AZIMUT

Air navigation
and communication
systems

Our products

About the company

AZIMUT Group designs, manufactures commercially, and supplies, on a turnkey basis, civil aviation enterprises with the facilities of navigation, landing, surveillance, and air traffic control automation, as well as develops and implements integrated projects of equipping and re-equipping aerodromes and air traffic control centre.

The Group's enterprises have all necessary certificates and licenses to perform works in the interest of civil and military users.

150 airports and ATC centres with our equipment worldwide

Our products

AIR TRAFFIC CONTROL SYSTEM

- ATC system «GALAXY»
- Controller Working Position «ORION»

COMMUNICATION SYSTEMS

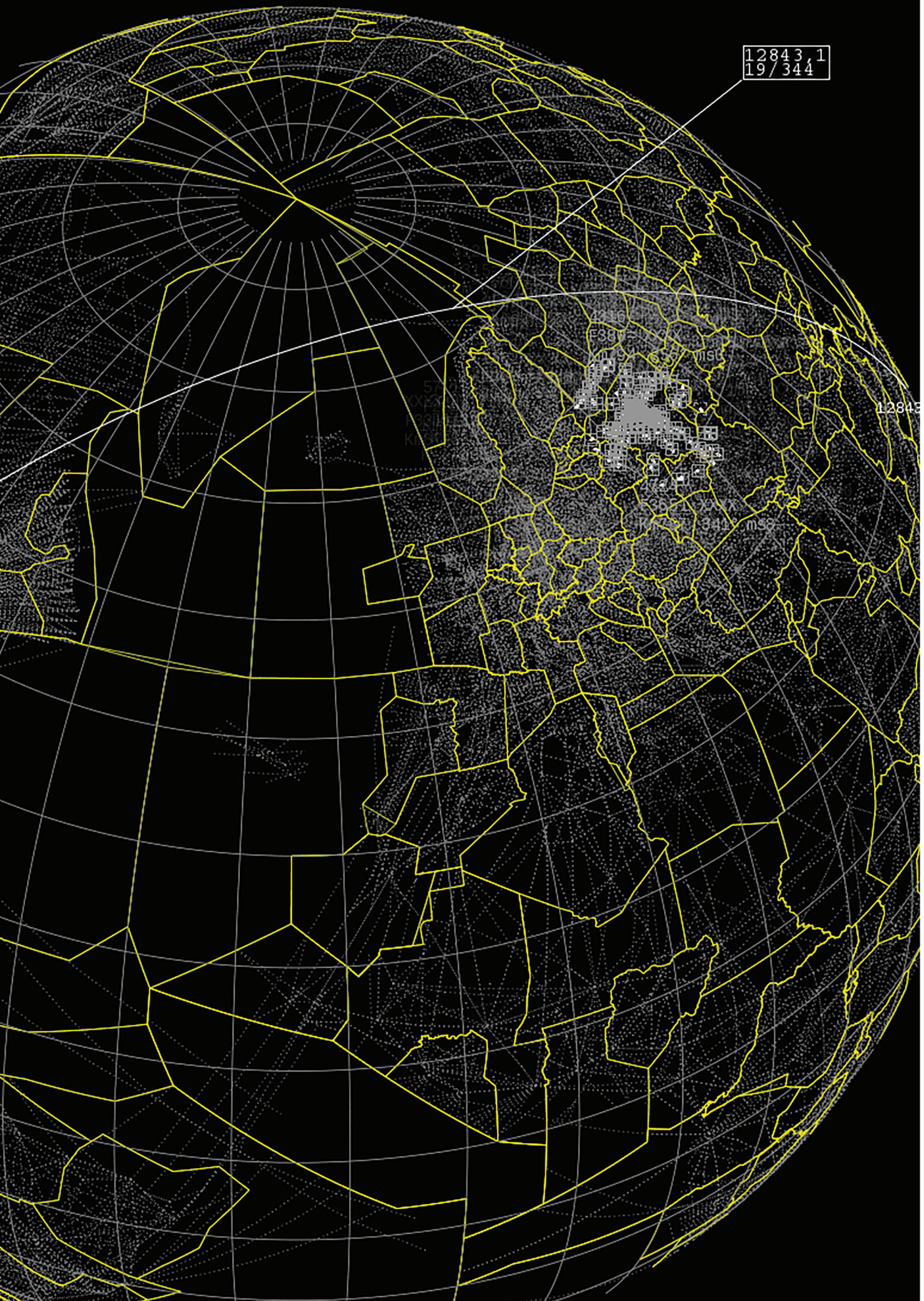
- Series 2000. Multi-channel VHF and VHF/UHF radio communication equipment
- VHF and UHF antennas
- TRS 200. VHF and UHF Automated transmitting and receiving communication centre (ATRC)
- Data transmitting equipment (ACARS/VDL2)
- ATN/ACARS equipment

NAVIGATION AND LANDING SYSTEMS

- The automatic direction finder DF 2000
- DME 2700
- DVOR 2000
- ILS 2700
- VOR/DME
- RMP-200
- Krona-M. Mono-pulse Secondary Surveillance Radar (MSSR)
- NDB
- AMI 2700. Approach (APP) Terminal Area (TMA) Primary Surveillance Radar Antenna Subsystem

SMF PRODUCT FAMILY

- SMF/PAPI – photometric system for PAPI lights
- SMF/M – mobile photometric measuring system

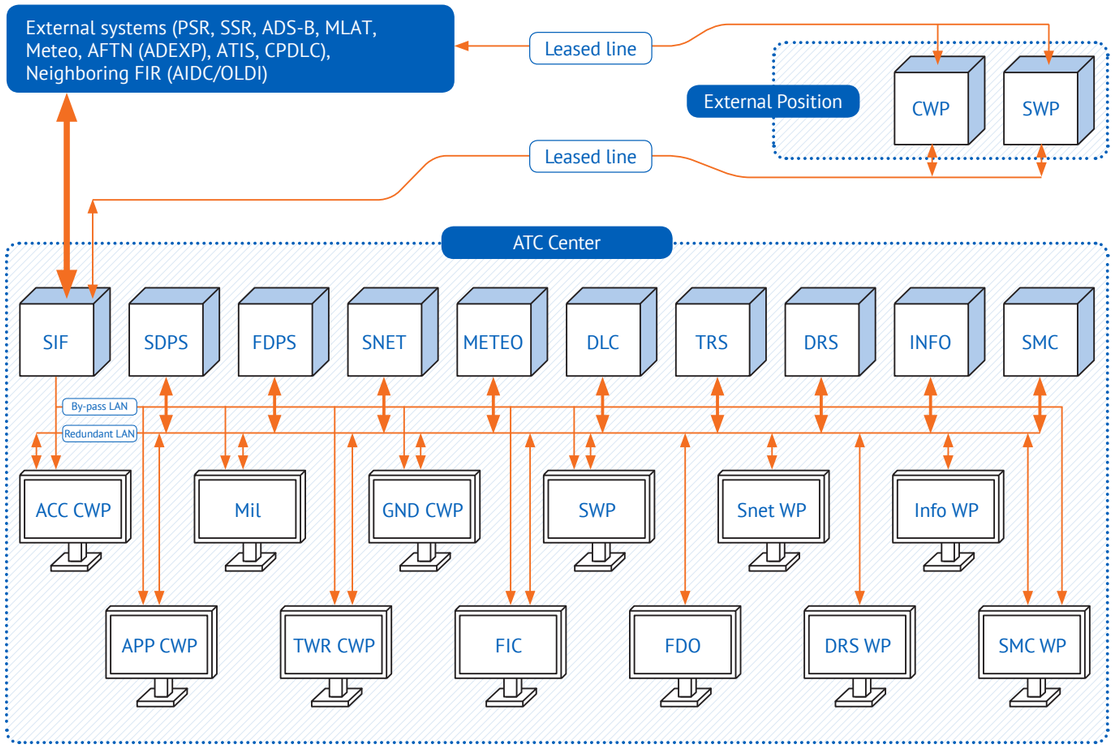


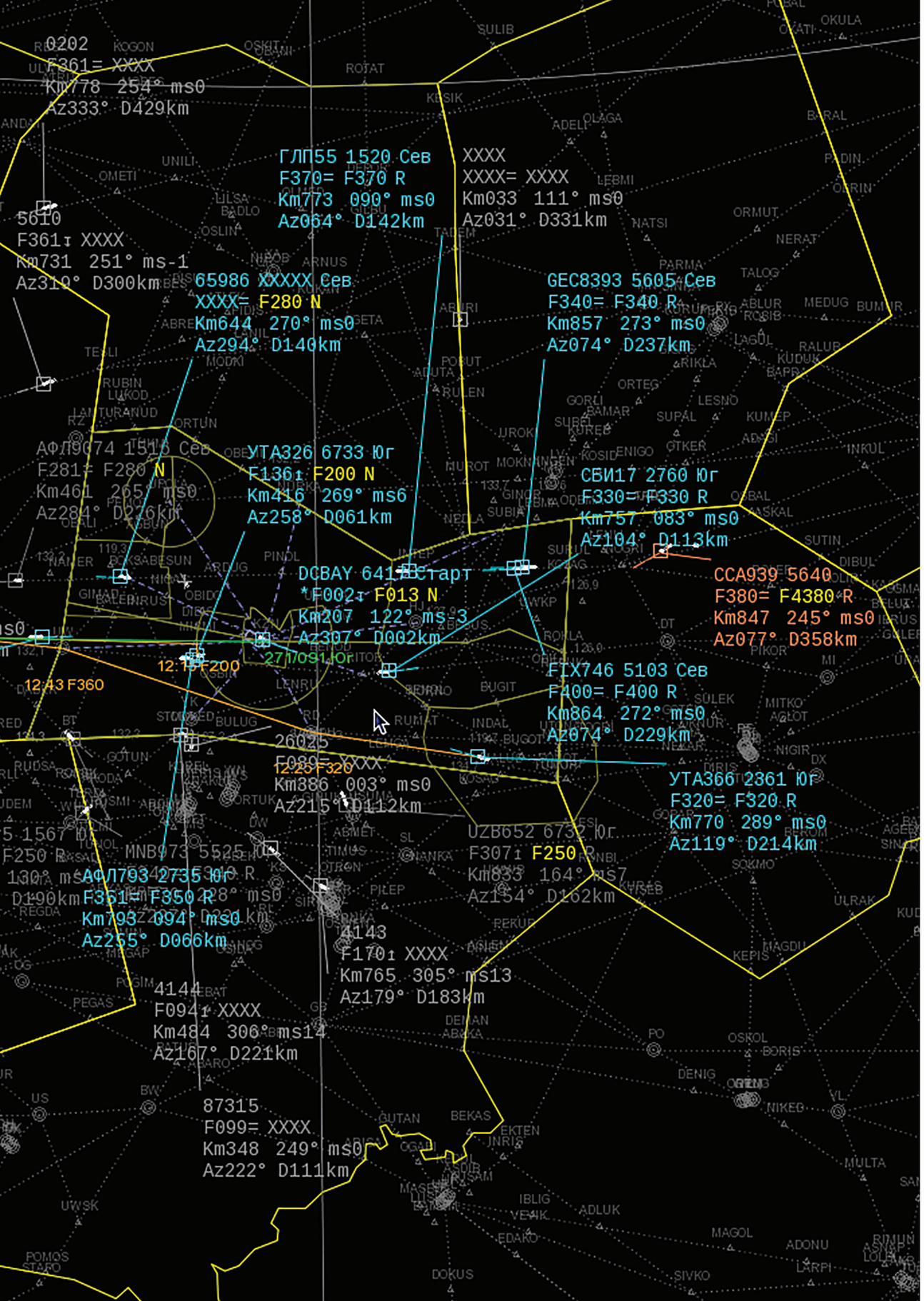
4D Trajectory based Air Traffic Management System «GALAXY»

«GALAXY», a 4D trajectory based air traffic control system, is a modern scalable solution for low, medium and high density airspace.

- Taxiing, taking off/landing, approach and ACC;
- Support of remote App and ACT;
- Open for customer's requirements;
- Designed based on ICAO and EUROCONTROL requirements;
- Compliant with International standards;
- Follows ICAO ASBU Initiative;
- WGS-84 based system: no limitation for dimensions of the processed area;
- Integration with EUROCONTROL IFPS and CFMU.

Structure of ATC System «GALAXY»





AZIMUT implements the advanced technologies and integrated approach of ATM System «GALAXY»

Advanced Surveillance Data Processing

- Full compliance with EUROCONTROL standard SUR.ET1.ST01.1000-STD-01-01;
- Multi-sensor data processing of all type of surveillance sensors: PSR, SSR (including Mode S), MLAT/WAM, ADS, surface sensors (aerodrome control radar);
- Performance: up to 32 000 tracks, and 300 sensors;
- The usage of Probability Data Association (PDA) and of Interactive Multiple Model (IMM) for filtering;
- Processing of Down-link Aircraft Parameters (DAPs) to increase the quality of system tracks and provide ATC controllers with additional information;
- System track update at the rate from 1 to 10 seconds.

4-D Trajectory Based System

- 4D trajectory is the background of main system services (LTCD, MTCD, MONA, etc.);
- Precise calculation of the 4D trajectories based on BADA and total energy model;
- Surveillance data and controller clearances are used to update the trajectory;
- Detection of long-term (oceanic sector) and medium-term conflicts (including the «what if» option);
- Support of Aeronautical data in AIXM format.

Dynamic Control of Airspace Structure

- Flexible use of airspace;
- Online reconfiguration of current airspace structure based on atomic volumes;
- Support of Civil/Military coordination and the control of military flights;
- Dynamic control of the specially used airspace.
- Support for automatic coordination between adjacent ATC centres (OLDI, AIDC).

Flexible Air Situation Display

- Integrated presentation of an air situation based on aeronautical, surveillance and flight plan data;
- An open opportunity of the adaptation of visualization settings (the colours of elements, text fonts and styles, the styles of dialog windows and etc.);
- Extended graphic capabilities of control: flexible rerouting, access to the functionality via the track label, multiple (air situation display) ASD views;

Reliable Safety Nets Functionality

- All the components of monitoring flight safety services comply with EUROCONTROL requirements;
- Alert and warning indication;
- Digital terrain elevation data support for MSAW and APM reason;
- ACAS alerts indication.

CNS/ATM in operation

- Support ATC applications of digital datalink (DCL, OCL, CPD LC, ADS-C);
- Using ADS data in trajectory processing.

Proven level of Quality & Safety

- Program management in close collaboration with customers;
- Process of product engineering and of software development complies with international standards ED 153, DO278/ED 109 (SWAL 3 and 4).
- Redundancy of critical subsystems with the use of redundant architecture and hitless switch-over to the backup set
- Triple redundant architecture (Active / Hot stand-by / Cold stand-by) for critical subsystems;
- Direct access to surveillance data from CWP in bypass mode.

Reliability and Support

- Use of COTS Hardware (OS Linux);
- ASTERIX inside: open architecture and standard internal interfaces (ASTERIX, Flight objects, SNMP);
- Long term support, upgrade and services.

Series 2000

Radio communication equipment

Purpose

Series 2000 represents a new-generation digital multichannel VHF and VHF/UHF radio communication equipment to be used in air traffic control systems for civil and state-owned aviation. Digital technology enhances radio communication and data transmission in ACARS and VDL-2 modes

Performance capabilities

- Full compliance with ICAO and National standards;
- High interference protection for adverse electromagnetic environment;
- Self-adaptation to environmental conditions;
- 24/7 operation with maximum (up to 50 W) radio transmitter output capacity;
- Advanced integrated test capabilities;
- Easy user interface and fool-proof operation;
- Remote control and monitoring capabilities over low-frequency lines and digital channels;
- Effective monitoring and redundancy;
- High reliability;
- Electronic event log (registration) with the support of local/remote access;
- Service software with user-friendly graphic interface;
- Compact and lightweight modular design that uses advanced and perspective components.

Main technical specifications

Type	**VHF** 118-137 MHz	**VHF/UHF** 100-400 MHz	**SW** band	**Options**
Transceiver	RS 2500V	RS 2500W		50W, w/o antenna switch 50W, with antenna switch
Radio-transmitter	TX 2500V	TX 2500W	TX 2300H	50W
Radio-receiver	RX 2500V	RX 2500W	RX 2000H	4-channel 8-channel

RMP-200

Non-directional radio beacon

Purpose

Non-directional radio beacon RMP-200 is intended for non-directional radiation of HF oscillations of one of the frequencies in the range of 190 to 1750 kHz, modulated by an identification signal or a voice message providing the identification of the beacon, determination of the aircraft bearing relative to the radio-beacon site, receiving voice messages transmitted by a ground-to-aircraft channel.

Performance capabilities

- The radio-beacon can be used as an outer non-directional radio beacon (ONDB), inner non-directional radio beacon (INDB), separate non-directional radio beacon
- The radio-beacon equipment (except for the antenna) is located in the equipment room (shelter) or fixed-site heated premises.

Main technical specifications

Coverage, not less:	
• ONDB	150 km
• INDB	50 km
Operating frequency range	190 – 1750 kHz
Frequency setting discretization	100 Hz
RF radiation modes	A2A, A3E, A1A
Identification signal	1-2-3 letters morse code
Average output power, adjustable	20 – 200 W
Peak output power, adjustable	40 – 400 W
Average lifetime	100 000 h
Life cycle	15 years

ILS 2700

Instrument landing system

Purpose

The ILS 2700 ground equipment is intended for emitting amplitude-modulated RF signals in the specified zone.

The signals contain data to be received on board the aircraft equipped with the relevant receiving devices. The ground equipment provides finding the aircraft position with reference to the runway during approach and landing phases.

Performance capabilities

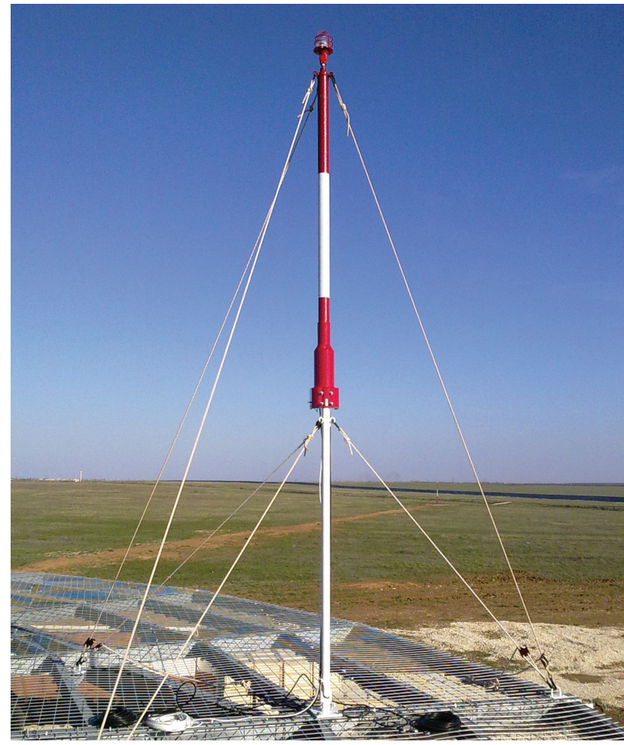
- On-course Beacon (Localizer): LLZ 2700;
- Glide Path Beacon: GP 2700;
- Landing distance measuring equipment DME/NL 2700 transponder;
- Far Zone Filed Control Device FFM 2700;
- Remote control equipment RCE 2700.

Main technical specifications

ILS 2700 basic parameters and technical specifications comply with ICAO requirements and recommendations for categories I, II, III.

DME 2700

Distance-measuring equipment



Purpose

The radio beacon of the DME system, in conjunction with on-board equipment, is intended for measuring the slant distance of an aircraft relative to the ground station. The radio beacon is utilized for enroute and terminal navigation of civil aircraft.

Performance capabilities

The DME 2700 radio beacon utilizes the operational principles and the signal format of DME/N equipment in accordance with Appendix 10 to the «Convention on International Civil Aviation (ICAO)». The radio beacon can be used in conjunction with the VOR (DVOR) and with Instrument Landing System (ILS) or independently.

Main technical specifications

Coverage:	
• in the horizontal plane	360°
• in the vertical plane	40°
• in the range (in conditions of direct visibility), at least	340 km (at the flight altitude of 12000 m) 240 km (at the flight altitude of 6000 m)
Inaccuracy of range measuring inserted by the radio beacon, at most:	
• during interaction with VOR, DVOR	±150 m
• during interaction with ILS	±75 m
Number of airplanes monitored simultaneously, up to	200
Frequency range	962 MHz to 1213 MHz
Pulse power	1 kW
Pulse form and other parameters	meets ICAO requirements

DVOR 2000

Doppler VHF omnidirectional radio range

Purpose

The radio beacon is designed to generate and transmit radio signals that provide measuring the azimuthal angle of an aircraft equipped with VOR avionics. The radio beacon is utilized for enroute and terminal navigation of civil aircraft.

Performance capabilities

The DVOR 2000 radio beacon has the signal format of VOR avionics and conforms to the requirements applied to this equipment as set forth in «Appendix 10 to the Convention on International Civil Aviation (ICAO)». The radio beacon can be used complete both with a distance measuring DME/N radio beacon and independently.

Main technical specifications

DVOR 2000 main parameters and technical specifications are compliant with ICAO requirements and recommendations

DF 2000

Automatic radio direction finder

Purpose

The automatic direction finder (ADF) DF 2000 is intended for the bearing of aircraft (during the operation of on-board radio-station transmitters) via 2—16 frequency channels depending on a delivered configuration.

Performance capabilities

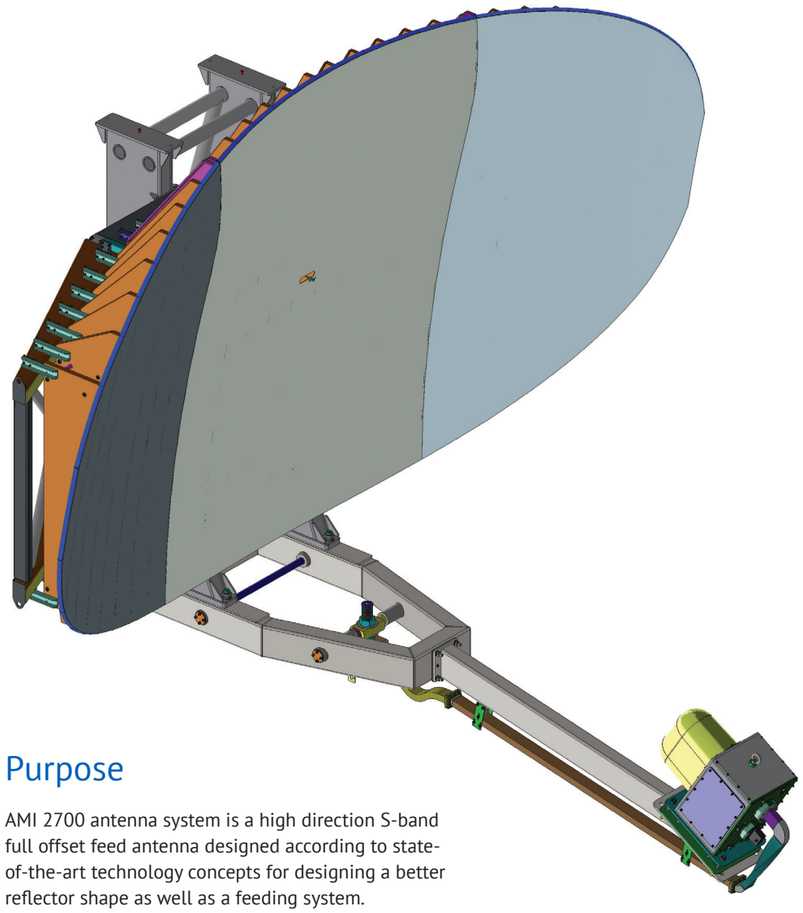
ADF provides the bearing of AM-modulated VHF signals using a phase method. ADF utilizes an electric switching of the ring vibrators of the antenna array, which causes the spinning effect of one vibrator.

Main technical specifications

Frequency range	118 MHz to 137 MHz
Frequency spacing	25 kHz; 8.33 kHz
Modulation type of the direction finding signal	AM
Modulation depth, at most	80%
Number of channels operating simultaneously	2—16 depending upon configuration
Direction finding sensitivity by each channel, at most	3 mV/m
Root-mean-square error of direction finding, at most	⩽1°
Direction finding distance at height, at least:	
(150 ± 50) m (300 ± 50) m (1000 ± 50) m (3000 ± 50) m (10 000 ± 50) m	45 km 65 km 120 km 200 km 360 km
Duration of the direction finding signal, at least	0,5 s
Coverage in the vertical plane	60°

AMI 2700

Approach (APP) terminal area (TMA) primary surveillance radar antenna subsystem



Purpose

AMI 2700 antenna system is a high direction S-band full offset feed antenna designed according to state-of-the-art technology concepts for designing a better reflector shape as well as a feeding system.

AMI 2700 Antenna complies with ICAO and EUROCONTROL requirements stated for ATC S-band approach (APP) primary radar systems for terminal area (TMA) applications, featuring a dual MAIN and AUX beam configuration.

Both MAIN and AUX channels are provided with circular polarization capability to improve target detection in rain conditions.

AMI 2700 Antenna provides fan beam coverage up to 45° (with hyper-directivity at angles > 25°), which is better than cosecant squared, to improve the detection of overfly targets, and a tight slope at the horizon for MAIN and AUX beams. The data of MAIN and AUX beams, properly combined by the receiver processor, can match any kind of ground clutter scenario under real-time clutter map control (Real Time Adaptability/ RTA).

International standards compliance

- EUROCONTROL radar surveillance in en-route and major terminal areas (TMA);
- EUROCONTROL radar sensor performance;
- ICAO Annex 10 Vol I section 3.2;
- ICAO Annex 10 Vol I Att C;
- ICAO Annex 10 Vol IV.

Main technical specifications

AMI 2700 basic parameters and technical specifications are compliant with ICAO requirements and recommendations.

KRONA-M

Monopulse Secondary Surveillance Radar (MSSR)

Purpose

«Krona-M» MSSR is produced in two configurations: self-contained and integrated in radar complexes. At the customer's request, each configuration can be produced in an en-route or terminal version. The versions differ from each other in radar data updating rate depending on an antenna system rotation speed. «Krona» MSSR passed acceptance tests and got approval of EU leading companies.

Standard delivery kit

- Shelter (container);
- Antenna system;
- Drive column;
- Test transponder;
- Site terminal;
- Remote terminal;
- Spares kit;
- Mounting parts;
- Instruments and accessories;
- Kit of radio-measuring equipment to carry out scheduled maintenance.

Type and height of the antenna system depend on terrain features and local constructions at the MSSR site. The mast may have the following height: 5 m; 15 m; 25 m; 32.5m; 37.5 m. At the customer's request, MSSR can be supplied with a drive column and a shelter joined as a single structure. In this case, the whole radar, including the antenna system shall be placed on the top of the mast. The antenna system is a flat phased array with a large vertical aperture. High quality integrated climatic system and design of the shelters, masts, antenna systems and other components enable MSSR to operate in deserts, highlands, subtropics as well as in polar latitudes. For extreme operation conditions, an MSSR version with an antenna system radome is available.

Features

- Total compliance with ICAO regulations and Russian standards;
- High level of reliability due to all solid-state equipment design and 100% redundancy of the electronic equipment (hot redundancy). Mean time between failures is not less than 20000 hours;
- Usability;
- Local and remote control;
- Continued built-in test control (control and monitoring system provides operation check and automatic switching over to the back-up, visualization of a block failure, a failure localization up to line replaceable level);
- Availability of an integrated high capacity uninterruptible power supply (UPS) operating in on-line mode. At voltage failure, the UPS provides MSSR operation for more than 10 minutes;
- Signal primary processing equipment is based on signal processors. Industrial versions of Advantech Company are used as computers and their components. The MSSR software is developed at NIIIT-RK;
- Guarantied continued operation without continued personnel presence;
- Possibility of rapid interfacing with any automated ATC systems (national and international) through interface software modification;
- Possibility of updating the radars up to the level of operation in Mode-S;
- Adaptation to electromagnetic environment and to the site.

«Krona-M» is a recent modification of an autonomous MSSR version. Its design is based on:

- Purchased euro-structures;
- Purchased units of industrial lot production: power supply sources, automated monitoring systems, functional modules of power automated equipment, ;
- CMS controllers, power automatics functional assemblies;
- Electronic devices on fpga circuits, microcontrollers, high integration uhf circuits;
- Ribbon intra-cabinet mounting;
- Priority use of screwdriver technology;
- Significant reducing of the number and variety of units, sections, and modules;
- Reduction in labour and materials consumption.
- Reduction in the number of soldered joints;
- Reduction in the load factor of elements;
- Reduction in the duration of production and adjustment;
- Reduction in power intensity;
- Increase in guaranteed reliability from 4000 hours to 20000 hours; reduction in the cost of the product.

VOR 2700 / DME/N 2700

Azimuthal/distance-measuring radio-beacon

Purpose

The azimuthal radio beacon VOR 2700 is the ground azimuthal equipment system for the navigation of aircraft operating in the meter wavelength range with VOR format of signals, and is recommended by ICAO as the primary means of measuring bearing in the airways or as an additional means of ensuring the approach and landing of civil aircraft (CA).

Performance capabilities

VOR/ DME basic parameters and technical specifications comply with ICAO requirements and recommendations. Control of VOR/ DME can be both local and remote.

Main technical specifications

VOR 2700 / DME/N 2700 main parameters and technical specifications are compliant with ICAO requirements and recommendations.

SMF Product Family

SMF/M – mobile photometric measuring system

Purpose

SMF/M is the top-of-the-line photometric instrument among the ones available at the market designed for lighting equipment. The system is based on the advanced technologies in the field of localization within the accuracy of less than 1 m, and uses a special coordinate comparison module capable of combining and integrating all position signals received from GPS SBAS, odometer, accelerometers, compass, and light finder optoelectronic sensor. 13 photometric sensors of the measuring bar capture a light beam in optimal measuring positions.

Restoration methods necessary for obtaining an isolux diagram for nodal points according to ICAO, allow of calculating and correcting guidance errors. The overall database allows of keeping all measurement data received from several airports. The system is equipped with an optical guidance camera and a sound unit. All aspects necessary for easy and convenient field photometric measurements are taken into account.

Operating Concept

Operation of SMF/M is based on the principle of movement of the measuring bar along the light line being measured (or in parallel with the line).

The SMF/M measuring bar is installed perpendicular to the light line and thus it can cross the radiated light beam in its base portion when the bar is over a distance from the light, and in its upper points as it approaches the light.

Generation of ICAO point grid is performed by means of routine simulation on the basis of discrete measurement results obtained during movement of measuring bar between the light being currently measured and the next nearest light.

The measuring bar contains 13 light sensors and 2 colour sensors according to CIE 1931 located above the bar in order to obtain the best resolution-distance ratio. The measuring bar also includes a special head, containing 2 fixed light position sensors as well as a guidance camera.

The scanning rate is determined by a movement speed rather than measurement time, therefore the system does not depend on a movement speed, and the driver can stop the car equipped with the SMF/M system if necessary and then move on without affecting the measurement results.

The SMF/M system records data every 10 cm of distance covered using a high-resolution odometer (1 pulse per every 0.7 mm).

The SMF/M system can make calculations on the basis of a large volume of data enabling accuracy and error parameters necessary for the assigned task. A user can direct the autocar accurately with the help of a guidance camera showing a current location of the measuring bar relative to the ideal line of movement.

The obtained data of the ICAO point grid for all measured lights are processed and saved in a system data base. A user can analyse all data relevant to the parameters of a separate light or the lights of entire lighting system. Photometric data are presented in a tabulated form or diagrammatically including isocandela diagrams according to the ICAO requirements.

SMF Product Family

SMF/PAPI – photometric system for PAPI lights

Purpose

The SMF/PAPI system has been designed as a stand-alone equipment fully devoted to the measurement of the correct setting and alignment of PAPI (Precision Approach Path Indicator) of AGLSs.

SMF/PAPI also enables to measure a colour transition aperture, an aperture angle and a light beam colour of the PAPI block.

Operating Concept

The SMF/PAPI system is constructed on the basis of a special photometer head with a stabilizing platform and sensors that can perform fully automatic measurements and setting of all parameters of the PAPI lights being measured.

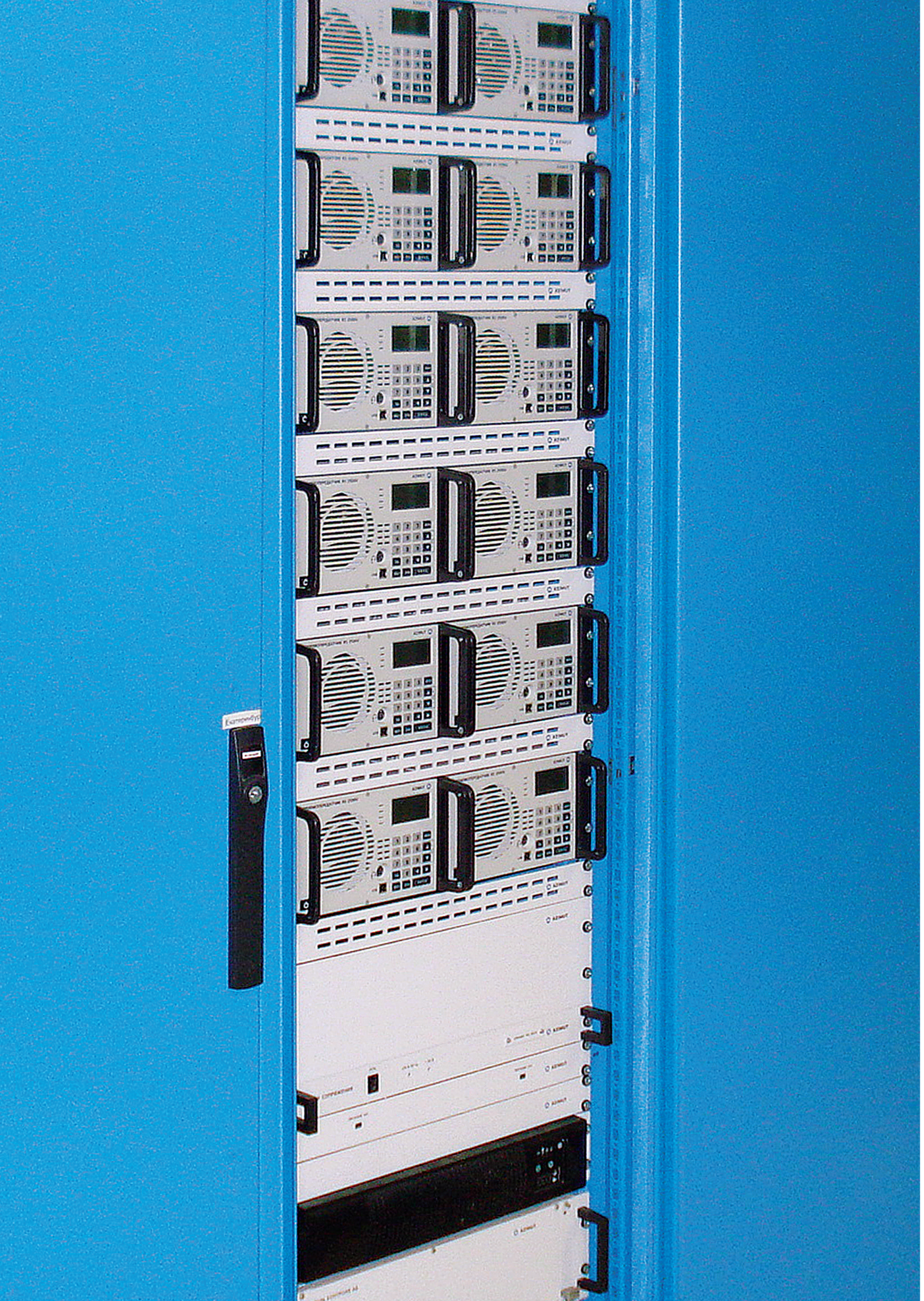
This easy-to-perform procedure run with the help of a portable PC provides the operator with correct information on what actions should be carried out in relation to the PAPI lights adjusting mechanisms in order to achieve fine tuning.

The SMF/PAPI adjustment procedure is quick and easy (less than 10 minutes per light) and can be repeated by the user periodically or when some special maintenance actions are necessary (i.e. during light repairing or replacing).

The user can perform flight checks only when it is strictly needed (i.e. in order to ensure coordination between the PAPI lights and the ILS system) having used preliminarily the SMF/PAPI system for PAPI adjustment, thus saving money and time. The SMF/PAPI system can create a system database containing data on all settings of the PAPI lights (i.e. light beam elevation angles for each light) made in the course of flight reviews with or without ILS system, and use this data as reference values for further measurements.

Thus, the user can be sure that after post-service resetting, the light parameters will have the same set in the course of flight checks.

A very important feature provided by means of high accuracy of the SMF/PAPI system, is a possibility of using PAPI lights as a reference information source for checking ILS settings.



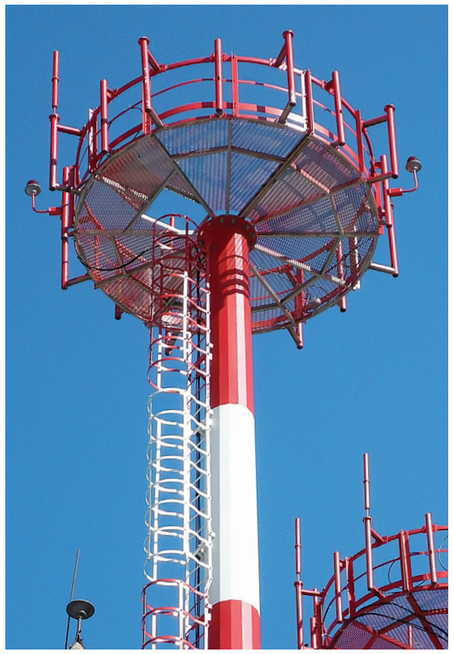
TRS 2000

Automated Transmitting and Receiving VHF and UHF centre

Purpose

The Automated Transmitting and Receiving Centre (ATRC) TRS 2000 is designed to provide fixed radio communication channels between controllers and aircraft crew to the benefit of the Unified Air Traffic Management System (UATMS) of the Russian Federation. Suitable for installation both in fixed-site premises or shelters, the ATRC is available in different hardware configurations:

- Separated transmitting and receiving radio centres;
- Combined automated transmitting and receiving radio centre.



ATRC features and capabilities

- Provides simultaneous independent operation from 2 to 46 frequency voice channels;
- Provides redundancy as radio and antenna feedlines radio by connecting to different filtration decoupler;
- Breaks in communication sessions on any of the radio channels air (due to a malfunction of radio technical equipment ATRC or power failure) 3;
- Monitors the continuous operation time of each transmitting device in radiation and prevents the continuous operation of the devices in this mode in case of failure of the control channel radio;
- Enables multiple receivers and transmitters to a single antenna;
- Both ATRC as a whole, and equipment from its structure do not require line maintenance;
- An integrated test provides automatic monitoring of all main ATRC parameters, search and localization of faults up to standard element replacement;
- A shelter with a life-support system provides air conditioning and heating, security and fire alarm, video surveillance and a gas fire-extinguishing system.

ATRC composition

ATRC consists of the following parts:

- VHF radios and VHF/UHF;
- Unified cabinets for equipment;
- Antennas for VHF and VHF/UHF;
- Filtered decoupling devices;
- Uninterruptible power supply;
- Equipment for remote control (optional);
- Shelter with a life-support system (optional).

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