TERMINAL AREA RADAR COMPLEX "RC-10RA"

PURPOSE

Terminal Area Radar Complex "RC-10RA" is intended for equipping regional airports. It has a primary surveillance channel of S-band and a secondary surveillance channel of RBS mode and complies fully with international standards.

"RC-10RA" is designed for aircraft detection and coordinate determination with subsequent transfer of air situation information to ATC centers for the purpose of monitoring and ensuring air traffic control in regional airports.

"RC-10RA" ensures:

» aircraft detection and coordinate determination via primary channel;

» detection and coordinate determination of aircraft equipped with transponders operating in RBS modes within the coverage area of the TARC;

» reception and processing of supplementary information from aircraft equipped with transponders operating in RBS modes;

» matching of coordinate and supplementary information of primary and secondary channels;

» output of radar data regarding aircraft position (slant range and azimuth) detected via primary channel to ATC systems;

» output of the following secondary radar data regarding aircraft position in RBS mode to ATC systems: slant range, azimuth, barometric altitude, aircraft number (identification code), special purpose identification (SPI) signals and alarm signals.

The TARC has an automatic dependent surveillance channel with extended squitter 1090 ES, which complies with all ICAO standards (Annex 10) and provides surveillance over aircraft equipped with means for automatic dependent surveillance ADS-B 1090 ES within the TARC coverage area. The TARC receives information from the aircraft via ADS-B channel within an area up to 370 km in range and up to 90° in elevation angle.

Radar data update rate does not exceed 4 seconds.

COMPOSITION

» antenna-feeder device, comprising antennas of primary and secondary channels;

» transmitting-receiving equipment of primary and secondary channels;

» radar information processing equipment;

» control and monitoring equipment with remote operation mode;

» means for interfacing with data transfer channels;

» UPS;

» temperature control system;

» security and fire alarm system;

» remote terminal for control and monitoring of the TARC, for displaying of air situation within the coverage area of the TARC;

» test responder;

» SPTA set;

» set of operational documents.

Optional: ATC AS "TOPAZ".

The TARC data transmission equipment ensures transfer of radar information to two radar information processing centers in ASTERIX cat. 1, 2, 34 and 48, information on targets in RBS modes and targets tracked via primary channel.

Time to switchover from readiness state to remote switching on does not exceed 3 minutes.

Technical requirements

The TARC is designed basing on the requirements of the following regulatory document:

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

Power supply

To prevent interruptions in radar data output, the radar uses an uninterruptable power supply (UPS) source, which provides autonomous operation for 10 minutes at minimum.

The UPS is capable to maintain operation of the TARC at voltage fluctuations of input mains from 304 to 477 V at full load without switching-over to operation from batteries.

Resistance to environmental effects

The range of operating temperatures is from -50 °C to + 50 °C (for equipment inside the shelter from 5 °C to 40 °C). Temperature control system maintains temperature inside the hardware module from 15 °C to 25 °C. To protect the antenna system from environmental effects, a radome capable of withstanding continuous solid icing with thickness up to 4 mm is used.

The "RC-10RA" preserves structural integrity and ensures operation at wind speed up to 50 m/s.

Reliability

The TARC equipment ensures the following reliability parameters and service life:

– specified service time – 120000 hours;

– specified service life – 15 years;

– mean time between failures – 20000 hours at least;

– mean time to recover – 20 minutes at most.

Automatic switch-over from failed functional assemblies of TARC to stand-by is provided.

Time for switch-over to standby set, including antenna rotation drive is 5 seconds at most.

Operation, maintenance and repair

The TARC has an automated fault detection system that detects a fault down to the level of a LRU.

Basic components of equipment (functional assemblies, units) are made as easily removable assembly units. Design of the TARC ensures monitoring of its parameters in the course of operation of the radar via built-in and external monitoring means.

Maintenance should be carried out depending on the state of the TARC, which is continuously monitored via local and remote terminals.

Maintenance and repair of the equipment do not require special tools and are done using the ones from the SPTA set.

Automatic control and monitoring system ensures switching-on/off and reconfiguration of the TARC equipment from local and remote terminals. The automatic control and monitoring system also ensures control over TARC operation, automatic switch-over to standby equipment if there are any failures of some devices and transmission of TARC technical status information to local and remote terminals.

Transportation

TARC remains serviceable after transportation inside a standard tare by any type of transport with no limitations to distance.

Design features

TARC can be installed in airports without performance of any major construction works.

TARC has modular design, which provides replacement or enhancement of the modules during manufacturing stage and operation depending on the Customer's requirements.

MAIN SPECIFICATIONS

Coverage area via the primary channel when the TARC is located on the ground is provided as the volume of airspace limited by:

» minimal elevation angle, deg., at most	0.3
» maximal elevation angle, deg., at least	45
» maximal altitude, m, at least	6000
» minimal instrumented range, km, at most	0.5
» maximal range, km:	
• at 400 m altitude, at least	40
• at 1000 m altitude, at least	80
• at 6000 m altitude, at least	100
Aforementioned coverage is ensured at detection probability of a target with RCS = 5 m^2, at least	0.9

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Coverage area via the secondary channel is provided as the volume of airspace limited by:	
» minimal elevation angle, deg., at most	0.3
» maximal elevation angle, deg., at least	45
» maximal altitude, m, at least	20000
» minimal instrumented range: surveillance in RBS modes, km, at most	0.5
» maximal range: surveillance in RBS modes, km, at least	300
Aforementioned coverage is ensured at detection probability of a target in RBS mode	0.98
Coordinate detection accuracy of aircraft (RMSE) at output of TARC information processing equipment not lower than:	
via primary channel:	
» in range, m	30
» in azimuth, min	15
via secondary channel in RBS mode:	
» in range, m	50
» in azimuth, min	10
Number of simultaneously tracked targets by the TARC at any proportion of aircraft traffic in RBS mode, aircraft, at least	100
Number of false targets that are output to a consumer per scan:	
» via primary channel, pcs., at most	3
» via secondary channel	Not more than 0.1 % from total number of messages about aircraft
Probability of corruption or mix of supplementary information received via secondary channel	Not more than 0.1 % from total number of messages about aircraft
Resolution at information processing equipment output, not lower than:	
via primary channel:	
» in range, m	70
» in azimuth, deg. (determined by antenna pattern width)	1.8
MSSR in A/C modes, not lower than:	
Zone 1:	
» difference of azimuths, deg	from 0.67 to 5.00
» difference of ranges, m, not less than	3600
» detection probability, more than	0.98
» probability of receiving true supplementary information	0.9
Zone 2:	
» difference of azimuths, deg. less than	0.67
» difference of ranges, m	from 90 to 3600
» detection probability, more than	0.98
» probability of receiving true supplementary information, more than	0.98
Zone 3:	
» difference of azimuths, deg. less than	0.67
» difference of ranges, m, not more than	90
» detection probability, more than	0.6
» probability of receiving true supplementary information, more than	0.3
Probability of matching of information received via primary and secondary channels from one aircraft in one scan, at least	0.95

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Operating band of TARC primary channel, MHz (two units: 2800-2950 MHz and 2900-3050 MHz)	2800-3050
Number of operating frequencies in each sub-band	unlimited
TARC primary channel ensures detection of aircraft with radial speed, km/h	40-1200

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