

Unit - 3	FLIGHT INFORMATION ALERTING SERVICES, COORDINATION, EMERGENCY PROCEDURES AND RULES OF THE AIR
<p>Radar service, Basic radar terminology – Identification procedures using primary / secondary radar – performance checks – use of radar in area and approach control services – assurance control and co-ordination between radar / non radar control – Emergencies – Flight information and advisory service – Alerting service – Co-ordination and emergency procedures – Rules of the air.</p>	

Radar Services

Radar systems capabilities

Radar systems used in the provision of air traffic services shall have a very high level of reliability, availability and integrity. The possibility of system failures or significant system degradations which may cause complete or partial interruptions of service shall be very remote. Back-up facilities shall be provided. Multi-radar systems, i.e. systems utilizing more than one radar sensor, should have the capability to receive, process and display, in an integrated manner, data from all the connected sensors.

Radar systems should be capable of integration with other automated systems used in the provision of ATS, and should provide for an appropriate level of automation with the objectives of improving the accuracy and timeliness of data displayed to the controller and reducing controller workload and the need for verbal co-ordination between adjacent control positions and ATC units. Radar systems should provide for the display of safety-related alerts and warnings, including conflict alert, minimum safe altitude warning, conflict prediction and unintentionally duplicated SSR codes.

States should, to the extent possible, facilitate the sharing of radar information in order to extend and improve radar coverage in adjacent control areas. States should, on the basis of regional air navigation agreements, provide for the automated exchange of co-ordination data relevant to aircraft being provided with radar services, and establish automated co-ordination procedures. Primary surveillance

radar (PSR) and secondary Surveillance radar (SSR) may be used either alone or in combination in the provision of air traffic services, including in the provision of separation between aircraft, provided:

- a) reliable coverage exists in the area; and
- b) the probability of detection, the accuracy and the integrity of the radar system(s) are satisfactory.

PSR systems should be used in circumstances where SSR alone would not meet the air traffic services requirements. SSR systems, especially those with mono pulse technique or Mode S capability, may be used alone, including in the provision of separation between aircraft, provided:

- a) the carriage of SSR transponders is mandatory within the area; and
- b) aircraft identification is established and maintained by use of assigned discrete SSR codes

The use of radar in air traffic services shall be limited to specified areas of radar coverage and shall be subject to such other limitations as have been specified by the appropriate ATS authority. Adequate information on the operating methods used shall be published in aeronautical information publications, as well as operating practices and/or equipment limitations having direct effects on the operation of the air traffic services.

Where PSR and SSR are required to be used in combination, SSR alone may be used in the event of PSR failure to provide separation between identified transponder equipped aircraft, provided the accuracy of the SSR position indications has been verified by monitor equipment or other means.

Basic radar terminology

Radar is an acronym for Radio Detection and Ranging. The term "radio" refers to the use of electromagnetic waves with wavelengths in the so-called radio wave portion of the spectrum, which covers a wide range from 104 km to 1 cm. Radar systems typically use wavelengths on the order of 10 cm, corresponding to frequencies of about 3 GHz. The detection and ranging part of the acronym is accomplished by timing the delay between transmission of a pulse of radio energy and its subsequent return.

Principle of Operation

The basic principle of operation of primary radar is simple to understand. However, the theory can be quite complex. An understanding of the theory is essential in order to be able to specify and operate primary radar systems correctly. The implementation and operation of primary radars systems involve a wide range of disciplines such as building works, heavy mechanical and electrical engineering, high power microwave engineering, and advanced high speed signal and data processing techniques. Some laws of nature have a greater importance here.

Radar measurement of range, or distance, is made possible because of the properties of radiated electromagnetic energy.

Reflection of electromagnetic waves The electromagnetic waves are reflected if they meet an electrically leading surface. If these reflected waves are received again at the place of their origin, then that means an obstacle is in the propagation direction.

Electromagnetic energy travels through air at a **constant speed**, at approximately the speed of light,

- 300,000 kilometers per second or
- 186,000 statute miles per second or
- 162,000 nautical miles per second.

This constant speed allows the determination of the distance between the reflecting objects (airplanes, ships or cars) and the radar site by measuring the running time of the transmitted pulses.

This energy normally travels through space in a **straight line**, and will vary only slightly because of atmospheric and weather conditions. By using of special radar antennas this energy can be focused into a desired direction. Thus the direction in azimuth and elevation of the reflecting objects can be measured.

These principles can basically be implemented in a radar system, and allow the determination of the distance, the direction and the height of the reflecting object.

Identification procedures using primary / secondary radar

Identification of aircraft

Establishment of radar identification:

Before providing radar service to an aircraft, radar identification shall be established and the pilot informed. Thereafter, radar identification shall be maintained until termination of the radar service.

If radar identification is subsequently lost, the pilot shall be informed accordingly and, when applicable, appropriate instructions issued. Radar identification shall be established by at least one of the following methods.

SSR identification procedures

Where SSR is used, aircraft may be identified by one or more of the following procedures:

- a) recognition of the aircraft identification in a radar label;
- b) recognition of an assigned discrete code, the setting of which has been verified, in a radar label;
- c) direct recognition of the aircraft identification of a Mode S-equipped aircraft in a radar label;
- d) by transfer of radar identification
- e) observation of compliance with an instruction to set a specific code;
- f) observation of compliance with an instruction to squawk IDENT;

When a discrete code has been assigned to an aircraft, a check shall be made at the earliest opportunity to ensure that the code set by the pilot is identical to that assigned for the flight.

Only after this check has been made shall the discrete code be used as a basis for identification.

PSR identification procedures

Where SSR is not used or available, radar identification shall be established by at least one of the following methods:

- a) by correlating a particular radar position indication with an aircraft reporting its position over, or as bearing and distance from, a point displayed on the radar map, and by ascertaining that the track of the particular radar position is consistent with the aircraft path or reported heading;
- b) by correlating an observed radar position indication with an aircraft which is known to have just departed, provided that the identification is established within 2 km (1 NM) from the end of the runway used. Particular care should be taken to avoid confusion with aircraft holding over or overflying the

aerodrome, or with aircraft departing from or making a missed approach over adjacent runways;

c) by transfer of radar identification

d) by ascertaining the aircraft heading, if circumstances require, and following a period of track observation:

When using these methods, the radar controller shall:

Verify that the movements of not more than one radar position indication correspond with those of the aircraft; and ii) ensure that the manoeuvre(s) will not carry the aircraft outside the coverage of the radar display;

Use may be made of direction-finding bearings to assist in radar identification of an aircraft. This method, however, shall not be used as the sole means of establishing radar identification, unless so prescribed by the appropriate ATS authority for particular cases under specified conditions.

When two or more radar position indications are observed in close proximity, or are observed to be making similar movements at the same time, or when doubt exists as to the identity of a radar position indication for any other reason, changes of heading should be prescribed or repeated as many times as necessary, or additional methods of identification should be employed, until all risk of error in identification is eliminated.

Performance checks

The radar controller shall adjust the radar display(s) and carry out adequate checks on the accuracy thereof, in accordance with the technical instructions prescribed by the appropriate authority for the radar equipment concerned.

The radar controller shall be satisfied that the available functional capabilities of the radar system as well as the information presented on the radar display(s) is adequate for the functions to be performed.

The radar controller shall report, in accordance with local procedures, any fault in the equipment, or any incident requiring investigation, or any circumstances which make it difficult or impractical to provide radar services.

Use of Radar in the Approach Control Service

Radar systems used in the provision of approach control service shall be appropriate to the functions and level of service to be provided.

Radar systems used to monitor parallel ILS approaches shall meet the requirements for such operations

Use of radar in the air traffic control (Area) service

The information presented on a radar display may be used to perform the following functions in the provision of air traffic control service:

- a) provide radar services as necessary in order to improve airspace utilization, reduce delays, provide for direct routings and more optimum flight profiles, as well as to enhance safety;
- b) provide radar vectoring to departing aircraft for the purpose of facilitating an expeditious and efficient departure flow and expediting climb to cruising level;
- c) provide radar vectoring to aircraft for the purpose of resolving potential conflicts;
- d) provide radar vectoring to arriving aircraft for the purpose of establishing an expeditious and efficient approach sequence;
- e) provide radar vectoring to assist pilots in their navigation, e.g. to or from a radio navigation aid, away from or around areas of adverse weather, etc.;
- f) provide separation and maintain normal traffic flow when an aircraft experiences communication failure within the area of the radar coverage;
- g) maintain radar monitoring of air traffic;
- h) when applicable, maintain a watch on the progress of air traffic, in order to provide a nonradar controller with:

Assurance Control & Co-ordination of traffic under radar and non-radar control

Appropriate arrangements shall be made in any air traffic control unit using radar to ensure the co-ordination of traffic under radar control with traffic under non-radar control, and to ensure the provision of adequate separation between the radar-controlled aircraft and all other controlled aircraft. To this end, close liaison shall be maintained at all times between radar controllers and non-radar controllers.

Flight information and advisory service

Flight information service

Recording and transmission of information on the progress of flights

Information on the actual progress of flights, including those of heavy or medium unmanned free balloons, under neither air traffic control service nor air traffic advisory service shall be:

- a) recorded by the air traffic services unit serving the flight information region within which the aircraft is flying in such a manner that it is available for reference and in case it is requested for search and rescue action;
- b) transmitted by the air traffic services unit receiving the information to other air traffic services units.

Transfer of responsibility for the provision of flight information service

The responsibility for the provision of flight information service to a flight normally passes from the appropriate ATS unit in a flight information region to the appropriate ATS unit in the adjacent flight information region at the time of crossing the common flight information region boundary. However, when co-ordination is required, but communication facilities are inadequate, the former ATS unit shall, as far as practicable, continue to provide flight information service to the flight until it has established two-way communication with the appropriate ATS unit in the flight information region it is entering.

Transmission of information

Means of transmission

Information shall be disseminated to aircraft by one or more of the following means as determined by the appropriate ATS authority:

- ✓ the preferred method of directed transmission on the initiative of the appropriate ATS unit to an aircraft, ensuring that receipt is acknowledged; or
- ✓ a general call, unacknowledged transmission to all aircraft concerned; or
- ✓ broadcast; or
- ✓ Data link.

The use of general calls shall be limited to cases where it is necessary to disseminate essential information to several aircraft without delay, e.g. the sudden occurrence of hazards, a change of the runway-in-use, or the failure of a key approach and landing aid.

Alerting service

When so required by the appropriate ATS authority to facilitate the provision of alerting and search and rescue services, an aircraft, prior to and when operating,

within or into designated areas or along designated routes, shall comply with the provisions concerning the submission, completion, changing and closing of a flight plan.

In addition to the above, aircraft equipped with suitable two-way radio communications shall report during the period twenty to forty minutes following the time of last contact, whatever the purpose of such contact, merely to indicate that the flight is progressing according to plan, such report to comprise identification of the aircraft and the words “Operations normal” or the signal QRU. The “Operations normal” message shall be transmitted air-ground to an appropriate air traffic services unit (e.g. normally to the aeronautical telecommunication station serving the air traffic services unit in charge of the flight information region in which the aircraft is flying, otherwise to another aeronautical telecommunication station to be retransmitted as required to the air traffic services unit in charge of the flight information region). It may be advisable, in case of a SAR operation of a substantial duration, to promulgate by NOTAM the lateral and vertical limits of the area of SAR action, and to warn aircraft not engaged in actual SAR operations and not controlled by air traffic control to avoid such areas unless otherwise authorized by the appropriate ATS unit.

Air traffic services units

When no report from an aircraft has been received within a reasonable period of time (which may be a specified interval prescribed on the basis of regional air navigation agreements) after a scheduled or expected reporting time, the ATS unit shall, within the stipulated period of thirty minutes, endeavour to obtain such report in order to be in a position to apply the provisions relevant to the “Uncertainty Phase” should circumstances warrant such application.

When alerting service is required in respect of a flight operated through more than one flight information region or control area, and when the position of the aircraft is in doubt, responsibility for coordinating such service shall rest with the ATS unit of the flight information region or control area:

- 1) within which the aircraft was flying at the time of last air-ground radio contact;

- 2) that the aircraft was about to enter when last air ground contact was established at or close to the boundary of two flight information regions or control areas;
- 3) within which the aircraft's intermediate stop or final destination point is located:
 - ✓ if the aircraft was not equipped with suitable two way radio communication equipment; or
 - ✓ was not under obligation to transmit position reports.

The unit responsible for alerting service, shall

- ✓ notify units providing alerting service in other affected flight information regions or control areas of the emergency phase or phases, in addition to notifying the rescue co-ordination centre associated with it;
- ✓ request those units to assist in the search for any useful information pertaining to the aircraft presumed to be in an emergency.
- ✓ collect the information gathered during each phase of the emergency and, after verifying it as

The various circumstances surrounding each emergency situation preclude the establishment of exact detailed procedures to be followed. The procedures outlined herein are intended as a general guide to air traffic services personnel. Air traffic control units shall maintain full and complete co-ordination, and personnel shall use their best judgment in handling emergency situations.

ATS units shall also:

- a) transmit, and continue to transmit, information pertinent to the safe conduct of the flight, without expecting a reply from the aircraft;
- b) monitor and plot the progress of the flight with the means available, and co-ordinate transfer of control with adjacent ATS units without requiring transmissions or other responses from the aircraft, unless communication with the aircraft remains normal;
- c) inform and continue to keep informed, appropriate ATS units, including those in adjacent flight information regions, which may be concerned with the progress of the flight; notify:
 - ✓ the operator or his designated representative;

- ✓ the appropriate rescue co-ordination centre in accordance with appropriate alerting procedures;
- ✓ the designated security authority;

relay appropriate messages, relating to the circumstances associated with the unlawful interference, between the aircraft and designated authorities.

Rules Of The Air

The operation of an aircraft either in flight or on the movement area of an aerodrome shall be in compliance with the general rules and, in addition, when in flight, either with:

- a) the visual flight rules, or
- b) the instrument flight rules.

Visual flight rules (VFR) are a set of regulations under which a pilot operates an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minimums, as specified in the rules of the relevant aviation authority. The pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other aircraft.

If the weather is below VFR minimums, pilots are required to use instrument flight rules, and operation of the aircraft will primarily be through referencing the instruments rather than visual reference.

Requirements

VFR require a pilot to be able to see outside the cockpit, to control the aircraft's attitude, navigate, and avoid obstacles and other aircraft.[2] Governing agencies establish specific requirements for VFR flight, including minimum visibility, and distance from clouds, to ensure that aircraft operating under VFR are visible from enough distance to ensure safety.

Under Visual meteorological conditions the minimum visual range, distance from cloud, and heights to be maintained above ground vary by jurisdiction, and may also vary according to the airspace in which the aircraft is operating.

The VFR pilot is required to "see and avoid" obstacles and other aircraft. Pilots flying under VFR assume responsibility for their separation from all other aircraft

and are generally not assigned routes or altitudes by air traffic control. Depending on the category of airspace in which the flight is being conducted, VFR aircraft may be required to have a transponder to help Air Traffic Control identify the aircraft on radar in order that ATC can provide separation guidance to IFR aircraft.

Instrument flight rules (IFR) is one of two sets of regulations governing all aspects of civil aviation aircraft operations; the other is visual flight rules (VFR). Federal Aviation Regulations (FAR) defines IFR as: “Rules and regulations established by the FAA to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals.” It is also a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying, such as an IFR or VFR flight plan.