



Ladies and Gentlemen,

Starting from July 1998 the State Foreign Trade Enterprise «SpetsTechnoExport» specializes in export of up-to-date military technologies and rendering services on repair, modernization and maintenance of weapons and special-purpose equipment. We also support and cooperate with various research centers and design bureaus of the military-industrial complex of Ukraine.

Being conscious of the necessity of wide implementation of electronic warfare in order to success on modern battlefield, we are proud to present range of electronic surveillance systems, radar complexes able to function despite of enemy jamming and suppression, our own jamming complexes and means of protection against high-precision weapons.

***Igor Gladush
Director***



RADIO-ELECTRONIC ENVIRONMENT CONTROL COMPLEX

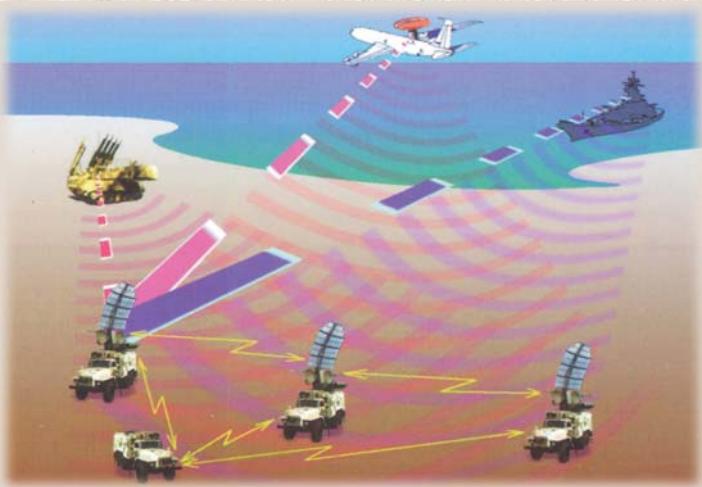
«KOLCHUGA»

The High-Precision (Passive) System of long-range targets detection, identification and determination of ground-, sea- and air targets coordinates and march routes.

«Kolchuga» as a mean of radio-technical reconnaissance allows to reveal on an operational-strategic depth the enemy grouping, define its composition, character of functioning and routes of moving. The complex determines with high accuracy in any point of the controlled space the coordinates of all known Radio-technical Equipment (RTE) of different classes and systems, installed on ground-, sea- and air targets, early-warning radar stations, multifunctional radars, recognition systems, air traffic control systems, navigation systems.

It allows:

- to reveal the location of aerodromes and define all RTE supporting its functioning;
- to define the number, type of aircrafts, being based on these aerodromes, and air crew level of attainment;
- to reveal the location of Air-Defense Missile Complexes and antiaircraft artillery, the number and type of RTE in their structure, its relocation;
- to determine the location and type of radar complexes and electronic warfare (EW) installations – thus to reveal zones of coverage of enemy radar and electronic countermeasure systems on a particular terrain / war theatre.



For Air Defense Forces

Increasing efficiency, secrecy, vitality and noise-immunity of the Air Defense system, complex allows to perform the followings tasks:

- air targets detection at the distances that are beyond the reach of active radars;
- determination of air targets formation and its threat level evaluation;
- early warning feature for AD installations (air borne targets data);
- real time scale detection, tracking and generation of march routes of up to 200 airborne targets;
- outputting/delivery of coordinates data to AD complexes;
- air traffic control capability (civil application).

For Naval Forces

On the sea direction complex allow to reveal the grouping of Naval Forces, the number and types of ships, its location, purpose of individual groups in march (cruise), the level of Naval attainment.

Features of “Kolchuga” complex significantly improve strategic and tactical control of troops on the war theatre / battlefield, allowing to predict and prevent probable threats from enemy air defence, electronic countermeasure and electronic reconnaissance activities.

«KOLCHUGA»

TECHNICAL DESCRIPTION.

Complex consists of one central and three side «Kolchuga» stations. Side stations are identical and interchangeable.

Each station consists of two machines with antennas, equipment and autonomous power supply, placed in specially-designed shelters, mounted on a chassis of high off-road capability trucks of KRAZ type.

The air-conditioning, heating and ventilation systems used in each unit enable normal working conditions for the equipment and an operator in any climatic zone with ambient temperature ranging between minus 50°C and plus 50°C and wind velocity of not more than 30 m/sec.

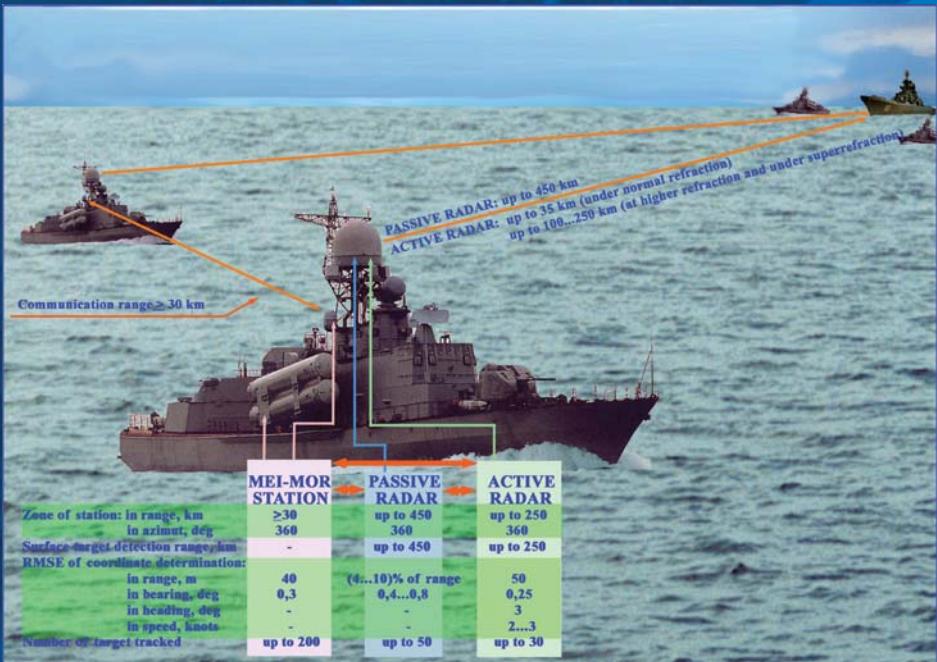
TECHNICAL SPECIFICATIONS OF KOLCHUGA SENSOR

1.	Operating frequency range, MHz	70-18000
	(with possible extension up to 40 GHz)	
2.	Real field sensitivity of a station (minus dB/W).....	108-156
3.	Instrument bearing error, degree.....	0,3-1,5
4.	Instantaneous dynamic range, dB.....	60±5
5.	Pulse width measurement range (), τ'.....	0,07 - 999,0
6.	Measurement range of pulse period running (T _i), τ'.....	from 1 to 99999,0
7.	Detection distance within an operating frequency range.....	up to 600 km
8.	Methods for coordinates definition for a complex: - triangulation method..... - TDOA (hyperbolic) method.....	available available
9.	Target coordinates measurement accuracy (% of the range): - triangulation method..... - TDOA (hyperbolic) method.....	3% 1-3%
10.	Topography tie-in system.....	GPS NAVSTAR, GLONASS
11.	Graphical display of radio electronic situation on a digital map.....	available
12.	A station crew at around-the-clock operation.....	7
13.	Power supply: - 3 phase, AC supply circuit..... - built-in power sully unit.....	50±2,5Hz,380±10%V GEKO 15001 ED-S/MEDA/ KUBOTAEP183TDE



THE MULTIFUNCTIONAL TARGET DESIGNATION RADAR COMPLEX

«MINERAL-ME»



BASIC TECHNICAL CHARACTERISTICS

Radar		Active	Passive	MEI-MOR
Frequency band		I	I, G, E/F, D	I
Scanning zone	Through azimuth	360°	360°	360 °
	Through range	Up to 250 km	Up to 450 km	Up 30 km
Number of targets tracked	Detection mode	-	Up to 50	-
	Target designation mode	-	Up to 10	-
Number of targets processed		-	-	Up to 200
Number of interacting ships		-	-	Up to 9

The Complex provides long-range over-the-horizon detection of the surface targets, reception and processing surface situation data received from coastal complexes, tactical group vessels, equipped with "Mineral" type complexes (systems), and also from aircraft and helicopters that transmit data using regular means of radio communication, develops and presents information on target coordinates to rocket weapon of a vessel and tactical group vessels, provides guidance for joint combat actions.

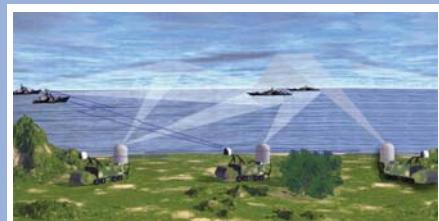
It represents multipurpose information-command-and-control system that operates using heterogeneous data detectors (active, passive, remote air and ship observation posts) within the limits of a unified information field and constitutes an independent mean of over-the-horizon target detection and designation.

Complex composition

- active radar for surface targets detection and target designation (ARS);
- passive radar for surface targets detection and target designation (PRS);
- station of mutual information exchange, mutual vectoring (orientation) and joint surface targets data processing (MEI-MOR station).

Deployment options

- Vessel-based;
- Stationary (coastal);
- Portable on the mobile chassis.



«MINERAL-ME»

BATTLE TASKS

- detection and coordinates setting of surface targets in active and passive modes of detection for possible use of weapons;
- automated acquisition, processing and an information display from PRS (passive radar), ARS (active radar), vessel remote sources of information acquisition equipped with "Mineral-ME" complexes (systems), and information received via regular radio communication means from air remote observation posts (ABНП);
- classification of the targets ;
- mutual vectoring (orientation) of vessels combined into a tactical group;
- automated information exchange between a flagship (FS) and the group vessels (GV);
- command and control of joint combat actions (C2JCA) of the vessels.

ARS (active radar) ensures:

- detection and tracking of surface targets , their coordinates setting and elemental motions;
- recognition of the state affiliation of tracked targets by means of staff radar identification equipment;
- elaboration and delivery of information on a target designation using information gained via staff radio communication equipment from air remote observation posts;
- classification of detected targets ;
- bearing of the jamming vessel;
- elaboration and delivery of information on a target designation to the automated command and control system (AC2Sys).

Besides, ARS (active radar) has special operation mode that makes it able to track surface targets using data of the staff vessel radar.

PRS (passive radar) ensures:

- reception, detection, bearing and parameters measurement of impulse signals of radiating radars within the frequency bands I, G, E/F, D;
- classification of received signals on the basis of an aprioristic (transcendental) databank (filled in by a customer);
- coordinates setting (bearing and range) of radiating radars by means of one maneuvering vessel or a group of two-three vessels interacting through the MEI-MOR station;
- elaboration and delivery of information on a target designation to the automated command and control system (AC2Sys).

MEI-MOR station ensures:

- the individual identification, mutual information exchange and mutual vectoring (orientation) between the tactical group vessels, equipped with "Mineral-ME" type complexes (systems);
- adaptive information exchange between the tactical group vessels depending on the number of interacting vessels and volume of current information;
- generation on a flagship of a unified information field about surface situation;
- information exchange organization in order to accomplish tasks related to coordinates setting of the radiating surface targets by several vessels;
- accumulation and joint information processing on surface targets by means of a single vessel and by means of the tactical group;
- forming and delivery of details on the tracked targets to the combat information-command-and-control system (ICCS) and information on operation modes and technical state of separate stations of "Mineral-ME" complex;
- solving calculation tasks;
- elaboration and delivery of information on a target designation to the automated command and control system (AC2Sys).



AUTOMATED RADIOPHYSICAL JAMMING COMPLEX

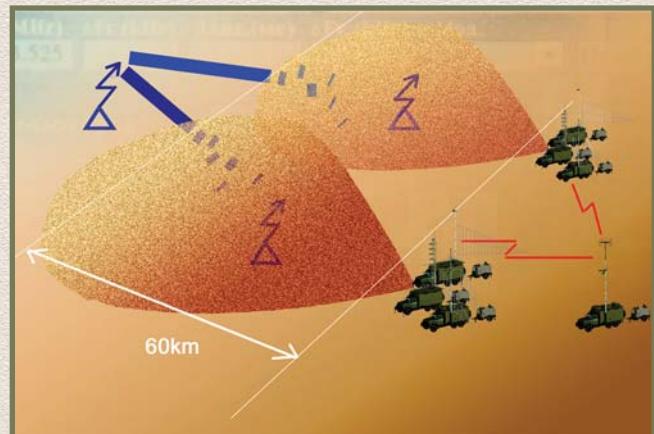
MANDAT-B1E

Radio-communications jamming complex Mandat-B1E is an automated data acquisition and data procession system. It gathers data on emission sources and radiates aimed barrage jamming signals within an area of monitoring.



The complex allows to reveal enemy grouping in operational and tactical depth, to define a disposition of military units, divisions, their terrain co-ordinates and relocation based on enemy radio command lines and radio networks.

Within the whole controlled / covered area (60km depth and 90km front) and within the whole operating frequency range (1,5-1000 MHz) the complex effectively jams up to 80 fixed frequency radio links or up to 6 radio links with FH technique – that allows to ruin the enemy forces control.



Full configuration of the complex : 2 posts and 1 control station. The complex consists of:

- | | |
|---|---------|
| a) R-330RD — reconnaissance station
(HF and UHF bands) | 1 unit |
| b) R-330KV1 — jamming station
(HF band) | 2 units |
| c) R-330UV1 — jamming station
(UHF1 band) | 2 units |
| d) R-330UV2 — jamming station
(UHF2 band) | 2 units |

MANDAT-B1E

The equipment of each station is located inside specially designed shelters mounted on high cross country capability trucks of KRAZ type. All UHF jamming stations are mounted on armored vehicles and inside armored shelters to protect crew staff and equipment from bullets and fragmentation damage. All units of the complex are fitted out with air conditioning, heating and ventilation systems ensuring normal working conditions for operators and the equipment in any climatic area at ambient temperatures ranging from -50°C up to +50°C and wind speed up to 30m/sec.

MAIN TECHNICAL SPECIFICATIONS

Name of the article	R-330RD	R-330KV1	R-330UV1	R-330UV2
Application	Reconnaissance station HF, UHF	Jamming station HF	Jamming station UHF1	Jamming station UHF2
Operating frequency range, MHz	1,5 Ɇ 1000	1,5 Ɇ 30	30 Ɇ 230	225 Ɇ 1000
Response time from signal appearance till jamming signal radiation, ms (within swath)	–	2 (28,5MHz)	0,3 (80MHz)	0,3 (80MHz)
Coordinates definition accuracy, % of the range			5±10	
Jamming signal strength, kW	–	1,0	2,0	2,0
Coverage area (front), km			up to 90	
Coverage area (depth), km			up to 60	
Communication range between units of the complex, km			up to 30	
Situational awareness display			available	
Navigation system			NAVSTAR GPS, GLONASS	
Power supply system			Autonomous electric power station, industrial power supply system 380V, 50Hz,	



MOBILE GROUND RADIO JAMMING SYSTEM FOR THE COMMUNICATION AND AIR CONTROL LINKS

«LIMAN»

The mobile ground system "Liman" intends for the radio suppression of the radio communication and control links and radio channels of the Identification Friend or Foe (IFF) system of the enemy.

The objects of the system "Liman" radio countermeasure are:

— all kinds of the VHF and UHF radio communications and guidance channels in the frequency ranges 100—150 MHz and 225—400 MHz used for the interaction of crews during air operation; for guidance of the aircrafts on air and ground targets by the air and ground control stations; for transmission of a reconnaissance data from the aircraft to the control station; for guidance of the aircrafts on ground targets by the forward air controller (FAC);

— the communication, control and navigation channels in the frequency range 960—1215 MHz (JTIDS, TACAN types), and also channels of the state identification system (IFF).

The distinctive feature of the system is the effective radio suppression of the modern jam proof radio channels using Frequency Hopping Spread Spectrum (FHSS) mode (Link-4, Link-11 type), and FHSS in a combination with spread spectrum radio signal (Link-16). It is reached due to high speed radio reconnaissance means of the system, application of original correlation methods of the noise like radio signals detection, high power potential of the jamming signal.

The system "Liman" authentically finds out the radio channel signals of the air control station on a distance up to 450 km. After this, onboard radio means — the receivers of the information and commands — are reliably suppressed on distances up to 200 km with radiation of powerful jamming in the frequency ranges 100—150 MHz, 225—400 MHz and 960—1215 MHz.

The creation of the high power potential jamming signal based on the technology of the phased array providing the value near 15—40 kW in a low and 60 kW in a high frequency bands, that in tens times exceeds the power potential of the analogous jamming stations.

The power potential of the system "Liman" jamming station provides the radio suppression for the control channels on distances when the attack aircraft cannot independently detect and strike the targets that provides significant decrease in efficiency of the enemy air activities.

Maximum quantity of jammers "Liman-Π1", "Liman Π2" and "Liman Π3" in the system structure up to 12 units (the quantity of each station type in one system can be definite by Customer) and 1 control station — the article "Liman-ΠУ".

The articles "Liman-ΠУ, -Π1, -Π2, -Π3" based on the truck-carrier with high cross-country ability KrAZ-6446 or KAMA3-4310 and body-van (equipped with the life support system). Use of other truck-carriers is possible.

The power supply of the articles is carried out from the industrial electric power-line or from the towed power generator a three-phase alternating current with frequency 50 Hz, voltage 380 10% V, with grounded neutral wire.

The power consumption of the article "Liman-ΠУ" is no more 4 kW; of the articles "Liman-Π1" and "Liman-Π2" — no more 16 kW.

The mass of the articles, no more:

"Liman-ΠУ, -Π1" — 17000 kg (including 1500 kg — power generator);

"Liman-Π2" — 17700 kg (including 1700 kg — power generator);

"Liman-Π3" — 17450 kg (including 1700 kg — power generator).

The dimensions of the units in a transport position, no more (length width height), mm:

the truck-carriers of the articles "Liman-ΠУ, -Π1, -Π2, -Π3" — 9100 3450 3950;

the towed power generators — 3950 2200 2400.



Control station
«Liman-ΠУ»

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BASIC PERFORMANCE OF SYSTEM «LIMAN»

1	Operating frequency bands for:	"Liman-Π1" "Liman-Π2" "Liman-Π3"	100–150 MHz; 225–400 MHz; 960–1215 MHz
2	Jamming objects:	– in the frequency ranges 100–150 MHz and 225–400 MHz – all kinds of the VHF and UHF radio communications and guidance channels used for the interaction of crews during air operation; for guidance of aircrafts on air and ground targets by air and ground control stations; for transmission of reconnaissance data from the aircraft to the control station; for guidance of aircrafts on ground targets by forward air controller (FAC); – in frequency range 960–1215 MHz – communication, control and navigation channels (JTIDS, TACAN types), and the state identification system channels (IFF)	
3	Kinds of jamming signals:	1) jamming for the radio links with fixed operating frequencies (FOF) mode over the frequency bands 100–150 MHz and 225–400 MHz 2) jamming for the radio links over the frequency bands 100–150 MHz and 225–400 MHz using FHSS mode with minimal duration of radiation on one frequency more than 13 ms 3) jamming for the radio links over the frequency bands 100–150 MHz and 225–400 MHz using FHSS mode with minimal duration of radiation on one frequency less than 13 ms 4) jamming for the radio links over the range 960–1215 MHz using FHSS mode	1) spot jamming signal on time and frequency; 2) spot jamming signal on time and frequency; 3) barrage jamming signal in frequency band; 4) barrage jamming signal in frequency band
4	Single jammer power potential:	"Liman-Π1" "Liman-Π2" "Liman-Π3"	up to 15 kW up to 40 kW up to 60 kW
5	Range of jamming area		up to 200 kms
6	Range of the air control station (ACS) and long radar detection (LRD) transmitters finding		up to 450 kms
7	The automatic analysis and determination of radio signals parameters, classification of radio emissions and selection of jamming objects, choice of kind and parameters of jamming signals, jamming signals forming for radio networks with FOF and FHSS		
8	Jamming signal radiation by means of transmitting phased array (PA) with automatic compensation of the nonidentical phase of a over the frequency bands 100–150 MHz, 225–400 MHz and 960–1215 MHz		
9	Electronic scanning of the transmitting PA antenna pattern maximum over the frequency bands 100–150 MHz, 225–400 MHz and 960–1215 MHz in directions of horizontal plane		–30 degrees 0 +30 degrees
10	Reaction time of the system:	– at jamming for the radio links with FHSS mode, no more – at jamming for the radio links with FOF mode, no more	0.3 ms; 0.5 s
11	Maximum quantity of jammers ("Liman-Π1", "Liman Π2" and "Liman Π3") in the system structure (each station type quantity in one system can be defined on demand of the Customer)		12
12	Possibility of autonomous operation of the jammers "Liman Π1", "Liman Π2" and "Liman Π3"		Present

Jammer
«Liman-Π1, -Π2»



BOMB RADIO JAMMING SYSTEM

«GARANT»

Purpose

The system "Garant" is intended for the protection of the mobile objects (moving columns and single vehicles) and stationary objects by prevention of radio-controlled firing of explosive devices (mines, high-explosive charges etc.), loaded by the terrorists.

The given problem is decided by the radiation of jamming radio signal in all frequency range, where use of the specified control radio links is possible.

System "Garant" structure

Num.	Name of components	Quantity
1	БПРЛ-1 radio jamming block with antenna	1
2	БПРЛ-2 radio jamming block with antenna	1
3	БПРЛ-3 radio jamming block with antenna	1
4	Power supply unit БЖ for the БПРЛ-1, -2, -3 blocks	3
5	Charging device БЕЖ	1
6	Kit of accessories for fastening of БПРЛ and БЖ on the carrier	1

Main technical features

1) Jamming radiation frequency band	—	20 --2000 MHz
2) Jamming type	—	wideband barrage
3) Total integral output jamming power	—	220 W
4) Distance of radio suppression (depending on parameters of the suppressed radio link)	—	75 – 5000 m
5) Power supply voltage	—	12 V
6) Operating temperature of an environment	—	from -40°C up to +60°C



Brief description of the system

Each of three БПРЛ blocks consists of four jamming transmitters and one high effective four lead-in wide band antenna with the circular directional pattern in a horizontal plane. The whole system includes 12 transmitters (the frequency range of jamming radio signal radiation is divided into 12 bands) and 3 antennas.

The choice of output power of jamming transmitters is optimum: at the effective suppression of radio receivers of explosive devices the negative influence of radio emission to staff is minimized.

The used wideband antennas on the characteristics have no analogs. The efficiency of the antennas in broad frequency band is reached due to use of special optimized inductance capacitor inclusions along with antenna conductor.

The antennas were developed specially for use on moving vehicles and placed directly on БПРЛ cases. The construction of antennas is executed folding.

At the deployment or displacing of the system the fast connection of the antenna with appropriate БПРЛ blocks without use of high-frequency cables is implemented, that ensures the convenience of operation, especially, in conditions of sandstorms.

The system "Garant" is completed by accessories for installation of БПРЛ blocks on the automobile, armored carrier or tank.

The highly effective radiators are used in the construction of the БПРЛ blocks, that allows maintaining the article in conditions of natural cooling (without use of cooling fans), including an open air.



GPS and/or GLONASS JAMMER

"KUPOL"

PURPOSE

System is designed for impeding operation of the equipment which uses GPS/GLONASS signals to determine current location by imitating structure navigation signals



TECHNICAL FEATURES

Working bandwidth: 1210-1260 MHz for channel 2 and 1550-1620 MHz for channel 1;

Approximate jamming range – up to 15 km (using omni-directional antennae) and up to 250 km (using directional antennae);

Transmitted power – no less than 10 W (1 W) on each of two channels (regulated);

Operating temperature (-20°C...+60°C);
Power consumption – less than 280 W,
optional power source – AC (110...250 V,
50...60 Hz) or DC (12V or 24V);

Full weight – less than 24 kg, approximate dimensions (excluding antennae and cables)
– 380x290x180 mm.

DIRECTIONAL ANTENNA SPECIFICATION

Transmits signal from SCU in frequency band 1220...1610 MHz with SWFV not more than 1,5;

Gain factor no less than 12 dB;

Antenna weights less than 2 kg, direction diagram 40°x40°.

OMNI-DIRECTIONAL ANTENNAS SPECIFICATION

Transmits signal from SCU in frequency band 1220...1610 MHz with SWFV not more than 1,5;

Antenna weights less than 2 kg, direction diagram 360°.

KASHTAN-3M

MOBILE AUTOMATED OPTICOELECTRONIC
COUNTERMEASURE SYSTEM

Immediate reaction —
reliable protection



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KASHTAN-3M

Mobile automated optoelectronic countermeasure system

The system is intended for protection of especially important objects against high-precision weapons (HPW) - missiles and air bombs equipped with semi active laser homing heads (SALHH).

System provides

- enemy laser emission devices detection and bearing such as enemy laser designators;
- laser decoy target (LDT) setting against HPW with laser guidance;
- target designation receipt from external information systems;
- information data delivery to higher Air Defense ACS;
- defense tactics selection depending on HPW configuration and quantity;
- possibility to change manually the decisions made by operator;
- registration and documentation of information about tactical situation, laser designators radiation parameters, system reactions of the complex and operator's actions;
- personnel training;
- system operability automated checking and fault tracing with defective module indication.

Technical features

Enemy laser designators radiation detection probability is not less than 0,9

Probability of the ammunition drift (re-aiming) on LDT is 0.6—0.8

Time from the moment of the enemy laser designator radiation detection to the moment of the LDT setting is no more than 1 s

Continuous running time in duty mode (enemy laser designators detection and bearing) is 24 hours

Apparatus transition time from off-mode to duty mode is no more than 3 min

Apparatus transition time from duty mode to combat mode is no more than 7 s

Operating wave length is 1,06 mm

Light-sensitive cells sensibility is no worse than $5-10^{-11} \text{ J/cm}^2$

Detection angle sector:

horizontal angle from 0 to 360°

elevation bearing –15 to +90°



STATION FOR OPTICAL-ELECTRONIC SUPPRESSION "ADROS-KT-01 AV"

The station for optical-electronic suppression "Adros-KT-01 AV" is intended for active protection of helicopters against guided missiles with infrared homing heads. The majority of known such stations is intended, basically, for suppression of infrared homing heads with amplitude-phase modulation (APM). Its interfering signal must exceed a signal from the helicopter's engines in 1.5-times, and on occasion up to 20 times. The station of "Adros-KT-01 AV" is capable to suppress infrared homing heads with heightened noise immunity for other types of modulation: frequency-phase modulation (FPM) and pulse-position modulation (PPM). This provides full locking-in failure for such guided missiles, as "Stinger" (FPM), "Igla" (PPM), "Igla-1" (FPM), R-60 (FPM), R-60M (FPM), R-73 (PPM), "Sidewinder" (APM) and others.

The station of "Adros-KT-01 AV" does not require considerable excess of interfering signal energy over the signal from the helicopter's engines, as it is necessary for other stations. We apply new method of optical-electronic suppression and new modulator design with electronic control of the basis of programmed processors.



CHARACTERISTICS:

Probability of attacking "Stinger"-type missile locking-in failure	0.7 ... 0.8
Time of full locking-in failure for HAM "Stinger", sec.	0.5 ... 0.8
Effective counteraction for HAM of "Stinger" type does not need an essential excess of static radiator energy over the helicopter radiation.	
Station provides simultaneous counteraction to missiles with infrared seekers of different types (amplitude-phase modulation, pulse-position modulation and frequency-phase modulation) without readjustment.	
Powered by helicopter onboard electrical grid:	
AC:	
three-phase	208 V, 400 Hz
single-phase	115 V, 400 Hz
DC	27 V
Weight, kg	25

THE MOBILE RADIOMONITORING SYSTEM

«ARGUS-M2»



Technical specification

Operating frequency ranges: direction finding mode radiomonitoring mode	20...3 000 MHz 20...26 500 MHz
Instrumental error of DF in frequency	
20... 80 MHz	2 degree
80...1 300MHz	1 degree
1,3...3 GHz	2 degree
Sensitivity at frequency of 1 GHz	-145 dBm
Average positioning error	less than 15m
Power supply systems:	
in the mobile mode	12V/ 24V DC 220
in the fixed mode	VAC (external)
Max power consumption	1000 W
Time to establish an operating mode	less than 15 min
Operating temperature (inside a car)	+5...+55°C
Maximum dimensions, WxHxD	2242x2650x5290 mm
Maximum height with deployed mast	9450 mm
Weight with driver	2870 kg

The Mobile Radiomonitoring System (MRMS) «ARGUS-M2» is designed for automated monitoring of radio-frequency spectrum, measurement of different parameters of electromagnetic emissions and radio signals, and for online direction finding of transmitters and radioelectronic systems outside the availability zones of fixed DF and radio-monitoring stations.

MRMS «ARGUS-M2» is based on high-performance measurement equipment of the ROHDE & SCHWARZ (Germany) company:

- R&S FSP30 spectrum analyzer;
- R&S EB200 monitoring receiver;
- R&S EBD195 direction finder processor;
- R&S HE010 and R&S HE500 monitoring antennas;
- R&S ADD195 and R&S ADD071 DF antennas;
- R&S AC008 microwave directional antenna;
- R&S HE200 portable directional antenna;
- R&S ARGUS-IT spectrum monitoring and management software;
- R&S Map View geographic information software.

MRMS «ARGUS-M2» ensures achieving following tasks:

- systematic monitoring and measurement of the radio stations parameters (level, frequency, offset, deviation, field strength and power flux density, bandwidth, modulation parameters);
- measurements for EMC (electromagnetic compatibility);
- identification of the interference sources.



1L220U, 1L220U-KC
RADAR COMPLEXES



**1L220U
1L220U-KC**

RADAR COMPLEXES



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RADAR COMPLEXES

**1L220U
1L220U-KC**

RADAR COMPLEX 1L220U (1L220U-KC) PROVIDES FOR:

- reconnaissance by the first shot of enemy artillery, Multi Barrel Rocket Launcher (MBRL) Fire Position (FP) coordinates, enemy tactical missiles Launching Positions (LP) coordinates, and transmit target designation signals to friendly fire means;
- check of impacts and adjustment of the friendly fire means.



THE COMPLEX IS CAPABLE TO QUICKLY AND ACCURATELY ACCOMPLISH THE FOLLOWING:

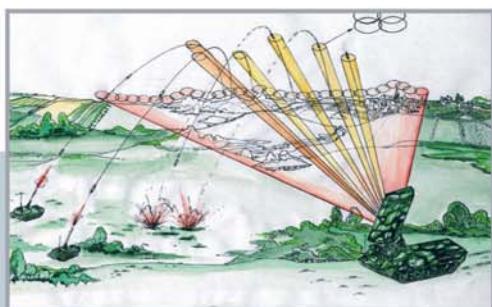
- identification of the firing system class: mortars, MBRL, artillery, tactical missiles;
- forecasting of the enemy impact points;
- collection of reconnaissance data concerning the battlefield, estimation of width and depth of enemy batteries location (orientation) and transmission of reconnaissance data to the command posts of the Higher Command and to the command posts of the cooperative fire units.

COMPLEX 1L220U (1L220U-KC) IS MULTIFUNCTIONAL ONE. IT IS PROVIDED WITH FLEXIBLE HARDWARE AND ALGORITHMIC FACILITIES THAT MAY BE EASILY ADAPTED FOR EXECUTION OF VARIOUS COMBAT MISSIONS IN CASES OF:

- wide-spread conflicts involving considerable concentration of forces and armament in complicated radio electronic and target situation;
- limited intervention aimed to suppress the wide-dispersed fire means;
- peace-making operations intended to control the fire and observation over a large territory.

THE EMPLOYMENT OF COMPLEX 1L220U (1L220U-KC) AND ARTILLERY OR MBRL BATTALIONS ENABLES:

- effective firing activity under the conditions of reduced visibility and enemy electronic counter-measures;
- increase of the reconnaissance and killing area by a factor 8 to 10 times, in comparison with the battalions equipped with standard facilities;
- reduction of fire mission execution time by a factor of 1.5 to 2 times;
- reduction of the ammunition expenditure by a factor of 2.5 to 3 times;
- creation of reconnaissance fire and reconnaissance-attack systems.



BASIC PERFORMANCE DATA

Description	1L220U	1L220U-KC
Reconnaissance/check range of fire positions, km:		
artillery	30	
mortars	30	
MBRL	30/50	
tactical missiles	55/80	
Electronic surveillance sector, deg:	60	90
Deployment/Closing time, min	5/3	10/15
Crew per shift, persons	3	5
MTBF	h>100	h>400



WEIGHT AND OVERALL CHARACTERISTICS

Type	Length, mm	Width, mm	Height, mm	Weight, t	Chassis type
1L220U	9214	3250	3350	39,5	ГМ 5951
1L220U-KC	11500	3160	3800	23,5	KrAZ 63221

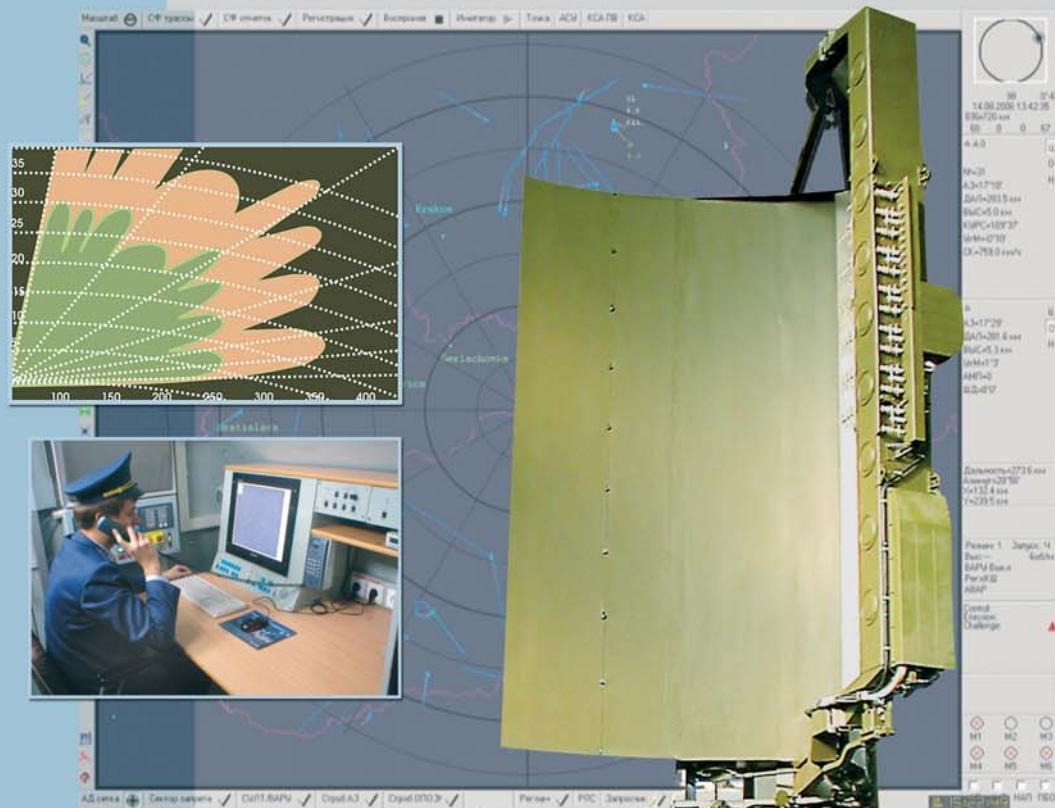




36D6-M

MOBILE 3D AIR SPACE SURVEILLANCE RADAR

36D6-M



MOBILE 3D AIR SPACE SURVEILLANCE RADAR

SPETSTECHNOEXPORT

STATE FOREIGN TRADE ENTERPRISE

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36D6-M

The mobile 3D air surveillance radar 36D6-M is designed to be used as a part of modern automated Air Defence systems, Anti-Aircraft Missile complexes and to detect low flying air targets under active and passive jamming as well as for Air Traffic Control both for military and civil needs.

Main Advantages of 36D6-M Radar

- High probability of detection of small air targets, hovered helicopters and targets slowly moving tangentially to the radar
- Extremely accurate positional information
- Exceptional interference immunity against jammers of all types
- Capability of jamming station direction finding
- Automatic association of echo signals with return signals of the built-in IFF equipment
- Capability to transmit radar information and targeting over narrow band communication channels
- High reliability
- High mobility
- Extreme stability of transmitter with true coherency

BASIC TECHNICAL DATA OF 36D6-M RADAR

Operation band	S
Instrumented range	90,180,360 km
Detection range for low flying targets: RCS - 1 m²	
at flight altitude 50m	31 km
at flight altitude 100m	42 km
at flight altitude 1000m	110-115 km
RCS - 0.1 m² (cruise missile) at flight altitude 50m	27 km
Azimuth coverage	360°
Elevation coverage	-0,5°...30°
RPM	6 and 12 rev/min
Suppression factor	>48 dB
Accuracy:	
range	50m
azimuth	0.2°
altitude	400m
Resolution:	
range	300m/at range of 90km
azimuth	3,5°
Track capability	>200tracks
Environmental conditions:	
temperature	-40°C...+50°C
humidity	98%
height	3000m
MTBF	>800hours
MTTR	<30min



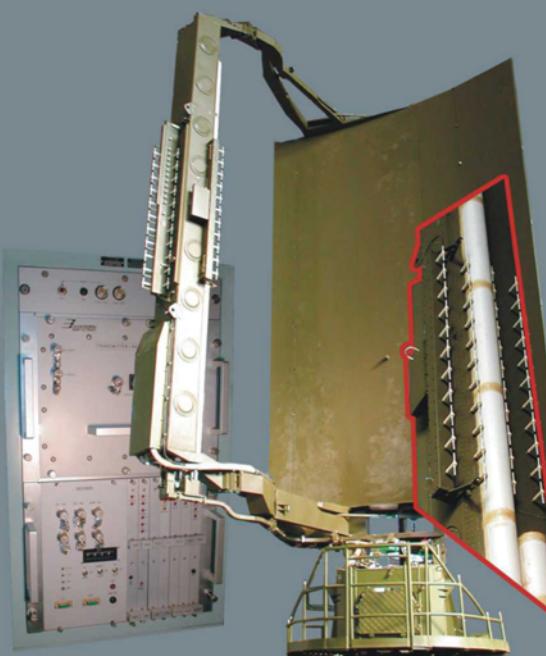
TRANSPORTATION BASE AND OVERALL CHARACTERISTICS OF 36D6-M

Description	Type of body	Dimension,mm			Weight, t	Transport vehicle
		Length	Width	Heighta		
Radar	СПП-15	13882	2890	3325	21,54	KrAZ-260B
Power station	КП-10	9040	2870	3300	10,8	KrAZ-260



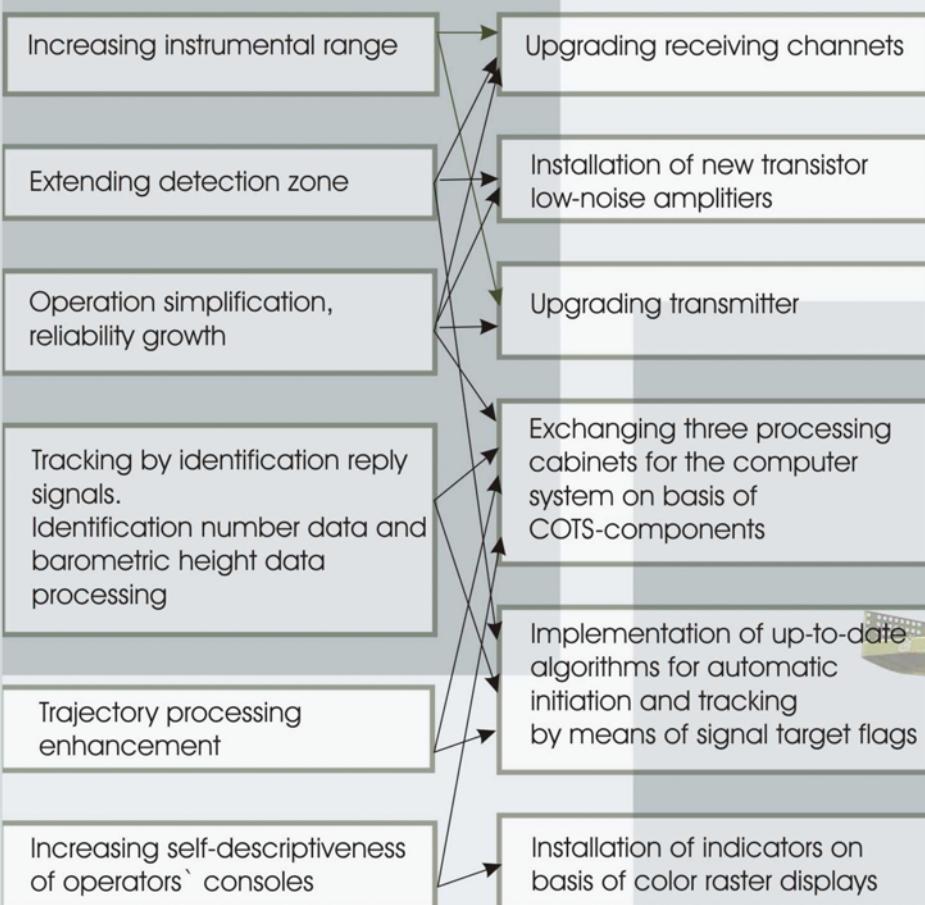
LIFE EXTENSION & UPGRADATION OF ST-68U (19ZH6) RADAR

- Increased radar range
- Enhanced trajectory processing parameters
- Enhanced operator's comfort
- Built-in identification equipment of NATO standards (MK-X, MK-XII)
- Extended functionality
- Reduced maintenance cost
- Extended life by 20 years
- Data output to anti-aircraft missile complexes
- Various interfaces, data interchange over communication links (formats – at customer's request)



UPGRADATION OBJECTIVES:

ACHIEVED BY:



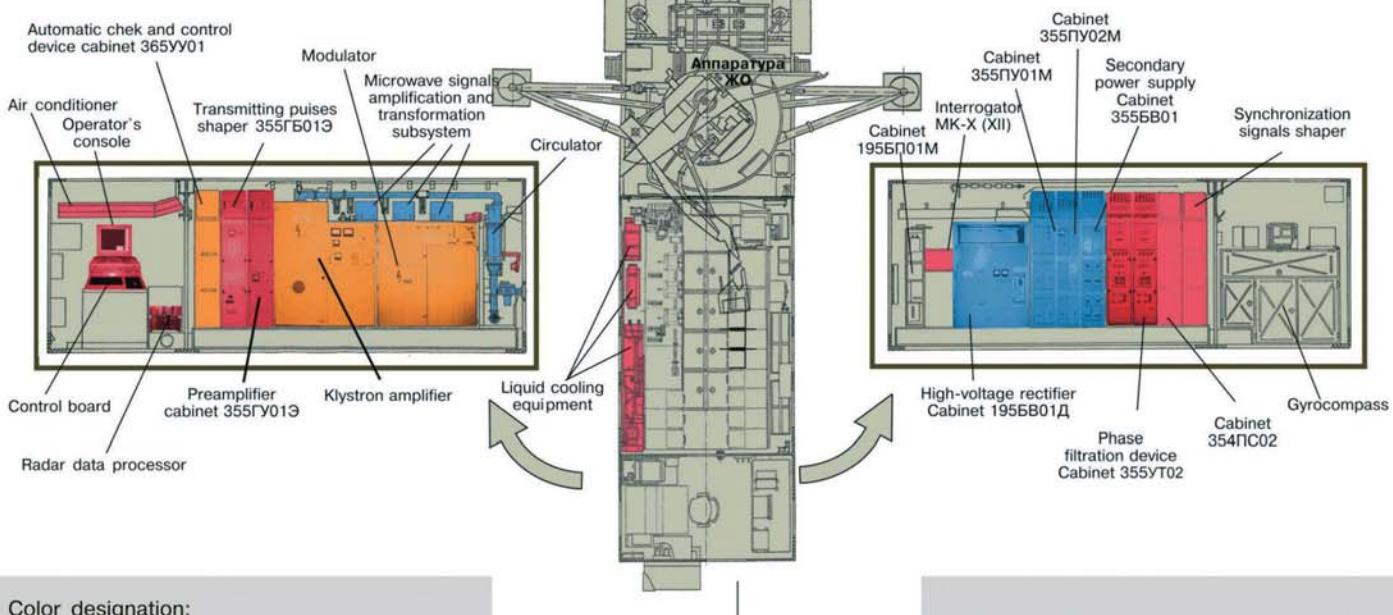


Upgrading Data ST-68U

Nr n\п	Parameters	Before updating	After updating
1	Maximum detection range, km Trigerring mode «Frequent» Trigerring mode «Rare» Trigerring mode «Super rare»	75 150 -	90 180 360
2	Radar detection range in free space		Increased by 10-15%
3	Data output to up-to-date automatic control systems in format ASTERIX or in formats by user's request	Not available	Available
4	Reflection zone control in strobes assigned by an operator	Not available	Available
5	Identification of targets equipped with transponders according to NATO standards	Not available	Available

Nr n\п	Parameters	Before updating	After updating
6	Tracking according response data of identification system	Not available	Tracking is provided according to response signals alongside with processing of the identification number data and barometric height data
7	Automatic detection of radar location	Not available	Provided by GPS receiver
8	Operators' training	Using auxiliary cabinet УЦ-10	Training function in consoles using data logging results and electronic data bases of training scenarios
9	Radar data logging	Photorecording	Data recording in to electronic mediums and subsequent data display at operator's console or Transferring data recorded to archive facilities
10	Recording operators' commands and radar operation parameters	Not available	Provided simultaneously with radar data recording
11	MTBF	200 hours	>800 hours

VOLUME OF RADAR ST-68U EQUIPMENT REPAIRED AND UPDATED



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MAINTENANCE MODULE

MM-36D6



Maintenance module (MM) is designed to control serviceability, diagnostics and renewal of Line Replacement Units (LRU) being incorporated in the Radar: digital, digital-to-analog and analog cells; high frequency units and subunits; PCBs and secondary power supply units.

MM INCORPORATES THE WORKSTATIONS:



WS-1 (Workstation 1) is designed for diagnostics and fault finding up to the element level (a group of elements) of digital and digital-to-analog LRUs based on TTL, CMOS or mixed TTL-CMOS logic as well as LRUs having analog elements with signal levels over the range from -7V to +9V.

WS-1 is made applying the automated diagnostic complex and is completed with multi-purpose programmer "UNIPROG".



The diagnostic complex consists of hardware, software and repair databases for the tested LRUs.



The hardware consists of 135-channel test-processor, 16-channel logic and signature analyzer and 6-channel analog generator and performs the following functions:

- Testing of PCBs via connectors with simultaneous recording of the PCB reaction for test;
- In-circuit testing of the PCB and elements;
- Providing LRUs under test with power supply.



WS-2 (Workstation 2) is the PC-based measuring-diagnostic complex which is designed to diagnose and measure the high-frequency LRU parameters.

The complex incorporates:

- RF and UHF units of oscillators being controlled;
- Digital oscilloscope unit;
- Built-in spectrum analyzer.



WS-3 (Workstation 3) is a multi-purpose workstation, intended for diagnostics of failed cells, assemblies, subunits and units providing switching, check and control, obtaining secondary voltages, processing and conversion of analog signals as part of the radar units and cabinets.

WS-3 possesses the built-in facilities of protection, control and check of its main parameters.

WS-4 (Workstation 4) is a multi-purpose repair station. It is equipped with a set of fixtures, tools and special-purpose equipment.

The dismounting of faulty radio elements, the radio elements performing, soldering of newly mounted elements and varnishing are accomplished at WS-4.



MM-36D6 is provided with Spare Parts, Tools and Accessories to repair six radars, radar reference LRUs, complete test-programs for LRUs being repaired and signatures for cells being tested.

MM-36D6 is located in the transportable module on the basis of a sea container with overall dimensions 6100x2450x2600 mm and equipped with the air-conditioning, ventilating and heating systems.



Power supply of MM-36D6 is fed:
from stationary industrial networks of three-phase voltage 380 V,
frequency 50 Hz;
from the stand-alone power supply source.
Consumed power is not more than 10 kW.



2D SURVEILLANCE RADAR FOR LOW-ALTITUDE TARGET DETECTION

P-190U



Features:

- all solid state design;
- full coherence is implemented, owing to which radar parameters are significantly improved;
- wide range of narrow- and broadband probing signals enabling radar adaptation to various combat conditions;
- digital signal processing, including matched filtration, clutter and active jamming suppression, target detection and coordinate measuring, target tracking and data distribution to consumers;
- practically approved reliable software, user-friendly interface;
- only COTS components are used from renowned suppliers, this coupled with quality system approval guarantees the high level of reliability.

Advantages:

- large number of probing signals, ability to choose the best depending on air situation, jamming and combat conditions;
- parameters of probing signal - working frequency, modulation type, waveform - reconfigurable;
- reconfiguration of signal parameters can be carried out via program or randomly (reconfiguration of probing signal parameters does not affect the quality of clutter suppression);
- increase of signal to noise ratio due to matched filtration of received signals, increase of detection range and accuracy;
- significant (up to 100dB) increase of dynamic range resulting in high jamming immunity and suppression of local targets and weather formations;
- efficient algorithms of clutter suppression with wind speed compensation;



Solid state transmitter

Dejamming capabilities

A range of hardware and software solutions are implemented in the radar P-190U enabling suppression of the following kinds of jamming:

- nonsynchronous and chaotic pulse noise;
- response pulse noise;
- active noise jamming.

P-190U

#	Specification	Value
	Frequency band	820-890 MHz, 0,4 MHz discreet
	Measured parameters	azimuth, range
1	Radar coverage zone:	
	min range	1,5 km
2	max range	300 km
	Location accuracy:	
	range	90 m
3	azimuth	0,3°
	bearing of active jammers	1.5°
	Resolution:	
4	range	550 m
	azimuth	5°
4	Jamming immunity:	
	4.1 Against active jamming:	
	automatic monitoring of jamming conditions and automatic adaptive working frequency hopping 0.2 MHz discreet	+
	high dynamic range of signal processing system (of the receiver and digital signal processing unit) – 105dB;	+
	extra expansion of dynamic range (by 30 dB) through automatic gain control;	+
4.2	4-channel dejammer of active jamming is offered as an option, providing jamming suppression of 32 dB (at SNR of 40 dB)	option
	Against passive jamming:	
	clutter suppression ratio (factor)	not less than 50 dB
	working zone of the MTI system	0-300 km, adaptive MTI, clutter map
4.3	Against nonsynchronous pulse jamming:	full suppression
	Target detection mode, tracking:	
5	plots per scan	up to 1000
	number of tracks	up to 150
	active jammer tracking	up to 36
6	Height-finder control mode: (option)	fully automatic, on condition of installation of height-finder extractors
	number of controlled height-finders	up to 4
7	FA guidance modes and ADMS targeting: (options)	+
8	Operating conditions:	
	temperature	-40... +50°C
	relative humidity	95%
9	max asl	2500 m
	Combat crew	3
	Start-up time	40 sec.
10	Set-up/tear down time	up to 20 min.
11	Power consumption	8 kVA



2D VHF SURVEILLANCE RADAR

P-180U



Interior of equipment cabin



Antenna cabin with AC generators



Radar equipment's cabin

Features:

- all solid state design;
- full coherence is implemented, owing to which radar parameters are significantly improved;
- wide range of narrow- and broadband probing signals enabling radar adaptation to various combat conditions;
- digital signal processing, including matched filtration, clutter and active jamming suppression, target detection and coordinate measuring, target tracking and data distribution to consumers;
- practically approved reliable software, user-friendly interface;
- only COTS components are used from renowned suppliers, this coupled with quality system approval guarantees the high level of reliability.

Advantages:

- large number of probing signals, ability to choose the best depending on air situation, jamming and combat conditions;
- parameters of probing signal - working frequency, modulation type, waveform - reconfigurable;
- reconfiguration of signal parameters can be carried out via program or randomly (reconfiguration of probing signal parameters does not affect the quality of clutter suppression);
- increase of signal to noise ratio due to matched filtration of received signals, increase of detection range and accuracy;
- significant (up to 100dB) increase of dynamic range resulting in high jamming immunity and suppression of local targets and weather formations;
- efficient algorithms of clutter suppression with wind speed compensation;
- automatic switching of amplitude and coherent channels decreasing signal loss and increasing detection range and accuracy;
- implemented functions of a radar extractor for post-detection signal processing (detection, location measuring, plots generation, clutter map, scan-to-scan processing, stabilization of false target generation, processing of identification signals, data distribution to consumers);
- low power consumption;
- handy design, easy operation of radar;
- efficient monitoring system of all components.

Dejamming capabilities

A range of hardware and software solutions are implemented in the radar P-180U enabling suppression of the following kinds of jamming:

- nonsynchronous and chaotic pulse noise;
- response pulse noise;
- active noise jamming.

P-180U

Radar specifications

#	Specification	Value	
	Frequency band	140-180 MHz, 0,2 MHz discreet	
	Measured parameters	azimuth, range	
1	Radar coverage zone:		
	min range	2,7 km	
2		max range	360 km
	Location accuracy:		
	range	180 m	
	azimuth	0,4°	
3		bearing of active jammers	2°
	Resolution:		
	range	1100 m	
4		azimuth	8°
	Jamming immunity:		
	4.1 Against active jamming:		
	automatic monitoring of jamming conditions and automatic adaptive working frequency hopping 0.2 MHz discreet	+	
	high dynamic range of signal processing system (of the receiver and digital signal processing unit) – 105dB;	+	
	extra expansion of dynamic range (by 30 dB) through automatic gain control;	+	
	4-channel dejammer of active jamming is offered as an option, providing jamming suppression of 32 dB (at SNR of 40 dB)	option	
	4.2 Against passive jamming:		
	clutter suppression ratio (factor)	not less than 50 dB	
	working zone of the MTI system	0-400 km, adaptive MTI, clutter map	
5	4.3 Against nonsynchronous pulse jamming:	full suppression	
	Target detection mode, tracking:		
	plots per scan	up to 1000	
	number of tracks	up to 150	
6		active jammer tracking	up to 36
	Height-finder control mode: (option)	fully automatic, on condition of installation of height-finder extractors	
7		number of controlled height-finders	2-4
	FA guidance modes and ADMS targeting: (options)	+	
	Operating conditions:		
8	temperature	-40... +50°C	
	relative humidity	95%	
	max asl	2500 m	
9	Combat crew	3	
	Start-up time	40 sec.	
10	Set-up/tear down time	1 hour	
11	Power consumption	up to 10 kVA	

P-19 AND P-18 RADAR MODERNIZATION

- all solid state design;
- improved combat performance features;
- improvement of radar maintenance;
- extension of radar service life;
- full coherence;
- cost-efficiency.

The following equipment is installed in a hardware compartment replacing the existing equipment:

- solid-state transmitter;
- solid-state receiver;
- digital signal processing system;



In addition, the following equipment can be supplied at Customer's request:

- 4-channel dejammer;
- height-finder control software and equipment;
- software for guiding fighter aviation;
- software for targeting ADS;
- equipment for documentation.

New possibilities and advantages:

- significant increase of detection range, accuracy, jamming immunity, numbers of plots and tracks, reliability;
- significant (up to 100dB) increase of a dynamic range resulting in high jamming immunity and suppression of clutter and weather formations;
- implemented functions of a radar extractor for post-detection signal processing (detection, location measuring, plots generation, clutter map, scan-to-scan processing, stabilization of false target generation, processing of identification signals, data distribution to consumers);
- large number of probing signals, ability to choose the best one depending on the air situation, jamming and combat conditions;
- reconfigurable (via program or randomly) parameters of probing signal - working frequency, modulation type, waveform;
- efficient algorithms for clutter suppression with wind speed compensation;
- automatic combining of amplitude and coherent channels that decreases signal loss and increases detection range and accuracy;
- implementation of automatic built-in diagnostic system.

A range of hardware and software solutions are implemented that enables suppression of the following kinds of jamming:

- nonsynchronous and chaotic pulse noise;
- response pulse noise;
- active noise jamming.

Fully automatic primary processing of radar data eliminates from the process one of its weakest links - a human-operator - and allows the separation of radar and command post by distance, this significantly increases system survivorship and minimizes the threat of being destroyed by homing missiles.

- operator working position;
- remote working position;
- modem;
- air conditioning system;
- power and lighting distribution unit;
- fire-control system;
- switchboard.

P-19 AND P-18 RADAR MODERNIZATION

No.	Specification	P-19		P-18	
		Before	After	Before	After
1	Frequency band	830-882 MHz	825-890 MHz,	150-170 MHz	140-180 MHz,
2	Measured parameters		azimuth, range		
3	Radar coverage zone:				
	min range	10 km	1.5 km		
	max range	140 km	300 km	270 km	up to 360 km
4	Location accuracy:				
	range	2,000 m	100 m	1,800 m	200 m
	azimuth	2°	0.3°	1.5°	0.4°
	bearing of active jammers	3°	1.5°	4°	2°
5	Resolution:				
	range	2500 m	600 m	2,000 m	1,200 m
	azimuth	8°	6°	8°	8°
6	Jamming immunity:				
4.1	Against active jamming:				
	working frequency hopping	manual	automatic adaptive, 0.4MHz discreet	manual	automatic adaptive, 0.2 MHz discreet
	dynamic range of signal processing system	32dB	105dB	30dB	105dB
	extra expansion of dynamic range through automatic gain control	18dB	+30 dB	18dB	+ 30 dB
	4-channel dejammer of active jamming	-	option	-	option
4.2	Against passive jamming:				
	clutter suppression ratio	26dB	not less than 50 dB	20dB	more than 50 dB
	working zone of the MTI system		0-150 km, adaptive MTI, clutter map	0-255km, manual	0-360 km, adaptive MTI, clutter map
4.3	Against nonsynchronous pulse jamming:	10 times	full suppression	10 times	full suppression
7	Target detection mode, tracking:	-	auto	-	auto
	plots per scan	up to 10	up to 1,000	up to 10	up to 1,000
	number of tracks	-	up to 150	-	up to 150
	active jammer tracking	-	up to 36	-	up to 36
8	Height-finder control mode (on condition of installation of height-finder extractors): (option)	-	fully automatic	-	fully automatic
	number of controlled height-finders	-	up to 4	-	up to 4
9	FA guidance modes and ADMS targeting: (options)	-	+	-	+
10	Operating conditions:				
	temperature		-40...+50°C		
	relative humidity		95%		
	max asl		2500 m		
11	Combat crew	5	3	5	3
12	Start-up time	180sec	40 sec.	180 sec	90 sec.
13	Set-up/tear down time		20min		1 hour
14	Power consumption	8 kVA	8 kVA	10 kVA	up to 10 kVA



MODERNIZATION OF P-14, 5N84 «OBORONA», 5N84A RADARS

Modernized P-14, 5N84 «Oborona», 5N84A are modern all solid-state radars. The equipment is installed on the trailer like ODAZ model

Main Advantages:

- all solid state design;
- full coherence is implemented;
- digital signal processing;
- high jamming capabilities;
- remote automated working position with full remote control of radar;
- COTS components only are used from renowned suppliers;
- efficient monitoring system of all radar components;
- certified quality system.

Among the essential features of modernized radars is full automation that eliminates possibilities for human operator errors from combat activity.



MODERNIZATION OF P-14, 5N84 «OBORONA», 5N84A RADARS

No.	# SPECIFICATIONS	VALUE	
		Before	After
1	Frequency band	170-190 MHz	150-200MHz
2	Measured parameters		azimuth, range
	Radar coverage zone		
3	min range		27 km
	max range	400 km	480 km
	Location accuracy:		
4	range	1000 m	270 m
	azimuth	0.8°	0.4°
	Resolution:		
5	range	3500 m	1600 m
	azimuth	8°	4°
6	Jamming immunity:		
	Against active jamming		
6.1	working frequency hopping	Manual	Automatic adaptive, 0.125 MHz discreet
	dynamic range of signal processing	18 dB	100 dB
	extra expansion of dynamic range	15 dB	32 dB
	Against clutter:		
6.2	clutter suppression ratio	17dB	Not less than 50 dB
	working zone of the MTI system	0-300 km, manual	0-500 km, adaptive MTI. clutter map
6.3	Against pulse jamming	10 times	full suppression
7	Height-Finder control mode: (on condition that radar extractor installed on height-finders)	-	Automated, up to 4 height finders
	Target detection mode, tracking		
8	plots per scan	8-10	up to 1000
	number of tracks		up to 150
	Environment		
9	temperature	from -40° C up to +50° C	from -40° C up to +50° C
	relative humidity	to 95%	to 95%
	max ASL	2500 m	2500 m
10	Start-up time	8 minutes	3 minutes
11	Power consumption	60 kVA	up to 40 kVA
12	Overall dimensions, mm		8850x2550x3000



MOBILE COHERENT-PULSE ALL-ROUND SURVEILLANCE RADAR

«DELTA»



TECHNICAL SPECIFICATIONS

Frequency range		I band
Antenna rotation period		3 s, 6 s, 12 s
Zone of action	In azimuth	0...360°
	In range	96 km
	In altitude	3 km
Maximum detection range	Of small-size airborne target	8...20 km
	Of ground target (motor vehicles)	16...20 km
	Of surface targets	Radio horizon range
Tracked target number		Up to 50
Power consumption		< 500 W
Equipment weight		< 250 kg

Main purposes:

observation of air and ground situation in the zone of location of particularly important objects;
monitoring of economic and customs zones with the aim to prevent smuggling and terrorist actions.

The radar ensures:

automatic detection and tracking of airplanes, helicopters, delta planes, ground and surface targets at any time of day and year, at rain, fog, dust, and sandstorms;
recording of selected paths of targets and transmission of data on them to police, border, customs, and security agencies as well as generation of an alarm signal.

It is installed on transport facilities (automobiles, armored personnel carriers, infantry combat vehicles, etc.), which in operation are arranged on hills or high places in order to assure necessary viewing conditions.

Main features:

solid-state transceiver;
digital generation of complex-modulated sounding signals;
digital processing of signals and information on paths;
high efficiency of detection of moving targets on the background of intensive passive interferences;
application of nonparametric algorithms of automatic detection, making it possible



80K6

3-D AIR
SURVEILLANCE
RADAR



80K6
3-D AIR
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The mobile 3-D air surveillance radar for low, medium and high altitudes with analog, coordinate and track outputs, operating off-line or as a part of regional and national automatic control post (ACP) is designed to be used:

- as a part of anti-aircraft missile troops to issue targeting to anti-aircraft missile complexes;
- as an information link in the air forces and air defense units for air traffics control.

THE RADAR SYSTEM PROVIDES:

- detection, tracking and measurement of the airborne target coordinates and their ground speed under conditions of no interference and of natural noise and active and passive jamming as well as under their combined effect;
- recognition of the aircraft IFF-equipment, the individual and flight information gaining from friendly aircraft, data representation and issuing to users;
- jamming station direction finding in elevation and azimuth;
- data issuing to off-line display facilities and interactions with command posts of regional and higher national ACP

OPERATING FREQUENCY RANGE

Operating frequency range	S
Radar operation limits in range:	
minimum, km	6
maximum, km	400
in azimuth, deg	360
in elevation, deg	0...35
in altitude, km	40
Scanning interval, s	5 or 10

Target detection range, RCS=3-5 m²

At P=0,8 F=10 ⁻⁶	
At flight altitude 100 m	40
At flight altitude 1000 m	110
At flight altitude 10...30 km	300-350
Clutter suppression, dB	>50
Simultaneously track capability	150-200
IFF equipment	built-in
Number of transport units	1+1 with a power station
Deployment/closing time, hour	<0,5



SURFACE SHORT RANGE RADAR

112L1 "BARSUK"



Portable radar 112L1 "Barsuk" was designed for detection of moving personnel and vehicles (patrol version) with the aim of reconnaissance or protection of territory.

It provides detection of the targets round the clock under low visibility conditions (rain, fog, snow etc.).

Detected targets is reflected at built-in indicator in form of amplitude of the signal with mark of range.

Recognition mode allows to specify range and azimuth of the target and classify it by acoustic spectrum (single person, grop of persons, animal, vehicle).

Solid-state transmitter of the radar implemented in microstrip version.

Low weight of the radar allows to carry it on the operator's chest and survey area of view by rotation of body. This radar is handy for search and pursuit of intruders.

MAIN TACTICAL AND OPERATION CHARACTERISTICS OF "BARSUK" RADAR

View area:

- azimuth 0-360°;
- range 0-2 km.

Detection range of targets

with radial velocity 2-50 km/h:

- single person 1200 m;
- vehicle 1600 m;
- armored vehicle 2000 m.

Resolution:

- azimuth 1,5°;
- range 25 m.

Frequency 36 GHz;

Transmitter power 60 mW;

Antennae aperture90 mm;

Power source - built-in rechargeable battery 12 V, 3 Ah;

Power consumption 8 W;

Operating temperature range - 30 ... + 50°C;

Wind speed up to 15 m/s;

Weight with battery 5,5 kg.

SURFACE SHORT RANGE RADAR

112L1-A "BARSUK-A"



112L1-A "BARSUK-A" is surface radar of remote guarding mounted on a support-rotating device with remote control of azimuth and elevation angles provides automatic detection and recognition of personnel and ground and water moving vehicles. It provides security of specified responsibility zone round the clock and all the year round under restricted visibility conditions.

RS-422 (485) is used for data transfer.

Targets detection and identification occurs in automatic mode at the same time targets marks displays at monitor. Targets data are automatically logged specifying their number, range, azimuth and class (personnel - vehicle) snap to map.

There is possibility to choose high alert and blank areas manually.

Possibility of recognition via sound channel is provided.

The product outputs electronic alarm information to the monitor of central guard console.

The product operates in millimeter band which practically harmless for human organism, does not interference with other radio means, does not interfere with the other same product if operating at the distance more than 50 m and is not sensitive to accidental or non-random interferences.

MAIN TACTICAL AND OPERATING CHARACTERISTICS

Scanning area:

- in azimuth 360°
- in elevation ±15°
- in range 0 - 1.6 km

Detection range of targets moving with radial velocity of 2-50 km/h:

- single person 1.2 km
- vehicle, ship 1.6 km
- armoured vehicle 1.6 km

Radar resolution:

- by angle 3°
 - by range 25 m
- Frequency 36 GHz
- Transmitter's power 60 mW
- Rotation speed (4-20)°/s
- Type of radiated signal continuous with phase code modulation

- Antennae aperture 90 mm
- Operating temperatures from - 30 to + 50°C
- Relative humidity up to 100%
- Wind speed up to 25 m/s
- Weight 10 kg

SURFACE AND LOW-FLYING SLOW TARGETS DETECTION RADAR

111L1 "LIS"



111L1 Radar is designed for detection of moving people and vehicles, low-flying slow targets and surface marine targets for security and reconnaissance support.

Radar provides automatic detection and location of targets at any time of the year under conditions of rain, fog, precipitation, smoke or dust, in absence of optical visibility. The targets are displayed on the LCD indicator together with azimuth and range data.

Digital forming methods of signal, filtering, automatic detection and coordinates measurement are used.

Target recognition mode allows to specify target range and its direction and after listening to the specific sound spectrum of a signal to classify the target (man, group, vehicle, helicopter, jam etc.).

The basic version is designed to allow the radar installation on the vehicle and includes facilities for automatic antenna system leveling using data from built-in accelerometric horizon sensors. The radar can be installed on APC or ACV.

The radar's operation is harmless to the human's body. The millimeter's bandwidth doesn't create interferences with other radio-technical systems and is not influenced by interferences of other systems because there is no equipment working in this bandwidth. Millimeter bandwidth beam is less influenced by water surface than the beam of centimeter bandwidth. This enables more precise small-target detection of water targets.

GENERAL SPECIFICATIONS

Scan Zones:

- in azimuth - (-60...+60)° with possibility of random sector reducing;
- in range - (0-15) km with possibility of random scan zone selection within a given range.

Full Scan Time (120°, 15 km) - 25-30 sec;

Target detection range (radial speed 2 - 50 km/h):

- single person - 5 km;
- vehicle - 10 km;
- armored vehicle - 10km;
- ship - 10 km;

Radar resolution range:

- bearing - 1°;
- range - 15.

Power consumption - not more than 65 W

Operation temperature range: -30°C...+60°C (-20°C...+50°C for remote display)

Radar weight with leveling platform - not more than 40kg.

Setting-up procedure - does not exceed 5 min.

SURFACE TARGET DETECTION RADAR

111L2 «MANGUST»



111L2 "MANGUST" is designed for surface and low-speed (low-flying) target detection and can be used for secure of land and water frontier areas, combat field observation. Hardware of this portable radar placed in 2 packs and can be transported and serviced by 2 men.

Radar provides targets search, detection and mapping automatically in continuous radiation mode (millimeter band). Target detection and localization generates by operator's console prosessor. The console's display shows circle diagram and table, featuring number of the target, it's range and azimuth. High alert and blank area can be set up by operator. Low-power solid-state transmitter (0,01 - 1,0 W) makes difficulties for electronic reconnaissance detection. Continuous radiation with phase-code manipulation makes it protected of clutter and jamming.

The radar's operation is harmless to the human's body. There millimeter's bandwidth doesn't create interferences with are the radio-technical systems and is not influenced by interferences of other systems because there is no equipment working in this bandwidth. Millimeter bandwidth beam is less influenced by water surface than the beam of centimeter bandwidth. This enables more precise small-target detection of water targets.

BASIC TECHNICAL CHARACTERISTICS

View zone azimuth360° and sector scan
Range (km):	
person	5
car	7;
armored vehicle	10
ship	10
Resolution:	
azimuth (deg)	1
range (m)	15
Operator's console:	Notebook
Power source:	
primary source	accumulator 12 V
power consumption (W)	65
Operational conditions:	
temperature (°C)	-30...+50
Mobility:	
weight	40 kg in two packs, 20 kg each
setting-up time (min)	5
remote control distance (m)	50

UP - TO - DATE RADAR SYSTEMS

SMSR

**STAND-ALONE MOBILE
SECONDARY RADAR**

«TRASSA»



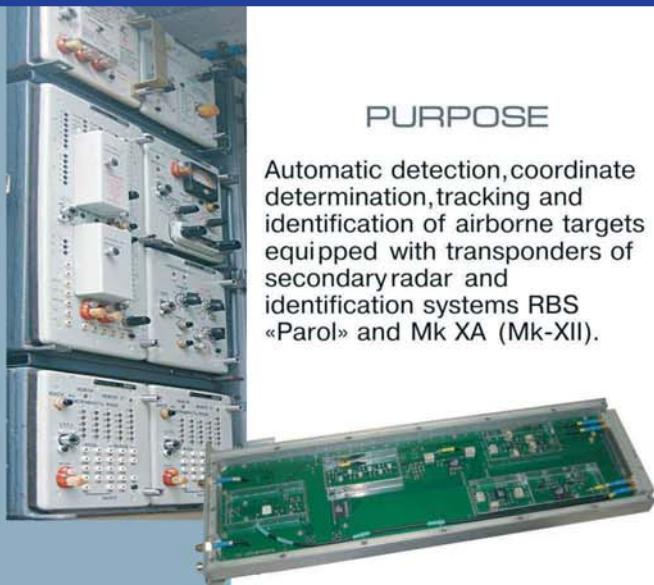
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STAND-ALONE SECONDARY RADAR (M)



PURPOSE

Automatic detection, coordinate determination, tracking and identification of airborne targets equipped with transponders of secondary radar and identification systems RBS «Parol» and Mk XA (Mk-XII).

THE MOBILE STAND-ALONE AUTOMATIC SOLID-STATE SECONDARY SURVEILLANCE RADAR WITH PHASED ANTENNA ARRAYS OPERATES IN RADAR SURVEILLANCE SYSTEMS OF NATO MK XA (MK -XII), «PAROL» AND INTERNATIONAL RBS ATC SYSTEM AND THE IDENTIFICATION «FRIEND-OR-FOE» SYSTEM AND EXECUTES A MISSION OF ISSUING RADAR INFORMATION TO UNITS OF RADIO-TECHNICAL TROOPS OF AIR DEFENCE, AIR FORCES, AAMS FND ATC.

FEATURES

- Two-band phased antenna array RBS, «Parol», Mk XA;
- Solid-state modular transmitter;
- High-efficient computing means of primary and secondary information processing based on signal processors and industrial computers;
- High-efficient automatic BITE system with a failure indication of each LRU.

BASIC SPECIFICATIONS

TACTICAL DATA

Scanning:

-range, km.....	2-360
-azimuth, deg	360
-height, km.....	25

Coordinate determination error:

-range, m	100
-azimuth, min	≤50

Qualitative indices of track information:

-tracking quality ratio.....	0,95
-false track ratio.....	0,0001

Throughput capacity, minimum «TRASSA»	250
Output information	track

Data read-out and transfer	Automatic
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TECHNICAL DATA

Band	dm
Power consumption, kW	8-10
Deployment time, min	30
Road transport speed:	
-highway, km/hour	60
-country road, km/hour.....	30
Number of transport units	1
MTBF, hour	1000
MTTR, min	30
Continuous operation time, hour	72
Turn-on time, minute, min	3
Electric power supply system	automatic (with stand-by), industrial supply mains

Environmental conditions:

-ambient temperature, °C	-40...+50
-relative air humidity, %	98% at 25°C
-hoar-frost, dew, rain	
-altitude, m	3000
-wind speed, m/s	30



MOBILE AUTOMATED COMMAND POST

«MODULE»

MODULE is a basic structure for composition of Command Posts up to AD, AF brigade level according to Customer requirements.

IT IS DESIGNATED FOR:

- automation of the process of collecting, processing and display of radar information from radars and subordinated command posts;
- transfer of a generalized radar information to high-leveled command posts;
- AD (air defense) and AF or FA (air force or fighter aviation) firing control;
- diagnostic of automation means and data transmission channels.

Application of Mobile Automated Command Post improves the efficiency and objectivity of display, perception and evaluation of air situation, increases the effectiveness of surveillance and combat control.

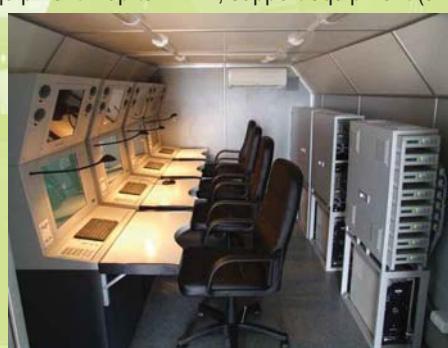
ADVANTAGES:

- module design principle;
- unification of hardware, data processing tools and facilities;
- flexibility of structure;
- capability of connection and usage in automatic mode of different types of radar data sources
- from "old fashioned" analogue radar positions to modern (existing and prospective) digital radars;
- easy upgradeability and extendibility



BASIC TECHNICAL SPECIFICATIONS:

- 1) Radar information sources – up to 16 (radars – 4, remote radars and control posts – 4, height-finders – 4).
- 2) Operator working positions – 4.
- 3) Targets automatically tracked – up to 250 (including up to 40 active jammers).
- 4) Control zone parameters:
 - range - 800 km;
 - height - 60 km;
 - speed - 3600 km/h.
- 5) MODULE coherence:
 - Radars:
analogue - P-18, P-19, P-14, 5N84 , P-37, SPS-49, SPS-55, TPS-43 and others;
digital - 19ZH6, 35D6, AN/TPS-70, P-18MA, P-19MA, P-180, P-190 and others;
height-finders - PRV-9, PRV-11, PRV-13, PRV-16, PRV-17.
- Automated control systems:
radio electronic troops - 68K6, 5N60, 5N93M, 5D91, 86ZH6, 5Y69;
anti-aircraft missile troops - 5N75, 5S99, 5N37, 73N6, 9S52, 9S52M;
fighter aircraft troops - 5K34.
 - 6) Data transfer speed – 9600 bit/sec.
 - 7) Data transfer protocol - ASTERIX, other – at Customers request.
 - 8) Combat crew – 3-4.
 - 9) Set-up time - 15 min.
 - 10) Start-up time – not more than 5 min.
 - 11) Operator working position restart time – not more than 2 min.
 - 12) Radar information documentation and storage time – not less than 30 days.
 - 13) MTBF – 10000 hrs.
 - 14) Power consumption: main equipment – up to 2 kVA, support equipment (air conditioning, light) – up to 4 kVA.



MODERNIZATION OF RSP-10 RADAR



The modernization of RSP-10 radar includes installation of the following equipment and supply of the technical documentation:

New combined antenna of PSR, SSR

Solid state transmitter of primary channel PSR (DRL of RSP-10 radar) of 835-880 MHz-band or L-band (1250- 1350MHz)

Solid state MAIN transmitter of secondary channel SSR (DRL) (1030MHz)

Solid state SLS transmitter of secondary channel SSR (DRL) (1030MHz)

Solid state receiver of primary channel of PSR (DRL of RSP-10 radar) of 835-880 MHz-band or L-band(1250-1350MHz)

Solid state MAIN receiver of secondary channel SSR (1090MHz)

Solid state SLS receiver of secondary channel SSR (1090MHz)

Solid state MAIN receiver of secondary channel SSR (740MHz)

Solid state SLS receiver of secondary channel SSR (740 MHz)

Solid state receiver of PAR (9430±30 MHz)

Digital signal processing and synchronization unit of PSR

Digital signal processing and synchronization unit of SSR

Digital signal processing and synchronization unit of PAR

Power supply and lighting distribution unit

Heating and air conditioning system

New magnetron (solid state transmitter) for PAR

New current collector

Operator working position of PAR

Operator working position of PSR, SSR

Voice and radar data recorder

Thus all old-fashioned equipment of surveillance (PSR. SSR) and landing radar of RSP-10 is replaced with modern fully solid-state equipment.

MODERNIZATION OF RSP-10 RADAR

Modernized Radar specification

No.	Specification	Value		
		PAR	PSR	SSR
1	Frequency band	9200; 9400 MHz	L	1030; 1090 MHz
2	Measured parameters	Azimuth. Range. Elevation	Azimuth, Range	
3	Radar coverage zone:			
	azimuth	+/-15°	360°	360°
	max range	40 km	150 km	160 km
	max height	2000 m	6000 m	10000 m
	elevation	-3...+15° * -1...+8° **	0.5-45°	0.5-45°
4	Mode	-	-	1,2, 3/AC; Eastern mode
5	Location accuracy:			
	range	20 m	100 m	200 m
	azimuth	0,03°	0,3°	0,2°
	elevation	0,01°	-	-
6	Resolution:			
	range	80 m	230 m	150 m
	azimuth	1°	5°	4°
	elevation	0.8°	-	-
7	Jamming immunity against clutter			
	clutter suppression ratio	-	more than 50 dB	-
	working zone of the MTI system	-	0-100 km, adaptive MTI, clutter map	"
8	Against pulse jamming:		full suppression	full suppression
9	Target detection mode, tracking:	fully automatic	fully automatic	fully automatic
	plots per scan	up to 20	up to 1000	up to 1000
	number of tracks		up to 150	up to 150
10	Operating conditions:			
	temperature	-40...+50°C		
	relative humidity	95%		
	max asl	2500		

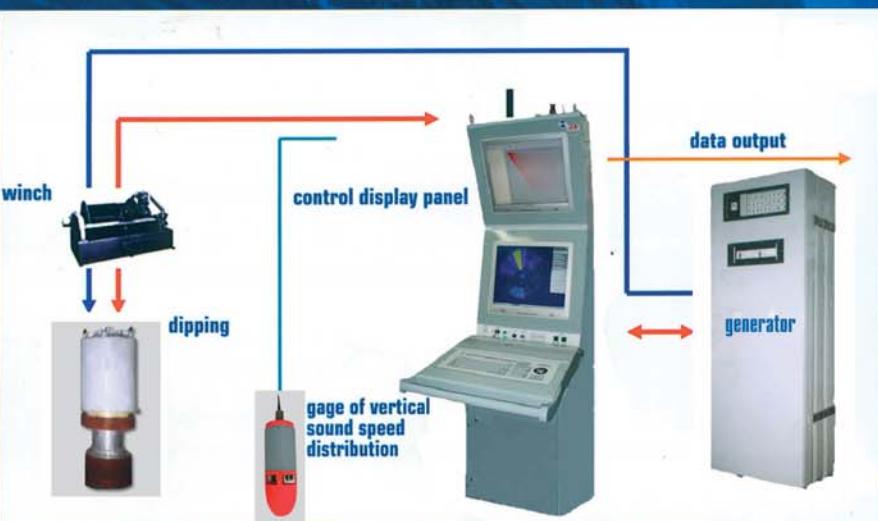
* Course / glidepath

**or programmable, according to the Customer requirements



SONAR SYSTEM FOR DETECTION OF UNDERWATER SUBVERSIVE FORCES AND MEANS

«TRONKA»



MAIN SPECIFICATIONS

Range, m	up to 500
Range accuracy, %	1.5
Azimuth accuracy, degree	2
Quantity of devices, items	4
Outboard installation weight, kg	115
Outboard installation weight, kg	300
Outboard devices dimensions:	
height, m	1.5
total area, m ²	0.8
Angular field of horizontal view, degree	360
Angular field of vertical view, degree	30
Antenna dip, m	up to 20
Sound speed measurement depth, m	up to 100
Power supply:	
frequency, Hz	50
voltage, V	~3ph, 380/220
Service life, years	10

The system is designed for detection of underwater subversive forces and means (UDFM) to protect:

- the ships at their anchorage in the high sea and on roadstead;
- the important objects in ports and harbors.

Sonar System provides:

- UDFM automated detection and tracking;
- automated measurement of coordinates for detected targets and data output.

It is stipulated in Sonar System:

- data indication on the flat color monitor;
- sound speed distribution measurement at depth and range forecast;
- measurement of noise interfering in sonar operation;
- data documentation;
- self-diagnosis and self-control of Sonar System.

