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CHAPTER ONE

DEFINITIONS

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INTRODUCTION

The standard for aeronautical operations was laid down by International Civil Aviation Organization(ICAO) in its 1944 Chicago convention. Most of the standards for Communication (equipment, standards and procedures) are laid down in Annex 10 Vol.2 to the convention. The UK guidance to pilots is the CAA publication CAP 413 which you should have in your possession.

The JAR-FCL Communications examination is divided into two half hour sections, VFR and IFR. It is not possible to separate entirely VFR and IFR communications because much of the detail is equally valid to both phases of flight. In the initial lessons we will concentrate on those sections that can be placed solely on the VFR section. Please note that what you learn in the VFR section may be tested again by similar (if not identical) questions in the IFR exam.

Note: The JAR-FCL standard for the exam is ICAO. Most of CAP 413 is valid for the exam but it differs especially in the use of R/T for take-off and for altitude instructions. These notes are based only on ICAO.

TRANSMISSION OF LETTERS AND NUMBERS

In some circumstances it could be difficult to hear clearly what is said over the radio. Perhaps the aircraft is noisy, or the reception poor, or there may be words that sound similar and could be confused. For example, the letter 'A' could be confused with the number '8', or the letter 'C (see) which sounds like 'D'(dee) or 'V'(vee). To help overcome these problems a standard way of saying letters, spellings, numbers and so on has been devised. You **must** know these.

Letters
The standard alphabet has a phonetic pronunciation for each letter. The **sound** should be the **same** whatever the speaker's natural language! A word should be spelt whenever its meaning is not clear technically or when using proper names, service abbreviations and words of which the spelling is doubtful. The phonetic alphabet is shown in below.

A	Alpha	Al FAH	**B**	Bravo	BRAH VOH
C	Charlie	CHAR LEE	**D**	Delta	DELL TAH
E	Echo	ECK OH	**F**	Foxtrot	FOKS TROT
G	Golf	GOLF	**H**	Hotel	HOH TELL
I	India	IN DEE AH	**J**	Juliet	JEW LEE ETT
K	Kilo	KEY LOH	**L**	Lima	LEE MAH
M	Mike	MIKE	**N**	November	NO VEM BER
O	Oscar	OSS CAR	**P**	Papa	PAH PAH
Q	Quebec	KEE BECK	**R**	Romeo	ROW ME OH
S	Sierra	SEE AIR RAH	**T**	Tango	TANG GO
U	Uniform	YOU NEE FORM	**V**	Victor	VIK TAH
W	Whiskey	WISS KEY	**X**	X-Ray	ECKS RAY
Y	Yankee	YANG KEY	**Z**	Zulu	ZOO LOO

Numbers
Similarly numbers must also be said precisely especially when discussing height, altitudes or flight levels. Any confusion could easily be deadly! See below for the pronunciation of numbers:

0	**ZERO**
1	**WUN**
2	**TOO**
3	**TREE**
4	**FOW-ER**
5	**FIFE**
6	**SIX**
7	**SEVEN**
8	**AIT**
9	**NIN-ER**

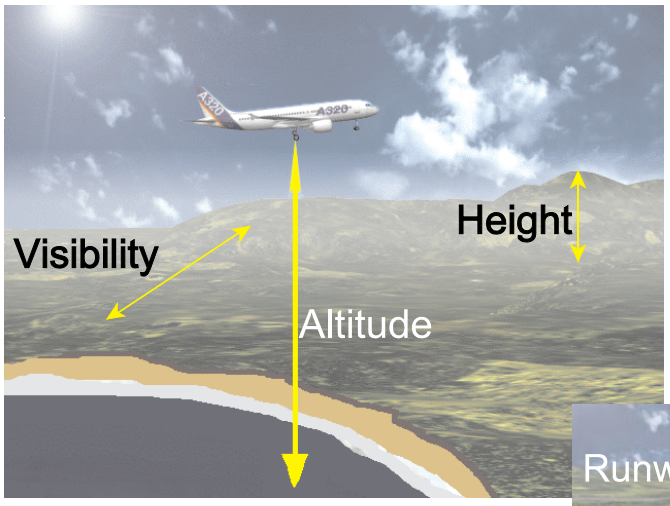
DECIMAL:	*DAY-SEE-MAL*
HUNDRED:	*HUN-DRED*
THOUSAND:	*TOU-SAND*

Combinations
When transmitting messages containing call signs, altimeter settings, flight levels, altitudes, wind velocity, frequencies etc. etc. each letter and digit is pronounced. Shown below is an example of a message with a combination of letters and numbers.

London Control Clears Golf Bravo Echo Juliet Victor to join controlled airspace at Bravo India Golf route Golf Wun Flight Level Ait Zero squawk 3217 contact London now frequency Wun Too Tree Day-se-mal Fower

Exceptions
Numbers used to describe Altitude, Height, Visibility, and Runway Visual Range (RVR) which contain whole HUNDREDS or THOUSANDS use "Hundred" and "Thousand", otherwise single digits e.g. Squawk 6500 - "Squawk six fife zero zero".

10	**WUN ZERO**
100	**WUN HUNDRED**
2500	**TOO TOUSAND FIFE HUNDRED**
11,000	**WUN WUN TOUSAND**
25,000	**TWO FIFE TOUSAND**



Numbers used to describe
Altitude
Height
Visibility
Runway Visual Range
Use "Hundred" & "Thousand."

Otherwise - single digits

Courtesy of Airbus Industrie

VHF Frequencies and Channel Spacing
The bandwidth allocated to VHF frequencies is at present, for the most part, 25 KHz; that is, the spacing between one channel and another. However, in many busy types of airspace, designated by the authorities, the spacing between channels has been reduced to 8.33 KHz (one third of 25 KHz) thus creating many more channels.

Channels which are spaced by 25 KHz require 5 digits, not more than 2 digits after the decimal point, whereas channels spaced by 8.33 KHz require 6 digits, 3 digits after the decimal point.

However, ICAO has now set a standard that requires all 6 digits of communications frequencies be passed in RTF instructions. This means that VHF channels will include 6 digits irrespective of whether the channel is 25 KHz or 8.33 KHz spaced. The only exception to this is where the final two digits are both zero, in which case only the first four digits need to be transmitted. When using a 5 digit radio, (25 KHz spacing), only the first 5 digits of the given frequency need be set on the radio.

DEFINITIONS

We have prepared a list of definitions which must be learned. Sadly there is no easy way to do it. However, some definitions may not be obvious to you so the following additional notes may help to clarify them.

Station
A station is simply a piece of equipment which is used to transmit or receive aeronautical information. It could be a radio in an aircraft or on the ground, or even a network of teleprinters or computers used by controllers, or operations departments.

Aeronautical Fixed Telecommunication Network
This is a network of fixed local based stations used to send information such as NOTAMS, WEATHER, FLIGHT PLANS, DEPARTURE & ARRIVAL INFORMATION etc. Formerly this was mostly teleprinter information but now it is increasingly a digital (computer) network usually called AFTN.

Aeronautical Mobile Service
This is the service that you will use whenever you use your radio. It is all stations on the ground or in the air involved in the day-to-day operations of the aircraft.

Blind Transmission
In this case one station is receiving no reply; it could be just his own receiver is not working. So he transmits 'blind', hoping that Control can hear him.

> ICAO DEFINITION. A transmission from one station to another in circumstances where two- way communication cannot be established but where it is believed that the **called** station is able to receive the transmission.

Read Back
Some important instructions or information **must** be readback to confirm or to check accuracy of reception.

SOME PRINCIPAL TERMS USED IN THE MANUAL

Note: Definitions of other terms will be found in appropriate ICAO documents.

Aerodrome control service. Air traffic control service to aerodrome traffic.

Aerodrome traffic. All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome.
Note: An aircraft is in the vicinity of an aerodrome when it is on, entering or leaving a traffic circuit.

Aerodrome traffic circuit. The specified path to be flown by aircraft operating in the vicinity of an aerodrome.

Aeronautical mobile service. A mobile service between aeronautical stations and aircraft stations; or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical station. A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located on board ship or on a platform at sea.

Air-ground communication. Two-way communication between aircraft and stations or locations on the surface of the earth.

Air-ground control clearance. Authorisation for an aircraft to proceed under conditions specified by air traffic control service.

Air traffic service. A generic term meaning, variously, air traffic control unit, flight information service, alerting service, air traffic advisory service, air traffic control service, approach control service or aerodrome control service.

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Airway. A control area or portion thereof established in the form of a corridor equipped with radio navigational aids.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level.

Approach control service. Air traffic control service for arriving and departing controlled flights.

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading and unloading passengers, Mail or cargo, fuelling, parking or maintenance.

Area control centre. A unit established to provide air traffic control service to controlled flights in control under its jurisdiction.

Automatic terminal information service. The provision of current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts throughout the day or a specified portion of the day.

Blind transmission. A transmission from one station to another station in circumstances where the communication cannot be established but where it is believed that the called station is able to receive the transmission.

Broadcast. A transmission of information relating to air navigation that is not addressed to a specific station or stations.

Clearance limit. The point to which an aircraft is granted an air traffic control clearance.

Control Area. A controlled airspace extending upwards from a specified limit above the surface of the earth.

Controlled airspace. An airspace of defined dimensions within which air traffic control service is provided for controlled flights.

Control Zone. A controlled airspace extending upwards from the surface to a specified upper level.

Estimated time of arrival (ETA). The time at which the pilot estimates that the aircraft will be over a specified location.

Expected approach time (EAT). The time at which ATC expects that an arriving aircraft, following a delay will arrive at the holding point to complete its approach for a landing.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or path of a flight of an aircraft.

Heading. The direction in which the longitudinal axis of an aircraft is pointed, usually expressed in degrees North (true, magnetic, compass or grid).

Holding Point. A specified location, identified by visual or other means, in the vicinity of which the point of an aircraft in flight is maintained in accordance with air traffic control clearances.

Holding procedure. A predetermined manoeuvre which keeps an aircraft which a specified airspace whilst awaiting further clearance.

IFR flight. A flight conducted in accordance with instrument flight rules.

Instrument meteorological conditions. Meteorological conditions expressed in terms of visibility, distance, cloud and ceiling, less than the minima specified for visual meteorological conditions.

Level. A generic term relating to the vertical position of an aircraft in flight and meaning variously, height or flight level.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of an aircraft excluding aprons.

Missed approach procedure. The procedure to be followed if the approach cannot be continued.

Movement area. That part of the aerodrome to be used for the take-off, landing and taxiing of aircraft, on the manoeuvring area and the apron(s).

Radar approach. An approach, executed by an aircraft, under the direction of a radar controller.

Radar identification. The process of correlating a particular radar blip of radar position symbol with a specific aircraft.

Radar vectoring. Provision of navigational guidance to aircraft in the form of specific headings, based on the use of radar.

Reporting point. A specified geographical location in relation to which the position of the aircraft can be reported.

Runway visual range. The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Threshold. The beginning of that portion of the runway useable for landing.

Touchdown. The point where the nominal glide path intercepts the runway.

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is visually expressed in degrees from North (true, magnetic or grid).

VFR flight. A flight conducted in accordance with visual flight rules.

Visual meteorological conditions. Meteorological conditions expressed in terms of visibility, distance form cloud and ceiling, equal to or better than specified minima.

ABBREVIATIONS

Here are some commonly used abbreviations which you will meet many times in your career. They must be learned for exams.

Note: - the abbreviations listed below are normally spoken using the constituent letters, rather than the spelling alphabet, except those indicated by an asterisk which are normally spoken as complete words.

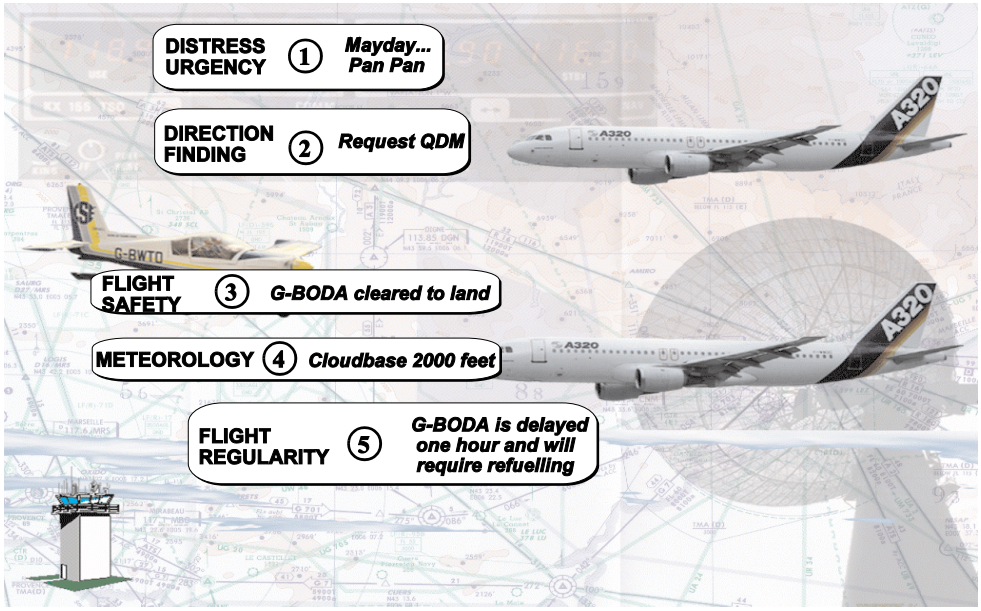
ACC	Area control centre or area control.
ADF	Automatic direction-finding equipment.
ADR	Advisory route.
AFIS*	Aerodrome flight information service.
AGL	Above ground level.
AIP	Aeronautical information publication.
AIRAC*	Aeronautical information regulation and control.
AIS	Aeronautical information services.
AMSL	Above mean sea level.
ATC	Air traffic control (in general).
ATD	Actual time of departure.
ATIS*	Automatic terminal information service.
ATS	Air traffic services.
ATZ	Aerodrome traffic zone.
CAVOK*	Visibility, cloud and present weather better than prescribed values or conditions.
CTR	Control Zone.
DME	Distance measuring equipment.
EET	Estimated elapsed time.
ETA	Estimated time of arrival or estimating arrival.
ETD	Estimated time of departure or estimating departure.
FIC	Flight information centre.
FIR	Flight information region.
FIS	Flight information service.
GCA	Ground controlled approach system or ground controlled approach.
HF	High frequency (3 to 30 MHz).
H24	Continuous day and night service.
IFR	Instrument flight rules.
ILS	Instrument landing system.
IMC	Instrument meteorological conditions.
INFO*	Information.
INS	Inertial navigational system.
LORAN*	LORAN (long range air navigation system).
MET*	Meteorological or meteorology.
MLS	Microwave landing system.
MNPS	Minimum navigation performance specifications.
NDB	Non-directional radio beacon.
NIL*	None or I have nothing to send you.
NOTAM*	A notice 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.
PAPIs*	Precision Approach Path Indicators
QFE	Atmospheric pressure at aerodrome elevation (or at runway threshold).
QNH	Altimeter sub-scale setting to obtain elevation when on the ground.
RCC	Rescue co-ordination centre.

RNAV*	Area navigation.
RVR	Runway visual range.
SELCAL*	A system which permits the selective calling of individual aircraft over radiotelephone channels linking a ground station with the aircraft.
SID*	Standard instrument departure.
SIGMET*	Information concerning en-route weather phenomena which may affect the safety of aircraft operations.
SNOWTAM*	A special series NOTAM notifying the presence or removal of hazardous conditions due to snow, ice, slush or standing water associated with snow, slush and ice on the movement area, by means of a specific format.
SPECIAL*	Special meteorological report (in abbreviated plain language).
SSR	Secondary surveillance radar.
SST	Supersonic transport.
STAR*	Standard (instrument) arrival.
TACAN*	UHF tactical air navigational aid.
TAF*	Aerodrome forecast.
TMA	Terminal control area.
UHF	Ultra high frequency (300 to 3000 MHz).
UIR	Upper flight information region.
UTA	Upper control area.
UTC	Co-ordinated universal time.
VASIS*	Visual approach slope indicator system.
VDF	Very high frequency direction-finding system.
VFR	Visual flight rules.
VHF	Very high frequency (30 to 300 MHz).
VIP	Very important person.
VMC	Visual meteorological conditions.
VOLMET*	Meteorological information for aircraft in flight.
VOR	VHF omnidirectional radio range.
VORTAC*	VOR and TACAN combination.

CATEGORIES OF MESSAGES

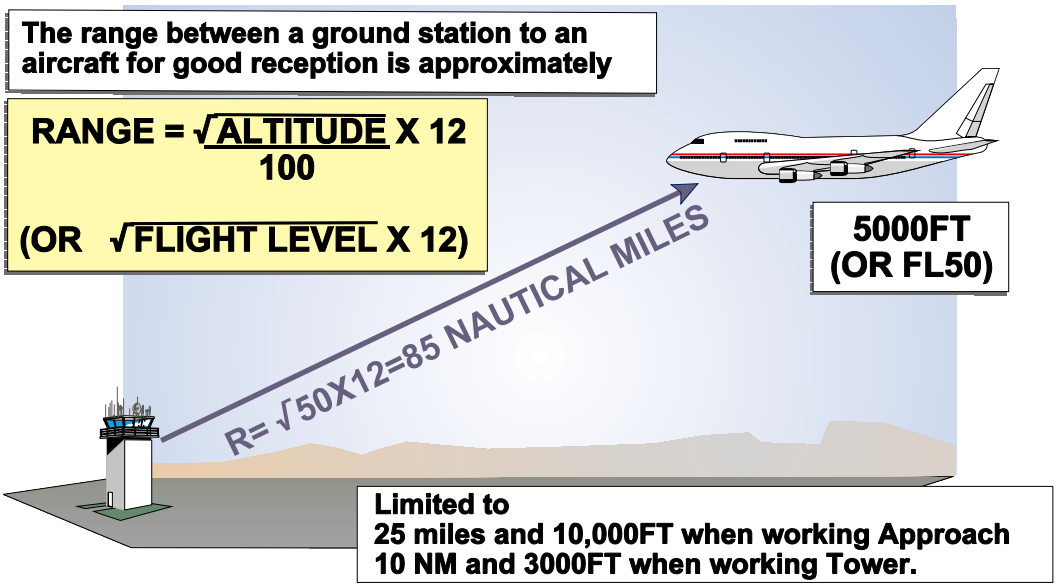
By convention, messages are placed into categories so that if several need to be sent, the highest priority messages are sent first. This also applies to normal radio communications; for example, an aircraft emergency call takes priority over a request for landing. The messages have the following order of priority:

- **Distress. (MAYDAY)** A condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.
- **Urgency**.(**PAN PAN**) A condition concerning the safety of an aircraft etc but does not require immediate assistance, including messages preceded by the medical transports signal – PAN PAN MEDICAL (see Chapter 5).
- **Direction Finding.** Communications relating to Direction Finding
- **Flight Safety.** Messages of immediate concern to an aircraft in flight. Meteorological advice of immediate concern to aircraft in flight or about to depart. Other messages to aircraft in flight or about to depart.
- **Meteorological Messages.** Reports, forecasts and warnings.
- **Flight Regularity** Messages regarding - operation or maintenance of facilities servicing changes in requirements for passengers and crew non routine landings aircraft parts or materials changes in aircraft operating schedules



VHF RANGE

Finally, you need to know a little about the range that you can get with your VHF radio. This is covered in the radio propagation theory in the Electrics book. The range of VHF radio in nm is about 1.25 times the square-root of the aircraft height in feet. Roughly this works out about 12 times the square-root of the flight level.



The full formula which also takes into account the height of the transmitting aerial when other than at mean sea level is as follows:

$$\text{Range} = 1.25 \times (\sqrt{h_1} + \sqrt{h_2})$$

where: h^1 is the height of the ground aerial (feet AMSL)

h^2 is the aircraft altitude (feet AMSL)

See chapter 7 for a fuller explanation.

APPENDIX 1A - ABBREVIATIONS USED IN AIS PUBLICATIONS

Abbreviations which differ from the ICAO abbreviations are shown in italics below.

† When radiotelephony is used, the abbreviations and terms are transmitted as spoken words.
‡ When radiotelephony is used, the abbreviations and terms are transmitted using the individual letters in non-phonetic form.

A

A	Amber
AAA	(or AAB, AAC... etc, in sequence) Amended meteorological message (message type designator)
A/A	Air-to-air
AAL	Above Aerodrome Level
ABM	Abeam
ABN	Aerodrome Beacon
ABT	About
ABV	Above
AC	Altocumulus
ACARS	Aircraft Communications Addressing And Reporting System
ACAS	Airborne Collision Avoidance Systems
ACC‡	Area Control Centre OR Area Control
ACCID	Notification of an Aircraft Accident
ACFT	Aircraft
AFS	Aeronautical Fixed Service
AFT	After... (time or place)
AFTN‡	AeronauticalFixed Telecommunication Network
A/G	Air-to-Ground
AGA	Aerodromes, Air Routes and Ground Aids
AGL	Above Ground Level
AGN	Again
AGNIS	Azimuth Guidance for Nose-In Stand
AIAA	Area of Intense Air Activity
AIC	Aeronautical Information Circular
AIM	ATFM Information Message
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIREP†	Air-Report
AIS	Aeronautical Information Services
ALA	Alighting Area
ACH	Asymmetric Committed Height
ACK	Acknowledge
ALERF	Alert Phase
ACL	Altimeter Check Location
ACN	Aircraft Classification Number
ACP	Acceptance (message type designator)
ACPT	Accept OR Accepted
ACT	Active OR Activated OR Activity
AD	Aerodrome
ADA	Advisory Area
ADDN	Addition OR Additional
ADF‡	Automatic Direction-Finding Equipment
ADGE	Air Defence Ground Environment

ADIZ†	(to be pronounced 'AY-DIZ') Air Defence Identification Code
ADJ	Adjacent
ADR	Advisory Route
ADS	Automatic Dependent Surveillance
ADSU	Automatic Dependent Surveillance Unit
ADT	Approved Departure Time
ADVS	Advisory Service
ADZ	Advise
AES	Aircraft Earth Station
AFIL	Flight Plan Filed in the Air
AFIS	Aerodrome Flight information Service
AFM	Yes OR Affirm OR Affirmative OR That is Correct
ALR	Alerting (message type designator)
ALRS	Alerting Service
ALS	Approach Lighting System
ALT	Altitude
ALTN	Alternate OR Alternating (Light alternates in colour)
ALTN	Alternate (Aerodrome)
AMA	Area Minimum Altitude
AMD	Amend OR Amended (used to indicate amended meteorological message; message type designator)
AMDT	Amendment (AIP Amendment)
AMS	Aeronautical Mobile Service
AMSL	Above Mean Sea Level
AMSS	Aeronautical Mobile Satellite Service
ANM	ATFM Notification Message
ANS	Answer
AO	Aircraft Operators
AOC	Aerodrome Obstacle Chart
AOC	Air Operator Certificate
AOD	Above Ordnance Datum (Newlyn)
AOM	Aerodrome Operating Minima
AP	Airport
APAPI	Abbreviated Precision Approach Path Indicator
APCH	Approach
APHAZ	Aircraft Proximity Hazzard
APIS	Aircraft Positioning and Information System
APP	Approach Control Office OR Approach Control OR Approach Control Service
APR	April
APRX	Approximate OR Approximately
APSG	After Passing
APV	Approve OR Approved OR Approval
ARFOR	Area Forecast (In aeronautical Meteorological Code)
ARNG	Arrange
ARO	Air Traffic Services Reporting Office
ARP	Aerodrome Reference Point
ARP	Air-Report (message type designator)
ARQ	Automatic Error Correction
ARR	Arrive OR Arrival
ARR	Arrival (message type designator)
ARS	Special Air-Report (message type designator)
ARST	Arresting (Specify (part of) Aircraft Arresting Equipment)
AS	Altostratus
ASC	Ascent to OR Ascending to
ASDA	Accelerate-Stop Distance Available

ASPH	Asphalt
AT...	At (followed by time at which weather change is forecast to occur)
ATA‡	Actual Time of Arrival
ATC‡	Air Traffic Control (in general)
ATD‡	Actual Time of Departure
ATFM	Air Traffic Flow Management
ATIS†	Automatic Terminal Information Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATOTN	Air Traffic Operation Telephone Network
ATP	At...(time or place)
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
ATTN	Attention
ATZ	Aerodrome Traffic Zone
AUG	August
AUTH	Authorised OR Authorisation
AUW	All up Weight
AUX	Auxiliary
AVASIS	Abbreviated Visual Approach Slope Indicator System
AVBL	Available OR Availability
AVG	Average
AVGAS	Aviation Gasoline
AVTUR	Aviation Turbine Fuel
AWTA	Advise at What Time Available
AWY	Airway
AZM	Azimuth

B

B	Blue
BA	Braking Action
BAA	British Airports Authority plc
BASE†	Cloud Base
BCFG	Fog Patches
BCN	Beacon (Aeronautical ground light)
BCST	Broadcast
BDRY	Boundary
BECMG	Becoming
BFR	Before
BKN	Broken
BL...	Blowing (followed by DU = Dust, SA = Sand or SN = Snow)
BLDG	Building
BLO	Below Clouds
BLW	Below
BOMB	Bombing
BR	Mist
BRF	Short (used to indicate the type of approach desired or required)
BRG	Bearing
BRKG	Braking
B- RNAV†	Basic - (To be pronounced 'AR-NAV') Area Navigation
BS	Commercial Broadcasting Station
BTL	Between Layers
BTN	Between

C

C	Centre (runway identification)
CAA	Civil Aviation Authority
CANP	Civil Aircraft Notification Procedure
CAP	Civil Aviation Publication
CAS	Calibrated Airspeed
CAT	Category
CAT	Clear Air Turbulence
CATZ	Combined Aerodrome Traffic Zone
CAVOK†	(To be pronounced 'KAV-OH-KAY') Visibility, cloud and present weather better than prescribed values or conditions
CB‡	(To be pronounced 'CEE BEE') Cumulonimbus
CBR	Cloud Base Recorder (ceilometer)
CC	Counter Clockwise
CC	Cirrocumulus
CCA	(Or CCB, CCC...etc, in sequence) Corrected meteorological message (message type designator)
CD	Candela
CDN	Co-ordination (message type designator)
CDR	Conditional Rout
CEU	Central Executive Unit
CF	Change frequency to...
CFMU	Central Flow Management Unit (Europe)
CGL	Circling Guidance Light(s)
CHAPI	Compact Helicopter Approach Path Indicator
CH	Channel
CHG	Modification (message type designator)
CI	Cirrus
CIDIN†	Common ICAO Data Interchange Network
CIT	Near OR over large towns
CIV	Civil
CK	Check
CL	Centre-Line
CLA	Clear Type of Ice Formation
CLBR	Calibration
CLD	Cloud
CLG	Calling
CLR	Clear(s) OR Cleared to... OR Clearance
CLSD	Close OR Closed OR Closing
CM	Centimetre
CMB	Climb to OR Climbing to
CMN	Control Motion Noise
CMPL	Completion OR Completed OR Complete
CNL	Cancel OR Cancelled
CNL	Flight Plan Cancellation (message type designator)
CNS	Communications, Navigation and Surveillance
Coded	Centre-line lights of approach light system are coded
COL	Column (in tables and text)
Colour Coded	Runway centre-line lights are coloured red over the final 300 m and alternately red/white in the penultimate 600 m.
COM	Communications
CONC	Concrete
COND	Condition

CONS	Continuous
CONST	Construction OR Constructed
CONT	Continue(s) OR Continued
COOR	Co-ordinate OR Co-ordination
CO-ORD	Geographical Co-ordinates
COP	Change-Over Point
COR	Correct OR Correction OR Corrected (Used to indicate corrected meteorological
COSPA S	message; message type designator) Cosmos Rescue System (USSR)
COT	At the Coast
COV	Cover OR Covered OR Covering
CPL	Current Flight Plan (message type designator)
CRM	Collision Risk Model
CRZ	Cruise
CS	Cirrostratus
CTA	Control Area
CTAM	Climb to and Maintain
CTC	Contact
CTL	Control
CTMO	Central Traffic Management Organisation
CTN	Caution
CTOT	Calculated Take-off Time
CTR	Control Zone
CU	Cumulus
CUF	Cumuliform
CUST	Customs
CW	Continuous Wave
CWY	Clearway

D

D...	DME Range (prefix used in graphics)
D	DME Frequency pairing (used in graphics as a suffix to a VOR/ILS frequency)
D...	Danger Area (Followed by Identification)
D	Downward (tendency in RVR during previous 10 minutes)
DA	Decision Altitude
DAAIS	Danger Area Activity Information Service
DACS	Danger Area Crossing Service
DBC	Comecon Data Bank
DBE	Eurocontrol Data Bank
DCD	Double Channel Duplex
DCKG	Docking
DCS	Double Channel Simplex
DCT	Direct (In relation to flight path clearances and type of approach)
DDM	Difference in Depth of Modulation
DEC	December
DECR	Decrease
DEG	Degrees
DENEB	Fog Dispersal Operations
DEP	Depart OR Departure
DEP	Departure (message type designator)
DER	Departure End of Runway
DES	Descend to OR Descending to
DEST	Destination
DETR	Department of the Environment, Transport and the Regions (UK)

DETRESFA†	Distress Phase
DEV	Deviation OR Deviating
DF	Direction Finding
DFR	Departure Flow Regulator
DFTI	Distance from touchdown Indicator
DH	Decision Height
DIF	Diffuse
DIST	Distance
DIV	Divert OR Diverting
DLA	Delay OR Delayed
DME‡	Distance Measuring Equipment
DNG	Danger OR Dangerous
DOC	Designated Operational Coverage
DOM	Domestic
DP	Dew Point Temperature
DPT	Depth
DR	Dead Reckoning
DR...	Low Drifting (followed by DU = Dust, SA = Sand or SN = Snow)
DRG	During
DS	Duststorm
DSB	Double Sideband
DTAM	Descend to and Maintain
DTG	Date-Time Group
DTRT	Deteriorate OR Deteriorating
DTW	Dual Tandem Wheels
DU	Dust
DUA	Dedicated User Area
DUC	Dense upper Cloud
DUR	Duration
DVOR	Doppler VOR
DW	Dual Wheels
DZ	Drizzle

E

E	East OR Eastern Longitude
EAT	Expected Approach Time
EB	Eastbound
ECAC	European Civil Aviation Conference
ED	Emergency Distance (AD 1.1.1)
EDT	Estimated Departure Time
EET	Estimated Elapsed Time
EFC	Expected Further Clearance
EFIS	Electronic Flight Instrument System
EHF	Extremely High Frequency (30000 to 300000 MHz)
ELBA†	Emergency Location Beacon - Aircraft
ELEV	Elevation
ELR	Extra Long Range
ELT	Emergency Locator Transmitter (GEN 3.6.6)
EM	Emission
EMBD	Embedded in a Layer (To indicate cumulonimbus embedded in layers of other clouds)
EMERG	Emergency
END	Stop-end (related to RVR)
ENE	East North East

ENG	Engine
ENRT	En-Route
EOA	Engine Out Allowance
EOBT	Estimated Off-Block Time
EPIRB	Emergency Position Indicating Radio Beacon
EQPT	Equipment
ER	Here...OR Herewith
ESE	East South East
EST	Estimate OR Estimated OR Estimate (message type designator)
ETA‡	Estimated Time of Arrival OR Estimating Arrival
ETD‡	Estimated Time of Departure OR Estimating Departure
ETO	Estimated Time Over Significant Point
ETOPS	Extended Twin-jet Operations
EV	Every
EXC	Except
EXER	Exercises OR Exercising OR To Exercise
EXP	Expect OR Expected OR Expecting
EXTD	Extend OR Extending

F

F	Fixed
FA	Area Forecast (ARFOR)
FAC	Facilities
FAF	Final Approach Fix
FAL	Facilitation of International Air Transport
FAP	Final Approach Point
FAT	Final Approach Track
FATO	Final Approach and Take-off Area
FAX	Facsimile Transmission
FBL	Light (Used to indicated the intensity of weather phenomena, interference or static reports, e.g. FBL RA = Light rain)
FBU	Flight Briefing Unit
FC	Funnel Cloud (tornado or water spout)
FCST	Forecast
FCT	Friction Coefficient
FEB	February
FG	Fog
FIC	Flight Information Centre
FIR‡	Flight Information Region
FIS	Flight Information Service
FISA	Automated Flight Information Service
FL	Flight Level
FLAS	Flight Level Allocation Scheme
FLD	Field
FLG	Flashing
FLR	Flares
FLT	Flight
FLTCK	Flight Check
FLUC	Fluctuating OR Fluctuation OR Fluctuated
FLW	Follow(s) OR Following
FLY	Fly OR Flying
FM	From
FM...	From (followed by time weather change is forecast to begin)
FMS	Flight Management System

FMU	Flow Management Unit
FMP	Flow Management Position
FNA	Final Approach
FOQNH	Forecast Regional QNH
FPL	Filed Flight Plan (message type designator)
FPM	Feet Per Minute
FPR	Flight Plan Route
FR	Fuel Remaining
FREQ	Frequency
FRI	Friday
FRNG	Firing
FRONT†	Front (Relating to Weather)
HLDG	Holding
HN	Sunset to Sunrise
FRQ	Frequent
FSL	Full Stop Landing
FSS	Flight Service Station
FST	First
FT	Feet (Dimensional Unit)
FTT	Flight Technical Tolerance
FU	Smoke
FZ	Freezing
FZDZ	Freezing Drizzle
FZFG	Freezing Fog
FZRA	Freezing Rain

G

G	Green
G/A	Ground-to-Air
G/A/G	Ground-to-Air and Air-to-Ground
GAT	General Air Traffic
Gauge	Indicates distance between two rows of runway lights
GCA‡	Ground Controlled Approach System OR Ground Controlled Approach
GEN	General
GEN	Generally
GEO	Geographic OR True
GES	Ground Earth Station
GLD	Glider
GND	Ground
GNDCK	Ground Check
GNSS	Global Navigation Satellite System
GP	Glide Path
GR	Hail
GRASS	Grass Landing Area
GRID	Processed Meteorological Data in the Form of Grid Point Values (In Aeronautical Meteorological Code)
GRVL	Gravel
GS	Ground Speed
GS	Small hail and/or snow pellets
GVS	Gas Venting Site

H

H24	Continuous Day and Night Service
H	Helicopter
HAPI	Helicopter Approach Path Indicator
HBN	Hazard Beacon
HDF	High Frequency Direction-Finding Station
HDG	Heading
HEL	Helicopter
HF‡	High Frequency (3000 to 30000 kHz)
HGT	Height OR Height Above
HIAL	Highlands and Islands Airports Ltd
HI	High Intensity directional lights
HIRTA	High Intensity Radio Transmission Area
HJ	Sunrise to sunset
HL	Height Loss
HN	Sunset to Sunrise
HO	Service available to meet operational requirements
HOL	Holiday
HOPA	Helicopter Operational Area
HORIZ	Horizontal
HOSP	Hospital Aircraft
HPA	Hectopascal
HR	Hours
HS	Service Available During Hours of Scheduled Operations
HT	High Tension (power)
HTA	Helicopter Training Area
HURCN	Hurricane
HVDF	High and Very High Frequency Direction Finding Stations (At the Same Location)
HVY	Heavy
HVY	Heavy (used to indicate the intensity of weather phenomena, e.g. HVY RA = Heavy rain)
HX	No Specific Working Hours
HYR	Higher
HZ	Dust Haze
Hz	Hertz (Cycle Per Second)

I

IAC	Instrument Approach Chart
IAF	Initial Approach Fix
IAO	In and Out of Clouds
IAP	Instrument Approach Procedure
IAR	Intersection of Air Routes
IAS	Indicated Air Speed
IBN	Identification Beacon
IC	Diamond Dust (very small ice crystals in suspension)
ICE	Icing
ID	Identifier OR Identify
IDENT†	Identification
IF	Intermediate Approach Fix
IFF	Identification Friend/Foe
IFR‡	Instrument Flight Rules
IGA	International General Aviation

ILS‡	Instrument Landing System
IM	Inner Marker
IMC‡	Instrument Meteorological Condition
IMG	Immigration
IMPR	Improve OR Improving
IMT	Immediate OR Immediately
INA	Initial Approach
INBD	Inbound
INC	In Cloud
INCR	Increase
INCERFA†	Uncertainty Phase
INCL	Included OR Including OR Inclusive
INFO†	Information
INOP	Inoperative
INP	If Not Possible
INPR	In Progress
INS	Inertial Navigation System
INSTL	Install OR Installed OR Installation
INSTR	Instrument
INT	Intersection
INTL	International
INTRG	Interrogator
INTRP	Interrupt OR Interruption OR Interrupted
INTSF	Intensify or Intensifying
INTST	Intensity
IR	Ice on Runway
ISA	International Standard Atmosphere
ISB	Independent Sideband
ISOL	Isolated

J

JAN	January
JTST	Jet Stream
JUL	July
JUN	June

K

KG	Kilogrammes
kHz	Kilohertz
KM	Kilometres
KMH	Kilometres per Hour
KPA	Kilopascal
KT	Knots
KW	Kilowatts

L

L	Left (Runway Identification)
L	Locator (NDB with published approach procedure, See LM, LO)
LAM	Logical Acknowledgement (message type designator)
LAN	Inland
LARS	Lower Airspace Radar Advisory Service

LAT	Latitude
LATCC	London Area and Terminal Control Centre
LDA	Landing Distance Available
LDAH	Landing Distance Available, Helicopter
LDG	Landing
LDI	Landing Direction Indicator
LEN	Length
LF	Low Frequency (30 to 300 kHz)
LFA	Low Flying Area
LFZ	Low Flying Zone
LGT	Light or Lighting
LGTD	Lighted
LHA	Lowest Holding Altitude
LHS	Left Hand Side
LI	Low Intensity omni-directional lights
LIH	Light Intensity High
LIL	Light Intensity Low
LIM	Light Intensity Medium
LITAS	Low Intensity Two Colour Approach Slope Indicators at .... and .... metres from threshold bracketing approach angle of degrees
LLIZ	Localizer
LM	Locator, Middle
LMT	Local Mean Time
LNG	Long (Used to Indicate the type of approach desired or required)
LO	Locator, outer
LOC	Local OR Locally OR Location OR Located
LONG	Longitude
LORAN†	LORAN (Long Range Air Navigation System)
LRG	Long Range
LSQ	Line Squall
LTD	Limited
LTT	Landline teletypewriter
LUT	Local User Terminal
LV	Light and Variable (Relating to Wind)
LVE	Leave OR Leaving
LVL	Level
LVP	Low Visibility Procedures
LYR	Layer OR Layered

M

M	Mach Number (Followed by figures)
M	Metres (Preceded by figures)
MAA	Maximum Authorised Altitude
MAG	Magnetic
MAINT	Maintenance
MAP	Aeronautical maps and charts
MAPt	Missed Approach Point
MAR	At sea
MAR	March
MAS	Manual A1 Simplex
MATZ	Military Aerodrome Traffic Zone
MAX	Maximum
MAY	May
MB	Millibars

MCA	Minimum Crossing Altitude
MCW	Modulated Continuous Wave
MDA	Minimum Descent Altitude
MDF	Medium Frequency Direction Finding Station
MDH	Minimum Descent Height
MEA	Minimum En-route Altitude
MEDA	Military Emergency Diversion Aerodrome
MVDF	Medium and Very High Frequency Direction Finding Stations (At the same location)
MEHT	Minimum Eye Height over Threshold (For VASIS and PAPI)
MWARA	Major World Air Route Area
MET†	Meteorological OR Meteorology
METAR†	Aviation routine weather report (in aeronautical meteorological code)
MF	Medium Frequency (300 to 3000 kHz)
MHDF	Medium and High Frequency Direction Finding Stations (At the same location)
MHVDF	Medium, High and Very High Frequency Direction Finding Stations (At the same location)
MHz	Megahertz
MID	Mid-point (related to RVR)
MIFG	Shallow fog
MIL	Military
MIN	Minutes
MKR	Marker radio beacon
MLWA	Maximum Landing Weight Authorised
MLS‡	Microwave Landing System
MM	Middle Marker
MNM	Minimum
MNPS	Minimum Navigation Performance Specifications
MNT	Monitor OR Monitoring OR Monitored
MNTN	Maintain
MOA	Military Operating Area
MOC	minimum Obstacle Clearance (required)
MOD	Moderate (Used to indicated the intensity of weather phenomena, interference or static reports, e.g. MOD RA = Moderate rain)
MOGAS	Motor Gasoline
MON	Above Mountains
MON	Monday
MOTNE	Meteorological Operational Telecommunications Network Europe
MOV	Move OR Moving OR Movement
MPH	Statute Miles Per Hour
MPS	Metres Per Second
MRA	Minimum Reception Altitude
MRG	Medium Range
MRP	ATS/MET Reporting Point
MS	Minus
MSA	Minimum Sector Altitude
MSD	Minimum Separation Distance (Mil)
MSG	Message
MSL	Mean Sea Level
MT	Mountain
MTOW	Maximum Take-off Weight
MTRA	Military Temporary Reserved Airspace
MTU	Metric Units
MTW	Mountain Waves

MTWA	Maximum Total Weight Authorised
MWO	Meteorological Watch Office
MX	Mixed type of ice formation (white and clear)

N

N	North OR Northern latitude
N	no distinct tendency (in RVR during previous 10 minutes)
NAT	North Atlantic
NATFMS	National Air Traffic Flow Management System
NAV	Navigation
NB	Northbound
NBFR	Not Before
NC	No Change
NDB‡	Non-Directional Radio Beacon
NDS	Non-deviating Status
NE	North East
NEB	North Eastbound
NEG	No OR Negative OR Permission not granted OR That is not correct
NGT	Night
NIL*†	None OR I Have nothing to send you
NM	Nautical Miles
NML	Normal
NNE	North North East
NNW	North North West
NOF	International NOTAM Office
NOSIG†	No Significant Change (Used in trend-type landing forecasts)
NOTAM†	A notice 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
NOV	November
NR	Number
NRH	No Reply Heard
NS	Nimbostratus
NSC	Nil Significant Cloud
NSW	Nil Significant Weather
NW	North West
NWB	North Westbound
NXT	Next

O

OAC	Oceanic Area Control Centre
OAS	Obstacle Assessment Surface
OAT	Operational Air Traffic
Obs	Obstacle lights
OBS	Observe OR Observed OR Observation
OBSC	Obscure OR Obscured OR Obscuring
OBST	Obstacle
OCA	Obstacle Clearance Altitude
OCC	Occulting (light)
OCH	Obstacle Clearance Height
OCNL	Occasional OR Occasionally
OCS	Obstacle Clearance Surface

OCT	October
OHD	Overhead
OIS	Obstacle Identification Surface
OLR	Off-load Routes
OM	Outer Marker
OPA	Opaque, white type of ice formation
OPC	The control indicated is operational control
OPMET†	Operational Meteorological (information)
OPN	Open OR Opening OR Opened
OPR	Operator OR Operate OR Operative OR Operating OR Operational
OPS†	Operations
O/R	On Request
ORCAM	Originator Region Code and Mode
ORD	Indication of an order
OSV	Ocean Station Vessel
OTLK	Outlook (used in SIGMET messages for volcanic ash and tropical cyclones)
OTP	On Top
OTS	Organised Track System
OUBD	Outbound
OVC	Overcast

P

P...	Prohibited area (Followed by identification)
PALS	Precision Approach Lighting System (Specify category)
PANS	Procedures for Air Navigation Services
PAPA	Parallax Aircraft Parking Aid
PAPI†	Precision Approach Path Indicator
PAR‡	Precision Approach Radar
PARL	Parallel
PAX	Passenger(s)
PCD	Proceed OR Proceeding
PCN	Pavement Classification Number
PDG	Procedure Design Gradient
PE	Ice pellets
PEC	Pressure Error Correction
PER	Performance
PERM	Permanent
PH	Public Holiday
PIB	Pre-flight Information Bulletin
PJE	Parachute Jumping Exercise
PLA	Practice Low Approach
PLN	Flight Plan
PLS	Passenger Load Supplement
PLVL	Present Level
PN	Prior Notice required
PndB	Perceived Noise Decibels
PNR	Point of No Return
PO	Dust Devils
POB	Persons on Board
POSS	Possible
PPI	Plan Position Indicator
PPR	Prior Permission Required
PPSN	Present Position
PRI	Primary

PRKG	Parking
PRM	Preferred Route Message
PROB†	Probability
PROC	Procedure
PROV	Provisional
PS	Plus
PSG	Passing
PSN	Position
PSP	Pierced Steel Plan
PTN	Procedure Turn
PTS	Polar Track Structure
PWR	Power

Q

QBI	Compulsory IFR flight
QDM‡	Magnetic Heading (zero wind)
QDR	Magnetic Bearing
QFA	Meteorological Forecast
QFE‡	Atmospheric pressure at aerodrome elevation (OR at runway threshold)
QFU	Magnetic orientation of runway
QNH‡	Altimeter sub-scale setting to obtain elevation when on the ground
QTE	True bearing
QUAD	Quadrant

R

R	Red
R...	Restricted Area (followed by identification)
R...	Radial (prefix for use in graphics)
R	Right (runway identification)
R	Rate of Turn
RA	Rain
RA	Resolution Advisory/Advisories (ACAS)
RAC	Rules of the Air and Air Traffic Services
RAD	Radar Approach Aid
RAD	Radius
RAF	Royal Air Force
RAFC	Regional Area Forecast Centre
RAG	Ragged
RAG	Runway Arresting Gear
RAI	Runway Alignment Indicator
RAL	Runway alignment beacon at distance from Beacon threshold indicated
RAS	Radar Advisory Service
RB	Rescue boat
RCA	Reach Cruising Altitude
RCC	Rescue Co-ordination Centre
RCF	Radio Communication Failure (message type designator)
RCH	Reach OR Reaching
RCL	Runway Centre Line
RCLL	Runway Centre Line Light(s)
RCLR	Recleared
RDH	Reference Datum Height (For ILS)
RDL	Radial

RDT	Requested Departure Time
RDO	Radio
RE...	Recent (Used to qualify weather phenomena, eg RERA = recent rain)
REC	Receive OR Receiver
REDL	Runway Edge Light(s)
REF	Reference to ...OR Refer to...
REG	Registration
RENL	Runway End Light(s)
REP	Report OR Reporting OR Reporting Point
REQ	Request OR Requested
RERTE	Re-route
RESA	Runway End Safety Area
RET	Rapid Exit Taxiway
RFF	Fire and Rescue Equipment
RG	Range (lights)
RHS	Right hand side
RIF	Reclearance in Flight
RIS	Radar Information Service
RITE	Right (Direction of Turn)
RIV	Rapid Intervention Vehicle
RL	Report Leaving
RLA	Relay to
RLCE	Request Level Change En-route
RLLS	Runway Lead-in Lighting System
RLNA	Requested Level Not Available
RMK	Remark
RN	Royal Navy
RNAV†	(To be pronounced 'AR-NAV') Area Navigation
RNG	Radio Range
RNP	Required Navigation Performance
ROBEX†	Regional OPMET Bulletin Exchange (Scheme)
ROC	Rate of Climb
ROD	Rate of Descent
ROFOR	Route Forecast (in aeronautical meteorological code)
RON	Receiving Only
RPL	Repetitive Flight Plan
RPLC	Replace OR Replaced
RPS	Radar Position Symbol
RQMNT	Requirements
RQP	Request flight plan (message type designator)
RQS	Request supplementary flight plan (message type designator)
RR	Report Reaching
RRA	(OR RRB, RRC...etc, in sequence) Delayed meteorological message (message type designator)
RSC	Rescue Sub-Centre
RSCD	Runway Surface Condition
RSP	Responder beacon
RSR	En-Route Surveillance Radar
RSS	Route Sum Square
RTD	Delayed (used to indicate delayed meteorological message; massage type designator)
RTE	Route
RTF	Radiotelephone
RTG	Radiotelegraph
RTHL	Runway threshold light(s)

RTN	Return OR Returned OR Returning
RTOAA	Rejected Take-off Area Available
RTODA	Rejected Take-off Distance Available,
RTR	Radar Termination Range
RTS	Return to Service
RTT	Radioteletypewriter
RTZL	Runway Touchdown Zone Light(s)
RUT	Standard regional route transmitting frequencies
RV	Rescue Vessel
RVA	Radar Vectoring Area
RVR‡	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum
RWY	Runway

S

S	South OR Southern Latitude
SA	Sand
SALS	Simple Approach Lighting System
SAN	Sanitary
SAP	As soon as possible
SAR	Search and Rescue
SARPS	Standards and Recommended Practices (ICAO)
SARSAT	Search and Rescue Satellite Aided Tracking System
SAT	Saturday
SATCOM†	Satellite Communication
SB	Southbound
SC	Stratocumulus
SCN	Slot Cancellation Message
SCT	Scattered
SDBY	Stand by
SDF	Step Down Fix
SE	South East
SPECIAL†	Special meteorological report (In abbreviated plain language
SEB	South Eastbound
SEC	Seconds
SECT	Sector
SPI	Special Position Indicator
SPL	Supplementary flight plan (message type designator)
SELCA L†	Selective calling system
SPOT†	Spot wind
SQ	Squall
SEP	September
SER	Service OR Servicing OR Served
SH...	Showers (followed by RA = Rain, SN = Sow, PL = Ice pellets, GR = Hail, GS = Small hail and/or snow pellets or combinations thereof, eg SHRASN = showers of rain and snow)
SHF	Super High Frequency (3000 to 30000 MHz)
SEV	Severe (Used eg to qualify icing and turbulence reports)
SFC	Surface
SFLOC	Synoptic report of the location of sources of atmospherics
SG	Snow Grains
SGL	Signal
SR	Sunrise
SRA	Surveillance Radar Approach

SRE	Surveillance Radar Element of precision approach radar system
SRG	Short range
SRP	Slot Reference Point
SRQ	Slot Request Message
SRR	Search and Rescue Region
SRY	Secondary
SS	Sandstorm
SS	Sunset
SSB	Single Sideband
SSE	South South East
SSR‡	Secondary Surveillance Radar
SST	Supersonic transport
SHINGALS	Supplementary High Intensity Narrow Gauge Approach Lighting System
SID†	Standard instrument Departure
SIF	Selective Identification Feature
STA	Straight in approach
STAR†	Standard instrument arrival
SIGMET†	Information concerning en-route weather phenomena which may affect the safety of aircraft operations
STD	Standard
STF	Stratiform
STN	Station
STNR	Stationary
SIGWX	Significant weather
SIMUL	Simultaneous OR Simultaneously
SIWL	Single Isolate Wheel Load
SKC	Sky Clear
SKED	Schedule OR Scheduled
SLAP	Slot Allocation Procedure
SLP	Speed Limiting Point
SLT	Slot Allocation Message
SLW	Slow
SMB	Side Marker Boards
SMC	Surface Movement Control
SMR	Surface Movement Radar
SN	Snow
SNOWTAM†	A Special series NOTAM notifying the presence or removal of hazardous conditions due to snow, ice, slush or standing water associated with snow, slush and ice on the movement area, by means of a specific format
SOC	Start of Climb
Sodium Box.	Sodium approach lights arranged in box formation
SPECI†	Aviation selected special weather report (In aeronautical meteorological code)
SPECIAL†	Aviation selected special weather report (In abbreviated plain language)
SSW	South South West
ST	Stratus
STOL	Short Take-Off and Landing
STS	Status
STWL	Stopway light(s)
SUBJ	Subject to
SUN	Sunday
SUP	Supplement (AIP Supplement)
SUPPS	Regional supplementary procedures
SVC	Service message
SVCBL	Serviceable
SVCE	Service

SVFR	Special Visual Flight Rules
SW	South West
SWB	South Westbound
SWY	Stopway

T

T	Temperature
TA	Transition Altitude
TACAN†	UHF Tactical Air Navigation Aid
TAF†	Aerodrome forecast
TAIL†	Tail wind
TAR	Terminal Area Surveillance Radar
TAS	True Airspeed
TAX	Taxiing OR Taxi
TBC	Tactical Booking Cell
TC	Tropical Cyclone
TCU	Towering Cumulus
TDA	Temporary Danger Area
TDO	Tornado
TDZ	Touch Down Zone
TECR	Technical Reason
TEL	Telephone
TEMPO†	Temporary OR Temporarily
TFC	Traffic
TGL	Touch-and-Go Landing
TGS	Taxiing Guidance System
THR	Threshold
THRU	Through
THU	Thursday
TIL†	Until
TIP	Until past... (place)
TKOF	Take-off
TL...	Till (followed by time by which weather change is forecast to end)
TLOF	Touchdown and Lift-off Area
TMA‡	Terminal Control Area
TNA	Turn Altitude
TNH	Turn Height
TO	To... (place)
TOC	Top of Climb
TODA	Take-off Distance Available
TODAH	Take-off Distance Available, Helicopter
TOP†	Cloud Top
TORA	Take-off Run Available
TOS	Traffic Orientation Scheme
TOSA	Take-off Space Available
TP	Turning Point
TR	Track
TRA	Temporary Reserved Airspace
TRA	Temporary Restricted Area
TRANS	Transmits OR Transmitter
TRL	Transition Level
TROP	Tropopause
TS	Thunderstorm (in aerodrome reports and forecasts TS used alone means thunder heard but no precipitation at the aerodrome)

TS...	Thunderstorm (followed by RA = Rain, SN = Snow, PL = Ice pellets, GR = Hail, GS = Small hail and/or snow pellets or combinations thereof, eg TSRASN = thunderstorm with rain and snow)
TT	Teletypewriter
TTA	Tactical Training Areas
TTT	Template Training Technique
TUE	Tuesday
TURB	Turbulence
TVOR	Terminal VOR
TWIL	Twilight (Civil)
TWR	Aerodrome control tower OR aerodrome control
TWY	Taxiway
TWYL	Taxiway-Link
TYP	Type of Aircraft
TYPH	Typhoon

U

U	Upward (tendency in RVR during previous 10 minutes)
UA	Air Report (AIREP)
UAB	Until Advised By....
UAC	Upper Area Control Centre
UAR	Upper Air Route
UDF	Ultra High Frequency Direction Finding Station
UFN	Until Further Notice
UHDT	Unable Higher Due Traffic
UHF‡	Ultra High Frequency (300 to 3000 MHz)
UIC	Upper Information Centre
UIR‡	Upper Flight Information Region
UKLFS	United Kingdom Low Flying System
ULR	Ultra Long Range
UNA	Unable
UNAP	Unable to Approve
UNL	Unlimited
UNREL	Unreliable
U/S	Unserviceable
UTA	Upper Control Area
UTC‡	Co-ordinated Universal Time

V

VA	Volcanic Ash
VAC	Visual Approach Chart
VAL	In Valleys
VAN	Runway Control Van
VAR	Magnetic Variation
VAR	Visual-aural radio range
VASIS†	Visual Approach Slope Indicator System
VC	Vicinity of aerodrome (followed by FG = Fog, FC = Funnel cloud, SH = Showers, PO = Dust/sand whirls, BLDU = Blowing dust, BLSA = Blowing sand or BLSN = Blowing snow, eg VC FG = Vicinity fog)
VCY	Vicinity
VDF	Very High Frequency Direction Finding Station

VER	Vertical
VFR‡	Visual Flight Rules
VHF‡	Very High Frequency (30 to 300 MHz)
VIP‡	Very Important Person
VIS	Visibility
VLF	Very Low Frequency (3 to 30 KHz)
VLR	Very Long Range
VMC‡	Visual Meteorological Conditions
VM(C)	Visual Manoeuvring (Circling)
VOLMET†	Meteorological information for aircraft in flight
VOR‡	Very High Frequency Omnidirectional Radio Range
VORTAC†	VOR and TACAN combination
VOT	VOR airborne equipment test facility
VRB	Variable
VRP	Visual Reference Point
VSA	By visual reference to the ground
VSP	Vertical speed
VSTOL	Very Short Take-Off and Landing
VTOL	Vertical Take-Off and Landing

W

W	West or Western longitude
W	White
WAC	World Aeronautical Chart - ICAO 1:1,000,000 (1 mil)
WAFC	World Area Forecast Centre
WB	Westbound
WBAR	Wing bar lights
WDI	Wing Direction Indicator
WDSPR	Widespread
WED	Wednesday
WEF	With Effect From OR Effective From
WI	Within
WID	Width
WIE	With Immediate Effect OR Effective Immediately
WILCO†	Will comply
WINTEM	Forecast upper wind and temperature for aviation
WIP	Work in Progress
WKN	Weaken or Weakening
WNW	Wet North West
WO	Without
WPT	Way-point
WRDA	Weapon Range Danger Area
WRNG	Warning
WS	Windshear
WSW	West South West
WT	Weight
WTSPT	Waterspout
WX	Weather

X

X	Cross
XBAR	Crossbar (of approach lighting system)
XNG	Crossing
XS	Atmospheres

Y

Y	Yellow
YCZ	Yellow caution zone (runway lighting)
YR	Your

Z

Z	Co-ordinated Universal Time (in meteorological messages)

CHAPTER TWO

GENERAL OPERATING PROCEDURES

Contents

INTRODUCTION

The use of correct and precise standard phraseology in communications between pilots and ground personnel is vitally important. Incidents and accidents have occurred in which a contributing factor has been the misunderstanding caused by the use of non-standard phraseology.

Therefore we need to ensure that we use the correct:

- Technique
- Phonetic sounds for letters and numbers
- Format for time
- Phraseology
- Callsigns.

This chapter also covers procedures relating to radio test, transfer of communications, readback, the radar environment and conditional clearances.

TECHNIQUE

- **Listen**
  Before transmitting check that the receiver volume is set and listen to make sure you do not interrupt another transmission.

- **Microphone**
  Be familiar with your microphone. Do not turn your head or vary the distance from the microphone. Distortion will result from:

  - talking too close to the microphone
  - touching the mike with the lips
  - holding the boom of the microphone

- **Voice**
  Use a normal conversational tone, speak clearly and enunciate each word. Maintain the speaking volume at a constant level.

  Note: You should depress transit switch before speaking and do not release it until after you finish. A common fault is to release the button too soon.

- **Rate of Speech** The correct rate of speech is about 100 words per minute, but if it is known that the information needs to be written down, speak slower. ATC controllers can be very bad at this.

- **Hesitation** ... avoid hesitation sounds such as er and um!

- **Abbreviations** Some abbreviations, which by common and frequent use are understood, need not be spelled out e.g.ILS, VOR, NDB, TACAN, GPS, SELCAL, Q-CODES (QFE, QNH, QDR,)

- **Long Messages** If you have a long message pause occasionally. This allows time to check that the frequency is still clear and gives time for receiver to request repetition or clarification of parts not received.

TRANSMISSION OF TIME

All time references should be made in Co-ordinated Universal Time (UTC) and using the 24 hour clock. This time zone is sometimes referred to as Zulu (Z). 2400 is midnight and 0001 begins the new day.

When transmitting time, only the minutes of the hour are normally required. However, the hour should be included if there is any possibility of confusion.

TIME	TRANSMITTED AS	PRONOUNCED AS
0803	ZERO THREE or ZERO EIGHT ZERO THREE	ZE-RO TREE or ZE-RO AIT ZE-RO TREE
1300	ONE THREE ZERO ZERO	WUN TREE ZE-RO ZE-RO
2057	FIVE SEVEN or TWO ZERO FIVE SEVEN	FIFE SEVen or TOO ZE-RO FIFE SEVen

Pilots may check the time with the appropriate ATS unit. Time checks shall be given to the nearest half minute.

STANDARD WORDS AND PHRASES

Whenever possible use standard words and phrases. Here is a list of commonly used words and phrases which should be used in radiotelephony communications as appropriate and shall have the meaning shown.

WORD/PHRASE	MEANING
Acknowledge	Let me know that you have received and understood this message.
Affirm	Yes.
Approved	Permission for proposed action granted.
Break	I hereby indicate the separation between portions of the message. (To be used where there is no clear distinction between the text and other portions of the message).
Break Break	I hereby indicate the separation between messages transmitted to different aircraft in a very busy environment.
Cancel	Annul the previously transmitted clearance.
Check	Examine a system or procedure. (No answer is normally expected).
Cleared	Authorised to proceed under the conditions specified.
Confirm	Have I correctly received the following...? or Did you correctly receive the message?
Correct	That is correct.

Contact	Establish radio contact with .....
Correction	An error has been made in this transmission (or message indicated). The correct version is....
Disregard	Ignore
Go ahead	Proceed with your message.
How do you read	What is the readability of my transmission?
I say again	I repeat for clarity or emphasis.
Maintain	Continue in accordance with the condition(s) specified.
Monitor	Listen out on (frequency).
Negative	No *or* Permission not granted *or* That is not correct.
Out	This exchange of transmissions is ended and no response is expected.
Over	My transmission is ended and I expect a response from you. *Note: The word "OVER" is not normally used in VHF communications.*
Read back	Repeat all, or the specified part, of this message back to me exactly as received.
Recleared	A change has been made to your last clearance and this new clearance supersedes your previous clearance or part thereof.
Report	Pass me the following information.
Request	I should like to know... or I wish to obtain.
Roger	I have received all of your last transmission. *Note; Under no circumstances to be used in reply to a question requiring "READ BACK" or a direct answer in the affirmative (AFFIRM) or negative (NEGATIVE).*
Say again	Repeat all, or the following part, of your last transmission.
Speak slower	Reduce your rate of speech.
Standby	Wait and I will call you.
Unable	I cannot comply with your request, instruction or clearance.
Wilco	(Abbreviation for "will comply"). I understand your message and will comply with it.
Words twice	**As a request:** Communication is difficult. Please send every word or groups of words twice. **As information:** Since communication is difficult, every word or group of words in this message will be sent twice.

CALL SIGNS

Aeronautical Station For aeronautical stations there are of two parts:

- Location name
- Suffix denoting unit or type of service

For example: Brize Radar or Oxford Tower

The suffix indicates the type of unit or service provided as shown in the list below.

UNIT OR SERVICE	CALL SIGN SUFFIX
Area control centre	CONTROL
Radar (in general)	RADAR
Approach control	APPROACH
Approach control radar arrivals	ARRIVAL
Approach control radar departures	DEPARTURES
Aerodrome Control	TOWER
Surface movement control	GROUND
Clearance delivery	DELIVERY
Precision approach radar	PRECISION
Direction finding station	HOMER
Flight information service	INFORMATION
Apron control/management service	APRON
Company dispatch	DISPATCH
Aeronautical station	RADIO

When satisfactory communication has been established, and provided that it will not be confusing, the name of the location or the call sign suffix may be omitted.

Initial Contact
On initial contact use the full call sign of the station you are speaking to, followed by your full call sign.

Aircraft full call sign
An aircraft callsign shall be one of the following types:

- **Type A** aircraft registration marking e.g. G-BTRY (Note: this my be prefixed by the name of the aircraft manufacturer or aircraft model Piper G-BTRY or Seneca G-BTRY)

- **Type B** operating agency designator plus last 4 characters of the registration:

  SPEEDBIRD ABCD

- **Type C** operating agency designator plus flight number

  SCANDINAVIAN 937

Aircraft Abbreviated Call Sign
Abbreviated call signs shall be used only after satisfactory communications have been established and provided no confusion is likely to arise.

Only air traffic control may **initiate** abbreviation of aircraft call signs. Thereafter the pilots may use abbreviations but must use full call signs if changing to another station. The call signs would be abbreviated as follows:

- Type A The first character plus at least two last characters

  "G- BTRY" becomes "G-RY" or "G-TRY".

Note: either the name of the aircraft manufacturer or the aircraft model may be used in place of the first character: "Piper G-BTRY" becomes "Piper RY" or "Piper TRY".

- Type B The operating agency designator followed by at least two last characters:

  "SPEEDBIRD ABCD" becomes "SPEEDBIRD CD" or "SPEEDBIRD BCD".

- Type C No abbreviation.

Examples of Full and Abbreviated Call signs

Call Sign	Type A		Type B	Type C
Full				
N57826	CESSNA FABCD	CITATION FABCD	VARIG PVMA	SCANDINAVIAN 937
Abbreviated				
N26	CESSNA CD or	CITATION CD	VARIG MA or	(No abbreviated form)
N826	CESSNA BCD	CITATION BCD	VARIG VMA	

DIRECTION FINDING (DF)

Q Codes Q-codes were used extensively when much of the communication work (especially HF-long range) was done in morse code. QNH was quicker to "key in" than A.L.T.I.M.E.T.E.R. S.E.T.T.I.N.G. S.E.A. L.E.V.E.L. P.R.E.S.S.U.R.E.! Today some Q-codes are still widely used because they are useful abbreviations. They are spoken in plain English <u>not</u> phonetically. Commonly used Q codes are listed below.

Q CODE	MEANING
QFE	Atmospheric pressure at aerodrome elevation
QNH	Altimeter sub-scale setting to obtain altitude above mean sea level
QDM	**Magnetic** direction **towards** facility
QDR	**Magnetic** bearing (radial) **from** a facility
QTE	**True** bearing **from** a facility
QUJ	**True** bearing **to** a facility

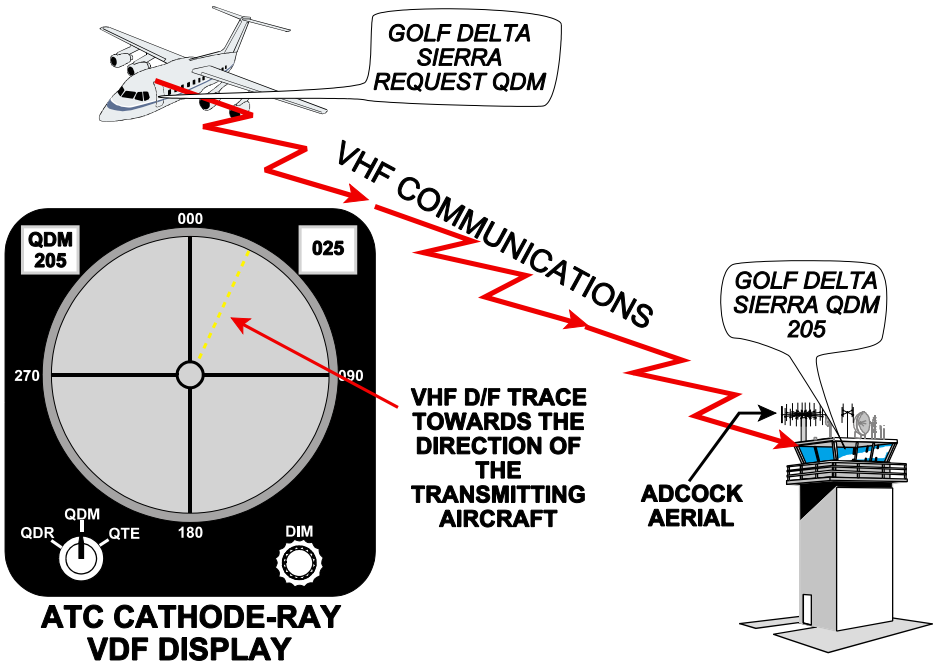
VHF DF (VDF)
Most air traffic control units (usually on Approach Frequency) are able to give pilots bearing or direction information based upon the pilot's transmission. The direction finding equipment can give a "steer"(QDM) towards the aerodrome or the pilot's true (or magneti c) bearing from the airfield (QTE or QDR).

The pilot in this case could also request a steer e.g.

"QDM QDM QDM Oxford Approach G-BODA request QDM G-BODA"

the transmission ends with the aircraft call sign repeated.

NOTE: The heading takes no account of wind effects (drift).



Ground Equipment for VHF Direction Finding.

Class of Bearing

The class of bearing refers to the accuracy of the bearing information as follows:

Class A	within ± 2°
Class B	within ± 5°
Class C	within ± 10°
Class D	less accurate than Class C

RADIO TEST PROCEDURES

Before flight, it is wise to ensure that your radios will transmit and receive properly. In order to do this a standard procedure is followed for each radio requiring a test. The meaning of this scale is as follows:

Readability Scale	**Meaning**
1	Unreadable
2	Readable now and then
3	Readable but with difficulty
4	Readable
5	Perfectly readable

The form of a test transmission should be as follows:

1 The identification of the station being called
2 The aircraft identification
3 The words '**Radio Check'**
4 The frequency being used

TRANSFER OF COMMUNICATIONS

An aircraft will normally be advised by the appropriate aeronautical station to change from one frequency to another.

"Fastair 345 contact Wrayton control 129.1"

"Wrayton control 129.1 Fastair 345"

Pilot's Choice. If the pilot wishes to change frequency he should notify the change as appropriate.

"Oxford Approach, G-BODA changing to Brize Radar 134.3"

The ICAO Annex10 also has the following advice. "When establishing initial contact, or when leaving, a VHF frequency, an aircraft station shall transmit such information as may be prescribed by the appropriate authority".

After a call has been made to an aeronautical station, a period of at least 10 seconds should elapse before a second call is made.

Stations having a requirement to transmit information to all stations likely to intercept the call should preface the transmission with general call **'ALL STATIONS'**, followed by the identification of the calling station. No reply is expected unless individual stations are subsequently called to acknowledge receipt.

READBACK

Readback of Clearances
A clearance may vary from a detailed description of a route and levels to be flown or it could be the name of a standard route such as a Standard Instrument Departure (known as "SID"). Clearances should be passed slowly to enable pilots to write down the information. If possible a clearance is passed before start up and certainly not when a pilot is engaged in manoeuvring his aircraft; of course, multi-crew aircraft do not have a problem here.

Messages to Readback
The ATC messages listed here must be read back in full by the pilot.

Level Instructions
Heading Instructions
Speed Instructions
ATC Route Clearances
Runway in use
Clearance to:
Enter, Land on, Take-off, Back-track, Cross, Hold Short of active runway

SSR operating Instructions
VDF information
Frequency changes
Type of radar service
Altimeter settings

If the controller does not receive a readback, he will instruct the pilot to do so. If the pilot does not understand the message he is expected to request that messages are repeated or clarified.

A route clearance is **not** a clearance to enter an active runway or to take off. The words:
"TAKE OFF" are only used when an aircraft is cleared to take-off or when canceling a take off clearance;
at other times the words
'DEPARTURE' and 'AIRBOURNE' are used. ATC route clearances shall always be read back unless otherwise authorised by the appropriate ATS authority.
Clearances and Readbacks always include the aircraft call sign.

In a readback the last thing you say is your callsign.

The JAR FCL makes **particular mention** of the need to read back the following clearances:

- ATC route clearances
- Clearances related to runway in use
- Other clearances such as conditional clearances.
- Data such as runway, altimeter settings, SSR codes etc.

RADAR PROCEDURES

Radar Identification and Vectoring
Before an aircraft can be given a radar service, the controller must positively identify which 'blip' on his screen is the aircraft requiring service. Usually this is done by giving the aircraft an SSR (Secondary Surveillance Radar) code to squawk, however if SSR is not available the controller will tell his 'target' to turn so that he may be identified on the radar screen.

Note: Identification is not a service, the pilot is told when he has been identified and has a radar service e.g. "Radar Control", he then acknowledges receipt of the service.

Radar Vectoring
Radar vectoring means that an aircraft may be told to fly specific headings by the radar controller. Pilots may be told the reason for this, but not always. Pilots may also request radar vectors in situations such as radar vectors to the ILS (final approach), avoiding severe weather ahead or to the next position / airfield.

Headings
The controller may wish to keep an aircraft on its present heading for a short while or change heading. Often the controller will ascertain the aircraft heading first.

"Oxford 30 turn left 300"

The clearance must be readback....

"Left 300 Oxford 30"

Vectoring Complete
When vectoring is no longer required by the controller, pilots will be instructed to resume own navigation, and if necessary they will be given position and appropriate instructions as necessary.

"Oxford 30, resume own navigation for Gloucester, position is 10 miles north of Brize Norton"

"Wilco, Oxford 30"

SSR instructions
All SSR instructions must be followed and readback, for example:

"Oxford 34, squawk 6411 ident" "6411 ident, Oxford 34"

SSR phrases and their meanings are listed below:

Squawk (code)	Set mode A code as instructed
Confirm squawk	Confirm the mode A code set on the transponder
Reset (code)	Reselect assigned mode A code
Squawk Ident	Operate the special identification feature ie press the ident button
Squawk Standby	Switch to standby
Squawk Mayday	Select emergency code (7700)

The communication failure code is 7600 and the hi-jack code is 7500

Orbit
Occasionally it is necessary to gain separation on an aircraft ahead by making a complete turn through 360°. This is known as an orbit.

"G-CD, FOR SEPARATION, ONE ORBIT LEFT"

"ONE ORBIT LEFT, G-CD".

Having completed the "orbit" the aircraft then resumes its original heading.

An instruction that simply says " G-CD ORBIT RIGHT " means that the aircraft is to continue orbitting right until advised.

Traffic Information and Avoidance
Whenever traffic appears to be conflicting with the "target" aircraft, the controller should pass information in the form:

- Relative Bearing — using the clock code
- Range — in miles (nm)
- Direction of flight — closing, converging, diverging, parallel, same direction, opposite direction, overtaking, crossing left to right or right to left
- Relative speed — if known

A typical "traffic information" report to a pilot would be:

"Oxford 94, unknown traffic 10 o'clock 6 miles, crossing left to right, height unknown fast moving. If not sighted turn left heading 270"

"Left heading 270, Oxford 94".

Avoiding Action
Avoiding action to be taken by the pilot will be given whenever the controller considers that there would be a collision risk if no action was taken.

"Oxford 94, avoiding action turn left immediately heading 270, traffic right 2 o'clock same level converging".

"Left heading 270, Oxford 94"

When the risk has passed

"Oxford 94, resume own navigation"

"Wilco, Oxford 94".

CONDITIONAL CLEARANCES

Conditional clearances are given by ATC in the following format:

1. Call Sign
2. The Condition
3. The Clearance
4. The Condition

When the clearance involves an active runway, both the controller and the pilot must have seen the aircraft or vehicle concerned.

Example of a conditional clearance:

"Oxford 95 behind the landing Airbus line up and wait behind"

The readback of a conditional clearance must follow the same pattern with the aircraft callsign at the end.

"Behind the landing Airbus line up and wait behind, Oxford 95"

CHAPTER THREE

PHRASEOLOGY

Contents

INTRODUCTION

The standard words and phrases and their meanings are given in this chapter. They cover general phraseology, co-ordination between units and various procedures as well as the whole range of services available on area, approach, ground and radar control.

In order to get some idea of the use of correct phraseology let us consider a VFR (visual flight rules) flight from Oxford to Gloucester with some radar assistance from Brize Norton along the way. Remember, we are only talking about VFR communications here.

EVENT	PILOT	ATC
Prior to engine start, select and listen to ATIS broadcast		Broadcast message: Oxford Departure information Bravo at 0830 Zulu. Surface wind 210 degrees 10 knots. QNH 1019 QFE 1009. Brize Norton outside air temp 15 dewpoint 14. Call 121.950 for taxi and report QNH and information Bravo
After engine start, on ground freq (121.950) request for taxi	Oxford Ground. GBODA Radio check and request taxi for (solo VFR to Gloucester). Information Bravo received QNH 1019 Holding point runway 20. GDA	GDA Readability 4 Taxi to the holding point runway 20
After pre-take-off checks, taxi to holding point	GDA to tower. Out.	
On tower freq (118.875)	Oxford Tower GBODA Ready for departure Clear take-off GDA	GDA wind 220 10 knots Clear take-off
After take-off	GDA Airborne. To approach	GDA Roger
On Approach freq (125.325)	Oxford Approach GBODA Departing VFR to Gloucester	GDA Roger Report passing 2500 feet

On passing 2500′	GDA passing 2500 feet Brize Radar 134.3 GDA	GDA Roger Contact Brize Radar 134.3
ON Brize freq	Brize Radar GBODA Request Radar Information Service GBODA is a PA28 from Oxford 5 miles NW of Oxford Heading 270 at 3000 feet QNH 1019 Routing to Gloucester Squawk 4311 GDA	GBODA Pass your message GDA Roger Squawk 4311
Brize RIS	Traffic not sighted Request avoiding action Right 360 degrees GDA	GDA identified 8 miles north of Oxford Traffic 12 o'clock 5 miles closing rapidly GDA turn right 360 degrees
Radar vectors	GDA request vectors for Gloucester Left 250 degrees GDA	GDA Roger Turn left 250 degrees
En route	Squawk 7000 Gloucester 125.650 GDA	GDA 20 miles NE Gloucester Squawk 7000 Contact Gloucester Approach 125.650
VDF Bearing info	QDM QDM Gloucester Approach GBODA Request QDM GBODA QDM 240 degrees Class Bravo GBODA	GBODA Gloucester Approach QDM 240 degrees Class Bravo

Joining	Gloucester Approach GBODA GBODA is a PA28 from Oxford 10 miles NE at 3000 feet Inbound to you Request joining instructions Join downwind runway 27 right hand circuit QNH 1010 Wilco GDA	GBODA Pass your message GDA Join downwind runway 27 right hand circuit wind 240 degrees 10 knots QNH 1010 Report airfield in sight
Field in sight	GDA Airfield in sight Tower 122.9 GDA	GDA Contact Tower 122.9
On tower freq	Gloucester Tower GBODA request right base join for runway 27 Wilco GDA	GDA right base join approved Report final
Final approach	GDA Final to land Continue GDA Clear to land GDA	GDA Continue GDA Clear to land Wind 260 degrees 20 knots
On runway	Wilco GDA	GDA Expedite vacating runway
Off runway	Runway vacated GDA	GDA Roger

GENERAL PHRASEOLOGY

Circumstances	*Phraseologies* * Denotes pilot transmission
Description of levels (subsequently referred to as "*(level)*")	FLIGHT LEVEL (number); *or* *(number)* METRES; *or (number)* FEET.
Level changes, reports and rates.	CLIMB (*or* DESCEND) *followed as necessary by:* TO *(level);* TO REACH *(level)* AT (*or* BY) *(time or significant point)* REPORT LEAVING (or REACHING, *or* PASSING) *(level)*. REPORT PASSING ODD (*or* EVEN) LEVELS; AT (*number*) METRES PER SECOND (or FEET PER MINUTE) [MINIMUM (or MAXIMUM)] REPORT STARTING ACCELERATION (or DECELERATION) STEP CLIMB *(aircraft identification*) ABOVE (*or* BENEATH) YOU; REQUEST LEVEL CHANGE FROM (*name of unit*) AT (*time or significant point*). STOP CLIMB (*or* DESCENT) TO (*level);* CONTINUE CLIMB (*or* DESCENT) TO *(level)*; EXPEDITE CLIMB (*or* DESCENT) [UNTIL PASSING (*level*)]; WHEN READY CLIMB (*or* DESCEND) TO (*level);* EXPECT DESCENT AT (*time*) REQUEST DESCENT AT (*time);*
.. . to require action at a specific time or place	IMMEDIATELY AFTER PASSING (*significant point*)

	AT (*time or significant point)*
...to require action when convenient	WHEN READY *(instruction*)
...to require an aircraft to climb	MAINTAIN OWN SEPARATION AND VMC [FROM (*level)*] *or* [to (*level*)];
or descend maintaining own separation and VMC	MAINTAIN OWN SEPARATION AND VMC ABOVE (*or* BELOW, *or* TO) (*level*)
.. when there is doubt that an aircraft can comply with clearance or instruction.	IF NOT POSSIBLE (*alternative instructions)* AND ADVISE;
.....when a pilot is unable to comply with an ACAS resolution advisory (Pilot and controller interchange)	* UNABLE TO COMPLY
... after modifying vertical speed to comply with an ACAS resolution advisory (Pilot and controller interchange).	* TCAS CLIMB (*or* DESCENT) (*acknowledgement*) * RETURNING TO (*assigned clearance*)
... after ACAS "Clear of Conflict" is annunciated (Pilot and controller interchange)	(*acknowledgement)* *(or alternative instructions)*
.. after the response to an ACAS resolution advisory is completed (Pilot and controller interchange)	* TCAS CLIMB (*or* DESCENT), RETURNING TO (*assigned clearance*) *(acknowledgement) (or alternative instructions)*
... after returning to clearance after responding to an ACAS resolution advisory (Pilot and controller interchange)	* TCAS CLIMB (*or* DESCENT,) COMPLETED (assigned clearance) *(acknowledgement) (or alternative instructions)*
... when unable to comply with a clearance because of an ACAS resolution advisory (Pilot and controller interchange)	* UNABLE TO COMPLY, TCAS RESOLUTION ADVISORY *(acknowledgement)*
Transfer of control and/ or frequency change	CONTACT *(unit call sign) (frequency)*; At (*or* OVER) (*time or place*) CONTACT *(unit call sign) (frequency)*
Note: An aircraft may be requested to "Stand By" on a frequency when it is intended that the ATS unit will initiate communications and to "MONITOR" frequency when information is being broadcast thereon.	IF NO CONTACT *(instructions*) STAND BY (*frequency*) FOR (*unit call sign)* REQUEST CHANGE TO (*frequency)* FREQUENCY CHANGE APPROVED

	MONITOR *(frequency)*
	MONITORING *(frequency)*
	WHEN READY CONTACT *(unit call sign) (frequency)*
	REMAIN THIS FREQUENCY.
Change of call sign	CHANGE YOUR CALL SIGN TO (*new call sign*) [UNTIL FURTHER ADVISED];
.. To instruct an aircraft to change its type of call sign	REVERT TO FLIGHT PLAN CALL SIGN (*call sign*) [AT (*significant point)*]
Traffic information	TRAFFIC (information)
... to pass traffic information	NO REPORTED TRAFFIC
... to acknowledge traffic information	LOOKING OUT
	* TRAFFIC IN SIGHT
	* NEGATIVE CONTACT [*reasons*]
	[ADDITIONAL] TRAFFIC (*direction)* BOUND (*type of aircraft*) (*level*) ESTIMATED (*or* OVER (*place)* AT (*time*) REPORTED *(level(s))* [*or* LEVEL UNKNOWN] MOVING *(direction) (other pertinent information, if any)*
Meteorological conditions	WIND (*number)* DEGREES *(number*) *(units);*
	WIND AT (*height/altitude/flight level*) *(number*) DEGREES *(number) (units);*
	Note:- Wind is always expressed by giving the mean direction and speed and any significant variations thereof;
	VISIBILITY *(distance) [direction*] RUNWAY VISUAL RANGE (*or* RVR) [RUNWAY *(number)*] (*distance*)
... for multiple RVR observations	RVR [RUNWAY (*number)*] (first position) (distance), (second position)(distance), (third position) (*distance*)
	Note: MultipleRVR observations are always representative of the touchdown zone, midpoint zone and the roll-out /stop end zone respectively

.. In the event that RVR information on any one position this information will be included in the appropriate sequence	RVR [RUNWAY (*number*)] (first position) (distance), (second position) MISSING, (*third position) (distance)*
	PRESENT WEATHER (*details*)
	CLOUD (*amount, [type] and height of base) (or* SKY CLEAR)
	CAVOK; *Note:-* CAVOK *pronounced* CAV-O-KAY
	TEMPERATURE [MINUS] *(number) (and/or dew point)* [MINUS] *(number*)
	QNH (*or* QFE) *(number) [units]*
	MODERATE (*or* SEVERE) ICING (*or* TURBULENCE) [IN CLOUD] (*area)*
	REPORT FLIGHT CONDITIONS
Position reporting	NEXT REPORT AT (*significant point)*
.. to omit position reports until a specified position	OMIT POSITION REPORTS [UNTIL (*specify*)]
	RESUME POSITION REPORTING.
Additional reports	REPORT PASSING (*significant point*)
... to request a report at a specified place or distance	REPORT (*distance*) FROM (*name of DME station*) DME
	REPORT PASSING (*three digits*) radial (*name of VOR*) VOR
... to request a report of present position (*significant point)*	REPORT DISTANCE FROM
	REPORT DISTANCE FROM (name of DME station) DME
Aerodrome information	RUNWAY *(number) (condition*)
	LANDING SURFACE (*condition)*
	CAUTION CONSTRUCTION WORK *(location*);
	CAUTION (*specify reasons*) RIGHT (*or* LEFT), (*or* BOTH SIDES) OF RUNWAY *[number]*
	CAUTION WORK IN PROGRESS (*or* OBSTRUCTION) (*position and necessary advice)*

RUNWAY REPORT AT *(observation time*) RUNWAY (*number) (type of precipitant*) UP TO (*depth of deposit*) MILLIMETRES. BRAKING ACTION GOOD (*or* MEDIUM TO GOOD, *or* MEDIUM, *or* MEDIUM TO POOR, *or* POOR, *or* UNRELIABLE) [(*and/or)* BRAKING COEFFICIENT (*equipment and number)]*

BRAKING ACTION REPORTED BY *(aircraft type*) AT (*time*) GOOD (*or* MEDIUM , *or* POOR)

RUNWAY (*or* TAXIWAY) WET [*or* DAMP, WATER PATCHES, FLOODED *(depth), or* SNOW REMOVED *(length and width as applicable), or* TREATED, *or* COMPACTED SNOW, *or* SLUSH, *or* FROZEN SLUSH, *or* ICE, *or* ICE UNDERNEATH, *or* ICE AND SNOW, *or* SNOWDRIFTS, *or* FROZEN RUTS AND RIDGES]

Operational status of visual and non-visual aids

(specify visual or non-visual aid) RUNWAY *(number) (description of deficiency)*

(type) LIGHTING (*unserviceability*)

MLS/ILS CATEGORY *(category) (serviceability state)*

TAXIWAY LIGHTING (*description of deficiency)*

(*type of visual approach slope indicator*) RUNWAY (*number) (description of deficiency)*

SECONDARY POWER SUPPLY NOT AVAILABLE.

AREA CONTROL SERVICES

Issuance of a clearance

(*name of unit*) CLEARS (*aircraft identification)*

(*aircraft*) CLEARED TO

RECLEARED (*amended route portion*) TO (*significant point of original route)*

ENTER CONTROL AREA (*or* ZONE) [*via* (SIGNIFICANT POINT)] at (*level)* {AT (*time)*}

LEAVE CONTROL AREA (*or* ZONE) AT *(level) (or* CLIMBING, *or* DESCENDING)

JOIN (*specify)* AT (*significant point*) AT (*level*) [AT *(time)*]

Indication of route and clearance limit

FROM (*place*) TO (*place*)

TO (*place);*
Followed as necessary by:

DIRECT

VIA (*route and/or reporting points*)

VIA FLIGHT PLANNED ROUTE

Note:- Conditions associated with the use of this phrase are in Part III, 12.2.

VIA (*distance*) ARC (*direction*) OF (*name of* DME *Station*) DME

(*level or route*) NOT AVAILABLE DUE (*reason*) ALTERNATIVE[S] IS/ARE (*levels or routes*) ADVISE

Maintenance of specified levels

MAINTAIN (*level*) [TO (*significant point*)]

MAINTAIN (*level)* UNTIL PASSING (*significant point*)

MAINTAIN (*level*) UNTIL (*time*);

MAINTAIN (*level*) UNTIL ADVISED BY (*name of unit*)

MAINTAIN *(level*) UNTIL FURTHER ADVISED

MAINTAINED (*level*) WHILE IN CONTROLLED AIRSPACE

	MAINTAIN AT LEAST (*number*) METRES (*or* FEET) ABOVE (*or* BELOW) (*aircraft identification*)
	Note:- the term "MAINTAIN" is not used in lieu of "DESCEND" or "CLIMB" when instructing an aircraft to change level
Specification of cruising levels	CROSS (*significant point*) AT (*or* ABOVE, *or* BELOW) (*level*)
	CROSS (*significant point*) AT (*time*) OR LATER (*or* BEFORE) AT (*level)* [MAINTAINING OWN SEPARATION AND VMC]
	CRUISE CLIMB BETWEEN (levels) (or ABOVE (level)) CROSS *(distance*) (*name of DME station*) DME AT (*or* ABOVE, *or* BELOW) (*level)*
Emergency descent	* EMERGENCY DESCENT (*intentions*)
	EMERGENCY DESCENT AT (*significant point or location*) ALL AIRCRAFT BELOW(*level)*WITHIN (*distance*) OF (*significant point or navigation aid)* LEAVE IMMEDIATELY (*followed as necessary by specific instructions as to direction, heading or track etc.)*
If clearance cannot be issued immediately upon request	EXPECT CLEARANCE AT (*time*);
En-route absorption of terminal delay	AT (*time or position*) DESCEND TO (*level*) FOR EN-ROUTE DELAY OF (*number*) minutes.
Separation instructions	CROSS (*significant point*) AT (*time*)
	ADVISE IF ABLE TO CROSS (*significant point*) AT (*time*);
	MAINTAIN MACH (*number*)

APPROACH CONTROL SERVICES

Departure instructions	AFTER DEPARTURE TURN RIGHT (*or* LEFT) HEADING *(three digits*)
	TURN RIGHT (*or* LEFT) HEADING *(three digits*)
	TRACK (*three digits*) DEGREES [MAGNETIC *or* TRUE] TO (*or* FROM) (*significant point*) UNTIL (*time, or* REACHING (*fix or significant point or level))* [BEFORE SETTING HEADING];
	SET HEADING AT (*or* BEFORE, *or* LATER THAN) *(time)*;
	SET HEADING TO (*or* DIRECT) (*significant point*) AT (*or* BEFORE, *or* LATER THAN) *(time)*
	AFTER REACHING (*or* PASSING) (*level or significantpoint)* SET HEADING [DIRECT] (*significant point*);
	CLEARED VIA *(designation*).
	Note :- Conditions associated with the use of this phrase are in Part III, 12.2.
Approach instructions	CLEARED VIA (*designation*)
	CLEARED TO (*clearance limit*) VIA (designation)
	CLEARED VIA (*details of route to be followed);*
	CLEARED (*type of approach*) APPROACH [RUNWAY (*number*)]
	CLEARED APPROACH [RUNWAY *(number)]*
	COMMENCE APPROACH [RUNWAY (*number)*]
	REQUEST STRAIGHT-IN APPROACH [RUNWAY (*number*)]
	COMMENCE APPROACH AT (*time*)
	REPORT VISUAL
	REPORT RUNWAY [LIGHTS] IN SIGHT

	* REQUEST VISUAL APPROACH
	CLEARED VISUAL APPROACH (number) REPORT (*significant point*); [OUTBOUND, or INBOUND]
	REQUEST VMC DESCENT
	MAINTAIN OWN SEPARATION
	MAINTAIN VMC
	ARE YOU FAMILIAR WITH (*name*) APPROACH PROCEDURE
	REPORT MLS CAPABILITY
	* REQUEST (*Type of approach*) APPROACH [RUNWAY (*number)*]
	* REQUEST (*MLS/RNAV plain language designator)*
	REQUEST (*MLS/RNAV plain language designator)*
Holding instructions ...visual	HOLD VISUAL [OVER] (*position*), (*or* BETWEEN (*two prominent landmarks*))
... published holding procedure over a facility of fix	HOLD AT (significant point, name facility or fix) (level) EXPECT APPROACH (*or* FURTHER CLEARANCE) AT (*time*)
... when a pilot requires an oral description of holding Procedure based on a facility (VOR or NDB)	* REQUEST HOLDING INSTRUCTIONS
	HOLD AT (*name of facility*) (*call sign and frequency, if necessary) (level)* INBOUND TRACK (*three digits*) DEGREES RIGHT (*or* LEFT) HAND PATTERN OUTBOUND TIME (*number*) MINUTES (*additional instructions, if necessary)*
	HOLD ON THE (*three digits*) RADIAL OF THE (*name)* VOR (*call sign and frequency, if necessary*) At (*distance*) DME (*or)* BETWEEN (*distance)* AND (*distance)* DME (*level*) INBOUND TRACK (*three digits*) RIGHT (*or* LEFT) HAND PATTERN (*additional instructions, if necessary)*
Expected approach time	NO DELAY EXPECTED
	EXPECTED APPROACH TIME (*time)*
	REVISED EXPECTED APPROACH (*time*)

	DELAY NOT DETERMINED (*reasons*)
Identification of aircraft	SHOW LANDING LIGHT
Acknowledgement by visual means	ACKNOWLEDGE BY MOVING AILERONS (or RUDDER)
	ACKNOWLEDGE BY ROCKING WINGS
	ACKNOWLEDGE BY FLASHING LANDING LIGHTS

STARTING PROCEDURES

... to request permission to start engines	[*aircraft location*] REQUEST START UP
	[*aircraft location*] REQUEST START UP, INFORMATION (*ATIS identification*)
.. ATC replies	START UP APPROVED
	START UP AT (*time*)
	EXPECT START UP AT (*time*);
	START UP AT OWN DISCRETION
	EXPECT DEPARTURE (*time*) START UP AT OWN DISCRETION
Starting procedures (ground crew/cockpit)	[ARE YOU READY TO START UP?]
	STARTING NUMBER (*engine number(s)*
	Note 1:- The ground crew should follow this exchange by either a reply on the intercom or a distinct visual signal to indicate that all is clear and that the start-up as indicated may proceed
	Note 2:- Unambiguous identification of the parties concerned is essential in any communications between ground crew and pilots
Push-back procedures	*Note: When local procedures so prescribe, authorisation for pushback should be obtained from the control tower*
..... aircraft /ATC	[*aircraft location*] REQUEST PUSHBACK;
	PUSHBACK APPROVED
	STAND BY
	PUSHBACK AT OWN DISCRETION

	EXPECT (*number*) *minutes delay due (reason)*
(Ground crew/cockpit)	ARE YOU READY FOR PUSHBACK?
	* READY
	CONFIRM BRAKES RELEASED
	* BRAKES RELEASED
	COMMENCING PUSHBACK
	PUSHBACK COMPLETED
	* STOP PUSHBACK
	CONFIRM BRAKES SET
	* BRAKES SET
	* DISCONNECT
Towing procedures	** REQUEST TOW [*company name*] (*aircraft type*) FROM (*location*) TO (*location*)
ATC response	HOLD POSITION
	STAND BY
	** denotes transmission from aircraft/tow vehicle combination
To request time check and/or aerodrome data for departure	* REQUEST TIME CHECK
	TIME (*minutes)*
.....when no ATIS broadcast is available	* REQUEST DEPARTURE INFORMATION
	RUNWAY (*number*), WIND (*direction and speed)*, QNH (*detail)*, TEMPERATURE (*detail*), [VISIBILITY FOR TAKE-OFF (*detail*) (*or* RVR *detail*)]
Taxi procedures .. for departure	* [*aircraft type*] [*wake turbulence category if "heavy"*] [*aircraft location*] REQUEST TAXI [*intentions*]
	* [*aircraft type*] [*wake turbulence category if "heavy"*] [*aircraft location*] (*flight rules*) TO (*aerodrome of destination*) REQUEST TAXI [*intentions*]

.... where detailed taxi instructions are required	TAXI TO HOLDING POINT *[number]* [RUNWAY (*number*)] TAXI [*intentions*]
	* [*aircraft type*] [*wake turbulence category if "heavy"*] REQUEST DETAILED TAXI INSTRUCTIONS
	TAXI VIA (*specific routing to be followed)* TO POINT [*number*] [RUNWAY (*number*)] [TIME (*minutes*)]
. where aerodrome information is not available from an alternative source such as ATIS	TAXI TO HOLDING POINT *[number]* (*followed by aerodrome information applicable*) [TIME (*minutes*)]
	TAKE (*or* TURN) FIRST (*or* SECOND) LEFT (*or* RIGHT)
	TAXI VIA (*identification of taxiway*)
	TAXI VIA RUNWAY (*number*)
... for helicopter operations	* REQUEST AIR-TAXIING FROM (*or* VIA) TO (*location or routing as appropriate*)
	AIR-TAXI TO (*or* VIA) (*location or routing as appropriate*) [*CAUTION (dust, blowing snow, loose debris, taxiing light aircraft, personnel, etc.)]*
	AIR TAXI VIA (*direct as requested, or specified route*) TO (*location, heliport, operating or movement area, active or inactive runway*). AVOID (*aircraft or vehicles or personnel)*
.... after landing	* REQUEST BACKTRACK
	BACKTRACK APPROVED
	BACKTRACK RUNWAY (number)
... general	* [*aircraft location*] REQUEST TAXI TO (*destination on aerodrome*)
	TAXI STRAIGHT AHEAD
	TAXI WITH CAUTION
	GIVE WAY TO (*description and position of other aircraft)*
	* GIVING WAY TO (*traffic)*

	* TRAFFIC (*or type of aircraft)* IN SIGHT FOLLOW (*description of other aircraft or vehicle)* FOLLOW (*description of other aircraft or vehicle)*
	VACATE RUNWAY
	* RUNWAY VACATED
	EXPEDITE TAXI [*reason*]
	* EXPEDITING
	[CAUTION] TAXI SLOWER [*reason*]
	* SLOWING DOWN
Holding	# HOLD (*direction*) OF (*position, runway number, etc.)*
	# HOLD POSITION
	# HOLD (*distance*) FROM (*position*)
	# HOLD SHORT OF (*position*)
	* HOLDING
	* HOLDING SHORT
	# Requires specific acknowledgement from the pilot
	The procedure words ROGER and WILCO are insufficient acknowledgement of the instructions. HOLD, HOLD POSITION and HOLD SHORT OF (position). In each case the acknowledgement shall be by the phraseology HOLDING or HOLDING SHORT, as appropriate
To cross a runway	* REQUEST CROSS RUNWAY (*number)*
Note 1- Unless otherwise specified by ATC, a taxi instruction which contains a taxi limit beyond a runway includes permission to cross that runway	*Note: If the control tower is unable to see the crossing aircraft (night, low visibility, etc.), the instruction should always be accompanied by a request to report when the aircraft has vacated and is clear of the runway*
	CROSS RUNWAY (*number*) [REPORT VACATED]

Note 2;- The pilot shall, when requested, report "RUNWAY VACATED" when the aircraft is well clear of the runway.	EXPEDITE CROSSING RUNWAY (*number)* TRAFFIC (*aircraft type*) (*distance*) KILOMETRES (*or* MILES) FINAL
Preparation for take-off	UNABLE TO ISSUE (*designator*) DEPARTURE (*reasons)* REPORT WHEN READY [FOR DEPARTURE] ARE YOU READY [FOR DEPARTURE] ARE YOU READY FOR IMMEDIATE DEPARTURE? *READY
.. If unable to issue take-off clearance	WAIT [*reason*] LINE UP
..clearance to enter runway and await take-off clearance	*Note: May be followed by phraseology* # LINE UP RUNWAY (*number*) LINE UP. BE READY FOR IMMEDIATE DEPARTURE
.. conditional clearances	** (*condition*) LINE UP
..acknowledgement of a conditional Clearance ..confirmation of a conditional clearance	* (*condition*) LINING UP;
.. Confirmation or otherwise of the readback of conditional clearance	[THAT IS] CORRECT *or* I SAY AGAIN ... (*as appropriate)*

When there is the possibility of confusion during multiple runway operations

** Provisions concerning the use of conditional clearances are contained on page 47.

Take off Clearance	CLEARED FOR TAKE-OFF (REPORT AIRBORNE)
When there is a possibility of confusion	CLEARED FOR TAKE-OFF RUNWAY (*number)* TAKE-OFF IMMEDIATELY OR VACATE RUNWAY

When take-off clearance has not been complied with	TAKE-OFF IMMEDIATELY OR HOLD SHORT OF RUNWAY
... to cancel a take-off clearance	HOLD POSITION, CANCEL, I SAY AGAIN CANCEL TAKE-OFF (*reasons*)
.. To stop a take-off in emergency conditions	* HOLDING STOP IMMEDIATELY (*repeat aircraft call sign*) STOP IMMEDIATELY
	* STOPPING
	HOLDING and STOPPING are the procedural responses to the above
	CLEARED FOR TAKE-OFF FROM *(present position, taxiway, final approach and take-off area, runway and number)*
... for helicopter operations from other than the manoeuvring area	* REQUEST DEPARTURE TURN RIGHT (*or* LEFT, *or* CLIMB) *(instructions as appropriate)*
	AFTER DEPARTURE TURN RIGHT *or* LEFT, *or* CLIMB, (*instructions as appropriate)*
After take-off	* REQUEST RIGHT (*or* LEFT) TURN [WHEN AIRBORNE]
	RIGHT (*or* LEFT) TURN APPROVED
	WILL ADVISE LATER FOR RIGHT (*or* LEFT) TURN
	AIRBORNE (*time*)
	AFTER PASSING *(level) (instructions*)
..... heading to be followed .. when a specific track is to be followed	CONTINUE ON (*magnetic direction of runway) (instructions)*
	TRACK (*magnetic direction of runway) (instructions)*
	CLIMB STRAIGHT AHEAD (*instructions).*
Entering an aerodrome traffic circuit	* [*aircraft type*] *(position) (level*) FOR LANDING
	JOIN (*position in circuit) (runway number*) [SURFACE] WIND (*direction and speed)* [TEMPERATURE (*degrees celsius*)] QNH (*or* QFE) (*detail)* [HECTOPASCALS] [TRAFFIC (*detail)*]

	MAKE STRAIGHT-IN APPROACH, RUNWAY (*number)* [SURFACE] WIND (*direction and speed)* [TEMPERATURE (*degrees celsius*)] QNH (*or* QFE) (*detail*) [HECTOPASCALS] [TRAFFIC (*detail*)]
when right hand traffic circuit in use	JOIN RIGHT HAND (*position in circuit*) (*runway number*) [SURFACE WIND (*direction and speed)*] [TEMPERATURE (*degrees celsius*)] QNH (*or* QFE) (*detail*) [HECTOPASCALS] [TRAFFIC (*detail)*]
.. when ATIS information is	* (*aircraft type) (position) (level*) information (*ATIS* available *identification*) FOR LANDING
	JOIN (*position in circuit*) RUNWAY (*number*) QND (*or* QFE) (*detail)* [HECTOPASCALS] (TRAFFIC) (*detail)*
In the circuit	* (*position in circuit*, - DOWNWIND / FINAL)
	NUMBER ... FOLLOW (*aircraft type and position)* *[additional instructions if required]*
Approach instructions	MAKE SHORT APPROACH
Note : - The report "LONG FINAL" is made when aircraft turn on to final approach at a distance greater than 7 km (4 NM) from touchdown or when an aircraft on a straight- in approach is 15 kn (8 NM) from . In both cases a report"FINAL " is required at 7 km (4NM) from touchdown.	MAKE LONG APPROACH (*or* EXTEND DOWNWIND)
	REPORT BASE (or FINAL, or LONG FINAL)
	CONTINUE APPROACH
Landing	CLEARED TO LAND.
..multiple runway operations	CLEARED TO LAND RUNWAY (*number*)
... special operations	CLEARED TO TOUCH AND GO
	MAKE FULL STOP
To make an approach along, or parallel to a runway, descending to an agreed minimum level	* REQUEST LOW APPROACH (Reasons)
	CLEARED LOW APPROACH [RUNWAY(*number)*][*(Altitude restriction if required) (go around restrictions*)]

to fly past the control tower or other observation point for the purpose of visual inspection by persons on the ground	* REQUEST LOW PASS (*reasons)* CLEARED LOW PASS [*as in f*)]..
	* REQUEST STRAIGHT-IN (*or* CIRCLING APPROACH, LEFT (*or* RIGHT) TURN TO (*location*))
	MAKE STRAIGHT-IN (*or* CIRCLING APPROACH, LEFT (*or* RIGHT) TURN TO (*location, runway, taxiway, final approach and take off area)* [ARRIVAL (*or* ARRIVAL ROUTE) (*number, name, or code*)] [HOLD SHORT OF (*active runway, extended runway centre line, other helicopter or aircraft*)]. [CAUTION (*power lines, unlighted obstructions, wake turbulence, etc*.)] CLEARED TO LAND
Delaying aircraft	CIRCLE THE AERODROME
	ORBIT (RIGHT, *or* LEFT) [FROM PRESENT POSITION]
	MAKE ANOTHER CIRCUIT
Missed approach	LANDING GEAR APPEARS DOWN
	RIGHT (*or* LEFT, or NOSE) WHEEL APPEARS UP (*or* DOWN) WHEELS APPEAR UP
	RIGHT (*or* LEFT, *or* NOSE) WHEEL DOES NOT APPEAR UP (*or* DOWN)
...wake turbulence.	CAUTION WAKE TURBULENCE
.. Jet blast on apron or taxiway	CAUTION JET BLAST
.. Propeller-driven aircraft slipstream	CAUTION SLIP STREAM
After landing	CONTACT GROUND (*frequency*)
	WHEN VACATED CONTACT GROUND (*frequency*)
	EXPEDITE VACATING
	YOUR STAND (*or* GATE) (*designation*)
	TAKE (*or* TURN) FIRST (*or* SECOND, *or* CONVENIENT) LEFT (*or* RIGHT) AND CONTACT GROUND (*frequency*)

... for helicopter operations	AIR- TAXI TO HELICOPTER STAND (*or*) HELICOPTER PARKING POSITION (*area)* AIR-TAXI TO (<u>or</u> VIA) (*location or routing as appropriate*) [CAUTION (*dust, blowing snow, loose debris, taxiing light aircraft, personnel, etc.*)] AIR-TAXI VIA (*direct, as requested, or specified route*) TO (*location heliport, operating or movement area, active or inactive runway*). AVOID (*aircraft or vehicles or personnel)*

CO-ORDINATION BETWEEN ATS UNITS

Estimates and revisions	ESTIMATE [*direction of flight*] (*aircraft call sign*) [SQUAWKING (*SSR code*)] (*type*) ESTIMATING (*significant point*) (*time) (level*) (*or* DESCENDING FROM (*level*) TO (*level*) [SPEED (*filed TAS*)] (*route*) [REMARKS]
... transmitting station	ESTIMATE (*significant point*) ON (*aircraft call sign)*
.. Receiving reply (if flight plan details are available)	(*Aircraft type) (destination*) [SQUAWKING (*SSR Code*) [ESTIMATING] (*significant point) (time)* AT (*level)* *Note: in the event that flight plan details are not available the receiving station shall reply NO DETAILS and transmitting station shall pass the full estimate as above.* ESTIMATE UNMANNED FREE BALLOON(S) (*identification and classification)* ESTIMATED OVER (*place*) AT (*time*)REPORTED FLIGHT LEVEL(S) (*figure or figures*) [*or* FLIGHT LEVEL UNKNOWN] MOVING (*direction*) ESTIMATED GROUND SPEED (*figure*) (*other pertinent information, if any)* REVISION (*aircraft call sign*) (*details as necessary).*
Transfer of control	REQUEST RELEASE OF (*aircraft call sign);* (*aircraft call sign*) RELEASED [AT (*time)*] [*conditions/restrictions*],

	IS (*aircraft call sign*) RELEASED [FOR CLIMB *or* DESCENT)]?
	(*aircraft call sign*) NOT RELEASED [UNTIL (*time or significant point*)]
	UNABLE RELEASE (*aircraft call sign*) [TRAFFIC IS (*details*)]
Change of clearance	MAY WE CHANGE CLEARANCE *OF (aircraft call sign*) TO (*details of alteration proposed)*? AGREED TO (*alteration of clearance*) OF (*aircraft call sign*)
	UNABLE TO APPROVE CHANGE TO CLEARANCE OF (*aircraft call sign*) UNABLE TO APPROVE (*desired route, level etc.*) [OF *aircraft call sign*);DUE *(reason)*] *(alternative clearance proposed)*
Approval request	APPROVAL REQUEST (*aircraft call sign*) ESTIMATED DEPARTURE FROM (*significant point*) AT (*time*)
	(*aircraft call sign*) REQUEST APPROVED [(*restriction if any*)]
	(*aircraft call sign*) UNABLE APPROVE (*alternative instructions*)
Inbound release	INBOUND RELEASE (*aircraft call sign*) [SQUAWKING (*SSR Code*) FROM (*departure point*) RELEASED AT (*significant point, or time, or level*) CLEARED TO AND ESTIMATING (*clearance limit) (time*) AT (*level*) [EXPECTED APPROACH TIME *or* DELAY EXPECTED] CONTACT AT (*time*).
Radar handover	RADAR HANDOVER (*aircraft call sign*) [SQUAWKING (*SSR Code*)] POSITION (*aircraft position or significant point) (level)*
Expedition of clearance	EXPEDITE CLEARANCE (*aircraft call sign*) EXPECTED DEPARTURE FROM (*place*) AT (*time*)
	EXPEDITE CLEARANCE (*aircraft call sign*) [*estimated*] OVER (*place*) At (*time*) REQUESTS (*level or route etc.*)

Note :- The following comprise phraseologies specifically applicable when radar is used in the provision of air traffic services. The phraseologies detailed in the sections above for use in the provision of air traffic services are also applicable, as appropriate, when radar is used.

GENERAL RADAR PHRASEOLOGIES

Identification of aircraft	REPORT HEADING [AND FLIGHT LEVEL (*or* ALTITUDE)]
	FOR IDENTIFICATION TURN LEFT (*or* RIGHT) HEADING (*three digits*)
	TRANSMIT FOR IDENTIFICATION AND REPORT HEADING
	IDENTIFIED [*position*]
	NOT IDENTIFIED [*reason*], [RESUME (*or* CONTINUE) OWN NAVIGATION]
Position information	POSITION (*distance) (direction*) OF (*significant point*) *or* OVER *or* ABEAM (*significant point*).
Vectoring instructions	LEAVE (*significant point*) HEADING (*three digits*) [INBOUND] AT (*time)*
	CONTINUE HEADING (*three digits*) AT (*time*)
	CONTINUE PRESENT HEADING
	FLY HEADING (*three digits*) TURN LEFT (*or* RIGHT) (*number*) DEGREES (*or* HEADING (*three digits)* [*reason*] STOP TURN HEADING (*three digits)* FLY HEADING (*three digits*), WHEN ABLE PROCEED DIRECT (*name) (navaid or way-point)*
	HEADING IS GOOD
Termination of radar vectoring	RESUME OWN NAVIGATION (*position of aircraft) (specific instructions)*
	PRESUME OWN NAVIGATION [DIRECT] (*significant point*) [MAGNETIC TRACK (*three digits*) DISTANCE (*number*) KILOMETRES (*or* MILES)]
Manoeuvres	MAKE A THREE SIXTY TURN LEFT (*or* RIGHT)[*reason*]

... (in case of unreliable directional Instruments on board aircraft)	ORBIT LEFT (or RIGHT) [*reason*]
	MAKE ALL TURNS RATE ONE (*or* RATE HALF, *or (number*) DEGREES PER SECOND EXECUTE INSTRUCTIONS IMMEDIATELY UPON RECEIPT
	TURN LEFT (*or* RIGHT) NOW
	STOP TURN NOW

Note:- When it is necessary to specify a reason for radar vectoring or for the above manoeuvres, the following phraseologies should be used:

	DUE TRAFFIC FOR SPACING FOR DELAY FOR DOWNWIND (or BASE, or FINAL)
Speed control	* SPEED (*number*) KILOMETRES PER HOUR (*or* KNOTS)
	REPORT SPEED
	MAINTAIN (*number*) KILOMETRES PER HOUR (KNOTS)
	MAINTAIN PRESENT SPEED;
	INCREASE (*or* REDUCE) SPEED TO (*number*) KILOMETRES PER HOUR (*or* KNOTS)
	INCREASE (*or* REDUCE) SPEED BY (*number*) KILOMETRES PER HOUR (*or* KNOTS)
	RESUME NORMAL SPEED;
	REDUCE TO MINIMUM APPROACH SPEED;
	REDUCE TO MINIMUM CLEAN SPEED;
	NO [ATC] SPEED RESTRICTIONS
Position reporting	
.. To omit position reports when under radar control	OMIT POSITION REPORTS [UNTIL (*specify*)]
	NEXT REPORT AT (*significant point*)
	REPORTS REQUIRED ONLY AT (*location(s*))

	RESUME POSITION REPORTING.
Traffic information and avoiding action	TRAFFIC (*number*) O'CLOCK(*distance) (direction of flight) [any other pertinent information]*
	avoiding action
	SLOW MOVING
	FAST MOVING CLOSING
	OPPOSITE (*or* SAME) DIRECTION
	OVERTAKING
	CROSSING LEFT TO RIGHT (*or* RIGHT TO LEFT)
.....if known	TYPE
	LEVEL
... to request avoiding action	CLIMBING (*or* DESCENDING)
	* REQUEST VECTORS
when passing unknown traffic	DO YOU WANT VECTORS?
... for avoiding action	CLEAR OF TRAFFIC [*appropriate instructions]*
	TURN LEFT (*or* RIGHT) IMMEDIATELY (*number*) DEGREES] *or* [HEADING (*three digits*)] TO AVOID [UNIDENTIFIED] TRAFFIC *(bearing by clock-reference and distance)*
Communications and loss of communications	[IF] RADIO CONTACT LOST (*instructions*)
	IF NO TRANSMISSIONS RECEIVED FOR (*number*) MINUTES (*or* SECONDS) (*instructions*)
	REPLY NOT RECEIVED (*instructions*)
	IF YOU READ [*manoeuvre instructions or* SQUAWK (*code or IDENT*)]
	manouevre (*or* SQUAWK) OBSERVED. POSITION *(Position of aircraft*). WILL CONTINUE TO PASS INSTRUCTIONS
Termination of radar service	RADAR CONTROL TERMINATED [DUE (*reason*)]

	RADAR SERVICE TERMINATED (*instructions*)
	WILL SHORTLY LOSE IDENTIFICATION (*appropriate instructions or information*)
	IDENTIFICATION LOST [*reasons*] *(instructions*)

RADAR IN APPROACH CONTROL SERVICE

Vectoring for approach	VECTORING FOR (*type of pilot-interpreted aid)* APPROACH RUNWAY (*number*)
	VECTORING FOR VISUAL APPROACH RUNWAY (*number)* REPORT FIELD (*or* RUNWAY) IN SIGHT
	VECTORING FOR (*positioning on the circuit*);
	VECTORING FOR SURVEILLANCE RADAR APPROACH RUNWAY (*number*)
	VECTORING FOR PRECISION APPROACH RUNWAY (*number) (type)* APPROACH NOT AVAILABLE DUE (*reason) (alternative instructions)*
Vectoring for ILS and other pilot-interpreted aids	POSITION (*number*) KILOMETRES (*or* MILES) from (*fix*). TURN LEFT (*or* RIGHT) HEADING (*three digits*)
	YOU WILL INTERCEPT (*radio aid or track distance*) FROM (*significant point or* TOUCHDOWN);
... when a pilot wishes to be positioned a specific distance from touchdown	REQUEST (*distance*) FINAL;
	CLEARED FOR (*type*) APPROACH RUNWAY (*number*)
instructions and information	REPORT ESTABLISHED [ON MLS APPROACH TRACK] *or* [ON ILS (LOCALIZER) *or* (GLIDE PATH)]
	CLOSING FROM LEFT (*or* RIGHT) [REPORT ESTABLISHED]
	TURN LEFT (*or* RIGHT) HEADING (*three digits*) [TO INTERCEPT] *or* [REPORT ESTABLISHED]

	THIS TURN WILL TAKE YOU THROUGH (*aid) (reason*)
	TAKING YOU THROUGH (*aid) (reason);*
	MAINTAIN (*altitude*) UNTIL GLIDE PATH INTERCEPTION
	REPORT ESTABLISHED ON GLIDE PATH; INTERCEPT (*radio aid)* [REPORT ESTABLISHED].
Manoeuvre during independent and dependent parallel approaches	CLEARED FOR ILS (*or* MLS) APPROACH RUNWAY (*number*) LEFT (*or* RIGHT);
	YOU HAVE CROSSED THE LOCALIZER (*or* MLS FINAL APPROACH TRACK). TURN LEFT (*or* RIGHT) IMMEDIATELY AND RETURN TO THE LOCALIZER (*or* MLS FINAL APPROACH TRACK)
... for avoidance action when an aircraft is observed penetrating the ATZ.	
	ILS (*or* MLS) RUNWAY (*number*) LEFT (*or* RIGHT) LOCALIZER (*or* MLS) FREQUENCY Is (*frequency*).
	TURN LEFT (*or* RIGHT) (*number*) DEGREES (*or* HEADING) (*three digits*) IMMEDIATELY TO AVOID TRAFFIC [DEVIATING FROM ADJACENT APPROACH], CLIMB

SURVEILLANCE RADAR APPROACH

Provision of service	THIS WILL BE A SURVEILLANCE RADAR APPROACH RUNWAY (*number*) TERMINATING AT (*distance*) FROM TOUCHDOWN, OBSTACLE CLEARANCE ALTITUDE (*or* HEIGHT) (*number*) METRES (*or* FEET) CHECK YOUR MINIMA [IN CASE OF GO AROUND (*instructions*)]
	APPROACH INSTRUCTIONS WILL BE TERMINATED AT (*distance*) FROM TOUCHDOWN
Elevation	COMMENCE DESCENT NOW [TO MAINTAIN A (*number*) DEGREE FLIGHT PATH
	distance) FROM TOUCHDOWN ALTITUDE (*or* HEIGHT) SHOULD BE (*numbers and units*)
Position	(*distance*) FROM TOUCHDOWN
Checks	CHECK GEAR DOWN
	REPORT RUNWAY [LIGHTS] IN SIGHT

PAR APPROACH

	APPROACH COMPLETED [CONTACT (*unit*)]
Provision of service	THIS WILL BE A PRECISION RADAR APPROACH RUNWAY (*number*)
	PRECISION APPROACH NOT AVAILABLE DUE (*reason) (alternative instructions)*
	IN CASE OF GO AROUND (*instructions*)
Communications	DO NOT ACKNOWLEDGE FURTHER TRANSMISSIONS
	REPLY NOT RECEIVED WILL CONTINUE INSTRUCTIONS
Azimuth	CLOSING [SLOWLY (*or* QUICKLY)] [FROM THE LEFT (*or* FROM THE RIGHT)]
	HEADING IS GOOD
Completion of approach	REPORT VISUAL
	REPORT RUNWAY [LIGHTS] IN SIGHT

	COMPLETED [CONTACT (*unit*)]
Missed approach	CONTINUE VISUALLY OR GO AROUND [*missed approach instructions*]
	GO AROUND IMMEDIATELY [*missed approach instructions*] *(reason);*
	ARE YOU GOING AROUND?
	IF GOING AROUND (*appropriate instructions*);
	GOING AROUND.
Track	ON TRACK
	SLIGHTLY (*or* WELL, *or* GOING) LEFT, (*or* RIGHT) OF TRACK
	(*number*) METRES LEFT (*or* RIGHT) OF TRACK.
Elevation	APPROACHING GLIDE PATH
	COMMENCE DESCENT NOW [AT (*number*) FEET PER MINUTE (or ESTABLISH A (*number*) DEGREE GLIDE PATH)]
	RATE OF DESCENT IS GOOD
	ON GLIDE PATH
	SLIGHTLY (*or* WELL, *or* GOING) ABOVE (*or* BELOW) GLIDE PATH
	[STILL] (*number*) METRES (*or* FEET) TOO HIGH (*or* TOO LOW)
	ADJUST RATE OF DESCENT;
	COMING BACK [SLOWLY (*or* QUICKLY)] TO THE GLIDE PATH;
	RESUME NORMAL RATE OFDESCENT
	ELEVATION ELEMENT UNSERVICEABLE (*to be followed by appropriate instructions)*
	(*distance*) FROM TOUCHDOWN. ALTITUDE *or* HEIGHT) SHOULD BE (*numbers and units*)
Position	(*distance*) FROM TOUCHDOWN
	OVER APPROACH LIGHTS

	OVER THRESHOLD
Checks	CHECK GEAR DOWN AND LOCKED
	CHECK DECISION ALTITUDE (or HEIGHT)

Note: Other phraseologies for use in the area control radar service are given in the section containing approach control radar service phraseologies.

SSR PHRASEOLOGY

To request the pilot to confirm the Mode A Code selected on the aircraft's transponder	CONFIRM SQUAWK (*code)*;
	* SQUAWKING (*code*).
To request the operation ofn the IDENT feature	SQUAWK IDENT
	LOW
	SQUAWK NORMAL.
To request temporary suspension of transponder operation	SQUAWK STANDBY
To request emergency code	SQUAWK MAYDAY
To request termination of transponder operation	STOP SQUAWK
To request transmission of pressure altitude	SQUAWK CHARLIE
To request pressure setting check and confirmation of level	CHECK ALTIMETER SETTING AND CONFIRM LEVEL
To request termination of pressure altitude transmission because of faulty operation	STOP SQUAWK CHARLIE WRONG INDICATION
To request altitude check	VERIFY (*level*).
To request the capability of the SSR equipment	ADVISE THE TYPE OF TRANSPONDER
	* TRANSPONDER (*as shown in flight plan*);
	* NEGATIVE TRANSPONDER.
To instruct setting of transponder	FOR DEPARTURE SQUAWK (*code*);
	SQUAWK (*code*);

To request the pilot to reselect the assigned mode and code	RESET (*mode) (code*); * RESETTING(*mode) (code*).
To request reselection of aircraft identification	RESET MODE S IDENTIFICATION

The following phrases together with their meanings are listed again in the following table and illustrations.

PHRASE	**MEANING**
SQUAWK (code)	Set the mode A as instructed.
CONFIRM SQUAWK	Confirm code A code set on the transponder.
SQUAWK IDENT.	Operate the "IDENT" feature.
SQUAWK MAYDAY	Select emergency code.
SQUAWK STANDBY	Select the standby feature.
SQUAWK CHARLIE	Select pressure altitude transmission feature
CHECK ALTIMETER SETTING AND CONFIRM LEVEL	Check pressure setting and confirm present level.
STOP SQUAWK CHARLIE WRONG INDICATION	Deselect pressure altitude transmission feature because of faulty operation
*VERIFY LEVEL	Check and confirm your level.
CHECK ID SQUAWK	For a mode S equipped aircraft, check the setting of the aircraft identification feature.
* Used to verify the accuracy of the Mode C derived level information displayed to the controller.	

The pilot reply to SSR instructions is usually an acknowledgement or readback.

FASTAIR 345 ADVISE TYPE OF TRANSPONDER	***FASTAIR 345 TRANSPONDER CHARLIE***
FASTAIR 345 SQUAWK 6411	***6411 FASTAIR 345***
FASTAIR 345 CONFIRM SQUAWK	***FASTAIR 345 SQUAWKING 6411***
FASTAIR 345 RESET 6411	***FASTAIR 345 RESETTING 6411***
FASTAIR 345 CHECK ALTIMETER SETTING AND CONFIRM LEVEL	***FASTAIR 345 ALTIMETER 1013 FLIGHT LEVEL80***
FASTAIR 345 CONFIRM TRANSPONDER OPERATING	***FASTAIR 345 NEGATIVE TRANSPONDER UNSERVICEABLE***

8.33 kHz PHRASEOLOGY

Circumstances	**Phraseology** *(*denotes pilot transmission)*
To request confirmation of 8.33 kHz capability	* Confirm Eight Point Three Three
To indicate 8.33 kHz capability	* Affirm Eight Point Three Three
To indicate lack of 8.33 kHz capability	* Negative Eight Point Three Three
To request UHF capability	* Confirm UHF
To indicate lack of UHF capability	* Negative UHF
To indicate UHF capability	* Affirm UHF
To request the status in respect of exemption	Confirm Eight Point Three Three Exempted
To indicate 8.33 exempted status	*Affirm Eight Point Three Three Exempted
To indicate 8.33 kHz non-exempted status	* Negative eight point three three exempted

INITIAL MESSAGE

When flying under VFR an aircraft may change frequency to establish communications with an aeronautical station to obtain:

- some form of service (FIS, RIS) from an ATSU or
- clearance to penetrate a MATZ or
- clearance to enter controlled airspace under special VFR

The initial call should include the callsign and a request for the type of service required. On receipt of the message ' GO AHEAD ' (or 'Pass your message' in the UK) from the ground station the initial message would be sent by the aircraft. The exact information and the order in which it must be passed will vary with each unit and this is tabulated below.

Information	**ATSU**	**MATZ**	**SVFR**
Callsign	✓	✓	✓
Type	✓	✓	✓
Position	✓	✓	
Heading	✓	✓	
Level	✓	✓	
Intention	✓	✓	✓
Type of service	**(✓)***		
ETA entry point			✓

* if not transmitted with initial call.

CHAPTER FOUR

WEATHER INFORMATION

Contents

INTRODUCTION

Knowledge of weather conditions likely to be encountered during flight is essential to the safe operation of aircraft. However, weather conditions change and therefore a convenient system to supply the latest information is required. To be effective these sources and the terms used must be globally understood.

SOURCES OF WEATHER INFORMATION

Sources
A pilot in flight can gain weather information from several sources; the main sources are:

ATC ATIS VOLMET
In all of these, standard met terms should be used and the information is transmitted slowly and enunciated clearly so that the data can be written down by the flight crew.

Request from ATC
For example, when returning to Oxford from Cardiff, you might be receiving a radar service from Brize Radar. In order to decide how you will approach Oxford you could request the weather from Brize.

"Brize Radar, Oxford 94 request Oxford weather"

"Oxford 94, the Oxford 0950 weather, surface wind 360 degrees 5 knots, visibility 10 kms, Nil weather, scattered 2500 feet. Runway 02 in use, QNH 1010"

ATIS(Automatic Terminal Information Service)
In order to reduce the workload on controllers, a recorded message is transmitted continuously on a discrete VHF frequency or on a VOR frequency. Pilots are expected to listen to the report before contacting the appropriate aerodrome controller. Every time the data is changed a new code letter is allocated.

Oxford has its own ATIS on 121.950, a typical example sounds like this:

"Oxford Departure information Bravo at 0830 Zulu. Surface wind 210 degrees 10 knots. QNH 1019 QFE 1009. Brize Norton outside air temp 15 dewpoint 14. Call 121.950 for taxi and report QNH and information Bravo**"**

> **Information Code.** On initial contact the pilot should state the information code that he has received so that the controller can update the information if necessary.
>
> "Oxford Ground, GBODA with **Information Bravo** QNH 1019 request taxi"

Volmet
Frequencies for Volmet information can be found in the Aeronautical Information Publication (AIP) or en-route booklets such as Aerad.
Each Volmet transmits a met information for a group of aerodromes at set times past the hour.

Contents of Volmet
Volmet broadcasts (and other Met transmissions) should follow a standard format. You should study the information on Met Reports in UK AIP MET so that you are familiar with terms and the units of measurement. A Volmet broadcast would include the following items and units of measurement:

Aerodrome identification			
Surface wind	Degrees and knots e.g. 250 degrees 10 knots		
Visibility	Metres (below 5 km) or kilometers		
Runway Visual range (RVR)	Metres (only reported 50 - 1500m)		
Weather	No units e.g. rain		
Cloud	Few	1-2 octas	(octa = 1/8)
	Scattered	3-4 octas	
	Broken	5-7 octas	
	Overcast	sky covered	
Temperature	Degrees Celsius		
Dew point	Degrees Celsius		
QNH	Hectopascals or millibars		
Trend	No units		

Cavok. This is pronounced "CAV-O-KAY" and means a combination of conditions where the visibility, cloud and present weather are better than prescribed valves**,** namely:

- Visibility is 10 km or more
- No cloud below 1500m (5,000 ft) or below MSA (minimum sector altitude) whichever is greater and no cumulonimbus (CB)
- No significant weather i.e no precipitation, thunderstorm, shallow fog or low drifting snow

Note: Surface wind is not included.

SUPPLEMENTARY INFORMATION

Some other information may also be included in reports, particularly with regard to runway conditions:

- Standing water, e.g. damp, wet, water patches or flooded. Snow, slush, ice.
- Braking action - given for Touchdown Zone, Mid-Point, Stop End. (see table below)
- Other runway surface conditions (e.g. threshold displaced 1000ft due to work in progress).
- Obstructions.
- Wind Shear warnings etc.

For example:

"Oxford 94, braking action medium due to heavy rain"

"Oxford 94".

Braking Action Code
From data collected from operations on compacted snow and ice, an assessment table has been produced to relate to a measured braking co-efficient to an estimated braking action and hence to a simple code for braking action. It must be borne in mind that the description "good" is a comparative value and is intended to mean that aeroplanes should not experience directional control or braking difficulties when landing, but conditions would not be as good as on a clean, dry, runway.

The measured co-efficient may be reported as a 2 digit code without the decimal.

Measured Co-efficient	**Estimated Braking Action**	**Code**
0.40 and above	Good	5
0.39 - 0.36	Medium to good	4
0.35 - 0.30	Medium	3
0.29 - 0.26	Medium to poor	2
0.25 and below	Poor	1

CHAPTER FIVE

FAILURES AND EMERGENCIES

Contents

INTRODUCTION

As with any field of human endeavour flight operations do not always go according to plan. In the worst case we may have to apply procedures designed to gain assistance in difficult situations**.** In this chapter we will consider communications failure and emergency procedures.

COMMUNICATIONS FAILURE

Breakdown of communications
Occasionally (rarely) communication between aircraft and ground stations can break down. It could be that either party has a partial failure (receiver failed, transmitter okay or vice versa) or even a total failure of equipment. The breakdown may be caused by interference or by wrong selection.

Actions
The most common reason for lack of communications is usually "finger trouble". Therefore you should check:

- Correct frequency selected
- Volume control not turned too low or squelch level too high
- Microphone/headset plugs fully home
- The aeronautical station is open for watch e.g. Military Training bases after 1700 hrs.
- You are within radio range

Radio Failure
It could be that your (or the other station) equipment's malfunctioning. It is possible that your receiver has failed but you are still transmitting satisfactorily.

In VMC and operating under VFR (visual flight rules) some aircraft still operate with no radio fitted, therefore unless you need an ATC service there is no cause for concern! However, if you do need a service (for example to join a traffic pattern to land) then you should follow the GENERAL PROCEDURE outlined here:

- Attempt communication on another frequency.
- If these attempts fail, continue to transmit your message twice on the designated requency.
- If you know that your receiver has failed, transmit reports (or positions) at the scheduled times on the frequency n use.

Note: *ICAO requirement states that "An aircraft which is receiving Air Traffic Control or Advisory Service shall also transmit information regarding the intent on of the pilot-in-command with respect to the continuation of the flight."*

Question How else could you inform ATC of your radio failure?

Answer SSR Code - squawk 7600 This code appearing on a radar screen informs the controller that the aircraft concerned has radio problems

Rules of the Air
The Rules of the Air (Annex 2 to the ICAO convent on) says that in Visual Meteorological Conditions (VMC) the aircraft with communications failure shall:

- Continue to fly in VMC (keep clear of cloud).
- Land at nearest suitable aerodrome.
- Report arrival by the most expeditious means to the appropriate ATC unit (telephone ATC).

Note 1: *"In addition, the aircraft when forming part of the traffic pattern (i.e. in the circuit to land) at a controlled aerodrome shall keep a watch for instructions as may be issued by visual signals"*

Note 2: *"Controlled VFR" is common in other countries and requires 2-way communications.*

EMERGENCIES

States of Emergency
The states of emergency are classified as follows:

DISTRESS - a condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.

URGENCY - a condition concerning the safety of an aircraft or other vehicle or of some person on board or within sight, but does not require immediate assistance.

Emergency communications
Distress and urgency traffic shall normally be maintained on the frequency on which such traffic was initiated until it is considered that better assistance can be provided by transferring that traffic to another frequency.

Note: *121.5 MHz or alternative available VHF or HF frequencies may be used as appropriate. In cases of distress and urgency communications, in general, the transmissions by radiotelephony shall*

DISTRESS PROCEDURES

Distress Message
In addition to being preceded by the radiotelephony distress signal MAYDAY, preferably spoken three times, the distress message to be sent by an aircraft in distress shall:

- be on the air-ground frequency in use at the time;
- consist of as many as possible of the following elements spoken distinctly and, if possible, in the following order:
  - name of the station addressed (time and circumstances permitting);
  - the identification of the aircraft;
  - the nature of the distress condition;
  - intention of the person in command;
  - present position, level (i.e. flight level, altitude, etc., as appropriate) and heading.

Supplemental Measures
The foregoing provisions may be supplemented by the following measures:

- the distress message of an aircraft in distress being made on the emergency frequency 121.5 MHz or another aeronautical mobile frequency, if considered necessary or desirable. Not all aeronautical stations maintain a continuous guard on the emergency frequency;

- the distress message of aircraft in distress being broadcast, if time and circumstances make this course preferable;

- the aircraft transmitting on the maritime mobile service radiotelephony calling frequencies;

- the aircraft using any means at its disposal to attract attention and make known its conditions including the act vat on of the appropriate SSR mode and code (mode A 7700);

- any station taking any means at its disposal to assist an aircraft in distress;

- any variation on the elements listed in ii)* above when the transmitting station is not itself in distress, provided that such circumstance is clearly stated in the distress message.

***Note**: The station addressed will normally be that station communicating with the aircraft or in whose areas of responsibility the aircraft is operating.*

Action by the station addressed or the first station acknowledging the distress message
The station addressed by the aircraft in distress, or first station acknowledging the distress message, shall;

- immediately acknowledge the distress message

- take control to the communications or specifically and clearly transfer that responsibility, advising the aircraft if a transfer is made

- take immediate action to ensure that all necessary information is made available, as soon as possible, to

  - the ATS unit concerned
  - the aircraft operating agency concerned, or its representative, in accordance with pre-established arrangements

***Note:** The requirement to inform the aircraft operating agency concerned does not have priority over any other action which involves the safety of the flight in distress, or of any other flight in the area, or which might affect the progress of expected flights in the area.*

- warn other stations, as appropriate, in order to prevent the transfer of traffic to the frequency of the distress communication.

Imposition of Silence.
The station in distress, or the station in control of distress traffic, shall be permitted to impose silence, either on all stations of the mobile service in the area or on any station which interferes with the distress traffic. It shall address these instructions "to all stations", or to one station only, according to circumstances. In either case, it shall use:

'STOP TRANSMITTING'

The radio distress signal **'MAYDAY'**. The use of the signals specified above shall be reserved for the aircraft in distress and for the station controlling the distress traffic.

Action by all other stations
The distress communications have absolute priority over all other communications, and a station aware of them shall not transmit on the frequency concerned, unless:

- the distress is cancelled or the distress traffic is terminated;
- all distress traffic has been transferred to other frequencies;
- the station controlling communications gives permission;
- it has itself to render assistance.

Any station which has knowledge of distress traffic, and which cannot itself assist the aircraft in distress, shall nevertheless continue listening to such traffic until it is evident that assistance is being provided.

Termination of Distress Communications and of Silence
When an aircraft is no longer in distress, it shall transmit a message cancelling the distress condition.

When the station which has controlled the distress communication traffic becomes aware that the distress condition is ended, it shall take immediate action to ensure that this information is made available, as soon as possible, to:

- the ATS unit concerned
- the aircraft operating agency concerned, or its representative, in accordance with pre-established arrangements. The distress communication and silence conditions shall be terminated by transmitting a message, including the words:

"DISTRESS TRAFFIC ENDED"

on the frequency or frequencies being used for the distress traffic. This message shall be originated only by the station controlling the communications when, after the reception of the message cancelling the distress condition, it is authorised to do so by the appropriate authority.

URGENCY PROCEDURES

Action by the aircraft reporting the condition
(other than by an aircraft used for medical transports)

In addition to being preceded by the radiotelephony urgency signal PAN PAN preferably spoken three times, the urgency message to be sent by an aircraft reporting an urgency condition shall:

- be on the air-ground frequency in use at the time
- consist of as many as required of the following elements spoken distinctly and, if possible, in the following order:
  - the name of the station addressed
  - the identification of the aircraft
  - the nature of the urgency condition
  - the intent on of the person in command
  - present position, level (i.e. flight level, altitude, etc., as appropriate) and
  - heading
  - any other useful information

Note 1: *The foregoing provisions are not intended to prevent an aircraft broadcasting an urgency message, if time and circumstances make this course preferable.*

Note 2: *The station addressed will normally be that station communicating with the aircraft or in whose area of responsibility the aircraft is operating.*

Action by the station addressed or the first station acknowledging the urgency message
The station addressed by an aircraft reporting an urgency condition, or first station acknowledging the urgency message, shall:

- acknowledge the urgency message;
- take immediate action to ensure that all necessary information is made available, as soon as possible, to;
  - the ATS unit concerned;
  - the aircraft operating agency concerned, or its representative, in accordance with pre-established arrangements;

Note: *The requirement to inform the aircraft operating agency concerned does not have priority over any other action which involves the safety of the flight in distress, or of any other flight in the area, or which might affect the progress of expected flights in the area.*

- if necessary, exercise control of communications.

Action by all other stations
The urgency communications have priority over all other communications, except distress, and all stations shall take care not to interfere with the transmission of urgency traffic.

MEDICAL TRANSPORTS

Action by an aircraft used for medical transports
The use of the signal **PAN PAN MEDICAL** shall indicate that the message which follows concerns a protected medical transport pursuant to the 1949 Geneva Conventions and Additional Protocols.

For the purpose of announcing and identifying aircraft used for medical transports, a transmission of the radiotelephony urgency signal PAN PAN, preferably spoken three times, shall be followed by the radiotelephony signal for medical transports MAY-DEE- CAL, pronounced as in the French "mèdical". The use of the signals described above indicates that the message which follows concerns a protected med cal transport. The message shall convey the following data:

- the call sign or other recognised means of identification of the medical transports;
- position of the medical transports;
- number and type of medical transports;
- intended route;
- estimated time en route and of departure and arrival, as appropriate; and
- any other information such as flight altitude, radio frequencies guarded, languages used, and secondary surveillance radar modes and codes.

Action by the station addressed or by other stations receiving a medical transports message
The provisions of the above shall apply as appropriate to stations receiving a medical transports message.

COMMUNICATIONS RELATED TO ACTS OF UNLAWFUL INTERFERENCE

The station addressed by an aircraft being subjected to an act of unlawful interference, or first station acknowledging a call from such an aircraft, shall render all possible assistance, including notification of appropriate ATS units as well as any other station, agency or person in a position to facilitate the flight.

CHAPTER SIX

IFR

Contents

INTRODUCTION

The procedures for IFR and VFR are mostly identical but some words and procedures are generally only used by large commercial aircraft; hence they appear in this section.

In this chapter we will discuss the remaining elements of communications which apply to IFR flight rather than to both VFR and IFR.

CALLSIGNS

'HEAVY'
Aircraft which are in the heavy wake turbulence category (mostly decided by aircraft weight) must use the word 'HEAVY' in the initial call to an ATSU (Air Traffic Service Unit).

"Brize Radar, Speedbird 213 Heavy, request radar advisory"

Change Call Sign
In the interests of safety an aeronautical station (ATC) may tell an aircraft to change call sign temporarily. The aircraft station cannot do this! For example there may be two aircraft on the same frequency with a similar sounding call sign: Speedbird 123 and Birdseed 123

"Speedbird 123 change call sign to BA 123"

When this is no longer required (one aircraft has left frequency or the subject aircraft is handed over to another agency for example) the aircraft is told to revert to his original call sign.

"BA123 revert to flight plan call sign"

LEVEL REPORTING

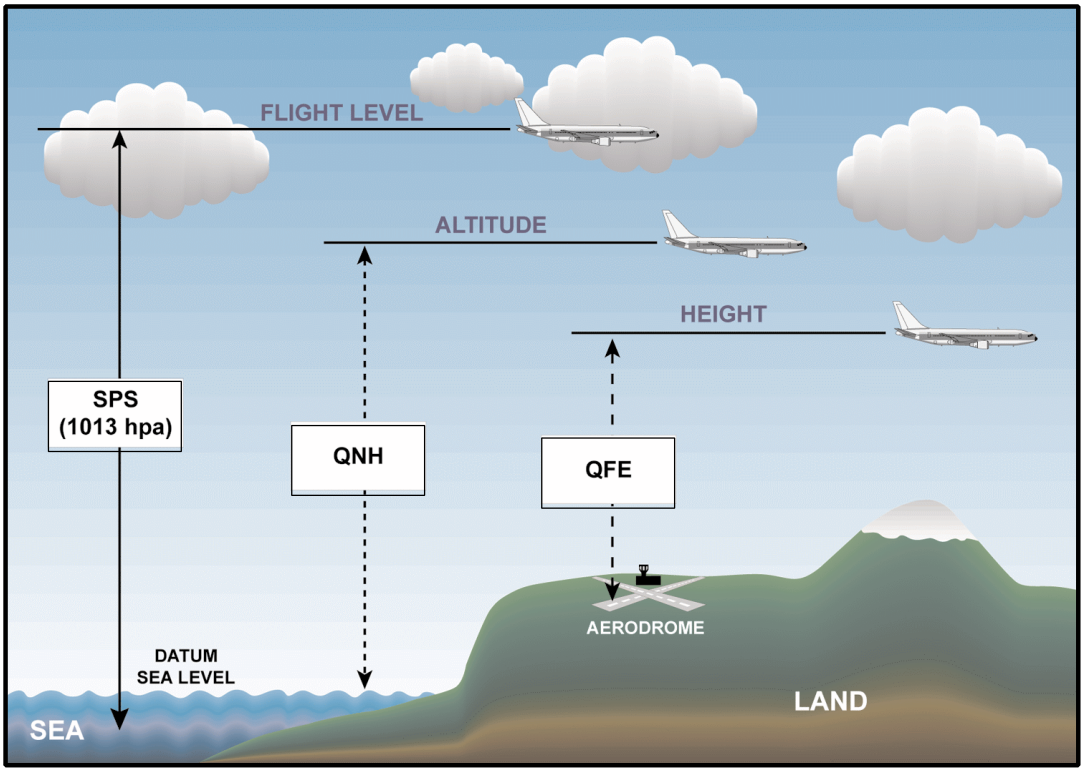
Vertical Position
The reporting of vertical position aircraft depends upon the altimeter pressure setting in use.

Standard Pressure Setting (SPS)
Its reading is based on sea level pressure in the standard atmosphere i.e.1013.2 hpa. The altimeter reads FLIGHT LEVEL.
Note: SPS does not read height above sea level but merely above a standard datum.

QNH.
With this pressure setting the altimeter reads ALTITUDE above mean sea level for the actual atmospheric conditions.

QFE
With this pressure setting the altimeter reads HEIGHT usually above the runway threshold. (Commercial operations rarely use this pressure setting now.)

Levels may be reported as Altitude, Height or Flight Level according to the phase of flight and the altimeter setting; with the SPS set, the words 'Flight Level' must be used prior to **the given level.**



Pressure Settings

Examples
In the following examples 'climb' or 'descend' are interchangeable.

Event	ATC	Pilot
Flight Level change	Fastair 243 Descend to FL 120	Descend to FL 120 Fastair 243
Flight Level change	Fastair 243 Re-cleared FL 60	Re-cleared FL 60 Fastair 243
Altitude	Fastair 243 Set QNH 1003 Descend to 3,000 ft	QNH 1003 Descend to 3,000 ft Fastair 243
Inability to climb	Fastair 243 Expedite climb to FL 200	Fastair 243 Unable due to weight

POSITION REPORTING

Compulsory position reports
Compulsory position reports may be required on some routes that may or may not have designated significant points. These reports shall contain the following elements of information, except that elements 4, 5 and 6 may be omitted under certain conditions:

1 callsign
2 position
3 time
4 level
5 next position and time
6 ensuing significant point.

Note: 1, 2 and 3 may not be omitted.

Exemptions
Where adequate flight progress data is available from other sources, such as surveillance radar, flights may exempted from compulsory position reports. Examples of messages relating to such exemption include:

" FASTAIR 345 NEXT REPORT COLINTON "

" FASTAIR 345 OMIT POSITION REPORTS UNTIL FIR BOUNDARY, NEXT REPORT COLINTON "

" FASTAIR 345 RESUME POSITION REPORTING "

The reply to such a message would be
" FASTAIR 345 WILCO "

MET REPORTS

Requirement
Occasionally aircraft meteorological observations are required. (In practice these are rarely required in the UK, but in some areas where observations are difficult [e.g. Atlantic] aircraft reports are valuable). The reports required are:

- routine aircraft observations during en-route and climb-out phases.
- special reports during any phase of flight.

The following flights are exempt from sending met reports:

- aircraft not equipped with RNAV (area navigation)
- flight is less than 2 hours
- aircraft is less than 1 hour from next landing
- altitude of flight is less than 1500m (5,000 ft)

Content of Routine Met Reports
The content of a routine report is combined with a routine position report as shown below:

SECTION 1 (POSITION)

Callsign, Position, Time, Level, Next Position & ETA

SECTION 2 (OPERATIONAL INFO)

ETA (at destination), Endurance

SECTION 3 (MET INFO)

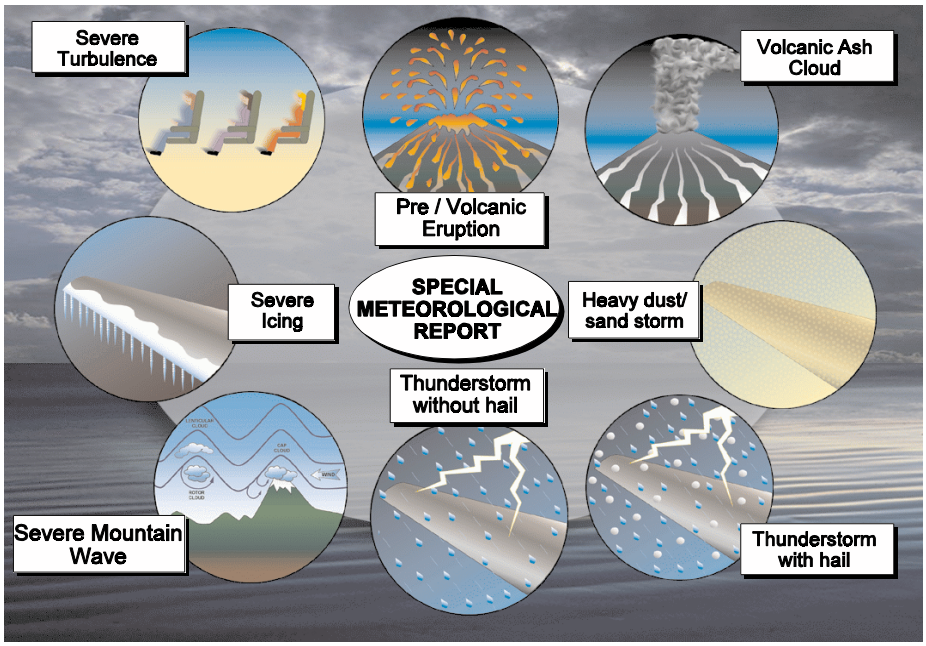
Air Temp, Wind (direction and speed), Turbulence, Icing, Humidity

Special Met Reports
The content of a special met report includes:

SECTION 1 *Callsign, Position, Time Level*

SECTION 2 *Special met condition*

Special reports are reported in SPECIAL weather conditions such as Severe Turbulence, Volcanic Ash, Pre-volcanic Eruption, Severe Icing, Heavy Dust / Sand Storm, Thunderstorm, severe Mountain Wave.



Special Weather Conditions

COMMUNICATION FAILURE UNDER IFR

IFR in VMC or IMC
In the event of a failure to establish or maintain communications, the initial actions are the same as for VFR, in other words check equipment, transmit blind etc. The ICAO reference really only considers "controlled flights" under VFR and IFR [In the UK controlled VFR is uncommon except under special circumstances in Control Zones e.g. crossing Brize Norton's control zone].
The subsequent actions in the event of communication failure depend upon whether the aircraft can maintain visual meteorological conditions (VMC) i.e. keep clear of cloud during descent and landing or whether the aircraft cannot avoid flying in cloud i.e. in instrument meteorological conditions (IMC).

IFR in VMC
The action for communication failure on a IFR flight in VMC is the same as the VFR procedure. If an aircraft can maintain VMC then the pilot must follow this procedure:

- Continue to fly in VMC
- Land at the nearest suitable aerodrome; and
- Report arrival by most expeditious means to the appropriate ATSU.

IFR in IMC
If in IMC the aircraft shall:

- unless otherwise prescribed on the basis of a regional air navigation agreement, in airspace where radar is not used in the provision of air traffic control, maintain the last assigned speed and level, or minimum flight level if higher, for a period of 20 minutes following the aircraft's failure to report its position over a compulsory reporting point and thereafter adjust level in accordance with the filed flight plan; or,
- in airspace where radar is used in the provision of air traffic control, maintain the last speed and level, or minimum flight level if higher, for a period of 7 minutes following:
  - the time the last assigned level or minimum flight altitude is reached; or
  - the time the transponder is set to code 7600; or
  - the aircraft's failure to report its position over a compulsory reporting point;

  which ever is later and thereafter adjust level and speed in accordance with the filed flight plan;
- when being radar vectored or having been directed by ATC to proceed offset using RNAV without a specified limit, proceed in the most direct manner possible to rejoin the current flight plan route no later than the next significant point, taking into consideration the applicable minimum flight altitude;
- proceed according to the current flight plan route to the appropriate designated navigation aid or fix serving the destination aerodrome and, when required to ensure compliance with 5) below, hold over this aid or fix until commencement of descent;

- commence descent from the navigation aid or fix specified in 4) at, or as close possible to, the expected approach time (EAT) last received and acknowledged; or, if no EAT has been received and acknowledged, at, or as close as possible to, the estimated time of arrival resulting from the current flight plan;

- complete a normal instrument approach procedure as specified for the designated navigation aid or fix; and

- land, if possible, within 30 minutes after the estimated time of arrival specified in 5 or the last acknowledged EAT, which is later.

SELCAL
SELCAL stands for selective calling, a system in which the voice calling is replaced by the transmission of coded tones to the aircraft over the radiotelephony channels. This means that the flight crew do not have to monitor the channel continuously - a very useful feature particularly on long oceanic flights using HF communications.

A single selective call consists of a combination of four pre-selected audio tones whose transmission requires about 2 seconds. Receipt of the assigned tone code (SELCAL code) activates a cockpit call system in the form of light and/or chime signals.

The procedure for the use of SELCAL by a flight crew is as follows:

- include the SELCAL code in the flight plan and

- establish HF communications temporarily while still within VHF coverage to ensure that the HF aeronautical station has the correct SELCAL code information.

The aircraft station should also carry out a pre-flight SELCAL check and ,if necessary give its SELCAL code.

IFR FLIGHT PROFILE
In order to put into practice some of the standard words and phrases from the list profiled in Doc 4444 (or summarised in 9432) we will follow a typical IFR flight profile.

Some of the profile is imaginary in that there is no standard departure from Cardiff nor is there an ILS at Oxford! However, the object is to fly IFR from Cardiff to Oxford with an ILS approach.

The list of phrases used is not exhaustive and therefore some private study of all phrases possible is essential.

EVENT	PILOT	ATC / Groundcrew
Departure ATIS		This is Cardiff Departure Information Delta. Time 1115 Runway 30 Surface wind 290 degrees 15 knots Visibility 10 km Sky clear Temperature 15 Dew point 10 QNH 1009 For start-up and taxi instructions contact Ground on 124.0
Start-up on 124.0 (this is requested to avoid unnecessary fuel wastage by delays on the ground. In case of a delay an expected start-up time is given)	Cardiff Ground Speedbird 123 Stand 24 Information Delta Request Start-up	Speedbird 123 Start-up at 35 QNH 1009 or Speedbird 123 Start-up approved QNH 1009
Push-back	Ground Speedbird 123 Request push-back	Speedbird 123 push-back approved
On groundcrew intercomm	Ready for push-back Brakes released Brakes set. Disconnect Roger	Confirm brakes released Commencing push-back Push-back complete confirm brakes set Disconnecting. standby for visual signal at your left
On Ground 124.0	Ground Speedbird 123 Request taxy Taxy to holding point D runway 30 Wilco Speedbird123	Speedbird 123 Taxy to holding point D runway 30 Give way to Boeing 747 on taxyway at C

Clearances are passed by ground controllers when they have received them from Approach or Airways controller	Ready to copy (or go ahead) Speedbird 123 Speedbird 123 is cleared for the Brecon 30 departure climbing to FL80 Onward clearance with Cardiff Approach 125.850 Squawk 3312 Speedbird 123 Tower 125.925 Speedbird 123	Speedbird 123 I have your clearance Speedbird 123 is cleared for the Brecon 30 departure climbing to FL80 Onward clearance with Cardiff Approach 125.850 Squawk 3312 Readback correct Contact tower 125.925
On tower freq 125.9 Conditional clearance Take-off (when runway vacated by B747)	Cardiff tower Speedbird 123 ready for departure Behind landing 747 line-up behind Speedbird 123 Cleared for take-off Speedbird 123	Speedbird 123 Behind landing 747 line- up behind Speedbird 123 cleared for take-off
Departure Then	Cardiff tower Speedbird 123 passing FL 50 for FL 80 Brecon 30 departure Climb FL150 Speedbird 123 Expedite climb until passing FL120 Speedbird 123	Speedbird 123 Roger continue climb FL 150 Speedbird 123 Expedite climb until passing FL120

Joining Controlled Airspace	London Control Speedbird 123 maintaining FL150 Speedbird123 is cleared to enter controlled airspace at Brecon FL150 route to Oxford via Golf 1 Leave controlled airspace at Malby Wilco Speedbird123 Squawk 2156 Contact London control 123.125 Speedbird 123	Speedbird 123 is cleared to enter controlled airspace at Brecon FL 150 route to Oxford via Golf 1 Leave controlled airspace at Malby Speedbird 123 readback correct Report at Alvin Speedbird 123 Squawk 2156 Contact London Control 123.125 for airways clearance
Position Reports: Callsign Position, time FL Next posn, time	Speedbird 123 Alvin 25 FL150 Wotan 30	Speedbird123 Roger
Descent	Speedbird123 Request leave controlled airspace by descent Descend FL 120 Expect further descent when clear of controlled airspace Speedbird 123	Negative Speedbird 123 Descend now to FL 120 Expect further descent when clear of controlled airspace
IFR Arrival	Oxford Approach Speedbird 123 FL80 Estimate Chalo 45 Information Delta QNH 1001 Descending 2,500 ft Speedbird 123 Right 020 degrees Speedbird 123 Wilco Speedbird123	Speedbird 123 QNH 1001 Descend to 2,500 ft Speedbird 123 turn right 020 degrees for separation Speedbird 123 self position for ILS runway 20 Report at Hey

ILS Approach (on Oxford Approach)	Speedbird 123 Heavy 2,500 ft Right 180 Wilco Speedbird 123	Speedbird 123 turn right 180 closing localiser from the right Report established
Clearances	Speedbird 123 Localiser established Cleared ILS runway 20 Wilco Speedbird123 Speedbird 123 Outer marker Tower 118.875 Speedbird 123	Speedbird 123 Roger Cleared ILS approach runway 20 Report outer marker Speedbird 123 contact tower 118.875
On tower 118.87	Oxford tower Speedbird 123 outer marker Cleared to land Speedbird 123	Speedbird123 Oxford tower Cleared to land runway 20

NDB APPROACH PROFILES

EVENT	PILOT	ATC
NDB Approach	Oxford Approach GBODA Chalo 45 FL 80 Estimate OX at 50 Hold at OX FL 45 GBODA GBODA OX FL 45 Entering the hold Roger GBODA	GBODA Oxford Approach hold OX at FL 45 Expect NDB approach runway 20 GBODA expected approach time 55
Clearance	Cleared for NDB approach runway 20 Wilco GBODA	GBODA Cleared for the NDB approach to runway 20 Report beacon outbound
Beacon Outbound	GBODA beacon outbound Wilco GBODA	GBODA report base turn complete
Base Turn	GBODA base turn complete Tower 118.875 GBODA	GBODA contact tower 118.875
Final Approach	Oxford Tower GBODA long final runway 20 Cleared to land GBODA	GBODA Oxford tower Cleared to land

CHAPTER 7

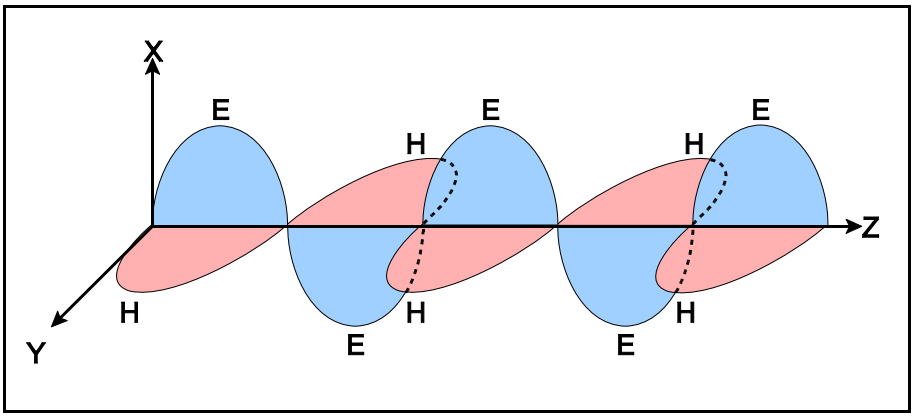
VHF PROPAGATION

Contents

INTRODUCTION

Radio Waves.
If an alternating current of suitably high frequency is fed to a transmitting aerial, the energy is not confined to the metal of the aerial but radiates out into space in the form of electro-magnetic waves (radio waves). This radiation of energy through space comprises alternating electrical and magnetic fields at right angles to each other. The amplitude of each field varies (oscillates) between zero and a maximum value, at the same frequency as the alternating current in the aerial.

Polarization.



Vertical Polarization.

The term polarization is used to describe the direction or plane of oscillation of the electrical field of an electro-magnetic wave. For instance a vertical transmitting aerial produces (mainly) a vertically polarized radio wave, with the electrical field (E) oscillations occurring in the vertical plane and the magnetic field (H) oscillations in the horizontal plane. For **efficient** reception, the receiving aerial should also be vertical. If the transmitting aerial is horizontal, the receiving aerial should also be horizontal.

The electric and magnetic fields oscillate at right angles to each other and both are at right angles to the direction of propagation (or travel) of the radio wave. Figure 7.1. shows the peak values E and H of the electric and magnetic fields of a vertically polarized wave.

Speed of Propagation.

Radio waves travel at the speed of light. The speed is virtually constant and is:-

300,000,000 metres per second,
or
162,000 nautical miles per second

Wavelength.
The wavelength of a radio wave can be defined as the distance travelled by the radio signal during the transmission of one cycle. Wavelength is normally expressed in metres unless it is less than one metre, when centimetres or millimetres are used.

Frequency Units.
Frequencies are expressed in Hertz (Hz). One Hertz equals one cycle per second. Radio frequencies are high and for convenience the following units may be used:-

Kilo-Hertz	(kHz)	= 1,000 Hz	= 10^3 Hz
Mega-Hertz	(MHz)	= 1,000,000 Hz	= 10^6 Hz
Giga-Hertz	(Ghz)		= 10^9 Hz
Tera-Hertz	(THz)		= 10^{12} Hz

RADIO FREQUENCY BANDS

Frequency Spectrum. The following table shows the division of radio frequencies into the various bands. The bands used for radio communications are the VHF and the HF bands.

Frequencies	Frequency Band	Wavelength	Facilities
3-30 kHz	VLF (Very Low Frequency)	100 km - 10 km	Very long range navigation
30-300 kHz	LF (Low Frequency)	10 km - 1km	NDB, Decca, Loran -C
300-3,000 kHz	MF (Medium Frequency)	1 km - 100 metres	NDB
3 - 30 MHz	HF (High Frequency)	100 metres-10 metres	HF R/T
30 - 300 MHz	VHF (Very High Frequency)	10 metres -1 metre	VHF R/T, VDF, VOR, ILS. marker beacons,
300 - 3,000 MHz	UHF (Ultra High Frequency)	1 metre -10 cm	ILS Glidepath, DME, some Surveillance Radar.
3 - 30 Ghz	SHF (Super High Frequency)	10 cm -1 cm	PAR, some Surveillance Radar, Doppler Radar, Radio Altimeter .AWR
30 - 300 GHz	EHF (Extremely High Frequency)	1 cm -1 mm	Airfield Surface Movement Radar

VHF FREQUENCY SPREAD

The frequencies in the part of the VHF band that may be of concern to the pilot are as follows:

88 to 107.95 MHz	Broadcasting (FM)
108 to 117.95 MHz	Radio Navigation (AM and FM)
118 to 136.975 MHz	Radio Communication (AM) This is the band that used for Aeronautical Mobile Service voice communications

(AM stands for amplitude modulation and FM for frequency modulation)

VHF FREQUENCY SEPARATION

Sidebands and Bandwidth.
The spread of side frequencies above and below the carrier frequency are known respectively as the upper and lower sidebands. The total spread of frequencies in the modulated emission is known as the Bandwidth of the signal. A voice (or music) transmission consists of many different audio frequencies, up to at least 5 kHz, impressed on the carrier wave. Consequently many side frequencies exist in the modulated signal, which may have a bandwidth of at least 10 kHz. Such a signal is classified as an A3E emission; an example is VHF R/T.

VHF Bandwidth
The bandwidth allocated to VHF frequencies is at present for the most part 25kHz or 0.025mHz i.e. the spacing between one channel and another. Wherever channels are separated by 25kHz, only the first five digits should be used, not more than 2 significant digits after the decimal point. In the case of these being 2 zeros, a single zero is considered significant.

118.0 transmitted as ONE ONE EIGHT DECIMAL ZERO
118.025 transmitted as ONE ONE EIGHT DECIMAL ZERO TWO

However, this is being reduced to 8.33kHz (one third of 25kHz) and is already mandatory for aircraft using the upper airspace over Europe under Eurocontrol. Wherever VHF channels are separated by 8.33kHz, all 6 digits of the numerical designator should be used to identify the transmitting channel. Three digits after the decimal are used for all channels.

118.005 transmitted as ONE ONE EIGHT DECIMAL ZERO ZERO FIVE

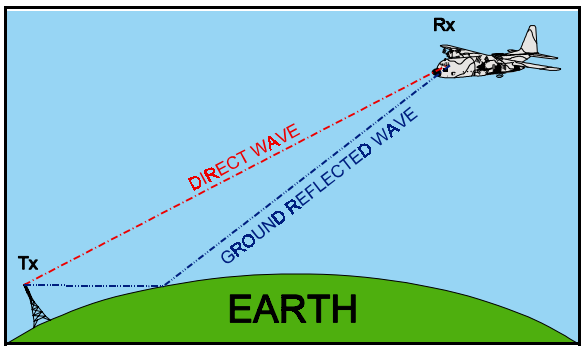
VHF PROPAGATION CHARACTERISTICS

Propagation Paths.
The path of a radio wave from a transmitter to a receiver many miles away is not necessarily direct. The following paragraphs describe the various paths a radio signal can follow. In many cases, the signal may be reaching the receiver by more than one path at the same time, and because of the different path lengths there will be phase differences between the signals. Such phase differences affect the resultant signal strength. For instance, if two waves from the same transmitter travel by different paths and arrive 180°

out of phase, they will cancel each other if their amplitudes are the same. The resultant signal strength will be zero, so no signal will be received. Changes in phase difference will cause changes in signal strength so producing the effect known as '**fading**'.

Direct and Ground-reflected Waves.

A signal which travels in a straight line between transmitter and receiver is called the **direct wave**. In addition to this, there is normally a signal arriving at the receiver after reflection at the earth's surface. This is the **ground-reflected wave**. These two waves are jointly known as the **Space Wave**. (In this and other diagrams, the abbreviation Tx is used for transmitter and Rx for Receiver.)



Space Wave.

Since the direct and reflected waves follow different paths they may arrive at the receiver with large phase differences. The situation is further complicated by a change in phase which occurs at the point of reflection of the ground-reflected wave. The net result is that, for instance, an aircraft flying towards a ground station may suffer fading or temporary loss of VHF communications with that station. The range at which this occurs depends on ground aerial height above the surface, aircraft altitude, and frequency. For instance, with VHF R/T, except in freak conditions, the curvature of the earth gives protection from mutual interference between stations using a common frequency provided they are well-separated geographically.

FACTORS AFFECTING VHF PROPAGATION

Attenuation.

The term **attenuation** means the loss in strength of a radio signal as range from the transmitter increases. The signal strength received is inversely proportional to the distance from the transmitter. A wave becomes attenuated as range increases because:-

- The radio energy available is spread over a greater area.
- Radio energy is lost to the earth, the atmosphere, and sometimes to the ionised layers above the earth.

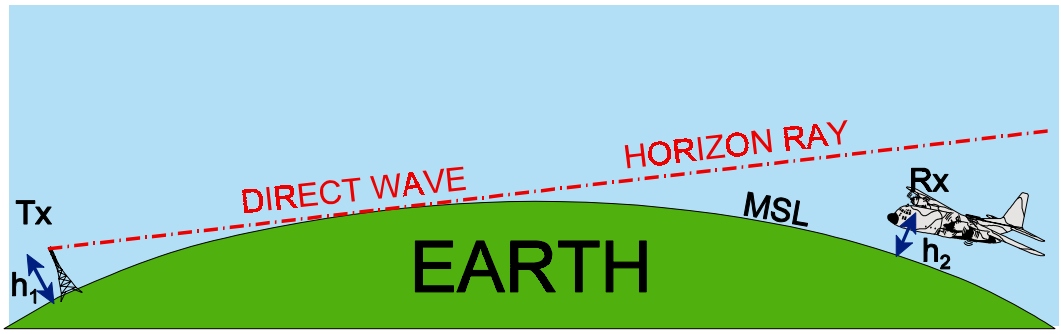
One factor on which the operational range of a radio emission depends is the transmitter power. The range obtainable is proportional to the square root of the power; in other words if the range is to be doubled, the transmitter power must be quadrupled.

Refraction.
As a general rule, radio signals travel in straight lines, that is, they follow great circle paths over the surface of the earth. Under certain circumstances, however, the path of a signal may change direction. This change of direction is known as **refraction**. The amount of refraction varies considerably, depending on conditions and on frequency. In the VHF range of frequencies there is negligible refraction.

EFFECTIVE RANGE OF VHF

Line of Sight Range
The curvature of the earth limits the use of the direct wave. It can be seen that the aircraft 'below the horizon' cannot use the direct wave for communications.

The lowest direct wave is just tangential to the surface and is known as the 'horizon ray'. It will be appreciated that direct wave communications for the aircraft could be restored by either raising the height of the ground aerial or increasing the aircraft's altitude.



Line of Sight.

A formula used for calculating the maximum range of direct wave reception is:-

Range (nm) = $1.25\ (\sqrt{h_1} + \sqrt{h_2})$

Where h_1 = height of ground aerial (feet AMSL)

h_2 = aircraft altitude (feet AMSL)

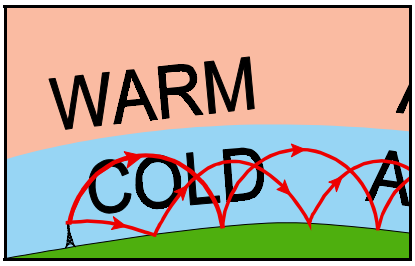
This formula allows for a small amount of refraction in the lower layers of the atmosphere, which gives a slightly better range than would be obtained if the direct wave followed a perfectly straight path without any downward refraction. Under normal conditions, the space wave provides the only propagation path for frequencies **above** about 30 MHz.

Therefore, except on fairly rare occasions, communications in the VHF and higher bands suffer from **line of sight** transmission with range limited by the curvature of the earth and any high ground which interrupts the line of sight. Note that the range limitation imposed by Line of sight transmission is useful when there is a shortage of available frequencies.

FREAK PROPAGATION

It has been stated that for frequencies above about 30 MHz, transmission is normally 'line of sight' so that propagation is by means of the space wave. Under certain conditions of freak or 'anomalous' propagation, however, ranges much greater than line of sight ranges can be achieved by means of **duct propagation** and **scatter propagation**.

Duct Propagation.
This effect, also called **'super-refraction**, is associated with a **temperature inversion** and a **rapid decrease in humidity with height**. Such meteorological conditions are most often found at the surface over land in high pressure conditions at night and in the early morning. A warm air mass over a cold sea can also produce the effect. It can also occur at higher levels.



Duct Propagation

The way in which radio signals can be 'trapped' in a duct of cold air is shown above. This process sometimes permits reception of signals at the surface hundreds of miles beyond the horizon. The effect is most common in the SHF and UHF bands, but is also encountered in the VHF band if the duct is sufficiently deep (say, 500 ft). Duct propagation can cause annoying interference between control towers using the same R/T frequency, and false range indications on ground radar screens.

Scatter Propagation.
The E-layer sometimes contains areas of very high ionisation density which can produce weak sky waves (known as 'Sporadic-E' reflections) in the VHF band. The effect is unpredictable and the sky waves are scattered at random in the forward direction from the transmitter. With specially designed aerials, scatter propagation can sometimes be used to provide intermittent extended range VHF R/T but it is not a reliable means of communication. Scatter propagation can cause mutual interference between VHF radio aids sharing a frequency and normally protected from interference by line of sight transmission. Television programmes also suffer from interference due to this effect.

CHAPTER EIGHT

REVISION QUESTIONS

Contents

SPECIMEN QUESTIONS - VFR

1 The abbreviation for the callsign CHEROKEE XY-ABC would be:

a. XY- BC
b. CHEROKEE XY-BC
c. CHEROKEE BC
d. ABC

2 The Q code for TRUE BEARING from a station is:

a. QDR
b. QFE
c. QUJ
d. QTE

3 The definition of the DISTRESS condition is that:

a. there is concern for the safety of the aircraft or a person on board or other vehicle but there is no need for immediate assistance
b. the aircraft is in imminent danger and requires immediate assistance
c. the aircraft has crashed
d. the aircraft is being hi-jacked

4 The words preceding an URGENCY message should be:

a.	Urgency	Urgency	Urgency
b.	Pan Pan	Pan Pan	Pan Pan
c.	Pan	Pan	Pan
d.	Mayday	Mayday	Mayday

5 The Q code on which height is based on:

a. QNH
b. QFF
c. QFE
d. QUJ

6 The frequency on which ATIS can be found is

a. Discrete VHF or VOR frequency
b. Discrete VHF only
c. VOR frequency only
d. any ATC frequency

7 The call from an aircraft for a missed approach is:

a. OVERSHOOTING
b. TOUCH AND GO
c. GOING AROUND
d. ABORTING

8 When asking for a repeat of a message, you should say:

a. WORDS TWICE
b. REPEAT MESSAGE
c. SPEAK SLOWER
d. SAY AGAIN

9 When reporting a frequency the use of the word "DECIMAL" can be omitted:

a. When there is no likelihood of confusion
b. After the initial call
c. Never
d. By the ground station only

10 The selection of the code 7600 on a transponder indicates:

a. loss of comms
b. distress
c. urgency
d. hi-jacking

11 Your action in response to the instruction from ATC to "RESET SQUAWK" is to:

a. set the numbers to 7000
b. reselect the numbers on the control unit
c. switch to standby and back to ON
d. press the IDENT button

12 If you are unable to contact a station on a designated frequency you should:

a. try a another appropriate frequency
b. start transmitting blind
c. land at the nearest suitable aerodrome
d. transmit words twice

13 The minimum content of a readback of the message from ATC "X-CD CHANGE FREQUENCY TO STEPHENVILLE TOWER 118.7" is:

a. 118.7
b. CHANGING FREQUENCY X-CD
c. TO STEPHENVILLE X-CD
d. 118.7 X-CD

14 The best signals for VHF communications are obtained when the position of the aircraft is at:

a. high altitude at long range
b. high altitude and in the vicinity of the aerodrome
c. low altitude and short range
d. low level and long range

15 The Q code for the magnetic bearing from a station is:

a. QDM
b. QDR
c. QTE
d. QNH

16 The abbreviation for a control zone is:

a. CTR
b. CTZ
c. ATZ
d. CTA

17 The condition that defines the state of an aircraft in imminent danger is:

a. Mayday
b. Distress
c. Pan Pan
d. Urgency

18 The callsign of a station controlling surface vehicles in the manoeuvring area would be:

a. TOWER
b. CLEARANCE
c. GROUND
d. APRON

19 The instruction "ORBIT" from ATC means that the aircraft should:

a. carry out a go around
b. continue with 360 degree turns
c. carry out one 360 degree turn only
d. reverse the direction of the turn

20 The time given in aeronautical communications is:

a. Local mean time
b. in minutes only
c. UTC
d. daylight saving time

21 In order to make message effective you should:

a. use words twice
b. speak slower
c. repeat the message
d. speak at a constant volume

22 When making a blind transmission you should:

a. transmit the message twice
b. transmit each word twice
c. repeat the message on 121.5 MHz
d. wait for visual signals

23 The abbreviation AFIS stands for:

a. Aerodrome flight information service
b. Automatic flight information service
c. Aircraft fire indication system
d. Automatic flight instrument system

24 The full range of VHF frequencies used for communications is:

a. 3 to 30 MHz
b. 88 to 108 MHz
c. 108.0 to 139.95 MHz
d. 118.0 to 136.975 MHz

25 The message "READABILITY 3" means:

a. Readable now and then
b. Unreadable
c. Readable
d. Readable but with difficulty

26 The phrase to use when you want to say "yes" is:

a. AFFIRMATIVE
b. ROGER
c. WILCO
d. AFFIRM

27 The definition of the phrase "STANDBY" is:

a. consider the transmission as not sent
b. proceed with your message
c. wait and I will call you
d. hold your present position

28 The correct readback of the frequency 123.725 on 25 kHz spacing is:

a. 123.725
b. 123.7
c. 12372
d. 123.72

29 The correct reply to the instruction "HOLD SHORT AT RUNWAY" is:

a. WILCO
b. ROGER
c. HOLDING SHORT
d. UNDERSTOOD

30 The priority of the message “LINE UP” is:

a. greater than “REQUEST QDM”
b. less than “CLEAR TO LAND”
c. same as “TAXI TO HOLDING POINT RUNWAY 20”
d. same as “WORK IN PROGRESS ON TAXIWAY”

ANSWERS - VFR

1	C	16	A
2	D	17	B
3	B	18	C
4	B	19	B
5	C	20	C
6	A	21	D
7	C	22	A
8	D	23	A
9	C	24	D
10	A	25	D
11	B	26	D
12	A	27	C
13	D	28	A
14	B	29	C
15	B	30	C

SPECIMEN QUESTIONS – IFR

1 Clearance limit is defined as:

a. the flight level to which an aircraft is granted ATC clearance
b. the time at which the ATC clearance expires
c. the point to which aircraft is granted ATC clearance
d. the height below which you will hit the first obstacle

2 The instruction from ATC to an aircraft to abandon its take off includes the phrase:

a. CANCEL TAKE-OFF
b. STOP IMMEDIATELY
c. ABORT ABORT
d. YOU WONT LIKE THIS

3 The term "DISREGARD" means:

a. Ignore
b. Cancel the last clearance
c. You have not been cleared
d. Pay no attention to what I say

4 The message "CHECK" to an aircraft means that you should:

a. confirm the you received and understood the last message
b. pass the required information to ATC
c. stay where you are
d. examine a system or procedure

5 The callsign suffix of a station providing clearance delivery would be:

a. CLEARANCE
b. GROUND
c. DELIVERY
d. PRESTO

6 The term "CORRECTION" is used when:

a. the readback of a message is incorrect
b. the readback of a message is correct
c. the message has to be deleted
d. an error has been made in the transmission and the correct version is ...

7 The state of urgency is defined as a condition:

a. of being threatened by serious and/or imminent danger and of requiring immediate assistance
b. concerning the safety of an aircraft or other vehicle or of some person on board but does not require immediate assistance
c. where an aircraft requires an immediate take-off
d. where the aircraft needs to land immediately because the crew are running out of duty time

8 The response to general call from ATC is for the aircraft to:

a. respond in alphabetic order
b. respond in numerical order
c. give no response
d. request a repeat of the message

9 If a transponder is unserviceable before an IFR departure, then the pilot:

a. has to cancel the flight
b. may proceed with the flight with ATC permission
c. has to fly low level only
d. should fly for another company

10 Following a communications failure the time at which the aircraft should aim to leave the hold is:

a. within 10 minutes of the EAT or ETA
b. within 30 minutes of the EAT or ETA
c. EAT or ETA
d. before it runs out of fuel

11 The call "PAN PAN MEDICAL" indicates that:

a. the flight is concerning a protected medical transport pursuant to 1949 Geneva Convention
b. there is concern about the safety of the aircraft or other vehicle or a person on board but does not require immediate assistance
c. one of the flight crew has taken ill
d. the crew require medical aid on the pan

12 An urgency message should include the following information:

a. name of station addressed, aircraft callsign, nature of urgency condition, intention of commander, position, level, heading
b. callsign, position, route, destination, endurance
c. name of station addressed, callsign, present position, level, ETA destination
d. captains number, rank and name

13 Readability 2 means that your transmission is:

a. readable but with difficulty
b. readable
c. readable now and then
d. two way communications have been established

14 How does ATC report RVR?

a. In kilometres along the final approach
b. In metres at touchdown, mid-point and stop-end of runway
c. In nautical miles along the runway
d. In feet and inches

15. The procedure to be followed in the event of communications failure after departure for an aircraft receiving radar vectors is to:

a. maintain the last cleared level and speed for 20 minutes and then continue with the flight plan
b. hold cleared level for 7 minutes and then continue in accordance with the current flight plan
c. land at the nearest suitable aerodrome
d. make a ninety degree turn and depart controlled airspace

16 An altitude of 13,500 feet would be spoken as:

a. THIRTEEN THOUSAND FIVE HUNDRED FEET
b. ONE THREE THOUSAND FIVE ZERO ZERO FEET
c. ONE THREE THOUSAND FIVE HUNDRED FEET
d. ANGELS THIRTEEN POINT FIVE

17 What cannot be left out from a position report?

a. Callsign Flight level and Time
b. Callsign, Position and Time
c. Position, Time, Flight level, Next position and ETA
d. Your signature

18 The callsign suffix for an airfield without radar would be:

a. APPROACH
b. CENTRE
c. INFORMATION
d. RADIO

19 The definition of the instruction "MONITOR …" is:

a. listen out on frequency
b. establish communications on frequency
c. watch out for visual signals on frequency
d. you are being watched

20 The phrase "BRAKING CO-EFFICIENT 20" from ATC means that the braking action is:

a. poor
b. medium to poor
c. medium
d. slippery

21 Your reply to the message "REPORT FLIGHT CONDITIONS" should be:

a. VFR / IFR
b. SMOOTH / TURBULENT
c. NOT BAD / SO SO
d. VMC / IMC

22 A waypoint is:

a. a designated reporting point
b. a geographical point at which a change of level takes place
c. a geographical location relating to area navigation (RNAV)
d. a visual sign pointing the way

23 If you are repeating a word or a message for clarity then you should use the phrase:

a. WORDS TWICE
b. I REPEAT
c. I SAY AGAIN
d. DITTO

24 The condition that describes the state of an aircraft in serious and/or imminent danger and requiring immediate assistance is:

a. Urgency
b. Flight safety
c. Hopeless
d. Distress

25 If you make a mistake in transmission you should use the phrase:

a. CORRECTION
b. CORRECT
c. I SAY AGAIN
d. SORRY

26 An example of a general call is:

a. STOP IMMEDIATELY I SAY AGAIN STOP IMMEDIATELY
b. BRAKING ACTION UNRELIABLE
c. ALL STATIONS
d. GOOD DAY

27 The frequency 121.5 MHz is the:

a. international flight safety frequency
b. one way air to ground emergency frequency
c. international emergency frequency
d. air to air chat frequency

28 The ATC message "DISTRESS TRAFFIC ENDED" signifies that:

a. all aircraft are to end their transmissions
b. all aircraft on the frequency are to change to another frequency
c. normal ATC is resumed after an emergency
d. ATC is shutting shop

29 The phrase used to separate portions of a message is:

a. BREAK BREAK
b. I SAY AGAIN
c. BREAK
d. UMM

30 The term "RECLEARED" means that:

a. your last clearance is confirmed
b. your last clearance has been cancelled
c. you may proceed as you please
d. a change has been made to your last clearance and this new clearance supersedes your previous clearance

ANSWERS - IFR

1	C	16	C
2	B	17	B
3	A	18	A
4	D	19	A
5	C	20	A
6	D	21	D
7	B	22	C
8	C	23	C
9	B	24	D
10	C	25	A
11	A	26	C
12	A	27	C
13	C	28	C
14	B	29	C
15	B	30	D