels are defined as 'odd' and westbound as 'even' from the first two digits of the FL number. Above 30 000 ft, generally, the vertical separation is doubled and IFR levels are all odd, and VFR levels are even. A special system of FL allocation is applied where reduced vertical separation (RVSM) minima is applied

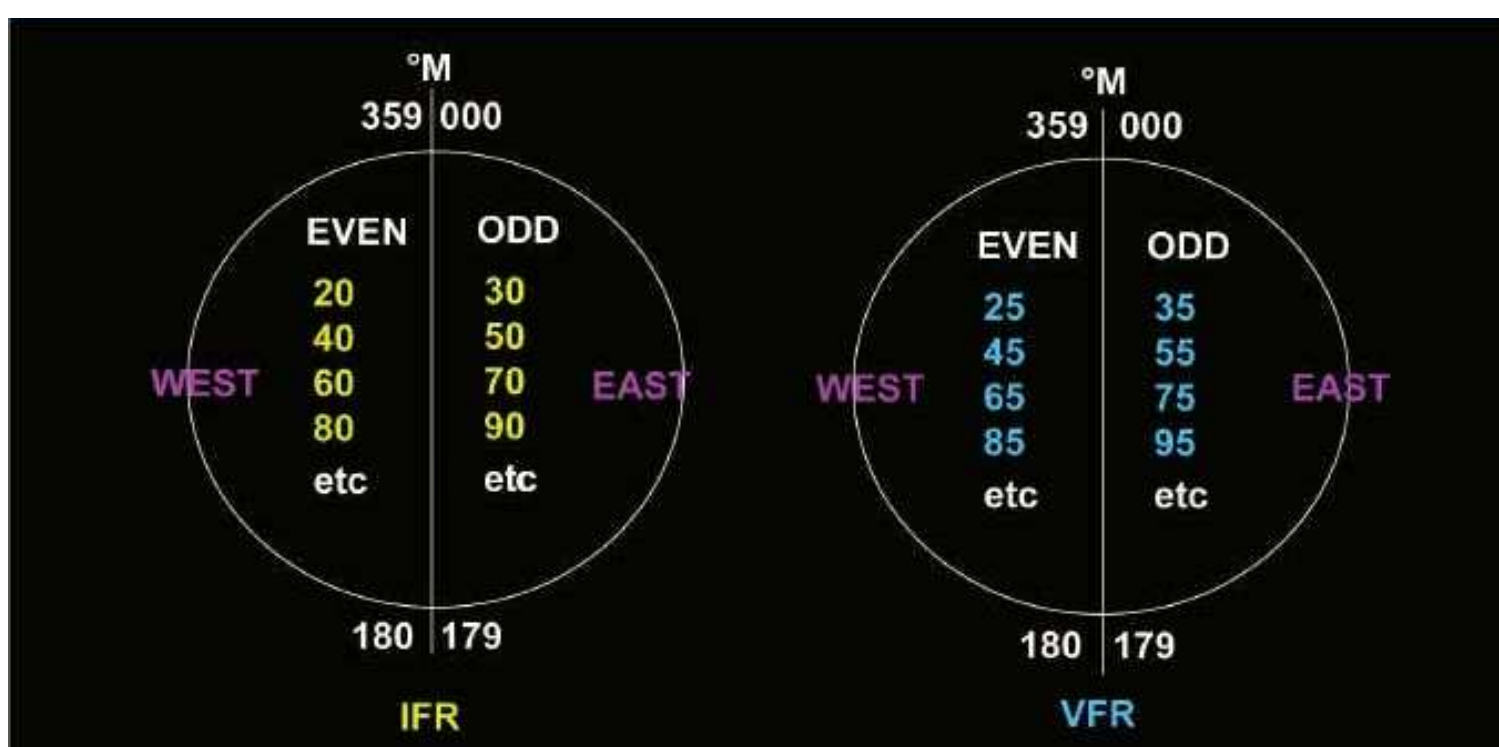


Figure 6.12 IFR and VFR flight levels up to and including FL290

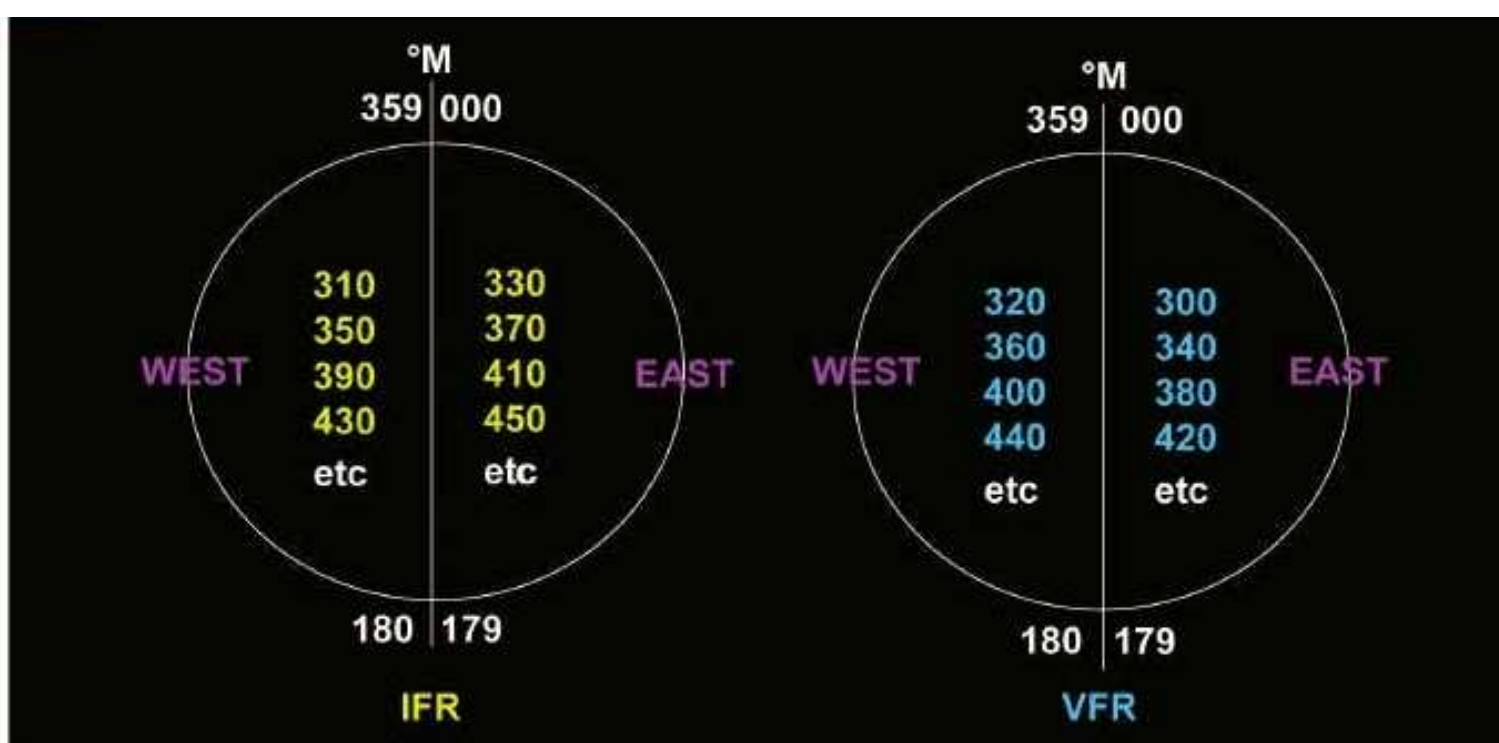


Figure 6.13 IFR and VFR flight levels above FL290

6.75 RVSM. In order to make more FLs available to turbojet traffic in the cruise, a system has been adopted which prohibits VFR flight (thus making VFR levels available to IFR traffic). In order to achieve this, the separation between IFR levels between FL290 and FL410 inclusive is reduced from 2000 ft to 1000 ft. It is a requirement of aircraft using the RVSM system that they be fitted with A/TCAS and be approved by the airspace authority. Above FL410 the altimeter errors are considered too great to continue the 1000 ft separation.

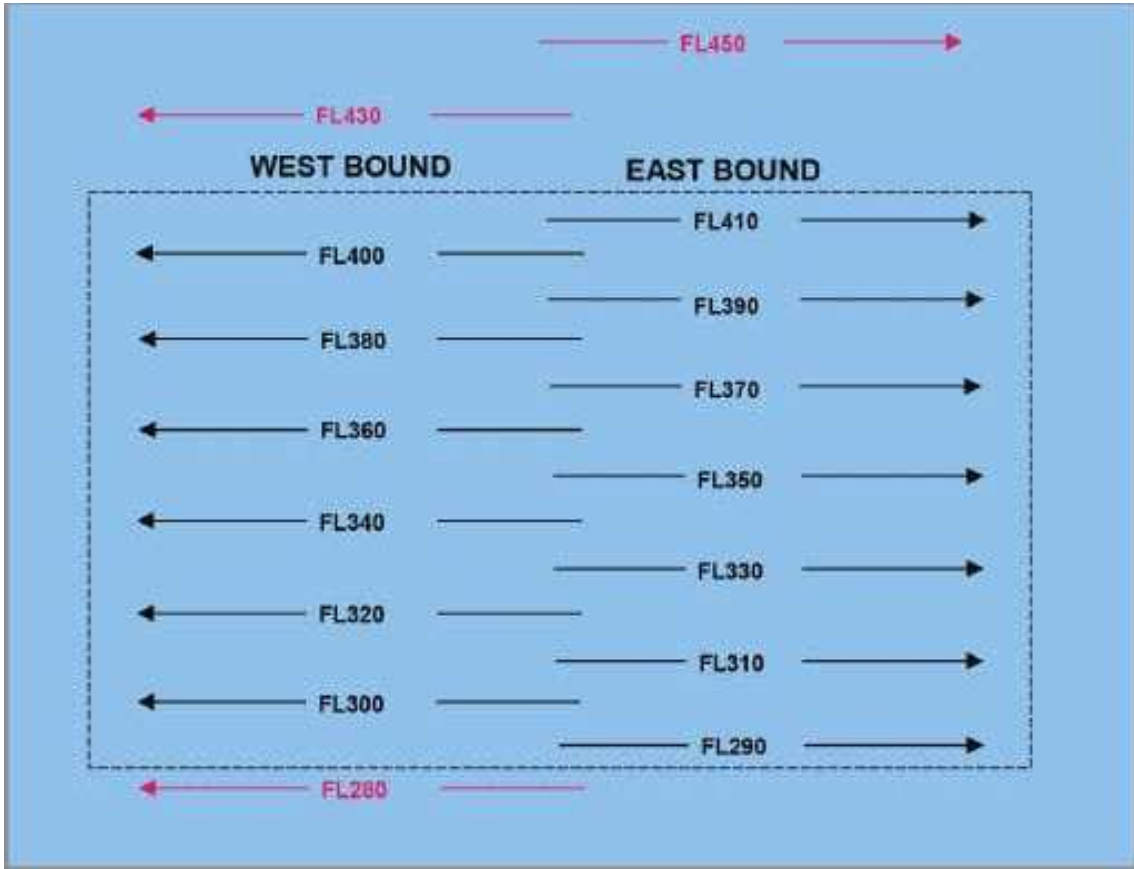


Figure 6.14 Reduced vertical separation minima

Special VFR

6.76 History. With the introduction of airspace restrictions in the late 1960s, military aerodromes close to large international aerodromes, specifically Northolt in proximity to the rapidly expanding Heathrow, found that IFR procedures were mandatory in the new control zones when previously VFR procedures were generally accepted. In order to allow aeroplanes to fly into and out of Northolt (in the then Heathrow Special Rules Zone) a procedure based on a corridor in which visual navigation was required was set up. Providing the pilot could see the ground, he could navigate and provided he remained clear of cloud he could avoid collisions. A system of ‘not quite’ IMC or special VFR was invented. Until the late 1970s this was applied in what was known as the Northolt special VFR corridor. It was expanded to include the general aviation aerodrome at Denham and its advantages for aeroplanes and pilots unable to comply with IFR were obvious. When the classes of airspace (A - G) were introduced, ICAO also adopted the special VFR as a procedure with appropriate international amendments.

6.77 SVFR. SVFR is defined by ICAO as a VFR flight cleared by ATC to operate within a CTR in meteorological conditions below VMC. It is only applicable to flights into, out of, or within a CTR. ICAO requires that the ground visibility within the CTR is not less than 1500 m before a SVFR flight is permitted to enter the CTR to land, take off and depart, cross or operate locally within the CTR. More restrictively, JAR OPS-1 requires 3000 m visibility for a SVFR flight to be commenced.

Distress and Urgency Signals

6.78 Distress: Definition - An aircraft (or vessel) is in grave and imminent danger and requests immediate assistance.

- A distress message is preceded by the word MAYDAY repeated 3 times.
- Visual signals from an aircraft in distress may include
 - A succession of RED pyrotechnics
 - A RED parachute flare

6.79 Urgency. Definition - An aircraft has an urgent message to transmit concerning the safety of a ship, aircraft, vehicle or other property of a person on board or within sight. An urgency message is preceded by the words PAN PAN repeated 3 times.

6.80 Non-emergency Situation. If an aircraft has a communications failure or a malfunction that makes it imperative that the aircraft is landed but the pilot does not require any other assistance, the pilot shall indicate the fact by repeatedly switching the landing lights (or any other light) on and off.

6.81 SSR. Secondary Surveillance Radar is covered in Chapter 13 of this book and in depth in Radio Navigation. There are, however, certain reserved codes (squawks) that have specific meaning, which you are required to know. At all times you should transmit the altimeter function (mode charlie) in addition to the reserved codes. The reserved transponder codes are:

- **Mode A code 7700.** This is the civil emergency code and is used unless a specific identification code has been allocated by a radar controller and the aircraft has been identified.
- **Mode A code 7600.** This is the squawk to indicate radio failure and should be used at all times when a failure occurs regardless of the ATC service being provided.
- **Mode A code 7500.** This code indicates unlawful interference. Its use does not imply that the fact is being generally advertised. Discretion and confidentiality will be preserved by the ATC authority until the pilot mentions the fact by RTF. A pilot may prefer to use the 7700 squawk to indicate the severity of the situation.
- **Mode A code 7000.** This code indicates that the aircraft is operating in an area where a radar service is available from an ATCU but the aircraft is not in receipt of the service. It implies that the aircraft is operating under VFR.
- **Mode A code 2000.** This code is used to indicate that an aircraft is entering an area where a radar service is available and will be requesting that service. Usually used by aircraft entering a domestic FIR from an Oceanic control area.
- **Mode A code 0000.** This code is reserved to indicate that the aircraft transponder is in some manner unserviceable or inaccurate.

Restricted, Prohibited or Danger Areas

6.82 Specification. Each state has the right to restrict or prohibit flight in territorial airspace for reasons of security or safety. Such areas are known as danger areas (indicated by the letter **D**), restricted areas (indicated by the letter **R**) or prohibited areas (indicated by the letter **P**) and are detailed in the AIP. These are designated by a code identifying the area and showing the altitude (usually in 1000s of ft) to which the area extends. Areas may be either permanently active (PERM) or activated by NOTAM. The area designator (for instance - **D001**) cannot be re-used for a period of not less than 12 months after the closure of the previously designated area. This allows for a full reprint of the 1/2 million topographical charts so that no confusion can exist.

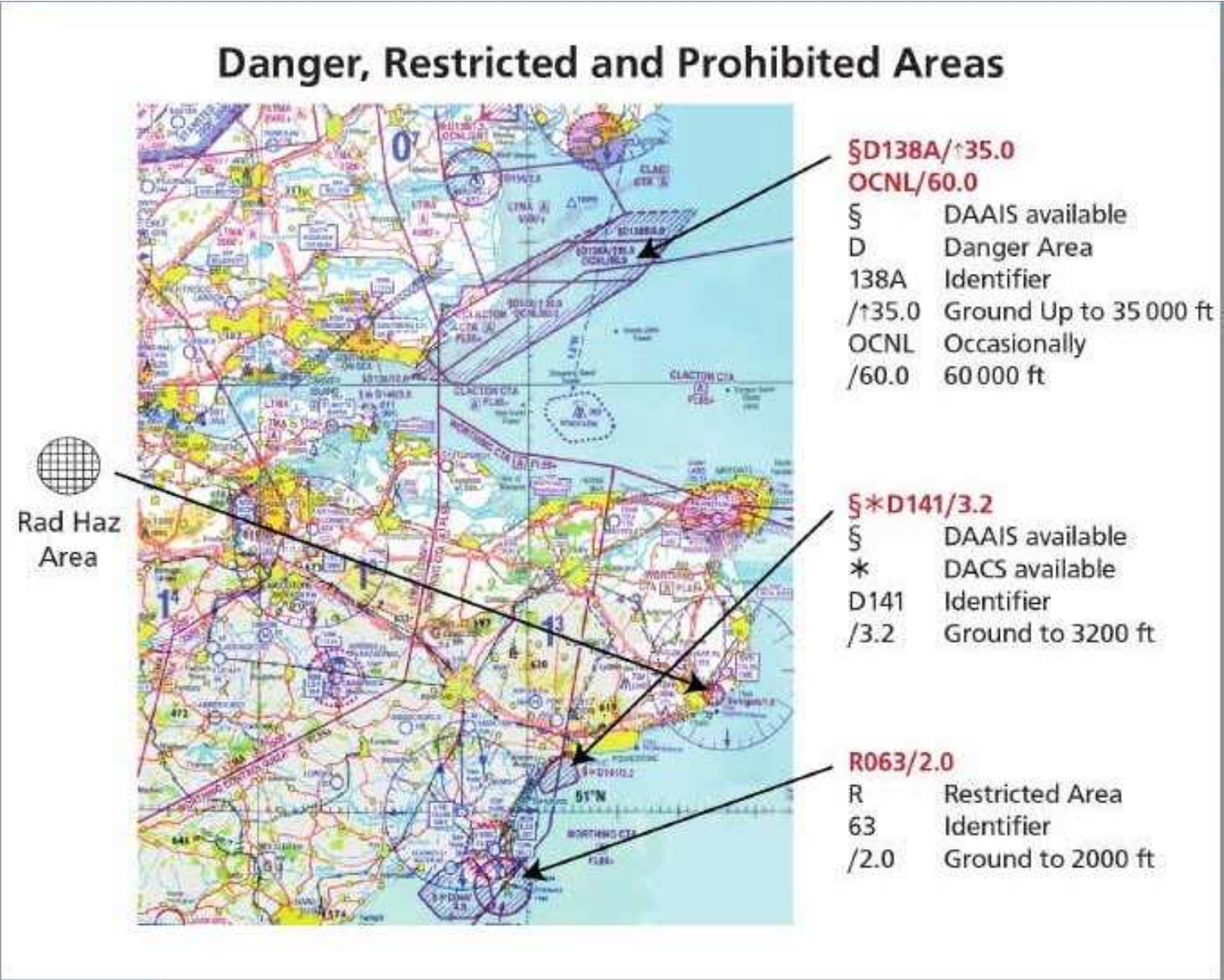


Figure 6.15

6.83 Visual Warning of Incursion. By day and night; a series of projectiles discharged from the ground at intervals of 10 secs, each showing on bursting red and green lights or stars, are used to warn aircraft that they are flying in or about to enter restricted, prohibited or danger areas.



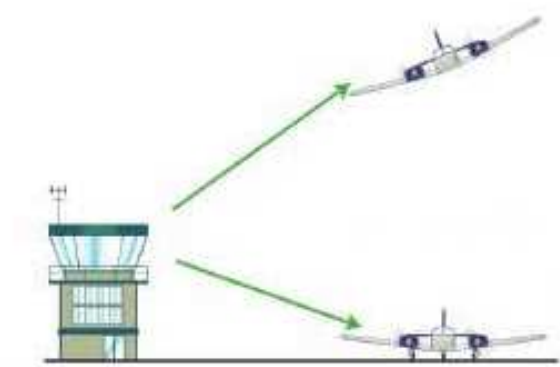
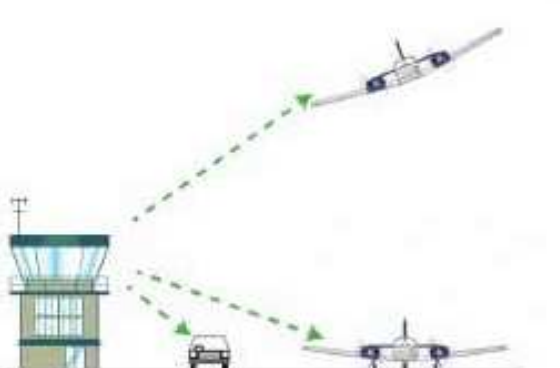
Figure 6.16

Signals for Aerodrome Traffic

6.84 Non-radio Traffic. Non-radio traffic on or in the vicinity of an aerodrome is to keep a good look out for visual signals from ATC. Aeroplanes with radios are also to comply with instructions given visually. The lamp used by ATC to communicate (Aldis lamp) is directional with a narrow beam. If you see a signal light from the tower, you must assume that it is meant for you.

6.85 Visual Signals. The following table gives the light and pyrotechnic signals used from ground to air:

Light	From Aerodrome Control to:	
	Aircraft in Flight	Aircraft on the Ground
Steady Green	Cleared to land	Cleared for take-off
Steady Red	Give way to other aircraft and continue circling	Stop
Green flashes	Return for landing and await landing clearance	Cleared to taxi
Red flashes	Aerodrome unsafe, do not land	Taxi clear of the landing area
White flashes	Land at this aerodrome after receiving clearance to land and then proceed to the apron	Return to the starting point on the aerodrome
Red pyrotechnic (flare)	Notwithstanding any previous instructions, do not land for the time being	

Signal Steady green.		Meaning Cleared to land. Cleared to take off.
Signal Steady red.		Meaning Give way to other aircraft and continue circling. Stop.
Signal Green flashes.		Meaning Return for landing and await landing clearance. Cleared to taxi.
Signal Red flashes.		Meaning Aerodrome unsafe, do not land. Taxi clear of the landing area.

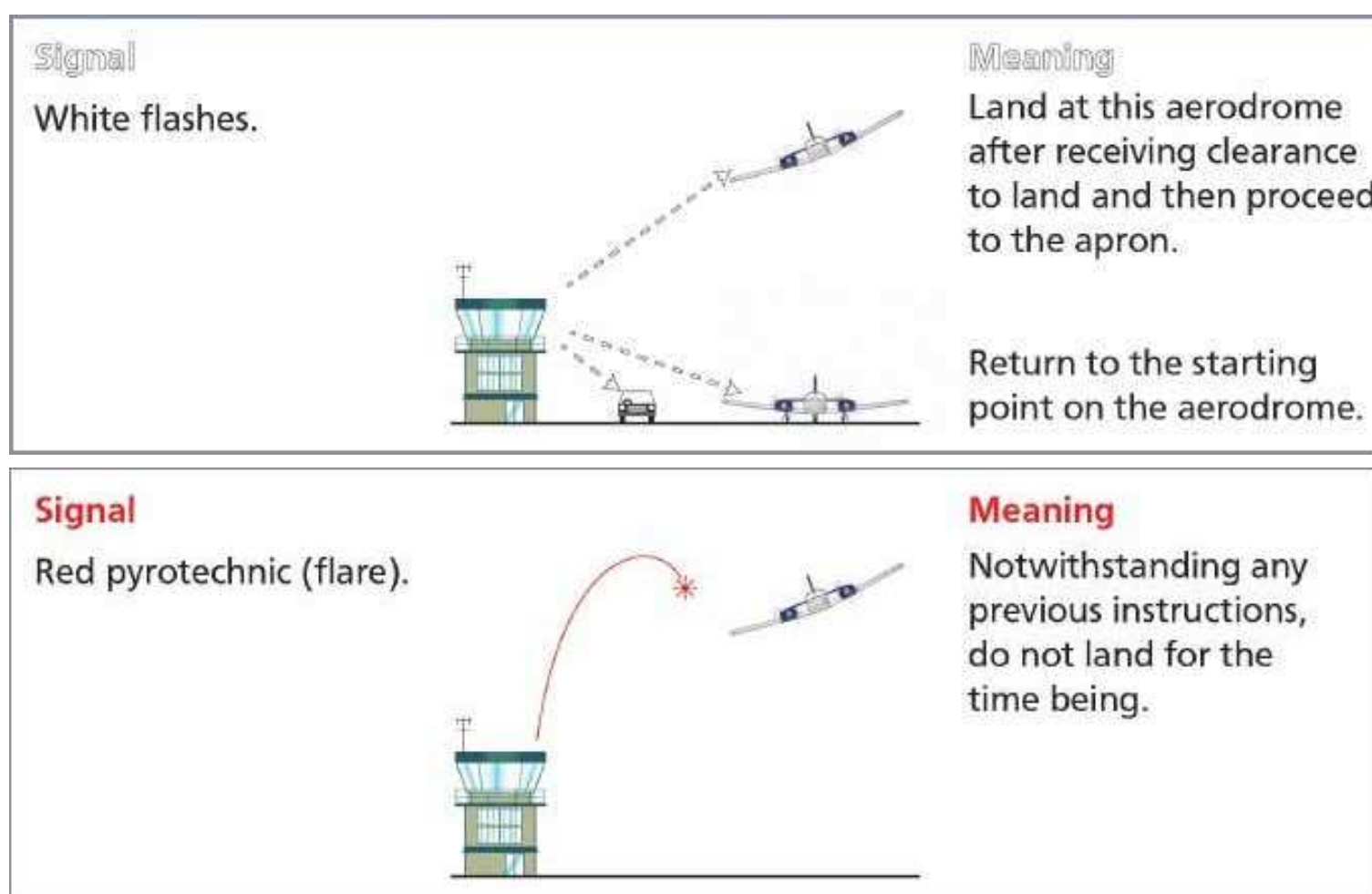


Figure 6.17

6.86 Acknowledgement by Aircraft. To acknowledge receipt of a signal as per Figure 6.17, an aircraft may make the following:

- When in flight:
 - During the hours of daylight, by rocking the aircraft's wings
 - During the hours of darkness, by flashing on and off twice the aircraft's landing lights or, if not so equipped, by switching on and off the navigation lights twice.
- When on the ground:
 - During the hours of daylight by moving the aircraft's rudder or ailerons;
 - During the hours of darkness by flashing on and off twice the aircraft's landing lights or, if not so equipped, by switching on and off the navigation lights twice.

6.87 Visual Ground Signals. The following signals may be shown on an aerodrome, either in the signal square or at other locations on the apron or movement area. A signal square is usually located in front (aerodrome side) of a control tower (visual control room) and is to be visible from the air anywhere in the vicinity of the aerodrome. The purpose is to convey essential information to pilots unable to communicate by radio. Other signals, applicable to non-radio traffic on the ground are displayed from a signals mast (also in front of the control tower) or by means of indicator boards (information signs) located on or adjacent to the control tower. The absence of a signal square indicates that the aerodrome is not to be used by non-radio traffic. This is the case at Oxford, where due to high traffic density and trainee pilots in the circuit, non-radio traffic is considered hazardous.

Note: The use of any signal by any person shall only have the meaning assigned to it under the rule.

7. **When is a flight plan required?**
 - a. For IFR flight in advisory airspace.
 - b. For all IFR flights.
 - c. For all flights in controlled airspace.
 - d. For all VFR and SVFR flights in controlled airspace.
8. **Whilst airborne in the vicinity of the aerodrome, you see a flashing green light from the Tower. What does this mean?**
 - a. Cleared to land.
 - b. Return for landing and await clearance to land.
 - c. Give way to other landing aircraft.
 - d. Land at this aerodrome after receiving clearance to land and proceed to the apron.
9. **You see a double white cross in a signal square, what does this mean?**
 - a. Glider flying in progress.
 - b. Tow ropes and banners may be dropped.
 - c. Runway unfit for aircraft movement.
 - d. Aerodrome unfit for aircraft movement.
10. **You are taxiing on the manoeuvring area of an aerodrome and see a flashing green light from the tower. What does it mean?**
 - a. Return to start point.
 - b. Clear to taxi.
 - c. Clear to take off.
 - d. Stop.
11. **You have been intercepted in the airspace of a foreign contracting state. What is the signal for 'clear to proceed' from the intercepting aircraft?**
 - a. Rocking wings.
 - b. Flashing lights.
 - c. Cut across track.
 - d. Breaking turn up and left.
12. **Which has priority to land?**
 - a. A hospital flight.
 - b. An emergency.
 - c. A military flight.
 - d. A VIP flight.
13. **What does a double horizontal white cross on an aerodrome indicate?**
 - a. Glider flying in progress.
 - b. Runway unfit for use.
 - c. Light aircraft may taxi on the grass.
 - d. Runway to be used for take-off but aircraft may taxi on the grass.

14. Which of these is not a distress frequency?
1. 121.5 MHz
 2. 2182 kHz
 3. 243.0 kHz
 4. 2430 kHz
- a. 4 only.
 - b. 1 and 2.
 - c. 2, 3 and 4.
 - d. 3 and 4.
15. If you are intercepted by another aircraft, what do you set on the SSR transponder?
- a. A/2000 + C.
 - b. A/7500 + C.
 - c. A/7600 + C.
 - d. A/7700 + C.
16. You are taxiing an aircraft on the ground at an aerodrome and you see a flashing red light from the tower. What does it mean?
- a. Stop.
 - b. Taxi clear of the landing area.
 - c. Give way to approaching aircraft.
 - d. You are not clear to take off.
17. Aircraft A is a VFR flight operating in a CTR under an ATC clearance. Aircraft B is entering the CTR without clearance. As they converge, which one has the right of way?
- a. B has right of way regardless of aircraft type and position.
 - b. A has right of way regardless of aircraft type and position.
 - c. A has right of way if B is on the right.
 - d. B has right of way if A is on the left.
18. What minimum ground visibility is required to enable a SVFR flight to take off from an aerodrome in a CTR?
- a. 1000 m
 - b. 1500 m
 - c. 2000 m
 - d. 3000 m
19. If a pilot wishes to cancel an IFR flight plan and proceed under VFR in VMC, he/she must inform ATC and include the phrase:
- a. "cancelling my flight plan".
 - b. "cancelling my flight".
 - c. "cancelling my IFR flight".
 - d. "cancelling my IMC flight plan".

20. What signal from a marshaller to a pilot indicates “apply brakes”?
- a. Waving the arms across the face.
 - b. Drawing the palm across the throat.
 - c. Clenching a raised fist.
 - d. Holding both arms up with palms facing forward.
21. ATC has given you the transponder code of A/5320. In case of a radio failure in flight you must squawk:
- a. A/7600 + Mode C.
 - b. A/0020 + Mode C.
 - c. A/5300 + Mode C.
 - d. A/7620 + Mode C.
22. For a controlled flight, a flight plan must be filed before departure at least:
- a. 60 minutes before off-block time.
 - b. 60 minutes before departure.
 - c. 30 minutes before departure.
 - d. 30 minutes before off-block time.
23. Which Mode A code must be used to make sure that your aircraft is recognized as an aircraft in distress?
- a. Code 7500
 - b. Code 7700
 - c. Code 7000
 - d. Code 7600
24. An aircraft which is intercepted by another aircraft must immediately try to contact the intercepting aircraft on the following frequencies:
- a. 121.5 MHz and/or 243.0 MHz.
 - b. 121.5 MHz and/or 282.8 MHz.
 - c. 121.5 MHz and/or 125.5 MHz.
 - d. 243.0 MHz and/or 125.5 MHz.
25. Your aircraft is intercepted by a military aircraft. Instructions given by this aircraft do not comply with ATC instructions. You should:
- a. select code 7500 A on your transponder.
 - b. ask ATC for different instructions.
 - c. comply with instructions given by the intercepting aircraft.
 - d. comply with ATC instructions.
26. A pilot crosses his/her hands in front of the face, palms outwards and then moves the arms outwards. What does this signal indicate?
- a. Clear to move forward.
 - b. Brakes off.
 - c. Remove chocks.
 - d. Clear to close all engines.

27. **A red flare fired at a flying aircraft means:**
- do not land, the aerodrome is unfit.
 - notwithstanding any previous instructions, do not land for the time being.
 - return to the aerodrome for landing.
 - give way to another aircraft and continue to circle.
28. **In order to avoid confusion, the identification numbers given to each prohibited, restricted and danger area shall not be re-used for a period of:**
- at least 12 months after the cancellation of the area referred to.
 - at least 6 months after the cancellation of the area referred to.
 - at least 3 months after the cancellation of the area referred to.
 - at least 2 months after the cancellation of the area referred to.
29. **When an aircraft has been subjected to unlawful interference, the pilot may wish to indicate the fact by squawking which SSR code?**
- 7500
 - 7700
 - 7600
 - 7000
30. **Which of the following procedures would a pilot follow in the event of communications failure whilst under IFR in VMC?**
- Return to the aerodrome of departure.
 - Continue the flight whilst maintaining VMC and land as soon as possible.
 - Continue the flight at the assigned level and route and start the approach at the stated ETA.
 - Maintain the assigned level and route and land at the nearest aerodrome that is reporting VMC.
31. **If so equipped, when should an aircraft display the anti-collision light?**
- Only at night in flight, but not on the ground if being towed.
 - Whilst taxiing but not whilst being towed.
 - Only at night with engines running.
 - At all times on the ground when the engines are running.
32. **The 'estimated elapsed time' in field 16 of a flight plan for a VFR flight is the estimated time:**
- From which the aircraft first moves under its own power until it finally comes to rest after landing.
 - From brakes release at take-off until landing.
 - At cruising level taking into account temperature and pressure for that day.
 - From take-off until overhead the destination aerodrome.
33. **What is the minimum vertical separation between IFR flights flying in the same direction below FL 290?**
- 500 ft
 - 1000 ft
 - 2000 ft
 - 4000 ft

34. The cruising speed entered in item 15 of a flight plan is:
- TAS.
 - TAS or Mach No.
 - IAS or TAS.
 - TAS at 65% engine power.
35. What action is required by the pilot of an aircraft flying in the vicinity of an aerodrome to indicate that the aircraft is experiencing radio failure or another difficulty that requires immediate landing but no other assistance?
- The repeated switching on and off of the landing lights.
 - Switching the landing lights on and off three times.
 - Switching the landing lights on and off four times.
 - Switching the navigation lights on and off three times.
36. A position report shall contain the following information in the order listed?
- Aircraft identification, position, time, true airspeed, flight level or altitude, next position and time over.
 - Aircraft identification, position, time, flight level or altitude, next position and time over.
 - Aircraft identification, position, time, flight level or altitude, next position and time over, ensuing position.
 - Aircraft identification, position, flight level or altitude, next position and time over, ensuing position and time over.
37. What defines EET for an IFR flight?
- from time of take-off until overhead the IAF.
 - from time of take-off until overhead the destination aerodrome.
 - from push back until overhead the IAF.
 - from push back until overhead the destination aerodrome.
38. A DISTRESS message differs from an URGENCY message because:
- there is grave and imminent danger which requires immediate assistance.
 - the aeroplane has suffered damage that endangers the ability to fly.
 - the aeroplane will not be able to reach a suitable aerodrome.
 - the situation concerns the safety of passengers on board or within sight.
39. If radio contact with an intercepting aircraft is established but not in a common language, what would the pilot of an intercepted aircraft say, if he/she is unable to comply with the instruction from the interceptor?
- "KAN NOTT KOMPLY"
 - "UNN-ABOL TOO KOMPLY"
 - "NOTT POSS ABOL"
 - "KANN NOTT"
40. Which of the following flight has the highest priority to land?
- VIP flight.
 - Hospital flight.
 - Emergency aircraft.
 - Military aircraft.

41. What letter is put in item 8 of a flight plan to indicate that a flight is to begin under IFR and finish under VFR?
- a. Y
 - b. I
 - c. V
 - d. Z
42. A white dumb-bell with black perpendicular bars indicates that:
- a. glider flying is being conducted outside the landing area.
 - b. landing and take-off is restricted to the runways but taxiing is not confined to the pavement areas.
 - c. this aerodrome is using parallel runways.
 - d. taxiing is confined to the taxiways.
43. If an ATC clearance is not suitable, the PIC may:
- a. offer ATC an acceptable alternative.
 - b. request and if practicable accept an amended clearance.
 - c. demand an alternative clearance and ATC must comply.
 - d. decline the clearance on the grounds that it is not in accordance with the filed flight plan.
44. What letter is put in item 8 of a flight plan to indicate that a flight is to begin under VFR and finish under IFR?
- a. Y
 - b. I
 - c. V
 - d. Z
45. Who has final authority as to the disposition of an aircraft during flight time?
- a. The owner.
 - b. The Operator.
 - c. The Commander.
 - d. The ATC controller.
46. The vertical separation minima for IFR flights in CAS applied by ATC above FL290 is:
- a. 500 ft.
 - b. 1000 ft.
 - c. 2000 ft.
 - d. 1000 ft if RVSM is applied otherwise 2000 ft.

47. Unless authorized by ATC, a VFR flight is not permitted to take off from an aerodrome within a CTR when:
- cloud ceiling is less than 1000 ft and ground visibility is less than 5 km.
 - cloud ceiling is less than 1500 ft and ground visibility is less than 5 km.
 - cloud ceiling is less than 1000 ft and ground visibility is less than 8 km.
 - cloud ceiling is less than 1500 ft and ground visibility is less than 8 km.
48. An aircraft is flying over the sea between 4500 ft and 9000 ft AMSL and outside CAS. To continue under VFR the meteorological conditions must remain:
- 2000 ft horizontally and 1000 ft vertically from cloud with visibility of 8 km.
 - 1500 m horizontally and 1000 ft vertically from cloud with visibility of 5 km.
 - 1500 m horizontally and 1000 m vertically from cloud with visibility of 5 km.
 - clear of cloud and in sight of the surface, with visibility of 5 km.
49. A change in flight rules from IFR to VFR will only take place:
- when initiated by the PIC.
 - when ordered by ATC.
 - at a point specified by the operator.
 - when the aircraft leaves CAS in VMC.
50. An aircraft is overtaking another aircraft if it is closing to the other aircraft from behind in a sector:
- 50° either side of the longitudinal axis.
 - 60° either side of the longitudinal axis.
 - 70° either side of the longitudinal axis.
 - 80° either side of the longitudinal axis.
51. When may a Repetitive Flight Plan be submitted?
- When flights are operated on the same day(s) of consecutive weeks and on at least 10 occasions or every day over a period of at least 10 consecutive days.
 - When flights are operated on the same day(s) of consecutive weeks and on at least 7 occasions or every day over a period of at least 10 consecutive days.
 - When flights are operated on the same day(s) of consecutive weeks and on at least 10 occasions or every day over a period of at least 7 consecutive days.
 - When flights are operated on the same day(s) of consecutive weeks and on at least 7 occasions or every day over a period of at least 7 consecutive days.

Answers

1	2	3	4	5	6	7	8	9	10	11	12
c	b	c	b	b	d	a	b	a	b	d	b

13	14	15	16	17	18	19	20	21	22	23	24
a	d	d	b	d	b	c	c	a	b	b	a

25	26	27	28	29	30	31	32	33	34	35	36
c	c	b	a	a	b	d	d	c	b	a	c

37	38	39	40	41	42	43	44	45	46	47	48
a	a	d	c	a	b	b	d	c	d	b	b

49	50	51
a	c	a

Chapter
7
Instrument Procedures - Departures

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Instrument Procedures

7.1 General Introduction. In order to permit all weather operation (low visibility take-off and landing) procedures must be established to provide track guidance and terrain avoidance for aircraft departing, and track guidance, terrain clearance and where special equipment is used, vertical displacement guidance for aircraft arriving at aerodromes. Low visibility operations (ICAO) are defined as take-off and landing operations with RVR less than 800 m. Remember, the minima for take-off from an aerodrome in a CTR is ground visibility not less than 5 km and cloud ceiling not less than 1500 ft. The criteria for the type of procedure to be employed are defined in terms of RVR and the limit to which a pilot is permitted to descend (DA/H or MDA/H). Clearly, obstacle avoidance during the procedure is of paramount importance. The fundamental assumption is that an instrument procedure (departure or arrival) will only be flown in conditions less than VMC. In this case, arrivals and departures from controlled aerodromes will be flown under IFR and hence subject to ATC. Therefore, prior to commencing any instrument procedure, an ATC clearance must be obtained. Procedures for departure and arrival are published and you are required to have the necessary plates (printed representations of the procedures) available on the flight deck. If you are required by ATC to divert to an aerodrome with which you are not familiar and do not have the plates, ATC will read the procedure, including the loss of communications and missed approach procedures, to you. Initially we will look at instrument departure procedures. The following abbreviations are required knowledge:

7.2 Abbreviations

C/L	Centre line	MSA	Minimum Sector Altitude
DA/H	Decision Altitude/Height	NOZ	Normal Operating Zone
DER	Departure End of Runway	NTZ	No Transgression Zone
DME	Distance Measuring Equipment	OIS	Obstacle Identification Surface
DR	Dead Reckoning	PDG	Procedure Design Gradient
FAF	Final Approach Fix	RTR	Radar Termination Range
FAP	Final Approach Point	SDF	Step Down Fix
FAT	Final Approach Track	SID	Standard Instrument Departure
IAF	Initial Approach Fix	STAR	Standard Arrival Route
IF	Intermediate Fix	TAA	Terminal Approach Altitude
LHA	Lowest Holding Altitude	TP	Turning point
MAPt	Missed Approach Point	VM(C)	Visual Manoeuvring Circling
MDA/H	Minimum Descent Altitude/Height	VM(C)A	Visual Manoeuvring Circling Area

7.3 Obstacle Clearance. It is implied that any procedure developed will not require the aeroplane to fly dangerously close to obstacles at any point during the procedure. Clearance from obstacles can be obtained by lateral clearance and vertical clearance. By requiring a pilot to fly the track accurately (within tolerances accepted) the aircraft can be guided over a surveyed flight path within the bounds of which, all obstacles can be determined and assessed. Obviously, the area surveyed must have finite limits. It is, however, not acceptable for, say, an area 5 NM wide to be surveyed and then permit aircraft to fly within guidance tolerance, 2.5 NM either side of the desired track. The extremities of the surveyed area must gradually permit higher obstacles until at the limit of reasonable expectations of accuracy (guidance tolerance - both equipment and flight technical), the guaranteed clearance is reduced to zero. This assessment is known as creation of MOC (minimum obstacle clearance areas). MOC is discussed later in this chapter. Obstacle clearance could be provided by assessing the highest obstacle to be flown over and by applying a safety margin to the obstacle height. An obstacle clearance altitude or height (OCA/H) can thus be obtained. This is the method of obtaining MSA and with refinements, minimum descent altitude/height (MDA/H) for non-precision procedures. As precision procedures provide height guidance, an obstacle 1000 ft high at 10 NM from the threshold is not as significant as an obstacle 150 ft high 1 NM from the threshold (assuming a 300 ft per mile glide slope). For precision systems, OCA/H is 'range from threshold' dependent. It should therefore be obvious that OCA/H for precision procedures are less than OCA/H for non-precision. It must be stressed that, from an operational point of view, the obstacle clearance applied in the development of each instrument approach procedure is considered to be the minimum required for an acceptable level of safety in operations. If you have your own aeroplane and it is not used for commercial air transport, you may operate to the published OCA/H limits. Operators apply higher criteria resulting in aerodrome operating minima for commercial air transport.

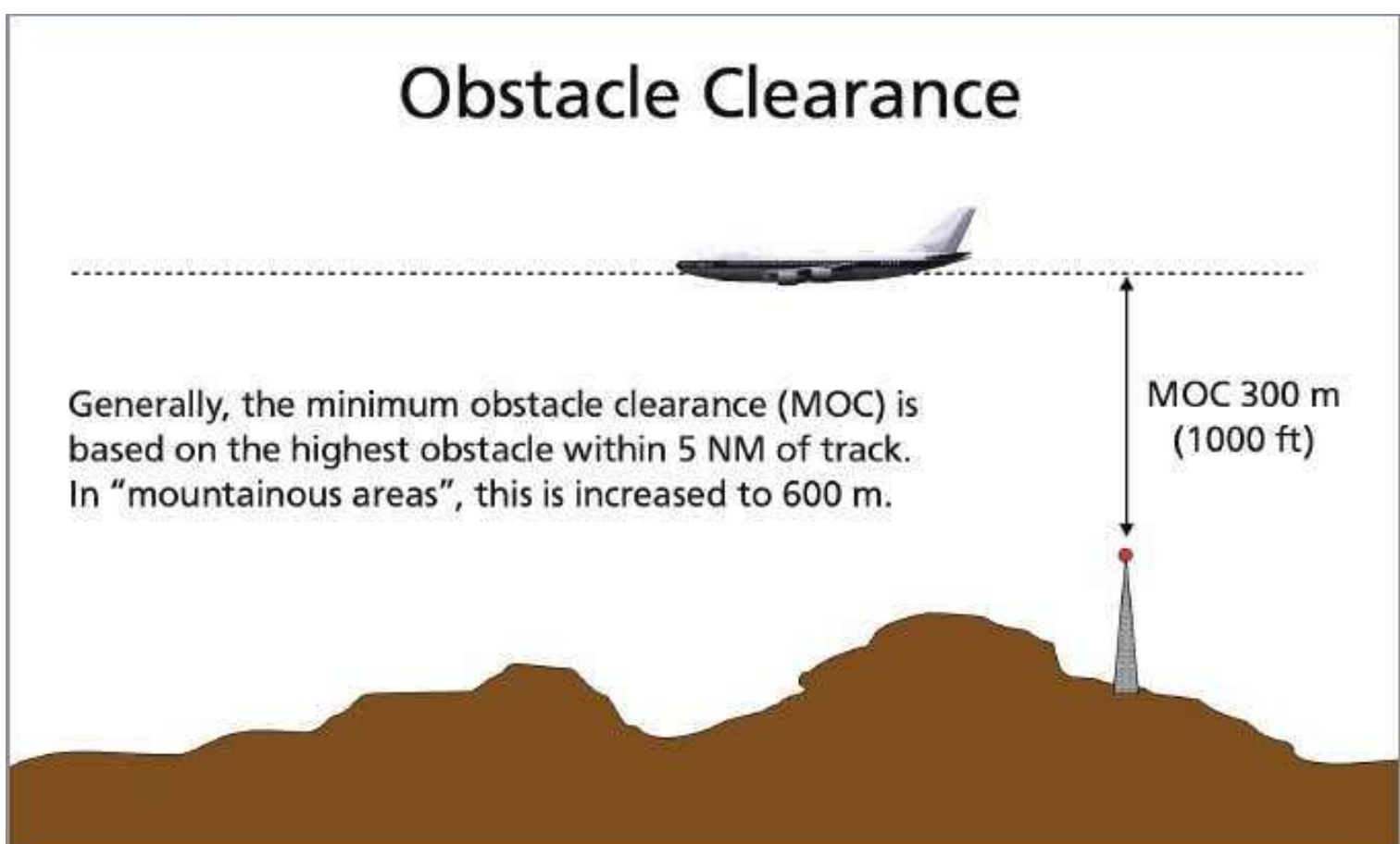


Figure 7.1

15. What are the Cat II ILS criteria for instrument runways?
- a. RVR $\geq$ 350 m DH not below 100 ft.
 - b. RVR $\geq$ 200 m DH not below 100 ft.
 - c. RVR $\geq$ 200 m DH not below 200 ft.
 - d. RVR $\geq$ 300 m DH not below 200 ft.
16. When is OCH for an ILS approach complied with?
- a. Not more than $\frac{1}{2}$ scale glide path and full scale localizer deflection.
 - b. Not more than $\frac{1}{2}$ scale localizer deflection.
 - c. Not more than $\frac{1}{2}$ scale glide path and localizer deflection.
 - d. Not more than full scale glide path and $\frac{1}{2}$ scale localizer deflection.
17. What is the MOC for the intermediate missed approach segment?
- a. 30 m.
 - b. 50 m.
 - c. 120 m.
 - d. 300 m.
18. In which stage of an instrument approach do you align with the runway?
- a. Initial segment.
 - b. Final segment.
 - c. Arrival segment.
 - d. Intermediate segment.
19. What are ICAO defined instrument approaches?
- a. Non-precision and CAT I/II/III precision.
 - b. Precision in general.
 - c. Precision CAT I/II/III.
 - d. Instrument precision and CAT II/III.
20. Within what angle of the extended centre line of a runway is a non-precision approach considered to be straight-in?
- a. 10° .
 - b. 15° .
 - c. 30° .
 - d. 40° .
21. What is the name of the phase of an instrument approach in which the aircraft is aligned with the runway and descent commenced?
- a. Final.
 - b. Initial.
 - c. Intermediate.
 - d. Arrival.

22. At what point does the intermediate phase of a missed approach end?
- When 30 metres obstacle clearance is attained and can be maintained.
 - When 50 metres obstacle clearance is attained and can be maintained.
 - When 75 metres obstacle clearance is attained and can be maintained.
 - When 90 metres obstacle clearance is attained and can be maintained.
23. The 45° leg of a 45°/180° procedure turn for a Cat C aircraft is:
- 1 min.
 - 1 min 15 seconds.
 - 1 min 30 seconds.
 - continued until interception of the glide slope.
24. Is it permitted to fly over the Missed Approach Point at an altitude higher than MDA?
- Yes.
 - Never.
 - Sometimes.
 - It depends on the flight conditions.
25. For an instrument approach, the missed approach gradient is:
- 3%.
 - 3.3%.
 - 5%.
 - 2.5%.
26. On a precision approach (ILS), the OCH(A) is based among other standard conditions, on the vertical limits between the flight path of the wheels and the glide path antenna. For a Category C aircraft this should not be more than:
- 6 m.
 - 7 m.
 - 3 m.
 - 12 m.
27. What is the turn from outbound to inbound called where the tracks flown are not reciprocal?
- Base turn.
 - Procedure turn.
 - Reversal procedure.
 - Racetrack procedure.
28. When following an instrument procedure, the pilot must:
- calculate the track required and request ATC clearance to follow it.
 - fly the heading without wind correction.
 - adjust the track specified to allow for the wind.
 - fly the heading to make good the required track allowing for the wind.

29. **Where does the initial phase of a missed approach procedure end?**
- From where a new instrument approach can be commenced.
 - Where 50 ft obstacle clearance is obtained and can be maintained.
 - Where a climb is established.
 - At the missed approach point.
30. **Who determines OCA/H?**
- The operator.
 - The flight operations department.
 - The authority of the State.
 - The Commander.
31. **What does an approach plate not include?**
- OCH.
 - ILS/DME frequencies.
 - Obstacles infringing the OIS.
 - Aerodrome operating minima for the use of the aerodrome as an alternate aerodrome, if higher than normal.
32. **The V_{at} for a Category B aircraft is:**
- up to 91 kt.
 - 90 to 121 kt inclusive.
 - 141 to 165 kt inclusive.
 - 91 to 120 kt inclusive.
33. **OCH clearance on ILS is given, provided the accuracy flown on the localizer is within:**
- $\frac{1}{4}$ scale deflection.
 - $1\frac{1}{2}$ scale deflection.
 - 1 scale deflection.
 - $\frac{1}{2}$ scale deflection.
34. **Where does the initial sector of a missed approach procedure end?**
- When a height of 50 m has been achieved and maintained.
 - When established in the climb.
 - At the missed approach point.
 - When en route either to the hold or departure.
35. **When using a DR segment to take up an ILS instrument approach, what is the maximum length of the track that may be used to intercept the localizer?**
- 10 NM.
 - 5 NM.
 - 10 minutes.
 - 5 minutes.

36. The obstacle clearance surfaces for an ILS assume a pilot localizer accuracy of:
- $\frac{1}{4}$ scale.
 - $\frac{1}{2}$ scale.
 - 1 scale.
 - $1 \frac{1}{2}$ scale.
37. The abbreviation OCH means:
- obstacle clearance height.
 - obstruction/collision height.
 - obstruction clearance height.
 - obstacle confirmation height.
38. What is the descent gradient in the final segment for an ILS CAT II approach?
- Between 2.5° and 3.5° .
 - 3%.
 - 3° .
 - Up to 400 ft/NM.
39. What are the 5 segments of an instrument approach?
- Initial; Intermediate; Descent; Final; Landing.
 - Arrival; Initial; Intermediate; Final; Missed Approach.
 - Initial; Intermediate; Final; Landing; Missed Approach.
 - Arrival; Initial; Intermediate; Final; Landing.
40. The minimum sector altitude gives an obstacle clearance of 300 metres within a certain radius from the navigation aid on which the instrument procedure is based. This radius is:
- 15 NM (28 km).
 - 30 NM (55 km).
 - 25 NM (46 km).
 - 20 NM (37 km).
41. What is the minimum ground visibility for a CAT I ILS approach?
- 800 m.
 - 550 m.
 - 50 m.
 - 550 ft.
42. Where does the initial approach segment begin in an instrument approach procedure?
- At the IF.
 - At the IAF.
 - At the FAF.
 - At the final en route fix.

43. Under which circumstances may an aircraft on a “straight-in” VOR approach continue below MDA/H?
- When it seems possible to land.
 - When the aircraft is in contact with the ground but does not have the runway in sight.
 - When the aircraft has the necessary visual criteria specified by the operator.
 - When the tower is visible.
44. What is the obstacle clearance in the primary area of the intermediate approach segment while on the instrument approach?
- 300 m (984 ft).
 - 450 m (1476 ft).
 - 300 m (984 ft) reducing to 150 m (492 ft).
 - 600 m (1968 ft).
45. What is the MOC in the primary area of the initial segment of an approach?
- At least 150 m.
 - At least 300 m.
 - 300 m.
 - 150 m.
46. When can an aircraft descend below MSA?
- The airfield and underlying terrain are visible and will remain so.
 - The aircraft is being radar vectored.
 - The underlying terrain is visible and remains so.
 - The aircraft is following an approach procedure.
- 1, 2 and 4 only.
 - 1, 3 and 4 only.
 - 2, 3 and 4 only.
 - 1, 2, 3 and 4.

Answers

1	2	3	4	5	6	7	8	9	10	11	12
a	b	c	b	b	a	c	b	c	b	c	c

13	14	15	16	17	18	19	20	21	22	23	24
a	d	a	c	a	b	a	c	a	b	b	a

25	26	27	28	29	30	31	32	33	34	35	36
d	b	a	d	c	c	d	d	d	b	a	b

37	38	39	40	41	42	43	44	45	46
a	c	b	c	a	b	c	c	c	d

Chapter
9
Circling Approach

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Circling Approach

9.1 General. Visual Manoeuvring (Circling) (VM(C)) is the term used to describe the visual phase of flight, after completing an instrument approach, to bring the aircraft into position for landing on a runway not suitably located for a straight-in approach. Any instrument procedure (precision or non-precision) may be used but the descent in the final segment will be to MDA/H for VM(C) as defined and calculated in 8.38. The procedure is defined as non-precision only, despite the type of approach.

9.2 Visual Flight Manoeuvre. A circling approach is a visual flight manoeuvre keeping the runway in sight. Each circling situation is different because of variables such as runway layout, final approach track, wind and meteorological conditions. Therefore there can be no single procedure that will cater for every situation. After initial visual contact, the basic assumption is that the runway environment (the runway markings, lights or approach lighting etc...) will be kept in sight while at MDA/H for circling.

9.3 The Visual Manoeuvring (Circling) Area. VM(C) is only permitted in the VM(C) area. This is determined for each category of aircraft by drawing arcs related to aircraft manoeuvring speed centred on each runway threshold and joining those arcs with tangential lines. The radius of the arcs is related to:

- Aircraft category
- Speed (for each category)
- Wind speed (assumed as 25 kt throughout the turn)
- Bank angle (20° or rate 1 whichever requires less bank)

9.4 Prohibited Sector. The area may be sectorised and VM(C) may be precluded from a particular sector where unrealistic MDA/H for VM(C) would otherwise exist. In this case, the published information will specify the sector and the restriction.

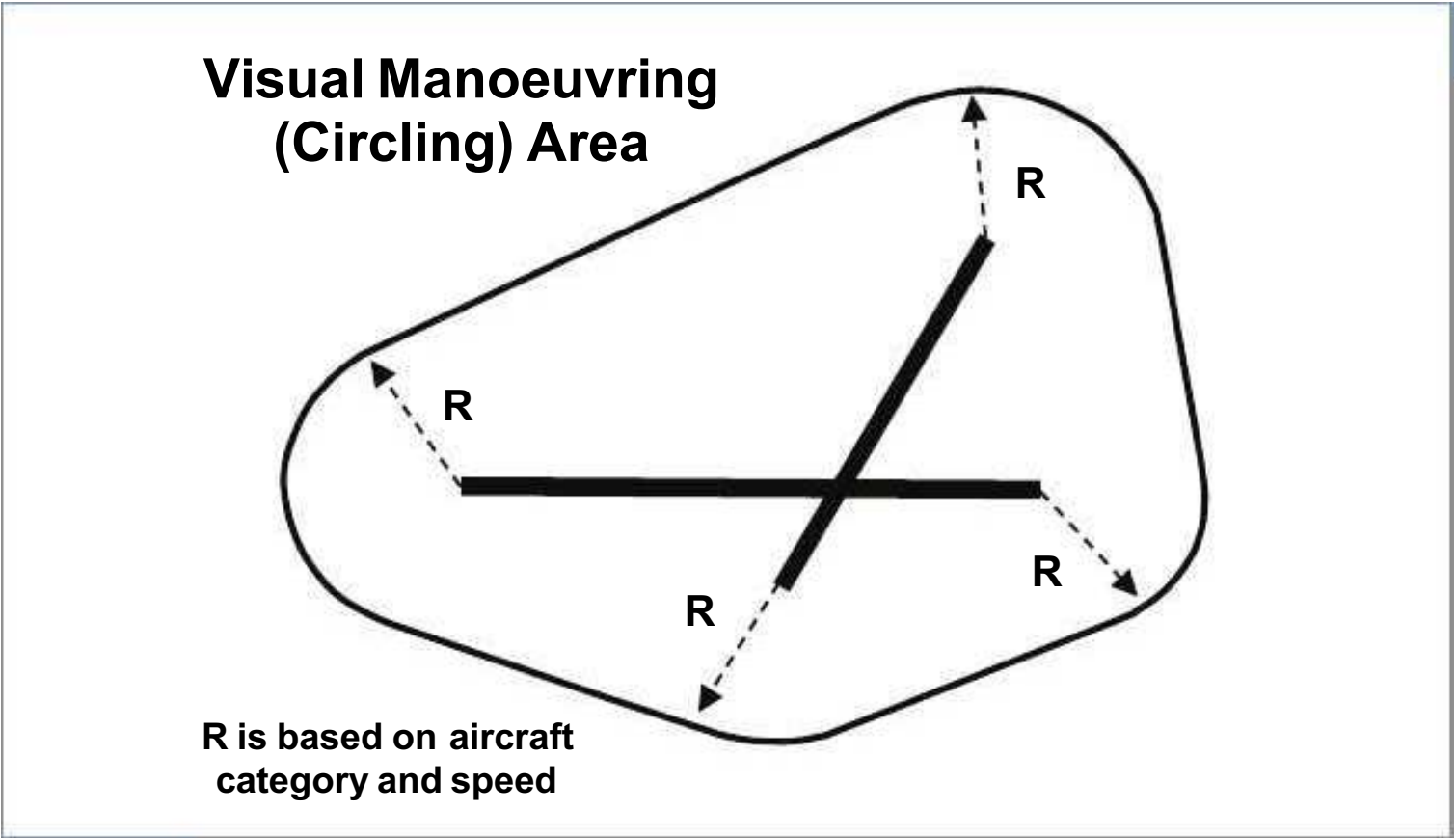


Figure 9.1

9.5 Missed Approach While Circling. If visual reference is lost while circling to land from an instrument procedure, the missed approach specified for the instrument approach runway must be followed. It is expected that the pilot will make a climbing turn towards the landing runway and when overhead the aerodrome, the pilot will establish the aircraft climbing on the specified missed approach track.

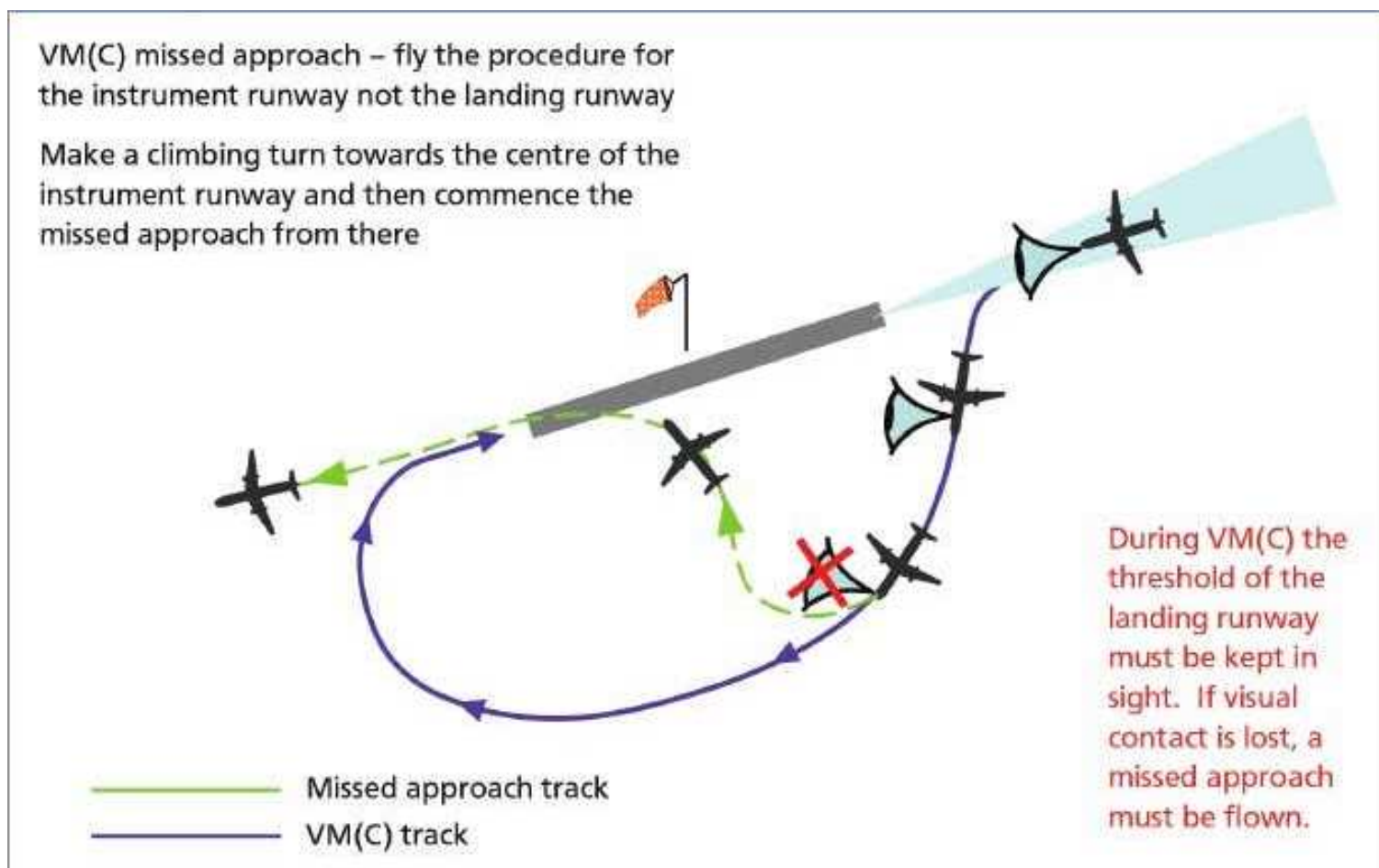


Figure 9.2

9.6 OCA/H for Visual Manoeuvring (Circling). The table below shows the OCA/H for visual manoeuvring (circling) and the minimum visibility for the procedure. Beware, these are the ICAO data and are different from the JAR-OPS data which is required learning for Operational Procedures.

Aircraft Category	Obstacle Clearance m (ft)	Lowest OCH above aerodrome elevation m (ft)	Minimum visibility km (NM)
A	90 (295)	120 (394)	1.9 (1.0)
B	90 (295)	150 (492)	2.8 (1.5)
C	120 (394)	180 (591)	3.7 (2.0)
D	120 (394)	210 (689)	4.6 (2.5)
E	150 (492)	240 (787)	6.5 (3.5)

Figure 9.3 OCA/H for visual manoeuvring (Circling)

Entry Sectors

10.5 Introduction. There are three methods of joining a holding pattern based on the heading of the aircraft as it approaches the holding fix. Based upon this heading, three sectors are defined with specific procedures appropriate to each. Between each sector there is a 5° 'flexibility' area either side of the defining heading within which the pilot has the choice of applicable joining procedure. The three sectors are illustrated below. For ease of definition the entry procedures below relate to a standard (right hand) pattern.

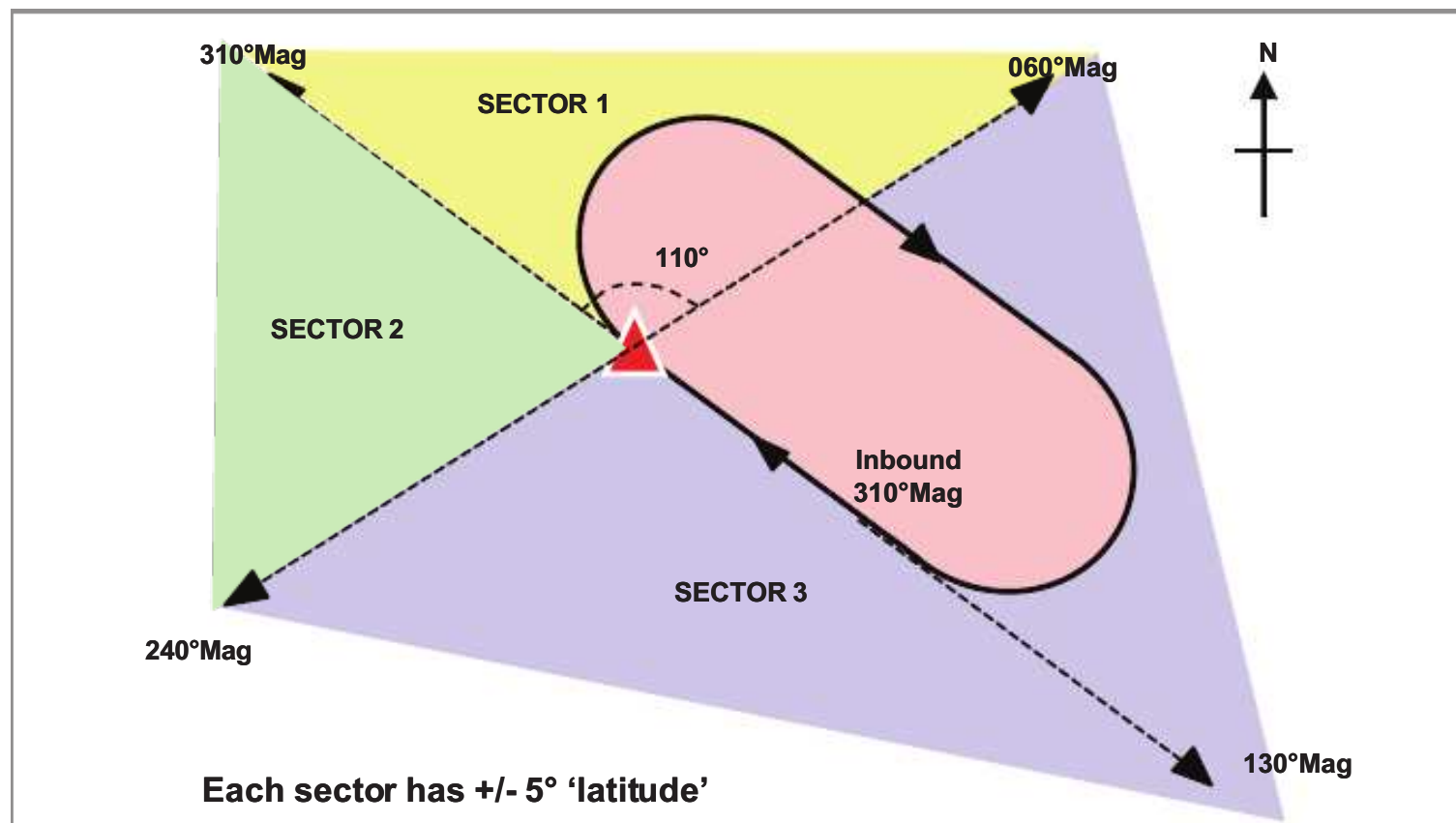


Figure 10.3

10.6 Sector 1 (Parallel Entry) Procedure. Having reached the fix, the aircraft is turned left onto an outbound heading to make good a track reciprocal to the stated inbound holding track. This is maintained for the appropriate period of time relating to the altitude of the aircraft, and then the aircraft is turned left to return to the fix. On the second time over the fix, the aircraft is turned right to follow the holding pattern.

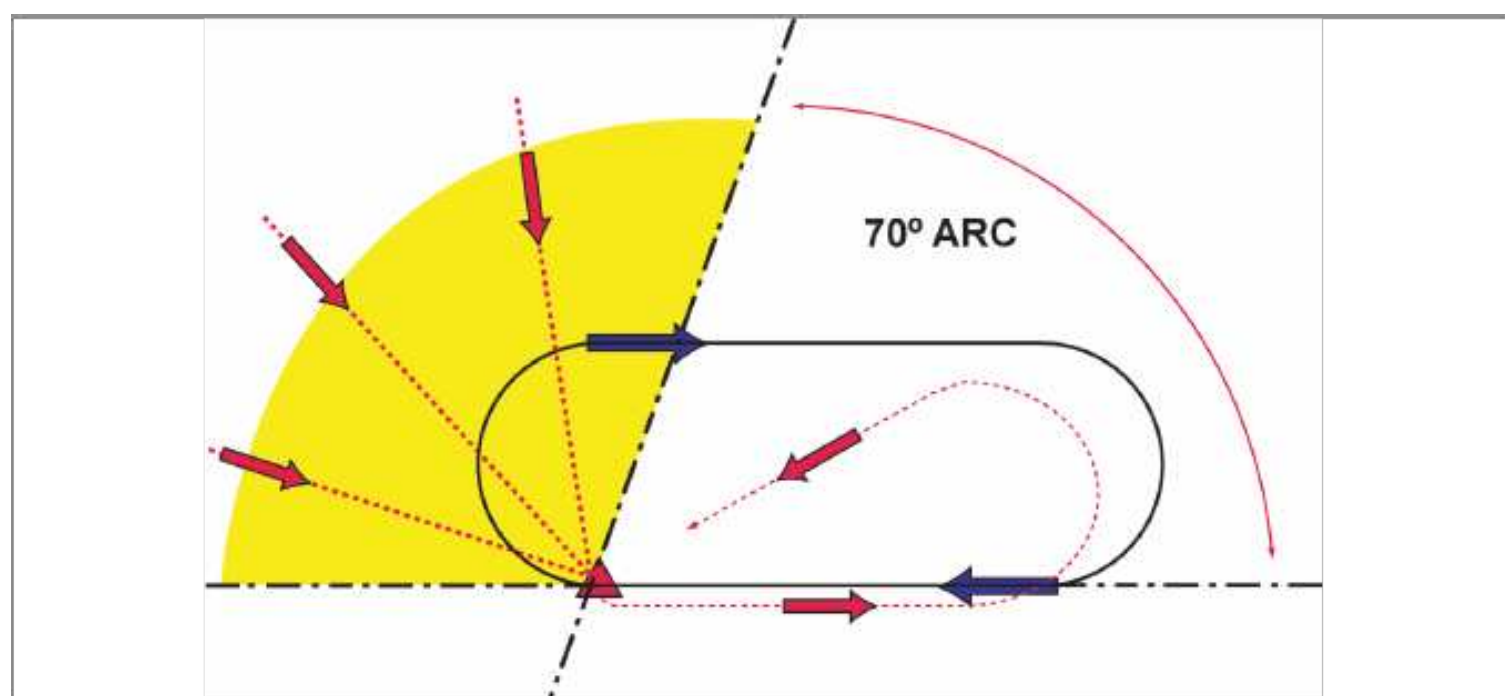


Figure 10.4

10.7 Sector 2 (Offset Entry) Procedure. Having reached the fix, the aircraft is turned onto the heading to make good the track diverging 30° left of the reciprocal of the inbound holding track. This is maintained for the appropriate period of time relating to the altitude of the aircraft, and then the aircraft is turned right onto the holding track to return to the fix. On the second time over the fix, the aircraft is turned right to follow the holding pattern.

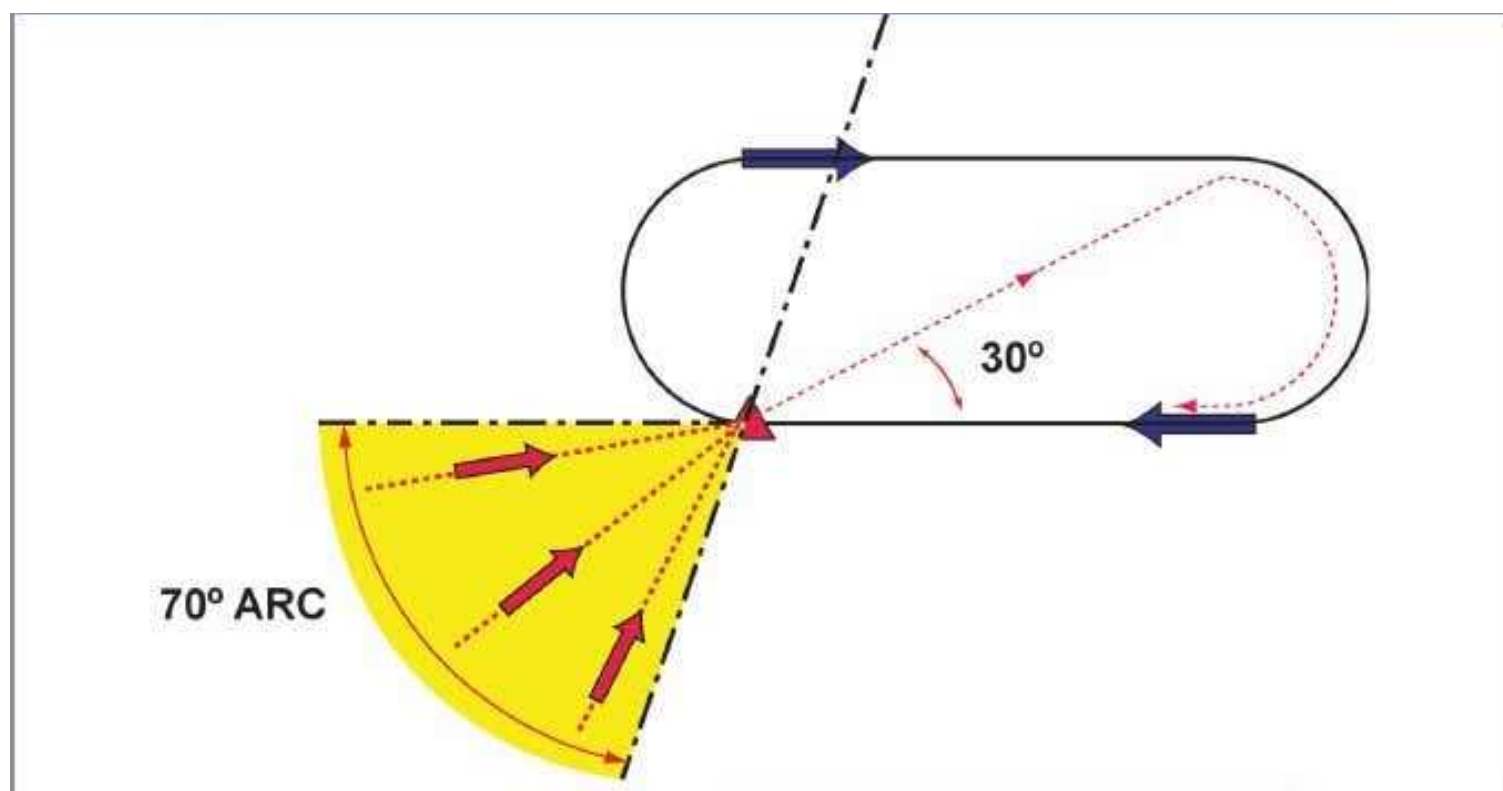


Figure 10.5

10.8 Sector 3 (Direct Entry) Procedure. Having reached the fix, the aircraft is turned right to follow the holding pattern.

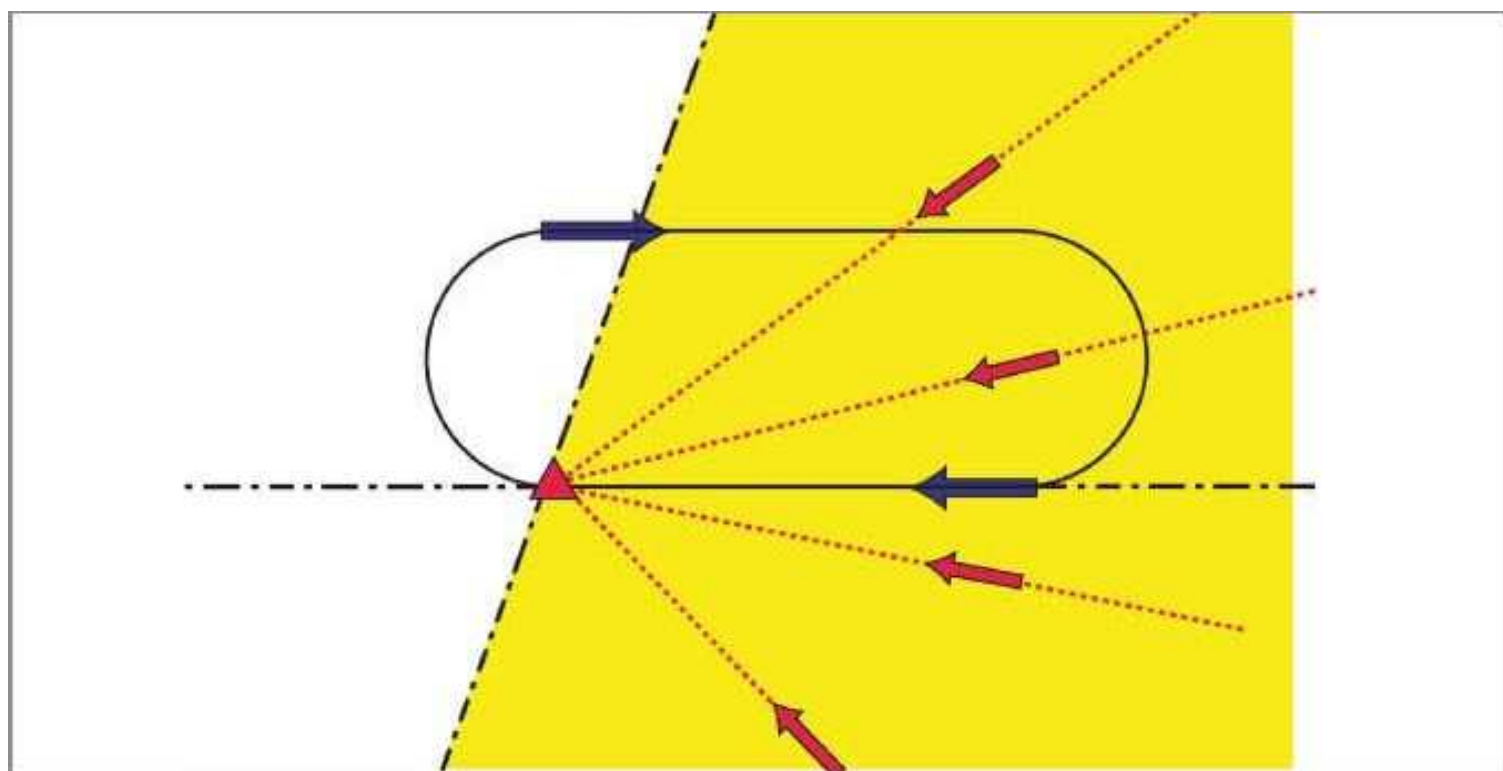


Figure 10.6

ATC Considerations

10.9 Clearance to Join. As the holding pattern will be in controlled airspace and used for controlled flights, ATC (usually the approach controller) will pass an ATC clearance to the pilot with instructions to take up the holding pattern. The clearance will specify the location of the hold to be used, details of the holding pattern (unless routinely published), the holding level and any special requirements.

"G-CD hold at OX FL50 expected approach time 1020"

"Hold OX FL50 1020 G-CD"

Followed by:

"Oxford Approach G-CD is established in the hold at FL50"

The pilot is required to ensure that the aircraft is level at the holding level at least 5 NM before reaching the holding fix. The clearance will be acknowledged and the ATCO will not expect to hear from the pilot again until the aircraft has completed the joining procedure and is established in the holding pattern.

10.10 Descending in the Hold. When the level below is vacant, the ATCO will re-clear the pilot to the lower level. The pilot will acknowledge the clearance and immediately commence descent.

Note: Shuttle is a climbing or descending manoeuvre in a holding pattern.

"G-CD shuttle in the hold to FL40"

"Leaving FL50 descending to FL40 G-CD"

Followed by:

"G-CD level FL40"

10.11 Departing the Hold. At the appropriate time, the ATCO will instruct the pilot to commence the instrument procedure. It is usual to leave a holding pattern at the fix, but where radar is used the Approach Radar controller may vector the aircraft from any position in the holding pattern. Typically a clearance would be as follows:

"G-CD advise when ready to commence the procedure"

"Ready to commence the procedure G-CD"

"G-CD set the Oxford QNH 1003, clear NDB/DME approach runway 01, report turning inbound at 2000 ft"

"1003 set clear NDB/DME runway 01 wilco G-CD"

Under certain circumstances (timed approaches) the ATCO will clear the aircraft to depart the holding pattern at a specific time to commence the procedure. In this case, the pilot should adjust the holding pattern leg lengths to depart the pattern from overhead the holding fix as close as possible to the stated clearance time.

Obstacle Clearance

10.12 Holding Area. The instrument procedure designer will ensure that the MOC (300 m or 600 m in mountainous terrain), is applied throughout the holding area. This will include the holding pattern and any necessary adjacent airspace that would be used during a joining procedure. The size of the holding area will depend upon the nature of the pattern, the type of aircraft using the hold, adjacent airspace requirements and maximum holding altitude. Surrounding the holding area a buffer zone, 5 NM wide, is established within which decreasing MOC is applied from full MOC at the boundary with the holding area, to zero at the extremity.

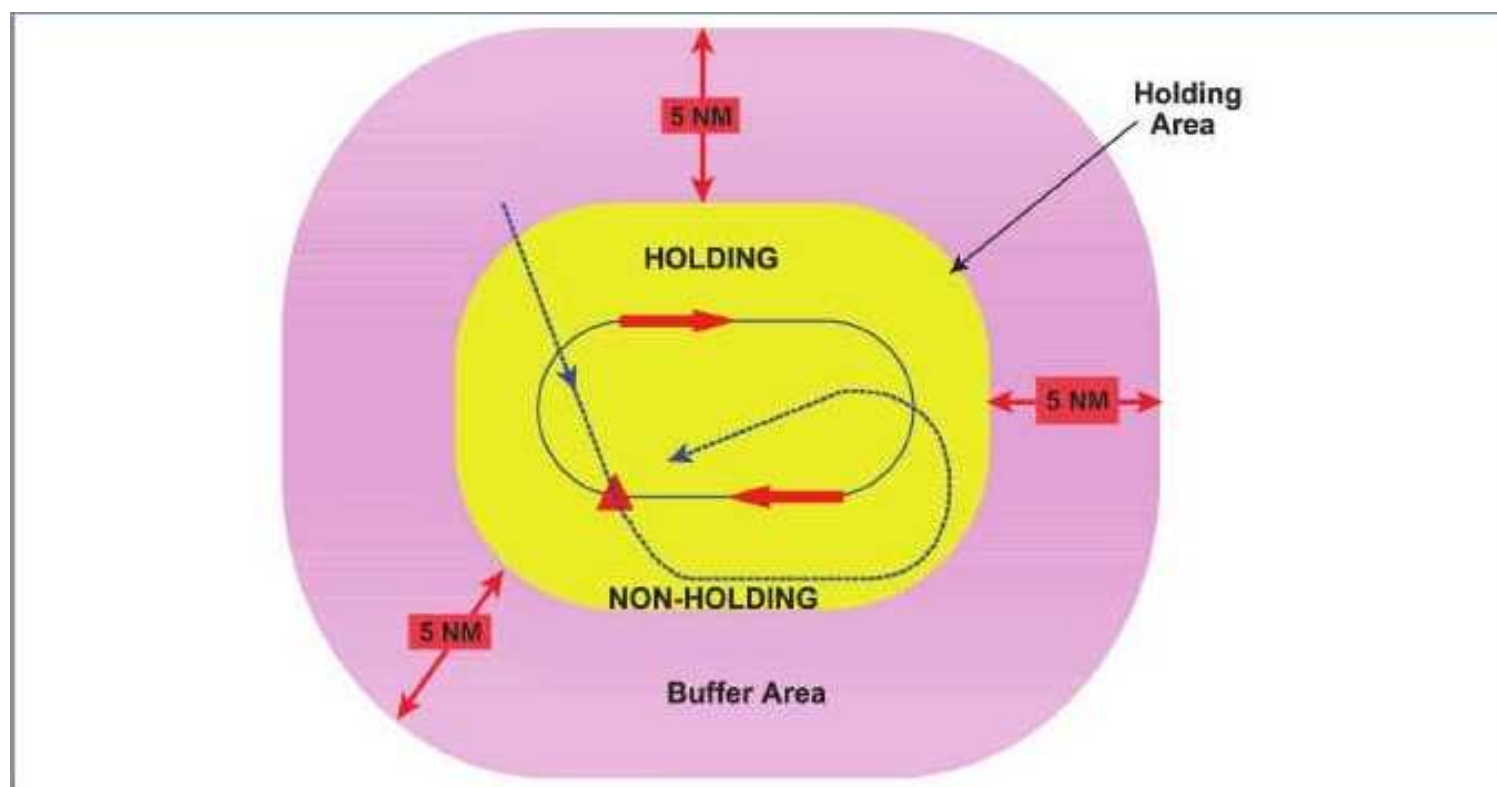


Figure 10.7

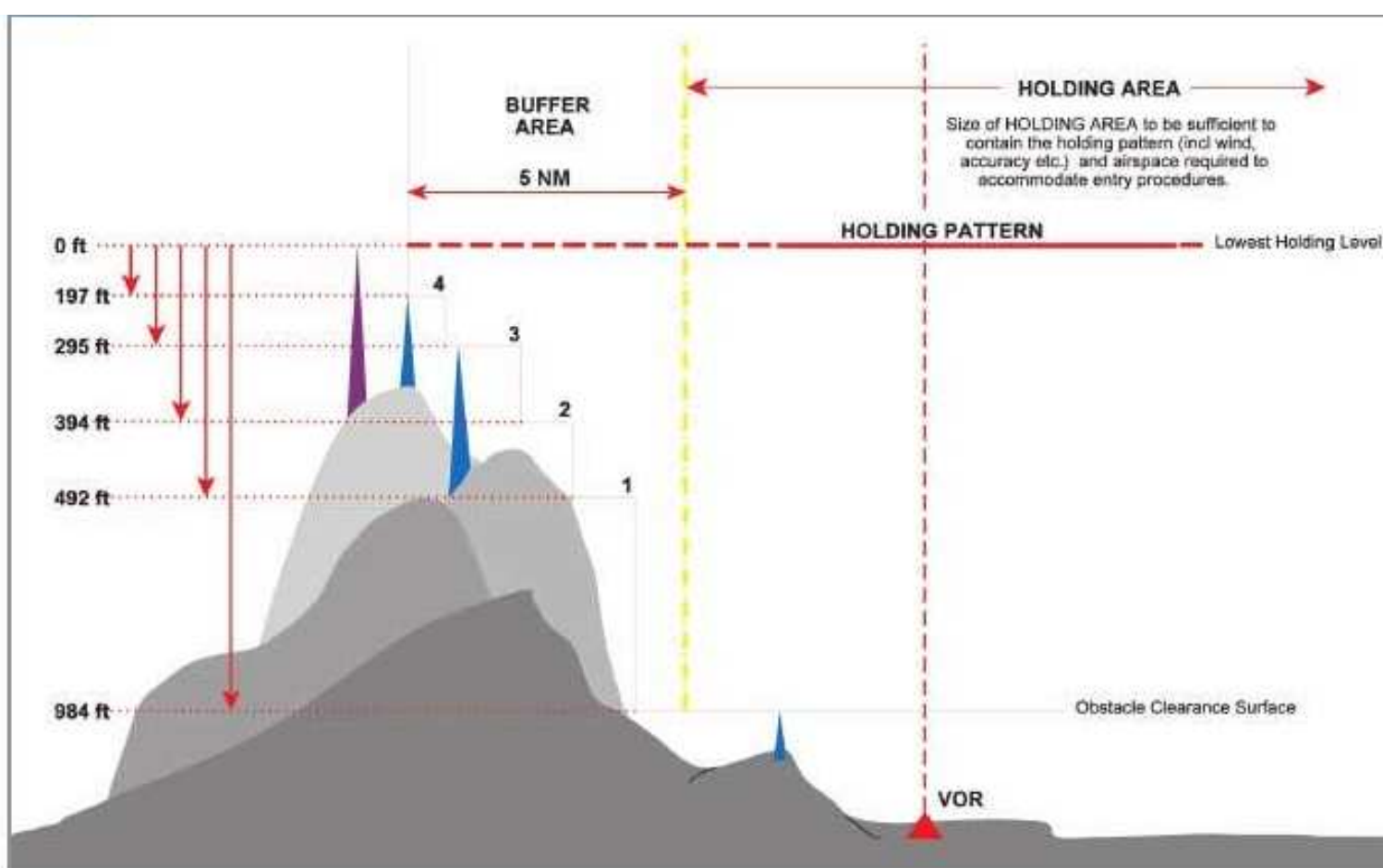


Figure 10.8

Questions

1. A procedure to alter level in a holding pattern is known as:
 - a. shuttle.
 - b. procedure turn.
 - c. base turn.
 - d. racetrack.
2. Unless otherwise published or informed by ATC, after entering a holding pattern all turns are made:
 - a. to the left.
 - b. to the left then right.
 - c. to the right.
 - d. procedure turn right then left.
3. In a holding pattern turns are to be made at a:
 - a. rate of turn = 3° /sec.
 - b. rate of turn = 3° /sec or 20° bank angle whichever is less.
 - c. rate of turn = 3° /sec or 25° bank angle whichever is less.
 - d. 25° bank angle.
4. What is the longest time you can fly the 30° offset leg of a joining procedure?
 - a. $1\frac{1}{2}$ minutes.
 - b. $2\frac{1}{2}$ minutes.
 - c. 3 minutes.
 - d. 30 seconds.
5. You are cleared to join a hold at 6000 ft. At what distance prior to reaching the holding fix must you be established at 6000 ft?
 - a. 5 minutes flying time
 - b. 5 NM
 - c. 10 minutes flying time
 - d. 10 NM

Answers

1	2	3	4	5
a	c	c	a	b

Chapter
11
Altimeter Setting Procedure

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Altimeter Setting Procedures

Basic Concepts

11.1 Introduction. In order to ensure separation and to make sure that when flying an instrument procedure the aircraft is actually at or above the procedure design minimum altitude, it is essential that the aircraft altimeter subscale is correctly set to the appropriate reference pressure. History is littered with accidents caused by incorrect altimeter setting and despite the best intentions of the Air Traffic Controllers, the basic responsibility remains with the pilot to ensure that whatever he/she does with an aircraft, it must be safe.

11.2 Terrain Avoidance. During instrument departure or arrival procedures the aircraft must be flown according to the published flight profile. Until the aircraft is at or above a 'safe in all cases' altitude, the altimeter must be referenced to mean sea level so that the pilot knows exactly how high the aircraft is. All obstacles shown on approach and departure plates are referenced to sea level and likewise, all altitudes required by the procedures are also referenced to sea level. As sea level pressure (QNH) varies geographically and the terrain avoidance problem is geographic in nature, the reference setting must be a local QNH.

11.3 Lowest Useable Flight Level. This is the flight level that corresponds to or is immediately above the established minimum flight altitude.

11.4 ATC Separation. Once above the 'safe in all cases' altitude, the problem ceases to be terrain avoidance and becomes avoidance of other air traffic. In this case it essential that all aircraft have at least one altimeter referenced to the same subscale setting so that a standard separation can be applied regardless of the sea level pressure. According to ICAO ISA the average barometric pressure is 1013.25 hPa and this (when rounded down to 1013 hPa) is defined as the Standard Pressure Setting (SPS).

Altimeter Setting Objectives

11.5 Objectives. The two main objectives of altimeter setting procedures are to:

- Provide adequate terrain clearance during all phases of flight especially departure and arrival.
- Provide adequate vertical separation between aircraft

11.6 Altimeter Subscale Settings. There are three altimeter subscale settings that can be applied at any aerodrome. These are:

11.7 QNH. This is the observed barometric pressure at an aerodrome adjusted in accordance with the ISA pressure lapse rate to indicate the pressure that would be observed if the observation was carried out at sea level. If QNH is set on the altimeter subscale, the altimeter would read aerodrome elevation at touchdown.

11.8 QFE. This is the observed barometric pressure at an aerodrome which, if set on the altimeter subscale, would result in the altimeter reading zero at touchdown.

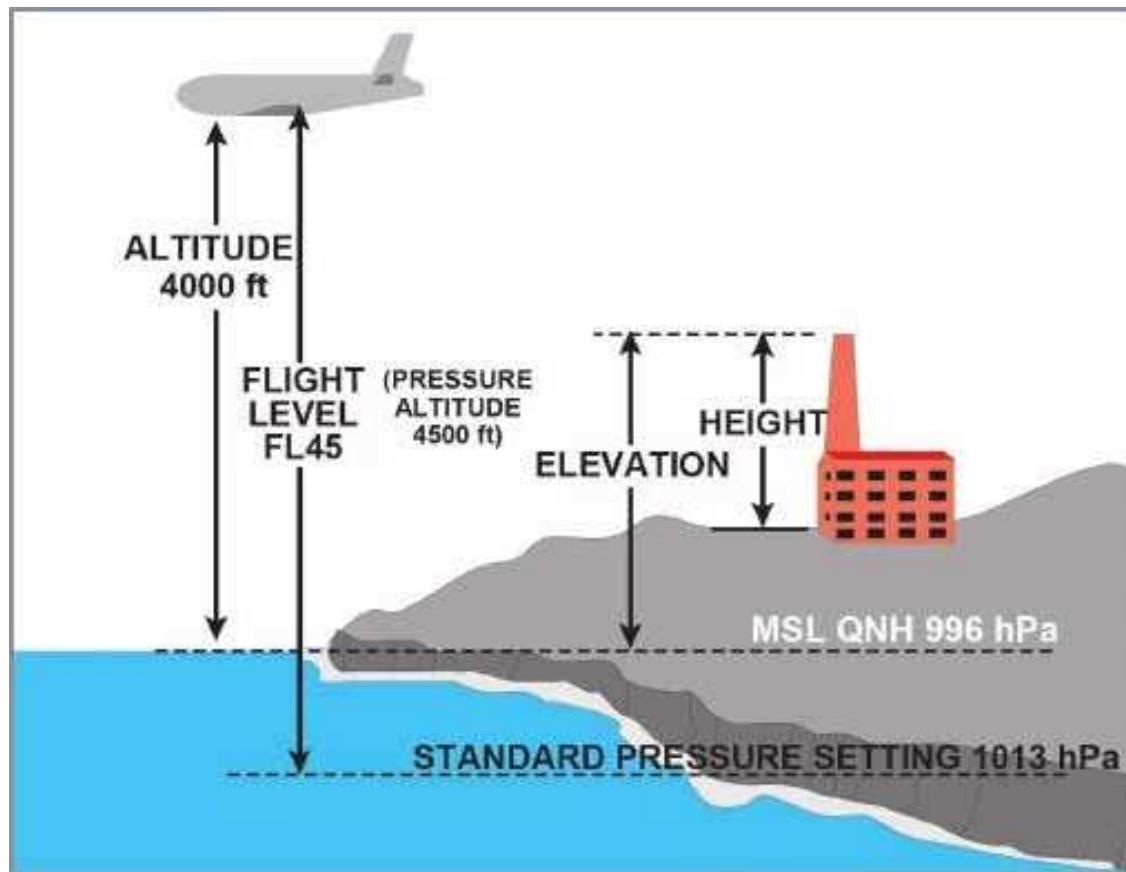


Figure 11.1

11.9 QNE. A situation can occur where the QNH is below the lowest altimeter subscale setting. For instance, if the altimeter subscale will not read below 940 hPa and the QNH is 935 hPa it would appear that the altimeter is useless. If, however, the altimeter subscale is set to a standard setting (e.g. 1013 hPa) then it would be possible to calculate what the altimeter would read at touchdown where the QNH is 930 hPa and the altimeter subscale is set to 1013 hPa using the ICAO ISA. Assume that the aerodrome elevation is 100 ft AMSL. On touchdown the altimeter will read:

$$1013 - 930 = 83 \text{ (amount of pressure wound on)}$$

$$83 \times 27 \text{ ft (ISA interval)} = 2241 \text{ ft} + 100 \text{ ft} = 2341 \text{ ft.}$$

In this case, 2341 ft is the QNE. A pilot would be instructed by the ATCO:

"G-CD set 1013 land with QNE 2340"

There is a popular misconception amongst pilots that QNE is 1013 hPa. When used as a reference as opposed to a QNH, 1013 hPa is defined as the standard pressure setting (SPS). Therefore QNE is what the altimeter will read at touchdown with SPS set.

Transition

11.10 Definition. After take-off, the altimeter setting will be changed from QNH to SPS at some point. Likewise in the descent to land, the altimeter will be set to QNH from SPS at some point. The process that allows this to be done safely and at a logical point is called transition. This requires the altitude (or FL) at which this is done to be specified. The altitude above the aerodrome for change from QNH to SPS is called the **transition altitude**, and from SPS to QNH is the **transition level**. When flying below the transition altitude, the aircraft is flown at altitudes determined with reference to sea level pressure (QNH) and the vertical position is expressed in terms of altitude. Above the transition altitude, the vertical position is expressed in terms of flight levels. During a climb upon reaching the transition altitude, SPS is set and the climb continued to the desired flight level. In the descent, upon reaching the transition level, the QNH is then set and descent continued to the desired altitude. An exception to the above is when, on descent, the pilot is passed the QNH whilst still above the transition level in which case the pilot would refer to vertical position as an altitude.

11.11 Flight Levels. A flight level (FL) is defined as the vertical displacement of the aircraft above a constant level of barometric pressure related to 1013 hPa. Flight Level Zero (FL0) is located at the atmospheric pressure level of 1013 hPa. Subsequent flight levels are separated by a pressure interval corresponding to 500 ft in standard atmosphere. Flight levels are numbered as follows:

FL30; FL35; FL40; FL45 etc.... and FL100; FL105; FL110 etc....

11.12 Transition Altitude. This is the altitude (with QNH set) above the aerodrome at which the altimeter subscale is reset to SPS and vertical position above that is then reported as a flight level. The transition altitude is specified for every aerodrome by the Authority of the State in which the aerodrome is located. The transition altitude shall be as low as possible but normally not less than 3000 ft. Transition altitudes are published in the AIP and shown on charts and instrument plates. A state may specify a general transition altitude (as in the USA, 18 000 ft).

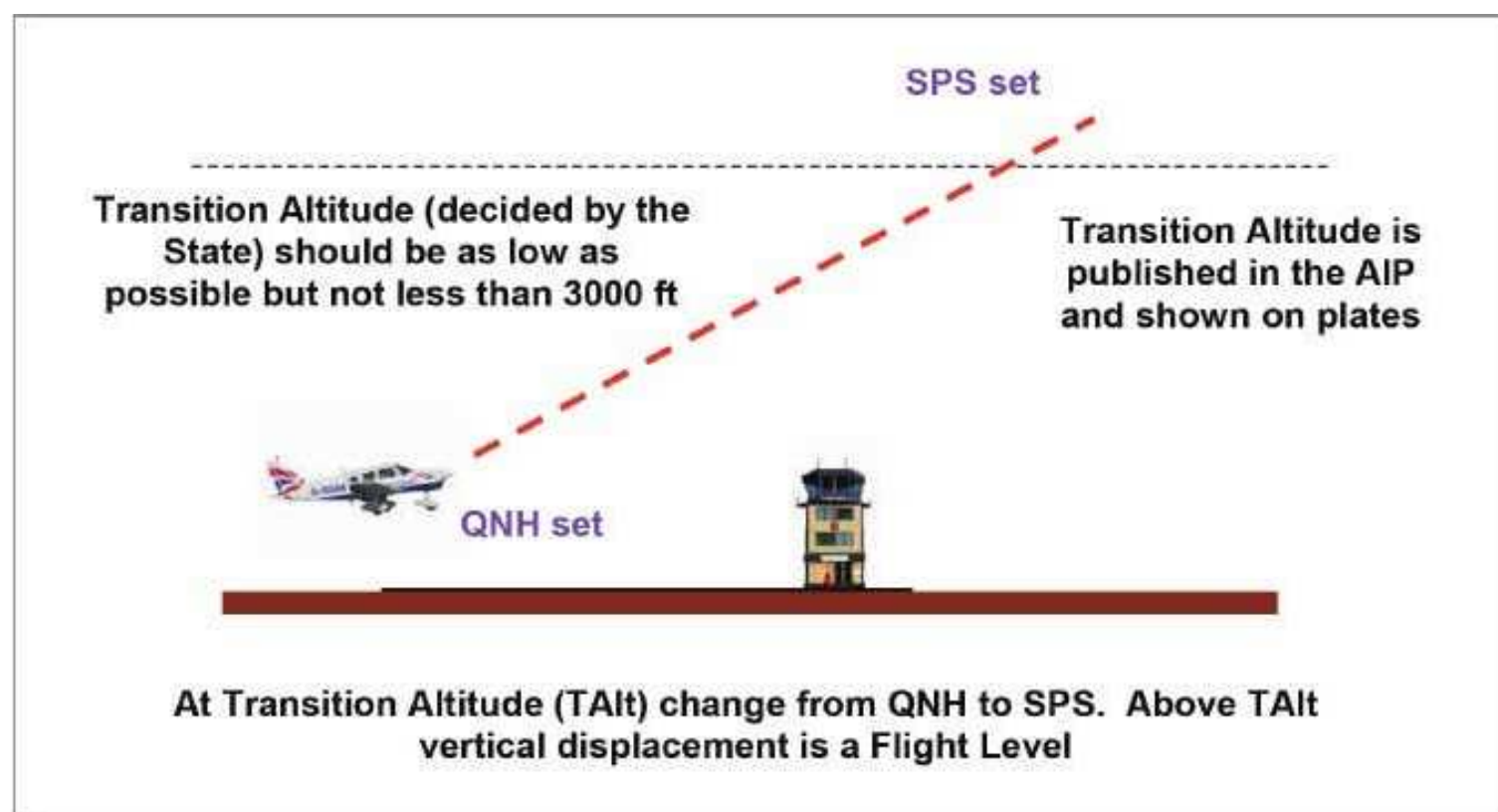


Figure 11.2 Transition altitude

11.13 Transition Level. The transition level is the flight level at which the altimeter is reset to the aerodrome QNH and subsequent flight is reported with reference to altitude. The transition level changes with the QNH. It is calculated by the Approach Controller at regular intervals and also when QNH changes. It is defined as the first available flight level above the transition altitude. This will be a 'rounding up' from what the altimeter is reading at the transition level with SPS set. Calculation of transition level is not required by the learning objectives.

The flight crew shall be provided with the transition level :

- prior to reaching the level during the descent
- in the approach clearance
- when requested by the pilot

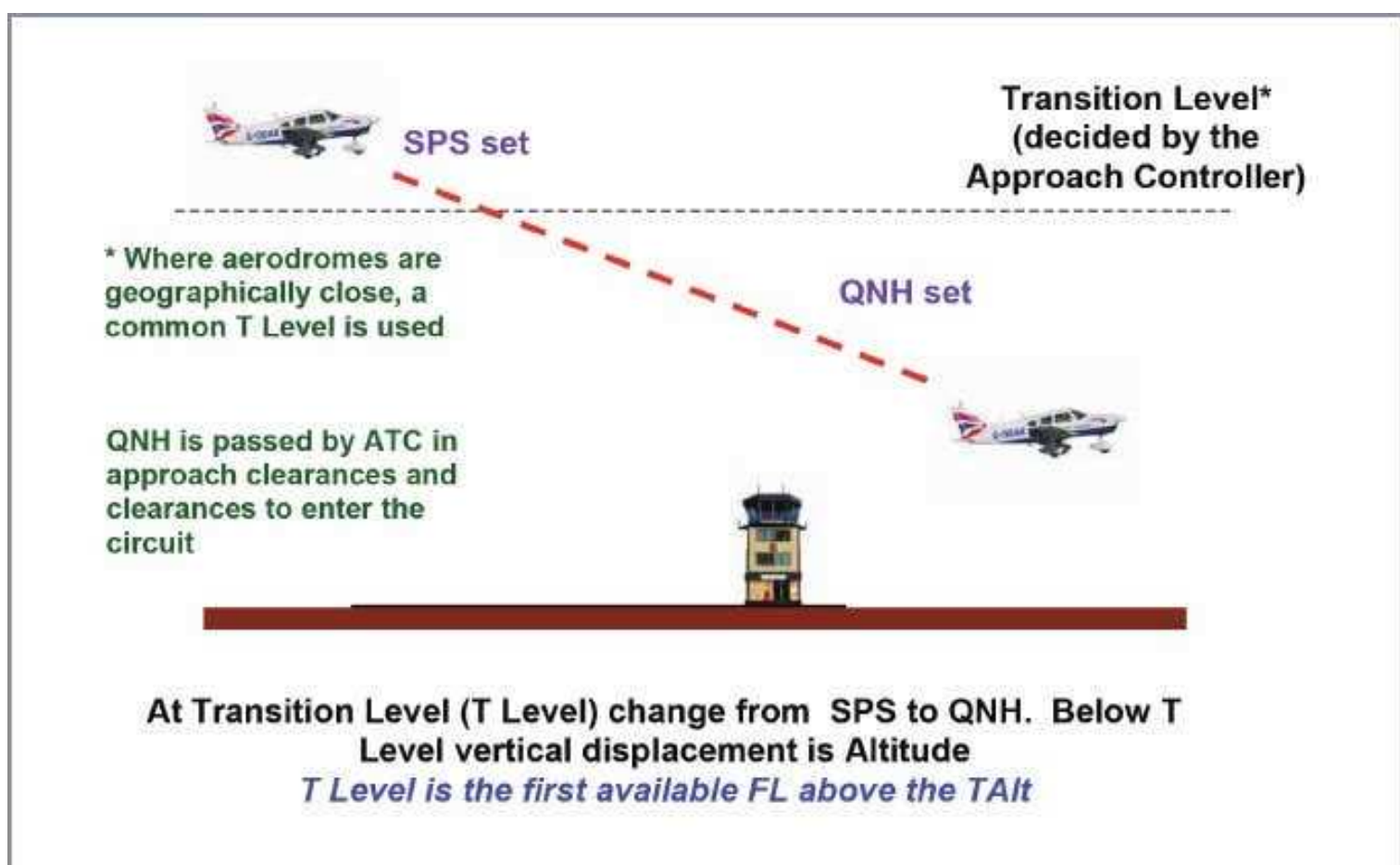


Figure 11.3 Transition level

11.14 Transition Layer. This is the airspace between the transition altitude with SPS set and the transition level. It is usually insignificant but some states require a minimum depth to the transition layer. When ascending through the transition layer (with SPS set) vertical position is reported as a flight level and when descending through the layer with QNH set, as an altitude.

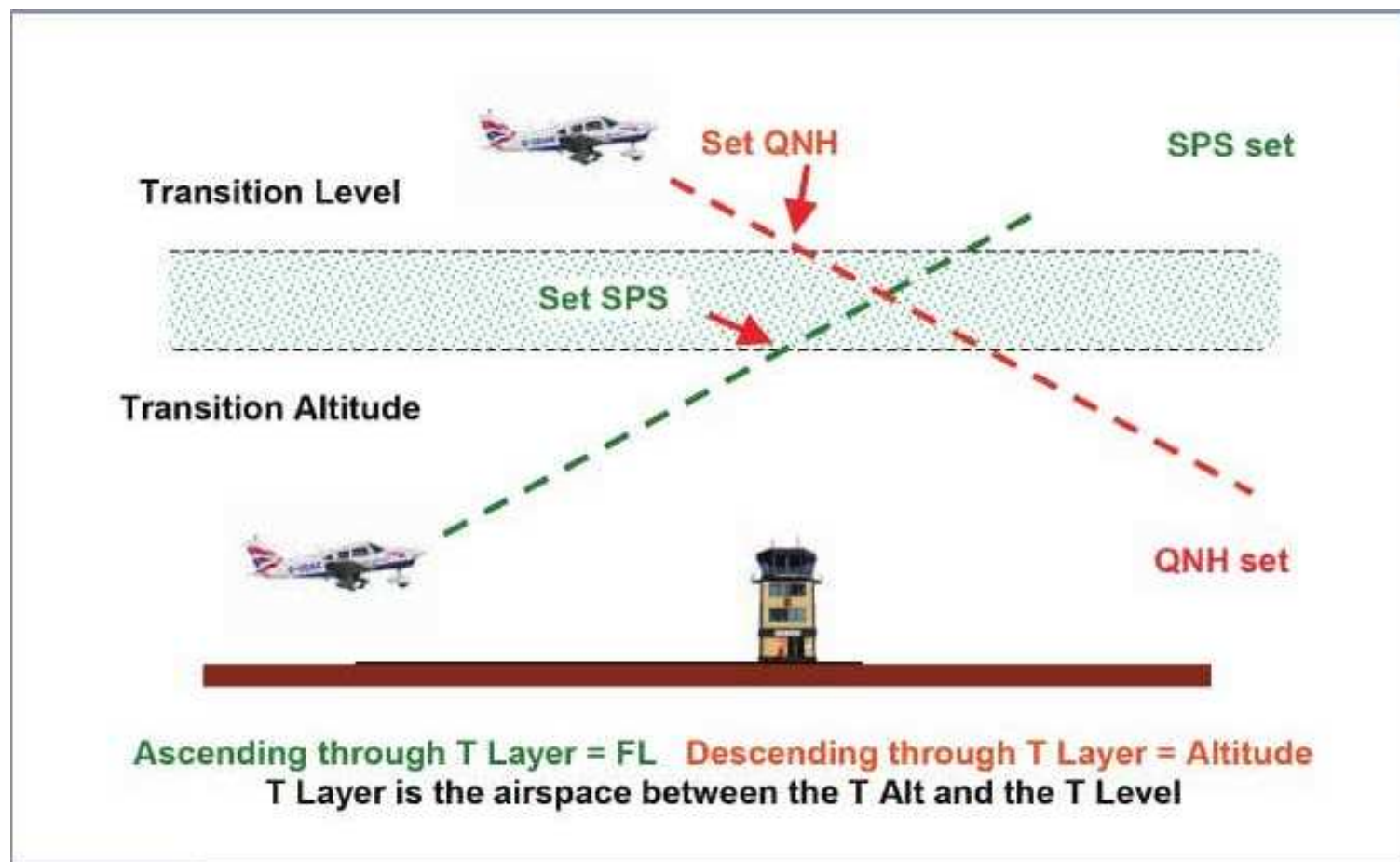


Figure 11.4 Transition layer

Phases of Flight

11.15 What Should be Set? The QNH should be passed to an aircraft in the taxi clearance prior to take-off. When flying en route below the transition altitude, the vertical position of the aircraft is reported as altitude (QNH set). When outside of the 'vicinity' of the departure aerodrome, QNH from another (closer) aerodrome will be required and set. In the UK we have a system of regional pressure settings (RPS) which cover this case without reference to en route aerodrome QNH. In the USA when flying cross-country, the pilot will need to contact ATC at 'local' aerodromes and update the altimeter setting regularly. This will allow determination of terrain clearance with an acceptable degree of accuracy. When en route and above the transition altitude, the aircraft level is reported as a flight level. When approaching an aerodrome to land, the QNH will be passed to aircraft in clearances to enter the traffic circuit. Normally, vertical position is reported as a flight level until reaching the transition level in the descent, however, after an approach clearance has been issued, reference should then be made in terms of altitude with the QNH set. This is intended to apply primarily to turbine aircraft for which an uninterrupted descent from high altitude is desirable.

11.16 Use of QFE. If a pilot decides to remain in the aerodrome traffic circuit (the visual circuit) throughout the flight, then the altimeter may be set to QFE.

11.17 Pilot/Operator Procedures. Pilots and operators are required to plan the route and, complying with the rules of a state and the general flight rules, are to select an appropriate IFR or VFR flight level for the flight. In selecting flight levels for a flight, those selected:

- Should ensure adequate terrain clearance at all points along the route;
- Should satisfy ATC requirements
and
- Should be compatible with the table of cruising levels in Chap. 6

The serviceability and accuracy of the altimeter should be confirmed prior to the commencement of a flight. With knowledge of the aerodrome elevation in the case of QNH, the altimeter should be set to either QNH or QFE. The instrument should then be vibrated (avoiding tapping the glass) to ensure that the instrument has reacted to the mechanical adjustment of setting the subscale. A serviceable altimeter will indicate:

- The height of the altimeter above the reference point (QFE)
or
- The elevation of the position of the aeroplane plus the height of the altimeter above the ground (QNH);

11.18 Altimeter Accuracy. Altimeters are to be checked for correct operation within the following tolerances:

- Plus or minus 60 ft (20 m) for a test range between 0 - 30 000 ft
or
- Plus or minus 80 ft (28 m) for a test range between 0 - 50 000 ft

11.19 Approach and Landing. Before commencing an approach to an aerodrome, the pilot is to obtain the transition level. Before descending below the transition level, the latest QNH for the aerodrome is to be obtained. (This does not preclude a pilot using QFE for terrain clearance purposes during the final approach to a runway.) ATC may clear an aircraft to be operated using QNH when above the transition level if so required for the purpose of descent in accordance with a prescribed procedure (i.e. not for level flight). When an aircraft which has been given clearance as number one to land is using QFE to complete the approach, OCH is to be established with reference to height above the aerodrome datum for that portion of the flight. On approach plates all vertical displacement is shown as both AMSL and AGL in the following form: **2000** (1485) with the AMSL figure in bold type and the AGL figure in parenthesis. This is a standard format and is used in all publications.

11.20 Minimum Flight Altitudes. Minimum flight altitudes are determined and promulgated by the State for each ATS route and Control Area (CTA) over its territory. They are published in the national Aeronautical Information Publication (AIP).

Questions

1. **What should be the minimum transition altitude?**
 - a. 3000 ft.
 - b. 1000 ft.
 - c. 1500 ft.
 - d. 2000 ft.
2. **Determination of the Transition Level is the responsibility of:**
 - a. the Authority of the State.
 - b. the ATC Authority.
 - c. Approach Control office or the aerodrome Control Tower.
 - d. Area Control.
3. **What is the transition level?**
 - a. The first available flight level above the transition altitude.
 - b. The highest flight level available below the transition altitude.
 - c. The top of the ATZ.
 - d. The level at which 1013 is set.
4. **When during the approach should the reported aerodrome altimeter setting be set?**
 - a. When passing 3000 ft AMSL or 1000 ft AGL.
 - b. When passing the transition level.
 - c. When passing the transition altitude.
 - d. Within the transition layer.
5. **The vertical position of an aircraft at or below the transition altitude will be reported as:**
 - a. flight level.
 - b. whatever the pilot chooses.
 - c. altitude.
 - d. height.
6. **In the vicinity of an aerodrome that is going to be used by the aircraft, the vertical position of the aircraft shall be expressed as:**
 - a. flight level at or below the transition level.
 - b. flight level at or below the transition altitude.
 - c. altitude above sea level at or below the transition altitude.
 - d. altitude above sea level at or above the transition altitude.
7. **The pilot of a departing aircraft flying under IFR shall change the altimeter setting from QNH to SPS when passing:**
 - a. transition level.
 - b. when specified by ATC.
 - c. transition altitude.
 - d. transition layer.

Chapter
14
Airspace

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Introduction

14.1 Division of Airspace. All the airspace within a state must be contained within one or more Flight Information Regions (FIR). This is the basic unit of airspace within which the most basic form of Air Traffic Service, a Flight Information Service, is available. The alerting service is also available in an FIR. It is usual to give each FIR a name i.e. the London FIR, which geographically identifies the location of the FIR and its associated Area Control Centre (ACC) within which the Flight Information Centre is located. Where a State strictly enforces its sovereignty, the boundaries of that State's FIR(s) usually coincide with the national borders of the state. It is not unusual (in Europe, for instance) for FIR boundaries to be 'convenient' (i.e. following Lat/Long or median lines) rather than to follow often convoluted national borders. As well as FIRs, the airspace of a state will be divided into Control Areas (CTAs) and Control Zones (CTRs) and may include restricted, prohibited and danger areas. CTAs can exist in the form of corridors linking other CTAs; these are known as airways. The airspace in the vicinity of an aerodrome is known as an Aerodrome Traffic Zone (ATZ).



Figure 14.1

14.2 Upper Information Regions (UIRs). Where a state applies a division of airspace vertically, the upper portion of the airspace is defined as an Upper Information Region UIR. Such a division facilitates the application of different rules and separation standards to those of the underlying airspace. The basic assumption is that traffic using the UIR will be essentially in transit en route, whereas lower traffic will be arriving or departing and therefore manoeuvring. In Europe the division between the FIR and UIR is at FL195 whereas in the USA it is at FL180. The lower boundary of a UIR will always be a VFR FL.

14.3 Open FIR. Airspace within an FIR that is not defined as a CTA, CTR or other 'restricted' airspace is known as the open FIR. Within the open FIR the only air traffic services offered are a Flight Information Service and the Alerting Service.

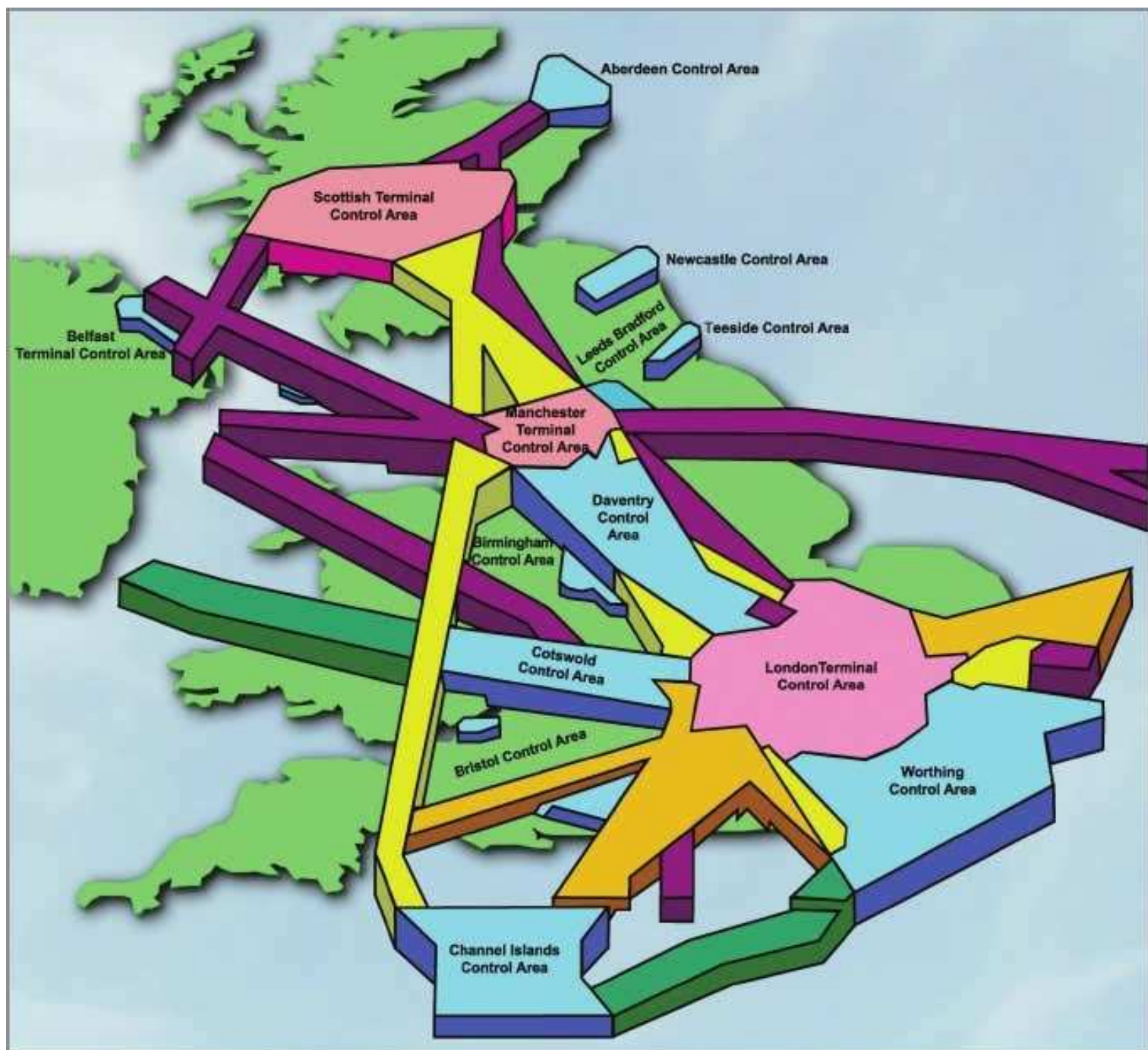


Figure 14.2

14.4 Oceanic Control Areas (OCAs). Over large areas of the world's Oceans e.g. the North Atlantic, traffic control has special problems (i.e. relatively poor navigation and of necessity HF communications requiring the use of radio operators). To solve the problems, or at least to make them manageable, the airspace above FL55 over the Oceans is designated as OCAs where strict rules are enforced and special navigation procedures are applied.

14.5 Prohibited, Restricted and Danger Areas. All Prohibited, Restricted and Danger Areas within a state are contained in the FIR(s) of that state and subject to notification of activity and change in status by NOTAM (see definition). Each area will be assigned an individual designator consisting of the country identifier, the letter P, R or D followed by a number in the range 001 - 999. For example in the UK a danger off the north coast of Cornwall is designated EG D001. EG is the ICAO identifier for the UK; D means a danger area and 001 is the unique number for that area.

Control Areas and Zones

14.6 CTAs and CTRs. Air Traffic Control is only provided inside what is known as controlled airspace (CAS). It is generally accepted that the upper limit of CAS is defined as FL660. CAS comprises CTAs and CTRs. The primary function of CTAs/CTR is to facilitate ATC to IFR traffic.

14.7 CTAs. A CTA is airspace within which ATC is provided to controlled flights (see definition) which are 'en route' (i.e. not in the departure or approach phases of a flight). The service provided in a CTA is Area Control and is discussed in detail in Chapter 17. CTAs are usually established in the vicinity of major aerodromes and at the confluence of airways. As already mentioned, the linking corridors of airspace (airways) are also CTAs. CTAs are defined to exist from a level above ground level (AGL) to an altitude or FL. Where the limit of a CTA is defined as a FL, it will be a VFR FL. The lowest level of a CTA must be at least 200 m (700 ft) AGL. The airspace within a CTA may be sub-divided to allow different types of operation to exist. The upper portion of a CTA will be predominantly for traffic that is in transit whilst the lower levels will be dedicated to aircraft entering the 'manoeuvring' airspace from above or leaving it. The lower part of the CTA will be used to route aircraft arriving to the individual IAFs for instrument approaches, and to separate departing aircraft from one aerodrome from arriving traffic to another.

14.8 CTRs. CTRs are established in the vicinity of aerodromes to provide ATC to arriving and departing controlled traffic. Within a CTR the ATC service is provided by Approach controllers and is mandatory. A CTR may serve more than one aerodrome. Because a CTR is a zone, the base of any zone is defined as ground level or MSL. Where the upper limit is defined as a FL it would always be a VFR FL. A CTR should be big enough to encompass the airspace required to provide the service and will usually extend at least 5 NM from the aerodrome reference position in the direction from which approaches are made. If established within the lateral limits of a CTA, the CTR must extend upwards to the lower limit of the CTA.

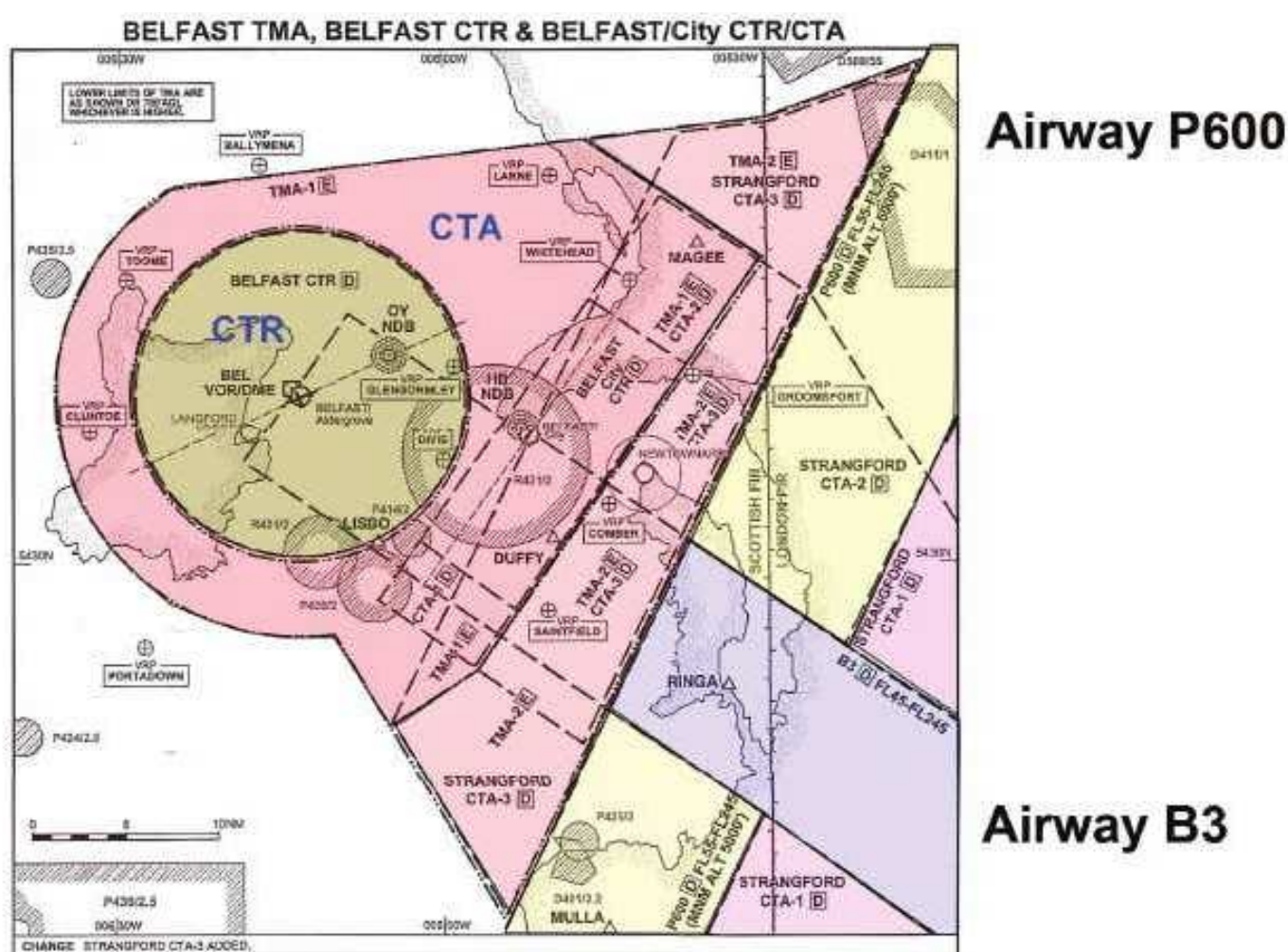


Figure 14.3

14.9 Upper Control Areas. Where a CTA extends above FL195, the rules applicable may be those pertaining to the lower airspace.

14.10 Control Units. The provision of ATC to flights in CAS is the responsibility of the air traffic control units (ATCUs) within the designated airspace. Area Control Centres provide ATC within CTAs and Approach Control Units and Aerodrome Control Towers provide the service required in CTRs.

Classes of Airspace

14.11 Introduction. In 1980, ICAO introduced a uniform system of classification of airspace to replace the disparate systems of airspace reservations throughout the world. The ICAO system classifies airspace in 7 categories from A to G each class dependent upon the rules applicable, the ATC service provided, separation standards applicable and the utilization of the airspace.

14.12 Controlled Airspace (CAS). Classes A - E are classified as controlled airspace within which air traffic control is provided to controlled flights. In these classes, IFR flights are always controlled flights. In classes A and B all permitted flights are controlled whereas in classes C and D, ATC is provided to VFR traffic only when conflicting with IFR traffic. CAS is defined as CTAs (including airways) and CTRs. ICAO states that class E airspace cannot be used as a CTR.

14.13 Advisory Airspace. Class F airspace is defined as advisory airspace in which advisory ATC is provided to IFR traffic which requests the service (participating traffic). All IFR traffic flying in class F airspace is required to file a FP but no ATC clearance will be issued. The service is limited to the provision of advice and information and only participating flights are separated. Class F airspace is considered to be temporary, established during a trial period whilst it is determined if a full ATC service is applicable.

14.14 SVFR. All classes of airspace which support the establishment of a CTR permit flight under SVFR. SVFR is covered in detail in chapter 6 - Rules of the Air.

14.15 Non-radio. Classes E - G permit VFR traffic to fly without VHF 2-way RTF communications. In areas where the ATC authority consider that the provision of the alerting service is essential (over remote areas or over expansive areas of sea), routes may be established along which (at the appropriate altitude) 2-way RTF communications will be available and traffic will be advised to maintain radio contact with an air traffic services unit.

14.16 Speed Limit. A speed limit of 250 kt IAS is applied to VFR traffic in class C and all traffic in classes D - G. The limit is applicable to traffic flying below 10 000 ft (FL100) only.

14.17 Flight Information Service (FIS). In classes C - G, a Flight Information Service is available to aircraft that either request the service, or are otherwise known to ATC. This service provides collision alerts but leaves it to the pilot to take the necessary (as per the rules of the air) avoiding action. Information considered necessary relating to collision avoidance is known as traffic information. In classes A and B airspace, FIS is available but is of a lesser priority to the provision of ATC. Where the provision of traffic information is considered to be of the same priority as ATC, the traffic concerned is known as 'essential traffic,' and the information relating to such traffic is called 'essential traffic information.'

14.18 Airspace Summary. The table below summarizes the requirements and restrictions of the 7 classes of airspace.

CLASSES OF AIRSPACE

Class	Rules	Service	Clearance	Separation	FIS	Speed Limit (NOTE 1)	Radio Watch	CTR SVFR	Use
A	IFR	ATC	YES	ALL		NO	YES	YES	CTA: CTR AIRWAYS: ROUTES
	IFR VFR	ATC	YES	ALL		NO	YES	YES	CTA: CTR AIRWAYS: ROUTES
C	IFR	ATC	YES	IFR-IFR		NO	YES	YES	CTA: CTR (AIRWAYS) (NOTE 5)
	VFR	ATC		IFR-VFR		YES			
		FIS		VFR-IFR	VFR-VFR				
D	IFR	ATC	YES	IFR-IFR		YES	YES	YES	CTA: CTR (AIRWAYS) (NOTE 5)
	VFR	ATC		IFR-VFR					
		(NOTE 4)			VFR-IFR				
E	IFR	ATC	YES	IFR-IFR		YES	YES	NO (NOTE 2)	CTA: (AIRWAYS) (NOTE 5)
	VFR	FIS			NO				
F	IFR	ADV ATC	NO	IFR-IFR (NOTE 3)	ALL	YES	YES	NO	ADVISORY ROUTES
	IFR	FIS					YES		
	VFR						NO		
G	IFR	FIS	NO	NONE	ALL	YES	YES	NO	OPEN FIR; FIS ROUTES
	VFR						NO		

- Note 1: General Speed Limit is 250 kts IAS enforced below FL100 (10 000ft)
- Note 2: Separation as far as is practical
- Note 3: Service to participating IFR traffic only (non participating IFR to file FP and maintain 2-way comms)
- Note 4: Radar information/advice may be provided to augment FIS in CAS
- Note 5: An airway will adopt the classification of the surrounding airspace when it passes through a CTA

Figure 14.4

Required Navigation Performance (RNP)

14.19 Definition. RNP is a numerical representation of the navigational accuracy required within ATS airspace of a State, and is prescribed on the basis of regional air navigation agreements (RANs). It is based on a 95% containment factor, implying that an aeroplane will be within the required RNP for a period of not less than 95% of the time the aircraft is within the airspace concerned. Alternatively, it can be implied that not less than 95% of the aircraft flying in a given airspace will be navigated within the stated RNP factor. The state is responsible for specifying the RNP value for its airspace.

14.20 Theory. The RNP factor relates to navigational accuracy relating to the aircraft plotted position in nautical miles. For instance, RNP4 implies that the aircraft will be within 4 NM of the plotted position for 95% of the time the aircraft is within the airspace concerned. The applicable RNP factors are: RNP1; RNP4; RNP10; RNP12.6; RNP20. All ATS airspace is classified for RNP. Where VOR/DME is used for airways or RNAV navigation, the RNP specified is RNP5. Within the classification of RNP however, RNP5 does not exist. It was envisaged that VOR/DME would cease to be used for RNAV by the year 2005 and be replaced by more accurate systems offering at least RNP4. This has proved not to be the case and VOR/DME at RNP5 will continue for the foreseeable future. The use of radar permits RNP1 whereas GPS theoretically offers a relative value of RNP0.3. The value of RNP12.6 is derived from the historical accuracy of multiple IRS used for transatlantic navigation.

14.21 Application. A good example of how RNP is used is the track spacing used for the NAT tracks in the MNP5A of the North Atlantic Oceanic regions. The airspace is classified as RNP20 therefore the aircraft flying the routes will be within 20 NM of the plotted position for not less than 95% of the flight time. This means that the airspace reserved to a NAT track must be 20 NM either side of the specified route. The additional safety 'buffer' will be equal to the RNP so the track spacing will be $20 + 20 + 20 = 60$ NM.

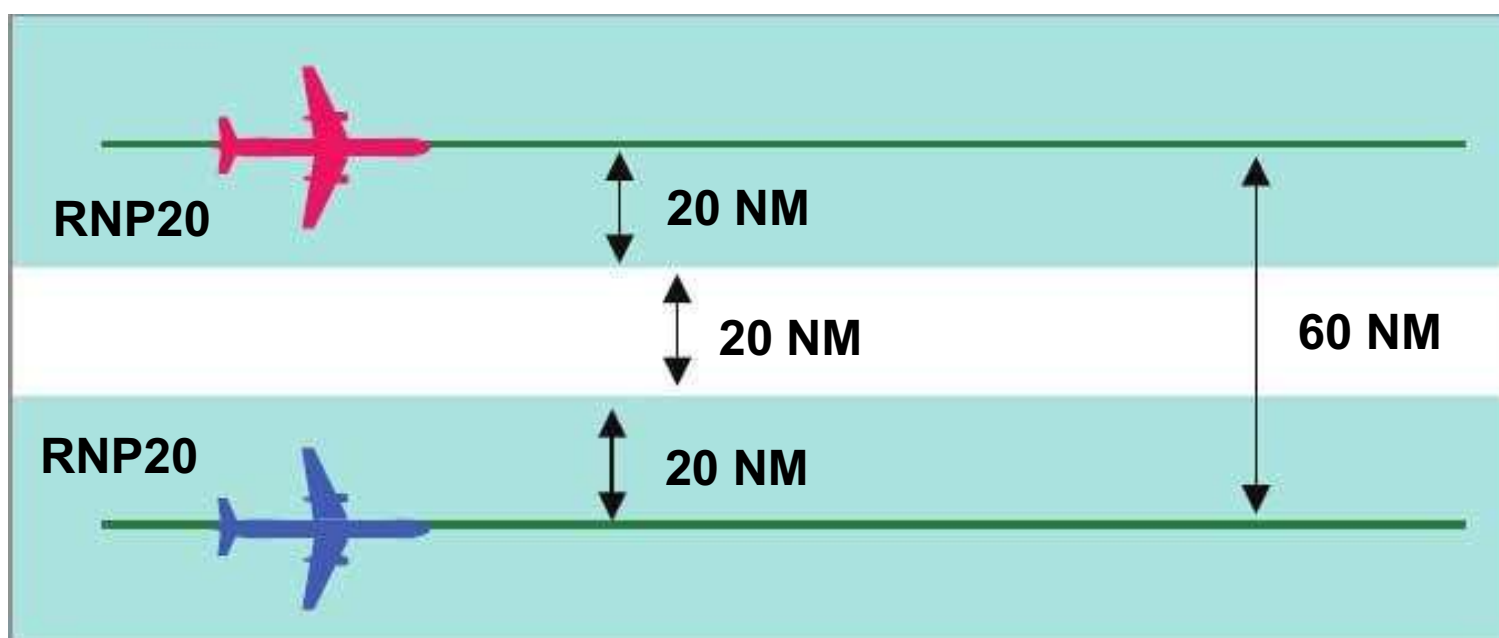


Figure 14.5

Airways and ATS Routes

14.22 Establishment. The corridors linking CTAs are called airways. These have evolved by a process of demand as has the road structure in the UK. The airways carry the en route traffic and are therefore primarily concerned with traffic in the cruise rather than manoeuvring traffic. The ATC problem is relatively simple and involves separating traffic heading in opposite

directions, and the allocation of FLs to same direction traffic. Whilst the upper limit of an airway may be defined as the lower limit of the UIR, the lower limit will be dictated by airspace restrictions, terrain avoidance considerations and the needs of other air users (e.g. the military).

Historically, airways served the purpose of linking CTAs with CAS, but in the modern environment of increasing traffic density, airways create as many problems as they solve. They create choke points, reduce flexibility, create delays, increase transit times and reduce fuel efficiency. With the use of smaller aeroplanes and many regional airports the use of airways is declining and a considerable amount of traffic (especially in the UK) now flies off-route making use of military radar facilities. Under the 'open skies' policy in Europe and the 'gate-to-gate' operations philosophy encouraged by Eurocontrol, the use of airways will continue to decline effectively making all airspace above about 6000 ft CAS.

14.23 Designation. Historically, airways are 'beacon hopping' routes (from VOR to VOR). During the 70s and 80s advances were made in area navigation (RNAV) techniques and RNAV airways using waypoints based on VOR/DME information, were established. Whilst beacon hopping routes (non-RNAV routes) still exist, nearly all the airways introduced in the latter part of the 20th century were RNAV routes. Routes are also classified as being regional (routes which exist between states in one ICAO region) or non-regional (routes which do not extend beyond the borders of a state). The options are therefore:

- Regional non RNAV routes
- Regional RNAV routes
- Non-regional non RNAV routes
- Non-regional RNAV routes

14.24 Other ATS Routes. Other ATS routes also include SIDs, STARs and low level helicopter routes. All these are given specific designators which can be referred to in ATC communications and in FPs.

14.25 Route Designators. Airways are given a 'designator' which defines the type of airway, gives it a unique number and provides additional information about the type of route. The specific route designator indicates what type of route is defined and, in addition, a unique number (1 - 999).

A prefix can be added from the following list:

- U = Upper air route
- S = Supersonic transport route
- K = Helicopter low level route

Additionally suffixes may be applied from the list:

- F = Advisory route (Class F airspace)
- G = FIS route (Class G airspace)
- Y = RNP1 route at and above FL200 where turns between 30° and 90° are to be made within the allowable RNP tolerance of a tangential arc defined by a radius of 22.5 NM.
- Z = RNP1 route at and below FL190 where turns between 30° and 90° are to be made within the allowable RNP tolerance of a tangential arc defined by a radius of 15 NM

Questions

1. **What is the speed restriction in class B airspace under FL100 (10 000 ft) in both VFR and IFR?**
 - a. 250 kt IAS.
 - b. 200 kt IAS.
 - c. 260 kt TAS.
 - d. Not applicable.
2. **In what class of airspace are all aircraft separated from one another and VFR is permitted?**
 - a. D
 - b. E
 - c. A
 - d. B
3. **What are the VMC limits for class B airspace?**
 - a. Clear of cloud and in sight of the surface.
 - b. 8 km flight visibility, 1000 ft vertically and 1500 m horizontally from cloud.
 - c. 5 km flight visibility, 1000 ft vertically and 1500 m horizontally from cloud.
 - d. The same as class D.
4. **A control zone extends laterally from the centre of an aerodrome or aerodromes in the direction of approaching aircraft for at least:**
 - a. 7 NM.
 - b. 5 NM.
 - c. 15 NM.
 - d. 20 NM.
5. **What is the speed limit below 10 000 ft in Class E airspace?**
 - a. 250 kt TAS.
 - b. 250 kt IAS.
 - c. Not applicable.
 - d. 200 kt IAS.
6. **FIS is provided to aircraft concerning collision hazards in the following classes of airspace:**
 - a. C, D, E, F and G.
 - b. F and G only.
 - c. F.
 - d. A, B, C, D, E, F and G.
7. **For VFR flight in class E airspace:**
 - a. ATC clearance and two way radio are required.
 - b. two-way radio not required.
 - c. ATC clearance and/or two way radio are required.
 - d. ATC clearance is required.

8. **Danger, Prohibited and Restricted areas must be designated by:**
- country identifier, followed by P/D/R, followed by a number.
 - country identifier followed by P/D/R.
 - P/D/R followed by the identifier.
 - country identifier followed by numbers.
9. **In which class or classes of airspace would VFR traffic be separated from other VFR traffic?**
- B
 - B; C; D; E
 - B; C
 - B; C; D
10. **What is the primary function of a CTR and a CTA?**
- The controlling of all traffic close to an aerodrome.
 - The controlling of all traffic in Class F airspace.
 - The controlling of all traffic in Class F & G airspace.
 - The controlling of IFR traffic.
11. **What is the speed limit for VFR traffic in class C airspace below 10000 ft?**
- not applicable.
 - 250 kt TAS.
 - 250 kt IAS.
 - 270 kt IAS.
12. **What type of airspace extends from the surface to a specified upper limit?**
- Control area.
 - Air Traffic Zone.
 - Control zone.
 - TMA.
13. **What class of airspace can you get an advisory service for IFR traffic and an FIS for VFR traffic?**
- A
 - D
 - C
 - F
14. **The lowest height of the base of a CTA above ground or water is:**
- 300 m.
 - 150 m.
 - 200 m.
 - 500 m.
15. **In which class or classes of airspace is IFR separated from IFR and all other traffic gets FIS?**
- A
 - B
 - D
 - D and E.

Answers

1	2	3	4	5	6	7	8	9	10	11	12
d	d	d	b	b	a	b	a	a	d	c	c

13	14	15	16	17	18	19	20	21	22	23	24
d	c	d	b	d	a	a	a	c	d	b	a

25	26	27	28	29	30	31	32	33	34	35	36
c	d	a	c	b	d	a	a	c	d	b	c

37
a

Chapter
15
Air Traffic Services

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Introduction

15.1 The Air Traffic Services (ATS). Annex 11 to the Chicago Convention lays down the SARPs for the establishment of an Air Traffic Control services in each of the contracting states. Each state is required to establish an authoritative body responsible for setting up and regulating the operation of the ATS of the state. In the UK the body responsible is the UK CAA and the operating organization is National Air Traffic Services (NATS).

15.2 Document 4444. Because the SARPs of Annex 11 are (by necessity) insufficiently detailed, PANS ATM (Air Traffic Management) (Document 4444) is published by ICAO as the definitive reference for the establishment and management of an ATS. PANS ATM is mainly directed to ATS personnel; however, flight crews should be familiar with the content of the sections relating to ATM; ATS and separation; ADS and CPDLC; ATIRs and RPL.

15.3 Objectives. The objectives of an ATS are to:

- Prevent collisions between aircraft;
- Prevent collisions between aircraft on the manoeuvring area and obstructions thereon;
- Expedite and maintain an orderly flow of air traffic;
- Provide advice and information useful for the safe and efficient conduct of flights;
- Notify appropriate organizations regarding aircraft in need of SAR aid, and assist such organizations as required.

15.4 ATS Divisions. ATS comprises three divisions:

- Air Traffic Control Service
- Flight Information Service
- Alerting Service

15.5 ATC Service. The ATC Service is divided into three sub-divisions:

- **Area Control Service.** The provision of ATC for controlled flights within CTAs and en route in FIRs and UIRs.
- **Approach Control Service.** The provision of ATC for controlled flights associated with arrival and departure. Usually provided within CTRs.
- **Aerodrome Control Service.** The provision of ATC to aerodrome traffic at controlled aerodromes.

15.6 The Need for ATS. An ATS is set up in consideration of the following:

- The types of traffic involved
- The density of traffic
- The meteorological conditions
- Other relevant factors (e.g. mountainous terrain, extensive sea areas, limited navigational facilities etc...)

15.7 ACAS. The carriage of ACAS by aircraft in a given area will not be taken into consideration when determining the level of service required to be established.

Air Traffic Control

15.8 Applicability. Air Traffic Control (ATC) is the service provided to controlled flights inside controlled airspace or to aerodrome traffic at controlled aerodromes. ATC is always provided to IFR traffic inside CAS whereas ATC is only provided to VFR flights in classes B, C and D. Additionally, all SVFR flights are provided with ATC.

15.9 ATS Units. ATS units comprise Air Traffic Control Units (ATCUs) and Flight Information Centres (FICs). The ATS unit providing ATC are ATCUs and those providing flight information are FICs. The ATCU providing area control (ATC to en route traffic) is known as an Area Control Centre (ACC). It is usual to prefix the unit with a geographical name e.g. London ACC. Within a CTR the unit providing approach control is the approach control office usually located in a control tower at an aerodrome. Combined approach control offices exist where approach control for multiple aerodromes/CTRs is provided e.g. London Terminal Control Centre (LTCC) which provides approach control for Heathrow, Gatwick, Stansted, Luton, London City, Biggin Hill and Northolt. Aerodrome Control is provided by an aerodrome control tower. Within an FIR, the provision of FIS and the Alerting service may be from the same ATSU.

15.10 Ground Control. The ground movement of aircraft and vehicles is the responsibility of the aerodrome controller. However, the provision of services to aircraft moving on the manoeuvring area of an aerodrome and on the apron may be delegated to a ground movements controller usually to limit the aerodrome RTF to flight safety messages concerning the take-off and landing of aircraft. At major aerodromes, the movement of aeroplanes and vehicular traffic on the apron may be delegated to an Apron Management Service. In this case, ATC would commence once the aircraft moves onto the taxi-way and will cease when the pilot takes instructions from a marshaller.

15.11 Time in ATC. ATC units throughout the world are required to report time in hours, minutes and seconds with time referenced to co-ordinated universal time (UTC). This uses the 24 hour clock. UTC has been previously known as 'Zulu' time or Greenwich Mean Time. 1200UTC would be the time at which the sun is directly overhead the Greenwich meridian (0°E/W). The use of one standard time reference (rather than local time) makes the handling of flight plans simple and facilitates co-ordination of ATC clearances.

15.12 Time Accuracy. ATSU clocks and timing devices are to be checked to ensure that the times indicated are within +/- 30 seconds of UTC at all times. Time checks round up or down to the nearest minute.

ATC Clearances

15.13 Definition. An ATC clearance is authorization for an aircraft to proceed under conditions specified by an ATCU.

15.14 Purpose. Clearances are issued solely for expediting and separating air traffic and are based on known traffic conditions. This includes traffic moving on the ground at an airport as well as airborne traffic. If a clearance given to a pilot is unsuitable (or impossible to comply with), an alternative clearance may be requested. If possible, such a clearance will be offered but the pilot must understand that alternative clearances may result in delays being incurred. A clearance must be issued early enough so that there is sufficient time for the clearance to be complied with.

15.15 Basic Responsibility. When flying in accordance with an ATC clearance, the pilot is not relieved of the basic responsibility for ensuring the safety of the aircraft, including terrain avoidance, and that of other air users. Likewise, the Rules of the Air apply to any flight proceeding in accordance with an ATC clearance. When an aircraft is under radar vectoring, the radar controller will issue clearances such that the required obstacle clearance will exist at all times.

15.16 Application. The practical application of ATC clearances is to provide a method whereby ATC gives instructions to aircraft to facilitate separation. In general, within CAS, IFR flights are always separated from other IFR flights. In classes B and C, IFR is separated from VFR and in class B, VFR is separated from other VFR. Within a CTR it is normal practice to separate SVFR flights.

15.17 Contents of a Clearance. Clearances are to contain positive and concise data and shall be phrased in a standard manner. An ATC clearance should include:

- The aircraft identification as shown on the FP;
- Any clearance limit;
- The route of the flight;
- Level allocated for the flight (or for the initial/current part of the flight);
- Any other necessary instructions or information, such as SIDs, STARs, communications or clearance expiry time;
- Transition level in approach clearances if so prescribed or when requested by the pilot;
- QNH (except when it is known that the aircraft has already received the information): when first cleared to an altitude below the transition level; in approach clearances; in clearances to enter the traffic circuit; in taxi clearances for departing aircraft.

In order to expedite the delivery and reading back of clearances, standard phraseology may be used such as *"cleared via flight planned route to"* or *"cleared via Midhurst departure 2G"* or *"cleared via Ockham 1D arrival"*. In such cases the pilot will be required to refer to the reference document or procedure plate.

15.18 Clearance Co-ordination. The responsibility for issuing a route clearance for a flight rests with the ACC of the FIR in which the flight originates. Ideally, before issuing a clearance, an ATCU would co-ordinate (agree) a clearance with all the other ACCs en route. In practice this is not feasible especially for long intercontinental flights. In this case, the ACC would issue a clearance limited to the initial FIR or where the flight time in the originating FIR is short (e.g. flights originating from Heathrow entering the Paris FIR), it would be essential to co-ordinate with at least the next FIR to be entered. Where it has not been possible to co-ordinate the clearance for the entire route, the aeroplane would be given clearances on a rolling (downstream) basis from FIR to FIR. Under certain circumstance it may not be possible for the current ACC to obtain a downstream clearance from the subsequent FIR in which case, the aircraft may be requested to originate communications with the downstream FIR and obtain a clearance prior to entering the airspace of that FIR.

- Between 9 and 5 minutes inclusive, providing the preceding aircraft is maintaining a Mach number greater than the following aircraft in accordance with the following:

Mach No. difference between preceding and following	Longitudinal Separation standard
0	10 minutes
0.01	10 minutes
0.02	9 minutes
0.03	8 minutes
0.04	7 minutes
0.05	6 minutes
0.06	5 minutes

Figure 16.12 Mach number separation

16.29 Longitudinal Separation Based on RNAV. This is applicable to RNAV aircraft operating along RNAV routes or ATS routes defined by VOR. In this case, separation is established by maintaining the specified distance between aircraft positions reported by reference to the RNAV equipment. It is a requirement that direct controller/pilot communications are maintained. RNAV positions are defined as standard way points common to both aircraft subject to separation. The minimum is 150 km (80 NM) distance based separation instead of the normally required 10 minutes. It is also essential that the Mach number technique is applied. In the event of equipment failure reducing the navigation capability to less than the RNAV requirement, the normal longitudinal separation will be applied. The specific separation requirements are:

- Same cruising level.** 150 km (80 NM) providing each aircraft reports position from same point and separation is checked by obtaining simultaneous RNAV distance readings from the aircraft at frequent intervals.
- Climbing or descending on same track.** 150 km (80 NM) whilst vertical separation does not exist, provided each aircraft reports distance from same way point, one aircraft maintains level flight whilst vertical separation does not exist, and separation is established by obtaining simultaneous RNAV distance readings from the aircraft.
- Reciprocal tracks.** Aircraft may be permitted to climb or descend through levels occupied by other aircraft providing it has been positively established by simultaneous RNAV distance readings to or from the same on-track way point that the aircraft have passed each other by at least 150 km (80 NM).

16.30 Longitudinal Separation Based on RNAV where RNP is Specified. For aircraft cruising, climbing or descending on the same track in an RNP RNAV environment, the separation standards detailed in the table below may be used. During the application of the 50 NM minimum, if an aircraft fails to report its position, the controller is to take action within 3 minutes to establish communications. If communication has not been established within 8 minutes, alternative separation is to be applied. An aircraft may climb or descend through an occupied level once it has been established that the aircraft concerned have passed.

RNP Type	Communication Requirement	Surveillance Requirement	Distance Verification Requirement	Separation
20	Direct pilot/controller communications	Procedural Position Reports	At least every 60 minutes	80 NM
10	Direct pilot/controller communications	Procedural Position Reports	At least every 30 minutes	50 NM

Figure 16.13 RNP RNAV separation

16.31 Reduction in Separation Minima. The separation minima may be reduced as determined by the appropriate ATS authority, after prior consultation with the aircraft operators, as appropriate, in the following circumstances:

- When special electronic or other aids enable the pilot-in-command of an aircraft to determine accurately the aircraft’s position and when adequate communication facilities exist for that position to be transmitted without delay to the appropriate air traffic control unit; or
- When, in association with rapid and reliable communication facilities, radar-derived information of an aircraft’s position is available to the appropriate air traffic control unit; or
- When special electronic or other aids enable the air traffic controller to predict rapidly and accurately the flight paths of an aircraft and adequate facilities exist to verify frequently the actual aircraft positions with the predicted positions; or
- When RNAV-equipped aircraft operate within the coverage of electronic aids that provide the necessary updates to maintain navigational accuracy.
- In accordance with RAN agreements, after prior consultation with the aircraft operators, when:
 - Special electronic, area navigation and other aids enable the aircraft to closely adhere to their current flight plans; and
 - The air traffic situation is such that the conditions regarding communications between pilots and the appropriate ATS unit or units need not necessarily be met to the degree specified therein, in order to maintain an adequate level of safety.

Radar Separation

16.32 Separation Minima. Radar provides the ATCO with fairly accurate position information for an aircraft under his/her control. Problems associated with radar include: slant range display, target discrimination and loss of contact close to the radar overhead. These 'errors' must be handled in the same manner that other positional errors are: by the addition of 'buffer' allowances. The errors are worse for long range radars used in area control but must still be considered for terminal radars covering a much smaller area. The basic radar separation standard is 5 NM. This means that where two aircraft identified on radar are at the same level, they are not permitted to approach closer than 5 NM to each other on the radar display.

16.33 Reduced Radar Separation. When approved by the authority and in specific circumstances, the radar separation standard (5 NM) may be reduced. The following describe these specific occasions:

- **Radar capabilities.** When radar capabilities so permit at a given location, the radar separation standard may be reduced to 3 NM.
- **ILS Localizer.** Where two (or more) aircraft are established on the same ILS localizer course and within 10 NM of the threshold of the landing runway, the separation standard may be reduced to 2.5 NM between contacts on the radar display.
- **Simultaneous Parallel Approaches (Mode 2 - Dependent).** During Mode 2 parallel runway operations radar separation is applied. Between aircraft on adjacent localizer courses the separation standard may be reduced to 2 NM between contacts on the radar display.

Procedural Wake Turbulence Separation



Figure 16.14

16.34 Situation. When the wings are creating lift (from 'rotate' to 'touchdown'), wake vortices are created behind the aircraft. This is apparent in the form of turbulence, the severity of which is a function of aircraft mass, the worst case being a heavy aircraft at low speed. Where an aircraft is following another aircraft, allowance must be made for the 'wake turbulence effect' which under certain circumstance can be so severe as to cause structural damage (even catastrophic damage) to an airframe. The nature of the wake vortex is that it emanates from the wing tip in the form of spiralling air from the high pressure area below the wing to the low

pressure area above the wing. It spirals 'in board' towards the fuselage. The vortex exists at the level of the generating aircraft and to an altitude not exceeding 1000 ft below the generating aircraft. Where the following aircraft is within this airspace, wake turbulence separation must be applied.

16.35 Wake Turbulence Categories. Aircraft are categorized by maximum take-off mass (MTOM) to relate to the severity of the wake vortices generated. There are three categories as follows:

- **Heavy** - all aircraft types with MTOM equal to 136 000 kg or more
- **Medium** - aircraft types with MTOM less than 136 000 kg but more than 7000 kg
- **Light** - aircraft types with MTOM of 7000 kg or less

Note: MTOM is stated on the Certificate of Airworthiness for the aircraft.

16.36 Separation Minima. The following procedural (non-radar) wake turbulence separation is applied. Note the criteria are only applicable where the following aircraft is 'lighter' than the preceding aircraft.

16.37 Arriving Aircraft. Timed approaches:

- Medium behind a heavy - 2 minutes
- Light behind a medium or heavy - 3 minutes

16.38 Departing Aircraft. For a light or medium taking off behind a heavy, or a light behind a medium, a minimum of 2 minutes is applied when they are using:

- The same runway.
- Parallel runways separated by less than 760 m.
- Crossing runways if the projected flight paths cross at the same altitude or within 1000 ft below the heavier.
- Parallel runways separated by 760 m or more if the projected flight paths cross at the same altitude or within 1000 ft below the heavier.

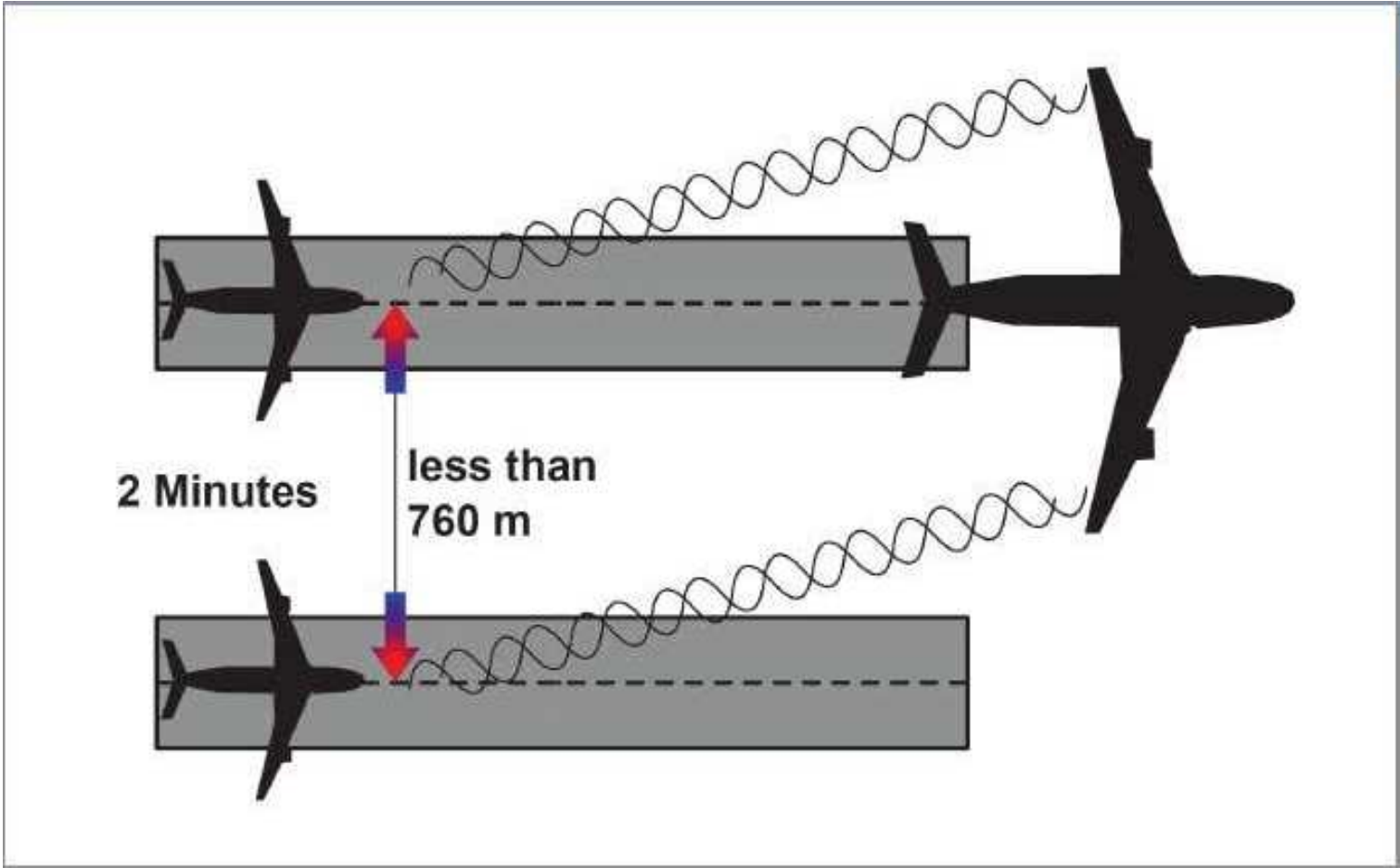


Figure 16.15 Parallel runways

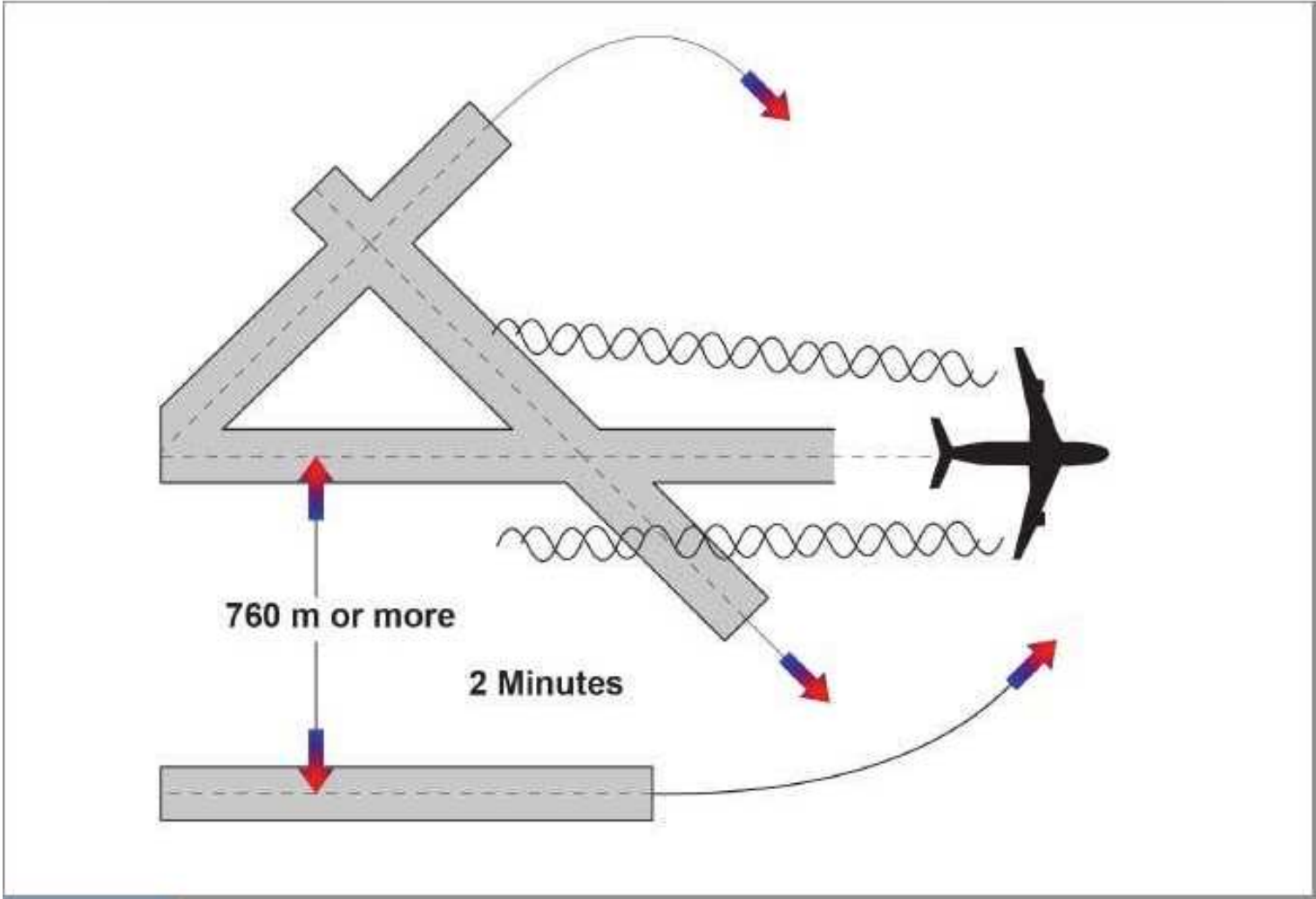


Figure 16.16 Parallel and crossing runways

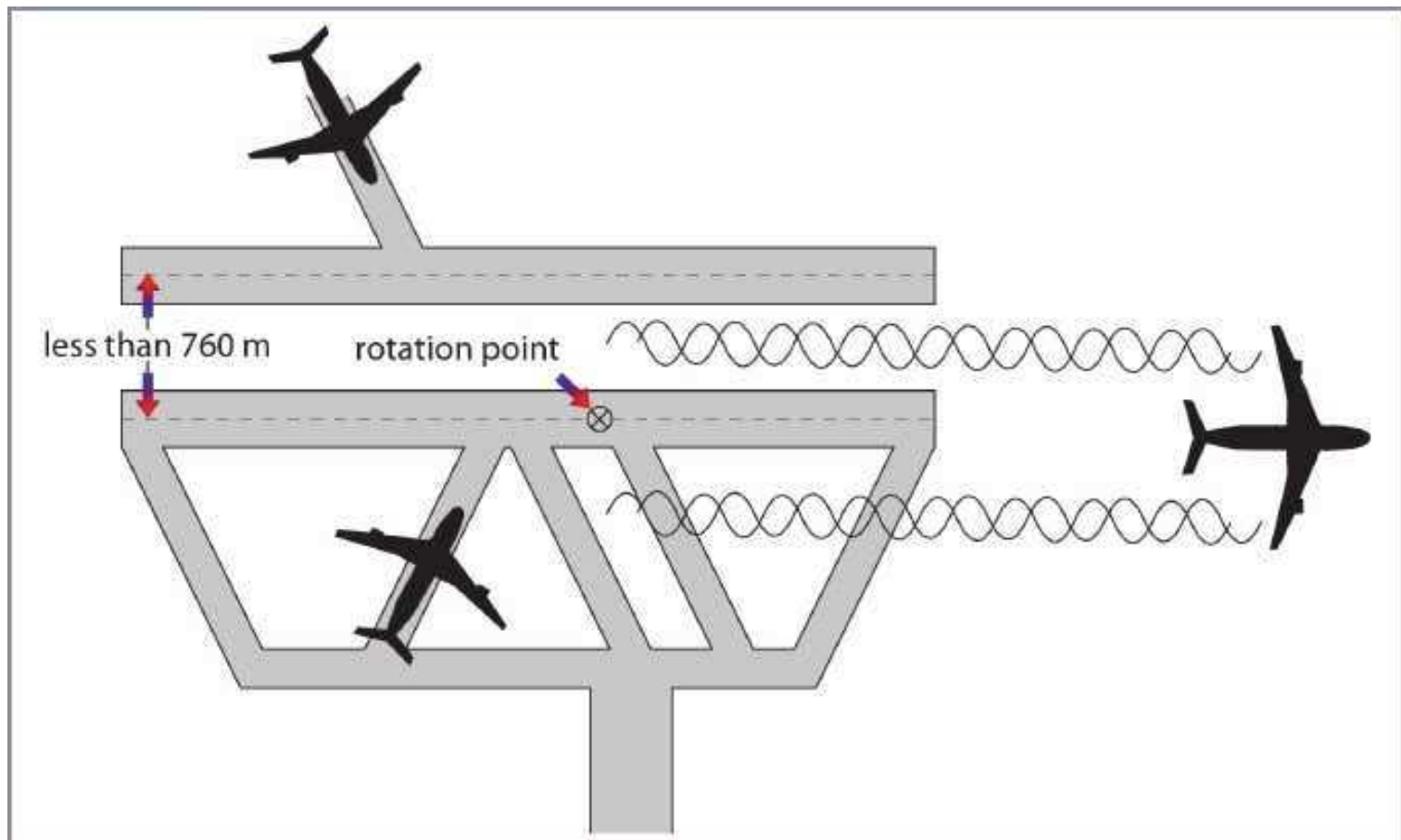


Figure 16.17 Intermediate take-off

Note: Separation is increased to 3 minutes where a light or medium is taking off behind a heavy (or light behind a medium) from an intermediate part of the same runway or an intermediate point on parallel runways.

16.39 Displaced Landing Threshold. A separation of 2 minutes is applied between light or medium and heavy (or between light and medium) when operating on a runway with a displaced threshold when:

- A departing light or medium follows a heavy arriving, or a departing light follows a medium arriving, or
- An arriving light or medium follows a heavy departing, or an arriving light follows a medium departing, if the projected flight paths are expected to cross.

16.40 Opposite Direction. A separation of 2 minutes is applied between a light or medium and a heavy, or between a light and a medium, when the heavier aircraft is making a low or missed approach and the lighter aircraft is using an opposite direction runway for take-off, or is landing on the same runway in the opposite direction, or on a parallel opposite direction runway separated by less than 760 m.

8. If two aircraft are using the same VOR for track separation, what distance must the aircraft be from the VOR before one of the two may commence a climb or descent?
- 5 NM.
 - 10 NM.
 - 15 NM.
 - 20 NM.
9. Whilst under IFR in VMC you decide to maintain your own separation to descend through the level of another aircraft. What is required?
- During day you must request clearance and with ATC authority approval.
 - You must request clearance and the ATC authority must approve, during day or night.
 - You only need to request approval for the manoeuvre.
 - In CAS the manoeuvre is illegal.
10. Two aircraft are on the same track at the same level and are using simultaneous DME fixes from the same on track DME station. What is the minimum longitudinal separation applied?
- 10 NM.
 - 5 NM.
 - 20 NM.
 - 15 NM.
11. What is the separation standard between aircraft at the same altitude when using DME to determine range from a beacon?
- 10 NM where the first aircraft speed is 40 kt faster than the second.
 - 10 NM where the first aircraft speed is 20 kt faster than the second.
 - 20 NM where the first aircraft speed is 40 kt faster than the second.
 - 20 NM where the first aircraft speed is 20 kt faster than the second.
12. Two aircraft are using the Mach number technique (both at same Mach number or first faster than second) for same track separation. If using an RNAV track, what would be the standard separation in lieu of time?
- 80 NM.
 - 60 NM.
 - 50 NM.
 - 25 NM.
13. When can a controlled flight be given permission to climb/descend maintaining own separation in VMC?
- When directed by ATC.
 - When requested by the pilot and the ATC approves.
 - When there is no conflicting traffic.
 - When approved by the operator.
14. What is essential traffic?
- Flights engaged in priority flights i.e. VIP, hospital or police flights.
 - Any conflicting traffic.
 - Traffic which should be separated but which isn't.
 - Unidentified traffic on radar.

15. When is essential traffic information passed to an aircraft?
- Before a take-off clearance is issued.
 - Where traffic constitutes essential traffic to another controlled flight.
 - When the separation minima cannot be maintained.
 - When a pilot requests permission to descend or climb maintaining own separation.
16. What is the divergence angle that must be maintained from overhead an NDB to a range of 15 NM to allow one aircraft to climb/descend through the level of another?
- 15°.
 - 30°.
 - 45°.
 - 60°.
17. The longitudinal separation minimum, based on time between two aircraft at the same altitude, for which navigation aids can give a frequent determination of position and speed and when the proceeding aircraft has a true airspeed of at least 40 kt higher than the following aircraft, is:
- 5 minutes.
 - 6 minutes.
 - 10 minutes.
 - 3 minutes.
18. A separation minimum based on "RNAV" distance can be used at the moment the level is being passed, assuming that every aircraft reports its distance to or from the same "on-track" waypoint. The minimum is:
- 60 NM.
 - 80 NM.
 - 50 NM.
 - 20 NM.
19. With the Mach number technique applied what is the longitudinal standard separation between two aircraft of which the preceding aircraft is M 0.04 faster than the following aircraft?
- 10 minutes.
 - 9 minutes.
 - 8 minutes.
 - 7 minutes.
20. What is the divergence angle that must be maintained from overhead a VOR to a range of 15 NM to allow one aircraft to climb/descend through the level of another?
- 15°.
 - 30°.
 - 45°.
 - 60°.

21. The longitudinal separation minimum, based on time between two aircraft at the same altitude, for which navigation aids can give a frequent determination of position and speed and when both aircraft have updated navigation data, can be reduced to 5 minutes if:
- a. the first aircraft has updated the navigation data within the last 10 minutes.
 - b. both aircraft have updated the navigation data within the last 10 minutes.
 - c. the second aircraft is updating navigation data at the time.
 - d. the second aircraft has updated the navigation data within the last 10 minutes.
22. Two aircraft are on crossing tracks at the same level where the navigation aids do not permit frequent update of speed and position. What is the minimum separation applied?
- a. 3 minutes.
 - b. 5 minutes.
 - c. 10 minutes.
 - d. 15 minutes.
23. What is the required track divergence between the departure track and the missed approach track for parallel runway operations?
- a. 15°.
 - b. 30°.
 - c. 45°.
 - d. 60°.
24. Longitudinal separation based on time for aircraft at the same level when navigation aids permit frequent determination of speed and position and where the preceding aircraft is maintaining TAS 20 kt faster than the succeeding aircraft, is:
- a. 10 minutes.
 - b. 2 minutes.
 - c. 5 minutes.
 - d. 3 minutes.
25. The reduced radar separation provided to aircraft established on the same localizer course is:
- a. 2 NM.
 - b. 5 NM.
 - c. 3 NM.
 - d. 2.5 NM.
26. Longitudinal separation based on time for aircraft at the same level when navigation aids permit frequent determination of speed and position is:
- a. 10 minutes.
 - b. 2 minutes.
 - c. 5 minutes.
 - d. 3 minutes.

27. If an aircraft is making a 'straight-in' approach a departing aircraft may take off in any direction:
- until 2 minutes before the arriving aircraft is estimated to be over the threshold of the instrument runway.
 - until 10 minutes before the arriving aircraft is estimated to be over the threshold of the instrument runway.
 - until 5 minutes before the arriving aircraft is estimated to be over the threshold of the instrument runway.
 - until 3 minutes before the arriving aircraft is estimated to be over the threshold of the instrument runway.
28. Unless otherwise prescribed by the appropriate ATS authority, the horizontal radar separation minimum is:
- 2.5 NM.
 - 5 NM.
 - 3 NM.
 - 2 NM.
29. Separation between departing aircraft may be reduced to 2 minutes when:
- the preceding aircraft is 30 kt or more faster than the succeeding aircraft.
 - the preceding aircraft is 20 kt or more faster than the succeeding aircraft.
 - the preceding aircraft is 10 kt or more faster than the succeeding aircraft.
 - the preceding aircraft is 40 kt or more faster than the succeeding aircraft.
30. To meet wake turbulence separation criteria for aircraft using timed approaches, what is the minimum applied to aircraft landing behind a heavy or medium aircraft?
- Medium behind heavy = 2 minutes.
 - Medium behind medium = 2 minutes.
 - Light behind medium = 4 minutes.
 - Medium behind heavy = 3 minutes.
31. Track separation between aircraft using the same DR fix shall be applied requiring the aircraft to fly:
- at least 45° separated at a distance of 15 NM or more from the fix.
 - at least 30° separated at a distance of 15 km or more from the fix.
 - at least 30° separated at a distance of 15 NM or more from the fix.
 - at least 45° separated at a distance of 15 km or more from the fix.
32. A separation minimum shall be applied between a light or medium aircraft and a heavy aircraft, and between a light and a medium aircraft, when the heavier aircraft is making a low or missed approach and the lighter aircraft is landing on the same runway in the opposite direction, or on a parallel opposite direction runway separated by:
- 730 m.
 - Less than 760 m.
 - 760 m.
 - Less than 730 m.

33. What would be the minimum distance applied in an approach sequence between a heavy aircraft followed by a light aircraft?

(Note: It is assumed that this question is applicable to radar wake turbulence and assumes that the following aircraft is at the same level as the preceding aircraft.)

- a. 6 NM.
 - b. 3 NM.
 - c. 4 NM.
 - d. 5 NM.
34. What is the minimum vertical separation between IFR aircraft flying below FL290?
- a. 500 ft.
 - b. 1500 ft.
 - c. 2000 ft.
 - d. 1000 ft.
35. What is the minimum radar separation applied between aircraft on adjacent localizer courses during simultaneous parallel approaches mode 2 - dependent?
- a. 2 NM.
 - b. 2.5 NM.
 - c. 3 NM.
 - d. 5 NM.
36. When one aircraft will pass through the level of another aircraft on the same track where navigation aids permit frequent determination of speed and position, the minimum longitudinal separation provided is:
- a. 5 minutes at the time the level is crossed.
 - b. 10 minutes at the time the level is crossed.
 - c. 15 minutes at the time the level is crossed.
 - d. 20 minutes at the time the level is crossed.
37. In order to meet the wake turbulence separation criteria, what separation should be applied when a medium aircraft is taking off behind a heavy and both are using the same runway?
- a. 2 minutes.
 - b. 3 minutes.
 - c. 4 minutes.
 - d. 1 minute.
38. What is the reduced radar separation applied between aircraft on the same ILS localiser course within 10 NM of touchdown?
- a. 5 NM.
 - b. 2.5 NM.
 - c. 3 NM.
 - d. 2 NM.

39. Longitudinal separation based on time for aircraft at the same level when navigation aids permit frequent determination of speed and position and the preceding aircraft is maintaining a TAS 40 kt faster than the succeeding aircraft is:
- a. 10 minutes.
 - b. 15 minutes.
 - c. 5 minutes.
 - d. 3 minutes.
40. RNAV distance based separation may be used at the time the level is crossed, provided that each aircraft reports its distance to or from the same 'on track' waypoint. The minimum is:
- a. 60 NM.
 - b. 50 NM.
 - c. 20 NM.
 - d. 80 NM.
41. The normal radar separation standard may be reduced, when radar capabilities permit, to:
- a. 3 NM.
 - b. 5 NM.
 - c. 1.5 NM.
 - d. 1 NM.
42. What wake turbulence separation is applied when a light aircraft is taking off behind a medium aircraft?
- a. 3 minutes.
 - b. 1 minute.
 - c. 2 minutes.
 - d. 5 minutes.
43. One minute separation may be used between departing aircraft if the tracks to be flown diverge by at least:
- a. 25° immediately after take-off.
 - b. 45° immediately after take-off.
 - c. 30° immediately after take-off.
 - d. 15° immediately after take-off.
44. The separation method whereby the vertical and horizontal separation may be reduced to a minimum of half the standard is called:
- a. composite separation.
 - b. combined separation.
 - c. reduced separation.
 - d. essential separation.

45. The longitudinal separation minima based on distance using DME from 'on track' DME stations is:
- a. 10 NM.
 - b. 5 NM.
 - c. 20 NM when the leading aircraft maintains a TAS 20 kt faster than the succeeding aircraft.
 - d. 20 NM.
46. The longitudinal separation minima based on distance using DME where each aircraft uses 'on track' DME stations is:
- a. 10 NM when the leading aircraft maintains a TAS 20 kt faster than the succeeding aircraft.
 - b. 10 NM when the leading aircraft maintains a TAS 40 kt faster than the succeeding aircraft.
 - c. 20 NM when the leading aircraft maintains a TAS 10 kt faster than the succeeding aircraft.
 - d. 10 NM when the leading aircraft maintains a TAS 10 kt faster than the succeeding aircraft.
47. Aircraft flying reciprocal tracks may be cleared to climb and descend through the level of the other aircraft provided the manoeuvre does not commence until:
- a. 5 minutes after the aircraft are assumed to have passed each other.
 - b. 10 minutes after the aircraft are assumed to have passed each other.
 - c. 15 minutes after the aircraft are assumed to have passed each other.
 - d. 20 minutes after the aircraft are assumed to have passed each other.
48. An aircraft will not be given clearance to take off until the preceding aircraft has:
- a. reported airborne and climbed to 500 ft.
 - b. left the aerodrome traffic zone.
 - c. crossed the upwind end of the runway or made a turn away from the runway.
 - d. reported 'downwind'.
49. A departing aircraft will not be permitted to take off when arriving instrument traffic has:
- a. started the procedure turn.
 - b. passed a point 10 minutes from the threshold of the instrument runway.
 - c. reported "field in sight".
 - d. reported "long final".
50. Wake turbulence separation is:
- a. applicable at all times.
 - b. applicable only between aircraft of different wake turbulence categories.
 - c. applicable only between aircraft at the same level or where the succeeding aircraft is less than 1000 ft below the preceding aircraft.
 - d. not applicable to parallel runway operations.

Answers

1	2	3	4	5	6	7	8	9	10	11	12
c	d	a	b	d	b	c	c	a	c	b	a

13	14	15	16	17	18	19	20	21	22	23	24
b	c	b	b	d	b	d	a	d	d	b	c

25	26	27	28	29	30	31	32	33	34	35	36
d	a	c	b	d	a	a	b	a	d	a	b

37	38	39	40	41	42	43	44	45	46	47	48
a	b	d	d	a	c	b	a	d	a	b	c

49	50
a	c

Chapter
17
Control of Aircraft

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Procedural ATC

17.1 Concept. The provision of ATC to air traffic is largely a post WW2 concept. The need for ATC was highlighted by the high loss rate of aeroplanes during WW2 on and in the vicinity of aerodromes due to mid air collisions, collisions with obstacles and inadvertent flight into terrain. This led to the establishment of ATC at aerodromes provided by the control tower but beyond the aerodrome boundary (now replaced by the ATZ) little was provided other than a 'flight following' monitoring service essentially to ascertain that the aircraft was still airborne! After an accident in the US involving two Constellations over the Grand Canyon in the early 1950s concern was expressed that two relatively small objects flying over a vast geographic area could be a threat to each other. This led to the establishment of a 'one-way' system for east/west flight over the continental US and gave rise to the first established 'procedural' ATC service. The service provided separation by requiring aircraft naturally cruising at the same altitude to fly via different routes (lateral geographic separation). It required the pilot to tell the air traffic controller where the aircraft was by passing position reports. The data collected was plotted and as the flight progressed any apparent collision risk was determined and the flights concerned would be asked to alter course to eliminate the problem. The problems with this were that the equipment used to determine the aircraft position was, by modern standards, somewhat crude; the communications equipment and facilities were poor and the availability of flight information including met data was virtually nonexistent. However, the density of air traffic was also low and the application of large 'buffer' distances overcame the problems of inaccuracy and poor communications.

17.2 Flight Strips. Within the ATC centres, the progress of a flight is tracked with a paper system known as a flight strip. The strip is originated from the ATS Flight Plan and in theory, is transferred from ATCO to ATCO and from centre to centre. Clearly, the progress of the flight strips may not actually be 'physical' but will require a new strip to be compiled at centre 'B' from information passed by telephone from centre 'A'. Within a centre the progress may be a physical passing of the strip from one controller to another. This system is virtually fool-proof and over the last 20 years ATC research centres (e.g. Eurocontrol at Brétigny) have tried to come up with electronic replacements.

17.3 Procedural Separation. The procedural separation standards are covered in Chapter 16 of these notes.

17.4 Communications. Ever since aircraft have been able to carry radios, they have been used for air to ground communications. The present day ATC system relies on VHF two-way communications to make the system work. Over the ocean areas and remote land areas, HF is used together with the ability to maintain a radio watch using the Selcal system which relieves the pilot of having to actually listen to the radio. Each ATC unit has a radio callsign e.g. Oxford Approach, as does each aircraft. If two aircraft have the same or confusingly similar call signs, ATC can ask one aircraft to use another call sign for the time being.

Radar Control

17.5 Concept. The primary use of radar in ATC is to enhance the provision of separation. In theory, radar gives the ATCO the ability to determine the aircraft position with more accuracy than the pilot can! However, SATNAV systems with precision accuracy (+/- 30 cm) are now adding a whole new dimension to ATC. Radar systems cover long range surveillance used in area control (en route traffic), terminal aerodrome radar (TAR) used in the vicinity of an aerodrome or aerodromes to provide a service to arriving and departing traffic, and surface movement radar at an aerodrome to provide the aerodrome controller with information in poor visibility or at night.

The system that provides a radar return displayed on a display system is called Primary Surveillance Radar (PSR). All radar systems can be augmented with Secondary Surveillance Radar (SSR) to provide flight specific identification and altitude information. Radar can also be used in the provision of precision or non-precision approaches.



Figure 17.1 ATC radar head at Cleve Hill, Shropshire



Figure 17.2 ATC radar head at London Heathrow

17.6 Radar Services. At its most basic, radar is used to derive information for the updating of information displayed on the flight strips. In this manner, it is augmenting a procedural system. If, however, the radar response from a specific aircraft can be individually determined (identified) then the provision of separation from other radar contacts (aircraft) can be achieved. In this manner, the radar derived information is used directly to provide separation to a much greater degree of accuracy. The types of radar service are:

- Radar Control for controlled en route aircraft
- Approach Radar Control for arriving and departing controlled traffic
- Radar vectoring: the provision of navigation instructions to an aircraft to achieve a specific aim e.g. positioning to intercept the ILS localizer.
- PAR and SRA as instrument approach systems

As with all ATC procedures, a radar service is only provided inside CAS. ICAO does however permit the use of radar to obtain information to enable the provision of an FIS outside of CAS. Radar may also be used to assist the provision of information as part of the Advisory ATC service provided in class F airspace. At an aerodrome, radar may be used by the aerodrome controller to determine the separation between departing aircraft but not to actually apply the separation.

17.7 Radar Separation. There is only one radar separation standard and this is 5 NM. As defined in Chapter 16, reduced radar separation may be applied under specific conditions. The separation applied is based upon the aircraft position derived from PSR only. As defined and specified in Chapter 16, wake turbulence separation can be applied using radar derived information. In this case the separation standards applied are based on distance.

Radar Identification

17.8 Requirement. Before a radar controller can provide any service to an aircraft, the radar identity of the aircraft must be established. Clearly, the basic SSR capability is to identify a specific aircraft squawking a specifically allocated code, therefore this method of identification is most commonly used. It is also the quickest method of identification. Once an aircraft has been allocated an SSR code, it must be retained until otherwise advised by the radar controller. If an emergency situation arises, the pilot should not squawk A7700 if the identity of the aircraft has already been established using SSR. All other methods of identification by radar require the ATCO to observe the radar contacts on the display screen and determine, either from geographic position or from a specific manoeuvre, which contact is the aircraft requiring the service. Such observations include:

- Geographic location e.g. '2 NM west of Woodstock'
- Relative to a radio navigation aid - "On the 230 radial from the Daventry VOR DME 5 NM"
- Latitude and longitude
- Georef position
- Turn through 30° or more away from desired course and then return to the course
- Positive handover from a radar controller who had previously identified the aircraft

17.9 Procedure. When identifying a radar contact as a specific aircraft, the radar controller must tell the pilot how the identification was achieved. The controller will use the phrase '**radar contact**' to indicate that the aircraft has been identified and that until further advised, a service will be provided - "G-CD radar contact 2 NM west of Oxford". This position should agree with the position the pilot thinks the aircraft is at. If significantly different, the pilot must inform the controller in the event that the controller has misidentified the aircraft.

Radar Service

17.10 Commencement. After identification, the pilot is to be told what type of radar service is to be provided and what the objective is - "G-CD radar contact 6 NM west of Compton, radar control, expect radar vectors for ILS approach runway 26"

17.11 Termination. When an aircraft reaches the limit of radar cover or the edge of a radar vectoring area, or the aim of the service has been achieved, the pilot will be advised that the service is terminated, given position information and instructions/advice how to continue. For instance: "G-CD radar service terminated, presently 10 NM south of Benson, resume own navigation, suggest continue with London Information 125.650"

17.12 Radar Vectoring. Radar vectoring is the passing of navigation information to a pilot by a radar controller to achieve the aircraft flying a required track. This may be simply to avoid weather or manoeuvre around another aircraft radar contact. Once the aim of the vectoring has been achieved, the pilot will be told to “Resume own navigation” giving the pilot the aircraft’s position and any appropriate instructions. This implies that the radar vectoring has ended. It may be provided to position the aircraft such that a straight-in instrument approach can be achieved. In any event, radar vectoring for approach control purposes is only carried out inside a radar vectoring area (RVA). Obstacles are marked on an RVA chart.

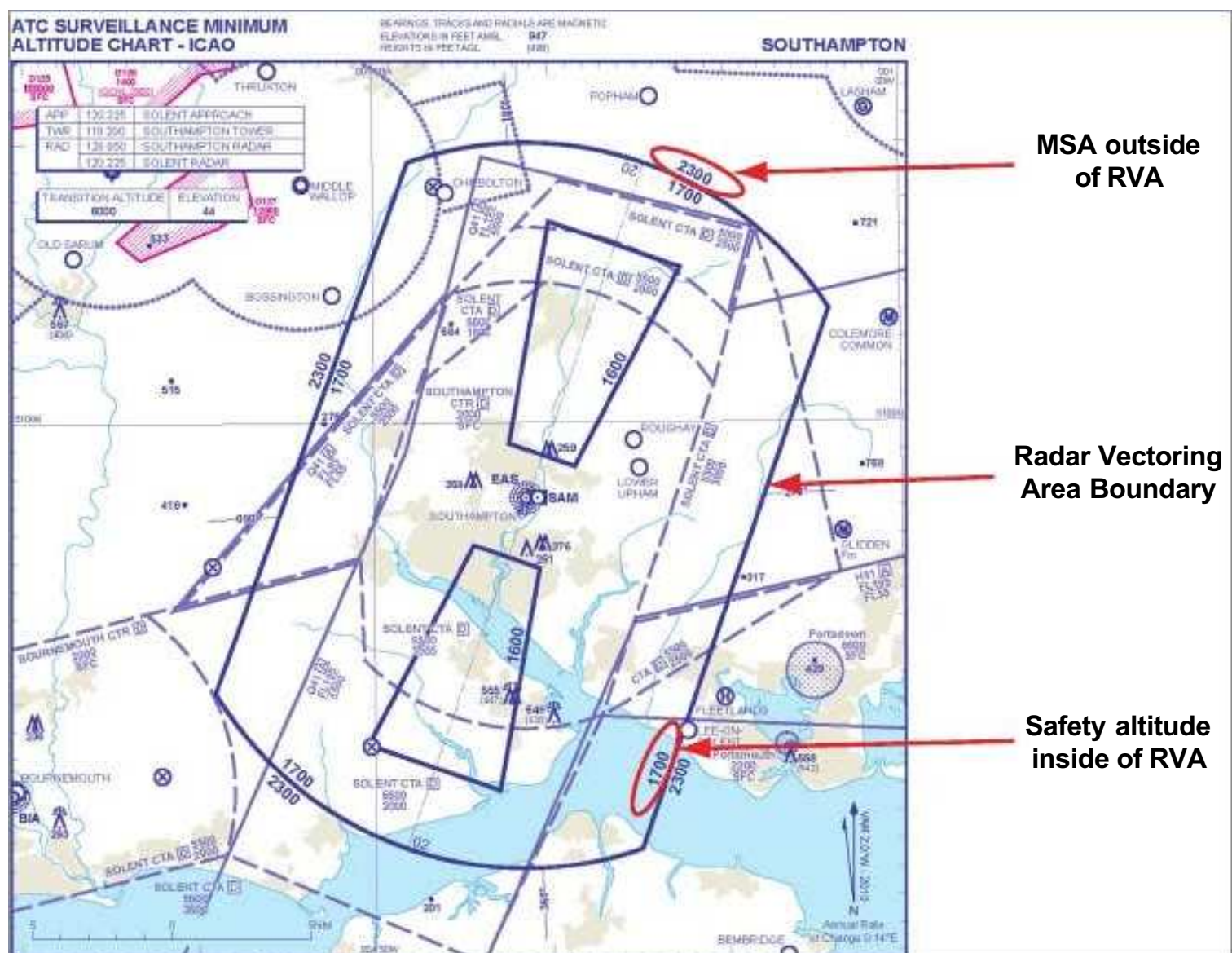


Figure 17.3 Radar vectoring area

17.13 Vectoring Procedure. Radar vectoring will not begin until the aircraft radar contact is determined to be within the RVA. The RVA will be displayed on the radar display in the form of a video map electronically generated within the radar display software. Because of possible inaccuracies ('slippage') aircraft will not be radar vectored closer to the edge of the RVA than half the applicable radar separation standard or 2.5 NM whichever is greater. Normally, radar vectoring will begin at a fix at MSA. It may, however, begin at any time after the aircraft has been identified on radar and the aircraft altitude is known to the ATCO. The RVA chart displays the obstacles in the area together with the elevation of the terrain. The radar controller will pass magnetic headings to the pilot to steer to make good a desired track over the ground. The pilot will fly the heading and the controller will adjust the heading for the wind. The aircraft will not be given clearance to descend below the RVA safe altitude (highest obstacle in RVA plus MOC rounded up) until established on the ILS localizer course or on the final approach track, or the pilot reports that he/she is continuing the approach visually. Throughout the procedure, the radar controller must be aware of the elevation of the terrain and the aircraft configuration to avoid spurious GPWS warnings.

17.14 ILS Vectoring Requirements. Where the purpose of vectoring is to position the aircraft at a point where localizer capture is achieved, the closing heading to the centre line of the ILS localizer is 45° . If parallel runway operations Modes 1 or 2 are in use, the angle is limited to 30° . The closing heading is to be maintained for a distance of not less than 1 NM.

17.15 Radar Controlled Approach. Radar may be used to provide a precision (PAR) or non-precision (SRA) approach to a runway. In both cases, the radar controller provides radar derived information to the pilot to permit the aircraft to be flown along a predefined track and, in the case of PAR, a defined glide path. For SRA, a recommended vertical profile (virtual glide path) is published. If radar contact is lost for any significant period during the last 2 NM of a radar approach, the pilot will be advised to carry out a missed approach procedure.

17.16 PAR. This is specifically engineered radar equipment that provides very accurate (precision) azimuth and glide path information to a dedicated radar controller. Whilst providing a PAR service, the controller will be engaged in providing the service to one aircraft and will not have any other duty. The pilot will be passed azimuth (right or left turn or heading) information and elevation ('on'; 'above'; or 'below') information to fly the aircraft along the predetermined flight path. The service will continue until the aircraft reaches DH which would have been passed by the pilot to ATCO at the beginning of the procedure. At DH the pilot will be informed that the aircraft is at DH and radar service is terminated. Because the information is passed in the form of a continuous talk-down, the pilot must stay on the PAR approach frequency. The radar controller is therefore responsible for obtaining a landing clearance from the aerodrome controller. Normally this would be done at 4 NM from the threshold of the landing runway, but may be delayed by the aerodrome controller until 2 NM. If no clearance has been received at 2 NM, the pilot will automatically begin the missed approach procedure. At some time during the approach (usually at 3 NM) the pilot will be asked to confirm a final check of the landing gear (and at a military aerodrome, the flap configuration). At some point during the approach, the flight crew will cross-check the position of the aircraft against the PAR information (for instance using DME and rad alt information). PAR will not generally be found at civilian aerodromes; however, the new generation of PAR equipment is widely installed at military aerodromes.



Figure 17.4 PAR installation at RAF Marham

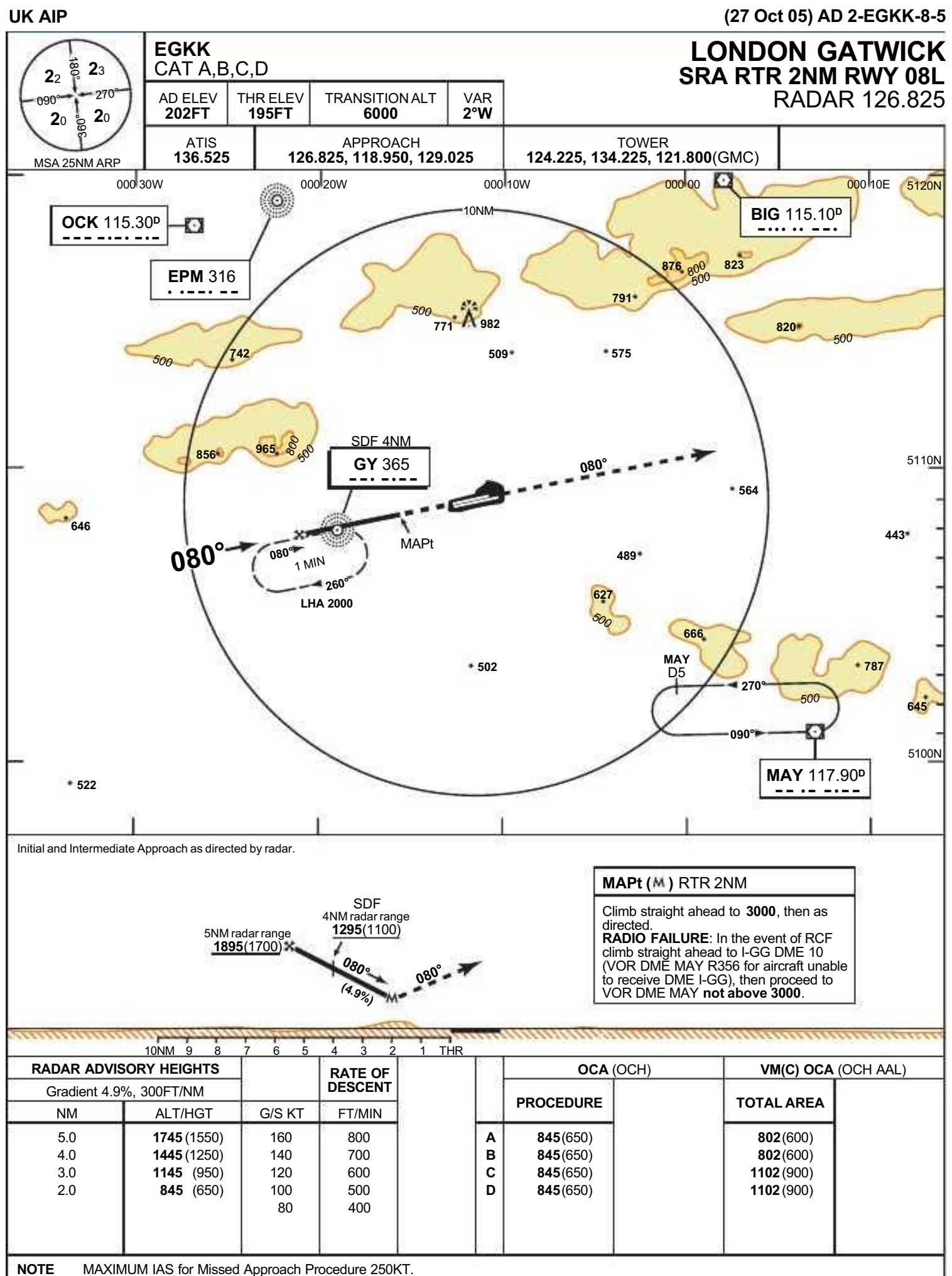


Figure 17.5 SRA approach

17.17 SRA. An SRA approach is a non-precision procedure using TAR and will therefore have a determined MDA/H. The procedure for SRA is similar to PAR except that in this case advisory height information is passed with range information e.g. "5 miles from touchdown, you should be passing one thousand five hundred and fifty feet". SRA approaches always have an RTR

figure stated. This is the range at which the radar service will be automatically terminated. RTR stands for Radar Termination Range. Typically RTR2 is used indicating that the radar service will be terminated at 2 NM from the threshold of the landing runway. During the procedure, the pilot is passed magnetic headings to fly and corrections (left or right) to the extended centre line of the landing runway. If the RTR is 2, distance information is passed (with advisory height information) every 1 NM. If RTR1 is applicable, range and height information is passed every 0.5 NM. As for PAR, the radar controller will be responsible for obtaining a landing clearance from the aerodrome controller and passing it to the pilot. The approach plate for the SRA approach to Gatwick is shown in *Figure 17.5*.

Aerodrome Control

17.18 Introduction. The responsibility for avoiding collisions involving aircraft, obstacles, vehicles and personnel on or in the air in the vicinity of an aerodrome rests with the aerodrome controller. At a 'controlled aerodrome' (see definition) the aerodrome controller usually operates from the visual control room (VCR) situated at the top of the control tower. The VCR normally allows the aerodrome controller to see all parts of the aerodrome but may also have electronic aids to assist the controller when visibility is poor or at night. The primary duty of the aerodrome controller is to control access to the runway in use. The nature of the service offered is procedural, with the pilot telling the aerodrome controller where the aircraft is and the controller basing any instructions or clearances on that information. For departing aircraft the aerodrome controller will give a take-off clearance which will be de-facto permission to enter and take off from the runway. Once airborne the pilot will report 'airborne' at which time another aircraft can be cleared to use the runway.

17.19 Use of the Runway. The aerodrome controller will normally decide which runway will be used for take-off and landing operations. The 'runway-in-use' will determine the direction for instrument approaches and the direction for the visual circuit. Normally, the wind direction will be the deciding factor; however, in calm or light wind conditions, another direction may be preferable for ATC, airspace restriction or noise abatement requirements. At London Heathrow, a departing aircraft will be expected to accept a 5 kt tail wind and use the noise preferential runways. It is a generally accepted practice that only one aircraft is permitted on the runway at any time.

17.20 Departing Aircraft. Aircraft waiting for take-off will be held at a runway holding point on the taxiway at a safe distance from the centre line of the runway. It is normal procedure for aircraft to be given a 'take-off immediate' clearance. This requires the pilot to taxi the aircraft on to the runway and without stopping, line the aircraft on the centre line and then apply the necessary power to commence the take-off run. A succeeding aircraft may be permitted to enter the runway (given the instruction 'line up and wait') as soon as the preceding aircraft has commenced the take-off run. A succeeding aircraft will not be given clearance to take off until the preceding aircraft has either crossed the upwind threshold, or has commenced a turn away from the runway direction.

17.21 Arriving Aircraft. When established on final approach, an arriving aircraft will be given clearance to land if the runway is available. For an arriving instrument approach, the clearance to land will normally be given at about 4 NM from the threshold and certainly no later than 2 NM from the threshold. If the pilot of an arriving instrument approach has not been given a landing clearance, the missed approach procedure is to be flown commencing at 2 NM. Once the landing run is complete and the pilot has turned the aircraft onto the taxiway, he/she is required to make a report to the aerodrome controller to confirm that the aircraft has 'vacated the runway'. This is to be made when all of the aircraft has passed the appropriate holding point.

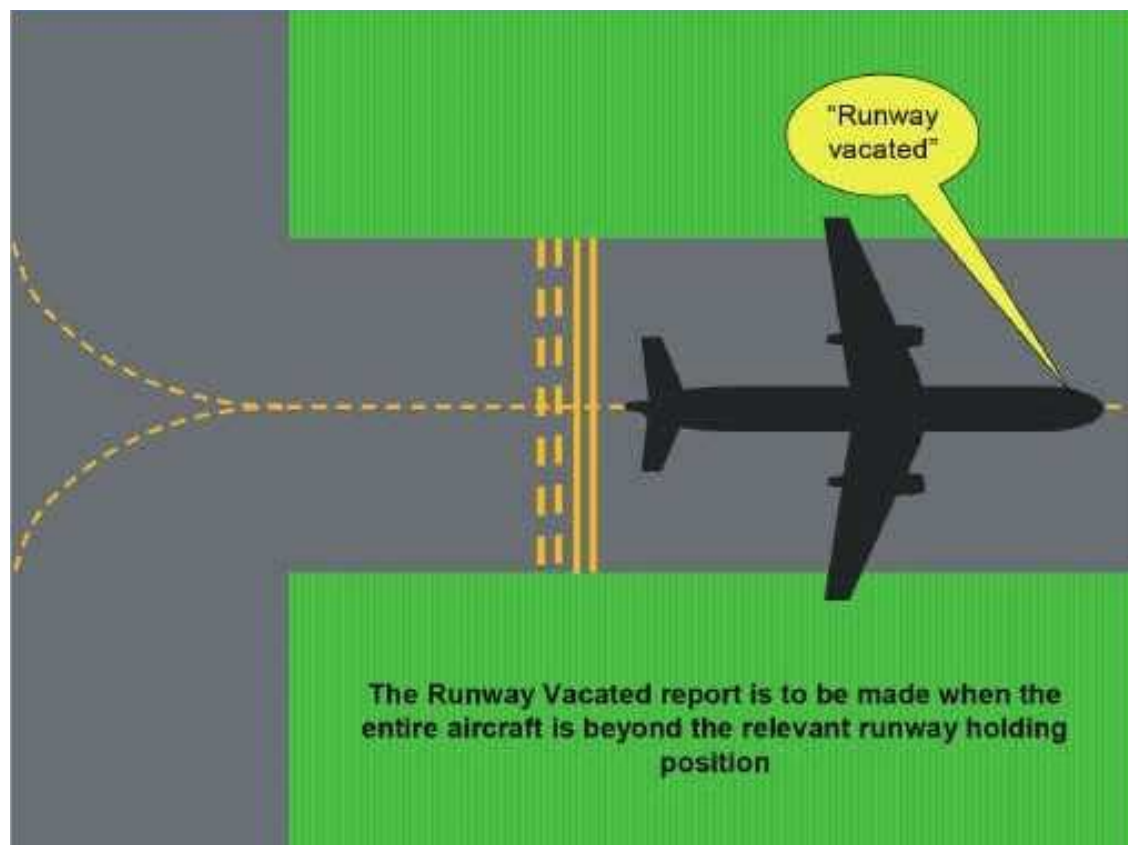


Figure 17.6 Runway vacated report

17.22 Essential Local Traffic. Information on essential local traffic known to the Controller, shall be also transmitted to departing and arriving aircraft. Essential local traffic consists of any aircraft, vehicle or personnel on or near the runway to be used, or traffic in the take-off, climb-out or final approach areas, which may constitute a collision hazard to a departing or arriving aircraft.

17.23 "Land After" Clearance. Under certain conditions, a pilot may be given a provisional clearance to "land after the preceding aircraft". This will be done to increase the utilization of the runway at peak times so that aircraft may arrive at 1 minute intervals. In this case, the pilot of the second aircraft will decide if the preceding aircraft will be clear of the runway at the time he/she lands and that there is sufficient separation between the aircraft throughout the manoeuvre. Throughout the landing, the pilot of the following aircraft must be able to see the previous aircraft and is responsible for maintaining separation. In this case, the pilot of the following aircraft will apply the appropriate visual separation which may be less than the procedural separation. The provision of 'fast turn off lanes' or 'rapid exit taxiways' on aerodromes enhances this option. The necessary conditions are:

- Only permitted during daylight;
- The pilot of the second aircraft must be able to see the preceding aircraft throughout the manoeuvre;
- The runway must be dry (braking action good);
- The pilot and operator of the aircraft concerned must be aware that the runway occupancy time is limited to 50 seconds;
- The ATCO must be able to see the entire length of the landing runway.

17.24 Flight Information. As with all other ATSUs the aerodrome controller is responsible for the provision of flight information to aircraft on the aerodrome or in flight in the vicinity of the aerodrome. Routine information may be passed using ATIS but the aerodrome controller is responsible for making sure that departing aircraft and arriving aircraft at the initial contact with 'tower' are aware of any limitations to the radio navigation or visual aids on the aerodrome. Likewise any work in progress on the aerodrome is to be reported in a timely manner.

17.25 Information to Departing and Arriving Aircraft. The aerodrome controller is required to ensure that pilots have adequate and accurate aerodrome information prior to using the aerodrome. Where wind information is passed, the direction is to be in degrees magnetic so that the pilot can relate this directly to the aircraft compass.

- **Prior to Taxi.** Before taxiing a pilot is to be told:
 - What runway is in use;
 - The surface wind direction and speed;
 - The aerodrome QNH;
 - The air temperature for the runway to be used (for turbine engine aircraft only);
 - The visibility in the direction of take-off or the RVR;
 - The correct time.
- **Prior to Take-off.** The following is passed to a pilot prior to take-off:
 - Any significant changes in wind conditions, air temperature, visibility or RVR
 - Significant meteorological conditions in the take-off and climb-out areas (unless the pilot has already been informed)
- **Prior to Entering the Traffic Pattern.** Before entering the traffic pattern or commencing an approach to land, a pilot is to be provided with the following information:
 - The runway to be used;
 - The surface wind direction and speed;
 - The aerodrome QNH;

17.26 Alerting Service. The aerodrome controller is responsible for the activation of the aerodrome crash rescue and firefighting service when required. If necessary, all visual circuit traffic can be suspended by the aerodrome controller for the duration of an emergency situation. The aerodrome controller may suspend the visual circuit on the instructions of the Area Control Centre if an aircraft in an emergency is likely to land at the aerodrome. If an aircraft which has been cleared to land fails to do so within 5 minutes after the landing clearance has been issued, or fails to contact the aerodrome controller after having been transferred, the aerodrome controller will report the fact immediately to the ACC or the FIC and the Alert Phase will be declared immediately.

Approach Control Service

17.27 Establishment. Approach control provides ATC to traffic departing from, and arriving at, aerodromes. Where IFR traffic is departing to join airways, the approach controller is the link between the aerodrome departure procedures and the airways joining procedures and vice versa for arriving traffic. It is usual nowadays for radar to be used in approach control although procedural approach control exists (as here at Oxford for the VDF and NDB approach procedures). Where an aerodrome is in a CTR, approach control is mandatory and the controller may be known as the zone controller. The approach office (approach control room) may be at another aerodrome if there is more than one aerodrome in the CTR. Where an aerodrome is outside of a CTR, approach control (where established, as here at Oxford) is advisory. Where procedures are established for instrument approaches, the approach controller may delegate radar vectoring (and monitoring of self positioning) to a radar director. At aerodromes in CTRs where the met conditions are IMC or the criteria for VMC take-off cannot be met, the approach controller will be responsible giving clearance for take-offs. It will also be the approach controller's responsibility for obtaining clearance to land from the aerodrome controller for IFR flights carrying out low visibility instrument approaches.

17.28 Departing Aircraft. When the control of traffic is based on an air traffic control clearances, the clearance is to specify:

- Direction of take-off and turn after take-off,
- Track to be made good before proceeding on desired heading,
- Level to maintain before continuing climb to assigned cruising level,
- Time, point and/or rate at which level change shall be made,
- Any other necessary manoeuvre consistent with the safe operation of the aircraft.

17.29 Take-off direction. Departing aircraft may be expedited by suggesting a take-off direction which is not into the wind. It is the responsibility of the pilot-in-command of an aircraft to decide between making such a take-off, and waiting for normal take-off in a preferred direction.

17.30 Delays. In order to avoid excessive holding at the destination, aircraft may be held at the departure aerodrome prior to take-off. ATC is required to advise operators (or their nominated representative) of substantial delays and in any case where the delay is expected to exceed 30 minutes.

17.31 Information for Departing Aircraft. The following information is to be passed to departing aircraft by the approach controller:

- **Meteorological information.** Information regarding significant changes in the meteorological conditions in the take-off or climb-out area, obtained by the unit providing approach control service is to be transmitted to departing aircraft without delay, except when it is known that the aircraft already has received the information. Significant changes in this context include those relating to surface wind direction or speed, visibility, runway visual range, or air temperature (for turbine engine aircraft), and the occurrence of thunderstorm or cumulonimbus, moderate or severe turbulence, windshear, hail, moderate or severe icing, severe squall line, freezing precipitation, severe mountain waves, sand storm, dust storm, blowing snow, tornado or waterspout.
- **Visual or non-visual aids.** Information regarding changes in the operational status of visual or non-visual aids essential for take-off and climb shall be transmitted without delay to a departing aircraft, except when it is known that the aircraft already has received the information.
- **Essential traffic information.** Information regarding essential local traffic known to the controller shall be transmitted to departing aircraft without delay.

17.32 Arriving Aircraft. Arriving aircraft (aircraft being handed over to approach from area (airways)) may be required to report when leaving or passing a reporting point, or when starting procedure turn or base turn, or to provide other information required by the controller to expedite departing aircraft.

17.33 Initial Approach Clearance. An IFR flight will not be cleared for an initial approach below the appropriate minimum altitude unless:

- The pilot has reported passing an appropriate point defined by a radio navigation aid; or
- The pilot reports that the aerodrome is (and can be maintained) in sight; or
- The aircraft is conducting a visual approach; or
- The aircraft's position has been positively determined by radar.

17.34 Visual Approach. Visual approach is defined as an approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed with visual reference to terrain. An IFR flight may be cleared to execute a visual approach provided that the pilot can maintain visual reference to the terrain and the reported ceiling is at or above the approved initial approach level for the aircraft so cleared; or the pilot reports at the initial approach level or at any time during the instrument approach procedure that the meteorological conditions are such that with reasonable assurance a visual approach and landing can be completed.

17.35 Separation. Separation shall be provided between an aircraft cleared to execute a visual approach and other arriving and departing aircraft. For successive visual approaches, radar or non-radar separation shall be maintained until the pilot of a succeeding aircraft reports having the preceding aircraft in sight. The aircraft shall be instructed to follow and maintain separation from the preceding aircraft. Transfer of communications should be effected at such a point or time that clearance to land or alternative instructions can be issued to the aircraft in a timely manner.

17.36 Instrument Approach. Instrument approaches are carried out under the supervision of the approach controller. Where radar vectoring and monitoring of approaches is carried out, control may be delegated to a radar director or radar final controller.

- **Speed control.** The method of maintaining separation during sequenced instrument approaches using radar is by asking the aircraft concerned to fly at specified a speed. It is usual for an aircraft to start an instrument approach (from the IAF) at 210 kt (IAS). For example a clearance might be: "Speedbird 289 leave Ockham heading 290 speed 210 kt". This is a speed that most commercial operations aircraft can achieve without having to use drag or lift enhancing devices. If necessary, the speed of a subsequent aircraft will be reduced to maintain the necessary time/distance interval between the aircraft. Speed adjustments will be made in intervals of no more than 20 kt and required speeds will always be in multiples of 10 e.g. "Speedbird 289 maintain 180 kt". During the latter stages of an approach, the pilot will need to reduce the speed to V_{at} so no further speed control will be applied after the aircraft has passed 4 NM from touchdown.
- **Unfamiliar procedures.** If a pilot-in-command reports (or if it is clearly apparent to the ATC unit) that he or she is not familiar with an instrument approach procedure, the initial approach level, the point (in minutes from the appropriate reporting point) at which procedure turn will be started, the level at which the procedure turn shall be carried out and the final approach track shall be specified, except that only the last-mentioned need be specified if the aircraft is to be cleared for a straight-in approach. The missed approach procedure shall be specified when deemed necessary.
- **Visual reference to terrain.** If visual reference to terrain is established before completion of the approach procedure, the entire procedure must nevertheless be executed unless the aircraft requests and is cleared for a visual approach.
- **Choice of procedure.** A particular approach procedure may be specified to expedite traffic. The omission of a specified approach procedure will indicate that any authorized approach may be used at the discretion of the pilot.

17.37 Holding. Where holding is required as part of an arrival procedure leading to an instrument approach, the approach controller will control the holding procedure (stack). Control may be delegated to a radar controller (director). Holding and holding pattern entry shall be accomplished in accordance with procedures established by the appropriate ATS authority and published in Aeronautical Information Publications. If entry and holding procedures have not been published or if the procedures are not known to the pilot-in-command of an aircraft, the appropriate air traffic control unit shall describe the procedures to be followed.

- **Holding point.** Aircraft shall be held at a designated holding point. The required minimum vertical, lateral or longitudinal separation from other aircraft, according to the system in use at that holding point, shall be provided.
- **Separation.** When aircraft are being held in flight, the appropriate vertical separation minima shall continue to be provided between holding aircraft and en route aircraft while such en route aircraft are within five minutes flying time of the holding area, unless lateral separation exists.
- **Holding levels.** Levels at holding points shall be assigned in a manner that will facilitate clearing each aircraft to approach in its proper priority. Normally the first aircraft to arrive over a holding point should be at the lowest level, with following aircraft at successively higher levels. However, aircraft particularly sensitive to high fuel consumption at low levels, such as supersonic aircraft, should be permitted to hold at higher levels than their order in the approach sequence, whenever the availability of discrete descent paths and/or radar makes it possible, subsequently, to clear the aircraft for descent through the levels occupied by other aircraft.
- **Alternative procedures.** If a pilot-in-command of an aircraft advises of an inability to comply with the approach control holding or communication procedures, the alternative procedure(s) requested by the pilot-in-command should be approved if known traffic conditions permit.

17.38 Stacking (Approach Sequence). Whenever approaches are in progress, the following procedures (stacking) are applied:

- **Priority.** The approach sequence (the stack) is established to permit the arrival of the maximum number of aircraft with the least average delay. Special priority **may** be given to:
 - An aircraft which anticipates being compelled to land because of factors affecting the safe operation of the aircraft (engine failure, fuel shortage, etc.).
 - Hospital aircraft or aircraft carrying any sick or seriously injured person requiring urgent medical attention.
- **Procedural sequence.** Except where timed approaches are in progress (see paragraph 17.39), succeeding aircraft will be cleared for approach (to start the procedure - leave the stack) when the preceding aircraft:
 - Has reported that it is able to complete its approach without encountering IMC; or
 - Is in communication with and has been sighted by the aerodrome controller, and reasonable assurance exists that a normal landing can be made.

- **Holding.** ATC will approve a request to hold for weather improvement (or for other reasons). If other aircraft holding decide to make an approach and radar is available, a pilot deciding to remain holding will be vectored to an adjacent fix to continue holding. Alternatively, he/she may be vectored (or given a procedural clearance) to place the aircraft at the top of the stack so that other aircraft may be permitted to carry out the procedure and land.
- **Credit time.** Where an aircraft has been authorized to absorb delay time whilst en route (by reduced cruising speed or en route holding), the time delayed should be credited in any stacking.

17.39 Timed Approaches. Timed approaches allow subsequent aircraft to commence approaches more frequently than as specified in paragraph 17.38. In this case an aircraft would be cleared to depart the fix of the stack a period of time after the preceding aircraft. The procedure must be authorized by the authority and the following complied with:

- A suitable point on the approach path (capable of being determined by the pilot - VOR radial, DME range) is to be specified as a check point for timing of successive approaches;
- Aircraft are to be given a time at which to pass the specified point inbound (the purpose of which is to achieve the desired interval between successive landings on the runway while respecting the applicable separation minima at all times including runway occupancy period). The time determined is to be passed to the pilot to allow sufficient time for him/her to arrange the flight to comply.

17.40 Expected Approach Time (EAT). An expected approach time shall be determined for an arriving aircraft that will be subjected to stacking, and shall be transmitted to the aircraft, as soon as practicable and preferably not later than at the commencement of its initial descent from cruising level. In the case of aircraft particularly sensitive to high fuel consumption at low levels, an expected approach time should, whenever possible, be transmitted to the aircraft early enough before its intended descent time to enable the pilot to choose the method of absorbing the delay and to request a change in the flight plan if the choice is to reduce speed en route. A revised expected approach time shall be transmitted to the aircraft without delay whenever it differs from that previously transmitted by 5 minutes or more or such lesser period of time as has been established by the appropriate ATS authority or agreed between the ATS units concerned. An expected approach time shall be transmitted to the aircraft by the most expeditious means whenever it is anticipated that the aircraft will be required to hold for thirty minutes or more. The holding point to which an expected approach time relates shall be identified together with the expected approach time whenever circumstances are such that this would not otherwise be evident to the pilot. Expected Approach Time is defined as the time at which ATC expects that an arriving aircraft, following a delay, will leave the holding fix to complete its approach for landing.

17.41 Information for Arriving Aircraft. The following information is to be passed to aircraft during the approach phase:

- **When established.** As early as practicable after an aircraft has established communication with the approach controller, the following information, in the order listed, shall be transmitted to the aircraft, except where it is known the aircraft has already received it:
 - Runway-in-use;
 - Meteorological information;

Note: The meteorological information is identical to that required in ATIS broadcasts for aircraft arriving, and is to be extracted from meteorological reports disseminated locally at the aerodrome.

- Current runway surface conditions, in case of precipitants or other temporary hazards;
- Changes in the operational status of visual and non-visual aids essential for approach and landing.
- **Commencing final approach.** At the commencement of final approach, the following information shall be transmitted to the aircraft:
 - Significant changes in the mean surface wind direction and speed;

Note: Significant changes are detailed in Annex 3 (Met). If the controller has access to wind component tables, the following are considered to be significant:

- Mean head-wind component 10 kt
 - Mean tail-wind component 2 kt
 - Mean crosswind component 5 kt
- The latest information, if any, on wind shear and/or turbulence in the final approach area;
- The current visibility representative of the direction of approach and landing or, when provided, the current runway visual range value(s) and the trend, if practicable, supplemented by slant visual range value(s), if provided.
- **During final approach.** The following information shall be transmitted without delay:
 - The sudden occurrence of hazards (for example: unauthorized traffic on the runway);
 - Significant variations in the current surface wind, expressed in terms of minimum and maximum values;
 - Significant changes in runway surface conditions;
 - Changes in the operational status of required visual or non-visual aids;
- Changes in observed RVR value(s), in accordance with the reported scale in use, or changes in the visibility representative of the direction of approach and landing.

17.42 Transfer of Aircraft from One ATC Unit to Another. Transfer of the control of aircraft from one ATC Unit to another shall be at such a point, level or time that information and instructions can be passed to the aircraft in a timely manner.

simulator; and the ATSU responsible for the FIS within an FIR and the services responsible for pre-flight information.

18.8 Publication. The AIS is to receive and/or originate, collate or assemble, edit, format, publish/store and distribute aeronautical information/data concerning the entire territory of the State as well as areas in which the State is responsible for ATS outside its territory. Aeronautical information is published in the form of an Integrated Aeronautical Information Package (IAIP).

18.9 World Geodetic System-1984 (WGS-84). Since 1 January 1998, published geographical co-ordinates indicating latitude and longitude used in aviation have been expressed in terms of the World Geodetic System - 1984 (WGS - 84). Since 5 November 1998, in addition to the elevation (referenced to mean sea level) for the specific surveyed ground positions, geoid undulation (gravity variations caused by the varying radius of the Earth referenced to the WGS-84 ellipsoid) for those positions specified in the AIP AD section is also required to be published. This has implications for the orbits of satellites used in SatNav systems.

The Integrated Aeronautical Information Package

18.10 Definition and Contents. The Integrated Aeronautical Information Package is a system of dissemination of information essential to aviation operations and safety. It consists of the following elements:

- Aeronautical Information Publication (AIP - including amendment service)
- Supplements to the AIP
- NOTAM and pre-flight information bulletins (PIBs)
- Aeronautical Information Circulars (AICs)
- Checklists and Summaries

The Aeronautical Information Publication (AIP)

18.11 Use. The AIP (previously called the 'Air Pilot' in the UK) is designed to allow information of a generally 'static' nature to be published, if practicable, in a form that can be used in flight (e.g. instrument approach plates or SID plates). The AIP is required to be the definitive reference for permanent information and for information concerning long duration temporary changes. This means that aircrew and operators can rely on the information published to be accurate and up to date. The AIP does not contain aerodrome operating minima which are defined by the operator e.g. visual criteria to continue an instrument approach.

18.12 Contents. The AIP consists of three parts:

- Part 1 - General (GEN)
- Part 2 - En route (ENR)
- Part 3 - Aerodrome Data (AD)

18.13 Part 1 - GEN. Part 1 contains information of a regulatory and administrative nature. It consists of five sections. It is important to know that differences to the ICAO SARPs and PANS notified by the State publishing the AIP are detailed fully at GEN 1.7 (this is the usual method of referral to the AIP contents). The complete content of part 1 (by headings) is as follows but the learning objectives only require the student to recall the location of the information in bold italics:

- **GEN 0** Preface; Record of AIP amendments; Record of AIP Supplements; Checklist of AIP pages; List of hand amendments to Part 1; Table of Contents to Part 1;
- **GEN 1** National regulations and requirements - Designated authorities; Entry, transit and departure of aircraft; **Entry, transit and departure of passengers, crew and cargo; Aircraft instruments, equipment and flight documents**; Summary of national regulations and international agreements/conventions; **Differences from ICAO Standards and Recommended Practices**.
- **GEN 2** Tables and Codes - Measuring system, aircraft markings, holidays; Abbreviations used in AIS publications; Chart symbols; **ICAO 4 letter Location indicators**; List of Radio Navigation Aids; Conversion tables; Sunrise/Sunset tables; Rate of Climb Table.
- **GEN 3** Services - **Aeronautical Information Services**; Aeronautical Charts; Air Traffic Services; Communications Services; **Meteorological Services**; Search and Rescue.
- **GEN 4** Charges for aerodrome/heliport and air navigation services.

18.14 Part 2 - En Route (ENR). This part contains information for planning flights. It also contains information of a procedural administrative nature to allow notification of flights (submission of a Flight Plan) and compliance with ATC requirements. It consists of seven sections.

- **ENR 0** Preface: List of hand amendments to Part 2; Table of Contents of Part 2.
- **ENR 1** General rules and procedures - **General rules; Visual flight rules; Instrument flight rules**; ATS airspace classification; **Holding, Approach and Departure procedures**; Radar services and procedures; **Altimeter setting procedures**; Regional Supplementary procedures; Air Traffic flow management; Flight Planning; Addressing of flight plan messages; **Interception of civil aircraft; Unlawful interference; Air traffic incidents**; Off-shore operations.
- **ENR 2** **Air traffic services airspace** - Detailed description of Flight Information Regions (FIR); Upper Flight Information Regions (UIR); Terminal Control Areas (TMA); other regulated airspace.
- **ENR 3** **ATS routes** - Detailed description of Lower ATS routes; Upper ATS routes; Area navigation routes; Helicopter routes; Other routes; En route holding; **Minimum flight Altitude**.
- **ENR 4** Radio Navigation aids/systems - Radio navigation aids - en route; Special navigation systems; Name-code designators for significant points; Aeronautical ground lights - en route.
- **ENR 5** **Navigation warnings - Prohibited, restricted and danger areas**; Military exercise and training areas; Other activities of a dangerous nature; Air navigation obstacles - en route; Aerial sporting and recreational activities; Bird migration and areas of sensitive fauna.
- **ENR 6** En route charts - En route Chart ICAO and index charts.

18.15 Part 3 - Aerodromes. This part consists of four sections containing information concerning aerodromes (and heliports). Each aerodrome entry contains specified information in accordance with a set schedule. For instance, AD2.3 for EGLL (Heathrow) contains details of operational hours of the aerodrome; AD2.3 for EGTK (Oxford) contains the same information applicable to that aerodrome. The contents are:

- **AD 0** Preface; List of hand amendments to Part 3; Table of Contents to Part 3.
- **AD 1** Aerodrome/Heliports - Introduction - Aeronautical/helicopter availability; Rescue and fire fighting services and snow plan; Index to aerodromes and heliports; Grouping of aerodromes/heliports.
- **AD 2** Aerodromes - Detailed information about aerodromes (including helicopter landing areas if located at the aerodromes) listed under 24 sub-sections, including information concerning: Aprons, taxiways and check locations; surface movement guidance and control systems and markings; radio navigation and landing aids; charts relating to an aerodrome; refuelling facilities.
- **AD 3** Heliports - Detailed information about heliports (not located at aerodromes), listed under 23 sub-sections.

18.16 AIP Amendments. All changes to the AIP, or new information on a reprinted page, is identified by a distinctive symbol or annotation. In the UK this is a vertical black line in the page margin adjacent to the amended/new data. The AIP is amended or reissued at regular intervals as are necessary to keep the data up to date. The normal method of amendment is by replacement pages. Permanent changes to the AIP are published as AIP amendments. Each AIP amendment is allocated a consecutive serial number and each amended page, including the cover sheet, shows the publication date.

18.17 AIRAC. Operationally significant changes to the AIP are published in accordance with Aeronautical Information Regulation and Control procedures, and shall be clearly identified by the acronym - AIRAC. Each AIRAC AIP amendment page, including the cover sheet, must display an effective date. AIRAC is based on a series of common effective dates at intervals of 28 days (started 10 Jan 91). AIRAC information is distributed by the AIS unit at least 42 days in advance of the effective date and the information notified must not be changed for at least another 28 days after the effective date, unless the circumstance notified is of a temporary nature and would not persist for the full period. Whenever major changes are planned and where additional notice is desirable, a publication date 56 days in advance of the effective date should be used.

18.18 AIP Supplements. Temporary changes of long duration (three months or longer) and information of short duration which contains extensive text and/or graphics are published as AIP supplements. Each AIP supplement is allocated a serial number which shall be consecutive and based on the calendar year. AIP supplement pages are kept in the AIP as long as all or some of their contents remain valid. When an AIP supplement is sent in replacement of a NOTAM, it is to include a reference to the serial number of the NOTAM. A checklist of AIP supplements currently in force is issued at intervals of not more than one month (i.e. monthly or more frequent). AIP supplement pages should be coloured in order to be conspicuous, preferably in yellow.

Notices to Airmen (NOTAM)

18.19 Definition: NOTAM are notices distributed by means of telecommunications containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

18.20 Origination. NOTAM are to be originated and issued promptly whenever the information to be distributed is of a temporary nature and of short duration, or when operationally significant permanent changes, or temporary changes of long duration, are made at short notice (except when extensive text and/or graphics is essentially included, in which case, the information is published as an AIP supplement). NOTAM are required whenever information is of direct operational significance.

18.21 AIRAC Notification. When an AIP amendment or an AIP Supplement is published in accordance with AIRAC procedures, NOTAM are to be originated giving a brief description of the contents, the effective date and the reference number to the amendment or supplement. This NOTAM shall come into force on the same effective date as the amendment or supplement.

18.22 Notice and Validity. NOTAM should remain in force as a reminder in the pre-flight information bulletin until the next checklist/summary is issued. Whenever possible, at least 24 hours' advance notice is desirable, to permit timely completion of the notification process and to facilitate airspace utilization planning. NOTAM notifying the unserviceability of aids to air navigation, facilities or communication services should give an estimate of the period of unserviceability or the time at which restoration of service is expected.

18.23 Excluded Matter. NOTAM should not include information of non-operational importance including partial failures of lighting or ground systems, routine maintenance, any work in progress on runways not in use or if the equipment can be rapidly removed from the duty runway, temporary obstructions, local area parachuting, and the lack of apron marshalling services and road traffic control.

18.24 Distribution. NOTAM are to be distributed to addressees to whom the information is of direct operational significance, and who would not otherwise have at least seven days prior notification. The aeronautical fixed telecommunication network (AFTN - teleprinter) is, whenever practicable, employed for NOTAM distribution. When NOTAM are sent by means other than the AFTN a six digit date-time group indicating the date and time of filing the NOTAM and the identification of the originator is used, preceding the text.

18.25 NOTAM Checklists. A checklist of current NOTAM is issued at intervals of not more than one month. The checklist is to refer to the latest AIP amendment, AIP supplement and the internationally distributed AICs.

18.26 Errors. When errors occur in a NOTAM, a NOTAM with a new number to replace the erroneous NOTAM will be issued or the erroneous NOTAM cancelled and a new NOTAM issued.

18.27 Summary. A monthly printed plain language summary of NOTAM in force, including the indications of the latest AIP amendments, checklist of AIP supplements and AIC issued, is to be sent by the most expeditious means to recipients of the IAIP.

SNOWTAM

18.28 Description. Information concerning snow, ice and standing water on aerodrome pavement areas is to be reported by SNOWTAM. Its validity is a maximum of 24 hours.

18.29 Contents of a SNOWTAM. Appendix 2 to Annex 15 details the requirements of a SNOWTAM. The information contained is as follows (If a field is not applicable then it is left blank and nothing is transmitted):

- A. The ICAO aerodrome locator code e.g. EGLL (Heathrow)
- B. The date/time of observation (UTC)
- C. Runway designators (e.g. 27R)
- D. Cleared runway length if less than published length (m)
- E. Cleared runway width if less than the published width (m; if off set: L or R)
- F. Deposits over total runway length:

• Nil - Clear and dry

• Damp

• Wet or water patches

• Rime or frost covered

• Dry snow

• Wet snow

• Slush

• Ice

• Compacted or rolled snow

• Frozen ruts or ridges
- G. Mean depth (mm) for each third of total runway length
- H. Friction measurement on each third of runway and friction measuring device

Friction Coefficient	Estimated surface friction	Code
0.4 and above	Good	5
0.39 – 0.36	Medium to good	4
0.35 – 0.3	Medium	3
0.29 – 0.26	Medium to poor	2
0.25 and below	Poor	1
Reading unreliable	Unreliable	9

Figure 18.1 Surface friction reporting codes

- J. Critical snow banks (m)
- K. Runway lights (if obscured "yes" followed by L , R or LR)
- L. Further clearance (if planned inset length/width to be cleared or if to full dimensions insert FULL)
- M. Further clearance expected to be completed by (UTC)
- N. Taxiway
- P. Taxiway snow banks (if > 60 cm insert "Yes" followed by distance apart (m))
- Q. Apron
- S. Next planned observation /measurement is for (month/day/hour (UTC))
- T. Plain language remarks

18.30 SNOWCLO. A term used in a VOLMET broadcast to indicate that an aerodrome is closed due to snow or snow clearance in progress.



Photo: Mercedes Benz

Figure 18.2 Snow clearance

18.31 Wheel Braking On Wet Runways. The inherent friction characteristics of a runway surface deteriorate only slowly over a period of time, but the friction of a runway surface and thus the braking action can vary significantly over a short period in wet conditions depending on the actual depth of water on the runway. Also, long term (six monthly) seasonal variations in friction value may exist. The consequence of combination of these factors is that no meaningful operational benefit can be derived from continually measuring the friction value of a runway in wet conditions. In the context of these paragraphs a 'wet runway' covers a range of conditions from 'Damp' to 'Flooded' as described below. It does not include ice or runways contaminated with snow, slush, or water associated with slush. Paved runways of 1200 m and longer at civil aerodromes licensed for public use have been calibrated, to ensure that the friction characteristics of a runway surface are of a quality to provide good braking action in wet conditions. The presence of water on a runway will be reported on R/T using the following descriptions:

Description	Meaning
Dry	The surface is dry
Damp	The surface shows a change of colour due to moisture
Wet	The surface is soaked but no significant patches of standing water are visible.
Water Patches	Significant patches of standing water are visible
Flooded	Extensive standing water is visible.

Figure 18.3 Runway surface description

18.32 Interpretation. When a runway is reported as ‘DAMP’ or ‘WET’ pilots may assume that an acceptable level of runway wheel braking friction is available. When a runway is reported as having ‘WATER PATCHES’ or being ‘FLOODED’ braking may be affected by aquaplaning and appropriate operational adjustments should be considered. “Water patches” will be used if at least 25% of the runway length is covered with standing water. When a runway is notified as liable to be slippery when wet, take-offs or landings in wet conditions should only be considered when the distances available equal or exceed those required for a very slippery or icy runway as determined from information in the aeroplane’s Flight Manual. At military aerodromes in the UK, runway surface conditions will be described in plain language, and, where a braking action measuring device has been used, braking action will be described as good, medium or poor.

ASHTAM

18.33 Purpose. Volcanic ash cloud presents a significant hazard to turbine engine aeroplanes. Timely warning of the presence of ash clouds or the possibility of an ash cloud existing is vital to safe operations in areas where volcanic activity is common. Information concerning an operationally significant change in volcanic activity, a volcanic eruption and/or volcanic ash cloud is reported by means of an ASHTAM.

18.34 Description. The ASHTAM provides information on the status of activity of a volcano when a change in its activity is, or is expected to be of operational significance. This information is provided using the volcano level of alert colour code. In the event of a volcanic eruption producing ash cloud of operational significance, the ASHTAM also provides information on the location, extent and movement of the ash cloud and the air routes and flight levels affected. The maximum period of validity of an ASHTAM is 24 hours. A new ASHTAM must be issued whenever there is a change in the alert level.

18.35 ASHTAM Colour Code. The table below details the volcano alert code used in field E of an ASHTAM:

Colour	Description of Volcanic Activity
Red	Volcanic eruption in progress. Pyroclastic ash plume/cloud reported above FL250, or volcano dangerous, eruption likely, with pyroclastic ash plume/cloud expected to rise above FL250
Orange	Volcanic eruption in progress. Pyroclastic ash plume/cloud not reaching nor expected to reach FL250, or volcano dangerous, eruption likely, with pyroclastic ash plume/cloud not expected to reach FL250
Yellow	Volcano known to be active from time to time and volcanic activity has recently increased significantly, volcano not currently considered dangerous but caution should be exercised, or after a volcanic eruption (i.e. change in alert to yellow from red or orange) volcanic activity has decreased significantly, volcano not currently considered dangerous but caution should be exercised.
Green	Volcanic activity considered to have ceased and volcano reverted to its normal state.

Figure 18.4 ASHTAM colour code

Aeronautical Information Circulars (AICs)

18.36 Description. AICs are a method whereby information that does not qualify for inclusion in the AIP or is not suitable for NOTAM is disseminated to all interested parties. An AIC is originated whenever it is desirable to promulgate: a long-term forecast of any major change in legislation, regulations, procedures or facilities; information of a purely explanatory or advisory nature liable to affect flight safety; or information or notification of an explanatory or advisory nature concerning technical, legislative or purely administrative matters.

18.37 General Specifications of AICs. AICs are issued in printed form, and both text and diagrams may be included. The originating State can select the AICs that are to be given international distribution. AICs are allocated a serial number which should be consecutive and based on the calendar year. When AICs are distributed in more than one series, each series is separately identified by a letter. It is normal for differentiation and identification of AIC topics according to subjects to use a colour coding system (i.e. the paper on which the information is published is distinguished by topic by different colour). A checklist of AIC currently in force is issued at least once a year, with distribution as for the AIC. AICs in the UK are published on Thursdays every 28 days.

18.38 Colour Coding of UK AICs. Annex 15 recommends that AICs are colour-coded according to topics. In the UK the following colour coding scheme for AICs is adopted.

Colour	Meaning
Pink	Matters relating to safety
Yellow	Operational matters including ATS facilities and requirements
White	Administrative matters e.g. exam dates and fees
Mauve (Purple)	UK airspace reservations imposed in accordance with applicable regulations
Green	Maps and Charts

Figure 18.5 Colour coding of AICs

Pre-flight and Post-flight Information

18.39 Pre-flight Information. At any aerodrome normally used for international air operations, aeronautical information essential for the safety, regularity and efficiency of air navigation and relative to the route stages originating at the aerodrome must be made available to flight operations personnel, including flight crews and services responsible for pre-flight information. Aeronautical information provided for pre-flight planning purposes at the aerodromes must include: relevant elements of the Integrated Aeronautical Information Package; and maps and charts. The documentation may be limited to national publications and when practicable, those of immediately adjacent states, provided a complete library of aeronautical information is available at a central location and means of direct communications are available between the aerodrome AIS unit and that library.

18.40 Aerodrome Information. Additional current information relating to the aerodrome of departure shall be provided concerning the following:

- Construction or maintenance work on or immediately adjacent to the manoeuvring area;
- Rough portions of any part of the manoeuvring area, whether marked or not (For example: broken parts of the surface of runways and taxiways);
- Presence and depth of snow, ice or water on runways and taxiways, including their effect on surface friction;
- Snow drifted or piled on or adjacent to runways or taxiways;
- Parked aircraft or other objects on or immediately adjacent to taxiways;
- Presence of other temporary hazards including those created by birds;

- 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;
- Failure, irregular operation and changes in operation status of ILS (including markers) SRE, PAR, DME, SSR, VOR, NDB, VHF aeronautical mobile channels, RVR observing system, and secondary power supply;
- Presence and operations of humanitarian relief missions, such as those undertaken under the auspices of the United Nations, together with any associated procedures, and/or limitations applied thereof.

18.41 PIBs. A recapitulation of current NOTAM and other information of urgent character shall be made available to flight crews in the form of plain language pre-flight information bulletins (PIB).

18.42 Post-flight Information. States shall ensure that arrangements are made to receive at aerodromes/heliports information concerning the state and operation of air navigation facilities noted by aircrews, and shall ensure that such information is made available to the aeronautical information service for such distribution as the circumstances necessitate.

Questions

1. **What level of alert would be inserted in field E of an ASHTAM following a volcanic eruption in which a pyroclastic ash cloud extends above FL250?**
 - a. Red alert.
 - b. Orange alert.
 - c. Yellow alert.
 - d. Green alert.
2. **In which section of the AIP would you find information on holding, approach and departing procedures?**
 - a. GEN.
 - b. ENR.
 - c. SAT.
 - d. AD.
3. **An integrated aeronautical information package consists of:**
 - a. AIP and amendment service, supplement to the AIP, NOTAM, Pre-flight Information Bulletins (PIBs), AICs, checklists and summaries.
 - b. AIP and amendment service, NOTAM, Pre-flight Information Bulletins (PIBs), and AICs, AIRAC, checklists and summaries.
 - c. AIP and amendment service, supplement to the AIP, NOTAM, AIRAC, AICs, checklists and summaries.
 - d. AIP & Supplements, AIRAC, NOTAM and pre-flight bulletins.
4. **In what section of the AIP are details of SIGMET found?**
 - a. GEN.
 - b. ENR.
 - c. AD.
 - d. COMMS.
5. **Where in the AIP is a list of Location Indicators to be found?**
 - a. GEN.
 - b. COMMS.
 - c. AD.
 - d. AGA.
6. **A check list for NOTAM is issued:**
 - a. every 5 days.
 - b. every 28 days.
 - c. every 18 days.
 - d. at intervals of not more than one month.
7. **AIP approach charts do not give information for Instrument Approach Procedures for:**
 - a. OCA/H.
 - b. visibility minima.
 - c. obstacles protruding above the obstacle free zone.
 - d. DME frequencies.

8. AIP supplements with extensive text and graphics cover a short period. What is a long period in this respect?
- a. 1 yr.
 - b. 2 months.
 - c. 3 months.
 - d. 6 months.
9. AIRAC is:
- a. a breakdown service.
 - b. operationally significant changes to the AIP.
 - c. a medical evacuation flight.
 - d. an Army Air Corps publication.
10. What information is not on an aerodrome approach plate?
- a. DME frequency.
 - b. OCA.
 - c. Dominant obstacles.
 - d. Operating minima if the aerodrome is being used as an alternative.
11. Where in the AIP is information concerning re-fuelling facilities and services found?
- a. ENR.
 - b. SUPP.
 - c. AD.
 - d. GEN.
12. Where in the AIP would you find information concerning prohibited, restricted or danger areas?
- a. ENR.
 - b. SUPP.
 - c. AD.
 - d. GEN.
13. In what part of the AIP are the details of SIGMET found?
- a. GEN.
 - b. ENR.
 - c. AD.
 - d. AIRAC.
14. What is the coefficient of braking, if the braking action is reported as medium?
- a. Between 1.0 and 0.25.
 - b. Between 0.25 and 0.3.
 - c. Between 0.30 and 0.35.
 - d. Between 0.35 and 0.4.

15. Regarding the AIS what is the time limit for a checklist of current NOTAM to be issued?
- a. 7 days.
 - b. 14 days.
 - c. 28 days.
 - d. One month.
16. A checklist of the active NOTAM must be published on the AFTN at intervals of:
- a. not more than 28 days.
 - b. not more than 15 days.
 - c. not more than 1 month.
 - d. not more than 10 days.
17. Operationally significant changes to the AIP shall be published in accordance with:
- a. AICs.
 - b. AIP Supplements.
 - c. AIRAC procedures.
 - d. trigger NOTAMS.
18. A notice containing information concerning flight safety, air navigation, administration or legislative matters and originated at the AIS of a state is called:
- a. Aeronautical Information Publication (AIP).
 - b. Aeronautical Information Circular (AIC).
 - c. AIRAC.
 - d. NOTAM.

15. TODA consists of:
- a. TORA but excluding the clearway.
 - b. TORA and includes the clearway.
 - c. TORA but excluding the stopway.
 - d. TORA only.

Answers

1	2	3	4	5	6	7	8	9	10	11	12
d	a	d	c	d	c	c	b	c	a	c	c

13	14	15
d	b	b

Chapter

20

Aerodromes - Visual Aids, Markings and Signs

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Requirements

20.1 Background. The complex nature of aerodromes coupled with the fact that no two aerodromes have the same layout, operations and geographic position, makes standardization in the provision of visual information to pilots taxiing aircraft and preparing for landing or take-off, essential. Annex 14 specifies the applicable SARPs and the learning objectives are specific in requiring the student to have more than just a theoretical understanding of the subject. The discussion is broken down into three sections dealing with visual aids for navigation, aerodrome markings, and aerodrome signage. It must be born in mind that whilst the SARPs are adopted by all Contracting States, there may be differences and there may be some signs for instance, seen at foreign aerodromes that are not seen on a UK aerodrome and vice versa.

Visual Aids for Navigation

20.2 Indicators and Signalling Devices. Aerodromes are required to be equipped with a means of indicating the wind direction to pilots of non-radio aircraft. Remember, the Rules of the Air require a pilot to land and take off into wind, so there must be a method of indication. In order for a non-radio pilot to know what the landing direction is, a landing indicator is required. Also a means of communicating visual signals to non-radio aircraft is required to be positioned in the visual control room.

20.3 Wind Direction Indicators. An aerodrome must be equipped with at least one wind direction indicator (commonly called a 'wind sock'). The wind direction indicator should be in the form of a truncated cone made of fabric and should have a length of not less than 3.6 m and a diameter, at the larger end, of not less than 0.9 m. It should be constructed so that it gives a clear indication of the direction of the surface wind and a general indication of the wind speed. The colour or colours should be so selected as to make the wind direction indicator clearly visible and understandable from a height of at least 300 m, having regard to background. Where practicable, a single colour, preferably white or orange, should be used. The location of at least one wind direction indicator (the 'master' wind sock) should be marked by a circular white band 15 m in diameter and 1.2 m wide. Provisions should be made for illuminating at least one wind indicator at an aerodrome intended for use at night.

20.4 Landing Direction Indicator. When provided, a landing direction indicator shall be located in a conspicuous place on the aerodrome. If a signal square is provided, a landing "T" will always be included in the signs in the square. The landing direction indicator should be in the form of a "T". The colour of the "T" should be either white or orange, the choice being dependent on the colour that contrasts best with the background against which the indicator will be viewed. Where required for use at night the landing "T" is to be either illuminated or outlined by white lights.

20.5 Signalling Lamp. A signalling lamp must be provided at a controlled aerodrome in the aerodrome control tower for the purpose of showing the light signals to aircraft either in the air or on the ground as defined in Chapter 6. The lamp, usually an Aldis lamp specially designed for signalling, must be capable of producing red, green and white light and of being aimed manually at any target as required; giving a signal in any one colour followed by a signal in either of the other two colours; and being operated to transmit a message in any one of the three colours by Morse code up to a speed of at least four words per minute.

20.6 Signal Panels and Signal Area. The provision of a signals area ('signals square') at an aerodrome implies that non-radio traffic is accepted. A signals area is not required if an aerodrome authority has proscribed routine non-radio traffic (the aerodrome would still be required to provide a service to an aircraft suffering a communications failure that has indicated the intention to land). The signals area should be located so as to be visible for all angles of azimuth above an angle of 10° above the horizontal when viewed from a height of 300 m. The signals area shall be an even horizontal surface of at least 9 m square. The colour of the signal area should be chosen to contrast with the colours of the signal panels used, and it should be surrounded by a white border not less than 0.3 m wide. It is normal for the signals area to be positioned in front (on the aerodrome side) of the control tower/VCR. The signals that may be displayed in the signals area are covered in Chapter 6.

Runway Markings

20.7 General. Markings are characters, numbers and shapes painted on the concrete surfaces of the aerodrome. Markings are found on runways, taxiways and aprons. Markings may either give location or directional information or indicate a mandatory requirement e.g. to stop. The colour of a marking is dependent upon where it is used and the size must be sufficient for it to be read or understood easily from the flight deck of an aeroplane. The ICAO standard is for runway markings to be white and taxiway markings to be yellow.

20.8 Runway Markings. Runway markings are white. It has been found that, on runway surfaces of light colour, the conspicuity of white markings can be improved by outlining them in black. Large areas of paint can create a friction problem; therefore this should be reduced, as far as practicable, by the use of a suitable kind of paint. Markings may consist of numbers and letters, solid areas, or a series of longitudinal stripes providing an effect equivalent to the solid areas. Generally, runway markings assist the pilot with locating the threshold, identifying the runway, defining the centre line and locating the aiming point. Additionally for an instrument runway, as well as the aiming point, it will have touchdown zone markings.



Figure 20.1 Runway markings at RAF Brize Norton

20.9 Runway Designation Marking. A runway designation marking is to be provided at the threshold of paved runways, and as far as is practicable at the threshold of unpaved (grass) runways. If the runway threshold is displaced from the extremity of the runway, a sign showing the designation of the runway may be provided for aeroplanes taking off.

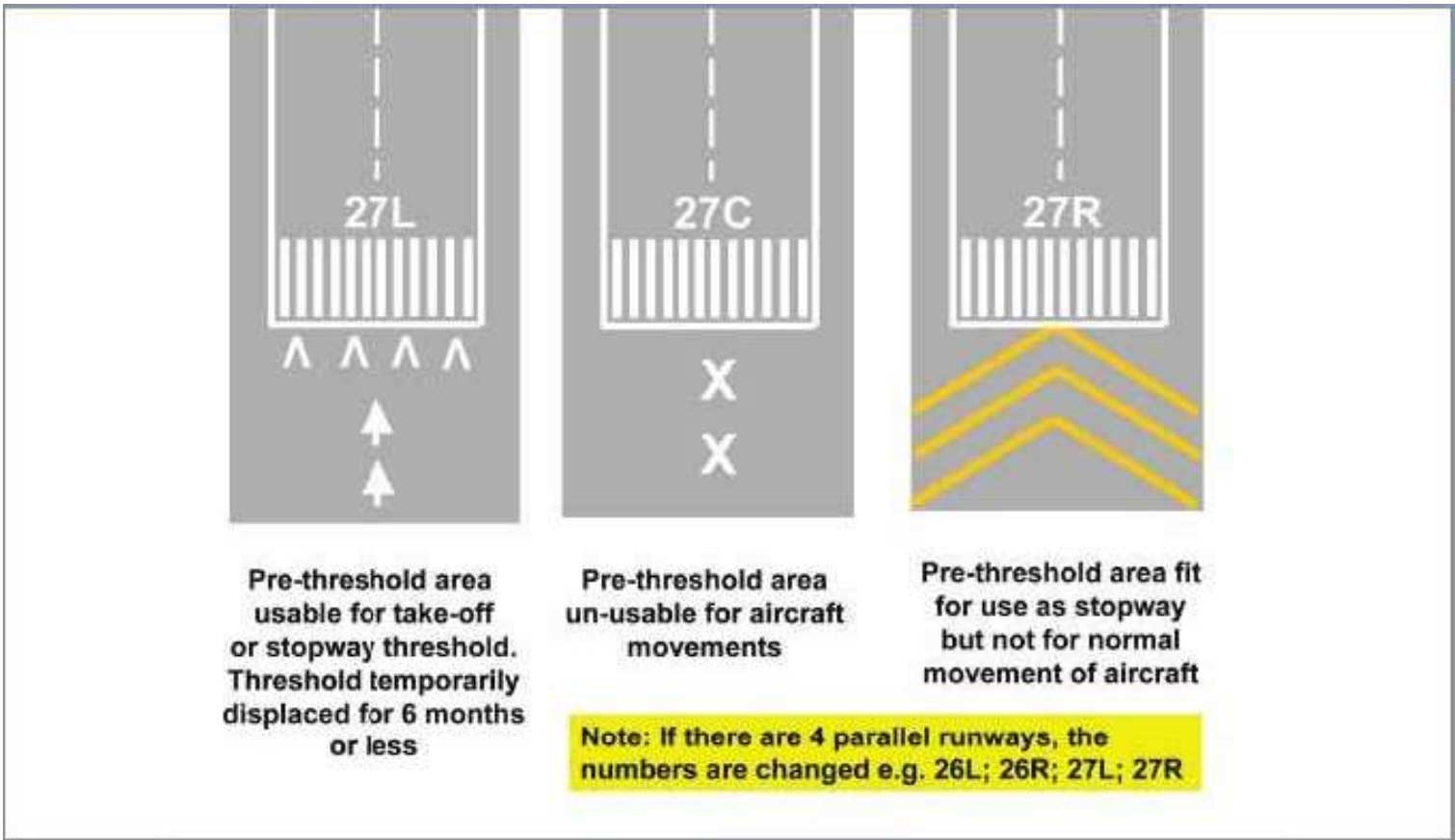


Figure 20.2 Runway designation markings

20.10 Characteristics. A runway designation marking should consist of a two digit number and on parallel runways shall be supplemented with a letter. On a single runway, dual parallel runways and triple parallel runways the two digit number shall be the whole number nearest the magnetic bearing (QDM) divided by 10 ($094 \div 10 = 09.4$ rounded down to 09) of the runway when viewed from the direction of approach. On four or more parallel runways, one set of adjacent runways shall be numbered to the nearest one tenth QDM and the other set of adjacent runways numbered to the next nearest one tenth of the QDM. When the above rule would give a single digit number, it shall be preceded by a zero. In some states the '0' is omitted e.g. at New York JFK the south to north runways are '4R' and '4L'. In the case of parallel runways, each runway designation number shall be supplemented by a letter as follows, in the order shown from left to right when viewed from the direction of approach:

- For two parallel runways "09L" "09R";
- For three parallel runways "09L" "09C" "09R";
- For four parallel runways "09L" "09R" "10L" "10R" (in this case the QDM for one pair will be increased to differentiate that pair from the other).

20.11 Runway Centre Line Marking. A runway centre line marking is required on a paved runway. The centre line marking is painted along the centre line of the runway between the runway designation markings.

20.12 Characteristics. A runway centre line marking consists of a line of uniformly spaced stripes and gaps. The length of a stripe plus a gap shall be not less than 50 m or more than 75 m. The length of each stripe shall be at least equal to the length of the gap or 30 m, whichever is greater.

20.13 Threshold Marking. The threshold of a runway is either the beginning of the marked out grass area, or the start of the concrete strip. A threshold marking is required to be provided at the thresholds of paved instrument runways, and of paved non-instrument code 3 and 4 runways and the runway is intended for use by international commercial air transport. A threshold marking should be provided, as far as is practicable, at the threshold of an unpaved runway.

20.14 Location. The stripes (commonly known as 'piano keys') of the threshold marking, should start 6 m from the threshold.

20.15 Characteristics. A runway threshold marking is a pattern of longitudinal stripes of uniform dimensions disposed symmetrically about the centre line of the runway. For a runway width of 45 m (for non-precision approach and non-instrument runways 45 m or greater in width) they may be placed either side of the runway designation number. The stripes should extend laterally to within 3 m of the edge of the runway or to a distance of 27 m on either side of a runway centre line, whichever results in the smaller lateral distance. Where a runway designation marking is placed within a threshold marking there will be a minimum of three stripes on each side of the centre line of the runway. Where a runway designation marking is placed above a threshold marking the stripes shall be continued across the runway. The stripes shall be at least 30 m long and approximately 1.80 m between them except where the stripes are continued across a runway, in which case a double spacing shall be used to separate the two stripes nearest the centre line of the runway. In the case where the designation marking is included within the threshold marking this spacing shall be 22.5 m. The number of stripes shall be in accordance with the runway width as follows:

Runway Threshold Markings	
Runway Width	Number of Stripes
18 m	4
23 m	6
30 m	8
45 m	12
60 m or more	16



Figure 20.4 Runway threshold markings

20.16 Transverse Stripe. Where a threshold is displaced from the extremity of a runway (the end of the concrete) or where the end is not at right angles to the runway centre line, a transverse stripe should be added to the threshold marking. When a runway threshold is permanently displaced, arrows shall be provided on the portion of the runway before the displaced threshold. The reasons why a threshold may be displaced have been discussed in Chapter 19.

20.17 Aiming Point Marking. The aiming point marking indicates the position of the origin of the visual glide slope (PAPI) and the ILS GP transmitter. An aiming point marking is to be provided at each approach end of code 2, 3 or 4 paved instrument runways. It is recommended that an aiming point marking is provided on code 1 paved instrument runways and code 3 or 4 paved non-instrument runways when additional conspicuity of the aiming point is desirable. An ICAO specification aiming point marking consists of two conspicuous stripes.

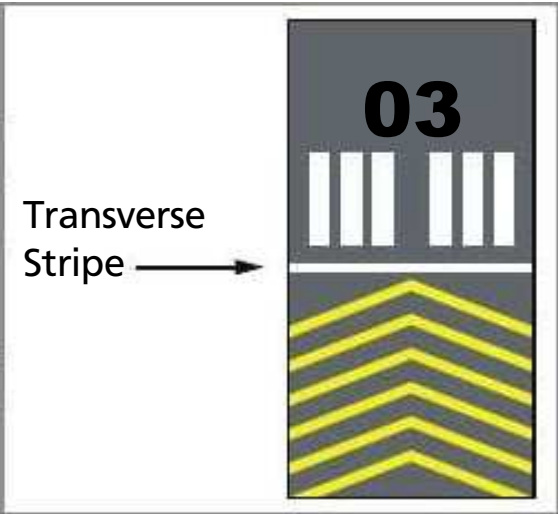


Figure 20.3

20.18 Location. The aiming point marking shall commence no closer to the threshold than the distance indicated in the appropriate column of *Figure 20.5*, except that on a runway equipped with a visual approach slope indicator system (PAPI or VASI), the beginning of the marking shall be coincident with the visual approach slope origin. For a code 4 runway less than 2400 m long, the aiming point is positioned 300 m from the threshold. For a normal 3° glide path (300 ft/NM), the aircraft on glide path will cross the threshold at a height of 50 ft. Bigger aircraft require longer LDA so for runways 2400 m or more in length have the aiming point 400 m from the threshold so the aircraft crosses the threshold at 67 ft thus giving additional gear to concrete clearance.

Aiming Point Marking Location	
Landing Distance Available (LDA)	Threshold to Beginning of Marking
Less than 800 m	150 m
800 m up to but not including 1200 m	250 m
1200 m up to but not including 2400 m	300 m
2400 m or more	400 m

Figure 20.5 Location of aiming point marking

20.19 Touchdown Zone Markings. Touchdown zone (TDZ) markings indicate the area of the runway where the aeroplane should be landed. Landing Distance Available is an operational consideration for the use of a runway, but it is not common practice to land the aeroplane on the threshold marking. The TDZ markings give the pilot an indication of extent of the usable touchdown area and if distance coded, the length of the touchdown zone remaining. Markings are required for code 2, 3 and 4 paved precision approach runways, and recommended for code 3 or 4 paved non-precision or non-instrument runways, where additional conspicuity is required.

20.20 Location. TDZ markings consist of pairs of rectangular markings symmetrically placed about the runway centre line with the number of pairs related to the landing distance available. For code 4 runways (2400 m or more in length) the TDZ markings have 6 pairs.

20.21 Characteristics. Touchdown zone markings conform to either of the two patterns shown below. Pattern "A" is the basic marking system whereas pattern "B" is distance coded. The choice of patterns is not runway length dependent. The pairs of markings have longitudinal spacing of 150 m beginning from the threshold. If a pair of TDZ markings is coincident with or located within 50 m of an aiming point marking, the TDZ marking at that position is deleted from the pattern.



Figure 20.6 Pattern "A", basic plain markings



Figure 20.7 Pattern "B", distance coded

20.22 Runway Side Stripe Markings. Runway side stripe markings are to be provided between the thresholds of precision runways, and paved runways where there is a lack of contrast between the runway edges and the shoulders or the surrounding terrain. It is recommended that side stripes are marked on all precision runways regardless of the contrast with the surrounding ground. The picture of the runway at Gran Canaria, *Figure 20.7* on the previous page, shows the use of side stripes.

Taxiway Markings

20.23 Requirements. Taxiway markings and aircraft stand markings are yellow. If there is a need to enhance conspicuity, the lines may be outlined in black.



Figure 20.8 Taxiway markings

20.24 Apron Safety Lines. Although not strictly taxiway markings, in the apron areas the safe movement of aircraft into and out of parking stands can be enhanced by the use of apron safety lines. If all ground equipment and vehicles are parked or positioned behind the apron safety lines, a pilot or a marshaller can ignore the presence of those obstacles when parking aircraft. Apron safety lines are to be of a conspicuous colour which shall contrast with that used for aircraft stand markings.

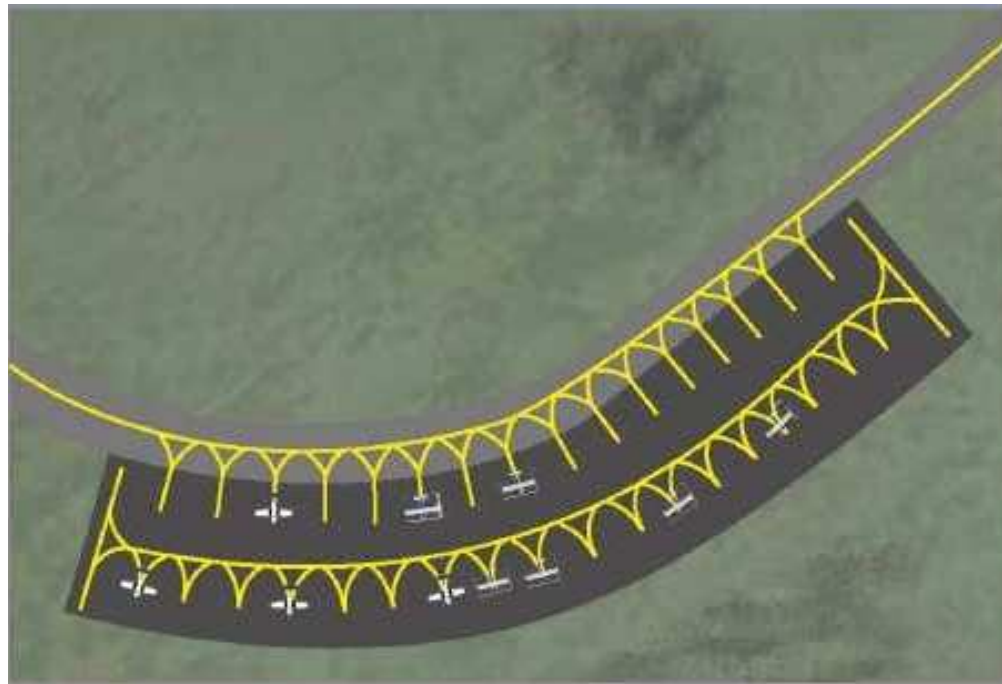


Figure 20.9 Example of aircraft stand markings

20.25 Taxiway Centre Line Markings. Taxiway centre line markings are to be provided on a paved taxiway, de/anti-icing facility and the apron areas where the code number is 3 or 4 (and recommended for code 1 and 2). Centre line markings are to give guidance from the runway centre line, to the point on the apron where aircraft stand markings commence. Taxiway centre line markings are also provided on a paved runway when the runway is part of a standard taxi-route and there is no runway centre line marking; or where the taxiway centre line is not coincident with the runway centre line. Taxiway centre line marking is a continuous yellow line. Should there be yellow side stripes, these mark non-load-bearing surfaces.

20.26 Runway Holding Position Marking. Holding points are established at the entrance to all runways. It is not uncommon for there to be more than one holding point at the entrance to a runway. A runway holding position marking is to be displayed at a runway holding point. The actual holding position is indicated by the mandatory sign (see signs later in this chapter) which will be displayed on at least the left hand side of the taxiway as the aeroplane approaches the runway. Ideally the sign should be on both sides of the taxiway. The marking is to extend all the way across the taxiway. The position may be augmented by stop bars or runway guard lights, see paragraph 21.38. The distance between a runway holding position and the centre line of the associated runway is specified in the picture after paragraph 19.53 and in the case of a precision approach runway, will be such that a holding aircraft (or vehicle) will not interfere with the operation of radio navigation aids, specifically ILS. A runway holding point may also be established where the approach to a runway passes over a taxiway to another runway. In this case, the associated sign will specify what the holding point is for.

20.27 Patterns. There are two distinct patterns for runway holding markings. These are defined as 'Pattern A' and 'Pattern B'.

20.28 Pattern A. The closest holding point to a runway will always be marked with a Pattern A marking, and it will be positioned at an intersection of a taxiway and a non-instrument (visual) runway, a non-precision approach runway or a take-off runway. Where a single taxi-holding position is provided at an intersection of a taxiway and a precision approach category I II or III runway, the taxi-holding position marking shall be Pattern A. For a code 4 runway, the Pattern A holding point will be no closer than 75 m to the centre line of the runway. It is also the visual holding point.



Figure 20.10 Runway holding markings, pattern A

20.29 Pattern B. Where two or three taxi-holding positions are provided at such an intersection, the taxi-holding position marking closer (closest) to the runway shall be as shown in pattern A and the markings further from the runway shall be pattern B. Any other holding point associated with a runway required on a taxiway will also be Pattern B.

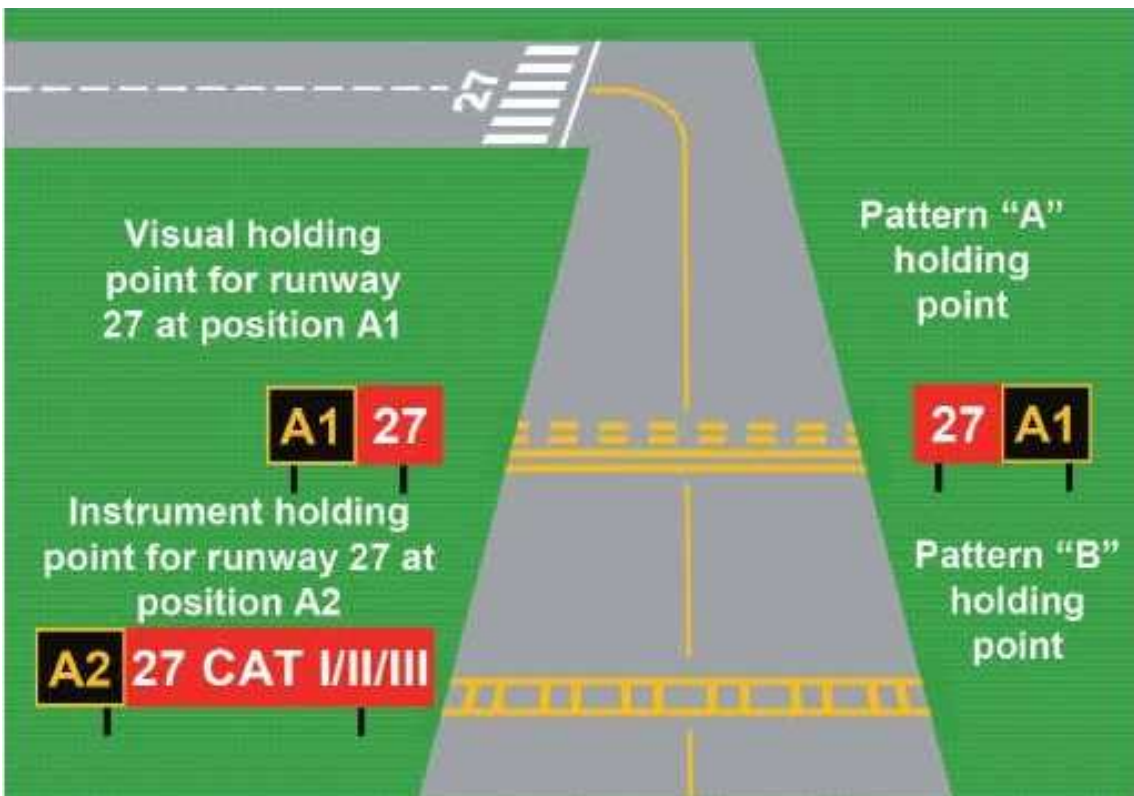


Figure 20.11 Runway holding markings, pattern B

20.30 Intermediate Holding Position Marking. Where two (or more) taxiways cross, holding points are established at suitable distances from the crossing taxiway. It may be that one taxiway has priority and the holding point marking may be augmented by a mandatory marking. It should be coincident with a stop bar or clearance bar, where provided. A taxiway intersection marking consists of a single broken yellow line.

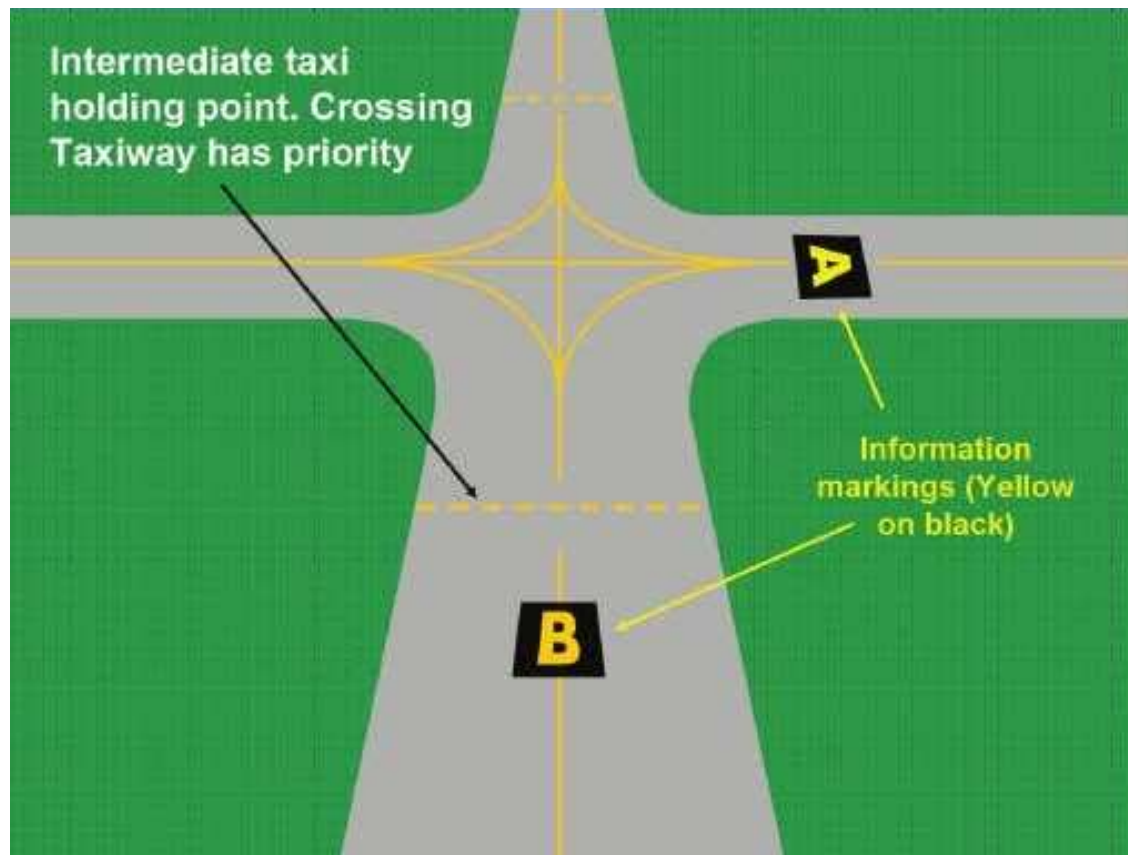


Figure 20.12 Intermediate holding position marking

20.31 Aircraft Stand Markings. Aircraft stand markings should be provided for designated parking positions on a paved apron and on de/anti-icing facilities. They should include such elements as stand identification, lead-in line, turn bar, turning line, alignment bar, stop line and lead-out line, as are required by the parking configuration and to complement other parking aids. The stand identification letter and/or number should be included a short distance after the beginning of the lead-in line. The height of the identification should be adequate to be readable from the cockpit of aircraft using the stand. Lead-in, turning and lead-out lines should normally be continuous in length. Where one or more sets of stand markings are superimposed on a stand, the lines should be continuous for the most demanding aircraft and broken for other aircraft. The curved portions of lead-in, turning and lead-out lines should have radii appropriate to the most demanding aircraft type for which the markings are intended. Where it is intended that aircraft proceed in one direction only, arrows pointing in the direction to be followed should be added as part of the lead-in and lead-out lines. A turn bar should be located at right angles to the lead-in line, abeam the left pilot position at the point of initiation of any intended turn. The distances to be maintained between the turn bar and the lead-in line may vary according to different aircraft types, taking into account the pilot's field of view. An alignment bar should be placed so as to be coincident with the extended centre line of the aircraft in the specified marking position and visible to the pilot during the final part of the parking manoeuvre. A stop line should be located at right angles to the alignment bar, abeam the left pilot position at the intended point of stop.



Figure 20.13 Aircraft stand markings

20.32 Road holding Position Markings. Road holding position markings are to be provided at all road entrances to a runway. The markings are to be located across the road at the holding position, and will be marked in accordance with the local road traffic regulations.

20.33 Mandatory Information Marking. Where it is impracticable to install a mandatory sign, a mandatory instruction marking is to be marked on the surface of the taxiway pavement. Mandatory markings are holding point signs (runway designator in white on a red background) and no entry signs. Pilots are not to pass any mandatory marking unless specifically cleared by ATC.

20.34 Information Markings. Where an information sign would normally be installed but it is physically impracticable, the information is to be displayed on the surface of the pavement. Where operationally required, an information sign should be supplemented by information markings. The information markings should be displayed across the surface of the taxiway or apron where necessary and positioned so as to be legible from the cockpit of an approaching aircraft. Information markings shall consist of an inscription in yellow, when it replaces or supplements a location sign; and an inscription in black, when it replaces or supplements a direction or destination sign. Where there is insufficient contrast between the marking and the pavement surface, the marking shall include a black background where the inscriptions are in yellow; and a yellow background where the inscriptions are in black. Markings will be combinations of characters and symbols. Markings containing numbers only are only used for runways and runway designators.

Signs

20.35 General Specification. Signs are provided on aerodromes to convey a mandatory instruction, information on a specific location or destination on a movement area, or to provide other information as required.

20.36 Characteristics. Signs shall be frangible. Those located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft. Signs shall be rectangular, with the longer side horizontal. The only signs on the movement area utilizing red shall be mandatory instruction signs. Signs showing numbers only refer to runways. Signs shall be reflective and/or illuminated when intended for use at night. Signs shall be illuminated when intended for use:

- In runway visual range conditions less than a value of 800 m, or
- At night in association with instrument runways, or
- At night in association with non-instrument runways where the code number is 3 or 4.

20.37 Mandatory Instruction Signs. A mandatory instruction sign is provided to identify the location beyond which an aircraft taxiing or vehicle shall not proceed unless authorized by the aerodrome control tower. Mandatory instruction signs include runway designation signs, category I, II and III holding position signs, taxi-holding position signs, road-holding position signs and NO ENTRY signs. A pattern "A" taxi-holding position marking shall be supplemented at a taxiway/runway intersection or a runway/taxiway intersection with a runway designation sign. A pattern "B" taxi-holding position marking shall be supplemented with a category I, II or III holding position sign. A runway designation sign at a taxiway/runway intersection should be supplemented with a location sign in the outboard (farthest from the taxiway) position as appropriate. A NO ENTRY sign shall be provided when entry into an area is prohibited.

20.38 Locations of Signs. Signs are to be located in positions such that pilots (or vehicle drivers) are able to see the sign. Signs are not to be positioned so as to create hazards to aircraft. Signs are positioned as follows:

- A runway designation sign at a taxiway/runway intersection shall be located at least on the left side of a taxiway facing the direction of approach to the runway. Where practicable, a runway designation sign shall be located on each side of the taxiway.
- A NO ENTRY sign shall be located at the beginning of the area to which the entrance is prohibited at least on the left hand side of the taxiway as viewed by the pilot. Where practicable, a NO ENTRY sign shall be located on each side of the taxiway.
- A Category I, II or III holding position sign shall be located on each side of the holding position marking facing the direction of the approach to the critical area.
- A taxi-holding position is to be located on the left-side of the taxi-holding position facing the approach to the runway or ILS/MLS critical/sensitive area, as appropriate, and where practicable, on each side of the taxi-holding position.

20.39 Characteristics. A mandatory instruction sign consists of white letters/numbers on a red background. The inscription on a runway designation sign consists of the runway designator. The inscription on a category I, II or III or joint II/III instrument approach holding position sign consists of the runway designator followed by CAT I, CAT II, CAT III, or CAT II/III, as appropriate. The inscription on a taxi-holding position sign shall consist of the taxiway designation and number.

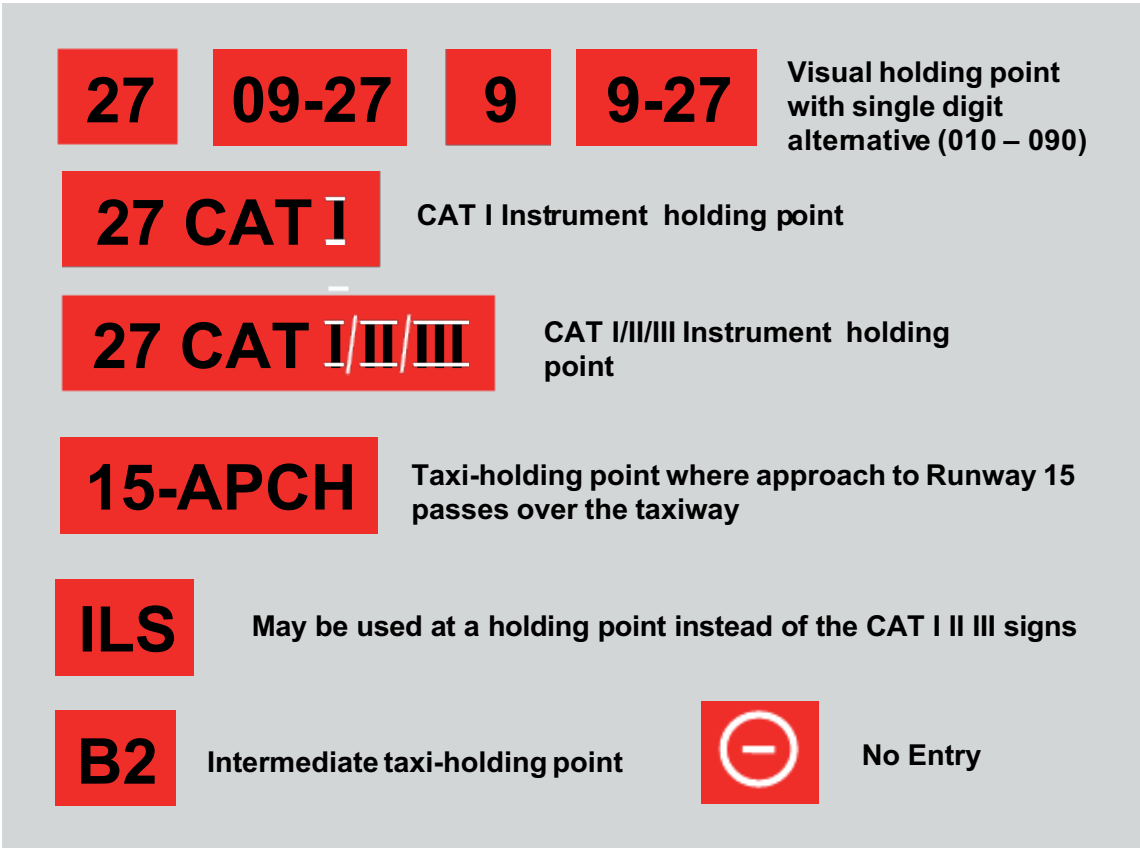


Figure 20.14 Sign characteristics

21.19 PAPI Indications. The possible combinations of the 4 light sets give 5 different indications relating to the aircraft position (correctly, the pilot's eye) with respect to the defined glide path.

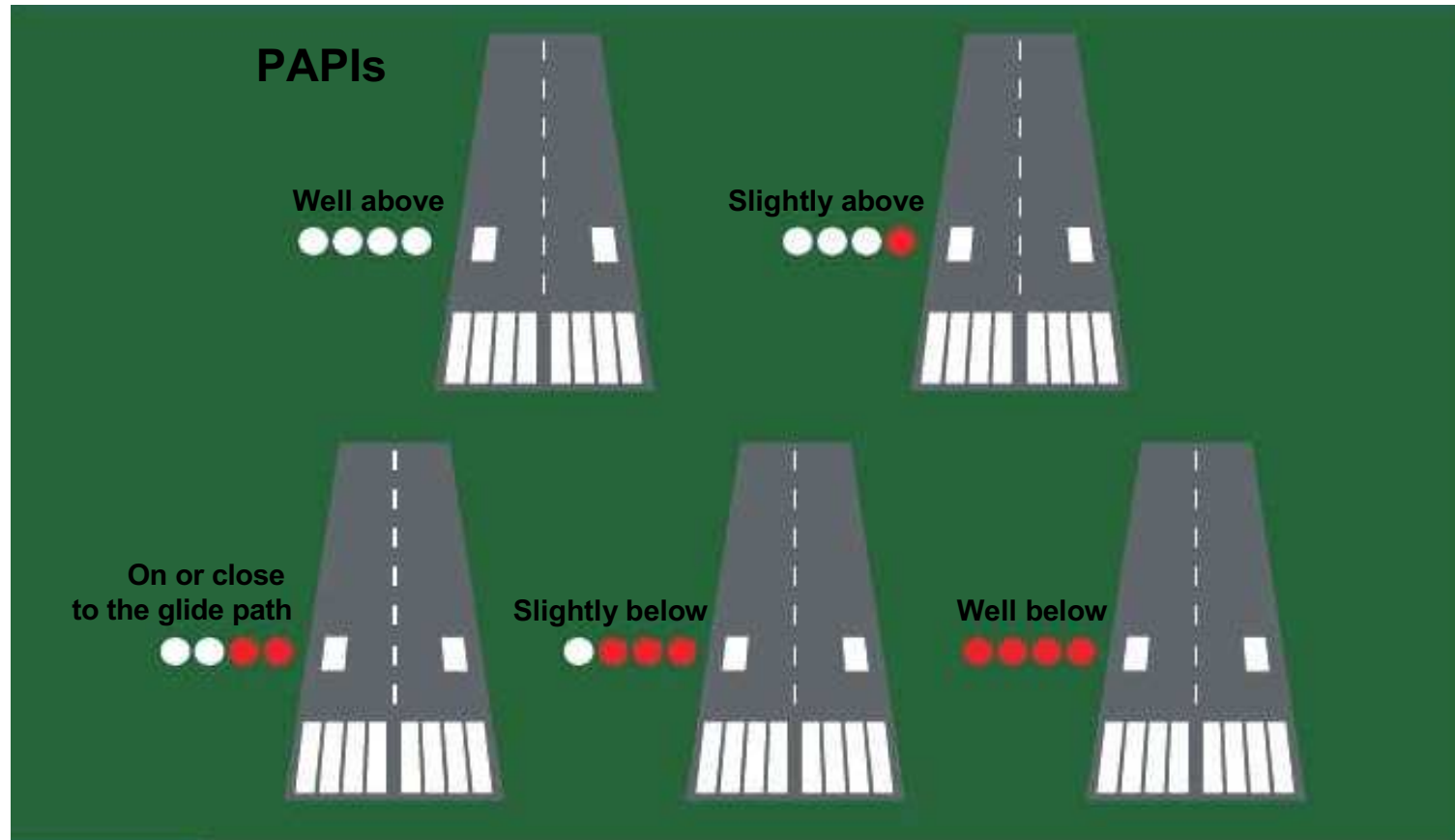


Figure 21.8 PAPI indications

21.20 Circling Approach. Where the runway is used for circling approaches (visual manoeuvring circling) a PAPI set is placed on either side of the runway. Normally there would only be one set on the left hand side. This allows the pilot to use the PAPI wing bars as a horizontal reference for aircraft attitude during the later part of the circling manoeuvre.

21.21 Minimum Eye Height (MEHT). If the PAPI system was located exactly at the threshold of the runway, and the pilot flew a visual approach keeping the aircraft exactly at the 'on glide path' position, the wheels of the aircraft would hit the ground before the aircraft reached the threshold. The distance before the threshold where the wheels hit the ground would be a function of the distance from the pilot's eye to the bottom of the undercarriage. To overcome this, the visual aiming point (coincident with the PAPI location) is set a distance down the runway. On code 4 instrument runways at least 2400 m in length, the aiming point is set 400 m from the threshold in which case, for a normal 3° glide path, the pilot's eye would be 65 ft above the surface on crossing the threshold. This assumes that the 'on glide path' indication is the 'mid angle', when in fact it is encompassed in a bandwidth of angles within which the 'on glide path' indication is visible. If the height of the pilot's eye can be established when the aircraft is over the threshold with the lowest possible 'on glide path' indication, this could be used to determine if an aircraft can use the PAPI system as set up for that runway. The figure quoted on the ICAO aerodrome chart is the MEHT (minimum eye height) and is printed alongside the location of the PAPI on the chart. During type rating instruction, you will be made aware of the 'eye to undercarriage' requirement of the type, so that you can assess the usability of the PAPIs.

21.22 VASI. Standard Visual Approach Slope Indicator. This consists of 2 sets of 3 lights positioned as wing bars. Each set of lights is designed so that the lights appear as either white or red, depending on the angle at which the lights are viewed. When the pilot is approaching the lights on the glide slope the first set of lights appears white and the second set appears red. When both sets appear white, the pilot is flying too high, and when both appear red the approach is too low.

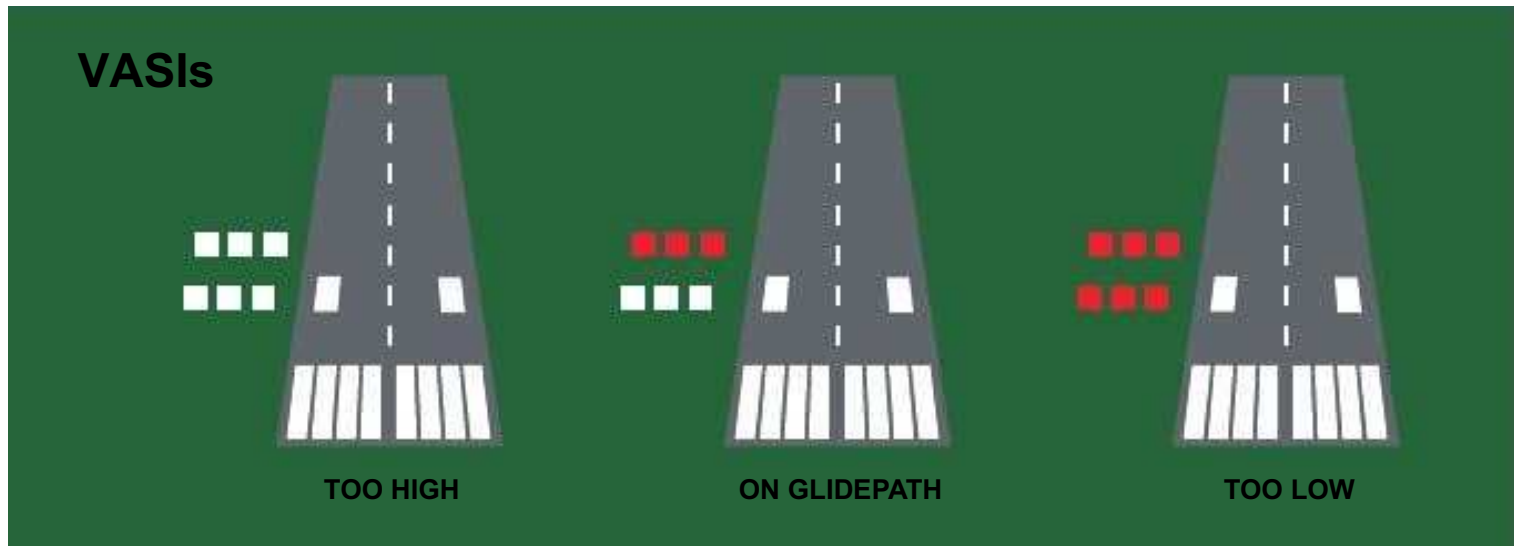


Figure 21.9 VASIs

Runway Lighting

21.23 Runway Edge Lights. Runway edge lights are provided for a runway intended for use at night or for a precision approach runway intended for use by day or night, and should be provided on a runway intended for take-off with an operating minimum below an RVR of the order of 800 m by day. Runway edge lights are placed along the full length of the runway in two parallel rows equidistant from the centre line. The lights shall be uniformly spaced. At intersections of runways, lights may be spaced irregularly or omitted, provided that adequate guidance remains available to the pilot. Runway edge lights are fixed, variable intensity white showing in the direction from which approaches are made. In the case of a displaced threshold, the lights between the beginning of the runway and the displaced threshold show red in the approach direction. A caution zone may be established over the last 600 m (or 1/3 of the runway whichever is least) where the lights are yellow. When the runway edge lights are intended to provide circling guidance, they shall show all round (omni-directional).

21.24 Runway Threshold and Wing Bar Lights. Runway threshold lights are provided for a runway equipped with runway edge lights (except on a non-instrument or non-precision approach runway where the threshold is displaced and wing bar lights are provided). When the threshold is at the extremity of a runway, the threshold lights are placed in a row at right angles to the runway axis as near to the extremity of the runway as possible. For a displaced threshold, the lights are in the form of a barrette (wing bar) either side of the displaced threshold. Runway threshold and wing bar lights are to be fixed, unidirectional lights showing green in the direction of approach to the runway.

21.25 Runway Threshold Identification Lights. Used at the threshold of a non-precision runway when additional threshold conspicuity is necessary or where the threshold is permanently displaced. They are flashing white lights unidirectional in the direction of the approach to the runway.

21.26 Runway End Lights. Runway end lights are provided for a runway equipped with runway edge lights. Runway end lights are fixed, unidirectional lights showing red in the direction of the runway. Runway end lights are placed in a line at right angles to the runway axis as near to the end of the runway as possible, and should consist of at least six lights. The lights should be either equally spaced between the rows of runway edge lights, or symmetrically disposed about the runway centre line.

21.27 Runway Centre Line Lights. Runway centre line lights are provided on Cat II/III precision approach runways. They should be provided on a Cat I precision approach runway where the width between the runway edge lights is greater than 50 m. Runway centre line lights are to be provided on a runway intended to be used for take-off with an operating minimum below an RVR of the order of 400 m. Runway centre line lights are fixed, variable intensity white. Over the last 900 m from the runway end, the lights show alternate red and white from 900 m to 300 m from the runway end; and all red from 300 m to the runway end.

21.28 Runway Touchdown Zone Lights. Touchdown zone lights are provided in the touchdown zone of a Cat II/III precision approach runway. Touchdown zone lights extend from the threshold for a distance of 900 m where the runway is 1800 m or more in length. The lights are arranged in the form of strips either side of the centre line, the width of the strips is to be the same width as the touchdown zone markings. Touchdown zone lights are fixed, variable intensity, unidirectional showing white.

21.29 Stopway Lights. Stopway lights are provided for a stopway intended for use at night with the lights placed along the full length of the stopway. Stopway lights shall be fixed, variable intensity, unidirectional lights showing red in the direction of the runway.

21.30 Runway Lead-in Lights. Runway lead-in lights provide visual guidance along a specific approach path to aircraft onto where the runway approach lighting is in view. The system may be curved, straight or a combination of both. They consist of groups of at least 3 flashing white lights and, where practical, each group should flash in sequence towards the runway.

21.31 Circling Guidance Lights. Circling guidance lights are provided when existing approach and runway lighting do not permit identification of the runway to an aircraft undertaking a circling approach to land. They may be fixed or flashing white.

Taxiway Lighting

21.32 Application. Taxiway lighting provides pilots with guidance and information during the taxi to and from the runway. It consists of centre line lights, edge lights, guard lights, and stop lights at holding points.

21.33 Taxiway Edge Lighting. Taxiway edge lighting is provided along the edges of holding bays, de/anti-icing facilities, aprons etc. It is intended for use at night on taxiways not provided with taxiway centre line lighting. If, however, sufficient alternative illumination is available (e.g. stadium lighting) then the edge lights may be dispensed with. Where a runway forms part of a standard taxi route intended for use at night and no taxiway centre line lighting exists, edge lights are to be provided. Taxiway edge lights are fixed, variable intensity omni-directional blue.

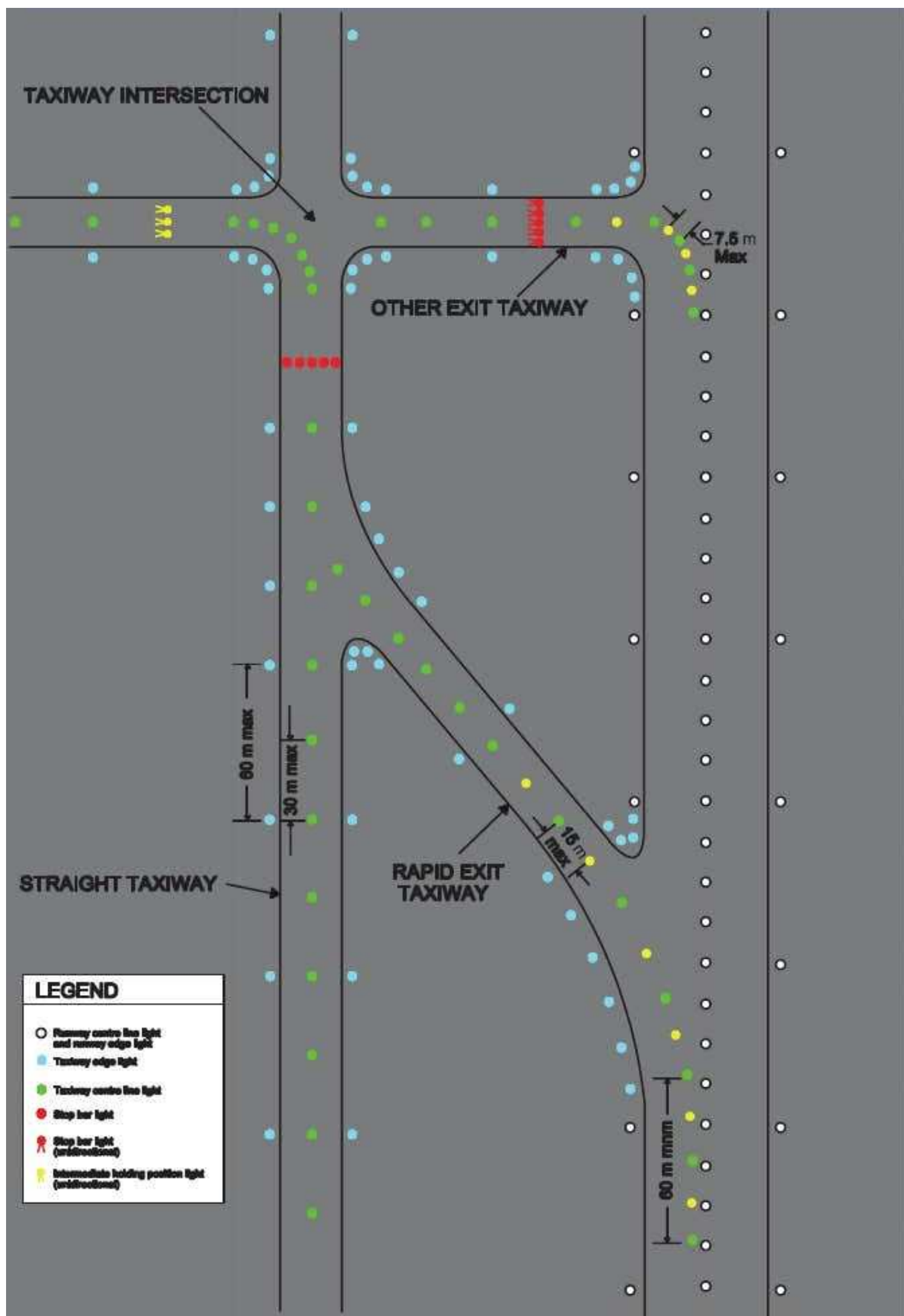


Figure 21.10 Arrangements of runway and taxiway lighting

21.34 Taxiway Centre Line Lights. Taxiway centre line lights are provided on an exit taxiway, taxiway and apron intended for use in runway visual range conditions less than a value of 350 m, in such a manner as to provide continuous guidance from the runway centre line to the point on the apron where aircraft commence manoeuvring for parking. These lights need not be provided where there is a low volume of traffic and taxiway edge lights and centre line marking provide adequate guidance. Taxiway centre line lights shall be provided on a runway forming part of a standard taxiway route and intended for taxiing in runway visual range conditions less than a value of 350 m. Taxiway centre line lights are fixed, variable intensity showing green such that the light is visible only from the aeroplanes on or in the vicinity of the taxiway. Within the ILS/MLS critical/sensitive area, the centre line lights are alternating green and yellow. This is the same for a high-speed exit. Where aircraft may follow the same centre line in both directions, all the centre line lights shall show green to aircraft approaching the runway.

21.35 Stop Bars. Stop bars are a row of red lights showing in the direction of taxiing aircraft and when illuminated require the aircraft to stop and not proceed until cleared by ATC. One or more stop bars, as appropriate, should be provided at a taxiway intersection or taxi-holding position when it is desired to supplement markings with lights and to provide traffic control by visual means. A stop bar shall be provided at every taxi-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 350 m. Where the normal stop bar lights might be obscured (from a pilot's view), for example, by snow or rain, or where a pilot may be required to stop the aircraft in a position close to the lights that they are blocked from view by the structure of the aircraft, a pair of elevated lights should be added to each end of the stop bar.

21.36 Intermediate Holding Position Lights. Intermediate Holding Position lights consist of 3 fixed unidirectional lights showing yellow in the direction of approach and at right angles to the taxiway.

21.37 Road-holding Position Lights. Comprise of either :

- a. a controllable red (stop) / green (go) or
- b. a flashing red light

21.38 Runway Guard Lights. These are used to warn pilots and drivers of vehicles that they are about to enter an active runway. They are installed at the entrance to runways used in RVR conditions less than 550 m where a stop bar is not fitted, and in RVR conditions of 550 - 1200 m where traffic density is high. There are two configurations of runway guard lights known as Configuration A and Configuration B. The lights are flashing yellow and show in the direction of taxiing aircraft.

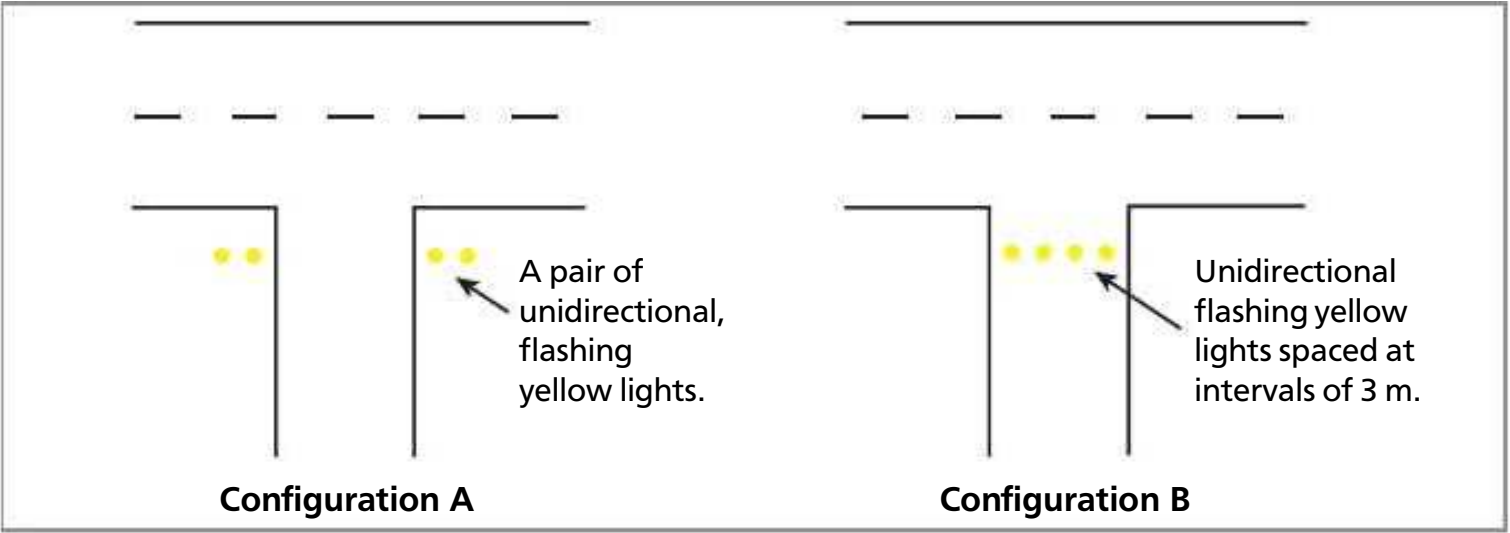


Figure 21.11 Runway and guard lights

Questions

1. How many bars are there on a full Calvert approach light system?
 - a. 5
 - b. 4
 - c. 3
 - d. 2
2. What length should the approach lighting system for a CAT I Calvert design be?
 - a. 900 m
 - b. 600 m
 - c. 1200 m
 - d. 400 m
3. What colour are runway end lights?
 - a. Unidirectional red
 - b. Unidirectional white
 - c. Omni-directional red
 - d. Omni-directional white
4. What is the colour of threshold lighting?
 - a. Omni-directional green
 - b. Unidirectional green, showing in the direction of the approach
 - c. Unidirectional white, showing in the direction of the approach
 - d. Red unidirectional
5. On a Cat I lighting system, what is the length of the single, double and treble light segments on the centre line of the approach lighting system?
 - a. 150 m
 - b. 200 m
 - c. 250 m
 - d. 300 m
6. What colour lights are runway edge lights, not including cautionary areas or pre-displaced thresholds?
 - a. White or yellow
 - b. White
 - c. Red
 - d. Blue
7. An aerodrome identification beacon on a land based aerodrome is:
 - a. blue
 - b. white
 - c. green
 - d. red

8. What colour is an aerodrome beacon for a land aerodrome?
- a. Flashing green
 - b. Flashing green and white
 - c. Steady green
 - d. Flashing red
9. What is the colour of threshold lights?
- a. Steady white
 - b. Flashing white
 - c. Steady green
 - d. Flashing green
10. What is the length of the approach lighting for a CAT I system?
- a. 300 m
 - b. 600 m
 - c. 900 m
 - d. 1200 m
11. What is a barrette?
- a. 3 or more single lights close together which appear at a distance to be a short bar
 - b. Frangible approach lights
 - c. Lead-in lights
 - d. Frangible lights
12. When the lights of an aerodrome are required to be on (night-time etc.) they can only be switched off providing it is possible to switch them on:
- a. not more than 1 hour before the ETA of an arriving flight
 - b. not more than 30 minutes before the ETA of an arriving flight
 - c. not more than 5 minutes before the ETA of an arriving flight
 - d. not more than 15 minutes before the ETA of an arriving flight
13. Taxiway edge lights are:
- a. fixed showing blue
 - b. fixed showing green
 - c. fixed showing yellow
 - d. flashing showing blue
14. A precision approach Category I lighting system, the centre line and the barrette lights have to be:
- a. flashing green lights for which the intensity of the light is adjustable
 - b. fixed white lights for which the intensity of the light is adjustable
 - c. flashing white lights for which the intensity of the light is adjustable
 - d. fixed green lights for which the intensity of the light is adjustable

15. What defines a Calvert type runway approach lighting system?
- 3 crossbars with 3 lighting segments providing centre line lighting
 - 3 crossbars with 2 lighting segments providing centre line lighting
 - 5 crossbars with 2 lighting segments providing centre line lighting
 - 5 crossbars with 3 lighting segments providing centre line lighting
16. On the PAPI system the pilot can see, during the approach, two white lights furthest from the runway and two red lights closest to the runway. The aircraft is:
- under the approach glide path
 - above the approach glide path
 - precisely on the glide path
 - on or close to the approach glide path
17. The abbreviation "PAPI" stands for:
- Precision Approach Path Index
 - Precision Approach Power Indicator
 - Precision Approach Path Indicator
 - Precision Approach Power Index
18. What is the light indication of a land-based aerodrome beacon?
- Green alternating with white flashes or white flashes only
 - White flashes only
 - Green flashes only
 - Same as an Aerodrome Identity Beacon
19. Runway guard lights are:
- flashing red
 - flashing yellow
 - flashing green
 - steady red
20. What are the characteristics of runway threshold identification lights?
- Unidirectional flashing green
 - Omni-directional flashing alternate green and red
 - Unidirectional flashing white
 - Omni-directional flashing white
21. A VASI consists of:
- 2 sets of 3 lights
 - 3 sets of 3 lights
 - 3 sets of 2 lights
 - 2 sets of 2 lights
22. What are the characteristics of intermediate holding position lights?
- 5 fixed unidirectional lights showing yellow
 - 3 fixed unidirectional lights showing yellow
 - Continuous fixed unidirectional lights showing yellow
 - 5 fixed unidirectional lights showing yellow and green

23. What are the characteristics of runway lead-in lights?

- a. Groups of at least 3 flashing red lights which flash in sequence towards the runway
- b. Groups of at least 5 flashing red lights which flash in sequence towards the runway
- c. Groups of at least 3 flashing white lights which flash in sequence towards the runway
- d. Groups of at least 5 flashing green lights which flash in sequence towards the runway

24. What are the characteristics of circling guidance lights?

- a. Fixed or flashing red
- b. Fixed or flashing white
- c. Fixed or flashing green
- d. Fixed or flashing blue

25. What are the characteristics of runway touchdown zone lights?

- a. Fixed variable unidirectional showing alternating white and red
- b. Flashing variable unidirectional showing green
- c. Fixed variable unidirectional showing red
- d. Fixed variable unidirectional showing white

Answers

1	2	3	4	5	6	7	8	9	10	11	12
a	a	a	b	d	b	c	b	c	c	a	a

13	14	15	16	17	18	19	20	21	22	23	24
a	b	d	d	c	a	b	c	a	b	c	b

25
d

Chapter
22

Obstacle Marking and Aerodrome Services

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Visual Aids for Denoting Restricted Use Areas	.443
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Introduction

22.1 Obstacles. The marking and/or lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations which may be imposed by obstacles. The responsibility for marking/lighting of obstacles on or near aerodromes must be determined between the aerodrome licensee and the owners of the structures. Licensees are responsible for the marking and lighting of all obstacles on the movement area irrespective of ownership. During the establishment of instrument approach and departure procedures, obstacles are identified to allow the calculation of operating minima and obstacle clearance height/altitude. The treatment of obstacles in this chapter is concerned with the identification and marking of obstacles on and in the vicinity of aerodromes, which may be collision hazards to local flying and en route operations. Obstacles inside and outside the aerodrome boundary may result in limitations on the distance available for take-off and landing and on the range of meteorological conditions in which operations can be undertaken. For these reasons certain areas of local airspace must be regarded as integral parts of the aerodrome environment. The degree of freedom from obstacles in these areas is as important in the granting and retention of an aerodrome licence as the more obvious physical requirements of the runways and their associated runway strips.

22.2 Obstacle Identification Surface (OIS). Aerodrome obstacles are those obstacles that protrude through the OIS out to a distance of 15 km from the aerodrome. The obstacles are determined by survey and are detailed in the aerodrome entry in the AIP. The OIS is a complex plane starting with the cleared strip either side of the runway. From the cleared strip, the inner transition plane extends from surface to 45 m, and extends out to 3000 m from the edges of the strip. Beyond this, the outer transition plane lifts the OIS to 150 m and extends to the full 15 km.

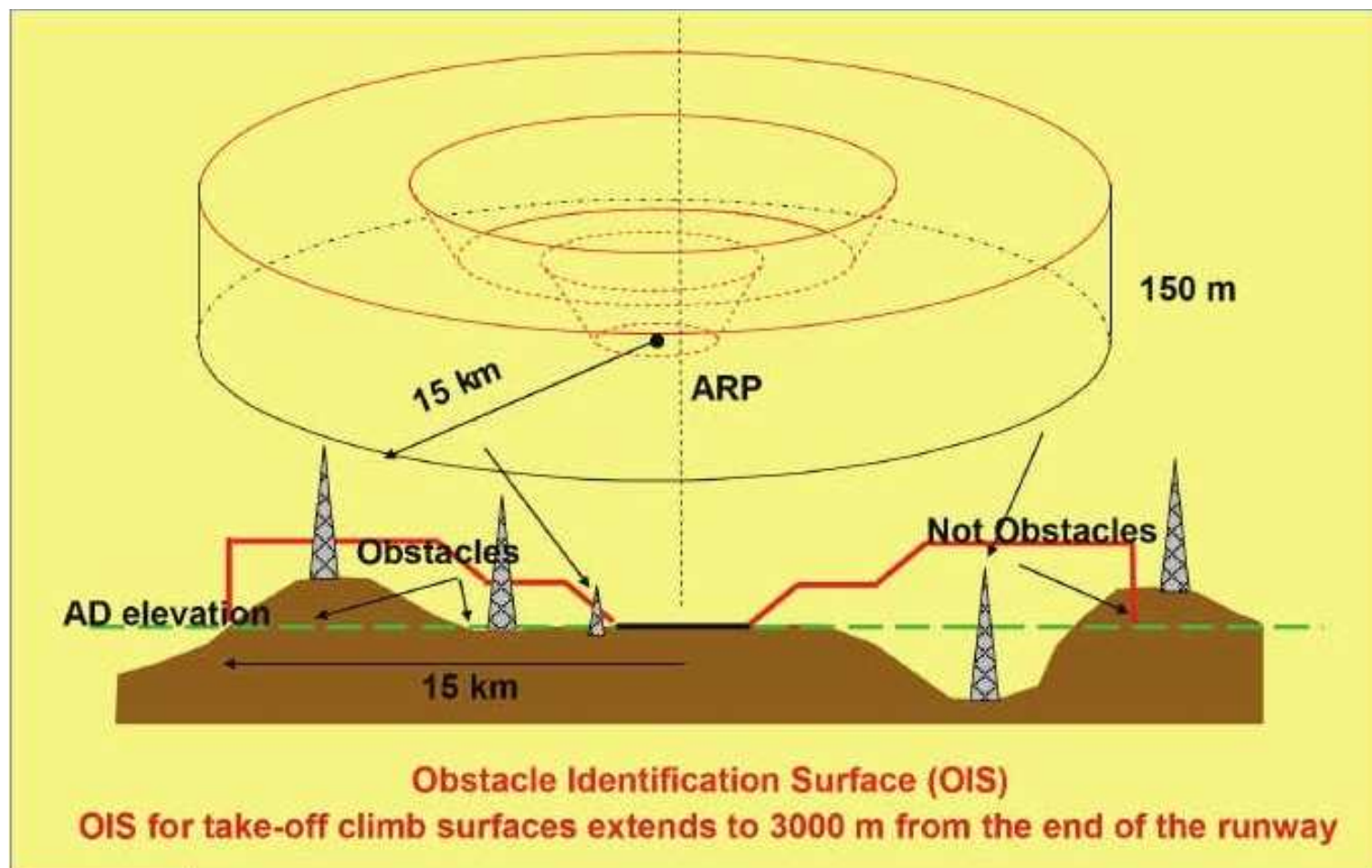


Figure 22.1 Obstacle identification surface (OIS)

Answers

1	2	3	4	5	6	7	8	9	10	11	12
a	c	c	c	b	a	d	d	b	b	d	a

13	14	15	16	17	18	19	20	21	22	23	24
c	b	a	b	a	c	b	d	a	a	c	b

25	26	27	28	29	30	31	32	33	34	35	36
d	a	d	c	d	b	d	d	a	b	d	d

37	38	39	40	41	42	43	44	45	46	47	48
a	d	d	b	d	c	a	b	a	a	c	d

49	50	51	52	53	54	55	56	57	58	59	60
a	a	d	d	c	c	b	a	a	c	b	a

61	62	63	64	65	66	67	68	69	70	71	72
c	a	a	b	b	d	b	a	b	a	a	c

73	74	75	76	77	78	79	80	81	82	83	84
b	d	c	c	b	c	a	b	c	d	a	a

85	86	87	88	89	90	91	92	93	94	95	96
c	b	c	d	b	c	b	a	d	b	b	b

97	98	99	100	101	102	103	104	105	106	107	108
a	a	b	a	b	a	b	a	b	a	a	b

109	110	111	112	113	114	115	116	117	118	119	120
c	d	b	b	c	b	c	b	a	b	b	b

121	122	123	124	125	126	127	128	129	130	131	132
b	d	a	a	a	a	d	c	d	d	c	b

133	134	135	136	137	138	139	140	141	142	143	144
a	a	a	b	d	c	a	a	c	c	a	b

145	146	147	148	149	150
a	a	b	b	a	d

EASA Specimen Examination

1. The 'standards' contained in the annexes to the Chicago Convention are to be considered:
 - a. advice and guidance for the aviation legislation within the member states.
 - b. binding for all member states.
 - c. binding for all member states that have not notified ICAO about a national difference.
 - d. binding for all airline companies with international traffic.
2. Which of the annexes deals with the transportation of cargo?
 - a. Annex 9 – Facilitation.
 - b. Annex 18 – Transportation of Dangerous Goods.
 - c. Annex 16 – Environmental Protection.
 - d. Annex 6 – Operation of Aircraft.
3. Which ICAO body furnishes the "Standards and Recommended Practices" (SARPs) for adoption by the Council?
 - a. The Assembly.
 - b. The Regional Air Navigation Meeting.
 - c. The Council itself.
 - d. The Air Navigation Commission.
4. To what did the Tokyo convention of 1963 address itself?
 - a. Licensing of scheduled air services.
 - b. Damage caused by a contracting state's aircraft to property in the same state.
 - c. Damage caused by a contracting state's aircraft to property in another state.
 - d. Interference with an aircraft in flight.
5. It is suspected that a person on board an aircraft will commit an act that would jeopardize the safety of the aircraft; the PIC may:
 - a. request the crew to detain the passenger.
 - b. ask the passenger to disembark.
 - c. order the other passengers to detain the passenger in question.
 - d. hand him/her over to the authorities.
6. What freedom covers landing and refuelling in another state?
 - a. 1st
 - b. 2nd
 - c. 3rd
 - d. 4th
7. Which of the following is permitted in the registration mark of an aircraft?
 - a. TTT
 - b. SRA
 - c. QEE
 - d. XXX

8. Which registration is disallowed?
- a. RCC
 - b. NNN
 - c. TTT
 - d. ZZZ
9. You can use simulator hours towards the 1500 hours required for an ATPL. How are simulator hours limited?
- a. Maximum of 100, not more than 15 in a procedural flight trainer.
 - b. Maximum of 100, not more than 30 in a procedural flight trainer.
 - c. Maximum of 100, not more than 25 in a procedural flight trainer.
 - d. Maximum of 100, not more than 50 in a procedural flight trainer.
10. The holder of a pilot licence when acting as co-pilot under supervision of the PIC and performing the functions and duties of the PIC shall be entitled to be credited:
- a. with 50% of the flight time towards the total time required for a higher grade of licence.
 - b. in full, but not more than 300 hrs towards the total time require for a higher grade of licence.
 - c. the flight time in full towards the total time required for a higher grade of licence.
 - d. the flight in full toward the total time required for a higher grade of pilot licence according to the requirements of the licensing authority.
11. Can a holder of a CPL(A) fly as PIC in any non-commercial aircraft?
- a. only if the aircraft is classified for single-pilot operations
 - b. Yes
 - c. No
 - d. Only if the aircraft has only one engine
12. When you are a newly qualified flying instructor (A) you have to be supervised by a qualified flying instructor. When will supervision cease?
- a. Once you have passed a competency check.
 - b. When you have completed 100 hours instruction and sent 25 students solo.
 - c. When you have completed 100 hours instruction and sent 100 students solo.
 - d. When you have completed 100 hours solo.
13. How long would a non-JAA licence be valid for if validated for use in a JAA state?
- a. 6 months.
 - b. 12 months.
 - c. 12 months if still valid in the State of Issue.
 - d. 3 months.

14. What is the period of validity of a PPL class 2 medical in accordance with JAR FCL 3?
- a. 24 months until age 30, then 24 months until 50, then 12 months until 65, then 6 months thereafter.
 - b. 24 months until age 30, then 24 months until 50, then 12 months until 65.
 - c. 60 months until age 30, then 24 months until 50, then 12 months until 65, then 6 months thereafter.
 - d. 60 months until age 30, then 24 months until 50, then 12 months until 65.
15. Which of the following requires a class rating?
- a. multi-engine turbine.
 - b. single-pilot multi-engine turbine.
 - c. microlight with fixed wings and able to move its surfaces in three dimensions.
 - d. touring motor glider.
16. A CPL applicant undergoing integrated flight training shall have completed:
- a. 150 hours flight time including 10 hours instrument ground time.
 - b. 150 hours flight time.
 - c. 200 hours flight time including 10 hours instrument ground time.
 - d. 200 hours flight time.
17. How many hours would you have to spend in a clinic or hospital before you would have to inform the authorities?
- a. 24 hrs.
 - b. 20 days.
 - c. 12 hours.
 - d. 12 days.
18. Which of the quadrantal levels should be used when true track is 358° ; variation is 3°W and deviation is 5°E ?
- a. FL75.
 - b. FL60.
 - c. FL70.
 - d. FL65.
19. Can a holder of a CPL(A) fly as PIC in any non-commercial aeroplane?
- a. only if the aircraft is classified for single-pilot operations
 - b. Yes
 - c. No
 - d. Only if the aircraft has only one engine
20. What are the VMC limits for class B airspace?
- a. Clear of cloud and in sight of the surface.
 - b. 8 km flight visibility, 1000 ft vertically and 1500 m horizontally from cloud.
 - c. 5 km flight visibility, 1000 ft vertically and 1500 m horizontally from cloud.
 - d. The same as class C.

21. According to ICAO, what minimum ground visibility is required to enable a SVFR flight to take off from an aerodrome in a CTR?
- a. 1000 m.
 - b. 1500 m.
 - c. 2000 m.
 - d. 3000 m.
22. In a holding pattern, turns are to be made at a:
- a. rate of turn of 3° /sec.
 - b. rate of turn of 3° /sec or 20° bank whichever is lesser.
 - c. rate of turn of 3° /sec or at a bank angle of 25° whichever is lesser.
 - d. bank angle of 25° .
23. What is the maximum track guidance distance for a turning departure?
- a. 10 km.
 - b. 10 NM.
 - c. 25 NM.
 - d. 25 km.
24. Visual circling for a class B aircraft is conducted in visibility not less than:
- a. 1500 m
 - b. 1600 m
 - c. 2800 m
 - d. 5000 m
25. At what distance from the holding navigation aid must an aircraft be established at the cleared holding level or altitude?
- a. 10 NM
 - b. 5 NM
 - c. 20 NM
 - d. 15 NM
26. The obstacle clearance in the primary area of an intermediate approach is:
- a. not more than 150 m.
 - b. reduces from 300 m to 150 m.
 - c. equal to or greater than 300 m.
 - d. 500 m in mountainous terrain.
27. What is considered to be "established" with regards to an NDB approach?
- a. within 5° of the Final Approach Track (FAT)
 - b. within 10° of the FAT
 - c. within half-scale deflection
 - d. once the threshold is in sight

28. What is the airspeed for holding area construction for a CAT B aircraft in a hold under normal conditions at 4250 m (14000 ft)?
- a. Mach 0.83.
 - b. 490 km/hr (265 kt).
 - c. 315 km/hr (170 kt).
 - d. 520 km/hr (280 kt).
29. For the intermediate section of a missed approach, what is the minimum obstacle clearance?
- a. 30 m.
 - b. 100 m.
 - c. 50 m.
 - d. 120 m.
30. At what distance does an SRA normally terminate?
- a. 2 NM.
 - b. 1 NM.
 - c. 3 NM.
 - d. ½ NM.
31. Taxiway side stripe marking indicates:
- a. non-load bearing surfaces
 - b. that no vehicles are to cross
 - c. maintenance work in progress
 - d. areas that can be used by the widest aircraft
32. What is the minimum obstacle clearance in the final phase of a missed approach?
- a. 50 m
 - b. 30 m
 - c. 300 m
 - d. 600 m
33. For Mode 2 parallel approach operations, what is the minimum radar separation prior to an aircraft being established on the localizer?
- a. 3 NM
 - b. 2.5 NM
 - c. 5 NM
 - d. 2 NM
34. The 45° leg of a 45°/180° procedure turn for a Cat D aircraft is:
- a. 1 min.
 - b. 1 min 15 seconds.
 - c. 1 min 30 seconds.
 - d. continued until interception of the glide slope.

35. On a precision approach (ILS), the OCH(A) is based among other standard conditions, on the vertical limits between the flight path of the wheels and the glide path antenna. For a Category A aircraft this should not be more than:
- a. 6 m.
 - b. 9 m.
 - c. 3 m.
 - d. 12 m.
36. What is the lowest OCH on a circling approach for a Cat B aircraft?
- a. 120 m.
 - b. 135 m.
 - c. 140 m.
 - d. 150 m.
37. What is the category of aircraft with a V_{S1g} of 132 knots?
- a. B
 - b. C
 - c. E
 - d. D
38. When using a DR segment to take up an ILS instrument approach, what is the maximum length of the track that may be used to intercept the localizer?
- a. 10 NM.
 - b. 5 NM.
 - c. 10 minutes.
 - d. 5 minutes.
39. What Obstacle Clearance is guaranteed at a range greater than 5 NM from the edge of the holding area of a holding pattern?
- a. 100 m.
 - b. 250 ft.
 - c. 300 ft.
 - d. none.
40. A small fire occurs in the toilet of an aircraft but is quickly extinguished by the use of extinguishing agents. This is classed as:
- a. an accident
 - b. an occurrence
 - c. a serious occurrence
 - d. an incident
41. A VFR flight in Class F airspace is:
- a. required to submit a flight plan and is required to carry a radio
 - b. required to submit a flight plan but is not required to carry a radio
 - c. not required to submit a flight plan but is required to carry a radio
 - d. not required to submit a flight plan and is not required to carry a radio

42. What is the speed limit below 10000 ft for an IFR flight in Class D airspace?
- a. 250 kt TAS.
 - b. 250 kt IAS.
 - c. not applicable.
 - d. 200 kt IAS.
43. What phase of the Alert Service is declared when apprehension exists?
- a. INCEFA
 - b. DETRESFA
 - c. EMERGFA
 - d. ALERFA
44. How must an AIRPROX (P) be initially reported?
- a. By RFT (aircraft radio)
 - b. Submitted to the Operator in writing as soon as possible on landing
 - c. By immediately declaring a MAYDAY
 - d. Included in an URGENCY message to the Company Operations
45. Prohibited, Restricted and Danger areas must be designated by:
- a. country identifier, followed by P/R/D, followed by the identifier.
 - b. country identifier followed by P/R/D.
 - c. P/R/D followed by the identifier.
 - d. country identifier followed by numbers.
46. In which class or classes of airspace would essential traffic information be given to VFR traffic about other VFR traffic?
- a. B
 - b. B,C,D,E
 - c. B,C
 - d. B,C,D
47. The lowest height of a CTA above ground or water is:
- a. 300 m.
 - b. 150 m.
 - c. 200 m.
 - d. 500 m.
48. RNP (Required Navigation Performance) is:
- a. based on Regional Air Navigation Orders (RANOs).
 - b. based on RANOs and applied by the state.
 - c. based on RANOs and applied by the state and ICAO.
 - d. based on RANOs and applied by the ICAO.

49. In what class of airspace can both IFR and VFR fly and IFR traffic only receives an advisory service for separation?
- a. F
 - b. E
 - c. G
 - d. D
50. Must a Final Report be sent to ICAO following an accident to an aircraft with an MTOM of 2250 kg?
- a. Yes
 - b. Not unless the accident has resulted in a fatality of any sort
 - c. No
 - d. Not unless the accident has resulted in a fatality of any sort and serious damage to the aircraft
51. What is the delay for a controlled flight after which a flight plan has to be re-filed?
- a. 30 minutes EOBT.
 - b. 30 minutes ETD.
 - c. 60 minutes EOBT.
 - d. 60 minutes ETD.
52. What are the contents of section 2 of an AIREP?
- a. Present position and ETA.
 - b. Estimated time over the FIR boundary and endurance.
 - c. Estimated elapsed time (EET) and endurance.
 - d. ETA and endurance.
53. If you want to descend through the level of another aircraft on the same track, the minimum separation is:
- a. 20 minutes.
 - b. 10 minutes.
 - c. 5 minutes.
 - d. 15 minute.
54. If two aircraft are using the same VOR, by what lateral distance must the aircraft be separated before one of the two may commence a climb or descent?
- a. 5 NM.
 - b. 10 NM.
 - c. 15 NM.
 - d. 20 NM.
55. What does the signal XX from a search party indicate?
- a. We have not found all personnel
 - b. We are not able to continue. Returning to base
 - c. Nothing found
 - d. Operation completed

56. What is the greatest radar wake turbulence?
- a. 2 NM
 - b. 10 NM
 - c. 5 NM
 - d. 6 NM
57. What is the maximum speed for a Category C aircraft for a departure procedure?
- a. 120 kt
 - b. 165 kt
 - c. 290 kt
 - d. 265 kt
58. Where an aeroplane is approaching to land, what is the maximum time spacing applied between that aeroplane and any other taking off in any direction?
- a. 3 minutes
 - b. 5 minutes
 - c. 10 minutes
 - d. 2 minutes
59. Which of the following statements is incorrect with regards to parallel runways operations?
- a. The maximum intercept angle to the final approach track for Mode 4 operations is 30°
 - b. Regardless of the weather all approaches are to be radar monitored
 - c. Only straight-in approaches may be conducted
 - d. All aircraft must have full ILS/MLS
60. For dependent parallel approaches what is the radar separation between two aircraft on the same ILS unless wake turbulence requires a greater separation?
- a. 3 NM
 - b. 5 NM
 - c. 1 NM
 - d. 10 NM
61. What is the separation for a light aircraft taking off after a medium aircraft providing they are both using the same runway?
- a. 5 min
 - b. 3 min
 - c. 1 min
 - d. 2 min

62. Between two aircraft on the same track what is the minimum radar separation which must be provided for wake turbulence?
- a. 4 NM
 - b. 2.5 NM
 - c. 2 NM
 - d. 3 NM
63. A heavy aircraft has made a missed approach to a runway in the opposite direction to normal take-off. What is the separation required for a light aircraft taking off?
- a. 2 minutes
 - b. 3 minutes
 - c. 1 minute
 - c. 5 minutes
64. Radar separation may be applied before an aircraft taking off and a preceding departing aircraft providing the departing aircraft can be identified from the end of the runway within:
- a. 5 NM
 - b. 3 NM
 - c. 2 NM
 - d. 1 NM
65. What is the minimum radar separation for two aircraft established on the same localizer?
- a. 5 NM
 - b. 5 NM when the first a/c is 20 kt faster than the second
 - c. 10 NM
 - d. 20 NM
66. Under normal circumstances, what is the radar separation applied between aircraft at the same altitude?
- a. 2 NM
 - b. 2.5 NM
 - c. 3 NM
 - d. 5 NM
67. If radar capability permits, the minimum longitudinal separation may be reduced to:
- a. 5 NM
 - b. 4.5 NM
 - c. 4 NM
 - d. 3 NM
68. A radar controller can request an aircraft to change speed when it is on the intermediate and final approach phase, except in certain conditions specified by the proper ATS authority. The speed change must not be more than:
- a. ± 15 kt
 - b. ± 8 kt
 - c. ± 10 kt
 - d. ± 20 kt

69. The minima that must be applied to aircraft which are landing after a “heavy” or “medium” aircraft complying with wake turbulence separation on a timed approach is:
- a. light aircraft behind medium aircraft ; 4 minutes
 - b. medium aircraft behind medium aircraft ; 2 minutes
 - c. medium aircraft behind heavy aircraft ; 3 minutes
 - d. medium aircraft behind heavy aircraft ; 2 minutes
70. An integrated aeronautical information package consists of:
- a. AIP and amendment service, supplement to the AIP, NOTAMs, Preflight Information Bulletins (PIBs), AICs, checklists and summaries
 - b. AIP and amendment service,, NOTAMs, Preflight Information Bulletins (PIBs), AICs, AIRACs, checklists and summaries
 - c. AIP and amendment service, supplement to the AIP, NOTAMs, AIRACs, AICs, checklists and summaries
 - d. AIP & Supplements, AIRACs, NOTAMs and pre-flight bulletins
71. AIP supplements with extensive text and graphics cover a short period; what is a long period in this respect?
- a. 1 year
 - b. 2 months
 - c. 3 months
 - d. 6 months
72. Regarding the AIS what is the time limit for a checklist of current NOTAMs to be issued?
- a. 7 days
 - b. 14 days
 - c. 28 days
 - d. one month
73. A VASI consists of:
- a. two sets of three lights positioned as wingbars
 - b. three sets of three lights positioned as wingbars
 - c. two sets of two lights positioned as wingbars
 - d. three sets of two lights positioned as wingbars
74. Which “code letter” has to be chosen to identify a taxiway that has to be used by an aircraft with a wheel-base of 15 metres?
- a. Code letter E
 - b. Code letter C
 - c. Code letter B
 - d. Code letter D

75. Which of the following is a non-standard Aerodrome Reference Code?
- a. 4A
 - b. 3F
 - c. 4G
 - d. 2E
76. What length should the approach lighting system for a CAT II Calvert design be?
- a. 900 m
 - b. 600 m
 - c. 1200 m
 - d. 400 m
77. What information must be passed to the Commander of an aircraft with regards to Law Enforcement Officers?
- a. The number on board, their names and their seat locations
 - b. The number on board and their seat locations
 - c. Their names and their seat locations
 - d. Only their seat locations
78. Medium intensity obstacle lighting will normally consist of flashing red lights except that they may be flashing white when used:
- a. in conjunction with high intensity obstacle lighting
 - b. in conjunction with low intensity obstacle lighting
 - c. in conjunction with runway obstacle lighting
 - d. in conjunction with the approach path obstacle lighting
79. Road Holding Position lights consist of either a controllable red (stop) /green (go) light or a:
- a. flashing red light
 - b. flashing yellow light
 - c. flashing blue light
 - d. flashing green light
80. The level of rescue and fire fighting facilities is dependent upon the category of the aerodrome. What factors determine this category?
- a. Aeroplane reference field length, wing span and outer main gear wheel span of the largest aircraft using that aerodrome
 - b. The length of the longest runway and the area to be covered
 - c. The overall length and the fuselage width of the longest aircraft using that aerodrome
 - d. The length of the longest runway and total area of hard standings including access roads

81. On departure, how many copies of the following are required:
1. the Gen Dec
 2. the stores list
 3. passenger manifest.
- a. 3 of each
 - b. 2 of 1; 2 of 2; 3 of 3
 - c. 2 of 1; 1 of 2; 2 of 3
 - d. 1 of 1; 1 of 2; 2 of 3
82. Which organizations are responsible for initiating the Alerting Service and moving from phase to phase?
- a. FIC and RCC
 - b. ACC and FIC
 - c. ACC and RCC
 - d. RCC and sub-units
83. Using the visual SAR signals the symbol for "we have found all personnel" is:
- a. + +
 - b. L L L
 - c. LL
 - d. Y
84. According to Annex 17, security is defined as "a combination of measures and human resources intended to safeguard:
- a. civil aviation operations against acts of unlawful interference"
 - b. international civil aviation operations against acts of unlawful interference"
 - c. international aviation operations against acts of unlawful interference"
 - d. aviation operations against acts of unlawful interference"
85. When an aircraft has sustained damage, the aircraft must be allowed to resume its flight provided that:
- a. the state where the aircraft is registered, the state where the aircraft is designed and the state where the prototype of the aircraft is declared to be airworthy, agree that the aircraft is still airworthy
 - b. the state where the aircraft is registered is of the opinion that the sustained damage is of such a nature that the aircraft is still airworthy
 - c. the state where the aircraft is designed and the state where the prototype of the aircraft is declared to be airworthy, send a message to the state where there aircraft is registered which says that the aircraft is still airworthy
 - d. the state where the prototype of the aircraft is declared to be airworthy has informed the state where the aircraft is registered that the sustained damage is of such a nature that the aircraft is still airworthy

- 200 hours cross-country flight time of which 100 hours shall be as PIC or PICUS
- 75 hours of instrument time of which not more than 30 hours may be instrument ground time and
- 100 hours of night flight as PIC or co-pilot

Note: of the 1500 hours of flight time, up to 100 hours of flight time may have been completed in an FFS and FNPT. Of these 100 hours, only a maximum of 25 hours may be completed in an FNPT.

Crediting

Holders of a pilot licence for other categories of aircraft shall be credited with flight time up to a maximum of:

- For TMG or sailplanes, 30 hours flown as PIC
- For helicopters, 50% of all the flight time requirements specified above

Skills test

Applicants shall pass a skills test to demonstrate the ability to perform, as PIC of a multi-pilot aeroplane, under IFR.

Ratings

5.17 Instrument Rating – Aeroplanes IR(A)

General

Operations under IFR on an aeroplane shall only be conducted by holders of a PPL(A), CPL(A), MPL and ATPL(A) with an IR appropriate to the category of aeroplane or when undergoing skills testing or dual instruction.

Privileges

- The privilege to fly an aeroplane under IFR with a minimum decision height of 200 ft (60 m)
- In the case of a multi-engine IR(A), the above privilege may be extended to decision heights of lower than 200 ft (60 m) as long as the applicant has undergone specific training at an ATO and has passed the necessary skills test

Prerequisites and crediting

Applicants shall hold at least:

- a PPL(A) with a night rating or
- an ATPL(A) in another category of aeroplane or
- a CPL in the appropriate aeroplane category

and

have completed at least 50 hours of cross-country as PIC of aeroplanes of which at least 10 hours shall be in the relevant aeroplane category.

Theoretical knowledge and flight instruction

Course

Applicants must have received a course of both theoretical knowledge and flight instruction at an ATO. The course may be either integrated or modular.

Applicants must sit an examination of theoretical knowledge in the following subjects:

Air Law

Aircraft General Knowledge – Instrumentation

Flight Performance and Monitoring

Human Performance

Meteorology

Radio Navigation

IFR Communications

Skills Test

Applicants must pass a skills test in accordance with Appendix 7 of Part-FCL.

Validity

An IR(A) shall be valid for 1 year.

Revalidation

- an IR(A) shall be revalidated within 3 months immediately preceding the expiry date of the IR(A)
- should an applicant fail the IR proficiency check before the expiry date of the IR(A), he/she may not exercise the IR privileges until he/she has passed the proficiency check
- if the IR(A) has expired, refresher training at an ATO is required before the applicant may take the proficiency check again
- if the IR(A) has not been revalidated or renewed within the preceding 7 years, the holder will be required to pass again the IR theoretical knowledge examination and skill test
- An FNPT II or an FFS may be used for revalidation, but each alternate proficiency check must be performed in an aeroplane

5.18 Class & Type Ratings

Circumstances in which class or type ratings are required

Holders of a pilot licence shall not act in any capacity as pilots of an aircraft unless they have a valid and appropriate class or type rating – except when undergoing skills tests, proficiency checks or receiving flight instruction

Requirements for the issue of class or type ratings

- Theoretical and flight training must take place at an ATO
- The skills test must be passed within 6 months after the commencement of the course. Also within 6 months preceding the application for a class or type rating

Validity

- class or type ratings are generally valid for 1 year
- however, a single-pilot single-engine class rating is valid for 2 years
- if the type or class rating has expired, refresher training at an ATO is required before the applicant may take the proficiency check again

Revalidation for multi-engine class and type ratings

- The proficiency check must be passed within 3 months immediately preceding the expiry date of the rating
- The revalidation of an IR(A) may be combined with a proficiency check for the revalidation of a class or type rating

Experience requirements for the issue of class or type ratings – aeroplanes

Single-pilot multi-engine aeroplanes

- at least 70 hours as PIC on aeroplanes

Multi-pilot aeroplanes

- at least 70 hours of flight experience as PIC on aeroplanes
- hold a multi-engine IR(A)
- have passed the ATPL(A) theoretical examinations
- hold a certificate of satisfactory completion of an MCC course in aeroplanes

5.19 Night Rating – aeroplanes

This rating is to allow PPL(A) holders to fly in VFR conditions at night.

Theoretical and flight instruction must be undergone at an ATO and at least:

- 5 hours of flight time in the appropriate category of aeroplane at night, including at least 3 hours of dual instruction, including 1 hour of cross-country flight of at least 50 km and 5 solo take-offs and 5 solo full-stop landings.

Certificates

5.20 Instructor Certificate – aeroplanes

General

A person shall only carry out:

1. flight instruction in an aeroplane when he/she holds:
 - a pilot licence
 - and
 - an instructor certificate appropriate to the instruction given
2. synthetic flight instruction or MCC instruction when he/she holds an instructor certificate appropriate to the instruction given

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