VNIIRA.

AIR TRAFFIC MANAGEMENT
SYSTEMS AND AIDS

Complexes of Air Traffic Control Automation Aids

Air Surveillance Aids

Navigation and Landing Radio Systems

Weather Radar Systems

Airborne Navigation and Landing Equipment

Antenna and Feeder Systems and Devices

Automated Flight Test System (ASLK)

ATC Training Systems

JSC VNIIRA

19, Shkiperskiy Protok,
Saint-Petersburg, 199106
Tel.: +7 (812) 356-06-11
Fax: +7 (812) 352-37-55
vniira@sp.ru
www.vniira.ru

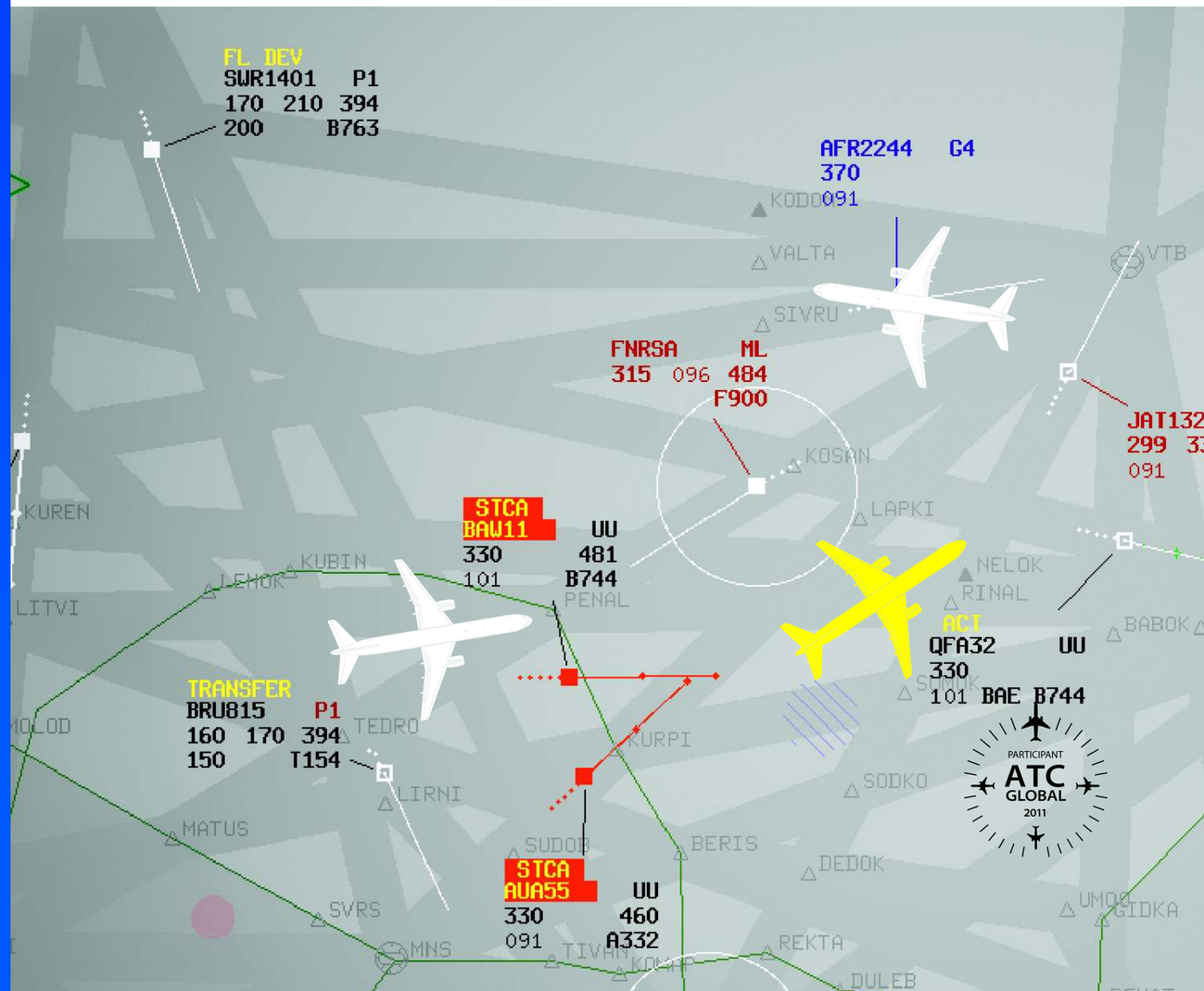
VNIIRA-OVD JSC,
exclusive representative
of JSC VNIIRA
in export markets

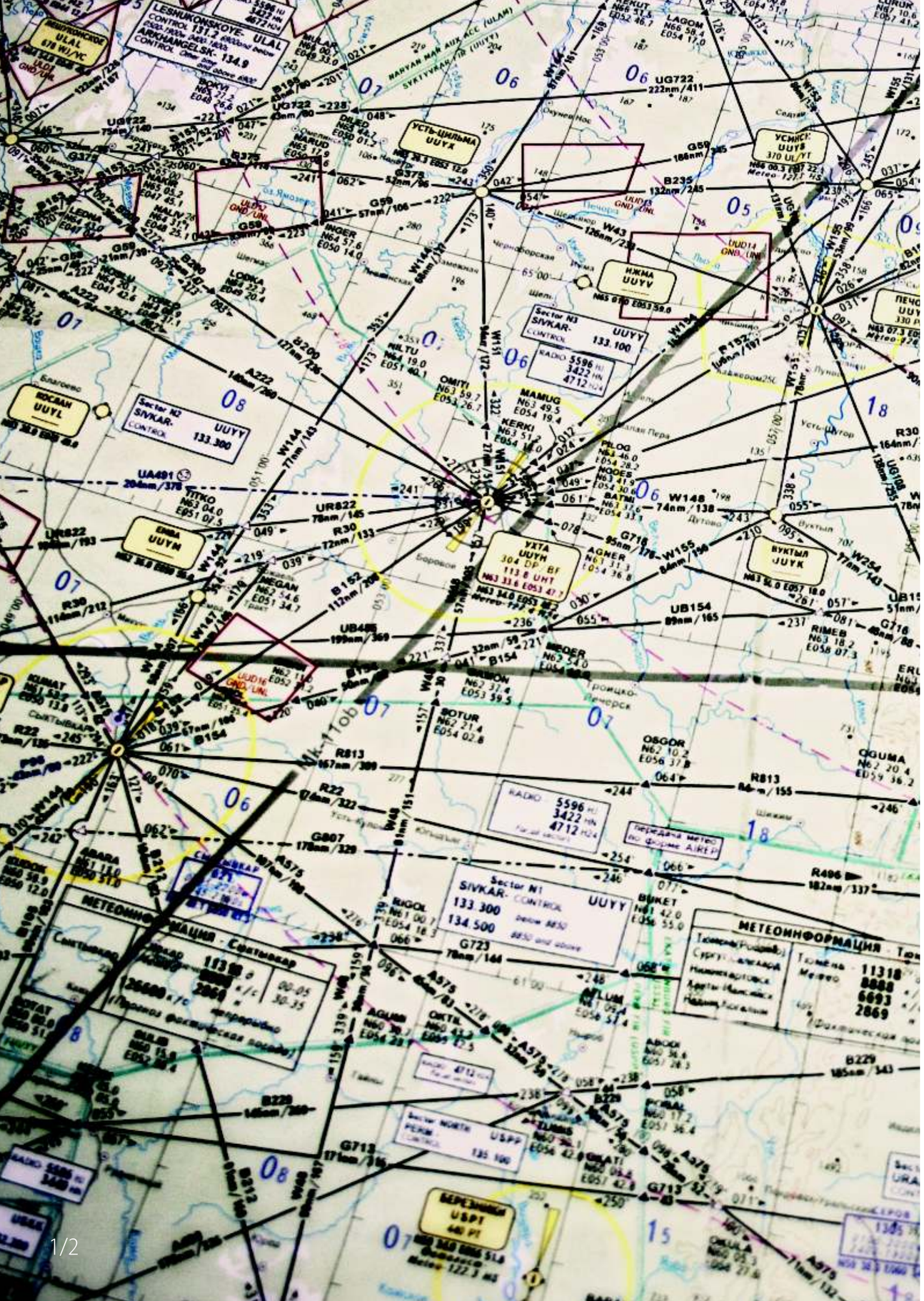
19, Shkiperskiy Protok,
Saint-Petersburg, 199106
Tel.: +7 (812) 356-01-40
Fax: +7 (812) 356-01-41
support@vniiraovd.com
www.vniira-ovd.com

AIR TRAFFIC MANAGEMENT
SYSTEMS AND AIDS

ATC Training Systems

SINTEZ-TC
COMPLEX SYSTEM SIMULATOR





VNIIRA. AIR TRAFFIC MANAGEMENT SYSTEMS AND AIDS

Information about the Company:

All-Russian Scientific Research Institute of Radio Equipment (JSC VNIIRA) has specialized in the development, production, commissioning and maintenance of navigation and landing systems and aids, air traffic control automation, airborne equipment and weather radars.

Areas of activities:

- automated ATC and ATM systems and facilities for various control areas and for large regions and separate countries;
- simulator systems for AT controllers;
- surveillance, approach control, secondary, and weather radars;
- ground and airborne equipment of short-range radio navigation systems and instrument landing systems;
- airborne equipment of range measuring, aircraft (A/C) collision avoidance, and early
- ground proximity warning systems, and transponders;
- onboard integrated navigation and landing systems;
- ground and airborne aids of the Automatic Dependent Surveillance-Broadcast (ADS-B).

In 1999 JSC VNIIRA has got a status of the Federal Scientific Production Center.
In 2004 JSC VNIIRA has joined JSC «Concern PVO «Almaz-Antey».
When working out a solution, VNIIRA specialists prove again and again that they are capable of achieving more, inasmuch as each follow-on development surpasses the previous one. The long experience and our Customers' acknowledgements confirm it.

VNIIRA is far more than:

- 65 years of the successful performance for the benefit of air safety;
- 150 prototypes of radio-technical systems and the complex of ground and airborne radio instruments;
- 1 300 Inventor's Certificates;
- 60 complexes of ATC automation systems and facilities for airports and regional centers of Russia and other countries;
- 100 types of home-produced aircrafts and helicopters employ the airborne equipment, navigation and landing facilities developed by VNIIRA;
- 1 600 employees including 11 Doctors of Engineering Science and 68 Candidates of Engineering Science.

Several generations of controllers have been educated by VNIIRA simulators.

History of Implementation

- 2001–2008 – delivery of 16 sets of SINTEZ-T simulators to different airports of the Republic of Kazakhstan.
- 2003 – development of the product to the order of «Belaeronavigation» and successful implementation of the first prototype in the Minsk-2 airport of the Republic of Belarus.
- 2004 – introduction of the SINTEZ-TC CSS into the controller practical training system of the Automated Air Traffic Control System (ATC AS) of «Kazaeronavigation» of the Republic of Kazakhstan.
- 2006 – the SINTEZ-TC Complex is deployed at Moscow State Technological University of Civil Aviation.
- 2007 – the SINTEZ-TC CSS began to be exploited at Civil Aviation University and at Aviation Transport College of Civil Aviation in Saint-Petersburg.
- 2010 – the upgraded SINTEZ-TC-V of the Tower type was supplied for the Khabarovsk Consolidating Interregional Center of ATM.

The SINTEZ-TC CSS was exhibited at the major Russian and International Shows such as
«AVIA-2000», «AVIA-2002» (Moscow);
«MAKS-2001» to «MAKS-2007» (Zhukovsky);
«ATC-2003», «ATC-2004» (Maastricht, the Netherlands);
«ATC GLOBAL-2009», «ATC GLOBAL-2010» (Amsterdam, the Netherlands).

The first simulator for practical training of the civil aviation controllers was developed by VNIIRA as far back as in 1976. All training centers of the USSR, where controllers were trained at that time, were equipped with the Instructor simulators. Several generations of controllers have been educated by various VNIIRA simulators.

Nowadays, JSC VNIIRA offers to the civil aviation market a new SINTEZ-TC Complex System Simulator (SINTEZ-TC CSS), in which all recommendations of Eurocontrol are included. The Complex is one of the best in Europe by tactical characteristics and training capabilities.

The SINTEZ-TC CSS is intended for training, exercising and refresher training of the controller personnel of airdrome and regional air-traffic control systems of various level of automation. The simulator provides training of air traffic control officers at all work stations of the ATC system. The simulator configuration and software are easily customized to the particular zones and sectors of the Customer's airdromes.

SINTEZ-TC

VNIIRA Simulators

Development of training-simulator complexes is a very responsible process. Thanks to simulators, a controller may save human lives.

The simulator imitates any conflict situations in the real and fast time scales; it enables the performance of up to 300 flight plans in one exercise; one task lasts for at least 120 minutes. It provides the simulation of extremely unfavorable conditions: heavy density of aircrafts, a direct danger of collision of two aircrafts, a complexity of aerodrome conditions, creating adverse weather conditions, for example, fog, and many others.

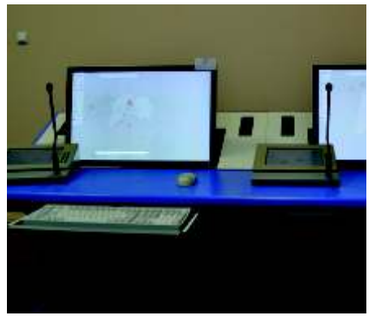
Having examined practically all unforeseen and severe situations on the simulator, specialists become psychologically ready to resolve them in the air. Furthermore, they develop their skills to the automatic actions. Eventually, in the actual conflict situation they do not waste any second of the precious time and know absolutely well, what should be done.

Several generations of controllers have been already trained by various VNIIRA simulators; and our experience has proven that we work not for nothing.

Why SINTEZ-TC in particular?

This is right the simulator offering an opportunity to prepare to the ultimate degree for any situation, which may arise in the controller's work. SINTEZ-TC possesses the following advantages:

- an OPPORTUNITY of exercising the group operations of ATC controllers-trainees throughout the ATC process flow from take-off to landing;
- an OPPORTUNITY of exercising skills of ATC controllers' actions when resolving conflicts and in adverse weather conditions;
- an ABSENCE of operational EXPENSES, consumption of aviation fuel, service life of an aircraft and engines;
- the REDUCTION of the overall TIME of controllers' training and retraining in exercising new ATC technologies;
- the CONTROL of the execution of actions of ATC controllers-trainees and the demonstration of the correctness of exercise performing by an instructor;
- the QUALITY of controllers' training for the actual ATC conditions of the used Customer's airport;
- MODERNIZATION or replacement of the simulator components with the more advanced equivalents upon the Customer's request.



Simulator Components

The SINTEZ-TC CSS is designed as a set of multipurpose training modules integrated with a computer network. The Customer, in accordance with the specifics of his airdrome area or nodal point, selects the following modules:

- work stations of controllers-trainees (ARM-D) implemented in various design styles (dual controllers' work stations of radar monitoring ARM-D1 and procedural monitoring ARM-D2);
- work stations of «operator pilots / instructors» (ARM-PO);
- ground situation visualization hardware and software tools (VHST);
- work stations of system administrators (RM-SAS of the system-level section and RM-SAM of the complex simulating section) and the radar and flight data processing server (RFDPS);
- recording and reproduction system;
- voice communication simulation tools.

Work Station of Controller-Trainee (ARM-D): Simulation of All Primary Functions of ATC System

- detection of potentially conflict situations and warning of controllers about potentially hazardous A/C proximity;
- detection and warning of controllers about reaching of the limiting values of the safety parameters;
- detection and warning of controllers about the A/C terrain proximity below the minimum safe altitude;
- detection of medium-term conflict situations;
- detection of the A/C deviation from the flight plan route;
- detection and warning of controllers about a possibility of the A/C entry in the hazardous weather phenomena zone.

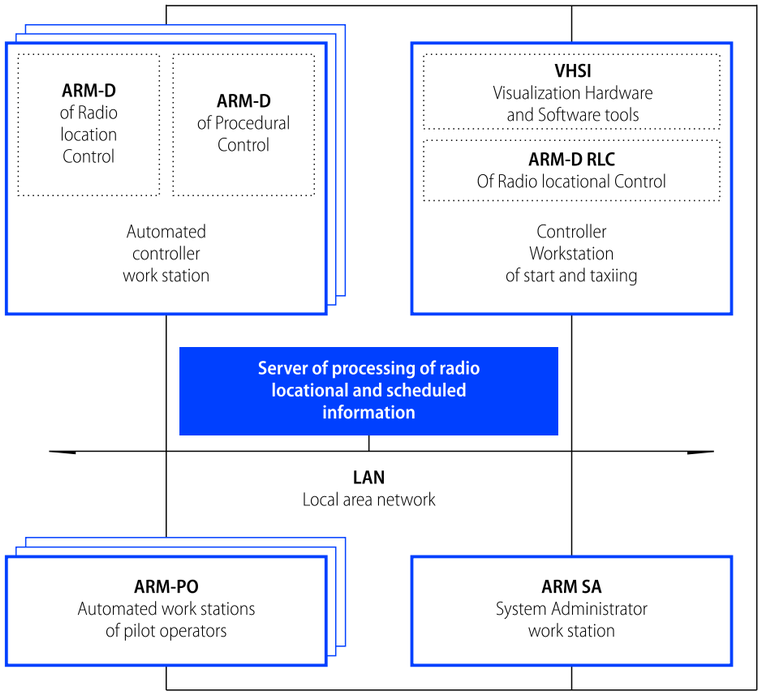
Loudspeaker Communication Simulation Equipment (LSC): Full Presence Effect

The ground-air communication simulation equipment and WKS order-wire service equipment (OWSE) is built in each SINTEZ-TC CSS WKS. OWSE provides the voice radio traffic between practicing controllers and operator pilots, as well as order-wire loudspeaker communication between controllers and operator pilots, and between controllers in case of a play-up by an operator pilot for the related services.

Work Station of Operator Pilot/Instructor (ARM-PO): Training and Supervision of ATC Controllers

- simulation of aircraft movement en-route and by charts preset in the exercise; exercising of controllers' commands;
- simulation of motion of targets of various types, with an allowance for the following characteristics: climbing and descending mode, fuel reserve, fuel flow for each type, and changeable in the process of exercising of disturbing factors of the ambient environment;
- simulation of conducting the «air-to-ground» radio traffic;
- simulation of conducting the order-wire loudspeaker communications (LSC);
- simulation of exception cases in flight;
- recording all information on actions of ATC controllers-trainees and parameters of an exercise for the follow-up checking;
- automated data collection for evaluation of trainees' actions;
- capability of entering potentially conflict situations (PCS), additional A/C, changing of weather conditions, stopping and starting of the exercise, etc. in the course of the exercise;
- simulation of meteorological data including hazardous weather phenomena and weather in the terminal area, and heap and rainy cloudiness.

Structural scheme of basic SINTEZ-TC Simulator



Automated Training and Test System (ATTS): Perfect Education and Improvement

- academic education and improvement of the level of ATC controllers' professional knowledge;
- individual and group testing of the progress of controllers' training at all stages of teaching;
- automated evaluation of the degree of ATC controllers' theoretical training.

ATTS functions in the following modes:

- a mode of creating the knowledge / data base containing the complete set of educational and methodical materials for ATC controllers' training;
- a mode of preparation and development of computer educational programs;
- a mode of independent training of trainees;
- a mode of conducting an automated training session (ATS);
- a mode of automatic test and evaluation of the trainees' knowledge by various disciplines;
- a mode of archiving of the training process results.

ATTS may be used in the autonomous mode in a computer class on the basis of the distributed structure of computer aids.

SINTEZ-TC-V

SINTEZ-TC-V is a version of the VNIIRA simulator for high airdrome flight control towers (Towers). It is intended for training controllers of the airdrome Towers ATC:

- start control station (SCS);
- taxiing control station (TCS);
- landing control station (LCS).

The simulator comprises ARM-D, ARM-PO, and VHST. The visualization hardware and software tools are intended for simulating a visual ground situation and controlling the movement of A/C and special transport vehicles on the airdrome maneuvering area. The primary function of the visualization complex is the generation of a pseudo three-dimensional model of the aerodrome conditions imaging on the 3D graphics vision module screens on the basis of projectors and LCD panels; any desired scan angle is provided.

The simulator provides:

- simulation of movement of A/C of various types on the ground and in the air;
- simulation of various structural changes of the airspace in the airdrome area;
- simulation of various weather phenomena (rain, snow, fog, etc.);
- simulation of various time of a day and year;
- displaying of meteorological data;
- displaying of information on the current and predicted air situation;
- displaying of information on the air situation restrictions;
- displaying of simulated special signals received from A/C;
- displaying of warning in case of A/C entering the forbidden and hazardous areas, A/C deviation from the route;
- displaying of formalized message according to the standards of ICAO and Eurocontrol and specific messages on ATM;
- simulation of movement of automotive transport and special-purpose transport on the terminal ramp, taxiway, access taxiway, runway;
- simulation of the local environment with the detailed elaboration of the terrain, specific landmarks visible from the observation place;
- recording and reproduction of radar and voice data («controller – crew», «controller – controller», «order-wire talks»);
- possibility of application of the model libraries created by the simulator developer (visualization systems).