AIR-ROUTE RADAR COMPLEX “SOPKA-2”

“Sopka-2” S-band Air-Route Radar Complex (ARRC) is intended for application as radar data source for air traffic control and airspace monitoring systems.

At the same time, the separate channel is provided within the ARRC for reception of meteorological data similar to the one obtained from specialized meteorological radars.

“Sopka-2” ARRC does ensure detection of air objects, measurement of range, azimuth and elevation angle (height) of targets, identification of state-belonging, obtaining via MSSR/GRI channel of supplementary data transmitted by aircraft on-board transponders, combining of radar data obtained from PSR, SSR and GRI, as well as sending the data processed to the consumers’ displaying facilities as per protocols agreed.

Upon the Customer’s request, ARRC may include ADS-B equipment.

Antenna device of primary radar is antenna phased array with frequency control over position of a beam in vertical plane. MSSR and GRI antennas are monopulse antenna arrays placed rearward to PSR antenna (as per “back-to-back” principle). Azimuthal rotation is ensured by means of gearless rotation drive.

Transmitting device of PSR is solid-state one, with coherent adding of power of 64 modules with air-cooling. Average radiated power at the transmitter output is not less than 4kW. Amplitude-phase stability of the transmitting device provides local clutter suppression factor of not less than 50dB. Transmitter operates in “soft-failure” mode. Replacement of faulty modules can be performed in the course of operation without radiation shut-off.

Receiving device of PSR is multi-channel one, comprising 4 main and 4 stand-by channels (100% redundancy). The each channel has single frequency conversion with noise factor of not more than 3dB.

Dynamic range of receiving device is not less than 60dB at intermediate frequency output. Each channel is made as the separate integrated unit (module). Failure of one or several reception channels will not result to PSR failure because of the reason that in such a case automatic switching-over to the stand-by set takes place. Replacement of faulty modules is possible in the course of PSR operation.

Multi-channel equipment for digital processing of signals is based on digital signal processors and field programmable logic devices (FPLDs). Analog-to-digital conversion of a signal received is performed on intermediate frequency with generation of amplitude-frequency response by means of digital filters, which do ensure high identity of channel characteristics as well as phase stability thereof. Intra-period processing of signal (compression, suppression of asynchronous impulse noises) is realized on FPLDs.

Period-to-period processing of targets (MTI, adaptation to wind speed and to clutter types and parameters) is performed on signal processors. Processor for primary processing generates bursts and calculates coordinates of air objects, generates bearings of jammers and maps of clutters.

Processor for secondary processing performs trajectory processing and identification of PSR data with MSSR/GRI data. Air object tracking is possible basing on data obtained from any channel (PSR or MSSR/GRI).

LIRA-VM intergrated Monopulse Secondary Surveillance Radar complies with ICAO regulations (Annex 10) and with the Russian standards, and does ensure obtaining via MSSR channels of supplementary data (flight data) transmitted by aircraft on-board transponders as per RBS standard including S mode, as well as identification of state-belonging of an aircraft in all modes of Parol system.

Integrated control system allows realizing in automated mode of surveillance programs by the way of detecting and tracking of air objects equipped with respective transmitters-responders.

Distinguishing feature of MSSR equipment design is the usage of completely digital and redundant equipment for processing of reply signals with encoding on intermediate frequency and digital phase detection.

Control over switching-on and alteration of interrogation modes is performed automatically basing on data of secondary processor.

Automated Monitoring and Control System does ensure diagnostics of radar complex devices for the purpose to localize failures and faults up to the level of a line replaceable unit, and automatic or manual reconfiguration of the system upon results of radar complex functionality monitoring, remote switching-on (-off) and control over operation modes.

Basic Technical Specifications

Operational limits:	
in range, km (PSR/MSSR)	370 / 450
In azimuth, deg.	360
In elevation, deg.	45
in height, km	35
Accuracy of coordinate measurement (RMS-error)	
for PSR: in range, m	50
in azimuth, arc minutes	10
in elevation, arc minutes	15
for MSSR / GRI: in range, m	50
in azimuth, arc minutes	6
Resolution:	
for PSR: in range, m	250
In azimuth, deg.	1.3
for SSR: in range, m	100
In azimuth, deg.	0.6
Probability of combining of PSR and SSR coordinates from DPPI output:	
for a single aircraft, not less than,	0.95
flight data	0.96
Data renewal ratio, s	10
Number of simultaneously tracked targets, not less than	300
Power consumption, kVA, not more than	40
MTBF, hrs	20 000

High reliability is ensured by means of full duplication of equipment with automatic redundancy. Availability of monitoring and remote control provides possibility of non-attended operation.

ARRC equipment is mounted inside the container-type building of the type Universal that ensures all conditions indispensable for equipment operation and personnel work (ventilation, air-conditioning, heating, lighting, fire and security alarms, automatic fire-extinguishing system etc.).

BASIC DISTINCTIVE FEATURES OF “SOPKA-2” ARRC

- Three-dimensional solid-state digital radar complex;
- High tactical-technical and operational characteristics;
- Possibility of non-attended operation;
- High reliability with automatic redundancy;
- Automated system for monitoring and diagnostics;
- Modern methods of signal and data processing;
- Integrated meteorological channel;
- Interfacing with any kind of ATC centers.

Type Certificate issued by Interstate Aviation Committee

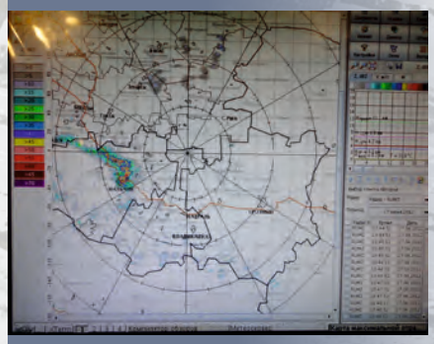
СЕРТИФИКАТ ТИПА
TYPE CERTIFICATE
№ 517

ОГРАНИЧЕНИЯ ДЕЙСТВИЯ
СЕРТИФИКАТА ТИПА № 517

MSSR Cabinet

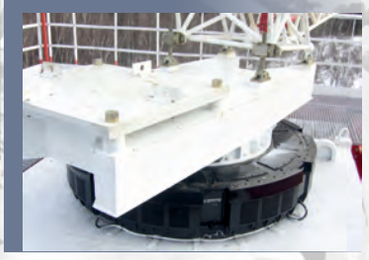
Transmitter of ARRC “Sopka-2”

IMPLEMENTATION OF NEW TECHNIQUES

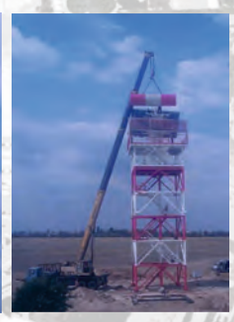


Display for Meteo Data

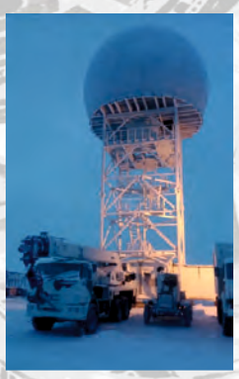
Gearless Rotation Drive



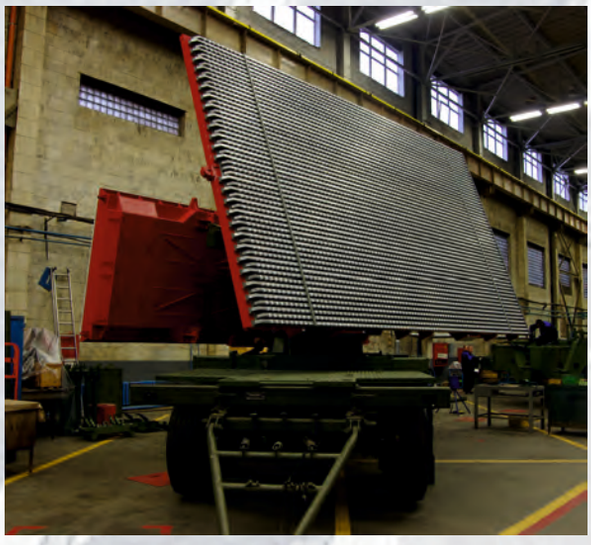
Construction and equipping of objects in favor of State Corporation for ATM



Radar sites put into operation



AIR-ROUTE RADAR COMPLEX “SOPKA-2” IN TRANSPORTABLE VERSION



“Sopka-2” ARRC with transportable antenna module is designed for implementation of a Customer’s capability to use the existing infrastructure of old-fleet radar sites (of P-35, P-37 type and other radars) with minimal preparation of radar stand points and communications.

Advantages of using the version of “Sopka-2” ARRC with transportable antenna module

-The time is reduced for ARRC commissioning and for substituting the existing radars of P-35/ P-37 type using previously established sites without significant expenses;

-Maintenance of the antenna module is simplified;

-Wind-loads of up to 50m/s are withstood with no additional jobs on affixing the trailer to the hill.

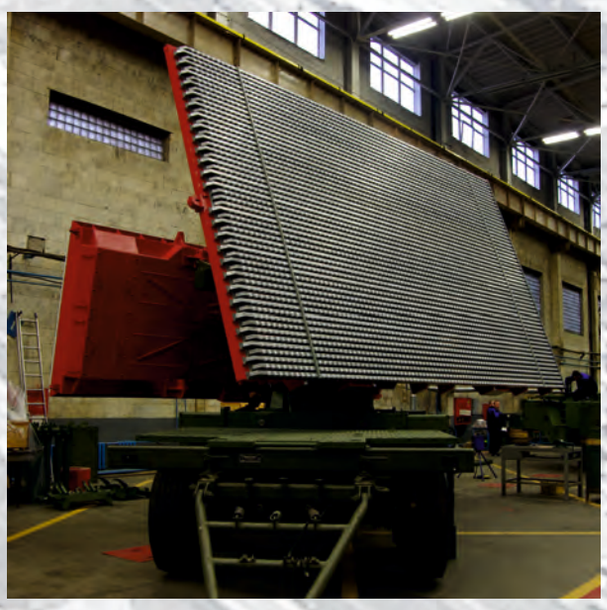
-Antenna module will go through the acceptance tests directly at the OEM factory and will be transported without disassembling;

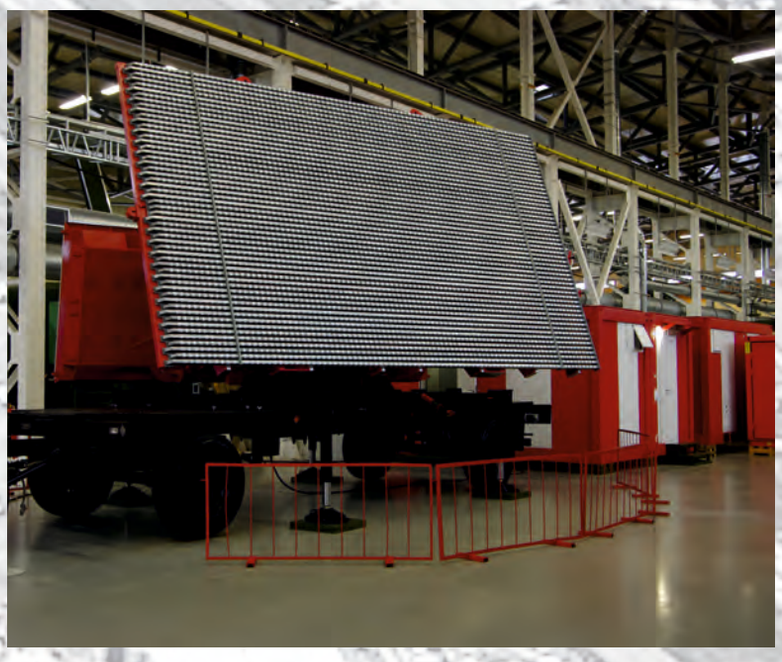
-The necessity to carry out design & exploration and construction & assembly work for installation of the tower is excluded;

-Possibility to use the existing infrastructure of old-fleet radar sites (of P-35/ P-37 type and other ones) with minimal preparation of radar standing point and communications;

-The possibility of redeployment of “Sopka-2” ARRC and its transportation to another site.

ASSEMBLY AND ADJUSTMENT OF ANTENNA MODULE AT FACTORY





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