



TERMINAL AREA RADAR COMPLEX “RC-10RA”



Terminal Area Radar Complex “RC-10RA” intended for regional airports has primary surveillance channel of S-band and secondary surveillance channel of RBS mode, complies fully with the requirements of international standards, the standards of the Russian Federation and Russian Federal Aviation Regulations.

“RC-10RA” is designed for aircraft detection and measurement of aircraft coordinates with subsequent transfer of air situation data to air traffic management centers for the purpose of monitoring and ensuring air traffic control in regional airports.

TARC comprises the following:

- Antenna device including antennas of primary and secondary channels;
- Transmitting-receiving equipment of primary and secondary channels;

- Radar data processing equipment;
 - Monitoring and control equipment including the remote mode;
 - Means for interfacing with data transfer channels;
 - UPS-source;
 - Life-support system;
 - Security and fire alarm system;
 - Remote terminal with the functions of TARC control and monitoring as well as functions of displaying air situation within TARC coverage zone;
 - Remote-field monitor;
 - SPTA set;
 - Set of operational documentation;
- Option:
- “TOPAZ” Air Traffic Control Automation Facilities Complex.

PURPOSE

TARC does ensure the following:

- Aircraft detection and measurement of coordinates thereof via primary channel;
- Detection and measurement of coordinates of aircraft equipped with transponders operating in RBS modes within the coverage area of TARC;
- Receiving and processing of supplementary data from aircraft equipped with transponders operating in RBS-modes;
- Identification of coordinate data and supplementary data of primary and secondary channels;
- Outputting to ATC systems the radar data regarding position (inclined range and azimuth) of aircraft detected via the primary channel;
- Outputting to ATC systems the secondary radar data regarding aircraft in RBS mode, namely: inclined range, azimuth, barometric altitude, aircraft number (identification code), special signals of identification (SPI), alarm signals.



SPECIFICATIONS

Coverage for primary channels in case of placing TARC on the ground is provided as the volume of air space limited by the following:

- Minimal elevation angle - not more than 0.3 degrees;
- Maximal elevation angle - not less than 45 degrees;
- Maximal height - not less than 6000m;
- Minimal instrumented range - not more than 0.5 km;
- Maximal range:
 - At height of 400m - not less than 40km;
 - At height of 1000m - not less than 80km;
 - At height of 6000m - not less than 100km.

The coverage specified is ensured at probability of aircraft detection of not less than 0.9 for aircraft with RCS area of 5m².

Coverage for secondary channel is provided as the volume of air space limited by the following:

- Minimal elevation angle - not more than 0.3 degrees;
- Maximal elevation angle - not less than 45 degrees;
- Maximal height - not less than 20000m;
- Minimal instrumented range for surveillance in RBS-modes of not more than 0.5km;
- Maximal range for surveillance in RBS-modes of not less than 300km.

The coverage specified is ensured at probability of aircraft detection in RBS-mode of not less than 0.98.

Accuracy of aircraft coordinate measurement (RMS-error) at the output of data processing equipment of TARC is not worse than:

- For primary channel:
 - In range - 30m;
 - In azimuth - 15 minutes.
- For secondary channel in RBS-mode:
 - In range - 50-100m;
 - In azimuth - 10 minutes.

TARC capacity at any ratio of quantity of aircraft operating in RBS mode is not less than 100 aircraft.

Quantity of false targets output to the user per each scan:

- For primary channel - not more than 3;
- For secondary channel - not more than 0.1 % of total quantity of messages regarding aircraft.

Probability of garbling or confusion of supplementary data obtained via the secondary channel of TARC is not more than 0.1% of total quantity of messages regarding aircraft.

Resolution of TARC at the output of data processing equipment is not worse than the following:

- For primary channel:
 - In range - 125m;
 - In azimuth - 1.8° (defined by the width of antenna directional pattern);
- For secondary channel in RBS-mode:
 - In range - 150m;
 - In azimuth - 5.5° (defined by the width of antenna directional pattern).

Probability of identification of data obtained per scan from the same aircraft via primary and secondary channels is not less than 0.95.

Operating frequency band of TARC primary channel is 2800-3050MHz (manufacturing version in two following characters: 2800-2950MHz and 2900-3050MHz). Number of operating frequencies within the each sub-range is not limited.

Primary channel of TARC ensures detection of aircraft, which move with radial velocities of 40-1200 km/h.

Clutter suppression factor is not less than 50dB.

Operating frequencies of TARC secondary channel in RBS-mode are as follows: 1030±0.01MHz for interrogation link, and 1090±3MHz for reply link.

TARC includes automatic dependent surveillance channel with application of 1090 ES extended squitter. It meets all ICAO regulations (Annex 10) as well as requirements of the Russian standard GOST R 51845-2001 and provides surveillance of aircraft located within TARC visibility zone and equipped with facilities, which ensure the functions of automatic dependent surveillance of ADS-B 1090 ES.

TARC ensures radar data renewal rate of not more than 4 seconds.

TARC equipment for data transfer provides transfer to two radar data processing centers in the formats of ASTERIX Cat 1, 2, 34 and 48 of data regarding the targets of RBS-modes and the targets observed via the primary channel.

Time for TARC switching-on from the status of readiness to remote switching-on does not exceed 3 minutes.

Technical Requirements

TARC is designed basing on statements of the following normative documents:



Federal Aviation Regulations for Radio-Engineering Support of Aircraft Flights and Aviation Telecommunication in Civil Aviation.

Russian Standard of GOST 21800-89 for Secondary Radar Systems for Air Traffic Control. General Technical Requirements.

Russian Standard of GOST R 51845-2001 for Secondary Radar Systems for Air Traffic Control. General Technical Requirements.

Annex 10 to Convention on International Civil Aviation, Vol IV Surveillance Radar and Collision Avoidance Systems.

Power Supply

For the purpose to prevent interruptions of radar data output, the UPS-source is provided with the time of self-contained operation of not less than 10 minutes.

UPS-source is capable to maintain TARC operation at voltage fluctuations of input circuit from 304 up to 477V at full load with no change-over for the work with storage batteries.

Withstandability to Environmental Effects

The range of operating temperatures is from -50°C up to $+50^{\circ}\text{C}$ (for equipment arranged inside the equipment container this range is from $+5^{\circ}\text{C}$ up to $+40^{\circ}\text{C}$). Life-support system ensures maintaining of the temperature mode from $+15^{\circ}\text{C}$ up to $+25^{\circ}\text{C}$ inside the equipment module.

For the purpose to protect the antenna system of TARC against external effects, the radome is used, which can withstand continuous solid icing with thickness of up to 4mm.

Reliability

The equipment of TARC does ensure the following figures of reliability and endurance:

- Specified endurance makes 120 000 hours;
- Specified service life makes 15 years;
- MTBF is not less than 20000 hours;
- Mean time to recover is not more than 20 minutes.

Automatic switching-over of faulty functional

assemblies of TARC to stand-by ones is provided.

Time for switching-over to the stand-by set:

-Including antenna rotation drive: not more than 5s.

Operation and Maintenance

The automated system of trouble finding up to the level of LRU is provided within TARC. Basic constituents of equipment (functional assemblies and units) are made as easily removable assembly modules. Design of TARC ensures monitoring of parameters thereof in the course of operation by means of integrated and external means of monitoring.

Maintenance of TARC should be carried as necessary, and technical status of the complex is monitored uninterruptedly by means of local and remote terminals.

Equipment maintenance does not require any special attachments and is carried out by means of items included into SPTA set. The system of automatic monitoring and control ensures switching-on, switching-off and reconfiguration of TARC equipment from local and remote terminals. The system of automatic monitoring and control provides as well monitoring of serviceability of TARC, automatic change-over to the stand-by equipment in case of detection of fault of a device, and transferring to local and remote terminals the data regarding technical status of TARC.

Transportation

TARC remains serviceable after transportation inside the standard tare by any means of transport with no limitations in distance.

Design Peculiarities

TARC can be installed in airports with no necessity to carry out any capital construction work. TARC is made in the form of modular structures, which can be replaced or updated both in the course of manufacture and during operation depending on the Customer's requirements.

