Part 303

Aviation Meteorological Service Organizations Certifications

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Subpart A
General

303.1 Applicability

This Part prescribes:

(a) Rules governing the certification and operation of organizations providing meteorological services for aviation;

(b) Requirements governing the provision of basic weather reports for aviation.

(c) The regulation shall be amended when deemed necessary

303.3 Reserved

303.5 ICAO References

Annex2

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303.7 Definitions

Note. — The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU) (see Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies (Doc 9718)).

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

“Aerodrome climatologically summary”:

Concise summary of specified meteorological elements at an aerodrome, based on statistical data.

"**Aerodrome control tower".** A unit established to provide air traffic control service to aerodrome traffic.

“Aerodrome climatologically table”.

Table providing statistical data on the observed occurrence of one or more meteorological elements at an aerodrome.

“Aerodrome meteorological office”

An office designated to provide meteorological service for aerodromes serving international air navigation.

Aerodrome reference point. The designated geographical location of an aerodrome.

“Aerodrome elevation” The elevation of the highest point of the landing area.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

Aeronautical fixed telecommunication network (AFTN). A worldwide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics.

“ **Aeronautical meteorological station “** A station designated to make observations and meteorological reports for use in international air navigation**.**

Aeronautical mobile service (RR S1.32). 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 telecommunication station. A station in the aeronautical telecommunication service.

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

“Aircraft observation”

The evaluation of one or more meteorological elements made from an aircraft in flight.

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

"Air-report".

A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting.

Note.— Details of the AIREP form are given in the PANS-ATM (Doc 4444).

AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.

"Area navigation (RNAV)

A method of navigation which permits aircraft operations on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Note.— Area navigation includes performance-based navigation as well as other operations that do not meet the definition of performance-based navigation .

Automatic dependent surveillance — contract (ADS-C). A means by which the terms of an ADS-C agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions ADS-C reports would be initiated, and what data would be contained in the reports.

Note.— The abbreviated term "ADS contract" is commonly used to refer to ADS event contract, ADS demand contract, ADS periodic contract or an emergency mode.

"Briefing" Oral commentary on existing and/or expected meteorological conditions.

"Cloud of operational significance"

A cloud with the height cloud base below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, or a cumulonimbus cloud or a towering cumulus cloud at any height.

Control area. A controlled airspace extending upwards from a specified limit above the earth.

"Consultation"

Discussion with a meteorologist or another qualified person of existing and/or expected meteorological conditions relating to flight operations; a discussion includes answers to questions.

Elevation. The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

"Flight documentation".

Written or printed documents, including charts or forms, containing meteorological information for a flight.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1. — A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

(a) when set to a QNH altimeter setting, will indicate altitude;

(b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

(c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2. — The terms "height" and "altitude", used in Note 1, indicate altimetry rather than geometric heights and altitudes.

Forecast. A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

"GAMET area forecast"

An area forecast in abbreviated plain language for low-level flights for a flight information region or sub-area thereof, prepared by the meteorological office designated by the meteorological authority concern Egyptian Civil Aviation and exchanged with meteorological offices in adjacent flight information regions, as agreed between the meteorological authorities concerned.

"Grid point data in digital form"

Computer processed meteorological data for a set of regularly spaced points on a chart, for transmission from a meteorological computer to another computer in a code form suitable for automated use.

Note.— In most cases, such data are transmitted on medium- or high-speed telecommunications channels.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

"International airways volcano watch (IAVW)"

International arrangements for monitoring and providing warnings aircraft of volcanic ash in the atmosphere.

Note.— The IAVW is based on the cooperation of aviation and non-aviation operational units using information derived from observing sources and networks that are provided by States. The watch is coordinated by ICAO with the cooperation ofother concerned international organizations.

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

"**Meteorological authority "**

The authority providing or arranging for the provision of meteorological service for international air navigation on behalf of a Contracting State.

Note.— on behalf of Egypt is called the Egyptian Meteorological Authority (EMA).

Meteorological information. Meteorological report, analysis, forecast, and any other statement relating to existing meteorological conditions.

Meteorological watch office. An office designated to provide information concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations within its specified area of responsibility.

Meteorological office. An office designated t or expected or provide meteorological service for international air navigation.

"**Meteorological bulletin"**

A text comprising meteorological information preceded by an appropriate heading.

"**Meteorological report**"

Means a statement, in support of aviation, of observed meteorological conditions related to a specific time and location.

"Meteorological satellite"

An artificial Earth satellite making meteorological observations and transmitting observations to Earth.

"Navigation specification."

A set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

Required navigation performance (RNP) specification. A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

Area navigation (RNAV) specification. A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

Note.— The Performance-based Navigation (PBN) Manual (Doc 9613), Volume II, contains detailed guidance on navigation specifications.

"Observation (meteorological)"

The evaluation of one or more meteorological elements.

"Operational planning."
The planning of flight operations by an operator.

"Performance-based navigation (PBN)."
Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note.— Performance requirements are expressed in navigation specification (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.

"Prevailing visibility"
The visibility value, observed in accordance with the definition of "visibility", which is reached or exceeded within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors.

Note.— This value may be assessed by human observation and/or instrumented systems. When instruments are installed, they are used to obtain the best estimate of the prevailing visibility.

"Prognostic chart"
A forecast of a specified meteorological element(s) for a specified time or period and a specified surface or portion of airspace, depicted graphically on chart.

Quality assurance. Part of quality management focused on providing confidence that quality requirements will be fulfilled(ISO 9000*).

***ISO standard9000**-QualityManagementSystem-Eundamentals and Vocabulary.

Quality control. Part of quality management focused on fulfilling quality requirements (ISO 9000*).

***ISO standard9000**-QualityManagementSystem-Eundamentals and Vocabulary 00*).

Quality management. Coordinated activities to direct and control an organization with regard to quality (ISO 9000*).

*ISO standard9000-QualityManagementSystem-Eundamentals and Vocabulary.

Regional air navigation agreement. Agreement approved by the Council of ICAO normally on the advice of a regional air navigation meeting.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway visual range (RVR). 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.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations.

"Search and rescue services unit"
A generic term meaning, as the case may be, rescue coordination centre, rescue sub centre or alerting post.

"Service area (world area forecast system WAFS)"
A geographical area within which a world area forecast centre is responsible for issuing area forecasts to meteorological authorities and other users.

"Standard isobaric surface".
An isobaric surface used on worldwide basis for representing and analyzing the conditions in the atmosphere State volcano observatory. A volcano observatory, designated by regional air navigation agreement, to monitor active or potentially active volcanoes within a State and to provide information on volcanic activity to its associated area control centre/flight information centre, meteorological watch office and volcanic ash advisory centre.

"Threshold".
The beginning of that portion of the runway usable for landing.

"Touchdown zone"
The portion of a runway, beyond the threshold, where it is intended landing aero planes first contact the runway.

"Tropical cyclone"
Generic term for a non-frontal synoptic-scale cyclone originating over tropical or sub-tropical waters with organized convection and definite cyclonic surface wind circulation.
"**Upper-air chart".**
A meteorological chart relating to a specified upper-air surface or layer of the atmosphere.
"Tropical cyclone advisory centre (TCAC)"
A meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, world area forecast centers and international OPMET data banks regarding the position, forecast direction and speed of movement, central pressure and maximum surface wind of tropical cyclones.
"Visibility"
Visibility for aeronautical purposes is the greater of**:**
(a) The greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background;
(b) The greatest distance at which lights in the vicinity 1000 candelas can be seen and identified against unlit background.
Note.— The two distances have different values in air of a given extinction coefficient, and the latter b) varies with the background illumination. The former a) is represented by the meteorological optical range (MOR).
"Volcanic ash advisory centre (VAAC)"
A meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, area control centers, flight information centers world area forecast centers and international OPMET data banks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions.
"VOLMET"
Meteorological information for aircraft in flight. Data link-VOLMET (D-VOLMET). Provision of current aerodrome routine meteorological reports (METAR) and aerodrome special meteorological reports (SPECI), aerodrome forecasts (TAF), SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET via data link.
"VOLMET broadcast."
Provision, as appropriate, of current METAR, SPECI, TAF and SIGMET by means of continuous and repetitive voice broadcasts.
"World area forecast centre (WAFC)"
A meteorological centre designated to prepare and issue significant weather forecasts and upper-air forecasts in digital form on a global basis direct to States using of the aeronautical fixed service Internet-based services.
"World area forecast system (WAFS)"
A worldwide system by which world area forecast centres provide aeronautical meteorological en-route forecasts in uniform standardized formats.

303.9 Terms used with a limited meaning

For the purpose of this ECAR, the following terms are used with a limited meaning as indicated below:
(a) Avoid confusion in respect of the term "service" between the meteorological service considered as an administrative entity and the service which is provided," meteorological authority" is used for the former and "service" for the latter.
(b) Provide is used solely in connection with the provision of service.
(c) Issue is used solely in connection with cases where the obligation specifically extends to sending out the information to a user.
(d) Make available is used solely in connection with cases where the obligation ends with making the information accessible to a user.
(e) Supply is used solely in connection with cases where either c) or d) applies.

303.11 Objective, determination and provision of meteorological service"

(a) The objective of meteorological service for international air navigation shall be to contribute towards the safety, regularity and efficiency of international air navigation.

(b) This objective shall be achieved by supplying the following users: operators, flight crew members, air traffic services units, search and rescue services units, airport management's and others concerned with the conduct or development of international air navigation, with the meteorological information necessary for the performance of their respective functions.

(c) Each Contracting State shall determine the meteorological service which it will provide to meet the needs of international air navigation. This determination shall be made in accordance with the provisions of this Annex and in accordance with regional air navigation agreements; it shall include the determination of the meteorological service to be provided for international air navigation over international waters and other areas which lie outside the territory of the State concerned

(d) Each Contracting State shall designate the authority, hereinafter referred to as the meteorological authority, to provide or to arrange for the provision of meteorological service for international air navigation on its behalf. Details of the meteorological authority so designated shall be included in the State aeronautical information publication, in accordance with Annex 15, Appendix 1, GEN 1.1.

(e) The EMA has the right to inspect all meteorological office activities to ensure that they comply with the requirements of the World Meteorological Organization (WMO) and all the provisions of this Part in respect qualifications and training of meteorological personnel providing service for international air navigation, in accordance with the approved training program.

Note: Requirements concerning qualifications and training of meteorological personnel in aeronautical meteorology are given in WMO Publication No. 49, Technical Regulations , Volume I — General Meteorological Standards and Recommended Practices, Chapter B.4 — Education and Training and guidelines of education & training published by WMO (doc.258).

303.13 "Supply, quality assurance and use of meteorological information"

(a) Close liaison shall be maintained between those concerned with the supply and those concerned with the use meteorological information on matters which affect the pro-vision of meteorological service for international air navigation.

(b) Each Contracting State ensure that the designated meteorological authority shall establishes and implements a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to the users.

(c) The quality system established in accordance with (b) should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards, and certified by an approved organization.

(d) The quality system should provide the users with assurance that the meteorological information supplied complies with the stated requirements in terms of the geographical and spatial coverage, format and content time and frequency of issuance and period of validity, as well as the accuracy of measurements, observations and forecasts.

(e) In regard to the exchange of meteorological information for operational purposes, the quality system should include verification and validation procedures and resources for monitoring adherence to the prescribed transmission schedules for individual messages and/or bulletins required to be exchanged, and the times of their filing for transmission. The quality system should be capable of detecting excessive transit times of messages and bulletins received.

(f) Demonstration of compliance of the quality system applied shall be by audit. If non-conformity of the system is identified, action shall be initiated to determine and correct the cause. All audit observations shall be evidence-based and properly documented.

(g) The meteorological information supplied to the users shall be consistent with Human Factors principles and shall be in forms which require a minimum of interpretation by these users, as specified in this Part.

303-14 Notifications required from operators

An operator requiring meteorological service or changes in existing Meteorological service shall notify, sufficiently in advance, the meteorological authority or the meteorological office(s) concerned. The minimum amount of advance notice required shall be as agreed between the meteorological authority or meteorological office(s) and the operator concerned.

303-14-1 The meteorological authority shall be notified by the operator requiring service when:

(a) new routes or new types of operations are planned;

(b) changes of a lasting character are to be made in scheduled operations; and

(c) other changes, affecting the provision of meteorological service, are planned.

Such information shall contain all details necessary for the planning of appropriate arrangements by the meteorological authority.

303-14-2 The aerodrome meteorological office, or the meteorological office concerned, shall be notified by the operator or a flight crew member:

(a) of flight schedules;

(b) when non-scheduled flights are to be operated; and

(c) when flights are delayed, advanced or cancelled.

303-14-3 The notification to the aerodrome meteorological office, or the meteorological office concerned, of individual flights should contain the following information except that, in the case of scheduled flights, the requirement for some or all of this information may be waived as agreed between the meteorological office and the operator concerned:

(a) aerodrome of departure and estimated time of departure;

(b) destination and estimated time of arrival;

(c) route to be flown and estimated times of arrival at, and departure from, any intermediate aerodrome(s);

(d) alternate aerodromes needed to complete the operational flight plan and taken from the relevant list contained in the regional air navigation plan;

(e) cruising level;

(f) type of flight, whether under visual or instrument flight rules;

(g) type of meteorological information requested for a flight crew member, whether flight documentation and/or briefing or consultation; and

(h) time(s) at which briefing, consultation and/or flight documentation are required.

303-15 For aerodromes without meteorological offices

(a) The meteorological offices shall supply meteorological information of those aerodromes without meteorological offices as designated by EMA in their privileges.

(b) The meteorological offices shall establish procedures by means of which such information can be supplied to the aerodromes concerned, those procedures shall be accepted by EMA.

303-16 World Area Forecast System and Meteorological Offices

Note. — Technical specifications and detailed criteria related to this chapter are given in Appendix 2.

Objective of the world area forecast system

The objective of the world area forecast system shall be to supply meteorological authorities and other users with global aeronautical meteorological en-route forecasts in digital form. This objective shall be achieved through a comprehensive, integrated, worldwide and, as far as practicable, uniform system, and in a cost-effective manner, taking full advantage of evolving technologies.

303-16-1 World area forecast centers

A Contracting State, having accepted the responsibility for providing a WAFC within the framework of the world area forecast system, shall arrange for that centre:

(a) To prepare gridded global forecasts of:

1) Upper wind;
2) Upper-air temperature and humidity;
3) Geopotential altitude of flight levels;
4) Flight level and temperature of tropopause;
5) Direction, speed and flight level of maximum wind;
6) Cumulonimbus clouds;
7) Icing; and
8) Turbulence;

Note.— Gridded global forecasts of cumulonimbus clouds, icing and turbulence are currently of an experimental nature, labeled as "trial forecasts" and distributed only through the Internet-based file transfer protocol (FTP) services.

(b) To prepare global forecasts of significant weather (SIGWX) phenomena;

(c) To issue the forecasts referred to in a) and b) in digital form to meteorological authorities and other users, as approved by the Contracting State on advice from the meteorological authority;

(d) To receive information concerning the accidental release of radioactive materials into the atmosphere from its associated WMO regional specialized meteorological centre (RSMC) for the provision of transport model products for radiological environmental emergency response, in order to include the information in SIGWX forecasts; and

(e) To establish and maintain contact with VAACs for the exchange of information on volcanic activity in order to coordinate the inclusion of information on volcanic eruptions in SIGWX forecasts.

303-16-2 In case of interruption of the operation of a WAFC, its functions shall be carried out by the other WAFC.

Note.— Back-up procedures to be used in case of interruption of the operation of a WAFC are updated by the World Area Forecast System Operations Group (WAFSOPSG) as necessary; the latest revision can be found at the WAFSOPSG website at www.icao.int/anb/wafsopsg.

303.17 Meteorological watch offices

(a) A Contracting State, having accepted the responsibility for providing air traffic services within a flight information region or a control area, shall establish, in accordance with_regional air navigation agreement, one or more meteorological watch offices, or arrange for another Contracting State to do so.

(b) **A meteorological watch office shall:**

(1) Maintain watch over meteorological conditions affecting flight operations within its area of responsibility;
(2) Prepare SIGMET and other information relating to its area of responsibility;
(3) Supply SIGMET information and, as required, other meteorological information to associated air traffic services units;
(4) Disseminate SIGMET information;
(5) When required by regional air navigation agreement.
(i) Prepare AIRMET information related to its area of responsibility;
(ii) Supply AIRMET information to associated air traffic services units; and
(iii) Disseminate AIRMET information;
(6) Supply information received concerning the accidental release of radioactive materials into the atmosphere, in the area for which it maintains watch or adjacent areas, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to aeronautical information service units, as agreed between the meteorological and appropriate civil aviation authorities concerned. The information shall comprise location, date and time of the accident, and forecast trajectories of the radioactive materials.

(c) Meteorological watch should be maintained continuously by the designated MET office.

303.19 Meteorological observations and reports

303.19.1

Each Contracting State shall establish, at aerodromes in its territory, such aeronautical meteorological stations as it determines to be necessary. An aeronautical meteorological station may be a separate station or may be combined with a synoptic station.

Note.— Aeronautical meteorological stations may include sensors installed outside the aerodrome, where considered justified, by the meteorological authority to ensure the compliance of meteorological service for international air navigation with the provisions of this Annex.

303.19.2

Each Contracting State should establish, or arrange for the establishment of, aeronautical meteorological stations on offshore structures or at other points of significance in support of helicopter operations to offshore structures, if required by regional air navigation agreement.

303.19.3

The following requirements shall be covered by the designated meteorological stations, on ground or offshore, covering the Egyptian FIR:

(a) shall make routine observations at fixed intervals. At aerodromes, the routine observations shall be supplemented by special observations whenever specified changes occur in respect of surface wind, visibility, runway visual range, present weather, clouds and/or air temperature.

(b) Each Contracting State shall arrange for its aeronautical meteorological stations to be inspected at sufficiently frequent intervals to ensure that a high standard of observation is maintained, that instruments and all their indicators are functioning correctly, and that the exposure of the instruments has not changed significantly.

Note.— Guidance on the inspection of aeronautical meteorological stations including the frequency of inspections is given in the Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837).

(c) At aerodromes with runways intended for Category II and III instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure shall be installed to support approach and landing and take-off operations. These devices shall be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems shall observe Human Factors principles and include back-up procedures.

(d) At aerodromes, with runways intended for Category I instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure should be installed to support approach and landing and take-off operations. These devices should be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems should observe Human Factors principles and include back-up procedures.

(e) Where an integrated automatic system is used for the dissemination/display of meteorological information, it should be capable of accepting the manual insertion of data covering those meteorological elements which cannot be observed by automatic means.

(f) The observations shall form the basis for the preparation of reports to be disseminated at the aerodrome of origin and for reports to be disseminated beyond the aerodrome of origin.

(g) Owing to the variability of meteorological elements in space and time, to limitations of observing techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a report shall be understood by the recipient to be the best approximation to the actual conditions at the time of observation.

(h) Agreement between air traffic services authorities and meteorological authorities

An agreement between the meteorological authority and the appropriate ATS authority should be established to cover, amongst other things:

(1) The provision in air traffic services units of displays related to integrated automatic systems;

(2) The calibration and maintenance of these displays/instruments;

(3) The use to be made of these displays/instruments by air traffic services personnel;

(4) As and where necessary, supplementary visual observations (for example, of meteorological phenomena of operational significance in the climb-out and approach areas) if and when made by air traffic services personnel to update or supplement the information supplied by the meteorological station;

(5) Meteorological information obtained from aircraft taking off or landing (for example, on wind shear); and

(6) If available, meteorological information obtained from ground weather radar.

Note.— Guidance on the subject of coordination between ATS and aeronautical meteorological services is contained in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377).

(i) At aerodromes, routine observations shall be made throughout the 24 hours of each day, unless otherwise agreed between the meteorological authority, the appropriate ATS authority and the operator concerned. Such observations shall be made at intervals of one hour or, if so determined by regional air navigation agreement, at intervals of one half-hour. At other aeronautical meteorological stations, such observations shall be made as determined by the meteorological authority taking:

Note (1) at aerodromes that are not operational throughout 24 hours, METAR shall be issued prior to the aerodrome resuming operations in accordance with regional air navigation agreement. Following the resumption and the issuance of METAR, SPECI shall be issued, as necessary.

(j) A list of criteria for special observations shall be established by the meteorological authority, in consultation with the appropriate ATS authority, operators and others concerned.

(k) Into account the requirements of air traffic services units and aircraft operations. Reports of routine observations shall be issued as:

(1) local routine reports, only for dissemination at the aerodrome of origin, (intended for arriving and departing aircraft); and

(2) METAR for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).At other aeronautical meteorological stations, such observations shall be made as determined by EMA.

(l) Reports of special observations shall be issued as :

(1) Local special reports, only for dissemination at the aerodrome of origin, (intended for arriving and departing aircraft);

(2) SPECI for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

(m) Contents of reports: Local routine reports, local and special reports and METAR and SPECI shall contain the following elements in the order indicated:

(1) Identification of the type of report;

(2) Location indicator;

(3) Time of the observation;

(4) Identification of an automated or missing report, when applicable;
(5) Surface wind direction and speed;
(6) Visibility;
(7) Runway visual range, when applicable;
(8) Present weather;
(9) Cloud amount, cloud type (only for cumulonimbus and towering cumulus clouds) and height of cloud base or, where measured, vertical visibility;
(10) Air temperature and dew-point temperature; and
(11) QNH and, when applicable, QFE (QFE included only in local routine and special reports), and any supplementary information shall be included in METAR and SPECI.

303.21 Observing and reporting meteorological elements

(a) Surface wind: The mean direction and the mean speed of the surface wind shall be measured, as well as significant variations of the wind direction and speed, and reported in degrees true and kilometers per hour (or knots), respectively.
(1) When local routine and special reports are used for departing aircraft, the surface wind observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the surface wind observations for these reports should be representative of the touchdown zone.
(2) For METAR and SPECI, the surface wind observations should be representative of conditions above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.

(b) Visibility: The visibility shall be measured or observed, and reported in meters or kilometers.
(1) When local routine and special reports are used for departing aircraft, the visibility observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the visibility observations for these reports should be representative of the touchdown zone of the runway.
(2) For METAR and SPECI, the visibility observations should be representative of the aerodrome.

(c) Runway visual range: Runway visual range shall be assessed on all runways intended for Category II and III instrument approach and landing operations.
(1) Runway visual range should be assessed on all runways intended for use during periods of reduced visibility, including:
(i) Precision approach runways intended for Category I instrument approach and landing operations; and
(ii) Runways used for take-off and having high-intensity edge lights and/or centre line lights.
(2) The runway visual range shall be reported in metres throughout periods when either the visibility or the runway visual range is less than 1500 m.
(3) Runway visual range assessments shall be representative of:
(i) The touchdown zone of the runway intended for non-precision or Category I instrument approach and landing operations;
(ii) The touchdown zone and the mid-point of the runway intended for Category II instrument approach and landing operations; and
(iii) The touchdown zone, the mid-point and stop-end of the runway intended for Category III instrument approach and landing operations.
(4) The units providing air traffic service and aeronautical information service for an aerodrome shall be kept informed without delay of changes in the serviceability status of the automated equipment used for assessing runway visual range.

(d) Present weather: The present weather occurring at the aerodrome and/or its vicinity shall be observed and reported as necessary.
(1) For local routine and special reports, the present weather information should be representative of conditions at the aerodrome.
(2) For METAR and SPECI, the present weather information should be representative of conditions at the aerodrome and, for certain specified present weather phenomena, in its vicinity.

(3) Where observations are made using automatic observing systems, provision should be made for manual insertion of those present weather elements which cannot be determined adequately by that equipment.

(e) Clouds: Cloud amount, cloud type and height of cloud base shall be observed, and reported as necessary to describe the clouds of operational significance. When the sky is obscured, vertical visibility shall be observed and reported, where measured, in lieu of cloud amount, cloud type and height of cloud base. The height of cloud base and vertical visibility shall be reported in meters (or feet).I.

(i) Cloud observations for local routine and special reports should be representative of the approach area.

(ii) It's observations for METAR and SPECI should be representative of the aerodrome and its vicinity.

(iii) Where observations of cloud amount and/or the height of cloud base are made using automatic observing systems, provision should be made for manual insertion of cloud amounts and, where appropriate ,cloud type, together with the heights of those layers or masses not directly measurable by that equipment.

(f) Air temperature & dew-point temperature and atmospheric pressure: The air temperature and the dew-point temperature shall be measured and reported in degrees Celsius. Observations of air temperature and dew-point temperature for local routine special reports and METAR and SPECI should representative of the whole runway complex. The atmospheric pressure shall be measured, and QNH QFE values shall be computed and reported in hectopascals.

303.23 Supplementary information

Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas. Where practicable, the information should identify the location of the meteorological condition.

303-25 Reporting meteorological information from automatic observing systems

(a) METAR and SPECI from automatic observing systems should be used by States in a position to do so during non-operational hours of the aerodrome, and during operational hours of the aerodrome as determined by the meteorological authority in consultation with users based on the availability and efficient use of personnel.

Note.— Guidance on the use of automatic meteorological observing systems is given in the Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837).

(b) Local routine and special reports from automatic observing systems should be used by States in a position to do so during operational hours of the aerodrome as determined by the meteorological authority in consultation with users based on the availability and efficient use of personnel.

(c) Local routine and special reports and METAR and SPECI from automatic observing systems shall be identified with the word "AUTO".

(d) Observations and reports of volcanic activity

The occurrence of pre-eruption volcanic activity, volcanic eruptions and volcanic ash cloud should be reported without delay to the associated air traffic services unit, aeronautical information services unit and meteorological watch office. The report should be made in the form of a volcanic activity report comprising the following information in the order indicated:

(1) Message type, VOLCANIC ACTIVITY REPORT;
(2) Station identifier, location indicator or name of station;
(3) Date/time of message;
(4) Location of volcano and name if known; and
(5) Concise description of event including, as appropriate, level of intensity of volcanic activity, occurrence of an eruption and its date and time, and the existence of a volcanic ash cloud in the area together with direction of ash cloud movement and height.

Note. — Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

303-27 Aerodrome Forecasts

An aerodrome forecast shall be prepared, in accordance with regional air navigation agreement, by the meteorological office designated by the meteorological authority concerned.

Note. — The aerodromes for which aerodrome forecasts are to be prepared and the period of validity of these forecasts are listed in the relevant facilities and services implementation document (FASID).

(a) Aerodrome forecasts prepared by the meteorological office designated by EMA, shall be issued at a specified time and consist of a concise statement of the expected meteorological conditions at an aerodrome for a specified period. and shall be issued as TAF and include the following information in the order indicated:
   (1) Identification of the type of forecast;
   (2) Location indicator;
   (3) Time of issue of forecast;
   (4) Identification of a missing forecast,
   (5) Date and period of validity of forecast;
   (6) Identification of a cancelled forecast, when applicable;
   (7) Surface wind;
   (8) Visibility;
   (9) Weather
   (10) Cloud
   (11) Expected significant changes to one or more of these elements during the period of validity**.**

(b) **Use of forecasts**

(c) The issue of a new forecast by a meteorological office, such as a routine aerodrome forecast, shall be understood to cancel automatically any forecast of the same type previously issued for the same place and for the same period of validity or part thereof.

(d) Meteorological offices preparing TAF shall keep the forecasts under continuous review and, when necessary, shall issue amendments promptly. The length of the forecast mess-ages and the number of changes indicated in the forecast shall be kept to a minimum.

(e) TAF that cannot be kept under continuous review shall be cancelled.

(f) The period of validity of a routine TAF should be not less than 6 hours nor more than 30 hours; this period should be determined by regional air navigation agreement. Routine TAF valid for less than 12 hours should be issued every 3 hours and those valid for 12 to 30 hours should be issued every 6 hours.

(g) When issuing TAF, meteorological offices shall ensure that not more than one TAF is valid at an aerodrome at any given time.

303.29 Landing forecasts

(a) A landing forecast shall be prepared by the meteorological office designated by the meteorological authority concerned; such forecasts are intended to meet requirements of local users and of aircraft within about one hour's flying time from the aerodrome.

(b) Landing forecasts shall be prepared in the form of a trend forecast, as determined by regional air navigation agreement.

(c) A trend forecast shall consist of a concise statement of the expected significant changes in the meteorological conditions at that aerodrome to be appended to a local routine report a local special report, or a METAR or SPECI. The period of validity of a trend forecast shall be 2 hours from the time of the report which forms part of the landing forecast.

303.31 Forecasts for take-off

(a) A forecast for take-off shall be prepared by the meteorological office designated by the meteorological authority concerned as agreed between the meteorological authority and operators concerned.

(b) A forecast for take-off should refer to a specified period of time and should contain information on expected conditions over the runway complex in regard to surface wind direction and speed and any variations thereof, temperature, pressure (QNH), and any other elements as agreed locally.

(c) A forecast for take-off should be supplied to operators and flight crew members on request within the 3 hours before the expected time of departure.

(d) Meteorological offices preparing forecasts for take-off should keep the forecasts under continuous review and, when necessary, should issue amendments promptly

303.33 Area and route forecasts, other than forecasts issued within the framework of the world area forecast system

(a) When the density of traffic operating below flight level 100 (or up to flight level 150 in mountainous areas, or higher, where necessary) warrants the routine issue and dissemination of area forecasts for such operations, the frequency of issue, the form and the fixed time or period of validity of those forecasts and the criteria of amendments thereto shall be determined by the meteorological authority in consultation with the users.

(b) When the density of traffic operating below flight level 100 warrants the issuance of AIRMET information, area forecasts for such operations shall be prepared in a format as agreed upon between the meteorological authorities in the states concerned. When abbreviated plain language is used, the forecast shall be prepared as a GAMET area forecast, employing approved ICAO abbreviations and numerical values; when chart form is used, the forecast shall be prepared as a combination of forecast of upper wind and upper air temperature, and of SIGWX phenomena. The area forecasts shall be issued to cover the layer between the ground and flight level 100 (or up to flight level 150 in mountainous areas, or higher, where necessary) and shall contain information on enroute weather phenomena hazardous to low-level flights, in support of the issuance of AIRMET information, and additional information required by low-level flights.

(c) Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be issued every 6 hours for a period of validity of 6 hours and transmitted to meteorological offices concerned not later than one hour prior to the beginning of their validity period.

303.35 SIGMET information

(a) SIGMET information shall be issued by a meteorological watch office and shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations, and of the development of those phenomena in time and space.

(b) SIGMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area. & The period of validity of a SIGMET message shall be not more than 4 hours,

(c) Close coordination shall be maintained between the meteorological watch office and the associated area control centre/flight information centre to ensure that information on volcanic ash included in SIGMET and NOTAM messages is consistent.

(d) A SIGMET messages shall be issued not more than 4 hours before the commencement of the period of validity. In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones,(VACCs-TCACs)these messages shall be issued as soon as practicable but not more than 12 hours before the commencement of the period of validity. SIGMET messages for volcanic ash and tropical cyclones shall be updated at least every 6 hours.

303.37 AIRMET information

(a) AIRMET information shall be issued by a meteorological watch office in accordance with regional air navigation agreement, taking into account the density of air traffic operating below flight level 100. AIRMET information shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather phenomena, which have not been included in Section I of the area forecast for low-level flights which may affect the

safety of low-level flights, and of the development of those phenomena in time and space .

(b) AIRMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.

(c) The period of validity of an AIRMET message shall be not more than 6 hours, and preferably not more than 4 hours.

303.39 Aerodrome warnings

(a) Aerodrome warnings shall be issued by the meteorological office designated by the meteorological authority concerned and shall give concise information of meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.

(b) Aerodrome warnings should be cancelled when the conditions are no longer occurring and/ or no longer expected to occur at the aerodrome.

303.41-303.45 Reserved

303.47 Wind shear warnings

(a) Wind shear warnings shall be prepared by the meteorological office designated by the meteorological authority concerned and shall give concise information of the observed or expected existence of wind shear which could adversely affect aircraft on the approach path or take-off path or during circling approach between runway level and 500 m (1 600 ft) above that level and aircraft on the runway during the landing roll or take-off run. Where local topography has been shown to produce significant wind shears at heights in excess of 500 m (1 600 ft) above runway level, then 500 m (1 600 ft) shall not be considered restrictive.

(b) Wind shear warnings for arriving aircraft and/or departing aircraft should be cancelled when aircraft reports indicate that wind shear no longer exists, or alternatively, after an agreed elapsed time. The criteria for the cancellation of a wind shear warning should be defined locally for each aerodrome, as agreed between the meteorological authority, the appropriate ATS authority and the operators concerned.

(c) At aerodromes where wind shear is detected by automated, ground-based, wind shear remote-sensing or detection equipment, wind shear alerts generated by these systems shall be issued. Wind shear alerts shall give concise, up-to-date information related to the observed existence of wind shear involving a headwind/tailwind change of 7.5 m/s (15 kt) or more which could adversely affect aircraft on the final approach path or initial take-off path and aircraft on the runway during the landing roll or take-off run.

(d) Wind shear alerts should be updated at least every minute. The wind shear alert should be cancelled as soon as the headwind/tailwind change falls below 7.5 m/s (15 kt).

303.49 Aeronautical Climatological Information

Note.— In cases where it is impracticable to meet the requirements for aeronautical climatological information on a national basis, the collection, processing and storage of observational data may be effected through computer facilities available for international use, and the responsibility for the preparation of the required aeronautical climatological information may be delegated as agreed between the meteorological authorities concerned

Aeronautical climatologically information required for the planning of flight operations shall be prepared in the form of aerodrome climatological tables and aerodrome climatological summaries. Such information shall be supplied to aeronautical users as agreed between the meteorological authority and the users concerned.

303.51 Service for operators and flight crew members

Meteorological information shall be supplied to operators and flight crew members fo

(a) Pre-flight planning by operators;

(a) In-flight re-planning by operators using centralized operational control of flight operations;

(c) Use by flight crew members before departure; and

(d) Aircraft in flight.

303.53 Meteorological information

Supplied to operators and flight crew members shall cover the flight in respect of time, altitude and geographical extent. Accordingly, the information shall relate to appropriate fixed times, or periods of time, and shall extend to the aerodrome of intended landing, also covering the meteorological conditions expected between the aerodrome of intended landing and one alternate aerodrome designated by the operator. In addition, if agreed between the EMA and the operator, information up to a further aerodrome shall be supplied.

303.54 Meteorological information

Meteorological information supplied to operators and flight crew members shall be up to date and include the following information, as agreed between the meteorological authority in and the operators concerned:

(a) Forecasts of
  (1) Uupper wind and upper-air temperature;
  (2) Uupper-air humidity;
  (3) Geopotential altitude of flight levels;
  (4) Flight level and temperature of tropopause;
  (5) Direction, speed and flight level of maximum wind; and
  (6) SIGWX phenomena.
    (i) Cumulonimbus clouds , icing and turbulence.
    Note 1.— Forecasts of upper-air humidity and geopotential altitude of flight levels are used only in automatic flight planning and need not be displayed.
    Note 2.— Forecasts of cumulonimbus cloud, icing and turbulence are intended to be processed and, if necessary, visualized according to the specific thresholds relevant to user operations.

(b) METAR or SPECI (including trend forecasts as issued in accordance with regional air navigation agreement) for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;

(c) TAF or amended TAF for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;

(d) Forecasts for take-off;

(e) SIGMET information and appropriate special air-reports relevant to the whole route;

(f) Volcanic ash and tropical cyclone advisory information relevant to the whole route;

(g) **As determined by** regional air navigation agreement, GAMET area forecast and/or area forecasts for low-level flights in chart form prepared in support of the issuance of AIRMET information, and AIRMET information for low-level flights relevant to the whole route;

(h) Aerodrome warnings for the local aerodrome;

(i) Meteorological satellite images; and

(j) ground-based weather radar information.

303.55 Meteorological information

Supplied to operators and flight crew members shall include upper winds and upper-air temperatures, significant en-route weather phenomena, METAR and SPECI (including trend forecasts), TAF, forecasts for take-off, SIGMET information and those special air-reports not covered by a SIGMET, and AIRMET information, which are available at the meteorological office and which are relevant to the planned flight operations.

303.57 When necessary, the meteorological authority of the State providing service for operators and flight crew members shall initiate coordinating action with the meteorological authorities of other States with a view to obtaining from them the reports and/or forecasts required**.**

303.59 Meteorological information

Shall be supplied to operators and flight crew members at the location to be determined by the meteorological authority, after consultation with the operators concerned and at the time to be agreed upon between the meteorological office and the operator concerned. The service shall normally be confined to flights originating within the

territory of the State concerned, unless otherwise agreed between the meteorological authority and the operator concerned. At an aerodrome without a meteorological office, arrangements for the supply of meteorological information shall be as agreed upon between the meteorological authority and the operator concerned.

303.61 Information for operators

For pre-flight planning and for in-flight re-planning under centralized operational control Meteorological information for pre-flight planning and in-flight re-planning by operators shall include any or all of the following information, as established by the meteorological authority in consultation with operators concerned:

(a) Current and forecast: upper winds, upper-air temperatures and humidity;
(b) Tropopause height and temperature, and direction, speed and height of maximum wind;
(c) Existing and expected significant en-route weather phenomena and amendments thereto;
(d) A forecast for take-off;
(e) METAR and, where available, SPECI (including trend forecasts) for the aerodrome of departure, take-off and en-route alternate aerodromes, the aerodrome of intended landing and destination alternate aerodromes, as determined by regional air navigation agreement;
(f) TAF and amendments thereto for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes as determined by regional air navigation agreement;
(g) SIGMET information and appropriate special air-reports relevant to the whole of the routes concerned as determined by regional air navigation agreement; and
(h) AIRMET information for low-level flights as determined by regional air navigation agreement.

303.63 Upper-air information

Unmanned free Balloon utilized for providing meteorological services shall comply with the operating rules mentioned in ECAR part 101 subpart G.

When upper-air information is supplied in chart form, it shall consist of charts for standard flight levels. The upper wind and upper-air temperature information and the significant en-route weather information requested for pre-flight planning and in-flight re-planning by the operator should be supplied as soon as it becomes available, but not later than 3 hours before departure. Other meteorological information requested for pre-flight planning and in-flight re-planning by the operator should be supplied as soon as is practicable.

(a) Forecasts listed under 303.61 shall be generated from the digital forecasts provided by the WAFCs whenever these forecasts cover the intended flight path in respect of time, altitude and geographical extent, unless otherwise agreed between the meteorological authority and the operator concerned.
(b) When forecasts are identified as being originated by the WAFCs, no modifications shall be made to their meteorological content.
(c) Charts generated from the digital forecasts provided by the WAFCs shall be made available, as required by operators, for fixed areas of coverage as shown in Annex 3 Appendix 8, Figures A8-1, A8-2 and A8-3.

303.65 Meteorological offices

An aerodrome meteorological office shall carry out all or some of the following functions as necessary to meet the needs of flight operations at the aerodrome:

(a) Prepare and/or obtain forecasts and other relevant information for flights with which it is concerned; the extent of its responsibilities to prepare forecasts shall be related to the local availability and use of en-route and aerodrome forecast material received from other offices.

(b) Prepare and/or obtain forecasts of local meteorological conditions.
(c) Maintain a continuous survey of meteorological conditions over the aerodromes for which it is designated to prepare forecasts.
(d) Provide briefing, consultation and flight documentation to flight crew members and/or other flight operations personnel.

303.67 Briefing, consultation and display

Briefing and/or consultation shall be provided, on request, to flight crew members and/or other flight operations personnel. Its purpose shall be to supply the latest available information on existing and expected meteorological conditions along the route to be flown, at the aerodrome of intended landing, alternate aerodromes and other aerodromes as relevant, either to explain and amplify the information contained in the flight documentation or, as agreed between the meteorological authority and the operator concerned, in lieu of flight documentation.

(a) Meteorological information used for briefing and consultation shall include any or all of the information
(b) The flight crew member or other flight operations personnel for whom briefing, consultation and/or flight documentation has been requested should visit the meteorological office at the time agreed upon between the meteorological office and the operator concerned. Where local circumstances at an aerodrome make personal briefing or consultation impracticable, the meteorological office should provide those services by telephone or other suitable telecommunications facilities.
(c) The required briefing, consultation, display and/or flight documentation shall normally be provided by the meteorological office associated with the aerodrome of departure. At an aerodrome where these services are not available, arrangements to meet the requirements of flight crew members shall be as agreed upon between the meteorological authority and the operator concerned. In exceptional circumstances, such as an undue delay, the meteorological office associated with the aerodrome shall provide or, if that is not practicable, arrange for the provision of a new briefing, consultation and/or flight documentation as necessary
(d) Flight documentation should cover the whole route to be flown. However, in accordance with regional air navigation agreement, or in the absence thereof flight documentation for flights of two hours' duration or less, after a short stop or turnaround shall be limited to the information operationally needed, as agreed between the meteorological authority and operator concerned, but in all cases the flight documentation should at least comprise information.
(e) The forms and charts included in flight documentation should be printed in English, they should, wherever practicable, be completed in the language requested by the operator, preferably using one of those languages. Where appropriate, approved abbreviations should be used. The units employed for each element should be indicated, they should be in accordance with Part 305.
(f) Meteorological offices should provide information received within the framework of the world area forecast system for flight documentation. The flight documentation should be presented in the form of charts, tabular forms, or abbreviated plain-language texts. TAF should be presented in accordance with the template in Appendix 5 or in abbreviated plain- language text using a tabular presentation.
(g) Whenever it becomes apparent that the meteorological information to be included in the flight documentation will differ materially from that made available for pre-flight planning and in-flight re-planning, the operator shall be advised immediately and, if practicable, be supplied with the revised information as agreed between the operator and the meteorological office concerned.
(h) Whenever necessary and possible, the flight documentation should be brought up to date, in writing or orally, before it is supplied to flight crew members. In cases where a need for amendment arises after the flight documentation has been supplied, and before take-off of the aircraft, the meteorological office should, as agreed locally, issue the necessary amendment or updated information to the operator or to the local air traffic services unit, for transmission to the aircraft.
(i) The EMA shall retain information supplied to flight crew members, either as printed copies or in computer files, for a period of at least 30 days from the date of issue. This information shall be made available, on request, for inquiries or investigations

and, for these purposes, shall be retained until the inquiry or investigation is completed.

(j) Automated pre-flight information systems for briefing, consultation, and flight planning and flight documentation.

Where the meteorological authority uses automated pre-flight information systems to supply and display meteorological information to operators and flight crew members for self-briefing, flight planning and flight documentation purposes.

(k) Automated pre-flight information systems providing for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned should be established by an agreement between the meteorological authority and the relevant civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with Annex 15, 3.1.1 c). Appendix 8 and in Annex 15, 8.1 and 8.2, respectively.

(l) Where automated pre-flight information systems are used to provide for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned, the meteorological authority concerned shall remain responsible for the quality control and quality management of meteorological information.

303.69 Information for aircraft in flight

Meteorological information for use by aircraft in flight shall be supplied by a meteorological office to its associated air traffic services unit and through D-VOLMET or VOLMET broadcasts. Meteorological information for planning by the operator for aircraft in flight shall be supplied on request, as agreed between the meteorological authority or authorities and the operator concerned.

(a) Meteorological information for use by aircraft in flight shall be supplied to air traffic services units in accordance with the specifications of this Part

(b) Meteorological information shall be supplied through D-VOLMET or VOLMET broadcasts as determined by regional air navigation agreement

(c) D-VOLMET shall contain current METAR and SPECI, together with trend forecasts where available, TAF and SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET.

(d) Continuous VOLMET broadcasts, normally on very high frequencies (VHF), shall contain current METAR and SPECI, together with trend forecasts where available.

(e) Scheduled VOLMET broadcasts, normally on high frequencies (HF), shall contain current METAR and SPECI, together with trend forecasts where available and, where so determined by regional air navigation agreement, TAF and SIGMET.

303.71 Information for air traffic services, search and rescue services and aeronautical information services

Information for air traffic services units. The EMA shall designate a meteorological office to be associated with each air traffic services unit. The associated meteorological office shall, after coordination with the air traffic services unit, supply, or arrange for the supply of up-to-date meteorological information to the unit as necessary for the conduct of its functions.

(a) The associated meteorological office for an aerodrome control tower or approach control office should be an aerodrome meteorological office.

(b) The associated meteorological office for a flight information centre or an area control centre shall be a meteorological watch office.

(c) Where, owing to local circumstances, it is convenient for the duties of an associated meteorological office to be shared between two or more meteorological offices, the division of responsibility should be determined by the EMA authority in consultation with the ECAA

(d) Any meteorological information requested by an air traffic services unit in connection with an aircraft emergency shall be supplied as rapidly as possible.

(e) Information for search and rescue services units: Meteorological offices designated by the meteorological authority in accordance with regional air navigation agreement shall supply search and rescue services units with the meteorological information they require in a form established by mutual agreement. For that purpose, the designated meteorological office shall maintain liaison with the search and rescue services unit throughout a search and rescue operation.

(f) Information for aeronautical information services units: The EMA, in coordination with the appropriate civil aviation authority, shall arrange for the supply of up-to-date meteorological information to relevant aeronautical information services units, as necessary, for the conduct of their functions.

(g) When air-ground data link is used and automatic dependent surveillance- Contract (ADS-C) or secondary surveillance radar (SSR) Mode S is being applied, automated routine observations should be made every 15 minutes during the en-route phase and every 30 seconds during the climb-out phase for the first 10 minutes of the flight.

(h) For helicopter operations to and from aerodromes on offshore structures, routine observations should be made from helicopters at points and times as agreed between the meteorological authorities and the helicopter operators concerned.

(i) In the case of air routes with high-density air traffic (e.g. organized tracks), an aircraft from among the aircraft operating at each flight level shall be designated, at approximately hourly intervals, to make routine observations in accordance with 5.3.1. The designation procedures shall in accordance with regional air navigation agreement.

(j) Aircraft observations shall be reported by air-ground data link. Where air-ground data link is not available or appropriate, special and other non-routine aircraft observations during flight shall be reported by voice communications.

(k) Aircraft observations shall be reported during flight at the time the observation is made or as soon thereafter as is practicable.

(l) Aircraft observations shall be reported as air-reports.

(m) The meteorological authority concerned shall make arrangements with the appropriate ATS authority to ensure that, on receipt by the air traffic services units of:

(1) Special air-reports by voice communications, the air traffic services units relay them without delay to their associated meteorological watch office; and

(2) Routine and special air-reports by data link communications, the air traffic services units relay them without delay to their associated meteorological watch office the WAFCs, and the centers designated by regional air navigation agreement for the operation of aeronautical fixed service Internet-based services.

(n) In the case of the requirement to report during the climb-out phase, an aircraft shall be designated, at approximately hourly intervals, at each aerodrome to make routine observations in accordance with 5.3.1.

(o) Routine aircraft observations — exemptions

Aircraft not equipped with air-ground data link shall be exempted from making routine aircraft observations.

(p) Special aircraft observations

(1) Special observations shall be made by all aircraft whenever the following conditions are encountered or observed:

(2) Moderate or severe turbulence; or

(3) Moderate or severe icing; or

(4) Severe mountain wave; or

(5) Thunderstorms, without hail, that are obscured, embedded, widespread or in squall lines; or

(6) Thunderstorms, with hail, that are obscured, embedded, widespread or in squall lines; or
(7) Heavy dust storm or heavy sandstorm; or
(8) Volcanic ash cloud; or
(9) Pre-eruption volcanic activity or a volcanic eruption.

303.73 Requirements for and use of communications

(a) Suitable telecommunications facilities shall be made available to permit aerodrome meteorological offices and, as necessary, aeronautical meteorological stations to supply the required meteorological information to air traffic services units on the aerodromes for which those offices and stations are responsible, and in particular to aerodrome control towers, approach control offices and the aeronautical telecommunications stations serving these aerodromes.
(b) Suitable telecommunications facilities shall be made available to permit meteorological watch offices to supply the required meteorological information to air traffic services and search and rescue services units in respect of the flight information regions, control areas and search and rescue regions for which those offices are responsible, and in particular to flight information centers, area control centers and rescue coordination centers and the associated aeronautical telecommunications stations.
(c) Suitable telecommunications facilities shall be made available to permit world area forecast centers to supply the required world area forecast system products to meteorological offices, meteorological authorities and other users.
(d) Telecommunications facilities between meteorological offices and, as necessary, aeronautical meteorological stations and aerodrome control towers or approach control offices shall permit communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds.
(e) Telecommunications facilities between meteorological offices and flight information centers, area control centres, rescue coordination centres and aeronautical telecommunications stations.
(f) As agreed between the EMA and operators, provision should be made to enable operators to establish suitable telecommunications facilities for obtaining meteorological information from aerodrome meteorological offices or other appropriate sources.

(g) Suitable telecommunications facilities shall be made available to permit meteorological offices to exchange operational meteorological information with other meteorological offices.
(h) The telecommunications facilities used for the exchange of operational meteorological information should be the aeronautical fixed service.
(i) Use of aeronautical fixed service communications-meteorological bulletins in alphanumeric format. Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service shall be originated by the appropriate meteorological office or aeronautical meteorological station.
(j) Use of aeronautical fixed service communications-world area forecast system products. World area forecast system products in digital form should be transmitted using binary data communications techniques. The method and channels used for the dissemination of the products should be as determined by regional air navigation agreement.

303.75 Meteorological bulletins

Containing operational meteorological information to be transmitted via the aeronautical fixed service shall be originated by the appropriate meteorological office or aeronautical meteorological station.

(a) Aeronautical climatological information should normally be based on observations made over a period of at least five years and the period should be indicated in the information supplied.

(b) Climatological data related to sites for new aerodromes and to additional runways at existing aerodromes should be collected starting as early as possible before the commissioning of those aerodromes or runways.

(c) Met offices shall fulfill the following Aerodrome climatological tables:

(1) Ore pare aerodrome climatologically tables for each regular and alternate international aerodrome within its territory; and

(2) Make available such climatological tables to an aeronautical user within a time period as agreed between the EMA and the user concerned.

(d) Met offices shall fulfill the following:

(1) Aerodrome climatologically summaries should follow the procedures prescribed by the World Meteorological Organization. Where computer facilities are available to store, process and retrieve the information, the summaries should be published, or otherwise made available to aeronautical users on request. Where such computer facilities are not available, the summaries should be prepared using the models specified by the World Meteorological Organization, and should be published and kept up to date as necessary.

(2) Copies of meteorological observational data shall be kept for at least 3 months and be made available on request by any official site.

303-76 Volcanic ash advisory centers

A Contracting State, having accepted, by regional air navigation agreement, the responsibility for providing a VAAC within the framework of the international airways volcano watch, shall arrange for that centre to respond to a notification that a volcano has erupted, or is expected to erupt or volcanic ash is reported in its area of responsibility, by arranging for that centre to:

(a) monitor relevant geostationary and polar-orbiting satellite data and, where available, relevant ground-based and airborne data to detect the existence and extent of volcanic ash in the atmosphere in the area concerned;

Note. — Relevant ground-based and airborne data includes data derived from Doppler weather radar, ceilometers, lidar and passive infrared sensors.

(b) Activate the volcanic ash numerical trajectory/dispersion model in order to forecast the movement of any ash "cloud "which has been detected or reported;

Note.— The numerical model may be its own or, by agreement, that of another VAAC.

(c) issue advisory information regarding the extent and forecast movement of the volcanic ash "cloud" to:

(1) Meteorological watch offices, area control centres and flight information centers serving flight information regions in its area of responsibility which may be affected;

(2) Other VAACs whose areas of responsibility may be affected;

(3) World area forecast centers, international OPMET databanks, international NOTAM offices, and centers designated by regional air navigation agreement for the operation of aeronautical fixed service Internet-based services; and

(4) Airlines requiring the advisory information through the AFTN address provided specifically for this purpose; and

Note.— The AFTN address to be used by the VAACs is given in the Handbook on the International Airways Volcano Watch (IAVW) (Doc 9766) and at http://www.icao.int/icao/en/anb/met/index.html.

(d) issue updated advisory information to the meteorological watch offices, area control centers, flight information centers and VAACs referred to in c), as necessary, but at least every six hours until such time as the volcanic ash "cloud" is no longer identifiable from satellite data, and, where available, ground-based and airborne data,, no further reports of volcanic ash are received from the area, and no further eruptions of the volcano are reported.

303-76-1 Volcanic ash advisory centers shall maintain a 24-hour watch.

303-76-2

In case of interruption of the operation of a VAAC, its functions shall be carried out by another VAAC or another meteorological centre, as designated by the VAAC Provider State concerned.

Note.— Back-up procedures to be used in case of interruption of the operation of a VAAC are included in the Handbook on the International Airways Volcano Watch (IAVW) (Doc 9766).

303-76-3 State volcano observatories

Contracting States that maintain volcano observatories monitoring active volcanoes shall arrange that selected State volcano observatories, as designated by regional air navigation agreement, observing:

(a) Significant pre-eruption volcanic activity, or a cessation thereof;

(b) A volcanic eruption, or a cessation thereof; and/or

(c) Volcanic ash in the atmosphere shall send this information as quickly as practicable to their associated ACC/FIC, MWO and VAAC.

Note. — Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

303-76-4 Tropical cyclone advisory centres

A Contracting State having accepted, by regional air navigation agreement, the responsibility for providing a TCAC shall arrange for that centre to:

(a) Monitor the development of tropical cyclones in its area of responsibility, using geostationary and polar-orbiting satellite data, radar data and other meteorological information;

(b) Issue advisory information concerning the position of the cyclone centre, its direction and speed of movement, central pressure and maximum surface wind near the centre, in abbreviated plain language to:

(1) Meteorological watch offices in its area of responsibility;

(2) Other TCACs whose areas of responsibility may be affected; and

(3) World area forecast centers, international OPMET databanks, and centers designated by regional air navigation agreement for the operation of aeronautical fixed service ; Internet-based services ; and

(c) Issue updated advisory information to meteorological watch offices for each tropical cyclone, as necessary, but at least every six hours.

Subpart B
Certification

303.77 Certification Requirements

(a) Certificate required: The EMA grant a certificate authorizing the provision of meteorological services varying from a single meteorological service to a range of meteorological services supported by a network of meteorological offices

(b) Site requirements: The EMA satisfies site requirements which shall establish procedures to ensure that:

(1) Each of the meteorological offices and facilities listed in their exposition is

(i) sited and configured in accordance with security measures designed to prevent unlawful or accidental interference;

(ii) provided with suitable power supplies and means to ensure appropriate continuity of service.

(2) Each of the remote weather sensing facilities listed in their exposition is installed and maintained in a technically appropriate position to ensure that the facility provides an accurate representation of the local meteorological conditions.

303.79 Basic weather reporting

Every person who provides a basic weather report shall be:

(a) Utilize equipment that is suitable for the observations being made;

(b) Employ a system for checking that equipment; and

(c) Be trained to provide accurate basic weather reports.

303.81 Application for certificate

(a) Each applicant for the grant of a meteorological service certificate shall:

(1) Complete the meteorological services certification form issued by the EMA which requires the following information:

(i) Address for service in Egypt;

(ii) The specific meteorological service to be provided;

(iii) The aerodrome location or airspace designation at or within which the Service will be provided; and

(iv) Such other particulars relating to the applicant and the intended service as may be required by the EMA as indicated on the form; and

(b) Submit:

(1) The exposition required by this Part. and

(2) Payment of appropriate application official fees;

(c) Each applicant shall include with the application; a schedule of proposed hours of service for the first 12 months of operation and a summary of safety factors shall be considered before seeking certification.

303.83 Issue of certificate

An applicant is entitled to a meteorological service certificate if the EMA is satisfied that:

(a) The applicant meets the requirements of this Part.

(b) The applicant, and the applicant's senior person or persons required by ECAR are fit and proper persons;

(c) The granting of the certificate is not contrary to the interests of aviation safety.

303.85 Privileges of certificate holder

(a) A meteorological service certificate specifies the types of facilities that the certificate holder is authorized to operate.

(b) The holder of a meteorological service certificate may provide the meteorological services listed on the holder's certificate provided that each meteorological service, and the meteorological information supplied for each meteorological service, and the location and airspace covered by each meteorological service is listed in the certificate holder's exposition.

303.87 Duration of certificate

(a) A meteorological service certificate may be granted or renewed for a period of up to 2 years.

(b) A meteorological service certificate remains in force until it expires or is suspended or revoked

(c) The holder of a meteorological service certificate that expires or is revoked shall forthwith surrender the certificate to the EMA

(d) The holder of a meteorological service certificate that is suspended, shall forthwith produce the certificate to the EMA for appropriate endorsement.

303.89 Renewal of certificate

(a) An application for the renewal of a meteorological service certificate shall be made on form and in a manner acceptable to EMA.

(b) The application shall be submitted to EMA before the application renewal date specified on the certificate or, if no such date is specified, not less than 30 days before the certificate expires.

303.91 Withdrawal of service

(a) Each holder of an ATS Certificate who wishes to permanently withdraw meteorological services shall give the EMA at least 90-days notice of the proposal and included in that notice a summary of factors considered in arriving at this decision; and

(b) This outgoing provider of meteorological services certificate shall not hinder the preparations and execution of transitional arrangements.

303.93 Impose a penalty, suspension or revocation penalties

(a) EMA may impose a penalty (according to the Civil aviation Law N.28 item No. 157), or reduce some privileges to the certificate holder if:

(1) It finds that the certificate holder does not comply with the requirements of this Part and such holder failed to remedy such non-compliance within 60-days after receiving notice in writing from EMA to do so;

(2) Such action is necessary in the interest of safety;

(3) Its inspector is prevented by the provider from carrying out a safety inspection when his report recommends such action

(4) The certificate holder failed to provide the service in the required standard level, which is confirmed to EMA by receiving reports from the users of the service and proved by a legal investigation; and

(5) When proposing a penalty, EMA will state the reasons for such action and will furnish them to the certificate holder.

(b) Suspension of Certificate this is a subsequent procedure to impose a penalty.

(c) EMA may suspend for a defined period, meteorological service unit certificate issued under this Part if:

(1) Subject to item 303.91 Paragraph (a), EMA is satisfied that the certificate holder still unable to remedy any of these non-compliant areas with the specified time frame of 60-days;

(2) The investigation, in case of an accident, proves that it was caused due to the faulty procedures and/or the malfunction or failure of ATC equipment or system;

(3) The certificate holder failed to perform the action plan stated in the certificate in the exact period of time if so stated; and

(4) Such actions still necessary in the interest of aviation safety.

(d) When proposing a suspension, the EMA will state the reasons for such action and furnish them to the certificate holder.

(e) The certificate holder may appeal against such notice within 30-days or receipt.

(f) The appellant shall furnish to EMA any documents, records, or other pertinent information supporting the appeal.

(g) EMA may confirm, modify, or set aside the proposed suspension based on the appeal.

(h) Revocation of certificate this is a subsequent procedure to suspension. EMA may permanently revoke Meteorological service unit certificates issue under this part if.

(1) It is verified that the certificate holder will not be able termed non-compliant areas; or

(2) The certificate holder stops providing the service concerned without a convincing argument.

(3) EMA has decided for the interest of safety to terminate services provided at this aerodrome.

(i) The Ministerial Order issued for the certificate holder is revoked.

(j) The revoked certificate cannot be renewed, it has to be reissued not less than one year after the revocation date

303.95 Provisional approval

EMA may, if it is considered in the interest of safety, grant an existing certificate holder a provisional approval to act as a substitute Meteorological service provider in respect to a certificate that has been withdrawn suspended or revoked. The substituting provider shall follow the specified conditions and responsibilities stated in the certificate.

303.97 MET personnel requirements

(a) An applicant for the grant of a MET service certificate shall employ or contract:

(1) A senior person who has the authority within the applicant's organization to ensure that all activities undertaken by the organization can be financed and carried out to meet applicable operational requirements, and in accordance with the requirements prescribed by this Part;

(2) A senior person or group of senior persons who are responsible for ensuring that the applicant's organization complies with the requirements of this Part; and

(3) Sufficient personnel to inspect, supervise, and maintain the facilities listed in the applicant's exposition according to the approved training mentioned in the MET training standards (refer to appendix G).

(b) The applicant shall:

(1) Establish a procedure to assess the competence of those personnel who are authorized to conduct the functions listed in the applicant's exposition;

(2) Establish a procedure to maintain the competence of those authorized personnel;

(3) Provide those authorized personnel with written evidence of their authorization and privileges according to their approved training and experience; and

(4) Ensure that authorized personnel only exercise the privileges of their authorization

303.99 Training

(a) Each applicant for the grant of meteorological service certificate shall establish procedures acceptable to the EMA and follow the approved training programs for:
  (1) Basic courses: to meet the requirements of meteorological services at the national levels,
  (2) Advanced and specialized training courses,
  (3) Practical training, and
  (4) Human factors initial and recurrent training.

(b) Meteorological training provided must have, and put into effect a training plan for the training relating to meteorological services for aviation.

(c) The applicant shall establish procedures acceptable to the EMA to ensure that the personnel giving instructions in an operational working position shall hold appropriate current instructor authorization by the EMA.

303.100 Training Record

Each applicant for the grant of aeronautical MET services certificate shall establish procedures acceptable to the ECAA for keeping training Record of All technical staff and MET inspectors and maintained up to date (by coordination with the EMA and refer to agreements between EMA and ECAA)

303.101 Site requirements

(a) Each applicant for the grant of a meteorological service certificate shall establish procedures to ensure that:
  (1) Each of the meteorological offices and facilities listed in their exposition is:
    (i) Sited and configured in accordance with security measures designed to prevent unlawful or accidental interference; and
    (ii) Provided with suitable power supplies and means to ensure appropriate continuity of service; and
  (2) Each of the remote weather sensing facilities listed in their exposition is installed and maintained in a technically appropriate position to ensure that the facility provides an accurate representation of the local meteorological conditions.

303.103 Communication requirements

(a) Each applicant for the grant of a meteorological service certificate shall establish communication systems and procedures to ensure that each of the meteorological offices and facilities listed in the applicant's exposition can provide the meteorological information for which it is intended.

(b) The communication systems and procedures must be able to handle the volume and nature of the meteorological information being communicated so that no meteorological information is delayed to the extent that the information becomes out-of-date.

303.105 Input requirements

(a) Each applicant for the grant of a meteorological service certificate shall establish procedures to obtain input meteorological information appropriate for the meteorological services being provided.

(b) The procedures shall ensure that:
  (1) Each meteorological office and facility listed in the applicant's exposition that provides a forecast service has continuing access to appropriate historical, real-time, and other meteorological information for the applicant’s forecast areas; and
  (2) Each meteorological office and facility listed in the applicant’s exposition that provides a meteorological briefing service in person or by any other interactive

visual means, has adequate display and briefing resources available for the briefings; and

(3) Each meteorological office and facility listed in the applicant's exposition that provides a meteorological reporting service has adequate observing systems to supply adequate, accurate and timely meteorological reports; and

(4) Each meteorological office listed in the applicant's exposition that provides a meteorological watch service has adequate meteorological information to supply an adequate, accurate and timely meteorological watch service; and

(5) Each meteorological office and facility listed in the applicant's exposition that provides a climatology service has adequate meteorological information for the preparation of climatologically information.

303.107 Output requirements

(a) Each applicant for the grant of a meteorological service certificate shall:

(1) Identify the output meteorological information provided by each meteorological service listed in their exposition; and

(2) Determine the standards and formats for that output meteorological information.

(b) The applicant shall establish procedures to ensure that the meteorological information supplied by each meteorological office and facility listed in their exposition complies with the standards and formats determined under paragraph (a)(2)

303.109 Coordination

(a) Each applicant for the grant of meteorological service certificate shall establish systems and procedures acceptable to the EMA to ensure where applicable coordination between each meteorological offices listed in the applicant's exposition and the following agencies:

(1) Aircraft operator
(2) Military authority
(3) Units handling activities hazardous to aircraft operation.
(4) Air traffic services department
(5) Aeronautical information center
(6) Search and rescue center
(7) Other related units and sectors.

(b) The applicant shall establish procedures acceptable to the EMA to ensure that each meteorological letter of agreement is kept current, details such matters are necessary, signed by senior representative and be part of the applicant operation manual.

(c) Coordination between meteorological and ATS authorities to ensure that aircraft receive the most up-to-date meteorological information for aircraft operations, arrangements shall be made, where necessary , between meteorological and ATS authorities for personnel :

(1) In addition to using indicating instruments, to report, if observed by ATS personnel or communicated by aircraft , such other meteorological elements as may be agreed upon;

(2) To report as soon as possible to the associated meteorological office meteorological phenomena of operational significant, if observed by ATS personnel or communicated by aircraft, which have not been included in the aerodrome meteorological report.

(3) Close coordination shall be maintained between area control centers , flight information centre and associated meteorological watch offices to ensure that all information include in NOTAM, and SIGMET messages is consistent.

303.111 Facility requirements

Establish procedures to ensure that all electronic data processing facilities used in the acquisition, compilation, computing, access or dissemination of meteorological information are of a nature, configuration and capability to ensure the adequacy, accuracy and timeliness of that meteorological and related information.

303.113 Documentation

(a) Each applicant for the grant of a meteorological service certificate shall hold copies of meteorological office manuals, facility manuals, technical standards and practices, procedures manuals, and any other documentation that is necessary for the provision of the meteorological services listed in their exposition.

(b) The applicant shall establish a procedure to control the documentation required by paragraph (a). The procedure shall ensure that:

(1) The documentation is reviewed and authorized by appropriate personnel before issue; and

(2) Current issues of relevant documentation are available to personnel at all locations where they need access to such documentation for the provision of the meteorological services listed in the applicant's exposition; and

(3) Obsolete documentation is promptly removed from all points of issue or use; and

(4) Changes to documentation are reviewed and approved by appropriate personnel; and

(5) The current version of each item of documentation can be identified to preclude the use of out-of-date editions.

303-115 Meteorological information check after accident or incident

(a) Meteorological information check after accident or incident: The EMA shall establish procedures for checking the adequacy, accuracy and timeliness of any of their meteorological information that may have been used by an aircraft or an air traffic service involved in an accident or incident.

(b) The procedures shall ensure that:

(1) The checks are carried out as soon as practicable after notification to the applicant’s organization of such an accident or incident;

(2) Copies of the meteorological information are kept in a secure

Subpart C
Surveillance

303.117 ECAA Inspection Authority

(a) Each person holds a certificate under this part (or applied for such certificate) shall grant unrestricted and unlimited access for ECAA inspectors to inspect his personnel, facilities, equipment, documents and records to determine:
 (1) Eligibility to continue to hold his certificate.
 (2) Compliance with this ECAR part

(b) Failure to comply with paragraph (a) above shall be a basis to suspend, withdraw or revoke any certificate issued under this part.

Subpart D
Meteorological Observations at Aerodromes

Chapter 1
Introduction

1- Requirements and standards for aerodrome meteorological observations, both within the Egypt as well as the surrounding offshore areas are determined in accordance with the standards and recommended practices (SARPs) of the International Civil Aviation Organization (ICAO) and the guidance issued by the World Meteorological Organization (WMO).
2- At licensed aerodromes, the aerodrome license is responsible for arranging the provision of aerodrome weather observations and other meteorological information to users.
3- It is recognized that this function may be performed by staff directly employed or contracted by the aerodrome licensee. In order to maintain clarity of responsibilities in respect of meteorological data, the arrangements for the compilation of aerodrome
Weather reports are described within this document as the responsibility of the Aerodrome Metrological office Provider. Within the EGYPT, the Aerodrome Metrological office Provider is commonly the air traffic service (ATS) provider organization. This document recognizes, however, that aerodrome weather reports may be produced by any suitably competent and qualified person.
4- At aerodromes with an Air Traffic Control unit, weather reports are provided and utilized in accordance with ICAO PANS ATM Doc 4444,and CAP 493,Manual of Air Traffic Services Part 1.At aerodromes that do not have an ATC unit, the procedures for ensuring that weather reports are made available to pilots and other users should be described locally.
5- The requirements contained within this document only apply to licensed aerodromes with instrument runways; however where other aerodromes operate meteorological equipment for the production of a meteorological aerodrome report (METAR), the standards contained within this document, relating to the meteorological equipment in use on the aerodrome will apply. For all other aerodromes, this document should be used as guidance on best practice.
6- Aerodrome meteorological observations are used for flight planning purposes and to facilitate safe operation of aircraft in the take off and landing phases of flight. The information includes direction and speed of the surface wind; horizontal visibility; prevailing weather; atmospheric pressure information; surface temperature and dew point; cloud amounts and height of the cloud base.
Equipment used to provide real-time information to ATC is subject to requirements specified in ATS Safety Requirements. If the same equipment is used to originate METAR reports and to provide real-time information to ATS, the sensing and data processing equipment will normally be subject to the requirements of the Egyptian Meteorological Authority (EMA) and the display equipment used within the ATS unit will normally be subject to the relevant requirements of ATS Safety Requirements.
7- Accurate, timely and complete aerodrome meteorological observations are necessary to support safe and efficient air navigation.
8- The purpose of this document is to describe how ICAO standards and recommended practices are applied in the EGYPT and to specify the requirements for observers and equipment to achieve this.
9- Two types of aerodrome meteorological observations may be provided.

Chapter 2
General Requirements for Aerodrome Observations

1- Timely and accurate meteorological information shall be available to aircraft operators and ATS providers. Also, Aerodrome Forecasts (TAF) are provided only on receipt of valid METARs and due account should be taken by aerodrome licensees of operator requirements for these forecasts.

2- A METAR shall contain the following items of information:

- Identification of the type of report (e.g. METAR)
- Location indicator
- Time of Observation, in UTC
- Surface wind direction and speed (including variations in direction)
- Visibility*-see note
- Runway visual range (where applicable and equipment/procedures have been approved)*-see note
- Present weather*-see note
- Cloud amount (and type, if applicable) and height of base*-see note
- Air temperature and dew point temperature
- QNH and, where applicable QFE
- Supplementary information (e.g. additional remarks/information from observer,
- controller or pilot report)

NOTE:

Asterisked elements are included as necessary.

The term CAVOK may replace visibility, present weather and cloud information under certain conditions (see glossary for definition).

3- Within the EGYPT, METAR reports shall be provided every 30 minutes during the operational hours of the aerodrome unless otherwise agreed with the Egyptian Meteorological Authority.

4- For ATS purposes, the measurements of meteorological elements should be representative of the landing and take-off areas on the runways.

For the METAR, the measurement should be representative over the whole aerodrome operating area.

Instrumentation used in the measurement of meteorological elements for METAR reports may also be used for reports to ATS providers, providing that the exposure of the instruments is suitable to provide representative readings for both purposes.

NOTE:

Although the content of meteorological reports for ATS purposes and METAR reports are similar, the averaging periods for certain elements in the reports differ.

Refer to chapters 4 and 5 for the requirements for each type of report.

5- A method to ensure that observing staff are aware of, and competent in, local observing and reporting procedures shall be established.

NOTE:

Local observing and reporting procedures include the way in which observations are recorded and disseminated both within and beyond the aerodrome, including any necessary backup arrangements.

6- The observer should be provided with a workplace from which a clear view over the whole aerodrome operating area is available either from a window or open area.

Chapter 3
Accreditation and Competence of Observers

1 Introduction

1.1 The Aerodrome Licensee is responsible for arranging provision of aerodrome weather reports and other meteorological information to users. For the purposes of this document, and to distinguish these responsibilities from other functions that are the responsibility of the Aerodrome License, the responsibilities relating to meteorological information are deemed to be delegated to the Aerodrome Meteorological Observing Service Provider.

1.2 The Aerodrome Metrological office Provider is responsible for ensuring the competence of each aerodrome meteorological observer employed at the aerodrome. This includes following initial training, during routine observing duties, following changes to observing equipment or METAR coding rules, and following the relocation of an observer from another aerodrome.

1.3 The Aerodrome Metrological office Provider should ensure that observing staff are sufficiently familiar with all meteorological phenomena that can reasonably be expected to occur at the aerodrome as to permit their competent observation and reporting.

1.4 It is recommended that a formal agreement, such as a Service Level Agreement, be reached between the Aerodrome Metrological office Provider and the ATS Provider and other agencies to which accurate and timely meteorological information is essential for safe operations.

2- The Meteorological Observer's Certificate

2.1 In order to gain a Meteorological Observer's Certificate, each aerodrome meteorological observer must successfully complete a recognized course of training on the preparation of aerodrome weather reports and must demonstrate basic competence in compiling such reports.

*NOTE***:**

The Met Office is the only organization that currently offers recognized observer training. A provider wishing to utilize an alternative training organization is advised to consult the Egyptian Meteorological Authority to ascertain the suitability of the training scheme.

2.2 The certification process comprises two parts; theory and practical. The theory part will provide the necessary background information on all elements of aerodrome meteorological observing; this is examined to ensure that the concepts have been fully understood.

The practical part puts the aerodrome meteorological observer in the company of an experienced observer in order to enable observing techniques to be practiced and allows the new observer's basic competence to be assessed.

2.3 The theoretical training syllabus is given in Appendix E, Theoretical Practical Observer Training Requirements; requirements for practical training requirements for observers are given in Appendix F, Practical Observer Training Requirements for a Meteorological Observer's Certificate (Manual Observed Weather Reports).

2.4 Following certification, the trainee observer shall continue to carry out all operational observing duties under supervision until such time that the observer can meet the competency requirements listed in Appendix H, Site Specific Competency Checking of Meteorological Observers.

3- The Restricted Meteorological Observer's Certificate

3.1 Semi-automated observing systems are utilized on many aerodromes for the provision of weather reports. Such systems process data from external sensors located at the aerodrome and compile the basic METAR report incorporating the measurements made by the sensors. Elements such as surface wind, temperature and pressure are acceptable as measured by the sensors, without verification by an observer.

3.2 Whilst automated sensors can measure visibility, weather type, and cloud height and amount, they are limited by the spatial coverage of the sensor and the capability to resolve present weather types.

3.3 In order to comply with ICAO SARPs, measurements of the surface horizontal visibility, weather type, and cloud details need to be verified by an accredited observer.

3.4 Where a semi-automated observing system is used on an aerodrome, aerodrome meteorological observers need only be competent to provide the visual elements. Reduced training may be provided, concentrating on observing visibility, weather types and cloud details.

3.5 Under these circumstances, following successful completion of the appropriate training course, a restricted met observer's certificate may be warded. The program for this training is given in Appendix G, Training Requirements for a Restricted Meteorological Observer's Certificate.

3.6 The provision of backup observing equipment shall take account of the limits of the observer's restricted accreditation.

3.7 Aerodrome Met Observers should note that a restricted met observer's certificate may only be transferred to another aerodrome where a semi-automated observing system is in operation. In these cases, the Aerodrome Meteorological office Provider should ensure that the observer is provided with sufficient training to ensure that the observer can competently use the primary and backup observing system at the new aerodrome.

4- Continued Accreditation and Refresher Training

4.1 The Aerodrome Metrological office Provider shall ensure that all accredited aerodrome met observers maintain their observing competence.

4.2 If an individual observer has been absent from observing duties for more than ninety days, the observer shall spend an appropriate period of observing under the supervision of another accredited observer, until such time that the observer can meet the competency requirements in ECAR, Site Specific Competency Checking of Meteorological Observers.

4.3 Following changes to observing practices or aeronautical codes, the Aerodrome Meteorological office Provider shall ensure that all staff are aware of the changes, additional training arranged as necessary and that the changes are implemented accordingly.

4.4 Optional meteorological observing theoretical and practical refresher training courses are available. These are suitable for observing staff who have not observed for more than a year and for observing staff to acquaint themselves with changes to observing practices and METAR codes. It is also a means by which aerodrome met observers can maintain their observing competence, referred to in paragraph 4.1.Further information on the courses can be obtained from the Egyptian Meteorological Authority (EMA).

4.5 Information on training courses for aerodrome observers is published and updated each year in an Aeronautical Information Circular (AIC).

5 Aerodrome Meteorological office Provider contingency

The Aerodrome Meteorological office Provider shall identify contingency and other mitigation measures as agreed between the Licensee and the Provider in case of such events as observer incapacitation or equipment failure.

6 Non-accredited Meteorological Reports

A weather report that has not been validated by an accredited observer may, by agreement with the Egyptian Meteorological Authority (EMA), be distributed locally and to the meteorological forecast office. Such a report will need to be clearly identified as an unofficial report and prefixed as such when being passed to aircraft or other agency.

Chapter 4
METAR Structure and EGYPT Coding Rules

1- Introduction

1.1 In the Egypt the standard codes used in composing a METAR report are based on **WMO Document No.306, Manual on Codes** .The full METAR message may contain up to 18 groups. The Meteorological Authority for each State determines the applicability of codes and practice to that State. The specific coding rules and practice detailed in this chapter are those applicable in the Egypt.

1.2 Entries for surface wind (including variations of speed and direction), surface visibility (including directional variation), present weather, cloud details, air temperature, dew point, QNH, QFE and supplementary information are normally completed. The quality of such reports shall conform to ICAO Standards and Recommended Practices (SARPs)as specified in ICAO Annex 3.

1.3 Appendix B, Frequently Asked Questions on METAR coding provides additional guidance on the compilation of the METAR.

2- Aviation Weather Report for METARs -Symbolic Code

NOTE:

This is the full METAR coding as given in WMO Document No.306,Manual on Codes, Volume1, Part A; FM15-X Ext. The EGYPT does not use all of the codes; variations are listed below.

2.1 EGYPT METAR coding variations

2.1.1 "AUTO" indicates that the report has been prepared by an automated observing system, without any human input or supervision. AUTO METARs shall only be disseminated when an aerodrome is closed or, at H24 aerodromes, when the Code name Location Date/time of report Automated Wind velocity/gust Extremes in direction

METAR ***CCCC YYGG$_{gg}$Z (AUTO) dddf_fG$f_m f_m$ KT $d_n d_n d_n V d_x d_x d_x$***
Prevailing visibility MNM visibility/dir 'n Runway Visual Range Present weather
VVVVD_v $V_x V_x V_x V_x D_v$ (R$D_R D_R$/$V_R V_R V_R V_R$i) (w`w`) or CAVOK

Cloud Air temperature and dew point QNH Recent weather Wind shear

$N_s N_s N_s h_s h_s h_s$ (CC) (or NSC (or VV$h_s h_s h_s$ T`T` / T`$_d$ T`$_d$ Q$P_H P_H P_H P_H$ REw`w` (WS RWY$D_R D_R$) (or WS ALL RWY)
Sea surface temperature Sea state Runway State Trend Remarks

W$T_s T_s$/SS (BECMG ..... (or (TEMPO ..... (or (NOSIG (RMK)

Chapter 5
Weather Reports to Air Traffic Services

1- Introduction

1.1 Weather reports to Air Traffic Services are issued half-hourly (exceptionally hourly) and are used by the ATS unit to provide weather information to pilots at or in the vicinity of the aerodrome. Whilst these reports are very similar to the METAR, there are slight differences in content and coding; these are highlighted below.
Further information can also be found in Manual of Air Traffic Services,

1.2 During any period that weather reports are being provided to ATS, special reports also shall be produced, if conditions warrant. Unless otherwise agreed by the Egyptian Meteorological Authority (EMA), the criteria for the production of a special report shall be those given in paragraph 11 of this chapter.

1.3 By agreement between the Aerodrome Meteorological Observation Service Provider and ATS Provider, the format of weather observations provided to ATS may be varied (e.g. the report may be provided in the METAR code).

1.4 Dynamic meteorological information may be provided by ATS units to aircraft for take-off and landing. Equipment used to provide dynamic meteorological information to ATS is subject to requirements specified in ATS Safety Requirements.
Equipment used to display dynamic meteorological information within an ATS unit will also be subject to the relevant requirements of ATS Safety Requirements.

2- Surface Wind

2.1 The surface wind information provided should be representative of the conditions along the runway. Since, in practice, the surface wind cannot be measured directly on the runway, surface wind observations for take-off and landing should be sited to give the best practicable indication of conditions along the runway, e.g., lift-off and touchdown zones.

2.2 In reports to Air Traffic Services, the anemometer reading is averaged over the previous two minutes. The direction from which the surface wind is blowing shall be given in degrees from true North and the speed given in knots.

NOTE:

In reports to aircraft for take-off and landing, direction is to be expressed in degrees Magnetic, and the reading is averaged over the previous 2 minutes; in addition, the extremes in direction and speed (gust and lull) during the past 10 minutes shall be provided. The instantaneous surface wind should be available to give to pilots on request. Further information can be found in ECAR ATS Safety Requirements.

2.3 As well as 2-minute mean wind speeds, maximum (gust) and minimum (lull) wind speeds shall be Provided when the difference is 10 knots or more from the 2-minute mean wind speed.

2.4 Variations in wind direction shall be reported when the total variation in direction over the previous ten-minute period is 60 degrees or more. Variations are reported in clockwise order (e.g.290V090 or 170V250).

2.5 The mean wind direction shall not be included for variable winds when the total variation in direction over the previous ten-minute period is 60 degrees or more or but less than 180 degrees and the wind speed is 3 knots or less; the wind in this case shall be reported as variable; however the two extreme directions between which the wind has varied should be included.

Chapter 6
General Requirements for Observing Equipment

1- Introduction

1.1 Meteorological observing equipment shall provide a timely and accurate source and display of meteorological information to aid in the safe and expeditious flow of civil air traffic.

1.2 The purpose of this chapter is to provide requirements and recommendations covering all meteorological instruments and systems installed at EGYPT aerodromes. It covers the performance criteria and safeguarding of meteorological equipment installed at the aerodrome and intended to be used for the origin of aerodrome weather reports.

1.3 The Aerodrome Meteorological office Provider should ensure that appropriate consideration and provision for service continuity of observing equipment has been made, including any necessary support facilities, such as backup power supply etc.

2- General Requirements

2.1 Equipment installed shall have been designed following design practices as described below and in Chapter 7, Design Requirements for Meteorological Equipment.

2.2 These shall include:

a) The existence of appropriate technical specifications for the equipment.

b) Calibration standards traceable to a recognized national or international standard.

2.3 Wherever possible the observing equipment should be designed in such a manner that:

a) The system alerts the user to a failure of part or all of the equipment or power supply. or

b) That such faults should be obvious to the user.

2.4 Equipment shall operate within and recover to the tolerance values specified in each element's requirements from the ranges given for each element in Chapter 7, Design Requirements for Meteorological Equipment.

2.5 The instrument housing shall be designed to prevent atmospheric influences and radiation errors from affecting the parameters measured by the installed sensor(s), whilst allowing a free flow of air across the sensor(s), to enable the sensor to represent the ambient environment.

2.6 Sensors are required to be positioned in such a manner that allows them to measure meteorological elements free of other influences e.g., jet-engine wash.

3- Operation and Maintenance Requirements of Meteorological Equipment

3.1 Equipment should be installed in accordance with the manufacturer's or supplier's instructions and shall be tested to confirm correct and reliable operation.

3.2 The frequency of calibration checks, replacement and servicing intervals shall be specified and based on manufacturers recommendations, or if operational experience indicates a need, more frequently.

Chapter 7
Design Requirements for Meteorological Equipment

1- Introduction

1.1 The purpose of this chapter is to provide minimum standards for meteorological equipment at EGYPT aerodromes producing METAR reports.

1.2 The Aerodrome Meteorological office Provider should ensure that appropriate consideration and provision for service continuity of observing equipment has been made, including any necessary support facilities, such as backup power supply etc.

1.3 If backup sensors are available, the procedures for use, operational limitations and maximum period of use must be documented by the Aerodrome Meteorological office Provider.

1.4 Sensor sitting shall not encroach the obstacle limitation surface or obstacle free zones.

However, consideration may be given by the Safety Regulation Group to the collocation of sensors on existing structures on the aerodrome.

1.5 Notwithstanding the constraints listed in paragraph 1.4, the exposure of the sensor should minimize the effects of all obstructions. The tower used to mount the wind sensor is not considered an obstruction to the sensor collection system but, with the exception of the temperature, dew point, and pressure sensors, it should be at least 3 meters away from all other meteorological sensors. Sensors should be located as far as practicable from any source likely to significantly affect the quality of the data.

1.6 The display shall present a clear and unambiguous indication of the operational status of the sensor system to the user, in a format applicable to the proposed installation.

1.7 Where possible, the equipment should be self-monitoring and provide a suitable indication of equipment status and serviceability.

1.8 Where equipment is not self-monitoring, a failure of the equipment should be obvious.

2- Requirements for Meteorological Displays

2.1 Performance

2.1.1 Meteorological displays that present dynamic meteorological information to ATS is subject to the requirements contained in ECAR ATS Safety Requirements.

2.1.2 Where separate display systems are used to source data for the preparation of METAR reports and for the presentation of dynamic meteorological information to ATS, the display device for the METAR shall be designed in such a way as to draw the attention of the operator to significant changes in the displayed meteorological information. (A significant change is defined in Chapter 5, Weather Reports to Air Traffic Services)

2.1.3 The wind sensor display shall indicate whether the direction is referenced to True North or Magnetic North.

2.1.4 On aerodromes with more than one wind sensor, the display shall clearly indicate the sensor or location from which the information is derived.

Chapter 8
Dissemination of Weather Reports

1- Introduction

1.1 Meteorological reports should be disseminated beyond the aerodrome in a manner agreed between the ATS Provider and the Egyptian Meteorological Authority (EMA).

*NOTE***:**

This is normally achieved by the transmission of routine reports to the EGYPT Civil Aviation Communications Centre by the Aeronautical Fixed Service.

1.2 ECAR Manual of Air Traffic Services describes the elements of a meteorological report that are routinely required to be passed to pilots by ATC.

*NOTE***:**

Where the passing of meteorological information increases ATC workload to the extent that the provision of the ATC service is affected, the Provider of ATC should consider the broadcast of meteorological reports on ATIS.

1.3 Meteorological reports included on ATIS is an ATS function and is covered in full detail in ECAR Manual of Air Traffic Services and ECAR ATS Safety requirements

2- Timing Requirements

2.1 In the EGYPT, METARs are transmitted every half hour or exceptionally every hour.

Typically observations are made at 20 minutes past the hour (where half-hourly observations are provided) and at 10 minutes to the hour (for both half-hourly and hourly observations).

Since aerodromes have pre-determined designated places in meteorological bulletins and on VOLMET etc., it is essential that observations are completed in accordance with normal observing practice and are transmitted within 5 minutes of normal dispatch time.

2.2 The Meteorological Forecast Office also requires timely observations to ensure that amendments to Aerodrome Forecasts are issued quickly, and to assist in the timely issue of aerodrome warnings.

3- METAR

3.1 Once a METAR has been transmitted it will be collected at the Civil Aviation Communications Centre and assembled into pre-determined 'bulletins'. The bulletins are then disseminated via Aeronautical Fixed Service (AFS) channels.

Selections of the AFS data will be available on the Aeronautical Fixed Telecommunications Network (AFTN) or via the Satellite Distribution System (SADIS), as agreed between the Egyptian Meteorological Authority (EMA), the EGYPT Civil Aviation Communications Centre and ICAO Regional Planning Groups.

3.2 A small selection of METARs is sent for broadcast on VOLMET. VOLMET is a voice broadcast of a set of METARs broadcast on four frequencies covering different regions of the EGYPT with each frequency transmitting a different METAR set. The one region is Cairo VOLMET (Main)

3.3 Many METARs and TAFs are grouped together into regions and available to telephone callers on DIALMET.

Full details are specified in the EGYPT AIP.

A selection of METARs and TAFs are also available via fax and Internet services.

Chapter 9
Reliability and Availability of Reporting

1 - Accredited Meteorological Aerodrome Reports

METAR reports shall be completed by an accredited observer. Procedures shall be in place to ensure that any observation generated by an automated weather observing system is not disseminated outside of the periods defined in Chapter 4 paragraph 2.1.1, unless it has been checked and qualified by an accredited observer.

2 - Completeness of Reports

2.1 The purpose of a weather observation is to provide a complete picture of the conditions at the aerodrome to a variety of recipients.

2.2 The meteorological forecaster is required to take account of all meteorological variables when preparing an Aerodrome Forecast; METARs are used to verify base conditions before forecasting how these elements will change with time. Missing information in the METAR may lead to greater inaccuracies in the forecast which may impact on tactical planning by pilots, operators and other aerodrome service providers.

3- Missing Meteorological Aerodrome Reports

3.1 If the routine supply of METARs ceases, f or whatever reason, there may be an impact on users of the meteorological information (e.g., selection of alternate aerodromes and fuel upload planning) and the provision of an Air Traffic Service. Wherever practical, suitable contingency measures shall be identified and associated operational procedures documented.

3.2 In accordance with ICAO Annex 3, if a regular supply of METARs ceases or is incomplete, the Aerodrome Forecast may be cancelled, as the meteorological forecaster loses the site-specific information on which to confirm the forecast. The forecaster will not issue further Aerodrome Forecasts until the transmission of METARs re-commences.

4 –Timeliness

4.1 The Aerodrome Meteorological office Provider shall allocate sufficient time resources to the aerodrome meteorological observing staff to enable them to carry out observing duties. The observer may need to assess certain elements of the weather from an outside observing position that is close to ground level. All reports should be checked before issue.

4.2 Data collection for observations made at 20 minutes past the hour (where half-hourly observations are provided) must begin no earlier than 10 minutes past the hour. Data collection for observations made at 10 minutes to the hour (for both half-hourly and hourly observations) must begin no earlier than 20 minutes to the hour.

4.3 METAR reports made at 20 minutes past the hour (where half-hourly observations are provided) shall be completed by 25 minutes past the hour and METAR reports made at 10 minutes to the hour (for both half-hourly and hourly observations)shall be completed by 5 minutes to the hour.

4.4 Specials reports, when applicable, should be made without delay and recorded in the appropriate manner.

Chapter 10
Records and Archives

1- Introduction

1.1 A continuous log shall be maintained of all METAR and special reports produced at the aerodrome. These data may be required in the event of an official enquiry relating to an aircraft accident or incident either at, or in the vicinity of the aerodrome and can be useful for planning future aerodrome services.

1.2 When the observations are made using a semi-automated observing system, the system should be arranged either so that a printout of the METAR and special reports is made for retention, or so that the METAR and special reports are stored on a disk, which can be retained for future reference.

1.3 For manual observations, a record shall be maintained to log all the readings and reports.

1.4 In the event of a mistake being discovered in the METAR report, a corrected METAR shall be issued. Following an erroneous log entry, the original value and corrected value shall be clearly indicated, especially when a report has been used by the Air Traffic Service Provider or coded in the METAR. An original erroneous figure must not be deleted and replaced at a later time with a corrected figure. Thus the log will show both the original erroneous report and the subsequent correction with the time at which the correction was made.

***NOTE*:**

A corrected METAR shall only be issued ahead of the subsequent METAR, typically 30 minutes later. Thereafter, any mistake should be logged only.

2- Meteorological Information Records

2.1 Where observing systems are in use, the equipment shall be capable of producing printed record of all observation reports (METAR, special reports and any non-routine observation at the time of an aircraft accident on or in the vicinity of the aerodrome) produced during the preceding 30 days. Where manual observations are produced, each instrument reading should be recorded in a book or other suitable log, in accordance with World Meteorological Organization guidance material, and retained for a period of at least 30 days. Similarly where continuous analogue recordings are made of meteorological elements, any charts or other recordings should be retained for at least 30 days.

NOTE 1:

Air Traffic Control units should examine the requirements for producing a printed post-incident meteorological report given in ECAR Manual of Air Traffic Services.

***NOTE 2*:**

METAR and TAF reports distributed via the AFS are stored by the EGYPT Met Office for a minimum of one year. Such data may be accessed on request.

The EGYPT Met Office may make a charge for this service.

2.2 Where observing systems sample conditions more frequently than is required for the production of routine or special reports, it is recommended that a facility exists for the system to store the previous 60 minutes of data from each sensor, on command from the observer (for example following the completion of a non-routine observation). Data should be retained for a period of at least 30 days.

2.3 All records and data should be available for examination by the CAA or the EGYPT Air Accidents Investigation Branch (AAIB) on request. The aerodrome shall agree that any

Chapter 11
Definitions, Abbreviations and Bibliography

1- Glossary of Definitions and Abbreviations

This Glossary contains terms that have a specific meaning in civil aviation, safety, or regulatory matters.

2-Definitions

Accuracy The stated value of required accuracy represents the uncertainty of the reported value with respect to the true value and indicates the interval in which the true value shall lie.

Aerodrome Any area of land or water designed, equipped, set apart or commonly used for affording facilities for the landing and departure of aircraft.

Aerodrome Meteorological Observing Units

A unit on an aerodrome that produces METAR observations or is responsible for the receipt (and onward transmission around the aerodrome, where appropriate) of aerodrome meteorological warnings Aeronautical Fixed Service A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services. (ICAO Annex 11, Chapter 1)

Aeronautical Fixed Telecommunication Network A worldwide system of aeronautical fixed circuits provided as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics. (ICAO Annex 11, Chapter 1)

Aeronautical Information Service (AIS) Publisher of Notices to Airmen (NOTAM) and Egypt Aeronautical Information Package.

Aerodrome Licensee In relation to any aerodrome, the person in charge of the aerodrome.

Air Traffic All aircraft in flight or operating on the maneuvering area of an aerodrome. (ICAO Annex 11,Chapter 1)

Air Traffic Control Centre An air traffic control unit established to provide an area control service to aircraft flying within a notified flight information region which are not receiving an aerodrome control service or an approach control service.(ECAR Air Navigation: The Order and the Regulations)

Air Traffic Control Unit A person appointed by the CAA or by any other person maintaining an aerodrome or place to give instructions or advice

or both instructions and advice by means of radio signals to aircraft in the interests of safety but does not include a person so appointed solely to give information to aircraft, and 'Air Traffic Control Service ' shall be construed accordingly.(ECAR Air Navigation: The Order and the Regulations)

Air Traffic Service A generic term meaning air traffic control service, flight information service and air-ground communication.

Appendix A
Purpose of the Aerodrome Meteorological Liaison Visits

1- Introduction

1.1 In order to comply with ICAO SARPs, the EGYPT Meteorological Authority arranges for aerodrome meteorological observing units to be visited at regular intervals. The aim of these visits is to ensure that a high standard of observations is maintained, instruments and their displays are functioning correctly and to check the exposure of instruments.

1.2 The Egyptian Meteorological Authority (EMA) requires annual liaison visits for all aerodromes that produce and disseminate METARs. These are listed in the EGYPT AIP (GEN table 3.5.3.2.).Aerodromes that are provided with a meteorological warnings service are visited every three years. The visit will check local meteorological procedures and inspect the standard of weather reports, instrumentation and, if applicable, meteorological flight briefing documentation provided. The inspector may also offer help and advice regarding the provision of meteorological services to both the airport management, observers and users.

1.3 The liaison visit may be used to send completed Register of Observations (Met form 2612) to the Public Record archive and to request new Registers.

NOTE:

The Met Office will supply Registers of Observations (Met form 2612) free of charge, on the basis that upon completion, these registers may be archived by the Met Office. Archived data and registers may be used in generating climatologically data, as noted in the EGYPT AIP (GEN table 3.5.3.2).

2- Conduct of Liaison Visit

2.1 Meteorological instrumentation will be checked during the visit. The exposure and accuracy of the instrumentation will be looked at, as well as procedures for use of the instrumentation.

2.2 The regularity of METAR observations will be checked prior to the visit and any issues raised on the day.

2.3 Time during the visit will also be made for possible meetings with users of meteorological information on the aerodrome, e.g., airlines, flying clubs, handling agents, to discuss the meteorological services provided for their operations. A summary of the discussions will be included in the report.

2.4 The aerodrome entry in EGYPT AIP GEN table 3.5.3.2, AD 2.11 and any weather-related warnings contained within AD 2.20 will be reviewed during the visit and details of any amendments taken.

2.5 Following the visit, a copy of the report shall be sent to the Manager of the Aerodrome Meteorological Observing Service Provider.

Appendix B
Frequently Asked Questions on the Compilation of the METAR

1- Introduction

There are a number of common queries that are often raised when completing the METAR. Full details can be found in the earlier sections of Chapter 6 but the most frequently asked questions are given below to assist the observer.

2- Questions

2.1 Wind

Which anemometer is used for the METAR report?

2.1.1 Whatever runway is in use, the wind velocity for the METAR is normally taken from one designated anemometer, and usually is averaged over 10 minutes. It may include a gust speed recorded in that 10 minute period when appropriate.

How is the wind direction reported and when is a variation group included?

2.1.2 Wind direction shall be recorded in degrees true, and shall include a variation group, if, during the previous 10 minutes the direction has varied though an arc of 60 degrees or more but less than 180 degrees and the mean speed during the previous 10 minutes is more than 3 knots.

2.2 Visibility

What visibility is reported in the METAR?

2.2.1 In the METAR, the prevailing visibility shall be reported. If the visibility in one direction, which is not the prevailing visibility, is less than 1500m or less than 50% of the prevailing visibility and less than 5 000 meters, the lowest visibility observed shall also be reported and its general direction in relation to the aerodrome indicated by reference to one of the eight points of the compass. If the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported. When the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction. When the minimum visibility is different from the prevailing visibility and represent 50% or more of the prevailing visibility, it must be inserted in the RMK group at the end of the report . The abbreviation NVD must be put after the visibility if the station is automated.

2.3 Present weather

When is mist reported?

2.3.1 Mist, dust (widespread), smoke and haze shall be reported only when the visibility is 5000m or less.

How often does heavy rain occur on average?

2.3.2 Care should be taken to avoid over-estimating the intensity of precipitation. Statistically, in the Egypt, light rain falls on 80%of occasions and heavy rain falls on less than 5%of occasions.

When should separate weather groups be reported?

2.3.3 Although up to three weather types may be reported, they should be occurring independently; e.g., a mist or fog group shall not inserted if the reduction in visibility is due wholly to falling precipitation.

How is 10km visibility and broken cloud at 5500 feet reported?

2.3.4 CAVOK should be used in this instance.

Appendix C
Human Observed RVR Calibration

1- The Egyptian Meteorological Authority (EMA) is responsible for arranging Human Observed Runway Visual Range Calibration.

2- Each aerodrome is re-calibrated once every 3 years or following any changes to the runway lighting system.

3- The calibration establishes the relationship between the apparent brightness of the runway lights seen by the pilot on the centre-line of the runway at the touchdown point with the apparent brightness of the runway lights seen from the Runway Observation Point (ROP), which is sited, where possible, opposite the touchdown point.

4- The measuring instrument used to obtain this relationship is the Gold Visibility Meter (GVM). This comprises an infinitely variable density filter through which a given runway edge light can be seen. Each light is viewed through the GVM from the ROP at the observer's normal eye height and then from the runway centre line abeam the RVR observation point at the height of approximately 5 meters. At both locations the filter is adjusted so that the light is just extinguished. By application of a formula to the readings of the Gold meter when the light is just extinguished at the two points, a table converting the number of lights visible from the RVR observation point to the RVR to be reported can be computed.

5- The calibration is done during the hours of darkness in good visibility (4000m or more). The calibration personnel should meet the same vision criteria as the RVR observers.

Appendix D
Daily Atmospheric Pressure Equipment QNH Check

1- Atmospheric pressure measuring equipment shall be checked daily for signs of sensor drift by comparison with other pressure instrumentation on the aerodrome. However, the check should not take place if the mean wind speed exceeds 25kts, or when the pressure change is greater than 1 hpa per hour, as this may adversely affect the comparison.

2- The Aerodrome QNH (to the nearest tenth of a hpa) should be used in the comparison.

3- The use of the table below to record the daily pressure check may indicate sensor calibration drift before the sensor reaches the limits of allowed accuracy. However, if differences consistently reach 0.5mb then calibration of the barometer should be brought forward.

Date Primary
Sensor
Backup
Sensor Date Primary
Sensor
Backup
Sensor

Appendix E
Theoretical Observer Training Requirements

1- Introduction

1.1 The objective of the theoretical training is to provide tuition in the skills required to accurately and reliably produce weather reports to ATS and to issue reports in the METAR format.

1.2 The theoretical training is intended to be classroom based on successful completion of the theoretical training, the trainee will be eligible to go forward for practical observer training session and, on suitable completion of this, will be awarded a meteorological observing certificate.

2 Training Program

2.1 The purpose of the theoretical training is to instruct the trainee observers on observing techniques and how to correctly encode and decode weather reports. The trainee will also be given instruction on how to carry out simple care and maintenance of instruments.

2.2 Details of approved training courses are specified annually in an AIC.

3- Training Syllabus

3.1 The training shall provide instruction on the following:

(a) The process of compiling and preparing weather reports, especially using the METAR code.
(b) The reporting of the surface wind measurements, including backup facilities.
(c) The observing and reporting of visibility by day and by night.
(d) Runway visual range (RVR)-familiarization with the code and when to report.
(e) The observing and reporting of "present weather" in its various forms, including the relationship between humidity and reporting of Mist/Haze.
(f) The observing and reporting of cloud base and height, including when to report CAVOK, SKY CLEAR and sky obscured. Identification of convective clouds and their reporting in the METAR code.
(g) The reporting of temperature and determination of dew point values, especially the attention and care required when reporting sub-zero temperatures.
(h) The observation of atmospheric pressure and the reporting of QNH and QFE.
(i) Runway State -familiarization with the code and when to report.
(j) When and how to report "Recent Weather".
(k) The criteria and process for issuing special weather reports.
(l) Familiarization with OPMET bulletins containing METAR reports.
(m) Interpretation of standard weather charts to self-brief on the prevailing weather.

Appendix F

Practical Observer Training Requirements for a Meteorological Observer's Certificate (Manual Observed Weather Reports)

1- Introduction

1.1 The purpose of the practical training is to apply the theoretical knowledge gained in the context of an operational environment and to enable the practical competence of the observer to be assessed.

1.2 The practical training will concentrate on the correct application of meteorological observing techniques, use of a range of meteorological instrumentation including, but not limited to, semi-automated observing systems.

1.3 Whenever possible, practical training should follow immediately after the theory training. This will allow the student to maximize the gain confidence in using and instrumentation, as well as allowing an assessment of the observing competence of the student to be carried out.

1.4 It is recommended that the formal practical observer training should last between 4 days and 2 weeks.

2 -Training Organizations

2.1 The training program, examinations and competency of aerodrome meteorological observers shall be approved by the Egyptian Meteorological Authority (EMA) .This is to ensure that the standard of observing training is uniform for all students. Details of the approval process are available from the Egyptian Meteorological Authority on request.

2.2 Practical training shall be supplied by suitably experienced observers, having at least 5 consecutive years experience of aviation meteorological observing. Ideally the experience will have been gained from working at more than one aerodrome and also have included experience of producing both fully manual observations and observations assisted by automated meteorological weather observing systems. Thus observers providing practical training will have a wide perspective on different observing methodologies used in the EGYPT.

2.3 A training supervisor (who may also be one of the observing staff discussed in Appendix G paragraph 2.2) should be assigned to the student to ensure that all aspects of the training program are covered and to act as a mentor for the student. The training supervisor will also have at least 5 consecutive years experience of aviation meteorological observing and preferably some experience of synoptic weather observing. The examination and/or report may be delegated to another member of the observing staff, if required.

2.4 Copies of the following publications should be held at the observing office for the use of trainees during training:

- Metform ---- Cloud Types For Observers
- Metform ---- Meteorological Observing Codes For Use In METARs
- Metform ---- METAR Register Of Observations, or equivalent form for manually recording observations.

Annex A to Appendix F

Observing competencies to be assessed during the Practical Simulations:

Elements Tasks The assessment will *check that you can:*

- **Comments Signed Cloud** Recognize and name cloud types relevant to METAR reports.
- Correctly identify all cloud types observed relevant to METARs. **(See note)**
- Estimate cloud amount, total and layers.
- Accurately estimate cloud amount in each layer ±1 okta. Estimate cloud heights.
- Accurately estimate cloud height ±30% if not using the LCBR.
- Encode cloud data.
- Correctly encode cloud data in the METAR register.

Visibility Estimate the visibility. Accurately estimate visibility using visibility points ±20%. Encode visibility data. Correctly encode visibility data in the METAR register

Temperature Read the various types of thermometers available. Accurately read **all** types of thermometers to ±0.1 °C. Encode temperature
data. Correctly encode temperature data in the METAR register.

Wind Estimate mean wind speed and direction. Estimate wind speed to the nearest force on the Beaufort scale and estimate wind direction using 16 point compass, ±1 compass point. Assess mean and gust wind speeds and direction from wind display systems including significant variations. Correctly obtain mean and extreme values from wind dials. Encode wind data. Correctly encode wind data in the METAR register

Appendix G
Training Requirements for a Restricted Meteorological Observer's Certificate and Training Requirements for MET inspectors

1- Introduction

1.1 The training aims to provide tuition in the theory and practical skills required to make semi-automated weather reports to the standard necessary to ensure the safety of aircraft. On completion the trainee is awarded a restricted meteorological observing certificate. The certificate will only apply to observing duties where the Aerodrome Meteorological office Provider uses approved semi-automated systems.

1.2 Weather reports to ATS may be compiled using an approved semi-automated observing system but the dissemination of a METAR requires validation of the visual elements (visibility, present weather and cloud) before transmission.

2 -Training Program

2.1 Training shall be carried out to enable the observer to visually evaluate the visibility, present weather, cloud amounts, height of cloud bases, and presence of significant convective clouds. This will allow either these parameters to be added to the weather report, or if sensors are available on the semi-automated system for recording these that they are validated before the weather report is disseminated.

2.2 It is expected that the training shall be conducted at the parent ATS unit. The theory training should last two days followed by supervised on the job training.

2.3 Aerodrome weather reports may be compiled using an approved semi-automated observing system. This allows the non-visual elements to be generated from sensor measurements, and the visual elements to be assessed by a qualified observer. Training is necessary to enable the observer to visually evaluate the visibility, present weather, cloud amounts/bases, and presence of significant convective clouds (TCU and CB) so that the sensor readings can be qualified.

2.4 The observer should be aware of the operational requirements for METAR reports at the aerodrome. At aerodromes where TRENDs are attached to the METAR reports, the observer should understand the procedures for obtaining the TREND message from the meteorological forecasting office.

2.5 The observer should understand the different requirements between weather reports provided for ATS and those disseminated beyond an aerodrome, in particular the METAR.

2.6 The observer should be able to interpret the self-briefing weather documentation available on an aerodrome.

3- Training Syllabus

3.1 The syllabus should cover the following aspects, in line with the requirements specified above:

(a) The METAR and introduction to ICAO Annex 3 Chapter 4.
(b) The purpose of the METAR to flight operations and forecasting.
(c) Differing requirements for surface wind reports ATC/METAR.

4- Minimum Qualifications for MET inspectors:

A MET Inspector shall have at least the following qualifications:

1 Bachelor's Degree in science (physics, mathematics).
2 Hold Meteorological physics proficiently diploma and Prediction analysis, proficiently diploma with at least 5 years' experience as a predictor/forecaster and at least 10 years' experience as an observer in the aviation field.
3 Metrological personnel course (class 1).
4 Should have successfully completed an audit/ inspection course.
5 Possess adequate knowledge of aviation Law and experience in MET procedures/practices and training, procedure.
6 Analytical ability, good inter personnel skill, flexibility of approach and safety oversight experience.

5- Training courses

5.1 Basic training

- Basic indoctrination course
- Safety Management System (SMS)
- Aviation audit techniques
- Human factors
- On Job Training
- On Job Training: The employee shall participate in at least three inspections under supervision of experienced, senior MET inspector.

5.2 Advanced training

- State Safety Program (SSP)
- Technical Report writing

5.3 Recurrent training

- Recurrent training can be classified into Refreshment courses, new technologies / new concepts and Seminars/Workshops.

a) New technologies / new concepts:

- The target of this phase is to ensure updating MET inspectors to address changes in available criteria, technologies and regulations

1. **Procedures of New technologies / new concepts:**
   - Meteorology Service providers are required to notify the Air Navigation Safety and Standard Central Administration of the courses schedules for new equipment/systems.
   - Airspace affairs and aeronautical information general Manager receives all letters from the Meteorology service provider for courses that will be held in Egypt or abroad.
   - If the course supports the administration and technical policy and objectives in various fields in MET,
   - Airspace affairs and aeronautical information general Manager proposes to the Head of Air Navigation Central Administration the list of eligible candidates (MET Inspectors) to attend each course.
   - Head of Air Navigation Central Administration assigns the attendees of each course.
   - Airspace affairs and aeronautical information general Manager informs the Meteorology service providers about the ECAA participants.
   - For the courses held in the foreign countries, a committee is assigned by Head of Air Navigation Central Administration to propose the eligible candidates for each course.
   - Each participant of any of the mentioned courses above will provide the training department with a copy of the course certificate to be kept in his file.

b) Seminars and workshops:

- Participation in seminars and Workshops organized by ICAO and international and regional aviation related organizations enable ECAA technical staff to enhance their competence and share experience with experts from other regions.
- The head of Air Navigation Central Administration assigns MET inspectors to attend Seminars and workshops organized by ICAO relevant to MET field.
- The ECAA identified the training seminars/workshops as Priority 1 to maintain at least one inspector with background in these subjects. For other inspectors this training will be treated as Priority 2.

c) Refreshments courses:

- Refreshment courses shall be provided at least one every two years.

6- Time-line for MET inspector:

- The timing goals are not absolutes, but will be closely followed.
- Inspectors will not be assigned as the "qualified" person for a task until he has completed the local formal and OJT qualification for that task.

6.1 First Week of Employment

- Basic indoctrination course

6.2 During the first 6 Months of Employment

- Safety Management System
- Aviation audit techniques
- Human factors

6.3 During the first 12 Months of Employment

- OJT

7- Meteorological Inspector

a. Brief Description

The holder of this position shall be responsible for performing Safety Oversight function of Meteorological service providers. The purpose of this position is to ensure the compliance of relevant ECARS, manuals, documents, ECAA rules, regulations, directives and upgrade the safety level of Meteorological services.

b. Duties and Responsibilities

1) Develop and amend Inspector Handbook/Checklist necessary for inspection.
2) Formulate and implement MET Safety Audit Surveillance Program.
3) Conduct safety oversight inspection for MET services to ensure the proper implementation of relevant ICAO Annexes, ECARS, related documents, manuals and directives issued by ECAA.
4) Prepare inspection report and highlight the deficiencies, if any.
5) To ensure flight safety, issue immediate directives to the service provider if there are any issues that need immediate attention.
6) Ensures that MET units regularly amends related documents to incorporate changes in ICAO SARPs.
7) Participate in any in-house and abroad workshops and seminars related to MET matters.
8) Participate when required in the investigation of ANS related Accident/Incident and Occurrences and submit the report.
9) Ensure EMA has developed training program including recurrent training for its staff.
10) Ensure procedure developed by service provider for continued competency of new equipment.

Appendix H

Site Specific Competency Checking of Observers

1- A trainee observer who has gained a basic certificate of competence on an observer training course shall also complete further practical experience of observing under supervision at the parent ATS unit.

2- The observer shall be required to demonstrate competence in all aspects of meteorological observing under normal working conditions.

3- Table 8 shows the minimum core competencies that an observer shall be required to demonstrate and a sample format that may be used to record their performance.

4- Table 9 shows an example of a work sheet that may be used during the supervision period to record progress on competency checking.

5- The formats of tables 8 and 9 may be varied to reflect differences in the prevailing conditions at aerodromes. A record should be made when an observer experiences, records and codes rare weather events such as thunderstorms or fog.

6- The formats of tables 8 and 9 may also be used to record observer's performance in ongoing competency checks or refresher training programs that are developed for all or individual members of observing staff.

7- Certificated observers should carry out a minimum of ten observations over a consecutive period of ninety days to maintain observing and METAR coding skills; ideally one of these observations should be during conditions when the visibility is less than 5 kilometers, one should be during a precipitation event and one should be during 'CAVOK' conditions.. Where observers do not meet the minimum requirements, the Manager ,or other nominated person, of the Aerodrome Met Observing Service Provider should ensure that the observer can demonstrate observing and METAR coding competence before resuming operational observing duties.

8- Every accredited observer should be assessed on an annual basis by the Manager, or other nominated person, of the Aerodrome Met Observing Service Provider to ensure the observer 's ongoing competence.

9- Observer's continued competence may also benefit from one or more of the following:

(a) The Manager, or other nominated person, of the Aerodrome Met Observing Service Provider, who assesses observer competence should periodically attend a met refresher training course to ensure that they are up to date on the latest coding requirements and observing techniques.

(b) The Aerodrome Met Observing Service Provider arranges for periodic met refresher training for all staff.

(c) Aerodrome Met Observing Service Provider staff attend a met refresher training course, on a rolling basis. As a guide, staff should attend at least once every five years.

(d) The Aerodrome Met Observing Service Provider arranges for an On Site Competency Assessment of Observers by a CAA-approved assessor.

Appendix I

Technical Specifications Related To Forecasts

1. Criteria related to TAF

1.1 TAF format

TAF shall be issued in accordance with the template shown in (Table A5-1) and disseminated in the TAF code form prescribed by the World Meteorological Organization.

Note: The TAF code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.1, Part A - Alphanumeric Codes.

1.2 Inclusion of meteorological elements in TAF

Note: Guidance on operationally desirable accuracy of forecasts is given in Attachment B.

1.2.1 Surface wind

In forecasting surface wind, the expected prevailing direction should be given. When it is not possible to forecast a prevailing surface wind direction due to its expected variability, for example, during light wind conditions (less than 6km/h "3kt") or thunderstorms, the forecast wind direction should be indicated as variable using "VRB".

When the wind is forecast to be (less than 2km/h "1kt") the forecast wind speed should be indicated as calm.

When the forecast maximum speed (gust) exceeds the forecast mean wind speed by 20km/h "10kt" or more, the forecast maximum wind speed should be indicated.

When a wind speed of 50m/s "100kt" or more is forecast, it should be indicated to be more than 49m/s "99kt".

1.2.2 Visibility

When the visibility is forecast to be less than 800m it should be expressed in steps of 50m, When it is forecast to be 800m or more but less than 5km, in steps of 100m; 5km or more but less than 10km in kilometer steps and when it is forecast to be 10km, or more it should be expressed as 10km, except when conditions of CAVOK are forecast to apply. The prevailing visibility should be forecast. When visibility is forecast to vary in different directions and the prevailing visibility cannot be forecast, the lowest forecast visibility should be given.

1.2.3 Weather phenomena

One or more, up to a maximum of three, of the following weather phenomena or combinations thereof, together with their characteristics and, where appropriate, intensity should be forecast if they are expected to occur at the aerodrome:

1. freezing precipitation
2. freezing fog
3. moderate or heavy precipitation (including showers thereof)
4. low drifting dust, sand or snow
5. blowing dust, sand or snow
6. dust storm
7. sandstorm
8. thunderstorm (with or without precipitation)
9. squall
10. funnel cloud (tornado or waterspout)
11. Other weather phenomena only if they are expected to cause a significant change in visibility.

The expected end of occurrence of those phenomena should be indicated by the abbreviation "NSW".

1.2.4 Cloud

Cloud amount should be forecast using the abbreviations "FEW", "SCT", "BKN" or "OVC" as necessary. If no clouds are forecast, and the abbreviation "CAVOK" is not appropriate, the abbreviation "NSC" should be used. When it is expected that the sky will remain or become obscured and clouds cannot be forecast and information on vertical visibility is available at the aerodrome, the vertical visibility should be forecast in the form "VV" followed by the forecast value of the vertical visibility. When several

layers or masses of cloud are forecast, their amount and height of base should be included in the following order:

(a) The lowest layer or mass regardless of amount, to be forecast as FEW, SCT, BKN or OVC as appropriate;

(b) The next layer or mass covering more than 2/8, to be forecast as SCT, BKN or OVC as appropriate;

(c) The next higher layer or mass covering more than 4/8, to be forecast as BKN or OVC as appropriate; and

(d) Cumulonimbus clouds, whenever forecast and not already included under a) to c). Cloud information should be limited to cloud of operational significance, i.e. cloud below 1500m (5000ft) or the highest minimum sector altitude whichever is greater, and cumulonimbus whenever forecast. In applying this limitation, when no cumulonimbus and no cloud below 1500m (5000 ft) or below the highest minimum sector altitude whichever is greater are forecast, and "CAVOK" or "NSC" are not appropriate, the abbreviation "NSC" should be used.

1.2.5 Temperature

When forecast temperatures are included in accordance with regional air navigation agreement, the maximum and minimum temperatures expected to occur during the period of validity of the TAF should be given, together with their corresponding times of occurrence.

1.3 Use of change groups

1.3.1 The criteria used for the inclusion of change groups in TAF or for the amendment of TAF should be based on the following weather phenomena or combinations thereof being forecast to begin or end or change in intensity:

1. Freezing precipitation
2. Moderate or heavy precipitation (including showers thereof)
3. Thunderstorm with precipitation
4. Dust storm
5. Sandstorm.

1.3.2 The criteria used for the inclusion of change groups in TAF or for the amendment of TAF should be based on the following:

(a) When the mean surface wind direction is forecast to change by 60^0 or more, the mean speed before and/or after the change being 5 m/s (10 kt) or more;

(b) When the mean surface wind speed is forecast to change by 5 m/s (10 kt) or more;

(c) when the variation from the mean surface wind speed (gusts) is forecast to increase by 5m/s (10kt) or more, the mean speed before and/or after the change being 7.5 m/s (15kt) or more;

(d) When the surface wind is forecast to change through values of operational significance the threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:

(1) Require a change in runway(s) in use; and

(2) Indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome;

(e) When the visibility is forecast to improve and change to or pass through one or more of the following values, or when the visibility is forecast to deteriorate and pass through one or more of the following values:

(1) "150, 350, 600, 800, 1500 or 3000" m; or

(2) "5000" m in cases where significant numbers of flights are operated in accordance with the visual flight rules;

(f) When any of the following weather phenomena or combinations thereof are forecast to begin or end:

1. Ice crystals
2. Freezing fog
3. Low drifting dust, sand or snow
4. Blowing dust, sand or snow
5. Thunderstorm without precipitation
6. Squall
7. Funnel cloud (tornado or waterspout);

(g) When the height of base of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lift and change to or pass through one or more of the following values, or when the height of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lower and pass through one or more of the following values:
(1) "30, 60, 150 or 300" m "100, 200, 500 or 1000" ft or
(2) "450m" "1500ft", in cases where significant numbers of flights are operated in accordance with the visual flight rules;

(h) When the amount of a layer or mass of cloud below "450m" "1500ft" is forecast to change:
(1) From NSC, FEW or SCT to BKN or OVC; or
(2) From BKN or OVC to NSC, FEW or SCT;

(i) When the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: "30, 60, 150 or 300" m "100, 200, 500 or 1000" ft; and

(j) Any other criteria based on local aerodrome operating minima, as agreed between the meteorological authority and the operators.

1.3.3 When a change in any of the elements given in Chapter 6, 6.2.3 is required to be indicated in accordance with the criteria given in 1.3.2 the change indicators "BECMG" or "TEMPO" should be used followed by the time period during which the change is expected to occur. The time period should be indicated as the beginning and end of the period in whole hours UTC. Only those elements for which a significant change is expected should be included following a change indicator. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change should be indicated.

1.3.4 The change indicator "BECMG" and the associated time group should be used to describe changes where the meteorological conditions are expected to reach or pass through specified threshold values at a regular or irregular rate and at an unspecified time during the time period. The time period should normally not exceed 2 hours but in any case should not exceed 4 hours.

1.3.5 The change indicator "TEMPO" and the associated time group should be used to describe expected frequent or infrequent temporary fluctuations in the meteorological conditions which reach or pass specified threshold values and last for a period of less than one hour in each instance and, in the aggregate, cover less than one-half of the forecast period during which the fluctuations are expected to occur. If the temporary fluctuation is expected to last one hour or longer, the change group "BECMG" should be used in accordance with 1.3.4 or the validity period should be subdivided in accordance with 1.3.6.

1.4 Use of probability groups

The probability of occurrence of an alternative value of a forecast element or elements should be indicated, as necessary, by use of the abbreviation "PROB" followed by the probability in tens of per cent and the time period during which the alternative value(s) is (are) expected to apply. The probability information should be placed after the element or elements forecast and be followed by the alternative value of the element or elements. The probability of a forecast of temporary fluctuations in meteorological conditions should be indicated, as necessary, by use of the abbreviation "PROB" followed by the probability in tens of per cent, placed before the change indicator "TEMPO" and associated time group. A probability of an alternative value or change of less than 30 per cent should not be considered sufficiently significant to be indicated. A probability of an alternative value or change of 50 per cent or more, for aviation purposes, should not be considered a probability but instead should be indicated, as necessary, by use of the change indicators "BECMG" or "TEMPO" or by subdivision of the validity period using the abbreviation "FM". The probability group should not be used to qualify the change indicator "BECMG" nor the time indicator "FM".

1.5 Numbers of change and probability groups

The number of change and probability groups should be kept to a minimum and should not normally exceed five groups.

1.6 Dissemination of TAF

TAF and amendments thereto shall be disseminated to international OPMET data banks and the centers designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

2. CRITERIA RELATED TO TREND FORECASTS

2.1 Format of trend forecasts

Trend forecasts shall be issued in accordance with the templates shown. The units and scales used in the trend forecast shall be the same as those used in the report to which it is appended.

2.2 Inclusion of meteorological elements in trend forecasts

2.2.1 General provisions

The trend forecast shall indicate significant changes in respect of one or more of the elements: surface wind, visibility, weather and clouds. Only those elements shall be included for which a significant change is expected. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, shall be indicated. In the case of a significant change in visibility, the phenomenon causing the reduction of visibility shall also be indicated. When no change is expected to occur, this shall be indicated by the term "NOSIG".

2.2.2 Surface wind

The trend forecast shall indicate changes in the surface wind which involve:

(a) A change in the mean wind direction of 60° or more, the mean speed before and/or after the change being 20km/h (10kt) or more;

(b) A change in mean wind speed of 20 km/h (10 kt) or more; and

(c) Changes in the wind through values of operational significance. The threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:

(1) Require a change in runway(s) in use; and

(2) Indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome.

2.2.3 Visibility

When the visibility is expected to improve and change to or pass through one or more of the following values, or when the visibility is expected to deteriorate and pass through one or more of the following values: "150, 350, 600, 800, 1500 or 3000" m, the trend forecast shall indicate the change. When significant numbers of flights are conducted in accordance with the visual flight rules, the forecast shall additionally indicate changes to or passing through 5000m.

Note: In trend forecasts appended to local routine and special reports, visibility refers to the forecast visibility along the runway(s); in trend forecasts appended to METAR and SPECI, visibility refers to the forecast prevailing visibility.

2.2.4 Weather phenomena

2.2.4.1 The trend forecast shall indicate the expected onset, cessation or change in intensity of one or more, up to a maximum of three, of the following weather phenomena or combinations thereof:

1. Freezing precipitation
2. Moderate or heavy precipitation (including showers thereof)
3. Dust storm
4. Sandstorm
5. Thunderstorm with precipitation
6. Other weather phenomena, only if they are expected to cause a significant change in visibility.

2.2.4.2 The trend forecast shall indicate the expected onset or cessation of one or more, up to a maximum of three, of the following weather phenomena or combinations thereof:

1. Ice crystals
2. Freezing fog
3. Low drifting dust, sand or snow

4. Blowing dust, sand or snow
5. Thunderstorm without precipitation
6. Squall
7. Funnel cloud (tornado or waterspout).

2.2.4.3 The total number of phenomena reported in 2.2.4.1 and 2.2.4.2 shall not exceed three.

2.2.4.4 The expected end of occurrence of the weather phenomena shall be indicated by the abbreviation "NSW".

2.2.5 Clouds

When the height of the base of a cloud layer of BKN or OVC extent is expected to lift and change to or pass through one or more of the following values, or when the height of the base of a cloud layer of BKN or OVC extent is expected to lower and pass through one or more of the following values: "30, 60, 150, 300, 450" m "100, 200, 500, 1000, 1500" ft, the trend forecast shall indicate the change. When the height of the base of a cloud layer is below or is expected to fall below or rise above 450m (1500ft), the trend forecast shall also indicate changes in cloud amount from NSC, FEW, or SCT increasing to BKN or OVC, or changes from BKN or OVC decreasing to NSC, FEW or SCT. When no cumulonimbus and no cloud below 1500m (5000ft) or below the highest minimum sector altitude, whichever is greater, are forecast and "CAVOK" and "NSC" are not appropriate, the abbreviation "NSC" shall be used.

2.2.6 Vertical visibility

When the sky is expected to remain or become obscured and vertical visibility observations are available at the aerodrome, and the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: "30, 60, 150 or 300" m "100, 200, 500 or 1000" ft, the trend forecast shall indicate the change.

2.2.7 Additional criteria

Criteria for the indication of changes based on local aerodrome operating minima, additional to those specified in 2.2.2 to 2.2.6, shall be used as agreed between the meteorological authority and the operator(s) concerned.

2.3 Use of change indicators

2.3.1 When a change is expected to occur, the trend forecast shall begin with one of the change indicators "BECMG" or "TEMPO".

2.3.2 The change indicator "BECMG" shall be used to describe forecast changes where the meteorological conditions are expected to reach or pass through specified values at a regular or irregular rate. The period during which, or the time at which, the change is forecast to occur shall be indicated, using the abbreviations "FM", "TL", or "AT", as appropriate, each followed by a time group in hours and minutes. When the change is forecast to begin and end wholly within the trend forecast period, the beginning and end of the change shall be indicated by using the abbreviations "FM" and "TL", respectively, with their associated time groups. When the change is forecast to commence at the beginning of the trend forecast period but be completed before the end of that period, the abbreviation "FM" and its associated time group shall be omitted and only "TL" and its associated time group shall be used. When the change is forecast to begin during the trend forecast period and be completed at the end of that period, the abbreviation "TL" and its associated time group shall be omitted and only "FM" and its associated time group shall be used. When the change is forecast to occur at a specified time during the trend forecast period, the abbreviation "AT" followed by its associated time group shall be used. When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period or when the change is forecast to occur within the trend forecast period but the time is uncertain, the abbreviations "FM", "TL" or "AT" and their associated time groups shall be omitted and the change indicator "BECMG" shall be used alone.

2.3.3 The change indicator "TEMPO" shall be used to describe forecast temporary fluctuations in the meteorological conditions which reach or pass specified values and last for a period of less than one hour in each instance and, in the aggregate, cover less than one-half of the period during which the fluctuations are forecast to occur. The period during which the temporary fluctuations are forecast to occur shall be

indicated, using the abbreviations "FM" and/or "TL", as appropriate, each followed by a time group in hours and minutes. When the period of temporary fluctuations in the meteorological conditions is forecast to begin and end wholly within the trend forecast period, the beginning and end of the period of temporary fluctuations shall be indicated by using the abbreviations "FM" and "TL", respectively, with their associated time groups. When the period of temporary fluctuations is forecast to commence at the beginning of the trend forecast period but cease before the end of that period, the abbreviation "FM" and its associated time group shall be omitted and only "TL" and its associated time group shall be used. When the period of temporary fluctuations is forecast to begin during the trend forecast period and cease by the end of that period, the abbreviation "TL" and its associated time group shall be omitted and only "FM" and its associated time group shall be used. When the period of temporary fluctuations is forecast to commence at the beginning of the trend forecast period and cease by the end of that period, both abbreviations "FM" and "TL" and their associated time groups shall be omitted and the change indicator "TEMPO" shall be used alone.

2.4 Use of the probability indicator

The indicator "PROB" shall not be used in trend forecasts.

3. CRITERIA RELATED TO FORECASTS FOR TAKE-OFF

3.1 Format of forecasts for take-off

The format of the forecast should be as agreed between the meteorological authority and the operator concerned. The order of the elements and the terminology, units and scales used in forecasts for take-off should be the same as those used in reports for the same aerodrome.

3.2 Amendments to forecasts for take-off

The criteria for the issuance of amendments for forecasts for take-off for surface wind direction and speed, temperature and pressure and any other elements agreed locally should be agreed between the meteorological authority and the operators concerned. The criteria should be consistent with the corresponding criteria for special reports established for the aerodrome.

4. CRITERIA RELATED TO AREA AND ROUTE FORECASTS, OTHER THAN FORECASTS ISSUED WITHIN THE FRAMEWORK OF THE WORLD AREA FORECAST SYSTEM

4.1 Format of area and route forecasts

4.1 Format and content of GAMET area forecasts

When prepared in GAMET format, area forecasts shall contain two sections: Section I related to information on en-route weather phenomena hazardous to low-level flights, prepared in support of the issuance of AIRMET information, and Section II related to additional information required by low-level flights. The content and order of elements in a GAMET area forecast, when prepared, shall be in accordance with the template shown in Table A5-3. Additional elements in Section II shall be included in accordance with regional air navigation agreement. Elements which are already covered by a SIGMET message shall be omitted from GAMET area forecasts.

4.2 Amendments to GAMET area forecasts

When a weather phenomenon hazardous to low-level flights has been included in the GAMET area forecast and the phenomenon forecast does not occur, or is no longer forecast, a GAMET AMD shall be issued, amending only the weather element concerned.

Note: Specifications regarding the issuance of AIRMET information amending the area forecast in respect of weather phenomena hazardous for low-level flights.

4.3 Content of area forecasts for low-level flights in chart form

4.3.1 When chart form is used for area forecasts for low-level flights, the forecast of upper wind and upper-air temperature shall be issued for points separated by no more than 500 km (300 NM) and for at least the following altitudes: 600, 1 500 and 3 000 m (2 000, 5 000 and 10 000 ft), and 4 500 m (15 000 ft) in mountainous areas.

4.3.2 When chart form is used for area forecasts for low-level flights, the forecast of SIGWX phenomena shall be issued as low-level SIGWX forecast for flight levels up to 100 (or up to flight level 150 in mountainous areas, or higher, where necessary). Low-level SIGWX forecasts shall include the following items:

missing forecast (C)					
END OF TAF IF THE FORECAST IS MISSING.					
Days and period of validity of forecast (M)	Days and period of the validity of the forecast in UTC (M)	nnnn/nnnn			1606/1624 0812/0918
Identification of a cancelled forecast (C)	Cancelled forecast identifier (C)	CNL			CNL
END OF TAF IF THE FORECAST IS CANCELLED.					
Surface wind (M)	Wind direction (M)	nnn *or* VRB[2]			24004MPS; VRB01MPS (24008KT); (VRB02KT) 19005MPS (19010KT)
	Wind speed (M)	[P]nn[n]			00000MPS (00000KT) 140P49MPS (140P99KT)
	Significant speed variations (C)[3]	G[P]nn[n]			12003G09MPS (12006G18KT) 24008G14MPS (24016G28KT)
	Units of measurement (M)	MPS (*or* KT)			
Visibility (M)	Prevailing visibility (M)	nnnn		C A V O K	0350 7000 9000 9999 CAVOK
Weather (C)[4, 5]	Intensity of weather phenomena (C)[6]	– *or* +	—		
	Characteristics and type of weather phenomena (C)[7]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or*	IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or*		RA HZ +TSRA FG –FZDZ PRFG +TSRASN SNRA FG

Element as specified in Chapter 6	*Detailed content*	*Template(s)*				*Examples*
		SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSRA *or* TSSN		BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG		
Cloud (M)[8]	Cloud amount and height of base or vertical visibility (M)	FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn *or* VV///	NSC		FEW010 VV005 OVC020 VV/// NSC SCT005 BKN012
	Cloud type (C)[4]	CB *or* TCU	—			SCT008 BKN025CB
Temperature (O)[9]	Name of the element (M)	TX				TX25/1013Z TN09/1005Z TX05/2112Z TNM02/2103Z
	Maximum temperature (M)	[M]nn/				
	Day and time of occurrence of the maximum temperature (M)	nnnnZ				
	Name of the element (M)	TN				
	Minimum temperature (M)	[M]nn/				
	Day and time of occurrence of the minimum temperature (M)	nnnnZ				
Expected significant changes to one or more of the above elements during the period of validity (C)[4, 10]	Change or probability indicator (M)	PROB30 [TEMPO] *or* PROB40 [TEMPO] *or* BECMG *or* TEMPO *or* FM				
	Period of occurrence or change (M)	nnnn/nnnn				
	Wind (C)[4]	nnn[P]nn[n][G[P]nn[n]]MPS *or* VRBnnMPS (*or* nnn[P]nn[G[P]nn]KT *or* VRBnnKT)				TEMPO 0815/0818 25017G25MPS (TEMPO 0815/0818 25034G50KT) TEMPO 2212/2214 17006G13MPS 1000 TSRA SCT010CB BKN020 (TEMPO 2212/2214 17012G26KT 1000 TSRA SCT010CB BKN020)
	Prevailing visibility (C)[4]	nnnn			C A V O K	BECMG 3010/3011 00000MPS 2400 OVC010 (BECMG 3010/3011 00000KT 2400 OVC010) PROB30 1412/1414 0800 FG
	Weather phenomenon: intensity (C)[6]	– *or* +	—	NSW		BECMG 1412/1414 RA TEMPO 2503/2504 FZRA TEMPO 0612/0615 BLSN PROB40 TEMPO 2923/3001 0500 FG
	Weather phenomenon: characteristics and type (C)[4, 7]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or*	IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or*			

Element as specified in Chapter 6	*Detailed content*	*Template(s)*				*Examples*
		SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSRA *or* TSSN	BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG			
	Cloud amount and height of base or vertical visibility (C)[4]	FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn *or* VV///	NSC		FM051230 15015KMH 9999 BKN020 (FM051230 15008KT 9999 BKN020) BECMG 1618/1620 8000 NSW NSC
	Cloud type (C)[4]	CB *or* TCU	—			BECMG 2306/2308 SCT015CB BKN020

Notes:

1. Fictitious location.
2. To be used in accordance with 1.2.1.
3. To be included in accordance with 1.2.1.
4. To be included whenever applicable.
5. One or more, up to a maximum of three, groups in accordance with 1.2.3.
6. To be included whenever applicable in accordance with 1.2.3. No qualifier for moderate intensity.
7. Weather phenomena to be included in accordance with 1.2.3.
8. Up to four cloud layers in accordance with 1.2.4.
9. To be included in accordance with 1.2.5, consisting of up to a maximum of four temperatures (two maximum temperature and two minimum temperatures)
10. To be included in accordance with 1.3, 1.4 and 1.5.

Use of change and time indicators in TAF

Change or time indicator		*Time period*	*Meaning*	
FM		$n_dn_dn_hn_hn_mn_m$	used to indicate a significant change in most weather elements occurring at n_dn_d day, n_hn_h hours and n_mn_m minutes (UTC); all the elements given before "FM" are to be included following "FM" (i.e. they are all superseded by those following the abbreviation)	
BECMG		$n_{d1}n_{d1}n_{h1}n_{h1}/n_{d2}n_{d2}n_{h2}n_{h2}$	the change is forecast to commence at $n_{d1}n_{d1}$ day and $n_{h1}n_{h1}$ hours (UTC) and be completed by $n_{d2}n_{d2}$ day and $n_{h2}n_{h2}$ hours (UTC); only those elements for which a change is forecast are to be given following "BECMG"; the time period $n_{d1}n_{d1}n_{h1}n_{h1}/n_{d2}n_{d2}n_{h2}n_{h2}$ should normally be less than 2 hours and in any case should not exceed 4 hours	
TEMPO		$n_{d1}n_{d1}n_{h1}n_{h1}/n_{d2}n_{d2}n_{h2}n_{h2}$	temporary fluctuations are forecast to commence at $n_{d1}n_{d1}$ day and $n_{h1}n_{h1}$ hours (UTC) and cease by $n_{d2}n_{d2}$ day and $n_{h2}n_{h2}$ hours (UTC); only those elements for which fluctuations are forecast are to be given following "TEMPO"; temporary fluctuations should not last more than one hour in each instance, and in the aggregate, cover less than half of the period $n_{d1}n_{d1}n_{h1}n_{h1}/n_{d2}n_{d2}n_{h2}n_{h2}$	
PROBnn	—	$n_{d1}n_{d1}n_{h1}n_{h1}/n_{d2}n_{d2}n_{h2}n_{h2}$	probability of occurrence (in %) of an alternative value of a forecast element or elements; nn = 30 or nn = 40 only; to be placed after the element(s) concerned	—
	TEMPO	$n_{d1}n_{d1}n_{h1}n_{h1}/n_{d2}n_{d2}n_{h2}n_{h2}$		probability of occurrence of temporary fluctuations

Table A5-4. Ranges and resolutions for the numerical elements included in TAF

Element as specified in Chapter 6		*Range*	*Resolution*
Wind direction:	° true	000 – 360	10
Wind speed:	MPS	00 – 99*	1
	KT	00 – 199*	1
Visibility:	M	0000 – 0750	50
	M	0800 – 4 900	100
	M	5 000 – 9 000	1 000
	M	10 000 –	0 (fixed value: 9 999)
Vertical visibility:	30's M (100's FT)	000 – 020	1
Cloud: height of cloud base:	30's M (100's FT)	000 – 100	1
Air temperature (maximum and minimum):	°C	–80 – +60	1

* There is no aeronautical requirement to report surface wind speeds of 50 m/s (100 kt) or more; however, provision has been made for reporting wind speeds up to 99 m/s (199 kt) for non-aeronautical purposes, as necessary.

Appendix J

Introduction

The courses are of various standards, some being designed for the newcomer to Meteorology and Hydrology. The primary purpose of most courses is to qualify the trainee for the duties which are expected to be undertaken by him as a member of a meteorological and hydrological service.

The Egyptian Meteorological Authority provides professional training for its meteorological staff. Many of the courses are-open to other Meteorological staff from other meteorological services.

A courses in this booklet have been prepared in the light of WMO publication (Guidelines for the education and training of meteorological personnel) WMO - No. 258. All training courses are given in Arabic or English, according to the requirement of training, under the supervision of the WMO RTC/Cairo, within the premises of the Egyptian Meteorological Authority.

Computer and Internet Lab.

The innovation in this issue is to complete the follow up of the new classification of WMO for meteorological personnel in levels and duties, taking into consideration the concept of continuous training. The course reference number is composed in an objective manner using one or more from the following abbreviations:

1. M For meteorologist
2. MT Meteorological Technicians
3. HT Hydrological Technicians
4. E Electronics
5. j Junior level
6. m Medium level
7. s senior level

Candidates from other countries can be admitted, subject to approval, for training at a standard rate, a reduced rate, or free of charge. Admittance of the trainees from these countries to the various courses could be achieved by one of the following means:

1. The UNDP fellowship included in the Country programme.
2. The World Meteorological Organization Programme.
3. The country's national funds.

The Egyptian Meteorological Authority would consider favourably granting short and long term fellowships in case none of the above facilities could be exploited, within the limits of the assigned budget.

In February 1965 the Institute of Meteorological Research and Training was designated with the help of UNDP. The Executive Council (EC)- 20 of the World Meteorological Organization (WMO) agreed in 1968 to announce the institute as a Regional Training Center for Meteorological Instruments for English speaker in Africa (RA I).

Inquiries and requests for places on particular courses should be addressed-as early as possible-to the following address:

The Chairman, Board of Directors
Egyptian Meteorological Authority
Qoubry Al-Qoubba
P.O.Box 11784
Cairo -*Egypt.*

Tel. +(202) 26841070 - 26849860 Fax. +(202) 26849857

E-mail: rtc@ema.gov.eg

At the termination of each course a report is issued to each participant, to reflect the activities of the trainee during the period of the course and the results achieved by him through his training; with a certificate recording his grades in the final examination.

Chairman Board of Directors
Egyptian Meteorological Authority
WMO RTC / Cairo

Finally, The EC– 41 in 1989 assigned the institute as a Regional Meteorological Training Center (RMTC-Cairo) for all meteorological personnel according to WMO Classification.

During the last 40 years RMTC-Cairo helped in preparing professional scientific and technical personnel in Meteorology for Egypt, Africa (RA I), Asia (RA VI) and all Arab countries.

Running Programs at WMO RTC/Cairo:

The training book of RTC / Cairo Contains about 22 training programs cover the new classification of WMO in the fields of Meteorology, Hydrology and instruments. During the last 40 years more than 450 meteorologists, thousands of Forecasters and Technicians had been trained in fields of meteorological observations and maintenance, in addition to large number of users of meteorological information, in civilian, military, aviation agriculture, environment, and publicity fields.

The above achievements were crowned in the WMO annual reports by announcing RTC/Cairo as the one of the FIRST over all regional and local training centers classified by WMO. A lot of thanks letters and certificates were received from the permanent representatives (P R) of met. authorities in the international organization.

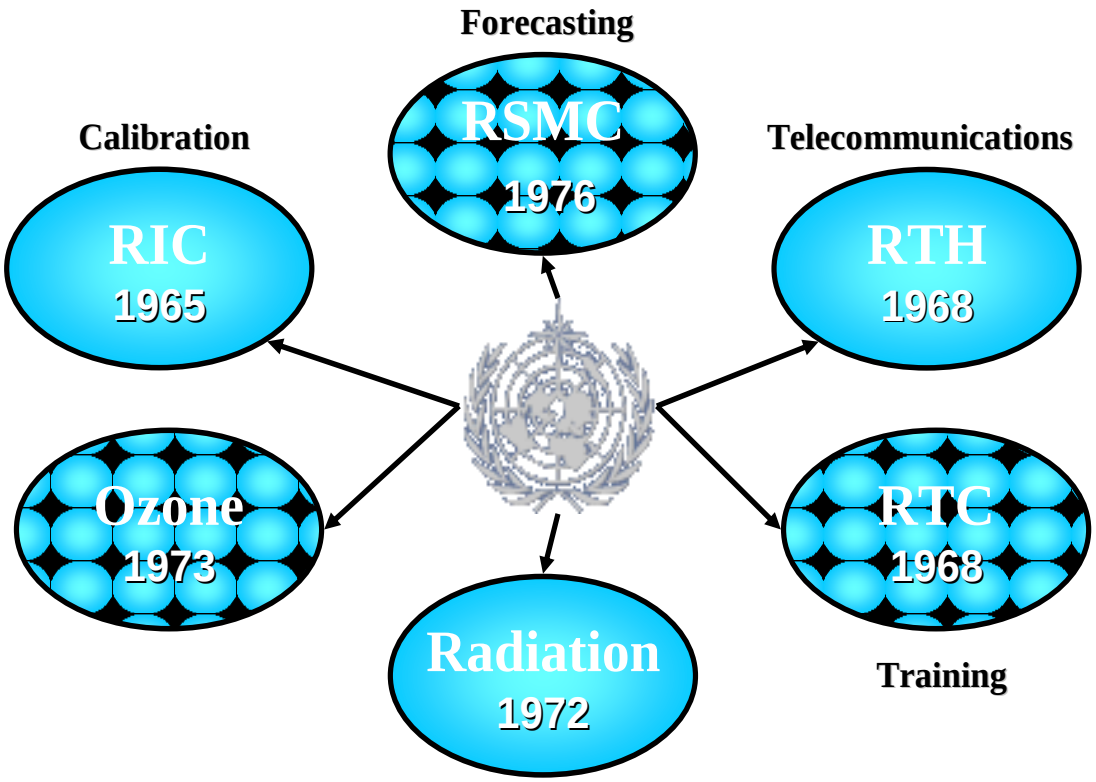
Reasons of Success:

1- RTC/Cairo has the advantages of using the available Remote sensing facilities real exist in the Met. Authority as :

Meteorological Data Distribution (MDD)
Satellite Distribution System (SADIS)
Primary Data Users Stations (PDUS)
High Resolution Picture Transmission (HRPT)
Eumetsat Second Generation (MSG)
MESSIER VISION (MV)

2- RTC/Cairo exist in the same building with 6 WMO Regional Centers:

Regional Centers at EMA



3- Egypt, as a historical, civilized and secure place, is a favorable place to visit, which give another advantages to train your people on it.

Besides , we have relations with many Academic and Research Centres in

national and international dimension

Table of Contents

Course reference number :	Mj-01
Level :	**JUNIOR -Level**
Objective :	**To serve as synoptic forecaster in general and aeronautical forecaster in particular.**
	To be able to study normal and upnormal cases and issue necessary reports.
Qualifications :	**B.Sc. in Physics and/or mathematics.**
Duration :	**32 weeks.**

Meteorologist

SYLLABUS

Introduction

Benefits of meteorology to the different activities of mankind and particularly on the economic side, brief introduction to the aims and functions of the international organizations in the field of meteorology and in particular that of the WMO, the role of meteorological services, the Egyptian Meteorological Authority, structure and functions of its main scientific and technical division.

Physical Meteorology

Thermodynamics and cloud physics: The equation of state for perfect gases and their mixtures applied to dry air and water vapor. Laws of thermodynamics and irreversible process, the concept of entropy. Change of phase in thermodynamics relationship of T, Te, e, ……etc. lifting condensation level and saturation point, thermodynamic diagrams and their uses, hydrostatic equation. Hydrostatics of special atmosphere, standard atmosphere, dry and saturated adiabatic laps rates, static stability, stability criteria for dry and moist air, parcel and slice methods, entertainment and buoyancy in cumulus clouds top mixing, diurnal variation of stability, radiative cooling, subsidence, formation of fog.
Atmospheric radiation: Black body radiation, methods of detection of radiation, instruments used of measurements of solar radiation and their calibration methods, the astronomy of the earth-sun system with practical calculations, global solar radiation, diffuse solar radiation, direct solar radiation, structure of the atmosphere and the interaction of solar radiation with the atmosphere, terrestrial radiation, the albedo of the earth's surface and the atmosphere, the energy budget at the earth's surface and outer atmosphere, the long cycles of the earth-sun system (MilanKovich cycles), the climate modeling and sensitivity barometer, the feedback process, and the factors affecting the climate system and the climate variability.

Dynamic meteorology

Real and apparent forces affecting atmospheric motions, equation of motion in inertial and rotating coordinate systems, relative equation of motion and its components in different coordinate. Scale analysis of the relative equation of motion, geostrophic and hydrostatic approximations, horizontal frictionless flow of balanced motions. thermal wind barotropic and baroclinic atmosphere, divergence and vorticity theorems, their scale analysis.

Wind field, rotational divergence and deformation fields, stream lines, Helmholtz theorem for resolving horizontal wind field into rotational and irrotational components, stream function and velocity-potential, vorticity and divergence equations in different coordinate systems, continuity equation, pressure tendency equation, barotropic and baroclinic fluids. atmospheric wave including Rossby waves, sound waves, gravity waves and Kelvin waves.

Numerical Weather Prediction

Introduction: General remarks about grid point methods, historical introduction, method for the numerical solution of the equations of motion, basic elements of the grid point methods, finite difference schemes, convergence and stability.

Time difference schemes: Definitions of some schemes, a property of schemes applied to the oscillation equation, properties of schemes applies to the friction equation and a combination of scheme.

Practice: the barotropic models.

Aeronautical Meteorology

Aircraft icing, turbulence, other hazardous phenomena, meteorological aspects of flight planning, definitions, procedures for meteorological services for international air navigation, air traffic services, aerodromes, operation of aircraft, aeronautical information services, aeronautical telecommunications, WMO documentation and ICAO documentation.

Agricultural meteorology

Plant physiology, bio-meteorological interrelationships, surface energy balance, water balance, observations and measurements, data processing, operational forecasts, assistance for planning preventing the impact of adverse weather conditions.

Synoptic Meteorology and chart analysis

Different types of charts used in a forecasting office, different scales of motion identifiable in the daily synoptic charts, analysis and identification in the middle and high latitude disturbances, waves in the westerlies, zonal index, long (Rossby) and short waves, pressure-wind relationship, quasi-geostrophy, streamline-isotach analysis, air-masses and fronts, airmasses transformations, frontal slope, weather associated with airmasses, extratropical cyclones and anticyclones, blocking systems, structure of jet streams, analysis and identification of the space time characteristics of tropical synoptic weather systems, vertical tilt of the synoptic scale systems.

Analysis, identification and forecasting of synoptic and meso-scale systems: ITCZ and ITF, monsoons, jet streams, anticyclones, easterly and westerly waves, geostrophic wind, gradient wind, thunderstorms, maximum wind gusts, marine systems, like state of the sea, ocean waves, swells, cyclones and other synoptic/meso/microscale systems, use of climatology in forecasting, daily, monthly and seasonal dominant synoptic and regional systems.

Meteorological instruments and methods of observations

Met. Observing systems, Surface-based subsystem (e.g. surface synoptic station, upper-air station, climatologically station, etc) and space-based subsystem. General requirements of a met. Station, Automatic weather station, observers sitting and exposure, General requirements, Measurements standards and definitions, Uncertainty of measurements.

Meteorological codes

Synop, METAR, SPECI, TEMP, TAF, ARFOR, ROFOR, SIGMET, AIRMET, WARNING, SIGWX chart.

Climatology

Introduction, the physical basis of climatology, world climatic patterns, regional climate, local climates, climatic change, variability, climatic impacts and applications.

Satellite images Interpretations

Fundamental ideas in Radiation transfer and satellite remote sensing, Types of meteorological satellite, Satellite characteristics, Dissemination of satellite imagery, Basic interpretation of VIS imagery, Basic interpretation of IR imagery, Basic interpretation of WV imagery, Basic interpretation of 3.7 μm (channel-3) imagery. MSG unit facilities, HRPT unit facilities, RGB Technique. Cloud types, Cloud patterns, The Earth's surface, and Atmospheric pollutants.

Waves and fronts. Position of Jet stream, types of cyclogenesis, ITCZ, cyclones and anticyclones.

Selected topics

Seminars on points of interest under supervision (Ozone, AgroMet, Satellite images, climate, synoptic situations, environment…….etc.)

Laboratory Exercises

Plotting and analysis of surface and upper level charts, evaluation of geostrophic wind, non-geostrophic wind and accelerations, geostrophic vorticity, geostrophic advection of different fields.

Construction of thickness charts by using graphical methods, evaluation of thermal wind.

Analysis of thermodynamic diagrams.

Jet stream and tropopause analysis.

Construction of vertical space and time cross sections for different meteorological elements.

Coding and decoding of surface and upper air observations.

lecture Room No.1

METEOROLOGICAL Forecaster

Course reference number : Mj-02

Level : JUNIOR -Level

Objective : To be able to use weather charts, NWP products and satellite Images in forecasting.

Qualifications : **B.Sc. in Physics and/or mathematics, or other suitable university degree.**

Duration : 16 Weeks

SYLLABUS

Introduction

The Egyptian Meteorological Authority, structure and functions of its main scientific and technical division.

Physical Meteorology

Thermodynamics and cloud physics: The equation of state for perfect gases and their mixtures applied to dry air and water vapor. Laws of thermodynamics and irreversible process, the concept of entropy. Change of phase in thermodynamics relationship of T, Te, e, ……etc. lifting condensation level and saturation point, thermodynamic diagrams and their uses, hydrostatic equation. Hydrostatics of special atmosphere, standard atmosphere, dry and saturated adiabatic laps rates, static stability, stability criteria for dry and moist air, parcel and slice methods, entertainment and buoyancy in cumulus clouds top mixing, diurnal variation of stability, radiative cooling, subsidence, formation of fog.

Dynamic meteorology

Real and apparent forces affecting atmospheric motions, equation of motion in inertial and rotating coordinate systems, Scale analysis, geotropic and hydrostatic approximations, horizontal frictionless flow of balanced motions. Thermal wind Barotropic and Baroclinic atmosphere, divergence and vorticity theorems. Wind field, rotational divergence and deformation fields, stream lines, vorticity and divergence equations in different coordinate systems, continuity equation, pressure tendency equation. Atmospheric wave .

Numerical Weather Prediction

Read, study and use NWP models products to enhance the accuracy of weather forecast.

Aeronautical Meteorology

Definitions and procedures for meteorological services for international air navigation, air traffic services, WMO documentation and ICAO documentation.

Synoptic Meteorology and chart analysis

Different types of charts used in a forecasting office, different scales of motion identifiable in the daily synoptic charts, analysis and identification in the middle and high latitude disturbances, streamline-isotach analysis, air-masses and fronts, air masses transformations, frontal slope, weather associated with air masses, extra tropical cyclones and anticyclones, blocking systems, jet streams, tropical synoptic weather systems, vertical tilt of the synoptic scale systems.

Analysis, identification and forecasting of synoptic and meso-scale systems: ITCZ and ITF, monsoons, anticyclones, easterly and westerly waves, geostrophic wind, gradient

wind, thunderstorms, maximum wind gusts, marine systems, like state of the sea, ocean waves, swells, cyclones and other synoptic/meso/microscale systems,

Meteorological instruments and methods of observations

Met. Observing systems, Surface-based subsystem (e.g. surface synoptic station, upper-air station, climatologically station, etc) and space-based subsystem. General requirements of a met. Station, Automatic weather station, observers sitting and exposure, General requirements, Measurements standards and definitions, Uncertainty of measurements.

Meteorological Codes

Synop, METAR, SPECI, TEMP, TAF, ARFOR, ROFOR, SIGMET, AIRMET, WARNING, SIGWX chart.

Climatology

World climatic patterns, regional climate, local climates, climatic change, variability, climatic impacts and applications.

Satellite images Interpretations

MSG unit facilities, HRPT unit facilities, RGB Technique, interpretation of cloud types, cloud patterns, earth's surface, and Atmospheric pollutants.

Waves and fronts. Position of Jet stream, types of cyclogenesis, ITCZ, cyclones and anticyclones

Laboratory Exercises

Plotting and analysis of surface and upper level charts, evaluation of geostrophic wind, non-geostrophic wind and accelerations, geostrophic vorticity, geostrophic advection of different fields.

Analysis of thermodynamic diagrams.

Jet stream and tropopause analysis.

Coding and decoding of surface and upper air observations.

Upper Air Station with GPS

Satellite Images Interprétation

Course reference number:	Mm-01
Level :	MID -Level
Objective :	To be able to use and interpret satellite Images in forecasting.
Qualifications :	Mj-01 or Mj-02 & 2 years Experience as a forecaster in any Forecasting Center.

Duration : 4 Weeks

SYLLABUS

Introduction

Basic principles: Fundamental ideas in Radiation transfer and satellite remote sensing, Types of meteorological satellite, Satellite characteristics, Dissemination of satellite imagery, Basic interpretation of WV imagery, Basic interpretation of 3.7 μm (channel-3) imagery.

Simple identification: Cloud types, Cloud patterns, The Earth's surface, Atmospheric pollutants. Interpretation of VIS imagery, Basic interpretation of IR imagery,

Synoptic-scale cloud and moisture patterns

Introduction: Conveyor belts associated with fronts and waves

Interpreting large-scale patterns of cirriform cloud and moisture: Cirrus cloud bands, Cirrus shields, Deformation zone cirrus and moisture.

Interpreting patterns of cumuliform clouds: Locating thermal troughs, locating upper short-wave troughs, locating jet-stream axes, locating surface ridges.

Interpreting features associated with baroclinic troughs: Leaf, Comma, Vortex.

Fronts and waves

Classical cold fronts: Differences between classical and split fronts, Development of cold frontal cloud bands, Conceptual model, Guidance on analysis from imagery, Surface weather, Squall line development, Interaction with jet streaks.

Split cold fronts: Development of split frontal cloud bands, Features on satellite images, Surface and upper air analyses, Conceptual model and surface weather.

Warm fronts: The cloud band, Cloud development in the warm sector, 'Detached' warm frontal cloud, Precipitation distribution.

Instant (pseudo) occlusions: Synoptic scale, Mesoscale.

Synoptic-scale waves: Basic dynamical concepts, Features on satellite images, Examples.

Depressions in mid-latitudes

Cloud signatures preceding cyclogenesis: identifying key components, upper-flow patterns from satellite images.

Types of cyclogenesis: Evolutions from enhanced cumulus or comma, Evolutions from the main frontal cloud, Flat trough, confluent flow cyclogenesis (cloud head).

Mid-latitude cyclogenesis associated with tropical storms: Tropical storm regeneration, Cyclogenesis initiated by tropical storms, forecasting guidelines.

Occlusions and mature depressions: Occluded fronts, Cloud and weather in occluded depressions.

Non-deepening depressions: Clues from imagery, Upper-air patterns.

Polar lows: Weather associated with polar lows, Polar lows within a synoptic-scale cold core aloft, Polar low development within a surface trough, Comma cloud associated with an upper trough, Waves associated with shallow baroclinic zones, Reverse-shear polar lows, A polar-low-like vortex in the Mediterranean.

Convective cloud patterns

Convection initiated over oceans: Cloud patterns and their relation to atmospheric structure, further examples of maritime convection, Modifications near coasts.

Topographically induced convective cloud patterns: Convection associated with sea-breezes, Convection associated with land-breezes, Land-based convection near inland water bodies, Winter time cloud bands, The influence of initial cloud cover on subsequent convection, The influence of wet ground and vegetation on convection, The influence of cities on convection, Convection over elevated terrain, Orographically induced convergence zones and meso-scale vortices.

Thunderstorm outflow and convective interaction: Convective storm low-level outflow and arc cloud lines, Outflow boundaries and new thunderstorm development.

Organized meso-scale convective systems: Features in the pre-storm environment, Types of meso-scale convective systems, Life cycle and evolution of an MCS, Precipitation

patterns in MCSs, Severe weather associated with MCSs, Summary of forecasting convection.

Fog and low cloud

Radiation fog and stratus: Detection of fog in the daytime, Distinguishing between fog and stratus, Detection of fog at night, Formation of fog and stratus within moisture boundaries, Guidelines on formation and detection of fog, Dissipation of fog and stratus: the role of inward mixing, Guidelines for forecasting dissipation of fog.

Sea fog: Daytime imagery, Nighttime imagery, Sea fog motion, the effect of coastlines and other meso-scale influences on fog.

Stratocumulus: The appearance of stratocumulus, The importance of stratocumulus, The physical environment and evolution of stratocumulus, The motion of stratocumulus, Satellite observations of stratocumulus cloud-top temperature, Small-scale structure of stratocumulus.

Orographic and polar phenomena

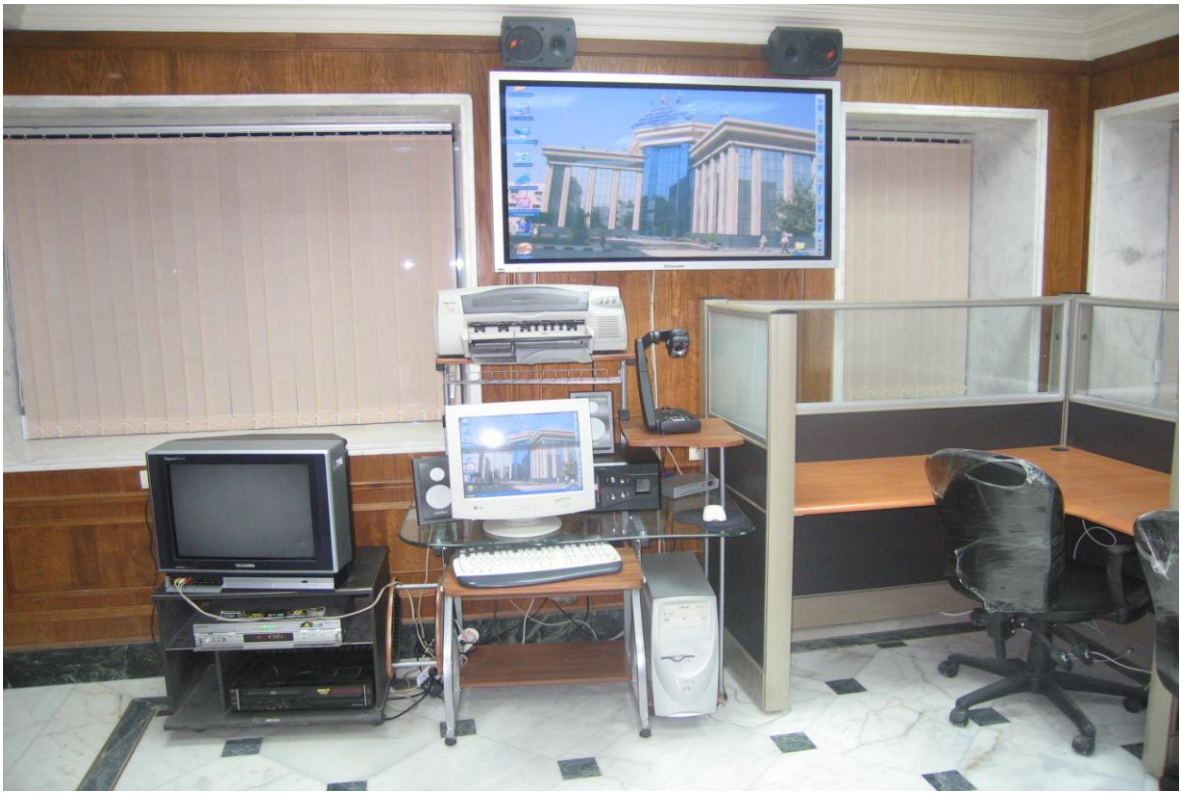
Clouds generated by mountains: Lee waves and orographic cirrus, Inferring areas of turbulence, other examples.

Mountain barrier effects: föhn : The barrage cloud, Fog

Polar phenomena: Identifying clouds in polar imagery, High-latitude cloud types, Topographical phenomena, Vortices in the Polar Regions.

On job training

The participants will take an hour every day on job training using HRPT, MSG, MESSIER VISION and SYNERGIE in the main remote sensing center.



MEDIA PRODUCTION UNIT AT RTC/C

Course reference number :	Mm-02
Level :	MID -Level
Objective :	To use, operate and/or modify the products of NWP models.
Qualifications :	Mj-01 & 2 years Experience as a forecaster in any Forecasting Center. (UNIX and Fortran are highly needed).
Duration :	8 Weeks

Numerical Weather Prediction

SYLLABUS

Introduction
General review on Fortran , Linux, Shell programming, and Grads .

Dynamic meteorology
The governing equations: equation of motion in different coordinate systems. Continuity equation. Scale analysis.
The dynamic boundary layer:
Simple types of wave motion in the atmosphere: linearized equation. The sound wave. The gravity wave. Barotropic and baroclinic instability Waves, boundary layers and vertical coordinates.

Physical meteorology
Physical fundamentals: 1st law of thermodynamics. Hydrostatic stability. Basic radiation laws. Radiation balance. Water balance. Energy balance.

Thermodynamic laws, energy equation.

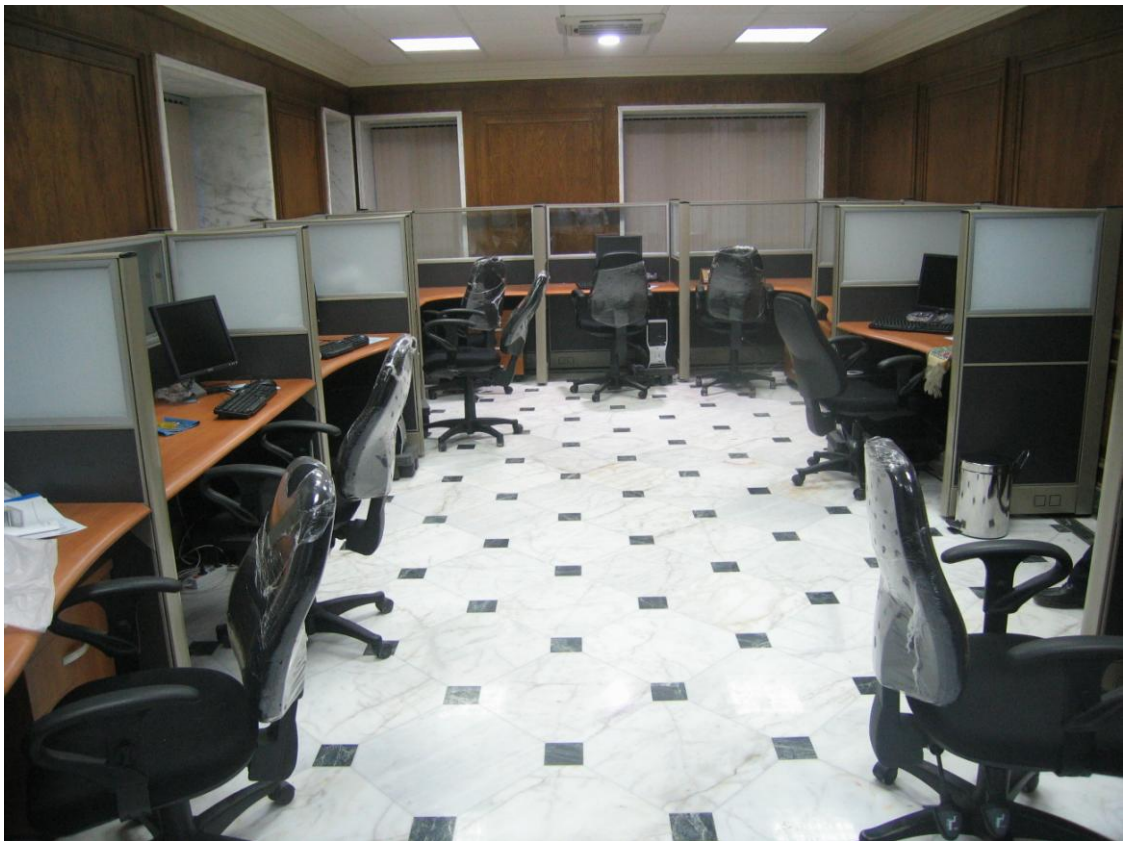
Numerical schemes
Numerical methods: Basic commands to deal with files & directory, Script files, download data, data types, subroutines & functions, modules,
Numerical practice: Time schemes, Grid types, ETA & Sigma coordinates, Dimensions & Arrays.

Objective analysis and data assimilation
Introduction, objective analysis methods. Data assimilation procedure.

Parameterization
Introduction. Convective parameterization: adjustment scheme, mass-flux scheme and large-scale precipitation scheme. Boundary layer parameterizations, radiation parameterization and dust parameterization.

Practice

Installing & running of MM5, Installing & running of WS_ETA, Installing & running of RegCM, Use of "ensemble model idea" by comparing ETA-product with other products of NOAA and ECMWF.



Numerical Weather Prediction Lab.

Use of nwp to enhance forecast

Course reference number :	Mm-03
Level :	MID -Level
Objective :	Read, Interpret & use the products of NWP models to enhance weather forecast.
Qualifications :	Mj-01 or Mj-02 & 2 years Experience as a forecaster in any Forecasting Center.
Duration :	2 Weeks

SYLLABUS

Introduction

General review on synoptic, physical & dynamical Met.

Numerical schemes

- Basic commands to deal with files and directory
- Introduction to shell programming
- Data types
- Input / Output files
- Finite difference
- Time schemes

Practice

Installing & running of MM5, Installing & running of WS_ETA, Installing & running of RegCM, Use of "ensemble model idea" by comparing ETA-product with other products of NOAA and ECMWF.

Synoptic meteorology

Course reference number : Mm-04

Level : **MID -Level**

Objective : **To be able to:**

- **Monitor the numerical analysis and if necessary correct them.**
- **Diagnose physically the momentary state of the atmosphere.**
- **Interpret the numerically computed forecasting results.**
- **Derive weather forecasts in case of obvious false prognosis from the models independently from numerical methods.**

Qualifications : **Mj-01 or Mj-02 & 2 years Experience.**

Duration : **4 Weeks**

SYLLABUS

Introduction

General revision on course Professional Forecaster with special emphasis in synoptic and dynamic meteorology.

Dynamic meteorology

Scale analysis of synoptic system, hydrostatic equilibrium, trajectories and stream lines, temperature advection and local temperature change, geostrophic and agestrophic wind

component, dynamic stability, translation, deformation, divergence, vorticity, circulation theorem, tropospheric waves, kinematics of large scale structures. Dynamic of convective weather system, numerical weather prediction, barotropic model, consideration of development in baroclinic to layer mode, ETA model, working with model ensample.

Synoptic meteorology

Structure of cyclones and anticyclones models of cyclogenesis and anti-cyclogenesis, quasi-geostrophic diagnostic, kinematics of large-scale structures, dynamic convective weather system, tropical meteorology, jet streams.

Satellite Images Interpretation

Clouds, Fronts, Jet streams and weather phenomena as appeared from satellite images and their classification. Use of the products of MDD and HRPT in forecasting.

Numerical Weather Prediction

Basic commands to deal with files and directory, Introduction to shell programming, Data types, Input / Output files, Finite difference, Time schemes.

Practice

An introduction to models, using ETA model. Case study using ETA model (synoptic and dynamical descriptions of the case). Using Egyptian - ETA model, case study using Egyptian-ETA model (synoptic and dynamical descriptions). Use of "ensemble model idea" by comparing ETA-product with other products of NOAA and ECMWF.

RECEPTION & SECURITY DEPARTMENT.

Agro meteorologist

Course reference number :	*Mm-05*
Level :	MID -Level
Objective :	To qualify professional forecasters to serve in the field of agro meteorology.
Qualifications :	Mj-01 & 2 years Experience as a forecaster.
Duration :	16 weeks.

SYLLABUS

Introduction

General revision of the main topics of relevance such as radiation and climatology. Importance of weather and climate for agricultural production, national agro meteorological services functions and aims Of the WMO commission for Agricultural Meteorology (CAgM). Maintenance and calibration of the agro meteorological station instruments

Biological measurements

- Stages of crop developments (from plantation to harvest).
- Pests and diseases affecting agriculture crops.
- Crop modeling (growth, elongation, irrigation schedule, bests and disease
- Specific examples of biological / phonological observation .
- Practical training to the topics using locally row data.

Soil and its heat balance

- Exchange the temperature between the atmosphere and the soil.
- Transmission of temperature during the soil.
- Behavior of soil temperature at different depths during bare and grass soil.
- The importance of studying of soil temperature for agriculture.
- Practical training to the topics.

Radiation balance and its relationship with the soil

- Direct and diffuse components of solar short-wave radiation.
- Solar radiation, instruments, calibration, methods of observation, maintenance and data analysis.
- Practical training to the topics using locally row data.

Rainfall data analysis

- Methods of Rainfall data analysis.
- Dry and wet seasons (spells).
- Analysis of extreme values.
- Practical training to the topics using locally row data.

Hydrological cycle and its importance for Agro meteorology

- Water and vegetation.
- Water and crop index.
- Determine of water loss from land surface.

- Evaporation and evapotranspiration measurements.
- Comparison between evaporation equations.
- Practical training to the topics using locally row data.

Statistical computing

- Introduction to the statistics
- Descriptive statistics, correlation, regression and multiple regression, Analysis Of Variance(ANOVA), confidence interval, F-test, Q_square test, --- ect.
- Rainfall data analysis.
- Dry and wet seasons (spells).
- Analysis of extreme values.
- Practical training to the topics using locally row data.
- Estimation of Evaporation and evapotranspiration.
- Using statistics to perform agro meteorological weather report

Agro meteorological stations

- The aim of agro meteorological station
- Routine work of the agro meteorological station
- Agro meteorological station instruments.
- Automatic agro meteorological station.
- Quality control of agro meteorological data.
- Practical training to the topics

Laboratory and field exercises

Visiting to the agro meteorological station. Another visiting to Water Requirements Department, Agriculture Research Center, Giza, Egypt.

Meteorological observer

Course reference number:	MTj-01
Level :	JUNIOR -Level
Objective :	To qualify the participants in the field of meteorology to enable them to perform meteorological observations, meteorological measurements, climatological studies. By this program, the participants have to be able to adapt themselves as appropriate in their future activities as meteorological technicians.
Qualifications :	Secondary school certificate (Science or Mathematics) and/or Electronic technician certificate.
Duration :	24 weeks

SYLLABUS

Introduction

Units and conversion of units, Study the motion of the earth, definition of heat and temperature, solar radiation, causes of the motion of the atmosphere, water in the atmosphere.
The Egyptian Met. Authority (EMA) Structures and functions of its main scientific and technical divisions.
WWW Functions.

General Meteorology

Composition of the atmosphere, vertical division of the atmosphere, heat exchange processes in the atmosphere, air temperature, effect of gravity on the atmosphere, air density, atmospheric pressure, moist air, moisture indicators, expansion (compression) of rising (falling) air bubble, elementary knowledge of synoptic meteorology, solar radiation, heat budget, Buys-Ballot's law and geostrophic wind, local winds, cyclones and anticyclones, air masses and fronts.

Aeronautical Meteorology

Observations peculiar to aviation meteorology, effects of weather elements on ground observations, dissemination of weather information, Aeronautical operational knowledge, general introduction to the procedures for meteorological services for international air navigation, air traffic services, regularity services.

Meteorological instruments and methods of surface observations

General requirements of met. Instruments, recording methods: thermograph, barograph, Sunshine Recorder…etc) conventional instruments (thermometers, mercuric barometers, psycho meter, …etc), Surface wind measurements, visibility, clouds, precipitation & clouds associated, state of ground & sea, electronic sensors, Automatic station, required uncertainty and representativeness with the aid of appropriate instruments.

Meteorological Instruments for upper air observations

General requirements for upper air observation, fundamentals of upper air observation, Radiotheodolite and GPS wind finding, wind profiling system, estimation of sounding balloon rates of ascent and free lifts, processing data by using minicomputer, sensors used in measuring pressure, temperature & RH, recording ground equipments, hydrogen generator, chemical and electrolyses methods. Study of upper air sounding instruments used in national network of aerological stations.

Meteorological Codes

International, regional and national meteorological codes used for reporting significant weather, surface and pilot balloon observations and their mean monthly values.

Climatology

General climatology, Climatic elements, Regional Climatology, Applied climatology, Normal and deviation from means.

Disciplinary Practices

Functions and responsibilities of duty surface observer in general, punctuality, alertness and honesty as being essential factors for the conduct of work in the field of observations.

Electricity and Radio

General principles of electric current, its effects and electrical units, conductors, semiconductors, insulators and electrical circuit components, Ohm's and Kerchief's laws, electrical fields, resistance and impedance, magnetic field of electrical current, inductance and transformers, emission, vacuum tubes, oscillatory circuits, transmitters and receivers, modulation, amplifiers, wave propagation and antenna.

Methods of Observations

Theoretical studies of different methods and systems used in probing the main atmospheric parameters, detailed study of the audio modulated frequency system of Radiosonde including transmitter and ground equipment, theoretical studies of different electronic equipment, detailed study of operations of the radiotheodolites radar wind finding, estimation of sounding balloon rates of ascent and free lifts, processing data by using minicomputer, hydrogen generator, chemical and electrolyses methods.

Laboratory and Field Exercises

1. Handling of measuring and recording meteorological instruments for observations, 1st line practice for simple repair and maintenance on site of these instruments.
2. Identification of weather phenomena, direct and estimated measurements of surface weather elements, cloud observations (form, amount and high).
3. Coding and decoding of surface and pilot balloons observations, and their mean monthly values.
4. Entry of observation in the proper registers, table and forms.
5. Plotting surface and upper air diagrams.
6. On Job Training.

MANUAL MET. INSTRUMENTS LAB.

Upper Air Observer

Course reference number :	MTm-03
Level :	MID –Level
Objective :	To qualify professional observers to serve in the field of upper air measurements
Qualifications :	MTj-01 & 2 years Experience as a Met. Observers
Duration :	4 weeks.

SYLLABUS

Introduction

General revision on Math. & Physics, Radiosonde sounding, Electricity and radio, oscillatory circuits, transmitters, receivers, modulation, amplifiers, power supply, wave propagation.

Meteorological Requirements

Radiosonde data for Met. Operations, Relationships between satellite and radiosonde upper air measurements maximum height of radiosonde observations, accuracy requirements, temperature, relative humidity, geopotential heights

Methods of measurements

Constrains on radio design, radio frequency used by radiosondes, radiosondes electronics, power supply, radio transmitter.

Met. Instruments for upper air observations

Sensors, Radiotheodolite wind measurements, GPS wind measurements, methods of calculations, ground station equipment, general features, software for data processing, preparation of radiosondes for flight, Avoidence of outside interference, Surface observations for sounding, data checking and reporting.

Meteorological codes

International and national Met. Codes used to report upper air observations.

Course reference number :	MTm-04
Level :	**MID –Level**
Objective :	**To qualify professional forecasters to serve in the field of agrorneteorology and hydrometeorology.**
Qualifications :	**MTj-01 and 2 years experience in the field of Meteorology.**
Duration :	**12 weeks.**

Agro met. Technicians

SYLLABUS

Introduction

General revision of the main topics of relevance such as radiation and climatology in course No. 100. Importance of weather and climate for agricultural production, national agrometeorological services functions and aims Of the WMO commission for Agricultural Meteorology (CAgM).

Agrometeorological stations

- Agrometeorological factors and instruments.
- Automatic agrometeorological factors.
- Quality control of automatic station data.

Statistical computing

- Introduction in statistics of data analysis, statistical packages that used in data analysis.
- Practical training to the topics using locally row data.

Analyzing of rainfall data

- Methods of Rainfall data analysis.
- Dry and wet seasons (spells).
- Analysis of extreme values.
- Practical training to the topics using locally row data.

Analysis Soil temperature

- Analyses of soil temperature at different depths at dry and grass field using water balance equation.

Hydrological cycle in Agriculture

- Estimates of evaporation and evapotranspiration from climatological data using empirical formula, desertification.
- Practical training to the topics using locally row data.

Biological measurements (phonology)

- Explain stages of crop developments.
- Pests and diseases.
- Crop modeling.

Weather report

Course reference number : MTm-01

Level : MID –Level

Objective : To be able to adopt themselves as supervisors on monitoring climatic data and observe local climatic variability.

Qualifications : MTj-01 and 2 years experience in the field of Meteorology.

Duration : 16 weeks.

- Steps of preparing 10-days agrometeorological weather report.
- Practical training for preparing 10-days agrometeorological weather report.

Laboratory and field exercises

Visiting to agrometeorological station and water requirements department at agriculture research center at GIZA, EGYPT.

Climatology Technical Assistant

SYLLABUS

Introduction

General revision on mathematics and physics. Definition of: climate, climate system, variables and controllers of climate, and T- Φ grams.

General climatology

General circulation, air masses, classification of climatic systems, locale climate, regional climate, and some climatic phenomena (El-niño, seasonal floods & storms,…….etc.)

Physical climatology

Radiation (heat) and energy budget, energy transfer, water budget concept, water balance components.

Statistics

Simple probability theory, independents of events, measures of dispersions, frequency distribution, data analysis, mapping, introduction to quality control concepts.

Data processing methods

Effect of network size and density, handling climatological data using computers, operating systems, use of utility programs for statistical methods, code and decode the climate data.

Computer science

Programming languages, algorithms, software used in climatology, archiving, construction of vertical and time cross-sections for various fields.

Laboratory exercises

- Building up a data bank
- Extreme value analysis
- Curvilinear relationships
- Validating statistical relationships
- Tests of regression analysis
- Using climatological normals
- ……etc.

Meeting Room.

Synoptic Technical Assistant

Course reference number :	MTm-02
Level :	**MID-Level**
Objective :	**To be able to adept themselves as appropriate in their future activities as synoptic meteorological technicians.**
Qualifications :	**MTj-01 and 2 years experience in the field of Meteorology.**
Duration :	**16 weeks**

SYLLABUS

Introduction

Mathematics: Functions, limits and derived functions, Integral calculus, partial derivatives and differentials, vector calculus, vector analysis and related operators.
Physics: General thermodynamics (1st and 2nd basic principles), fundamental of elementary mechanics, static and dynamics of a particle, deriving speeds and accelerations.

General Meteorology

General circulation (Surface and altitude), Air masses and Frontal boundaries, formation and developments of disturbances, local phenomena.

Physical Meteorology

Overview of the atmosphere and terrestrial system: Description of the atmospheric environment, recalling basics about electromagnetic radiation, solar and terrestrial radiation, Thermodynamics of the dry and wet atmosphere, Depiction of the vertical structure of the atmosphere on dedicated documents (Tephigram), vertical equilibrium and hydrostatic approximation.

Dynamic Meteorology

Introduction to dynamic meteorology, Basic equation of motion, Affecting forces on the atmosphere, Divergence and vorticity.

Statistics

Probability laws, basic assumptions for the statistical approach, sample studies, case studies in meteorology.

Weather analysis and forecasting

Basic principals of weather forecasting, importance of the analysis step, extrapolation, persistence and analogue schemes, methods to be used for forecasts of different ranges, numerical model output and forecast guidance to prepare forecast, global data processing scheme in meteorology, adaptation of general forecasts to lower scale prediction.

Satellite Imagery

Orbits, Different kinds of satellites, Characteristics of meteorological Satellites, Interpretation of satellite images and data.

Computer Science

Programming languages, algorithms and methods used in computer sciences, software development.

Meteorological Telecommunications

The global telecommunication Systems, National meteorological telecommunication networks.

Tropical Meteorology

Energy budget of the earth, general wind circulation, Meteorological equator, Tropical disturbance and hurricanes.

Geography

Map marking, climatology and geography of climates, definitions and classification, climatic area about numerical geographical information systems.

Laboratory exercises

Analysis, Forecasting, Observations, Local climatology, climatology and computer techniques.

Fundamentals Of Electronics

SYLLABUS

Course reference number: MTm-01-E

Level : **MID-Level**

Objective : **To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of electronics.**

Qualifications : **Secondary school certificate (science or math) or MTj-01 or equivalent.**

Duration : **4 weeks**

Introduction

Introduction to the nature of the electricity, where is the flow of electrons in a conductor and there are four quite intuitive quantities help to characterize it. voltage, current, resistance and power.

The behaviour of passive components in DC and AC

Introduction to passive electronic components provides the participants with both a basic and practical understanding of electricity and electronics. The emphasis is an applications rather than theory. Consequently there is a strong hands-on component to the subject to enable students to gain practical experience. Topics covered in the subject include:

- DC and AC circuits
- Resistor in DC and AC circuits.
- Resistor networks
- Capacitor DC and AC circuits.
- Coil DC and AC circuits.

Transformer

- Basic construction and schematic diagram of a real and Ideal transformer.
- Transformer application
- Pulse transformers
- Transformers for blocked oscillators

Semiconductor electronic components

- Physics of the semiconductors
- Characteristics of semiconductor devices
- Power supply topics include half-wave and full-wave rectifiers, filtering, zener regulation.
- Transistors
- Transistor characteristics
- Basic Transistor Circuits
- Voltage divider polarization
- The transistor as a switch
- The transistor as a regulator

Amplification

- Linear amplification of current, voltage and power
- BJT amplifiers: EC, CC and BC configuration
- Power amplifiers in class A
- Power amplifiers in class B
- Power amplifiers in class C

Operational Amplifiers

- Ideal operational amplifier
- Main operational amplifier linear configurations
- Inverting and Non- Inverting configuration
- Differential amplifier
- Integrator
- Comparators, ramp and square wave generators
- Inverting Schmitt trigger

Power electronics components

- Typical problems relevant to power devices
- Power amplifier parameters
- Classification of the output stage
- Harmonic distortion
- Heat dissipation

Met Instrument Calibration lab.

Logic Circuits

Course Reference Number:		**MTm-02-E**
Level	**:**	**MID-Level**
Objective	**:**	**To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of logic circuits.**
Qualification	**:**	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration	**:**	**2 weeks**

SYLLABUS

Introduction

Introduction of this subject focuses on Number Systems and several theoretical and practical issues related to digital logic circuits.

Digital Systems

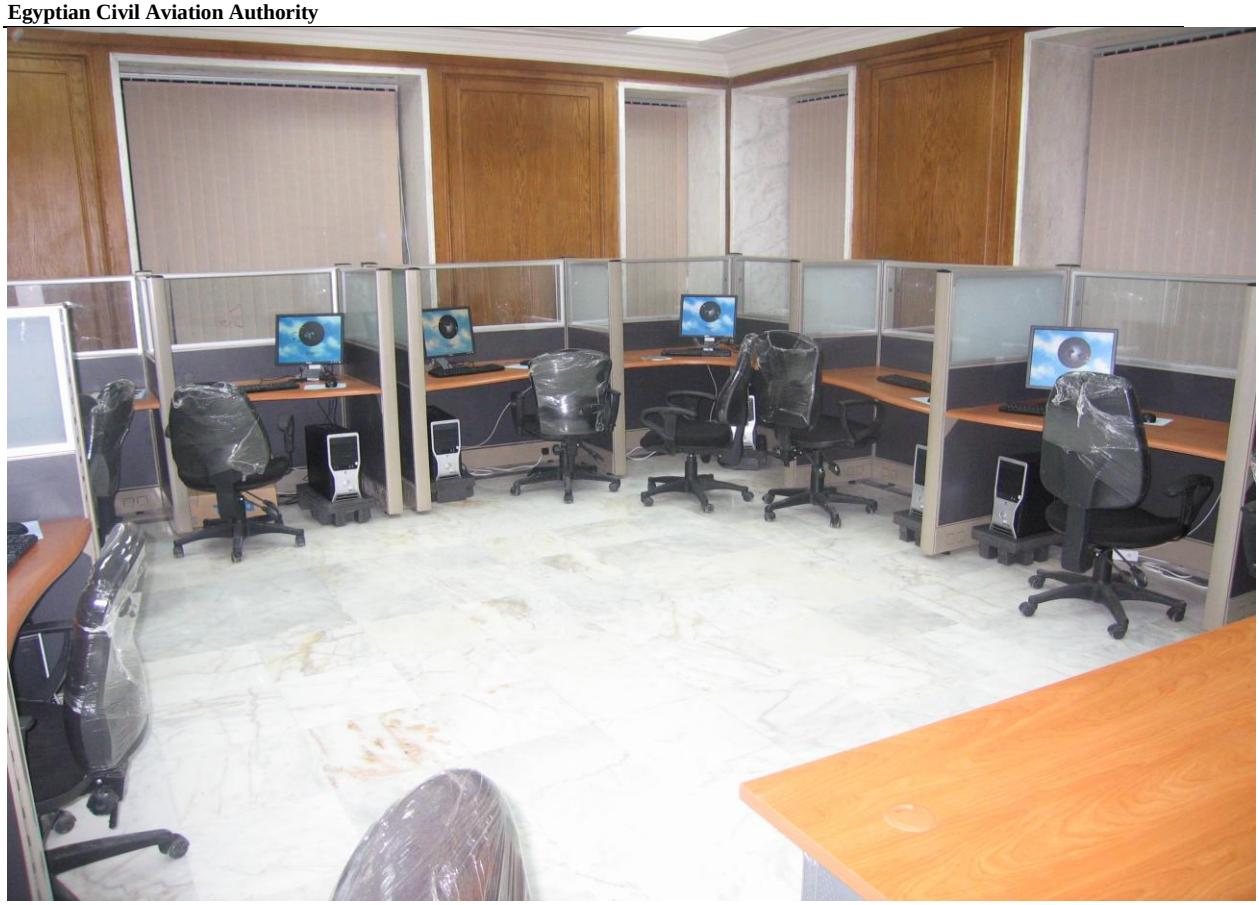
- Combinational Logic
- The theorems of Boolean Algebra
- The Karnaugh's map
- Logic Gates (AND, OR, NAND, NOR, NOT, XOR, XNOR)
- Encoder and Decoder
- Multiplexer and Demultiplexer
- Sequential Logic
- Latches
- Flip-Flops
- Counters
- Shift registers

Memories

- Memory classification
- Terminology and main characteristics
- Elementary memory cells
- Structure and operating principles
- ROM memory
- RAM memory
- Sequential memory

Conversions

- Digital-to-Analogue conversion
- Analogue-to-Digital conversion
- Voltage-to-Frequency conversion



Internet Lab.

Automatic Weather Observing Systems (AWOS)

Course Reference Number:		**MTm-03-E**
Level	**:**	MID-**Level**
Objective	**:**	**To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of automatic weather observing systems.**
Qualification	**:**	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration	**:**	**2 weeks**

SYLLABUS

introduction

Introduction to the function of AWOS

Definitions

- AWOS component
- system definitions

Transducers for Applications in meteorological phenomena sensing

- Transducers for applications in temperature sensing
- Transducers for applications in measurement of linear position and force
- Transducers for applications in measurement of pressure
- Transducers for rotational speed or applications for angular position measurement

Microprocessor Operations

Course Reference Number:		**MTm-04-E**
Level	**:**	MID-**Level**
Objective	**:**	**To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of microprocessor operations.**
Qualification	**:**	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration	**:**	**2 weeks**

SYLLABUS

introduction

Introduction to Microprocessor techniques

Microprocessor Operation

- Microprocessor internal structure
- Addressing modes
- Microprocessor instructions
- Input/Output operations
- Memory operations
- Parallel and series bus
- Parallel interface programming
- Series interface programming
- A/D and D/A programming and interfacing
- Interrupts

Digital Signal Communication

Course Reference Number:	**MTm-05-E**
Level :	MID-**Level**
Objective :	**To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of Digital Signal Communication.**
Qualification :	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration :	**2 weeks**

SYLLABUS

introduction

Introduction to digital signal communication fundamentals.

Digital Signal communication

- Delta modulation and demodulation process.
- PWM and PPM modulation and demodulation process.
- Analog signal impulsive modulation.
- Relationship between sampling frequency and transmission band.
- Sampling Theorem.
- Time multiplexing and TDM signal transmission.
- Problems of receivers synchronization; PAM decoding and demultiplexing.
- Numeric codification of signals.
- Multiplexing for time divisions.
- Numeric signals receiving.
- Numeric/Analogic decodification.
- Time demultiplexing.
- TDM-PCM systems applications.
- Transmission numeric systems behavior in present of attenuation and noise

Digital Signal Transmission

- Study of the ASK, FSK and PSK.
- Study of the base band transmission techniques
- Study of the following types of encoding: RZ, NRZ. Manchester, Bi-phase and Dual binary.

Automatic Met. Stations Lab.

Meteorological Instrument Calibration

Course Reference Number:		**MTm-06-E**
Level	**:**	MID**-level**
Objective	**:**	**To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of Meteorological Instrument Calibration.**
Qualification	**:**	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration	**:**	**2 weeks**

SYLLABUS

introduction

Introduction to Calibration methods.

Calibration techniques

- Calibration of temperature instruments.
- Calibration of humidity instruments.
- Calibration of pressure instruments.

Satellite Communication System

Course Reference Number:	**MTm-07-E**
Level :	MID-**Level**
Objective :	**This course covers the principal aspects of a satellite communication system. The topics are covered at an introductory level, with emphasis on qualitative descriptions of the important concepts. The course is intended for participant who is interested in learning about the fundamentals of communication by satellite.**
Qualification :	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration :	**2 weeks**

SYLLABUS

Introduction

Introduction to satellite communication system fundamentals.

The operation of receiving and transmitting satellite signals

- Study uplink and downlink satellite signals.
- Study and analyze the digital baseband signals in a satellite link.
- Study the energy dispersal of modulated signal.
- Study the process of telecommunication and telemetry.
- Study various analog and digital modulation parameters.
- Measure the cross polarization discrimination for linear polarized antennas.
- Measure the discrimination of LHCP and RHCP antennas.
- Measure the gain of a given antenna.
- Measure noise parameters in the system and observe its effect.
- Measure the C/N, S/N and threshold in given link.
- Measure the path loss in a satellite link and observe its effect on communication.
- Measure propagation delay in a given satellite link and observe its effect.
- Measure fading of signal in a satellite link and observe its effect.
- Setup active and passive satellite communication link.
- Setup an analog FM – FDM satellite link.
- Transmit and Receive analog and digital modulation parameters.

Logic & Microprocessor Lab.

MET. INSTRUMENTS TECHNICIANS

Course Reference Number:		**MTm-08-E**
Level	**:**	MID-**Level**
Objective	**:**	**To improve the ability of the technicians with an excellent educational tool, for the gradual learning of the basic theoretical principles , verification of the practical progress, and testing the practical knowledge of the participants in the field of Met. Instruments Technicians.**
Qualification	**:**	**Secondary school certificate (science or math) or MTj-01 or equivalent.**
Duration	**:**	**12 weeks**

SYLLABUS

Introduction

General revision on Math. & Physics, Radisson sounding, Electricity and radio, oscillatory circuits, transmitters, receivers, modulation, amplifiers, power supply, wave propagation.

The behaviour of passive components in DC and AC

- DC and AC circuits
- Resistor in DC and AC circuits.
- Resistor networks
- Capacitor DC and AC circuits.
- Coil DC and AC circuits.

Transformer

- Basic construction and schematic diagram of a real and Ideal transformer.
- Transformer application
- Pulse transformers
- Transformers for blocked oscillators

Semiconductor electronic components

- Physics of the semiconductors
- Characteristics of semiconductor devices
- Power supply topics include half-wave and full-wave rectifiers, filtering, zener regulation.

Transistors

- Transistor characteristics
- Basic Transistor Circuits
- Voltage divider polarization
- The transistor as a switch
- The transistor as a regulator

Amplification

- Linear amplification of current, voltage and power
- BJT amplifiers: EC, CC and BC configuration
- Power amplifiers in class A
- Power amplifiers in class B
- Power amplifiers in class C

Operational Amplifiers

- Ideal operational amplifier
- Main operational amplifier linear configurations
- Inverting and Non- Inverting configuration
- Differential amplifier
- Integrator
- Comparators, ramp and square wave generators
- Inverting Schmitt trigger

Power electronics components

- Typical problems relevant to power devices
- Power amplifier parameters

Digital Systems

- Combinational Logic
- The theorems of Boolean Algebra
- The Karnaugh's map
- Logic Gates (AND, OR, NAND, NOR, NOT, XOR, XNOR)
- Encoder and Decoder

- Multiplexer and Demultiplexer
- Sequential Logic
- Latches
- Flip-Flops
- Counters
- Shift registers

Microprocessor Operation

- Microprocessor internal structure
- Addressing modes
- Microprocessor instructions
- Input/Output operations
- Memory operations
- Parallel and series bus
- Parallel interface programming
- Series interface programming
- A/D and D/A programming and interfacing
- Interrupts

Transducers for Applications in meteorological phenomena sensing

- Transducers for applications in temperature sensing
- Transducers for applications in measurement of linear position and force
- Transducers for applications in measurement of pressure
- Transducers for rotational speed or applications for angular position measurement

Instruments maintenance

- Repair and maintenance: electric and electronic practices,
- Safety and security precautions.
- Installation, repair and field tests for instruments.

Calibration techniques

- Calibration of temperature instruments.
- Calibration of humidity instruments.
- Calibration of pressure instruments.

AERONAUTICAL METEOROLOGY

Course Reference Number:	**MTj-02**
Level :	Junior-**Level**
Objective :	**To be able to use and interpret meteorological codes and Satellite Images and issue forecaster.**
Qualification :	**Secondary school certificate (science or math.)**
Duration :	**12 weeks**

SYLLABUS

Introduction

General revision of the atmospheric elements and structure.

Aviation Weather

Air temperature, atmospheric pressure and altimetry, Surface wind, Humidity, Clouds, Visibility, Fog, Vertical stability of the atmosphere , Air masses and fronts, Thunderstorms and Turbulence.

Climatology

General circulation of the atmosphere, Climate of the Mediterranean basin and Route climatology.

Meteorological codes

METAR, SPECE, TEMP, TAF, ARFOR, ROFOR, SIGMET, AIRMET, WARNING, SIGWX chart.

Chart Analysis

Meteorological station and upper air station, analysis of surface and upper air weather chart , SIGWX chart.

Satellite Images Interpretations

Fundamental ideas in Radiation transfer and satellite remote sensing, Types of meteorological satellite, Satellite characteristics, Dissemination of satellite imagery, Basic interpretation of VIS imagery, Basic interpretation of IR imagery, Basic interpretation of WV imagery, Basic interpretation of 3.7μ imagery, Cloud types, Cloud patterns. The Earth's surface and Atmospheric pollutants.
Waves and fronts, Position of Jet-stream, types of cyclogenesis,
ITCZ, cyclones and anticyclones.

Aeronautical Meteorology

Aircraft icing, turbulence, other hazardous phenomena, meteorological aspects of flight planning, definitions, procedures for meteorological services for international air navigation, air traffic services, aerodromes, operation of aircraft, aeronautical information services, aeronautical telecommunications, WMO documentation and ICAO documentation.

Lobe of second flour In RTC/Cairo building

HYDROLOGICAL TECHNICIAN

Course reference number :	HTj-01
Level :	**MID –Level**
Objective :	**To qualify the participants in the field of Hydrology to enable them to perform Hydrological observations, Hydrological measurements, Hydrological studies.** **By this program, the participants have to be able to adapt themselves as appropriate in their future activities as Hydrological technicians.**
Qualifications :	**Secondary school certificate (science or math.) or MTj-01 or equivalent.**
Duration :	**12 weeks.**

SYLLABUS

Mathematics

Algebra**,** Plane and solid geometry, Plane analytic geometry, Trigonometry.

Statistics

- **Introduction in statistics of data analysis, statistical packages that used in data analysis.**
- **Introduction to frequency distribution.**
- **Correlation.**

Metrology and sensor technology

- **Physical parameters and their relations and units [SI].**
- Measuring principle and installation requirements for bubble gauges, pressure sensors, ultrasonic sensors, turbidity sensors/samplers. GPS, geodetic "total station" Practical .

Computer operations

- **Introduction to PCs; general principles.**
- **Introduction to a simple programming language.**
- use of programme packages in hydrology.
- **Practical training to the topics using locally row data.**

Hydrological subjects Meteorology

- **General Meteorology.**
- **Climatology.**
- **Synoptic meteorology and weather forecasts.**

Hydraulics

Hydrostatics: pressure and its measurement.

- Open channel hydraulics: steady and unsteady flow, uniform and non-uniform flow.

Hygrometry

- **Design and construction of stations; types of gauges, stage Measurement.**
- **Operation and maintenance of gauges.**

Analysis of hydrological data

- Evaporation and evapotranspiration.
- **Evaporation from free water and soil surfaces .**
- **Pan coefficient.**
- Statistical analysis of floods and droughts.

Data storage and retrieval

- **Quality control.**
- **General methods of processing.**
- **Yearbooks.**

Instruments maintenance

- Repair and maintenance: electric and electronic practices, safety and security precautions.
- Installation, repair and field tests for instruments.