AIR DEFENCE SYSTEMS

export catalogue

Rosoboronexport

Air Defence Systems
Export Catalogue

This Catalogue has been prepared by the Rosoboronexport's Air Defence Department and Media & PR Service with valuable support of Russian defence enterprises.

Additional information on the equipment described within can be requested at the Rosoboronexport central office and its representations abroad.

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GLOSSARY

3D . . . . . Tri-Dimensional
AA . . . . . Anti-Aircraft
AAGM . . . . . Anti-Aircraft Gun Mount
AAGMS . . . . . Anti-Aircraft Gun/Missile System
AA SPM . . . . . Anti-Aircraft Self-Propelled Mount
ACCS . . . . . Automated Command and Control System
AD . . . . . Air Defence
ADGMS . . . . . Air Defence Gun/Missile System
ADM . . . . . Air Defence Missile
ADMS . . . . . Air Defence Missile System
ADS . . . . . Air Defence System
AJS . . . . . Active/Automated Jamming System
ASALM . . . . . Advanced Strategic Air-Launched Missile
AWACS . . . . . Airborne Warning & Control System
AWS . . . . . Automated Workstation
BVR . . . . . Beyond Visual Range
C2 . . . . . Command & Control
C3I . . . . . Command, Control, Communications & Information/Intelligence
CCP . . . . . Command and Control Post
CCS . . . . . Command and Control System
CP . . . . . Command Post
CSV . . . . . Command-Staff Vehicle
CV . . . . . Combat Vehicle
dB . . . . . Decibel
DMTI . . . . . Digital Moving Target Indicator
ECCM . . . . . Electronic Counter-Countermeasures
ECM . . . . . Electronic Countermeasures
ELINT . . . . . Electronic Intelligence
EOC . . . . . Electro-Optical Converter
EPB . . . . . Electronic Plotting Board
ESM . . . . . Electronic Support Measures
EW . . . . . Electronic Warfare
HE . . . . . High Explosive
IFF . . . . . Identification Friend or Foe
IGR . . . . . Illumination and Guidance Radar
IR . . . . . Infra-Red

LCD . . . . . .Liquid Crystal Display
LF . . . . . .Low Frequency
LLLTV . . . . . .Low Light Level Television
LLV . . . . . .Launcher-Loader Vehicle
LM . . . . . .Launch Module
LRU . . . . . .Line Replaceable Unit
MANPADS . . . . . .Man-Portable Air Defence System
MRS . . . . . .Multiple Rocket System
MTBF . . . . . .Mean Time Between Failures
MTI . . . . . .Moving-Target Indication
n/a . . . . . .not available
POD . . . . . .Probability of Detection
PPI . . . . . .Plan Position Indicator
RCS . . . . . .Radar Cross-Section
RF . . . . . .Radar/Radio Frequency
RMS . . . . . .Root-Mean-Square
SAM . . . . . .Surface-to-Air Missile
SHF . . . . . .Super High Frequency
SP . . . . . .Self-Propelled
SPAAG . . . . . .Self-Propelled Anti-Aircraft Gun
SPLV . . . . . .Self-Propelled Launcher Vehicle
SPTA . . . . . .Spare Parts, Tools and Accessories
TAR . . . . . .Target Acquisition Radar
TI . . . . . .Thermal Imager
TLC . . . . . .Transport-Launch Container
UAV . . . . . .Unmanned Air Vehicle
UBCP . . . . . .Unified Battery Command Post
UHF . . . . . .Ultra High Frequency
VHF . . . . . .Very High Frequency
V_{max} . . . . . .maximum speed

FOREWORD

The Rosoboronexport State Corporation publishes its new export catalogue "Air Defence Systems" to present major Russian-made air defence missile, artillery and electronic systems offered for export.

The catalogue contains concise data on both newly-made and modernised air defence equipment divided into the following sections:

- missile and artillery systems;
- surveillance;
- command and control systems;
- electronic warfare; intelligence and communications systems;
- test range equipment.

Modern air defence systems of Russian origin are designed to protect ground units on the battlefield, and military, industrial and administrative installations against attacks of aerodynamic and ballistic air weapons, notwithstanding severe hostile ECM and fire counteraction. Among others, Rosoboronexport promotes multi-layered air defence system projects. They can be developed on the basis of the combat and support assets integrated in accordance with customer specifications to provide efficient anti-aircraft/anti-missile protection of wide areas and important pinpoint targets.

The Rosoboronexport's Air Defence Systems catalogue is addressed primarily to air defence commanders, defence procurement specialists and military experts seeking reliable data on anti-aircraft/anti-missile systems exported by Russia.

AIR DEFENCE SYSTEMS

MISSILE AND ARTILLERY SYSTEMS

S-300PMU1

Air Defence Missile System

Mission

The S-300PMU1 air defence missile system is designed to counter mass raids of air attack weapons, including modern and prospective aircraft, low-flying targets, strategic cruise missiles, aeroballistic, tactical and theatre ballistic missiles within a vast variety of their operational altitudes and speeds, under severe ECM conditions.

The S-300PMU1 multi-channel mobile air defence missile system is a long-range SAM asset. It is capable to operate both autonomously or as part of AD grouping, when controlled by the 83M6E, Baikal-1E or Senezh-M1E command and control systems.

With the use of dedicated interface units, compatible ground-based interrogator and communications means, the S-300PMU1 ADM system can be integrated into any national air defence system.

The S-300PMU1 ADMS and the 83M6E CCS can be upgraded to the Favorit ADMS level in customer countries.

Composition

- air defence missile system
- 48N6E SAMs (as well as 5V55R and 5V55K SAMs) - four in each launcher
- maintenance assets
- auxiliary assets

Typical composition of the ADMS system includes combat, maintenance and auxiliary assets.

The combat assets include:

- one multi-channel 30N6E1 (30N6E) illumination and guidance radar providing automatic data exchange with the 83M6E, Baikal-1E or Senezh-M1E CCS, (30N6E IGR ensures this capability only in relation to the Senezh-M1E CCS);
- up to 12 self-propelled missile launchers (or 5P85SE or 5P85TE missile launchers on SP chassis or semi-trailers accordingly) - four SAMs on each;
- 1T12-2M-2 survey vehicle.

The maintenance assets include:

- 82Ts6E missile operation and storage assets (5T58E transporter vehicle, 22T6E loading vehicle and other means);
- 48N6E2.GVM SAM's weight-size mock-up;
- sets of auxiliary means and operating manuals;
- external power sources for IGR and missile launchers.

The auxiliary assets can include:

- 96L6E all-altitude/76N6 low-altitude target acquisition radars;
- 40V6M mobile antenna tower;
- 48N6EUD combat training missile;
- ADMS maintenance and repair assets.

The S-300PMU1 can be supplemented with the ALTEK-300 simulator, designed to train the 83M6E and S-300PMU1 system crews.

Basic specifications	
Target detection range, km	300*
Number of simultaneously detected targets	up to 300*
Number of simultaneously tracked targets	up to 100*
Number of simultaneously tracked and engaged targets	up to 6
Engagement range, km:	
aerodynamic targets (min - max)	5 – 150
ballistic targets (min - max)	5 – 40
Min/max target altitude, km	0.01/27
Max target speed, m/s	2,800
Number of simultaneously guided missiles	12
Reaction time, sec	5 – 7*
Reaction time (in autonomous target acquisition mode with targets designated by 96L6 or 76N6 radars), sec	up to 22
Deployment time from march, min	5

* - when controlled by the 83M6E CCS

FAVORIT

Long-Range Air Defence System

Mission

The Favorit air defence system is designed to ensure effective defence of important military and state installations, and task forces against any attack of aviation, strategic, cruise, air ballistic, theatre and tactical ballistic missiles and other air strike weapons in complex tactical environment and under severe ECM conditions.

The Favorit multi-channel mobile air defence system is a long-range SAM system made up of a group of assets including the 83M6E2 command and control system and the S-300PMU2 SAM systems with the 48N6E2 and 48N6E surface-to-air missiles. It can also launch the 5V55R and 5V55K SAMs.

With the use of dedicated interface units, compatible ground-based interrogator and communications means, Favorit can be integrated into any national air defence system and operate jointly with the country's own command and control and information systems, as well as with the vintage S-75, S-125 and S-200 SAM systems.

The S-300PMU1 ADMS and 83M6E CCS can be upgraded to the Favorit ADS level in customer countries.

Basic specifications	
Target detection range, km	300
Number of simultaneously detected targets	up to 300
Number of simultaneously tracked targets	up to100
Engagement range, km, min – max:	
aerodynamic targets	3 – 200
ballistic targets	5 – 40
Target altitude, km, min – max	0.01 – 27
Max target speed, m/s	2,800
Number of targets engaged simultaneously	up to 36
Number of SAMs guided simultaneously	up to 72
Reaction time, sec	7 – 11
Deployment time from march, min	5

Composition

The Favorit ADMS includes one 83M6E2 CCS and up to six S-300PMU2 ADM systems.

The 83M6E2 CCS incorporates:

- 54K6E2 command and control post;
- 64N6E2 target acquisition radar;
- 1T12-2M-2 survey vehicle;
- maintenance assets;
- assigned facilities.

The S-300PMU2 typical structure includes combat, maintenance assets and assigned facilities.

The combat assets include:

- 30N6E2 multi-role illumination and guidance radar;
- up to 12 self-propelled 5P85SE missile launchers (or 5P85TE missile launchers on semi-trailers) - four SAMs on each;
- 48N6E2, 48N6E (5V55R, 5V55K) surface-to-air missiles;

- 1T12-2M-2 survey vehicle.

The maintenance assets include:

- 82Ts6E2 missile maintenance and storage assets (5T58E2 transporter vehicles, 22T6E2 loader vehicles and other assets);
- 48N6E2.GVM weight-size mock-up and 48N6E2UD combat training missile;
- a set of auxiliary means for S-300PMU2 ADM system, and operating manuals;
- external power sources for IGR and missile launchers.

The assigned facilities include:

- 96L6E all-altitude or 76N6 low-altitude target acquisition radars;
- 40V6M mobile antenna tower;
- maintenance and repair assets for the ADM system.

The ALTEK-300 simulator system, designed to train the 83M6E2 and the S-300PMU2 systems' crews can be included into a delivery package of the Favorit ADS.

S-300V

Air Defence Missile System

Mission

The S-300V air defence missile system is designed to provide air defence of task forces and key military and state installations against mass attacks by theatre and tactical ballistic missiles, aeroballistic and cruise missiles, strategic and tactical aircraft, as well as to engage loitering ECM aircraft and other air strike assets.

The S-300V system is a mobile multi-channel long-range surface-to-air missile system. It can provide effective theatre missile and air defence.

Basic specifications	
Max target detection range, km	up to 250
Aerodynamic target engagement envelope, km:	
range	up to 100
altitude	0.025 – 30
Ballistic target engagement range, km	up to 40
Max target speed, m/s	3,000
Target radar cross section, sq. m	0.05 +
Max hostile ballistic missile launch range, km	1,100
Number of simultaneously engaged targets	up to 24
Number of simultaneously guided missiles	up to 48
Missile launch preparation time, sec	15
Into/out-of-action time, min	5
ADMS continuous operation time, hrs	up to 48

The system has high jamming immunity, and therefore is capable of engaging aerial targets in heavy ECM and fire counteraction, in any weather, by day and night.

Composition

A typical S-300V system structure includes:

- target detection and designation unit;
- up to four SAM systems;
- missile support and technical maintenance assets.

The target detection and designation unit includes:

- 9S457-1 command post;
- 9S15MV (9S15MT) all-round surveillance radar;
- 9S19M2 sector-surveillance radar.

Each SAM system typically includes:

- 9S32-1 multi-channel missile guidance radar;
- up to six launchers in two variants: 9A83-1 with four 9M83 missiles in transport-launch containers and 9A82 with two 9M82 missiles in each TLC;
- up to six loader/launchers in two variants:

9A84 with four 9M83 SAMs in TLC, and 9A85 with two 9M82 SAMs in each TLC.

A typical ADM system, consisting of four 9A83-1 launchers, four 9A84 loader/launchers, two 9A82 launchers and two 9A85 loader/launchers, has ammunition allowance of 32 9M83 missiles and eight 9M82 SAMs.

The ADMS technical support facilities include:

- maintenance and repair assets for all the elements of the ADM system, as well as automated integrated missile test and monitoring system;
- missile TLC short-term storage and transportation assets, as well as rigging equipment for missiles loading/unloading;
- training assets;
- a group set of spare parts, tools and accessories for all the elements of the ADM system.

S-300VM (ANTEY-2500)

Air Defence Missile System

Mission

The S-300VM (Antey-2500) air defence missile system is designed to protect task forces and vital national and military installations from mass attacks of medium range ballistic missiles, theatre/tactical ballistic missiles, aeroballistic and cruise missiles, strategic and tactical aircraft, as well as to engage AWACS-type aircraft, reconnaissance-and-strike air systems, loitering ECM aircraft, and other air attack assets.

The S-300VM ADM system is a long-range multi-channel mobile air defence system. It can provide effective non-strategic anti-missile and anti-aircraft defence. The system has efficient anti-jamming immunity and therefore is capable of engaging air targets in intensive electronic and fire counteraction environment, in any weather, by day and night.

Basic specifications	
Max target detection range, km	up to 250
Aerodynamic target engagement envelope, km:	
range	up to 200
altitude	0.025 – 30
Max target speed, m/s	4,500
Target radar cross section, sq.m	0.02 and over
Max hostile ballistic missile launch range, km	2,500
Number of simultaneously engaged targets	up to 24
Number of simultaneously guided missiles	up to 48
Reaction time, sec	7.5
Deployment/out-of-action time, min	5
ADMS continuous operation time, hrs	up to 48

Composition

A typical S-300VM ADMS includes:
- target detection and designation unit;
- up to four SAM systems;
- missile and technical support assets.

The target detection and designation unit includes:
- 9S457ME command post;
- 9S15M2 (or 9S15MT2E, 9S15MV2E) all-round surveillance radar;
- 9S19ME sector-surveillance radar.

Each SAM system includes:
- 9S32ME multi-channel missile guidance radar;
- up to six 9A84ME launchers with up to four 9M83ME missiles in transport-launch containers;
- up to six launcher/loader vehicles assigned to each launcher. One LLV mounts up to two 9M82ME missiles in TLCs.

Typically, one SAM system includes six launchers and three LLVs.

The missile and technical support assets of the SAM system include:
- maintenance and repair assets for all the elements of the system, as well as integrated functional testing system;
- missile TLC storage and transportation assets, as well as rigging equipment set for missiles loading/unloading;
- training assets;
- a set of spare parts, tools and accessories for all the elements of the SAM system.

Buk-M1-2

Air Defence Missile System

Mission

The Buk-M1-2 air defence missile system is designed to protect task forces and installations against mass attacks of existing and prospective high-speed manoeuvring strategic and tactical aircraft, helicopters, including hovering ones, tactical ballistic and air-launched cruise missiles, under intensive electronic and fire counteraction, as well as to destroy radio-contrast surface and ground targets, in any weather conditions, by day and night.

Buk-M1-2 is a state-of-the-art mobile multi-channel medium-range ADMS capable of providing highly effective anti-aircraft and anti-tactical ballistic missile defence.

Basic specifications	
Max target detection range, km	up to 160
Aerodynamic target engagement envelope, km:	
range	3 – 42
altitude	0.015 – 25
Ballistic target engagement envelope, km:	
range	up to 20
altitude	up to 16
Max engagement range, km:	
antiradiation and cruise missiles	up to 20
radio-contrast ground targets	up to 15
surface targets (missile boats, destroyers)	up to 25
Max air target speed, m/s	1,200
Warhead weight, kg	70
SAM load factor, g	up to 30
Number of SLVs controlled and targets engaged simultaneously	up to 6
ADMS reaction time, sec	up to 18
Into/out-of-action time, min	5

Composition

- combat assets
- support assets

Typical combat assets include:

- 9S470M1-2 command post;
- 9S18M1-1 target acquisition radar;
- up to six 9A310M1-2 self-propelled launch vehicles;
- up to six 9A39M1 launcher-loader vehicles, assigned to SPLVs;

- up to 72 9M317 surface-to-air missiles, carried on SPLVs (up to four on each) and LLVs (up to eight SAMs with four of them ready-to-fire on launch rails).

The support assets include maintenance and repair assets for the ADMS main elements, including tracked vehicles.

A group of up to four ADMS is provided with the following support assets:

- maintenance and repair facilities for the ADMS elements, and an automated integrated missile test and monitoring system;
- missile storage and transportation means (with rigging equipment to load/unload the missiles);
- training facilities;
- a group set of spare parts, tools and accessories for the ADMS elements.

PECHORA-2M/PECHORA-2K

Air Defence Missile System Upgrades

Mission

The modernisation programme for the S-125 Pechora air defence missile system developed by the Kuntsevo Design Bureau, envolves two variants: self-propelled Pechora-2M (S-125-2M) and containerised Pechora-2K (S-125-2K).

The S-125 Pechora ADMS upgrades are designed to protect administrative, industrial and military installations against air strikes by aircraft, helicopters and cruise missiles (including stealth ones) in simple and complex jamming conditions.

Basic specifications

	Pechora	Pechora-2K/Pechora-2M
Min target RCS area, sq.m	0.5	0.1 – 0.15
Engagement envelope, km:		
range	3.5 - 25	3.5 - 30/32*
altitude	0.02 - 18	0.02 - 20
course parameter	16	16.5
Max target speed, m/s	560	700
Target acquisition time (lock-on/autotracking), s	up to 8	not more than 3
Anti-jamming capacity, W/MHz	200	2000
Number of target/missile channels	1/2	1/2 (2/4)**
Number of missiles on one launcher	4	4/2
ECCM system antiradiation missile deviation probability (attack from two directions)	-	0.96 – 0.98
Into/out-of-action time, hrs	3	3/0.5

* – with the upgraded 5V27DE SAM

** – with the second UNV-2M antenna post included

The upgraded systems feature improved performance:

- combat efficiency is improved thanks to employment of the 5V27DE upgraded surface-to-air missile with expanded kill envelope;
- enhanced survivability is provided by introducing advanced electronic, optronic and ECCM equipment;
- tactical mobility is increased for the Pechora-2M ADMS by mounting its principal units on the wheeled chassis equipped with autonomous power supply units, satellite navigation equipment;
- into/out-of-action time is reduced considerably due to fewer cabin-to-cabin cable links;
- enhanced reliability and prolonged service life are obtained thanks to wide application of modern electronic components in basic units;
- operational and maintenance characteristics are improved by reducing maintenance/servicing time thanks to the introduction of automated test equipment and providing smooth spare parts supply.

Upgraded Systems Composition

- SNR-125M-2M(K) missile guidance radar, comprising: UNV-2M antenna post (self-propelled wheeled variant), or UNV-2K antenna post on a semi-trailer with a tractor (containerised variant), upgraded UNK-2M control cabin on wheeled chassis
- SM-RB-125-2M(K) missile battery, comprising:
  - up to 8 5P73-2M launchers with two guiding rails each (self-propelled wheeled variant), or up to 4 launchers with 4 guiding rails each on semi-trailers with a tractor (containerised variant);
  - up to 8 transporter-loader vehicles on the ZiL-131 or Ural-4210 chassis (self-propelled variant), or PR-14AM on ZiL-131 automobile chassis (containerised variant);
  - 5V27D/5V27DE SAMs;
  - power supply system, consisting of the RKU-N distributive cabin and 5E96A diesel-electric power station, KU-03T cable layer (containerised variant).

The PRM-NM1A mobile repair shop with a single SPTA set, sets of cables, and an ECCM system are offered optionally.

Thanks to the introduction of the second UNV-2M antenna post, the upgraded ADM systems enjoy enhanced channel capacity: two target channels, and up to four missile channels.

On customer request, the ADM system delivery set can be changed to include foreign-made equipment, chassis, materials, software, components, etc.

PECHORA-2A

Air Defence Missile System Upgrade

Mission

The S-125-2A Pechora-2A upgraded air defence missile system is designed to provide AD cover for administrative, industrial and military installations against air attacks of aircraft, helicopters and cruise missiles under simple and heavy ECM conditions.

The S-125 Pechora ADMS modernisation programme is developed by the Raspletin Almaz Scientific Production Corporation to enhance tactical and technical parameters of the basic system.

Basic specifications

	Pechora	Pechora–2A
Min target radar cross section, sq. m	0.5	0.5
Engagement envelope, km:		
range	3.5 - 25	3.5 - 28
altitude	0.02 - 18	0.02 - 20
course parameter	16	24
Max target speed, m/s	560	700
Target acquisition time, s	up to 8	2,5 - 3
Anti-jamming capacity, W/MHz	200	2,000
Number of target/missile channels	1/2	1/2
Number of missiles on one launcher	4	4
Into/out-of-action time, hrs	3	3

The upgrading of the S-125 Pechora system envisages:

- extension of ADMS engagement zone by introducing improved missile guidance methods;
- enhancement of target kill probability (including low-altitude targets) by improving SAM guidance accuracy;
- augmented capability to detect and track air targets in conditions of intensive jamming and passive interference, including meteoghosts and background clutter;
- improved ADMS performance in the TV/optical mode thanks to introduction of automatic target acquisition and tracking into the TV channel;
- improvement of operational characteristics, including partial automation of combat work; substitution of some units with up-to-date hardware; upgrading of the crew training facilities; reduced volume and duration of scheduled maintenance works; enhancement of operational reliability; prolongation of service life; reduction of power consumption.

Composition

- SNR-125M-2A missile guidance radar comprising UNV antenna post, upgraded UNK-M2A control cabin and mobile repairs workshop
- air defence missile battery including up to four 5P73 launchers and up to 8 PR-14AM transporter-loader vehicles on wheeled chassis
- 5V27D SAMs
- electrical power supply system consisting of the RKU-N distribution cabin, 5E96A diesel-electric power station and 5E74M-230 mobile transformer unit

The KU-03T cable layer with a set of cables can be delivered additionally.

At customer request, delivery set of the S-125-2A Pechora-2A ADMS can be supplemented with foreign-made equipment and facilities.

The upgrading of the S-125 Pechora ADMS can be conducted both in Russia and on the customer territory.

OSA-AKM

Air Defence Missile System

Mission

The Osa-AKM air defence missile system is designed to protect ground troops in all kinds of combat operations, as well as installations from attacks of aircraft, helicopters, cruise missiles and unmanned aerial vehicles.

Osa-AKM is an autonomous self-propelled all-weather short-range ADMS. Each combat vehicle mounts radar, optical and computer systems, launching units with missiles, and power supply unit on the amphibious chassis. Their integration assures autonomous operation, including missile launches while on the move (one-two missiles against one target from a short halt).

Basic specifications	
Max target detection range, km	45
Target engagement envelope, km:	
range	1,5 - 10
altitude	0,025-5,0
Number of simultaneously tracked/engaged targets	1/1
Max target speed, m/s	up to 500
Reaction time, s	26 - 39
CV loading time, min	5
Missile launch weight, kg	127
Warhead weight, kg	15
Into/out-of-action time, min	up to 4

A group of combat vehicles can be controlled by means of existing control posts such as PU-12M7 and PPRU-M1.

Composition

- combat assets
- maintenance, support and training assets

The combat assets include:

- up to four 9A33BM3 (9A33BM2) CVs in one battery;
- up to six 9M33M3 (9M33M1) SAMs in the transporter-launcher containers on each CV.

The maintenance, support and training assets include:

- transporter/loader vehicle on amphibious wheeled chassis (up to 12 missiles);
- CV servicing and adjustment means, automated integrated missile test and monitoring, a group set of spare parts, tools and accessories, ground support equipment set;
- autonomous simulator for CV operators.

The Osa-AKM ADMS can be transported by any types of transportation means.

Modernisation programme

Modernisation of the Osa-AKM ADMS aims to increase combat and information capabilities of the system by introducing:

- telecoded datalink into the combat vehicle to automate control procedures, target designation data reception and two-way data exchange with the PU-12M7 or PPRU-M1 control posts at a distance of up to 5 km on the move and in station;
- Mk-X/Mk-XII IFF interrogator on the CV;
- TV/optical viewfinder with an electro-optical system based on low-light/thermal-imaging devices;
- SAM's warhead with 25% enhanced lethality;
- improvements of the crew's habitability conditions.

After minimal upgrading of the missile and combat vehicle equipment they can be used as the Saman aerial target system.

TOR-M1

Air Defence Missile System

Mission

The Tor-M1 air defence missile system is designed to protect ground troops and installations from attacks of air attack assets, especially precision-guided weapons, as well as fixed- and rotary-wing aircraft, cruise missiles and remotely piloted vehicles.

Basic specifications	
Max target detection range, km	25
Number of simultaneously detected and identified targets	48
Elevation of detected targets, deg	0 - 32 or 32 - 64
Number of simultaneously tracked target paths	10
Target engagement envelope, km:	
range	1.0 – 12
altitude	0.01 – 6.0
Number of simultaneously engaged targets	up to 2
Target speed, m/s	up to 700
Number of CV-mounted SAMs	8
SAM warhead weight, kg	14.8
Reaction time after target detection, sec	5 - 8
Max road speed, km/h	65
CV weight, t	37
Fuel endurance (with 2 hours of operation), km	500
Crew	4

The Tor-M1 is a state-of-the-art mobile all-weather short-range ADMS with radar, optical and computer systems, launchers, surface-to-air missiles and power supply units on board the combat vehicle. It can operate autonomously launching missiles on the move from short halts. The ADMS is highly immune to both active and passive ECM. Maximum automation of operation thanks to the use of a high-speed digital computer, coupled with the vertical launch and subsequent gas-dynamic declination (inclination) of the missile towards the target, ensure minimum reaction time possible.

Automated control for the Tor-M1 ADMS battery is provided by the 9S737M unified battery command post.

Composition

The Tor-M1 ADMS includes combat, technical and auxiliary assets.

Typical combat assets include:

- up to four 9A331-1 CVs with two SAM modules on each;
- 9M334 missile modules with four 9M331 missiles in each;
- 9S737M battery command post.

Technical assets include:

- maintenance assets for the ADM system and its vehicles;
- missiles loading/unloading, storage and transportation facilities with rigging equipment;
- ADMS group set of spare parts, tools and accessories.

Auxiliary assets comprise 9F678 self-contained simulator for CV operators.

Each CV is equipped with life-support equipment, navigation and mission recording means. The CV onboard equipment can be mounted on either tracked or wheeled chassis, or in container.

The Tor-M1 ADMS can be shipped by all transportation means, including aircraft.

STRELA-10M

Air Defence Missile System Modernisation

Basic specifications	
Night sight:	
target detection range, km	up to 10
spectral range of TI, μm	8-12
narrow/wide field of vision, deg	6 x 8/13 x 19
Engagement envelope, m:	
range	500-800 – 5,200
altitude (for 9M37MD, 9M333/9M37M1 SAMs)	10-3,500/25-3,500
Target speed, m/s	0-420
Target designation data reception mode	automatic with launcher turned towards the target
SAM guidance	passive optical seeker with two target and jamming channels
Weight of missile/missile with container, kg	41/72
SAM weight (9M37MD, 9M333/9M37M1), kg:	
rod warhead	5.0/3.5
high explosive	2.6/1.1
SAM fuse	impact/proximity laser, 8-beam

Mission

The Strela-10 short-range ADMS is designed to provide close air cover for ground forces in all types of combat operations and on the march, as well as to protect installations against low-altitude airborne threats, including fixed- and rotary-wing aircraft, cruise missiles, remotely piloted vehicles, under conditions of natural clutter and man-made optical (thermal) interferences by day and night, in restricted visibility conditions.

There are two modernisation options of the Strela-10 mobile short-range self-contained ADMS, namely: Strela-10M4 and Strela-10A (9A34A Gyurza). The upgraded systems can launch missiles from stationary positions, at short halts and on the move, both against approaching and receding targets.

For its deployment in restricted visibility/night conditions, the system is fitted with a new night sight with thermal imager and/or LLLTV camera.

Composition

- combat assets, including: 9A35M2(M3), 9A34M2(M3) or 9A35M (9A34M) combat vehicle upgraded to ensure automatic target designation data reception
- 9M37M1, 9M37MD, and 9M333 SAMs (four missiles per each CV)
- night sight

Maintenance and training assets are common both for the basic and modernised ADMS.

9A34A Gyurza modernisation option

Modernised Gyurza is distinguished from the basic system by the combat vehicle outfitted with all-round IR detection/acquisition system with digital computer, control and display panel. The Gyurza ADMS is operational round-the-clock, including nighttime.

The modernised Strela-10M Gyurza system features:

- automatic detection of aerial targets by day and night, beyond visual range;
- automatic selection of the most dangerous targets for engagement;
- fully automated pre-launch combat procedures;
- indication of tracked target paths and air target bearings;
- automated control of the launcher's actuators to guide SAM homing head on target;
- remote combat management of the battery combat vehicles from one of the CVs assigned as a commander's vehicle, or from a remote control panel at a distance of up to 300 m;
- display of technical status and operability of the CV onboard systems;
- centralised operation when remotely controlled from the command post.

Basic combat performance data and maintenance assets are identical to those of Strela-10M4 AMDS.

IR Target Acquisition System of the Strela-10M (9A34M Gyurza) ADMS	
Head-on/tail-on detection range, km	up to 10/20
Surveillance envelope, deg	
elevation	30
azimuth	360
Spectral range, μm	3 - 5

KVADRAT

Air Defence Missile System Modernisation (1st stage)

Mission

The modernised Kvadrat medium-range air defence missile system is designed to defend friendly troops and installations against modern high-speed manoeuvring strategic and tactical aircraft, as well as against attack helicopters and cruise missiles, under conditions of mass attack, in hostile electronic countermeasures and fire counteraction environment.

Scope of modernisation

The upgrading of the Kvadrat ADM system envisages modification of:

(a) the SURN reconnaissance and guidance radar post:

- replacement of the analogue moving target selection system with a digital one, featuring a suppression coefficient increased up to 28 - 30 dB;
- introduction of the tracked target classification system (aircraft, helicopter, cruise missile and other classes of air targets);
- extention of the illumination channel waveband from 6 to 12 lettered frequencies;
- replacement of electro-vacuum UHF amplifiers with solid-state ones, including substitution of their high-voltage power units for low-voltage ones, as well as introducing new electronic elements;
- replacement of the cathode-ray tubes of display system with colour LCDs, which notably increases the amount of data displayed and extends service life (up to 10,000 - 15,000 hours), and also reduces power consumption and the number of operating adjustments;

(b) the self-propelled launcher vehicle:

- introduction of testing and monitoring system providing real-time recording with subsequent playback of all data on operation of the ADMS major elements including radar, launcher and missiles.

The ADMS is equipped with a testing and measuring equipment set providing integral check-up of radar/launcher electronic equipment.

A follow-on modernisation of the Kvadrat ADMS envisages considerable improvement of its combat capabilities by introducing some of the elements of the advanced Buk-M1-2 medium-range ADMS.

IGLA

Man-Portable Air Defence Missile System

Mission

The Igla man-portable air defence system is designed to engage visible turbo-jet, turbo-prop and piston-engined aircraft, as well as helicopters and remotely piloted vehicles, both approaching and receding, under conditions of natural cluster and man-made IR interferences.

Composition

- combat assets
- maintenance assets
- training assets

The combat assets include: 9M39 SAM in the launch tube, and 9P516 launching mechanism.

The launch tube can mount a night sight and an IFF interrogator.

The maintenance assets include mobile and stationary test equipment for checking combat/training missiles in launch tubes, and launching mechanisms.

The training assets include training equipment, mock-ups and other assets to help develop firm skills in operating the system.

Modernisation

A new-generation 9K338 Igla-S MANPADS is a follow-on derivative of the Igla MANPADS. It features a new warhead with considerably increased HE charge and number of fragments, laser impact/proximity fuse and new homing (guidance) system, providing higher accuracy and increased (to 6 km) killing range.

The upgraded Igla-S MANPADS has the same weight and size as the predecessor, as well as launch preparation and maintenance procedures. The 9F859 Konus versatile simulator is developed for training Igla-S systems operators. It also includes training means for Igla and Igla-1 system operators.

The Igla-S is two-three times superior to the baseline Igla system in terms of combat effectiveness, especially when used against cruise missiles and small-size air targets.

Basic specifications	
Target engagement envelope, m:	
range	500 – 5,200
altitude	10 –3,500
Approaching/receiding target speed, m/s	up to 400/320
Guidance mode	homing
Control system	single channel
Type of homing head	heat-seeking (passive)
Warhead explosives weight, kg	0.405
Fuse type	impact deep penetrating
Reaction time, sec	not more than 5
Deployment time, sec	not more than 13
Combat assets weight, kg	18
Crew	1

9S520 NIGHT LAUNCH CAPABILITY ASSETS

for Igla-type MANPADS

Mission

The 9S520 assets are designed to increase Igla MANPADS combat effectiveness by day and night, as well as to ensure fire control of an AD section consisting of 3 - 4 crews.

Composition

- one to three sets of individual target designation assets, comprising the support structure, transmission lines with a reel and cable (50 m), MANPADS-to-support structure joint, 1PN72M night sight and three sets of the PNV 90V-1 night vision goggles
- 1L110-2 hand-held electronic plotting board with the Arbalet-1U radio set, the TLM-1 unit, fittings, and electric power supply cables
- a set of satellite navigation system equipment
- spare parts, tools and accessories set, with back-up power supply source and charger
- test and monitoring equipment with an SPTA set, and operating manuals

The night launch capability assets ensure:

- reception of telecoded alerts from control posts - 9S80M(M1), 9S737M, PU-12M (M4, M6, M7, or P-19 type radars of various modifications represented in the single topographic/survey reference system with target coordinates recalculated in relation to positions of Igla operators;
- presentation of target coordinates, their identification and composition data on the portable electronic plotting board;
- address transfer of relevant target distribution and designation data on azimuth and range, as well as voice and visual information to Igla operators;
- search for and acquisition of aerial targets, aiming SAMs at them by day and night, as well as increase of target detection probability and range in daytime.

Basic specifications	
Displayed air situation zone, km	25.6 x 25.6 and 51.2 x 51.2
Number of simultaneously displayed targets	up to 4
Target tracking by EPB	automatic
Reception of target designation data form launchers	address and broadcasting
Data presentation on SAM operator's daytime indicator or night sight, km:	
range	0 – 9.9
azimuth	«left», «right»
Aircraft detection probability:	
in daytime within 6-km limit (15-km visibility range)	0.9
at night within 2-km limit (illumination of $3x10^{-3}$ lux)	0.6
Overall weight, kg	80
Crew	3 - 4

203-OPU DZHIGIT

MANPADS Pedestal Launcher

Mission

The 203-OPU Dzhigit ground/vehicle-based MANPADS pedestal launcher is designed to carry two combat-ready Igla-type SAMs allowing one operator to aim and launch one missile after another or two missiles simultaneously against approaching and receding targets in manual and automatic modes.

The launcher complex improves kill probability by up to 1.5 times thanks to the salvo firing of two missiles, and reduced time between one-missile-at-a-time launches. Ergonomically designed launcher provides ease of operator's combat handling procedures.

Additionally, the Dzhigit launcher can be fitted with a night sight and an IFF interrogator using the same frequency band and operating modes as the MkX/MkXII system, as well as with target designation assets.

A test vehicle and test-and-monitoring equipment are used to provide functional testing of the launcher and its components and localize malfunctions, as well as to provide maintenance of the launcher.

Basic specifications	
Dimensions in deployed position, mm:	
pedestal-mounting diameter	2,180
height	1,546
weight of tilting part	1,304
Launcher weight (w/o missiles), kg	128

LAUNCH MODULE & CONTROL EQUIPMENT SET

for Igla-type MANPADS

Mission

The launch module and control equipment for Igla-type MANPADS is designed to ensure automated remote launch of portable SAMs in different modes: single, successive (2-8 SAMs) or salvo (2 SAMs at a time from different launchers) launches from ground, sea and air platforms.

Composition

- versatile launch module (up to four units)
- control and communications equipment (one set)
- set of connectors
- control panel
- synchroniser
- testing and monitoring equipment
- SPTA set

Basic specifications	
Number of missiles in launch module	2
Missile types	Igla-1, Igla, Igla-S
Max number of missile «power-on's» in LM (w/o replacing disposable power supply sources)	not less than 4
Sighting mode	(a) line-of-sight (b) target designation at ±10 deg off homing head axis
Reaction time, sec	6.5
Mean time between failures, hrs	500

TUNGUSKA-M1

Anti-Aircraft Gun/Missile System

Mission

The Tunguska-M1 anti-aircraft gun/missile system is designed to provide air defence for ground forces in all kinds of combat operations, as well as AD cover for installations.

The Tunguska-M1 is a state-of-the-art mobile short-range air defence asset capable of defeating aircraft, helicopters (including hovering and pop-up ones) and low-altitude air targets while moving, stationed or halted for a short time. It can also engage land and surface targets.

Basic specifications	
Max target detection range (by target acquisition radar post), m	18,000
AA gun engagement envelope, km:	
altitude	0 – 3,000
range	200 – 4,000
SAM engagement envelope, m:	
altitude	15 - 3,500
range	2,500 – 10,000
Ammunition load, rounds/missiles	1,904 / 8
AA gun calibre, mm	30
Number of twin-barrel AA gun mounts	2
Cumulative rate of fire, rds/min	up to 5,000
Air target speed, m/s	up to 500
Reaction time, sec	less than 10
Max external target designation communications range, km	up to 5
Into/out-of-action time, min	not more than 5
Loaded AA SPM weight, t	not more than 35
Crew, persons	4

Composition

The Tunguska-M1 system includes combat, maintenance and training assets.

Typical set of combat assets of the system consists of:

- 2S6M1 anti-aircraft self-propelled mounts;
- 9M311-1M surface-to-air missiles in transport-launch containers, eight missiles on each SPM;
- ammunition allowance of 30mm rounds.

The maintenance assets include:

- AAGMS maintenance and repair assets and automated integrated missile test equipment;
- missile/round storage, transportation and loading means;
- group and repair SPTA sets for all elements of the system.

PANTSYR-S1

Air Defence Gun/Missile System

Mission

The Pantsyr-S1 air defence gun/missile system is intended to provide air defence to small-size administrative, industrial and military installations, including mobile ones, against modern air strike weapons, including precision-guided munitions, as well as to reinforce defence groupings in countering air raids.

The Pantsyr-S1 short-range mobile all-weather air defence gun/missile system is capable of engaging targets by a combined fire of artillery and missile weapons. The system is highly autonomous as regards combat operation in automatic cycle. The combat vehicle is mounted on tracked chassis and has a jam-resistant integrated radar/optical weapons control system. The CV can fire missiles and guns when on the move.

Composition

- combat assets
- maintenance assets
- training assets

A typical set of combat assets includes:

- up to six tracked/wheeled/containerised CVs in a battery;
- battery command post;
- up to 8/12 CV-mounted 57E6-E SAMs in TLC (their number depends on design/configuration features);
- up to 1,400 30-mm rounds per one CV;
- transporter/loader vehicle.

The maintenance assets include:

- CV repair, maintenance and adjustment means;
- basic set of missile test and monitoring equipment;
- storage and transportation means for a group set of spare parts, tools and accessories.

The training assets include mobile and classroom-based simulators.

Each CV has a satellite navigation system, air conditioning system, electric power supply system, voice and data communications, meteorological, and combat operation recording equipment.

Basic specifications	
Target detection and designation radar:	
max detection range (RCS = 2 sq.m), km	32 – 36
number of simultaneously tracked targets	20
Target and missile tracking radar:	
max tracking range (RCS = 2 sq.m), km	24 – 28
number of simultaneously tracked targets/missiles	1 / 2
Electro-optical system:	
max autotracking range, km	17 – 26
number of simultaneously tracked targets/missiles	1 / 1
Missile/gun engagement envelope, km:	
range	1.2 – 20 / 0.2 - 4
altitude	0.005 – 10 / 0 - 3
Max target speed, m/s	1,000
Reaction time, sec	4 - 6
Missile weight, kg	74.5
Warhead weight, kg	20
Artillery weapons	two anti-aircraft automatic cannons
Total rate of fire, rds/min	4,500 –5,000
Crew	3

ZSU-23-4 SHILKA

Self-Propelled Anti-Aircraft Gun System Modernisation

Mission

The ZSU-23-4 Shilka self-propelled anti-aircraft gun system is designed to provide air defence of land forces in all kinds of combat operations, as well as that of installations. The ZSU-23-4 SPAAG system can detect and engage fixed- and rotary-wing aircraft (including hovering helicopters) and other low-altitude air targets from stationary position, short halts or on the move, as well as ground/surface targets.

Profound modernisation of the vintage ZSU-23-4 Shilka systems is proposed as ZSU-23-4M4. Hit probability (with up to 300 rounds allowance) of the upgraded Shilka against one air target passing through its engagement envelope is increased by 0.6 approaching that of a close-range ADMS.

Basic specifications

	Before modernisation	After modernisation
Integration into a single AD system	n/a	available
Aerial targets detection range, km	12	34 (with external target designation)
Fire control system	radar	radar (ZSU-23-4M4)
Tracking and engagement of manoeuvring targets	restricted	available
Aerial targets hit probability with radar guidance	0.07 – 0.12	0.3 – 0.6
On-line testing of the system's operability	n/a	available
Integrated training equipment	n/a	available

ZSU-23-4 Shilka SPAAG system modernisation envisages:

- replacement of the existing with advanced radar system featuring improved performance;
- replacement of the analogue with up-to-date digital computer;
- introduction of equipment to receive external target designation data, ensuring automated combat control of the AA gun from a command post of the unit;
- introduction of built-in test equipment, as well as a multi-functional simulator to provide training at operators' workstations;
- introduction of self-defence system elements: to protect the SPAAG system against high-precision weapons, to reduce its IR signature, as well as fitting it with an air conditioning system.

Modernisation of the SPAAG systems by introducing up-to-date microcircuitry and components providing digital data processing and exchange will ensure SPAAG system's repairs and supply of spare parts, tools and accessories for another 10 – 12 years.

The Shilka modernisation programme is aimed at improving control, operational and life support capabilities. It includes upgrading of tracked chassis and primary power supply system. An economical diesel-electric power unit improves combat control and crew's working conditions.

At customer request, the SPAAG system can mount a set of control equipment with two Strelets-23 launch modules, designed to carry and launch four Igla-type missiles, as well as an IFF transponder complying with customer's existing standards.

ZU-23

Anti-Aircraft Gun Mount Upgrade

Mission

The upgraded ZU-23 anti-aircraft gun mount is designed to effectively engage air attack weapons, including low-flying manoeuvring air targets of opportunity (tactical aircraft, attack helicopters, cruise missiles and remotely piloted vehicles), by day and night, in restricted visibility conditions.

The ZU-23 is upgraded into the ZU-23M and the ZU-23M1 variants.

Composition

The modernised AD systems comprise new elements, such as:

- launch module with two Igla SAMs and a set of control equipment (ZU-23M1 only);
- electro-optical target search-and-track system, consisting of an electro-optical module (TV-camera, thermal imager, laser range-finder and control unit) with automatic tracker;
- digital computer;
- targeting servos;
- rotating contact device;
- control and display panel;
- target designation data receiving equipment;
- radio and wire communications means;
- primary electric power supply system.

With the crew reduced by one man, the upgraded AD systems boast the following features: full guidance automation and precision target tracking, as well as automatic computations and processing of lead angles and gun/SAM engagement envelopes (ZU-23M1), which have considerably increased AD systems' fire efficiency. The ZU-23M1 provides target engagement by combined fire of the missile/gun weapons.

Basic specifications

	ZU-23M	ZU-23M1
Target engagement envelope, km:		
range	0.2 - 2.5	0.2 – 5.2
altitude	up to 1.5	up to 3.5
Guidance mode	automatic + semiautomatic	
Target tracking error, min	not more than 5	
Lead angle computation and processing error, min	not more than 3	
Target speed, m/s	0 - 300	0 - 400
Target hit probability:		
by missile	same as for Igla MANPADS	
by a twin-barrel gun mount	up to 0.3	
Night and poor visibility capacity	available	

AIR DEFENCE SYSTEMS

SURVEILLANCE RADARS

55Zh6UE NEBO-UE

Radar

Mission

The 55Zh6UE Nebo-UE radar is designed to detect, automatically track and determine coordinates and flight parameters of air targets including low-observable, small-size and ballistic ones; to feed radar data to users; to identify aircraft as friend or foe; to display individual and flight data on the radar operators workstations and to classify targets by their trajectory parameters.

The Nebo-UE mobile medium- and high-altitude 3D digital phased array radar can be integrated into both automated and non-automated control systems of air force and air defence units.

Features

- phased array antenna
- precision detection of small-size and stealth targets
- advanced techniques to suppress natural clutter and active jammers
- all-track data processing with automatic lock-on, tracking and trajectory identification of aerial targets

- ability to integrate into any Russian or foreign-made automated control systems, including integration/coupling with air defence gun/missile systems
- continuous automated built-in functional testing and fault detection system

Composition

The Nebo-UE radar comprises electronic equipment suite (the AP cabin), an antenna mast assembly mounted on three semi-trailers, a remote display device (the UV cabin); the 19U6 self-contained power supply system, a set of cable links, connecting with the UV cabin and automated control system; an SPTA set.

The radar can operate in various climates, at ambient temperatures ranging from -50°C to +50°C, relative air humidity of 98% and wind speed of up to 30 m/s at 1,000 m above sea level.

Nebo-UE has no analogues in the world. If compared with the Martello 743D radar, the Nebo-UE's most close and best foreign-made counterpart, the Nebo-UE radar features 1.5-times greater maximum detection range and altitude, at similar power consumption and detection accuracy.

Basic specifications	
Waveband	metric
Fighter-type target (RCS = 2.5 sq.m) detection range, km, not less than:	
at 500 m	65
at 10,000 m	310
at 20,000 m	400
Hypersonic cruise missile (RCS – 0.9 sq.m) detection range, km, not less than:	
at 10,000 m	250
at 20,000 m	300
Top boundary of operational coverage and coordinates measurement area:	
altitude, km	65
elevation, deg	16
Coordinates measurement accuracy:	
range, m	60
azimuth, ang. min	10
altitude, m:	
at 2-16° elevation	400
at 0.8-2° elevation	600
Number of target tracks processed	not less than 100
Mean time between failures, hrs	not less than 250

OBORONA-14

Radar Modernisation

Mission

The Oborona-14 radar modernisation is carried out to replace cathode-ray vacuum-tube components with solid-state devices and improve radar technical and operational characteristics, including:

- jamming resistance to passive, asynchronous pulse jamming and clutter from local objects;
- data processing capacity;
- data exchange within automated air defence systems, as well as fusing and identification of data received from several radars and other sources;
- reliability and service life.

Composition

The equipment intended for modernisation includes:

- digital ECCM equipment for protection from passive and asynchronous jamming;
- automatic radar data pick-up equipment and data collection set.

The ECCM equipment based on detachable functional cells is integrated into a single line replaceable unit. It ensures simultaneous electronic protection of the radar from passive and asynchronous jamming in the coherent zone, and from asynchronous jamming in the amplitude zone, without loosing quality within the entire radar coverage zone.

The data pick-up equipment is mounted in the radar equipment van instead of the remotely-mounted plan position indicator. Mounting dimensions of the pick-up equipment and PPI are the same.

The data collection equipment is mounted on stationary command and control posts. Distance from the data collection equipment to the radar is not limited and depends on communications channels available on site.

Both data pick-up and collection equipment are computer-based.

Basic specifications

	Before modernisation	After modernisation
Clutter suppression ratio, dB	20	26
Passive interference suppression ratio, dB	20	26
Simultaneous interference suppression ratio in coherent zone, dB, not less than:		
passive interference	20	26
asynchronous interference	-	26
Compensation of asynchronous interference in amplitude zone, dB	20	26
Automatic display of radar data/target track forming	n/a	available
Automatic tracking of jammers' bearings	n/a	available
Throughput (number of targets processed within a 10-sec scanning period)	up to 10 (visual reading)	up to 120 (automatically)

NEBO-SVU

Radar

Mission

The Nebo-SVU radar is designed to automatically detect, measure co-ordinates of and track a wide range of modern airborne platforms, including strategic and tactical aircraft, ASALM-type air-launched missiles, ballistic targets such as small-size hypersonic cruise missiles warheads, low-observable targets, in particular those embodying stealth technology; to identify targets as friend or foe; to detect active ECM threats; to transfer radar surveillance data to automated control systems, and to display individual and flight-related information at the radar's workstations.

The Nebo-SVU mobile phased-array radar can be integrated into both automated and non-automated control systems of air force and air defence units.

Basic specifications	
Waveband	metric
Detection range (fighter-type target RCS = 2.5 sq.m), km, not less than:	
at 500 m	50
at 10,000 m	250
at 20,000 m	350
Top boundary of coverage area:	
in regular circular scan mode, not less than:	
altitude, km	100
elevation, ang. deg	25
in tracking mode:	
altitude, km	180
elevation, ang. deg	45-50
Coordinates measurement accuracy:	
range, m	400
azimuth, ang. min	30
elevation (for angles exceeding 5 deg), ang. deg	1.5
Jamming immunity, dB:	
clutter	45
passive interference	30
active noise jamming	28
Number of tracked targets	not less than 100
Mean time between failures, hrs	not less than 250
Deployment/out-of-action time, min	25

Features

- phased array antenna
- fully-digital space-time signals pre-processing
- signal processing system's ability to adapt it to the clutter, jamming and radar's technical condition
- high-capacity digital moving-target indication system
- adaptive suppression of side lobes of the array's directional pattern

Composition

The Nebo-SVU radar comprises antennas and electronic equipment, mounted on a semi-trailer; and the autonomous electric power plant, based on the ED-2x30-T400-1RA1M4 diesel-engine power plant, carried by the KamAZ truck.

The radar can operate in any climate at ambient temperatures between –50°C and +50°C, with relative air humidity of 98%.

The Nebo-SVU radar has no analogues in the world.

P-18

Radar Upgrade (Version 1)

Purpose

The P-18 radar modernisation programme is proposed to improve its tactical-technical and maintenance characteristics, namely:

- to increase accuracy of target coordinates measurement;
- to enhance radar's ECCM capability;
- to improve reliability characteristics;
- to extend radar's service life.

The programme is intended to replace existing electronic equipment with an installation kit to be fitted directly in the radar's equipment van.

Composition of the installation kit

- 259-1 case with solid-state transceivers, housed in three racks, with six cells in each
- two PMO1 cases with Baget 01-05 computer
- one PMO2 case with Baget 01-05 computer
- software package
- aerial feeders
- SOCT equipment
- power-on unit
- interface cables

The modernisation programme envisages:

- introduction of radar signals digital processor;
- introduction of active noise jamming autosuppression system;
- replacement of tube transmitter with a solid-state one;
- introduction of a computerised operator workstation, secondary data processing systems, and computerised test equipment;
- replacement of the obsolete radar components with modern ones;
- introduction of track data processing and a capability to link the radar with modern automated control systems.

Thus, the modernisation will result in creating an all-new modern VHF (metric-wave) radar, capable of efficiently monitoring airspace within a specified sector in severe ECM environment.

Small dimensions of the installation kit allow the P-18 radar to be upgraded directly at the customer facilities.

Basic specifications

	P-18	P-18 upgrade
MiG-21-type target detection range, POD=0.8, km:		
at 3,000 m	110	110
at 10,000 m	180	180
at 20,000 m	260	260
MiG-21-type target detection range (at active noise direct-barrage jamming spectral density of 200 W/MHz), km:		
at 3,000 m	-	88
at 10,000 m	-	152
at 20,000 m	-	170
Coordinates determination accuracy:		
range, m	1,400	250
azimuth, deg	47	25
Active noise direct-barrage jamming suppression ratio, dB	-	25*
Clutter suppression ratio, dB	20	not less than 45
Number of tracked targets	-	up to 120
Mean time between failures, hrs	-	20,000 - 25,000
Installation kit service life, years	-	not less than 12

* - with jamming-to-noise signal ratio of 24-40 dB

P-18-2

Radar Upgrade (Version 2)

Purpose

The P-18 radar modernisation programme is proposed to replace vacuum-tube components with solid-state technology and improve the radar performance.

Composition

Equipment to be modernised includes:

- active jamming suppression equipment;
- digital passive interference suppression equipment;
- transmitter control display and automatic frequency control amplifier;
- automatic radar data reading and recording equipment;
- receiver and coherent local oscillator.

Basic specifications

Target detection range (POD=0.8), km:	
RCS = 2.6 sq.m, active noise directed-barrage jamming spectral density = 200 W/MHz generated by four jammers from 200-km range and 10,000-m altitude:	
at 3,000 m	84
at 10,000 m	150
at 20,000 m	162
Number of suppressed directions	4
Active noise jamming suppression ratio, dB, not less than	23*
Clutter suppression ratio, dB, not less than	26
Asynchronous jamming suppression ratio, not less than	20
Simultaneous suppression ratio, times, not less than:	
passive jamming	20
asynchronous jamming	20
Receiver operating frequency adjustment	electronic
Automatic radar data display and target tracking	available
Automatic jamming source tracking	available
Throughput (targets processed within a 10-sec scanning cycle	up to 120 (automatically)

* - with jamming/noise ratio of 25 - 40 dB

1L117M

Mobile 3D Radar

Mission

The 1L117M mobile 3D radar is designed to detect, identify and measure three coordinates (azimuth, slant range and altitude) of various aerial targets, as well as to provide radar data for external users.

The radar can be used as part of air defence and air force automated and non-automated air defence and air traffic control systems.

The 1L117M radar differs from its predecessor 1L117 radar by having the transmitter's klystron-based power amplifier, which enhances stability of emitted signals, increases passive noise suppression characteristics and improves the radar's ability to detect low-flying targets. In addition, frequency agility improves the radar's jamming resistance when operating in heavy ECM environment.

Composition

The radar equipment is mounted on five vehicles:

- vehicle No. 1 – transceiver;
- vehicle No. 2 – control and datalink equipment and operators' workstations;
- vehicle No. 3 – diesel-electric power plant with two diesel generators;
- vehicles Nos 4 and 5 – trailers to carry antenna systems and an SPTA set.

The radar has an all-weather capability and can operate in various climates at ambient temperatures between –40°C and +50°C, in relative humidity 98% and at an altitude above sea level amounting to 3,000 m.

The radar can be transported by automobile, railway and sea transport.

Basic specifications	
Waveband	centimetric
Coverage area:	
range, km	350
elevation, deg	28
azimuth, deg	360
Detection range (target RCS = 1 sq.m, jam-free environment), km, not less than:	
at 500 m	70
at 3,000 m	140
at 5,000 - 15,000 m	180
Detection range (target RCS = 10 sq.m, jam-free environment), km, not less than:	
at 500 m	70
at 3,000 m	160
at 8,000 m	280
at 10,000 - 25,000 m	320
Coordinates measurement accuracy (target RCS = 10 sq.m):	
range, m	150
azimuth, ang.min	7
altitude, m	400
Number of target tracks	not less than 200
Clutter rejection ratio, dB	not less than 45
Mean time between failures, hrs	not less than 350
Deployment/out-of-action time, hrs	not more than 8

PROTIVNIK-GE

Track Data Processing Radar

Mission

The Protivnik-GE 3D decimetric-waveband track data processing radar is designed to detect, determine coordinates and track strategic and tactical aircraft, ASALM-type missiles, small-size low-speed aircraft; classify and identify them as friend or foe; to take bearings of jamming sources; to designate targets to fighter aircraft and air defence missile systems.

The Protivnik-GE 3D track data processing radar can be used as part of automated and non-automated air force and air defence command and control systems.

Features

- digital phased array antenna
- highly automated combat operation
- high jamming immunity
- no field adjustment/tuning is required
- continuously operating automated built-in functional testing and fault detection system
- display of all necessary information on a wide-scope colour TV indicator
- automated mapping of local objects and passive interferences

Composition

The radar consists of equipment unit, antenna/instrumentation unit and autonomous power supply system.

A four-seat remote post can be delivered. Data is transferred to the remote post via a fibre-optic line at a range of up to 1,000 m from the radar.

The radar can operate in various climates, at a relative air humidity of 95% and a wind speed of up to 30 m/s, at an altitude of 2,000 m above sea level. The radar can be shipped by sea and air, automobile and railway transport.

The Protivnik-GE radar is similar in basic specifications to the best foreign radars of this class, yet outperforms them as regards altitude and elevation operational limits, elevation measurement accuracy. It provides higher scanning rate and detection altitude limit, thus being capable of acquiring high-speed air targets with ballistic flight trajectories.

Basic specifications	
Waveband	decimetric
Surveillance zone:	
range, km	10 - 400
azimuth, deg	360
altitude, km	200
elevation, deg	45
target speed, km/h	60-8,000
Target detection range (RCS = 1.5 sq.m), km:	
at 100 m	40
at 1,000 m	100
at 5,000 m	240
at 12,000 - 80,000 m	340
Coordinates measurement accuracy:	
range, m	100
azimuth, ang. min	12
elevation, ang. min	10
Number of target tracks	150
Natural clutter rejection ratio, dB	50
Mean time between failures, hrs	not less than 600
Deployment time, min	40

67N6E GAMMA-DE

Radar

Mission

The 67N6E Gamma-DE target acquisition radar is designed to effectively acquire, identify, measure 3D coordinates and track a wide variety of modern and prospective air attack assets, including high-altitude low-observable air-launched missiles (targets) in severe ECM and clutter conditions, as well as to receive data from aircraft fitted with the ICAO-code transponders.

The Gamma-DE mobile high-energy medium- and high-altitude fully solid-state radar can be operated within automated and non-automated command and control posts of air force and air defence units, or in civil air traffic control systems as enroute surveillance radar. It can also be used in various military and civil-purpose applications, for combat training and combat air operations, as a mobile radar of a rapid deployment force reserve.

Features

The radar features modular design, phased array antenna, solid-state transmitters of different transmitting power, digital data processing, and good repairability. It can use data from external intelligence sources.

Composition

The radar comprises a phased-array antenna with the turntable, an operator's cabin housing electronic equipment and a spare parts, tools and accessories set, a diesel power plant with two diesel-generators, and a self-contained power source for the operator's cabin.

A remote control equipment kit can be provided for setting up at unit command posts to ensure radar operation at a distance of up to 15 km away with datalink coupling. The kit also allows the crew to operate from the cabin moved 1,000 m away from the rotating antenna unit and sheltered in an emplacement.

The Gamma-DE is an all-weather radar operating in various climates at temperatures between -50°C and +50°C, with relative humidity of 98%, wind speed up to 25 m/s and above-sea-level altitude amounting to 2,000 m. The radar is fitted with an automatic test and monitoring equipment, air conditioning, automatic fire-alarm and fire-extinguishing systems, other technical support assets. It can be airlifted/transported by air, sea, railway or road.

Basic specifications	
Waveband	decimetric
Coverage area:	
range, km	10 - 400
elevation, deg	-2...+60
azimuth, deg	360
altitude, km	120
Target acquisition range, km:	
RCS = 1 sq.m	up to 400
RCS = 0.1 sq.m	up to 240
Coordinates measurement accuracy:	
range, m	60 - 100
azimuth, ang. min	10 - 11
elevation, ang. min	15 - 18
Number of tracked targets	not less than 200
Natural clutter rejection ratio, dB	50
Mean time between failures, hrs	1,000
Deployment time, min	20
Continuous operation time, hrs	72

64L6E GAMMA-S1E

Radar

Mission

The 64L6E Gamma-S1E radar is designed to acquire and track a wide spectrum of up-to-date and prospective air threats, including air-launched missiles, in conditions of natural clutter and electronic countermeasures, to operate as part of air force/air defence automated command and control systems, non-automated units and rapid reaction forces, as well as to transmit data to automated control posts and civil aviation air traffic control facilities. The radar can classify single targets, such as aircraft, missiles and decoys, by their signatures.

The Gamma-S1E mobile 3D phased-array radar can be used as part of various military (automated control systems and non-automated units) and civil systems, for combat training and combat air operations, and as a task force mobile radar.

Features

The radar features a planar phased-array antenna, modular design, ability to be integrated into various automated control systems, availability of remote control equipment and ability to control the radar from shelters, ECCM protection against anti-radar missiles, automated built-in functional testing and single-mission crew training assets.

Basic specifications	
Waveband	centimetric
Radar coverage:	
range/special mode, km	10-300/400
elevation, deg	-2...+30
azimuth, deg	360
altitude, km	not less than 30
Coordinates measurement accuracy:	
range, m	50
altitude, m	400
azimuth, ang. min	15
elevation, ang. min	10 - 15
Number of tracked targets	not less than 100
Natural clutter rejection ratio, dB	not less than 45
Mean time between failures, hrs	500
Standard/emergency turn-on time, min	5/3
Deployment/out-of-action time, min	40

Composition

The radar comprises the M1 vehicle, mounting a phased-array antenna with an integral turntable, a transceiver and a ground radar interrogator; the M2 vehicle, mounting control, signal processing, data display, recording/print out facility, communications and datalink equipment; and the M3 vehicle, carrying spare parts, tools and accessories set; as well as two electric power plants in trailers, towed by M1 and M2 vehicles.

Provision is made for a four-operator remote control facility to control the radar from a distance of up to 1 km via a fibre-optic line or from 15km-distance - via a radiolink.

The Gamma-S1E is an all-weather radar operating in various climates at temperatures between -50°C and +50°C, in relative humidity totalling 98%, wind speed equalling up to 25 m/s and above-sea altitude amounting to 2,000 m. The radar is fitted with an automated testing/monitoring equipment, air conditioning, automatic fire-alarm and fire-extinguishing systems, other technical support assets.

The radar can be shipped by all means of transportation.

39N6E KASTA-2E2

Low-Altitude 3D All-Round Surveillance Radar

Mission

The Kasta-2E2 low-altitude 3D all-round surveillance radar is designed to control airspace and to perform automatic detection, range/azimuth/altitude measurements and flight path characteristics of fixed-wing and rotary-wing aircraft, unmanned aerial vehicles and cruise missiles, including low-flying, terrain-hugging and stealth ones, in conditions of intensive clutter reflections from a background surface, local objects and weather formations.

The Kasta-2E2 mobile automated solid-state low-altitude radar can be integrated into various military and civil-purpose systems used for air defence, coast and border control, air traffic control and air operations control in aerodrome zones.

Features

The radar features modular design with a solid-state emitter, digital data processing and automated operation, built-in functional testing system, a 14-m antenna tower to detect very low-flying air targets, high degree of immunity to interference from neighbouring electronic assets when operating in close formations (protection rate – up to 50 dB).

Composition

The Kasta-2E2 radar comprises a hardware vehicle, an antenna vehicle, a diesel-electric power plant mounted on all-terrain wheeled chassis; two single-axle trailers carrying auxiliary equipment; a remote workstation enabling radar control from a distance of up to 300 m.

The radar can detect small-size targets, including low-speed ones, at great distances. It is a jam-immune, reliable, easy and safe to operate and maintain asset that can be shipped by various transportation means.

At customer request, a containerised radar variant can be supplied to operate with its antenna mounted on an Unzha-type mast.

Basic specifications	
Waveband	decimetric
Coverage area:	
range, km	5 - 150
elevation, deg	25
azimuth, deg	360
altitude, km	6
Target detection range, km (antenna tower height = 14/50 m, RCS = 2 sq.m):	
at 100 m	41/55
at 1,000 m	95/95
Coordinates measurement accuracy:	
range, m	100
altitude, m	900
azimuth, ang. min	40
Clutter rejection ratio, dB	54
Number of target tracks	50
Mean time between failures, hrs	700
Deployment/out-of-action time, min	20
Power consumption, kW	23
Continuous operation time, days	not less than 20

KASTA-2E

Radar

Mission

The Kasta-2E radar is designed to control airspace and to measure range and azimuth of air targets, such as fixed- and rotary-wing aircraft, unmanned aerial vehicles and cruise missiles, including those flying at low and very low altitudes, in conditions of intensive clutter reflections of underlying terrain, local objects, and meteorological formations. The radar is capable of detecting stealth air targets.

The Kasta-2E mobile solid-state low-altitude surveillance radar can be employed in various military and civil-purpose systems used for air defence and air force systems, coastal defence and border guard security, air traffic control, and airspace control over airfields.

Features

- modular design of radioelectronic equipment with a solid-state transmitter
- digital data processing
- built-in functional test equipment
- capability to operate with an organic aerial system (7m high) or a transported aerial mast (50m high)
- ability to control the radar from a remote operator post

Composition

- equipment vehicle with radar equipment
- antenna vehicle with a standard rotating antenna unit, the AD-30 autonomous diesel electric power unit and external power source frequency converter
- standby AD-30 diesel electric power generator in a single-axle support trailer
- remote control post which can be carried away from the radar to 300 m

The radar boasts high range of detection of small-size low-altitude targets, including low-speed ones, as well as high jamming immunity. It is an efficient and reliable system, safe and convenient to operate, and simple to maintain. The radar can be transported by various transportation means.

Basic specifications	
Waveband	decimetric
Coverage area:	
range, km	5 - 150
azimuth, deg	360
altitude, km	up to 6
Target detection range (antenna tower height = 14/50m, target RCS = 2 sq.m), km:	
at 100 m	32/53
at 1,000 m	95/105
Coordinates measurement accuracy:	
range, m	300
azimuth, ang. min	70
Clutter rejection ratio, dB	53
Mean time between failures, hrs	300
Deployment/out-of-action time, min	20
Continuous operation time, days	not less than 20

9S15MV3

Mobile 3D All-Round Surveillance Radar

Mission

The 9S15MV3 mobile 3D all-round surveillance radar is designed to detect and identify any aerodynamic target as friend or foe, as well as tactical ballistic missiles, and to transmit target track data and bearings to enemy jammers to the command post via encrypted radio or cable communications channels.

The all-round surveillance radar is employed as part of the target acquisition and designation unit of the S-300V ADMS and radar posts of land forces' air defence units.

Composition

- antenna post based on a planar waveguide array, with electronic scanning in elevation and mechanical - in azimuth
- transceiver
- ground-based IFF interrogator
- data processing and control equipment, including integrated digital computer, automated work-stations fitted with air situation displays, diagram-cueing displays, and controls

Features

- waveguide array antenna
- high jamming immunity
- high mobility and self-sustained combat operation capability, which is achieved thanks to the radar components mounted on a cross-country tracked chassis and integrated power supply system, navigation and survey instruments and coded data and voice communications systems
- built-in automatic test and malfunction detection system

The radar's electronic equipment is arranged in an armoured hull mounted on the tracked chassis.

The 9S15MV3 all-round surveillance radar provides continuous airspace scanning in the anti-aircraft and anti-missile modes of operation.

Basic specifications	
Waveband	centimetric
Radar coverage:	
range (indicated), km	up to 320
altitude, km	up to 50
azimuth, deg	360
elevation, deg	up to 55
Scan cycle (depending on operational mode), sec	6 - 18
Data throughput, tracks per scan cycle	up to 250
Crew	4

9S19M2

Sector Scanning Radar

Mission

The 9S19M2 sector scanning radar is designed to detect and identify aerodynamic targets designated by the command post in heavy clutter and ECM environment, as well as to detect and track high-speed small-size ballistic targets (theatre/tactical and air-launched ballistic missiles), and to feed target data (blips or tracks) to the command post via coded datalinks.

The 9S19M2 mobile 3D sector scanning radar is employed as part of the target detection and designation subsystem of the S-300V ADMS and radar posts of land forces' air defence units.

It is a high-energy jam-resistant programmed scanning radar featuring a multi-element phased array with a high amplification ratio and 2D electronic beam scanning of the antenna directive pattern.

Composition

- antenna post with a phased array, a transmitter, and an IFF equipment
- equipment compartment with receiving, computing, and data display systems, and control equipment

The radar equipment is housed in the armoured hull mounted on a tracked chassis.

The 9S19M2 sector scanning radar provides continuous airspace scanning in the anti-aircraft and anti-missile modes of operation.

Basic specifications	
Waveband	centimetric
Radar coverage:	
range, km	up to 175
azimuth, deg:	
anti-missile mode	±45
anti-aircraft mode	±30
elevation, deg:	
anti-missile mode	from 30 to 73
anti-aircraft mode	from 0 to 50
Scan cycle, sec	12.5-14
Number of ballistic targets tracked simultaneously	up to 16
Rate of target updates fed into the CP, sec	1 - 2
Crew	4

9S18M1-1

Target Acquisition/Designation Radar

Mission

The 9S18M1-1 target acquisition/designation radar system is designed to detect targets, to identify them as friend or foe, to process and transmit to the command post target radar data (blips and bearings) on hostile jammers.

The mobile 3D target acquisition radar system is part of the Buk-M1 ADMS. It can also operate autonomously as an all-round surveillance radar.

Composition

The radar system comprises an all-round surveillance radar based on the planar waveguide array antenna, providing electronic scanning in elevation and mechanical - in azimuth, transceivers, display system, ECCM system, digital computer, and IFF system.

The TAR also incorporates secondary radar data processing system, coded datalink and combat command communications systems, as well as life support, survey and relative orientation assets.

The radar's electronic equipment is arranged in the armoured hull mounted on the tracked chassis.

Basic specifications	
Waveband	centimetric
Radar coverage:	
azimuth, deg	360
elevation	
in anti-missile/anti-aircraft mode, deg	55/40
Detection range, km	160
Scan cycle, s	4.5 and 6

REZONANS-N

Stealth Air Target Early Warning Radar

Mission

The Rezonans-N radar is a mobile highly automated coherent all-round surveillance phased-array radar employing the resonance wave reflection effect in the metric wavelength band. It is designed to monitor airspace, to acquire, identify and measure with high accuracy co-ordinates and flight characteristics of a wide range of existing and prospective air targets at long ranges and high altitudes, including low-observable cruise and ballistic missiles and hypersonic aircraft, as well as stealthy ones, in severe jamming and clutter environment, as well as to be used within automated/non-automated command and control systems, non-strategic missile defence systems, rapid deployment assets, and in various military/civil-purpose applications.

Basic specifications	
Wavelength band	metric
Radar coverage:	
range, km	10-1,100
altitude, km	up to 100
azimuth, deg	360
elevation, deg	1.5-80
Fighter detection range, km	350
Coordinates measurement accuracy, at least:	
range, m	300
elevation, deg	1.5
azimuth, deg	1.5
speed, m/s	1-1.5
Data update cycle, s	1-10
Number of tracked targets	up to 500
Mean time between failures, hrs	1,500

96L6E

Radar

Mission

The 96L6E radar is designed to detect and identify air targets, to determine the coordinates – azimuth, slant range and altitude, and to feed radar data to users. It can operate as part of the S-300PMU, S-300PMU1 and Favorit air defence missile systems and interoperate with the Baikal-1E, Senezh-M1E, Osnova-1E and Pole-E command and control systems.

The 96L6E all-altitude target acquisition radar can detect various air targets, including stealth ones, and high precision weapons within a wide altitude-speed envelope. Through adaptive use of wideband signals and multi-frequency operation, the radar efficiently acquires low-, medium- and high-altitude targets under ECM conditions, with few false alarms. To detect targets flying at very low altitudes over woodlands or rugged terrain, the radar's antenna can be raised on a special tower.

Features

The 96L6E radar is capable of scanning designated coverage areas and automatically selecting high-priority targets to generate tracks, automatically locking on targets, tracking and prioritising them, automatically selecting high-priority targets and feeding their coordinates to illumination and guidance radars, updating coordinates of the targets being tracked.

Composition

The 96L6E radar configuration depends on its version.

The single-vehicle version includes an antenna assembly; a container housing electronic equipment, operator's workstation, communications and IFF equipment, a set of spare parts, tools and accessories; a self-propelled platform fitted with a self-contained power supply system.

The two-vehicle version comprises an antenna post on a truck-and-semi-trailer road train, mounting an antenna assembly and a self-contained power supply system; an electronic equipment van on a truck-and-semitrailer road train housing equipment container and self-contained power supply system. This variant allows for a 100-m spacing between antenna and electronic equipment posts.

External power sources, trucks, an antenna tower with a tractor to carry it, remote operator workstations (up to four units) and group sets of spare parts, tools and accessories can be attached to the radar.

The 96L6E radar can be transported by railway, sea and air.

Basic specifications	
Waveband	centimetric
Radar coverage:	
range, km	5 - 300
azimuth, deg.	360
elevation, deg.	-3...+60
speed, m/s	30 - 2,800
Clutter suppression ratio, dB	up to 70
Number of target tracks	up to 100
False target designations during 30min-operation	not more than 5
Data update rate, s	6 - 12
Continuous operation time	unlimited
Deployment time (from march), min:	
single-vehicle version	5
two-vehicle version	30

PRV-13

Mobile Radar Altimeter Modernisation

Mission

The PRV-13 radar altimeter modernisation is to improve its tactical and technical characteristics and extend service life, namely: to increase target acquisition range by augmenting receiver sensitivity, to enhance protection against passive interference, clutter, meteorological ghosts and their combinations with non-synchronous pulse jamming, to increase reliability characteristics, and to reduce power consumption.

The modernisation envisages replacement of the existing electronic equipment in the main functional parts of the radar system with new equipment based on modern components.

It comprises a number of unit/component replacements:

- of the input microwave amplifiers employing the UV-54 travelling wave tubes by solid-state microwave amplifiers;
- of the hydrogen thyrotron in the modulator by a metal-ceramic one;
- of the high-voltage vacuum rectifiers by semiconductor diodes;
- of the receiver units in main and auxiliary channels by ones employing modern components;
- of the oscillator unit by one built with the 3rd/4th-generation components employing SHF micro-assemblies;
- of the moving target selection, non-synchronous interference protection and synchronisation equipment by equipment built with modern electronic components;
- of the circular scan and altitude indicators by new units incorporating the 23LM34V cathode-ray tubes together with their beam-deflection systems.

The equipment introduced does not require scheduled maintenance, and the upgraded PRV-13 total maintenance time is reduced by 1.4-1.6 times.

If the modernisation is carried out along with the renewal repair of the non-modernised equipment of the PRV-13 radar altimeter, its operating life is restored to at least 80% level.

Thus, the modernisation allows to create practically new, modern radio altimeter capable of performing airspace control missions.

Basic specifications

	PRV-13	Upgraded PRV-13
Max detection range, km	310	350
Receiver noise factor, dB	7	4,5
Clutter rejection factor, dB	17	30-36
Asynchronous interference suppression factor, dB	17	30
Operating life restoration, %	-	80*
Operating life extension, years	-	8-10*
Upgraded equipment operating life, hours, at least	-	10,000

* - modernisation+renewal repair

MOMENT-1

Unified Mobile Radar Repair Module

Mission

The Moment-1 radar repair module is designed to provide:

- automated technical status checking of standard line replaceable units of modern and prospective radars and automated command and control systems;
- computer-aided malfunction diagnostics and fault-finding down to a single LRU;
- repairs of various LRUs, such as microprocessor, analogue and digital cells, backup power units;
- LRU post-repair testing in accordance with the manufacturer's technical specifications.

Main features of the module include automated workstation preparation for computer-aided testing and fault-finding; a comprehensive set of testing and measuring equipment, processing and rigging devices; a wide spectrum of plug-in electronic components and materials; and a comprehensive computer-based information reference system.

Basic specifications	
Workstations:	
for electronic equipment repairs	3
for testing and diagnostics	4
Functional test accuracy probability	0.95
Work capacity, cell/hour:	
functional testing	12
fault-finding	8
repairing	5
Types of cells tested and repaired	1,129
Deployment and preparation-to-work time, hrs	2

Composition

The mobile variant of the module comprises a control post in the box body, a repair facility mounted on the KamAZ-4310 truck chassis, the ED 2x16-T400-1VAS self-contained power supply unit mounted on the KamAZ-4310 truck chassis.

The Moment-1E unified repair module is self-sufficient as far as electronic equipment in-field repairs are concerned.

PHOENIX

IR All-Round Surveillance System

Mission

The Phoenix IR all-round surveillance system is designed to automatically detect, identify and track air and surface targets, as well as measure their range, azimuth and elevation angles.

The system carries out all-round surveillance in the infrared waveband. It can be deployed both independently and together with air defence weapon and radar systems.

The Phoenix system can be employed as a mobile reconnaissance asset when mounted on ground vehicles, SAM launchers, combatant ships of different classes or as a stationary variant.

The Phoenix system is very efficient in intensive electronic countermeasures and fire suppression of friendly air defences, as well as in the radio blackout mode.

Composition

- input electro-optical sensor
- control panels and data displays
- special computer
- auxiliary power sources
- set of cables and fasteners

Basic specifications	
Target detection range, km:	
cruise missiles and UAV	5 - 7
helicopters	8 - 9
tactical aircraft	15 - 18
Coverage area, deg:	
elevation	10 - 40
azimuth	360
Spectral range, μm	8 - 12
Elevation scan area, deg	18
Data update frequency, Hz	0.5
Number of simultaneously detected targets	more than 50

ZOOPARK-1

Artillery/Missile Location Radar System

Mission

The 1L219M Zoopark-1 artillery/missile location radar system radar system is designed to automatically locate firing positions of hostile artillery (mortars, field artillery, multiple rocket and tactical missile systems) by their shots (launches), feed target designation data to friendly counter-battery weapons, and provide damage assessment for them.

In counter-battery fire the radar provides enemy firing position reconnaissance data and real-time corrections of friendly fire, thus enhancing its efficiency by 2-2.5 times (compared with firing without reconnaissance).

Composition

- phased-array radar mounted on the MT-LBu chassis
- maintenance vehicle with the integral ED30-T230P-4RPM1 towed electric powerplant

The Zoopark-1 radar system enjoys high mobility and operational autonomy thanks to integration of all its equipment on the MT-LBU armoured tracked vehicle. It is capable of travelling at high speed over rugged terrain, crossing water obstacles, rapidly deploying on and abandoning positions. Radar deployment/displacement is carried out by the crew from the cabin without dismounting to increase the system's survivability.

The radar system meets all the requirements specified and holds one of the first places among analogue systems.

Basic specifications	
Operating waveband	centimetric
Simultaneous scan sector, deg	90
First-shot firing position detection range, km:	
mortars	20
field artillery guns	15
MLRS	30
tactical ballistic missiles	40
First-shot fire control range, km:	
mortars	22
field artillery guns	20
MLRS	35
tactical ballistic missiles	40
Average firing position/shell burst location errors, m:	
mortars	35
field artillery guns	45
MLRS	60
tactical ballistic missiles	75
Number of targets tracked simultaneously	12
Deployment/displacement time, min	5

FARA-1

Man-Portable Grouped Target Acquisition/Designation Radar

Mission

The 1L111 Fara-1 radar is designed to detect moving ground targets (individuals and groups of people, automobiles and armoured vehicles), to aim heavy automatic weapons and machine guns at concentrated targets round-the-clock in any season, including zero visibility conditions (fog, smoke, dust), and to provide protection of installations and areas of terrain in the automatic mode of operation.

Besides reconnaissance tasks, the Fara-1 radar can be mated with optical and thermal imaging assets to perform surveillance.

In terms of functional versatility the radar has no rivals all over the world.

Composition

The Fara-1 radar consists of a transceiver, an antenna unit with guidance devices, a control panel, a tripod, a radar carrying container, a grenade launcher/machinegun interface device, a standard battery and a power unit to connect to combat vehicle power supply.

The radar's configuration, weight and size allow for its carriage by an operator.

Basic specifications	
Waveband	centimetric
Coverage:	
range, km	up to 5
azimuth, deg	24, 45, 90, 120
Moving target detection range	
(with probability of 0.8), km, at least:	
man	2
tank	4
Average coordinate measurement errors:	
in range, m	20
in azimuth, mil	00 - 20
Into/out-of operation time, min	1
Continuous operation time	
(with a standard battery), hrs	6
Mean time between failures, hrs	5,000
Weight, kg	16.5

CREDO-1

Ground Surveillance Radar

Mission

The 1L244 Credo-1 ground surveillance radar is designed to detect moving ground and water surface targets (a person, a group of people, vehicles) and support artillery fire round-the-clock in any season, including poor visibility conditions (fog, smoke, dust).

Composition

- transceiver
- control panel
- tripod
- radar-carrying container
- battery and external power supply connector unit

The Credo-1 radar is a self-sustained reconnaissance asset whose transceiver and control panel can be mounted on tripod, on self-propelled chassis, or fixed on top of buildings and terrain features.

The radar is powered by a battery or any other 24V DC source.

Basic specifications	
Waveband	centimetric
Coverage:	
range, km	0.15 - 40
azimuth, deg	180
Moving target detection range (POD = 0.8), km, at least:	
person	15
tank	40
truck	40
155mm-round burst coordinates	15
Average location error (in autotracking mode):	
in range, m	10
in azimuth, mil	00 - 02
Number of tracked targets	up to 20
Deployment/displacement time, min	5
Continuous operation time, hrs	24
Weight, kg	100

AIR DEFENCE SYSTEMS

COMMAND AND CONTROL SYSTEMS

9S52M1 POLYANA-D4M1

Automated Command and Control System for Air Defence Brigade (Mixed Grouping)

Mission

The 9S52M1 Polyana-D4M1 air defence brigade (mixed grouping) automated command and control system is designed to provide automated control of separate air defence missile systems, and their combinations, making up air defence grouping, with the S-300, Buk, Tor AD missile systems and Tunguska gun-missile systems, via relevant command and control posts.

Composition

- combat control post
- command-staff vehicle
- autonomous automated workstation
- SPTA & maintenance trailer
- two ED2x30-T400-1RAM3 mobile electric power stations

Features

The Polyana-D4M1 ACCS provides:

- radar data gathering and processing, air situation monitoring;
- command and control of on-duty AD assets;
- friendly aviation flight safety;
- ground situation data receiving, gathering, and processing;
- generation of recommendations on subordinate unit control and interoperation by automatically solving problems pertaining to target distribution, assets allocation, combat operations coordination, and troop assets distribution ia areas of cooperation when countering enemy air strikes;
- automated data registration and recording;

- automated data exchange with superior and interacting elements by employing data transmission and ciphering equipment.

Polyana-D4M1 can be deployed in various weather conditions at an ambient temperature of -40°C to +50°C, average air humidity of 98%, and reduced pressure of up to 60 kilopascals (450 mm Hg).

Basic specifications	
Number of interfaces with:	
superior CPs	1
interacting CPs	up to 4
radar data sources	up to 3
subordinate assets	up to 6
Number of air targets tracked simultaneously	up to 250
Number of	
automated workstations in CCP/CSV	8/3
communications operator's automated workstations in CCP/CSV	1/1
data transfer channels in CCP/CSV	16/4
Max data transmission rate in CCP/CSV, kbit/s	4.8/32
Continuous operation time, hrs	not less than 72
Mean time between failures, hrs	1,000
Into/out-of-action time, min	not more than 35

UNIVERSAL-1E

Air Defence and Air Force C3I System

Mission

The Universal-1E C3I system is designed to provide automated control of combat operations of air defence, interceptor fighter, electronic warfare and electronic intelligence units repelling air attacks and performing alert duty.

The C3I system is capable of:

- bringing subordinate units into combat-ready status;
- monitoring status and combat readiness of subordinate forces and assets;
- gathering and processing radar tracking data received from subordinate and interoperating CPs;
- coordinating combat operations of zonal AD forces and assets;
- cueing interceptors via integral and remote interceptor CPs;
- providing centralised information support of CP's combat work, and flight safety of friendly aircraft;
- interaction with CPs in adjacent AD zones;
- current and summary reports of combat work and actions conducted by subordinate forces and assets in the AD zone.

Basic specifications	
Number of air targets processed simultaneously	300
Number of controlled and interoperating units:	
via telephone channels (by the ACCORD-SS-PD/ARAGVA algorithm)	16
via telephone channels (by the T-235-1L algorithm)	4
via telegraph channels	16
Max operating limits:	
range, km	3,200
altitude, km	100
speed, km/h	4,400
Into-action time, min	5
Number of automated workstations	15

Composition

The Universal-1E C3I system comprises a central computer system, data presentation system, data transfer equipment, summary report system, recording computer, and a coded data recording equipment.

83M6E

Command and Control System

Mission

The 83M6E command and control system is designed for battle management of the S-300PMU1 and S-300PMU ADM systems fitted with an appropriate interface equipment.

The mobile 83M6E command and control system provides the above ADM systems with target designation of current and prospective aircraft, cruise missiles, ballistic targets, and other air attack weapons, within the range of the air defence systems responsibility coverage zone, as well as their interoperability in adverse tactical environment.

The ADMS generates target designation data using signals from its own acquisition radar and data from subordinate SAM systems, as well as information received from superior command and control systems or adjacent 83M6E C2 systems, and/or (any other) radar assets of AD grouping, in case superior C2 systems are not available.

Composition

Combat assets:
- 54K6E command post;
- 64N6E target acquisition radar;
- 1T12-2M survey vehicle.

Technical support assets:
- ZIP-1B and ZIP-2 SPTA sets;
- external power sources (two 5I57A diesel generators and three 63T6A distributing converters.

Assigned facilities:
- YuT24Ts and YuT24V antenna masts;
- 15Ya6E relay station;
- 66Ya6 radio relay station;
- 13Yu6E central computer repair lab.

Basic specifications	
Number of tracked targets	up to 100
Number of controlled S-300PMU1 ADMS	up to 6
Number of simultaneous target designations	up to 36 (up to 6 per one AMDS)
Max target designation range, km:	
aerodynamic targets:	
strategic aircraft (RCS > 4 sq.m)	280
multi-role aircraft (RCS = 0.2 sq.m)	263
strategic cruise missiles (RCS = 0.2 sq.m)	160
ballistic missiles:	
RCS = 0.4 sq.m V_{max} = 1,800 m/s	127
RCS = 0.4 sq.m V_{max} = 2,800 m/s	113
RCS = 0.1 sq.m V_{max} = 950 m/s	110
Target designation accuracy (target probability to enter lock-on area):	
strategic and multi-role aircraft	0.99
strategic cruise/ballistic missiles	0.95-0.98
Track generation time based on radar data, sec:	
aerodynamic/ballistic targets	12/6
Target distribution and designation time, sec:	
aerodynamic/ballistic targets	9/3
Combat readiness time from march/deployed position, min	not less than 5/4

9S737M

Unified Battery Command Post

Mission

The 9S737M unified battery command post is designed to automate control of combat operations conducted by air defence units, either moving or stationary, in conditions of air attack.

The command post is a self-contained system of automation, communications, power supply and life support equipment mounted on the GM5965.05 tracked chassis.

Its major task consists in providing control of one Tor-M1 air defence missile system comprising four combat vehicles via coded datalinks.

A command post for the Tor-M1 ADMS unit can be set up on the basis of the 9S737M UBCP to manage its combat operations via corresponding UBCPs.

Basic specifications	
Functional capacity:	
simultaneous automatic reception, processing, identification and presentation of target data fed from:	
superior CP/radar, targets	up to 40
leading Tor-M1 combat vehicle, targets	up to 9
line Tor-M1 combat vehicle, targets	up to 2
automated reception of target data from airborne early warning system and simultaneous target designation, targets	4
Ground objects displayed on radar screen	up to 15
Max single target reaction time, s	5
Max displayed range, km	100
Communications range, km	up to 30
Combat workstations	5
Data transmit/receive channels	5
Min continuous operation time, hrs	not less than 48
Max combat deployment and preparation time, min	not more than 10

Composition

- automation equipment set
- recording system
- communications system
- life support system
- power supply system
- navigation and survey system
- night vision device
- spare parts, tools and accessories set

PPRU-M1

Mobile Air Target Reconnaissance and Control Post

Mission

The PPRU-M1 air target reconnaissance and control post is designed to control, both on the move and at halt, combat actions and fire delivery of air defence units armed with close/short-range antiaircraft artillery and missile systems.

Composition

- radar
- computer control system
- multichannel data transceiver
- external and internal communication aids
- navigation and survey system
- training facility
- life support system
- power supply system
- tracked chassis, the MT-LBu multipurpose light armoured extended tractor
- single spare parts, tools and accessories kit

The PPRU-M1 CP provides full control of combat operations of any AD unit irrespective of its armaments and table of organisation.

It exercises combat control of units armed with manportable surface-to-air missile systems via coded datalinks provided that MANPADS operators employ the 1L15/1L110 hand-held electronic data displays.

The PPRU-M1 CP can be operated in various climates at ambient temperatures from -20°C to +50°C, relative air humidity of 98%, and wind speed of 30 m/s.

Basic specifications	
Radar operating waveband	centimetric
Max target acquisition range, km, at least:	
at over 500 m	34
at 25 m	22
Max coded data reception/transmission range (operations at halt and on the move), km	not less than 10
Automatic target tracking capability, targets	not less than 40
Number of objects controlled simultaneously	up to 6
Continuous operation time, hrs	24
Into/out-of-action time, min	not more than 5

PU-12M6

Mobile Control Post

Mission

The PU-12M6 mobile control post is designed to automate combat control of weapons employment by AD units on the move and at halt under air attack.

It is a battery CP intended to operate as part of special purpose automated control systems.

Composition

The PU-12M6 mobile CP is mounted on the BTR-80 wheeled armoured personnel carrier fitted with:

- life support system;
- power supply system;
- navigation and survey system;
- radiation and chemical agent sensors;
- night vision devices;
- data transmission and reception equipment;
- communications aids;
- spare parts, tools and accessories kit.

Basic specifications	
Functional capacity:	
Control of short-range air defence missile batteries:	
Strela-10M2 and Strela-10M3 (via coded datalink)	up to 6
Shilka AA self-propelled gun mounts (via telephone link)	up to 4
Osa-AK ADMS CV (via telephone link)	up to 4
Igla MANPADS (via coded datalink)	up to 6
Radar data sources connected at any given time	1
Number of received targets	up to 99
Number of targets tracked by an operator	5 - 7
Coordinates measurement envelope, km	up to 100
Target data limits:	
in altitude, km	up to 25
in speed, m/s	up to 787
Data transmission range, km:	
via radiolink	up to 40
via field telephone wire	up to 15

PU-12M7

Mobile Control Post

Mission

The PU-12M7 mobile control post is designed to automate combat control of weapons employment by AD units on the move and at halt under air attack.

It is a battery CP intended to operate as part of special purpose automated control systems.

Composition

The PU-12M7 mobile CP is mounted on the BTR-80 wheeled armoured personnel carrier fitted with:

- life support system;
- self-contained power supply system;
- navigation and survey system;
- radiation and chemical agent sensors;
- night vision devices;
- data transmission and reception equipment;
- communications aids;
- spare parts, tools and accessories kit.

Basic specifications

Functional capacity:	
Control of short-range air defence missile batteries:	
Strela-10M2/Strela-10M3 (via coded datalink)	up to 6
Shilka AA self-propelled gun mounts (via telephone link)	up to 4
Osa-AK ADMS CV (via telephone link)	up to 4
Tor-M1 launchers (via coded datalink)	up to 4
Tunguska-M1 ADGMS SP mounts (via coded datalinks)	up to 6
Igla MANPADS (via coded datalink)	up to 6
Radar data sources connected at any given time:	
primary (radars with analogue output signal)	1
secondary (airborne early warning systems, radars with coded output signal)	3
Number of targets received from external sources	up to 99
Number of targets tracked by an operator	up to 9
Coordinates measurement envelope, km	up to 100
Target data limits:	
in altitude, km	up to 25
in speed, m/s	up to 787
Data transmission range, km:	
via radiolink	up to 40
via field telephone wire	up to 15

FUNDAMENT-E

Interservice Unified Mobile Automation Sets for ELINT Unit Command Posts

Mission

The Fundament-E unified automation sets are designed to automate combat operation of command posts of electronic intelligence units (from company to division level) as regards radar/ELINT data gathering and processing, and its transmission to external users.

Composition

Fundament-E automation sets include:

- Fundament-1E automation set for ELINT company CP;
- Fundament-2E automation set for ELINT battalion CP;
- Fundament-3E automation set for ELINT division CP.

Fundament-1E

The Fundament-1E ELINT company CP's mobile automation set is designed:

- to automate collection and processing of radar data provided by radars, radar networks, secondary radars, versatile ground-based IFF interrogators, interoperating ELINT systems and units;
- to control subordinate data sources;
- to transmit data to superior, subordinate and interoperating control posts;
- to perform automatic data calculation during alert duty or combat missions.

The Fundament-1E automation set comprises a command vehicle, communications vehicle, electric power supply system, SPTA set vehicle, and a mounting tools set.

Basic specifications

	Fundament-1E	Fundament-2E	Fundament-3E
Functional capacity:			
simultaneous reception, processing and display of radar data from various sources	up to 4	up to 4	-
interoperation with superior CPs (Fundament-2E, 3E)	1	1	2
interoperation with adjacent CPs (Fundament-1E)	2	4	up to 6
provision of early warning data to supported CPs f AD combat assets	up to 3	up to 4	up to 6
data gathering, processing and display:			
from subordinate ELINT company CPs	-	up to 4	up to 11
from airborne early warning systems	-	up to 2	up to 2
Total number of simultaneously tracked air targets (including jammer aircraft)	120 (10)	200 (20)	300 (30)
Operational limits:			
range, km	600	1,200	1,200
altitude, km	100	100	100
speed, km/h	6,000	6,000	6,000
Number of datalinks	4 (8)	12	16
Mean time between failures, hrs	1,500	1,500	1,500

Fundament-2E

The Fundament-2E ELINT battalion CP's automation set is designed to automate gathering and processing of radar data provided by primary and secondary radars, ground-based IFF interrogators, ELINT systems, early warning radar systems, subordinate and interoperating ELINT units; to control subordinate data sources; to feed data to superior, subordinate and interoperating CPs; to automate data calculation when on alert duty and during combat mission planning and executing, as well as providing combat, logistic and special support of operations conducted by ELINT units.

The Fundament-2E automation set comprises a combat control vehicle, command-and-staff vehicle, communications vehicle, electric power supply system, SPTA set vehicle, and a mounting tools set.

Fundament-3E

The Fundament-3E ELINT division/unit CP's automation set is designed to automate gathering/processing of radar data from early warning radars and ELINT systems, subordinate and interoperating ELINT units including Joint Air Traffic Control System centres; to control subordinate data sources; to feed data to superior, subordinate and interoperating CPs and Joint ATC System centres; to automate data calculation during alert duty, combat mission planning and execution, as well as during combat, logistic and special support of operations conducted by ELINT divisions and units.

The Fundament-3E automation set comprises a combat control vehicle, command-and-staff vehicle, communications vehicle, electric power supply system, SPTE set vehicle, testing and maintenance vehicle, and a mounting tools set.

46S6-1E

Joint Unified Radar Data Readout Unit

Mission

The 46S6-1E radar data readout unit is designed:

- to provide automated air target data lock-on and tracking, as well as readout and primary processing/re-processing (data can be fed from analogue radars, radio altimeters, auxiliary radars and IFF interrogators);
- to automatically transfer target track data to superior and supported command posts equipped with the Fundament-1E, 44B6-E, Fundament-2E and 79B6 command, control and communications systems, as well as to civil aviation air traffic control centres.

The 46S6-1E comprises a readout/interface unit; a PC-equipped automated workplace; a group signal transformation device; communications equipment; an assembly unit kit.

Basic specifications	
Coverage:	
azimuth, deg	0 – 360
range, km	600
altitude, km	40
speed, km/h	6,000
Number of radars simultaneously interfaced with the unit	up to 2
Multiple radar data processing capability:	
radars (primary radar, IFF)	1
mobile radio altimeter	max 2
Number of data exchange links with users	up to 4
Mean time before failures, hrs	min 2,500

PORI-P3

Mobile Automated Radar Data Processing Post

Mission

The PORI-P3 system is designed to receive and process radar data fed by mated radars and interoperating systems.

The PORI-P3 data processing post is a unified air situation data source for Polyana-D4M1 air defence missile brigade automated control system, Ranzhir UBCP, and PORI-P1M/PORI-P2M/PORI-P2VM posts.

The PORI-P3 ensures information and technical compatibility with different automated control systems, high ECM immunity, high operational capacity and minimal air target tracking errors, automatic tracking initiation by analogue and coordinate target echoes, calculation of target tracks with identification of all data sources.

Basic specifications	
Simultaneous connections via digital datalinks:	
with superior CPs	1
with interoperating installations	up to 2
with subordinate installations	up to 3
with radars with digital signal output	up to 5
Simultaneous connections via remote multiplexing equipment:	
with radars with analogue signal output	up to 2
with mobile radio altimeters with analogue signal output	up to 2
Total number of targets received via coded datalinks	up to 255
Single and group target tracks and bearings:	
when working with digital output radar	up to 70
when working with analogue output radar	up to 30
Data transmission range to radios, km	up to 40
Into-action time, min (with data received from digital output radar)	not more than 20
Into-action time, min (with all radars/mobile radio altimeters connected and long-range communications antenna assembly deployed), min	not more than 45
Uninterrupted operation time, hrs	not less than 72

Composition

The PORI-P3 system comprises MP204 mobile unit mounted on the Ural-43203 truck chassis, VP501 trailer mounted on the van body, and EDx30-T400-1RAM3 mounted on the KamAZ-4114 truck chassis.

AIR DEFENCE SYSTEMS

EW, ELINT, AND COMMUNICATIONS SYSTEMS

AKUP-1

Automated Jammer Control System

Mission

The AKUP-1 (1L213M) automated jammer control system is designed to control operation of a group of jamming stations of three jamming companies.

Each jamming company can comprise up to nine jamming stations (six SPN-4s and three SPN-2s) and one automated control post.

Basic specifications	
Number of systems controlled:	
by AKPB automated battalion command post	up to three APUR CPs
by APUR automated company control post	up to 9 SPN-2/SPN-4 (in any combination)
AKPB battalion CP's coupling range, km:	
with radar data source	up to 20
with APUR company CP	up to 20
Number of distributed targets:	
by AKPB CP	50
by APUR CP	20
Data transfer rate, bit/s	1,200
Into/out-of action time, min	not more than 45
Operational readiness time (after turning-on, without data feed), min	not more than 45
Continuous operation time, hrs	24

Composition

The AKUP-1 automated jammer control system comprises one AKPB automated battalion command post and three APUR automated company control post. Each post incorporates:

- a command vehicle;
- a communications vehicle;
- an electric powerplant (a 2x16-kW diesel generator and an industrial power converter);
- a spare parts, tools and accessories kit (one for the whole system).

The jamming companies operation is coordinated by the automated battalion command post.

The AKUP-1 jammer control system is fitted with the automatic testing and fault-finding equipment capable of tracing malfunctions to individual line replaceable units. It can operate reliably with temperatures ranging from -50°C to +40°C and relative air humidity of up to 98%.

The AKPB and APUR control posts are manned with seven- and six-person crews respectively.

SPN-2

Powerful Noise Jamming System

Mission

The SPN-2 (1RL248-2) noise jamming system is designed to deny enemy reconnaissance and observation of area and small-size ground objects by airborne side-looking radars, air-to-surface guided weapons control radars, as well as navigation and low-altitude flight control radars.

The SPN-2 system can suppress two side-looking radars, or two low-altitude flight control radars, or up to six weapons control radars in two directions simultaneously. Suppression can be carried out depending on the antenna beam width: within a 10x45-deg sector (narrow beam mode) or a 45x45-deg sector (wide beam mode).

Composition

- antenna vehicle with antenna-feeder system and associated equipment
- combat control vehicle fitted with communications, data transmission, testing and recording systems
- electric power supply system including a 60 kW diesel generator and industrial electric converter

Types of jamming signals:

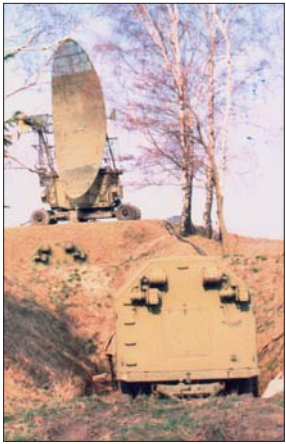
- quasi-continuous noise/masking jamming of either selective (6 to 19 MHz) or barrage (260 to 270 MHz) type;
- repeater noise jamming, if the hostile radar being suppressed operates in the pulse-to-pulse frequency agility mode.

All components of the SPN-2 jamming system are mounted on a self-propelled high-mobility wheeled chassis, and are operated by a crew of five.

Basic specifications	
Operating frequency band, MHz	13,333-17,544
Total power output, W	1,100
Receiver sensitivity, dB/W	-90
Detection/suppression range, km:	
air-launched weapon control radars	not less than 130-150
side-looking radars	at least 60 (one radar) at least 40 (two radars)
low-altitude flight control radars	at least 50 (one radar) at least 30 (two radars)
Angular coverage limits, deg:	
azimuth	0 - 360
elevation	-2.5...+45
Instant coverage sector, deg:	
Angular coordinates measurement accuracy, deg:	
in azimuth	45
in elevation	10
Number of beams in instant coverage sector	24
Paraxial beam width, deg:	
in azimuth	7.5
in elevation	2.5
Repeater jamming signal delay (after receiving signal of the hostile frequency-hopping radar), microsec	not more than 15
Max continuous operation time, hrs	24
AC power supply, V:	
400 Hz	220
50 Hz	380
Power consumption, kW	50

PELENA-1

Ground-Based AWACS-Type Radar Jammer



Mission

The Pelena-1 jamming system is designed to jam airborne early warning radars of AWACS-type aircraft.

The system denies detection by AEW radars of the protected installations with radar cross-sections of up to 15 sq.m. It is effective at a range of 50-80 km from installations protected and up to 250 km from radars being jammed.

Basic specifications	
AEW radar suppression sector, deg	+/-45
AEW suppression probability	at least 0.8
Operational envelope, deg:	
azimuth	360
elevation	-1...+25
Automatic azimuth scan sector, deg	30; 60; 120
Power consumption, kW	80
Operational conditions:	
ambient temperature, °C	-50...+40
humidity at 25°C, %	98
Crew	7
Malfunction location capability	Down to LRU

Composition

- P-01 antenna trailer
- P-02 powerplant trailer
- P-03 control trailer
- 5E96 electric power station
- spare parts, tools and accessories kit
- cable sets
- operational documentation

R-934B

VHF/UHF Aircraft Communications Automatic Jamming Station

Mission

The R-934B VHF/UHF aircraft communications automatic jamming station is designed to detect and monitor radio emissions, to suppress airborne VHF/UHF communications and tactical aircraft guidance systems.

Composition

The system can be mounted on:

- MT-LBU armoured tracked vehicle (option 1);
- equipment vehicle on the Ural-4320-31 truck chassis in the K1-4320-body, and a 16-kW power plant on a trailer (option 2).

Basic specifications	
Operating frequency band, MHz	100-399.975
Azimuth search coverage, deg	360
Automatic frequency measurement accuracy, kHz	(±4)
Transmitter output power, W	500
Types of jamming signals:	
HF oscillation frequency-modulated by noise voltage with 800/6,000-Hz deviation	
HF oscillation with frequency-shift keying at 5/10/20/40-kHz increment and 150/800-microsec signal element duration	
HF oscillation with phase-shift (0-180 deg) keying at 800-microsec signal element duration	
Number of targets jammed quasi-simultaneously	1 (with PFT) up to 4 (at fixed frequencies)
Detection-to-suppression time (from 20-frequencies list), ms	5
Into-action time, min	20

85V6-A VEGA

Electronic Intelligence System
(R&D Project)

Mission

The 85V6-A Vega ELINT system is designed for detection, location, identification, classification and tracking of ground/air/maritime targets by their radio emissions.

The 85V6-A Vega system can provide radio control and information support to groupings of AD, ELINT and EW units, as well as to early warning, air traffic control, and jamming source detection systems.

Composition

- three signal detection/direction-finding/classification stations
- ELINT system control post

In combat the Vega stations are placed up to 30 km apart with the control post usually deployed near one of them.

The Vega station can be used autonomously and within AD, EW, border guard and other combat units.

Basic specifications	
Number of radio emitting sources simultaneously reported to superior CP	up to 60
ELINT update rate, s	10
RMS radio emitting source location error (at 150-km target range and 30-km between-station range), km	not more than 5
ELINT frequency range, GHz:	
basic	0,2 – 18
expanded	up to 40
Scanning range, deg:	
azimuth	360
elevation	0 – 20
Min scan period, s	2
Above-horizon target detection range, km	not less than 400
Number of vehicles (with trailers)	4

The ELINT system's control post is designed to define planar coordinates and motion parameters of radio emitting sources based on data provided by the three stations, as well as to couple with the superior control centre.

Bearings and other target data are transfered from the detection and direction-finding stations to the control post via data links. Based on these data, target locations and tracks are calculated by means of triangulation and visualized on the digital map of the monitored region with false tracks eliminated by programme methods and identified with bearings of objects.

Functional testing of the station is to be accomplished and ELINT summaries registered periodically.

85V6-V

Mobile Automated Electronic Intelligence System

Mission

The 85V6-V ELINT system is designed to perform radio reconnaissance and location of ground, surface and airborne radio-emitting sources, disclosure of command, control and communications systems, radio control and detection of radio-emitting sources.

Composition

- three detection and direction-finding stations providing radio-emitting sources detection, direction finding, classification, analysis and registering
- central classification and control station

Each station has autonomous power supply and is accommodated in two air-conditioned box-bodies mounted on KamAZ trucks.

The detection and direction-finding station is designed for all-round detection and direction-finding of radio-emitting sources, radio transmission classification, signal analysis and intercept. Stations can be used both autonomously and make part of the 85V6-V ELINT system.

The central automated classification and control station is designed to control operation of detection and direction-finding stations, to locate radio-emitting sources, to collect, process and display electronic situation data within coverage of the 85V6-V system. It ensures the system's autonomous operation and integration into other automated SIGINT/EW systems.

The central control station executes the following operations: digital processing of bearings data, determination of radio-emitting sources coordinates, and their mapping on cartographic background; two-way coded voice/data communications between detection/direction-finding stations and SIGINT/EW system control post stationed at the range of up to 15 km; mission planning and control for up to three detection/direction-finding stations; automated ELINT data collecting, processing, classification and database management; comparative electronic situation analysis for different data combinations and change dynamics; recording of operation results.

In general, the 85V6-V system provides:

- automatic panoramic search, detection, measurement of signal parameters and classification of types of radio transmissions;
- radio-emitting source detection, direction-finding and location, and position display against map background;
- collection, accumulation and comparative analysis of electronic situation data for different combinations and change dynamics;
- radio intercept with data recording;
- technical analysis of radio-emitting source signals;
- automated preparation of standardized messages.

The 85V6-V system can be used both autonomously and within automated SIGINT/EW systems.

Basic specifications	
Operating frequency band, MHz	30 - 1,700
RMS direction-finding instrument error, deg, not more than:	
in 30-150 MHz range	3
in 150-1,700 MHz range	2
Operating frequency band scanning period, s	not more than 10
Instant scan swathe, MHz	6,0
Number of channels recording LF receiver output signals	3
Number of listening channels	1
Power consumption, kW	not more than 5
Continuous operation time, hrs	24
Station deployment time, min	40

AVTOBAZA

Ground-Based Executive ELINT System

Mission

The Avtobaza ELINT system is designed to detect airborne side-looking radars, air-to-ground fire-control radars and low-altitude flight control radars, as well as to provide intelligence data for the 1L125M APUR.

Basic specifications	
Max ELINT range, km	up to 150
Radar detection frequency range, MHz	8,000 - 17,544
Operational envelope, deg:	
in azimuth	360
in elevation for A, B/V bands	18 / 30
Target detection/data transmission-to-APUR delay, microsec	500
Number of emitting target bearings (at 15 tgt/s flow)	up to 60
Probability of radar type classification	0.8
Into/out-of-action time, min	not more than 25
Power consumption, kW	not more than 12
Crew	4

Composition

- equipment vehicle based on the Ural-43203 chassis with the K1.4320 van
- ED2x16-T230P-1VAS electric power generator in the K1.4320 van on the Ural-4310 chassis

The ELINT system displays on the TV screen acquired targets with data on their direction finding, angular coordinates (azimuth and elevation), radiation signal parameters (carrier frequency, duration, pulse repetition frequency) and radar type classification (side-looking, fire control, low-altitude flight control radar). The APUR automated jamming control system is fed with target data (frequency band number according to frequency assignment of jamming systems, type of emitting radars and their angular coordinates) via cable at a range of up to 100 metres.

1L245

Ground-Based Weapons Control Radar Suppression System

Mission

The 1L245 radar suppression system is designed to protect friendly ground installations, weapons and other materiel, including small-size materiel, from electronic reconnaissance by airborne radars.

The system provides electronic suppression of the main antenna directional lobe of airborne target acquisition radars making part of reconnaissance/strike systems and operating in the terrain-mapping and moving target selection modes, as well as tactical aircraft radars including side-looking radars.

Composition

- equipment, including primary power source, mounted on a single MT-LBU-1 chassis
- single spare parts, tools and accessories kit
- operating equipment set

Basic specifications	
Waveband, GHz	8-18
Simple pulse signals received and analysed:	
duration, microsec	1-5
repetition rate, kHz	0.25-10
Pulse linear-frequency modulated signals:	
duration, microsecond	1-25 (60-300)
spectral width, MHz	1-20 (3)
repetition rate, kHz	0.5-3.0 (0.5-3.0)
Polarisation of signals received	vertical horizontal
Sector, deg:	
combat operation (azimuth x elevation)	120 x 15
ECM with respect to the main radar directional lobe of the reconnaissance strike system	2 x 2
Radar detection and suppression range, km:	
reconnaissance strike system	80-200
tactical aircraft	30-100
Jamming power potential, W	1,000
Polarisation of signals transmitted	chaotic
Types of jamming	noise, frequency-aimed and spectrum-conjugated, quasi-continuous or time-responsive
Crew	3
Mean time between failures, h	at least 200

KONSOL

Truck-Mounted Testing/Repair Station

Mission

The Konsol truck-mounted testing/repair station is designed for field testing of the SPN-2, SPN-4, Avtobaza ground ELINT system, the APUR and AKPB control posts and their equipment according to their operational documentation, as well as for their routine and intermediate repairs.

Basic specifications	
Deployment/out-of-action time, min	not more than 25
Power consumption, kVA	not more than 50
Operational environment:	
ambient temperature, °C	-10...+ 40
relative humidity at +25°C, %	up to 98
atmospheric pressure,	
Pa/mm (mm Hg)	not less than 60×10^3 (430)
Crew	7

Composition

- three (MA1, MA2, MA3) equipment trucks with box-bodies mounted on the KamAZ-4310 chassis
- three electric power generators on the biaxial wheeled trailers

The three equipment trucks accommodate workstations with numerous electrical and radio meters, testing panels, tools and accessories, providing:

- testing of the SPN-2, SPN-4, Avtobaza, APUR, AKPB main parameters;
- testing and repair of transceiving units and microwave paths;
- testing and repair of transmitting systems;
- checking of microwave energy density at the workstations;
- testing and repair of power supply modules;
- carrying out of bench and assembly works, including works on bulky equipment.

The Konsol testing/repair station provides measurement of the following ELINT system parameters:

- receivers' real sensitivity and dynamic range;
- transmitters' electrical and spectral parameters;
- accuracy of received signal parameter measurements and emitter direction-finding;
- microwave devices' amplitude/frequency and phase/frequency characteristics;
- parameters of secondary switched power supply units.

R-330K

Mobile Automated Control Station (Upgraded Version)

Mission

The R-330K mobile automated control station is designed for automated centralized control of the R-325U, R-378A(B), R-330T(B), R-934B automated jamming systems and their modifications.

The MACS provides a coordinated use of controlled AJS and increased efficiency of jamming HF and VHF/UHF communication lines and networks operating in state-of-the-art transmission modes (including pseudorandom frequency hopping), with the aim to disorganise enemy command and control at tactical and theatre levels.

Composition

All equipment with the built-in 5-kVA electric power generator is mounted on one vehicle (Ural/KamAZ-type truck or armoured chassis).

The MACS functions include:

- automated assignment of frequency bands and ELINT sectors with due regard to current tactical situation;
- automated gathering of ELINT data about RF emitters from the controlled AJS;
- automated disclosure of communication lines, networks and nodes, and their display on personal computer monitor against topographic map background;
- automated target distribution of the detected radio emitting sources between automated jamming stations taking into account their frequency and energy capabilities;
- transfer of target designation data to the AJS for narrowband jamming.

Basic specifications	
Number of controlled AJS	up to 20
Number of independent encoded data communications links	4
Number of independent voice communications links	4
Number of automated workplaces	2
Number of processed information and calculation tasks when controlling AJS	30
Deployment/out-of operation time, min	not more than 15
Crew	4

R-330B/R-330T

Automated VHF Jamming System
(Upgraded Version)

Basic specifications	
Operational frequency range	30-99.9999
Azimuth search coverage, deg	360
Frequency panoramic scan rate, MHz/s	up to 1,900 (7,000)
RMS direction-finding error, deg	not more than 3 (2.5)
Transmitter output power, kW	1.0
Types of received signals:	AM, FM, CW, SSB, ISB, FSK, PSK, keying, PFT
Types of jamming signals:	noise, meander type, with random encoding
Jamming spectrum width, kHz:	
narrowband	2, 10, 20, 100
barrage	1,000
Number of simultaneously jammed RF links	up to 3 (at fixed frequencies) 1 (with PFT)
Detection-to-suppression time, ms	not more than 5

Mission

The upgraded R-330B/R-330T VHF jamming system is designed for detection, direction-finding and jamming of VHF communication facilities operated at tactical command level at fixed frequencies with conventional waveforms, in programmed and automatic frequency tuning modes, as well as for transmitting short encoded messages. The jamming system provides analysis and selection of emitters' signal parameters.

Composition

The R-330B/R-330T VHF jamming system consists of an equipment vehicle on a wheeled (R-330T) or tracked (R-330B) chassis, a diesel electric power station mounted on a two-axle trailer (R-330T), or MT-Lbu armoured tracked chassis (R-330B), a set of operational documentation, and a single spare parts, tools and accessories set.

R-378AM

Automated HF Communications Jammer System (Upgraded Version)

Mission

The upgraded R-378AM HF communications jammer is designed for detection, direction finding and jamming of hostile HF radio communication facilities operated in tactical command and control links at fixed frequencies with conventional waveforms, in programmable and automatic frequency tuning modes, as well as for transmitting short encoded messages. The jammer provides analysis and selection of emitters' signal parameters.

Composition

The R-378AM jammer system includes equipment vehicle, ED30-T400-1RPM1 electric power station mounted on a biaxial trailer, a set of operational documentation, and a single spare parts, tools and accessories set.

Basic specifications	
Operating frequency range, MHz	1.5 - 30
Panoramic scan rate, MHz/s	480
Types of jamming signals	noise, meander type, pseudorandom code, Morse code electronic music
Jamming output power, kW	1.0
Jamming signal bandwidth, kHz:	
narrowband	3.0; 10.0; 20.0; 50.0
barrage	150 – 8000
Response rate (from detection to jamming), ms	15
RMS direction-finding error, deg	not more than 3
Multitarget jamming capability	up to 5
Types of received signals	AM, FM, CW, SSB, ISB
Deployment time, min	not more than 40

R-325U

HF Communications Automated Jamming System

Mission

The R-325U HF communications automated jamming system is designed to jam by a surface wave HF radios operated at operational-tactical command level.

The jamming system provides search for their jamming with the capability to retarget automatically onto a newly detected emitter after the jammed RF link has ended its operation, generation of different jamming signals for each jammed RF link, and exchange of information with a control centre.

Composition

There are six composition options with the following components:

- equipment vehicle based on the KamAZ-43101 truck chassis;
- ED2x30-T400-1RAMZ electric power generator mounted on the KamAZ-43101 chassis, or ED60-T400-RP on a biaxial trailer.

Basic specifications	
Operating frequency range, MHz	1.5-29.9999
Types of jamming signals	noise, chaotic pulse sequence
Transmitter output power, kW	4 - 7
Suppression depth, km	up to 60
Suppression azimuth sector, deg	80±30
Detection capability, deg	0 - 360
RMS direction-finding error, deg	not more than 4
Number of radio links suppressed quasi-simultaneously	up to 4
Number of RF links simultaneously monitored in the jamming mode	up to 10

SPR-2 RTUT-B

Artillery Radio Proximity Fuse Jamming Station

Mission

The SPR-2 Rtut-B jamming station is designed to protect friendly troops and materiel against hostile artillery fire with munitions equipped with radio proximity fuses by jamming them to cause premature detonation at safe altitudes.

The station is powered by a dedicated electric powerplant (primary source) or onboard electric system (standby source).

The SPR-2 station is mounted on an armoured personnel carrier, and can operate on the move.

Basic specifications	
Operating frequency range, MHz	95-420
Receiver sensitivity, dB/W	-95...-110
Jamming power, W	not less than 300
Protected area, ha	at least 50
Jamming capacity, fuses/sec	at least 40
Into/out-of-action time, min	not more than 4
Operation on the move	available
Operating conditions:	
ambient temperature, °C	-40...+50
relative humidity at 25°C, %	98
atmospheric pressure, kPa (mm Hg)	60 (430)
Power supply:	
primary (DC)	27 V, 4 kW
standby	onboard electric system
Crew	2

RAVNINA

Frequency-Hopping Communications Network Detection, Identification and Classification System

Basic specifications	
Operating frequency band, MHz :	
HF	1.0-30.0
VHF/UHF	30.0-550.0
Receiver sensitivity, dBW/Hz :	
HF	not worse than 180
VHF/UHF	not worse than 180
Receiver dynamic range (for 10-MHz band in the two-signal mode), dB	not worse than 70
Image channel suppression, dB	not less than 80
Signals detected	CW, FAX (G3 and G4), SSB (USB/ISB), PSK, ISB, AM, FM, FSK, CW, FM/WBWM, DQPSK, MSK, MFSK, GMSK, QAM, DPSK, ASK Link-4/Tadil-C; Link-11/Tadil-A, Tadil-B; frequency-hopping modulation
Detected signal frequency-hopping rate, hops/sec:	
HF	100 (fast) 10 (slow)
VHF/UHF	up to 2,000
Effective scanning speed, GHz/s:	
HF	up to 5
VHF/UHF	up to 100
Instantaneous scan zone (w/o frequency tuning), MHz:	
HF	4; 30
VHF/UHF	100
RMS direction finding error, deg:	
HF	not worse than 3
VHF/UHF	not worse than 2
Mean time between failures, hrs	not less than 10,000

Mission

The system is designed to search for, detect and determine bearings of standard HF and VHF/UHF radio communications systems operating both on fixed frequencies and with frequency hopping.

Composition

The Ravnina system comprises receiver/direction-finder antenna system, HF and VHF/UHF radio tuners, oscillator unit, power unit, multi-channel digital data unit, monitor, and keyboard.

The equipment provides detection, direction finding, spectral and time signal analyses, as well as signal classification and monitoring.

The Ravnina provides data transfer by wire and by radio through the built-in RS-485 radio modem, as well as coupling with automated systems via the RS-232 standard interface.

SMALL-SIZE MOBILE DIRECTION FINDER

Mission

The small-size direction finder is designed for effective detection and position finding of electronic assets.

It ensures automatic detection of radio signals in the given frequency band, reading, recording and playback of voice messages from the revealed radio emitting sources, as well as finding their bearings with subsequent jamming or providing designation data for their destruction.

The system can be employed by radio control agencies, police, border guards and customs detachments, coast guards, and security services of seaports, airports and large railway stations.

Composition

- detection and direction-finding antennas
- detection and direction-finding equipment (direction finder, portable computer and GPS receiver)
- jamming and communications equipment (radio transmitter, radio modem and transmitting antenna)

The system is carried in two suitcases, and can be deployed in field, stationary or vehicular configuration. On customer request, the system can be made man-portable or airmobile.

Basic specifications	
Frequency band, MHz:	
detection	20 - 2,000
direction finding	100 - 1,000
jamming	137 - 170/430 - 450
Direction-finding error, deg	not more than 5
Average direction-finding range	within radio visibility range
Continuous operating time (with the battery power supply):	
direction finding, hrs	5
jamming, min	45
Deployment time, min	not more than 3-5

AKVEDUK

HF/UHF Radio Communications System

Mission

The R-168E Akveduk HF/UHF tactical communications system is designed to provide reliable ECM/ECCM-resistant radio communications in tactical networks from individual soldiers to division-level commanders.

The Akveduk system comprises 16 handheld, manpack and vehicular redio sets with output power of 0.1 to 100 W operating in the 15-120 MHz frequency band, vehicular/manpack cryptographic devices, and 15 auxiliaries to expand operational capabilities of the system.

All HF/VHF radios are provided with automatic functional testing, remote controls, reliable cyphering with the key length and pseudo-random crypto-algorithm, automatic input of frequency, key and other communications data.

Features

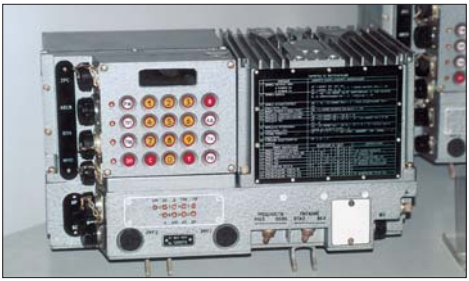
- economiser for handheld and manpack radiosets to save energy
- frequency hopping by a given algorithm within the whole operating band to counter modern ECM systems
- automatic adaptive communications to ensure stable operation despite jamming and interference, with automatic jamming situation analysis at the assigned frequencies and transfer to a channel where jamming signal is minimal
- communications cyphering to deny eavesdropping
- ease of operation provided by automated selection and input of frequency keys and other communications data
- modular design allowing rapid in-field repairs by replacing faulty units

Types of operation

- simplex, two-frequency simplex and duplex
- frequency hopping
- automatic adaptive communications
- secure communications
- selective and circular communications
- voice/data transmission and reception at 100, 200, 1,200 b/s in HF and 1.2 – 16 kb/s in VHF bands
- scanning reception at 4 – 8 preset frequencies
- operation at 4-8 preset frequency channels
- tone call reception/transmission
- manual and automated radio data input
- remote control from a removable control panel at up to 10-m distance
- data retransmission
- RS 232C PC-interface
- interoperability with older-generation radios

R-163-50U

Radio Set



Mission

The R-163-50U radio set is designed to provide preset radio communications in the telephone, telegraph, digital data and coded signal modes between ground mobile systems at a range of up to 20 km.

The R-163-50U is a fifth-generation radio set boasting high reliability and long service life under harsh climatic and mechanical effects. It features increased operational frequency range, capability to preset frequencies at 1-kHz frequency pitch; minimal preset frequency tuning time (up to 0.1 sec); increased communications stability/quality in hostile ECM environment; jam-proof reception/transmission of coded messages (with message pre-storage at transmit phase and readout at receive phase).

Main operational modes – simplex, duplex (with additional receiver), automated mode, standby mode, address call, adaptive communications, automatic relay, and remote control. In the stand-by receive mode the radio set performs frequency scanning, selects standby jam-free frequency, and automatically stops scanning at the operational frequency on receiving a call.

Radio sets of the same type can be automatically switched onto standby jam-free frequency for selective address call operation.

When interfaced with external computer, the R-163-50U radio set allows quick change of communication conditions by superior command posts, as well as automatic re-transmission if the relay station is equipped with the additional R-163UP receiver. The radio set can be remotely controlled at a distance of up to 10 m, being mounted on various vehicles, including helicopters.

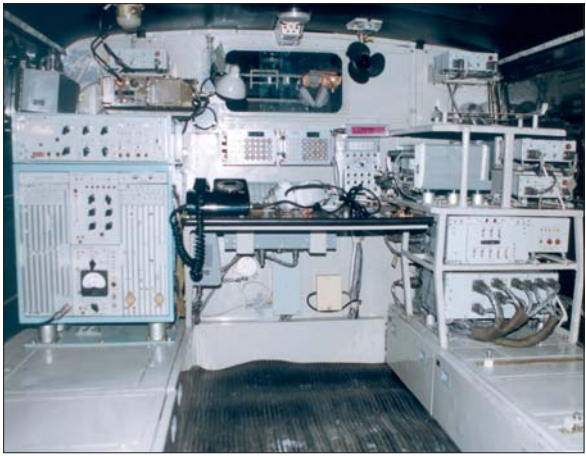
With the additional heat sink (B-11 unit) fitted, the R-163-50U operation time is unlimited.

The R-163-50UP is proposed as the R-173/R-123 radio set replacement.

Basic specifications	
Waveband, MHz	30-79.999
Frequency grid pitch, kHz	1
Transmitter output power, W	30 (automated control system output)
Standby frequencies	10 (manual) 16 (automatic)
Receiver sensitivity, microV	1.2
Communications range, km:	
spike antenna	20 (ASh-2M)
antenna mast assembly	40 (AMU-5)
Integrated power supply, V	22.1 -29.7
Dimensions, mm	428x239x222
Weight, kg	27
Mean time between failures, hrs	at least 3,200

KShM R-125B-1M2, R-125B-2M2

Command-Staff Vehicles
for Automated Command and Control Systems



Composition

	R-125B-1M2	R-125B-2M2
R-168-5KNE HF radio set	1	1
R-168-25UE VHF/UHF radio	1	1
R-163-10V VHF/UHF radio	1	1
R-415V radio relay station	-	1
R-438 satellite communications system	1	1
P-193M2 telephone switchboard		-
1		
E-9U scrambler	1	1
E-24D scrambler with the VE-24 input device	1	1
Channel and subscriber switchboard	1	1
AT-3031 telephones	4	4
Chassis	UAZ-469 (or customised)	UAZ-452 (or
customised)		

Mission

The R-125B-1M2/R-125B-2M2 command-staff vehicles are designed for command, control and communications on the tactical and theatre level.

The R-125B-1M2 and R-125B-2M2 are mobile communications systems forming basis of different command and control systems and subsystems. The HF and VHF/UHF radio channels of the vehicles provide coded data and voice communications with automated command and control systems of various ground force groupings.

The command-staff vehicles provide:

- stable and continuous command and control of subordinate units on the move and at station;
- timely, reliable and covert data exchange within command and control systems (subsystems);
- automation of command and control functions carried out by officers;
- open and secure telephone communications via HF and VHF/UHF channels from three workstations (officer, vehicle commander, radio operator) and a remote telephone;
- open and secure telephone communications via two radio relay channels;
- high jamming immunity and data security through adaptive operational modes, frequency agility mode, and technical masking and scrambling;
- transfer of two R-415V channels to external telegraph centre;
- radio communications on the move in a convoy and within communications centre.

Each command-staff vehicle accommodates a crew of three and four workstations. It can deploy in five minutes for operation on the move, and in 20 minutes for operation at station.

Basic specifications

Radio systems	Frequency band, MHz	Power, W	Communications range, km	
			at station	on the move
R-168-5KNE HF radio set	1.5-29.9999	5	300	10
R-168-25UE VHF/UHF radio set	30.0-107.975	25	40	20
R-163-10V VHF/UHF radio set	80.0-120.0	10	20	10
R-415V radio relay station	380-430	6.5	30	-

R-142NMR

Integrated Radio Station

Mission

The R-142NMR integrated radio station is designed to provide tactical command, control and communications at the division-regiment level.

Composition

- R-171M duplex VHF radio set
- R-163-50U/R-163-10V VHF radio sets
- R-163-1V VHF radio sets
- R-438 satellite communication radio set
- R-134M HF radio set
- SCh-4 equipment
- intercom and switching hardware

The radio station accommodates five persons: two commanding officers (commander and communications officer) and three-person crew (chief of radio station, radio operator and driver/electrician). For the commanding officers two workplaces are equipped.

The R-142NMR radio station equipment can be mounted on the KamAZ or URAL chassis.

Basic specifications	
On-the-move/at-station communications range, km:	
R-171M	30/60
R-163-50U	20/40
R-163-10V	5/10
R-438 (at station)	5,000
R-134M	250/350
Deployment time, min	not more than 20
Onboard power supply, V	27

R-149BMR

Command-Staff Vehicle

Mission

The R-149BMR command-staff vehicle is designed to provide tactical command, control and communications.

Composition

- R-171M UHF radio (duplex version)
- R-163-50U/R-163-10V/R-163-1V UHF radio sets
- R-134M/R-163-50K HF radio sets
- 3K-TA special equipment
- SCh-4 navigation equipment
- intercom and switching equipment

The command-staff vehicle provides:

- simplex HF/duplex UHF voice communications from all workstations and two remote telephones brought to a range of up to 1,000 m;
- data exchange with the use of data exchange equipment;
- duplex radiotelephone communications via the external radio set remotely controlled by wire or R-163-10V radio;
- contacting communications centre by any workstation;
- radiotelephone communications via the remote command-staff vehicle commander's radios with the use of the R-163-1V radio set and special man-portable equipment;
- positioning of the command-staff vehicle with the use of satellite navigation system;
- data reception/transmission with the use of a personal computer (notebook);
- internal communications between workstations of the command-staff vehicle;
- alternate use of the same channel in any radio set either for voice communications or data exchange, the latter being a priority.

The command-staff vehicle accommodates a three-person crew (vehicle's commander, radio operator, driver/electrician) and two officers including the commanding officer. The commanding officer is provided with two workstations on the command-staff vehicle.

The vehicle is mounted on the standard K1Sh1 chassis of a modified BTR-80 armoured personnel carrier.

Electric power can be provided by the AD-3.5U-28.51VM-2 DC generator, three-phase 380V/50Hz AC mains, electric power unit of the G-290 chassis, and the 12ST-85 battery (in the standby receiving mode).

Basic specifications	
Communications range, km:	
UHF radios on the move/at halt	up to 20/60
HF radios on the move/at halt	up to 60/350
Deployment time, min:	
for operation on the move	up to 5
for operation at halt	up to 25
Crew	3

AIR DEFENCE ASSETS CAMOUFLAGE SETS

Mission

Camouflage sets are designed to conceal air defence assets and installations from reconnaissance carried out with:

- optical devices - against vegetative (MKT-2L, MKT-3L), desert/steppe (MKT-2P) and snowy (MKT-2C) backgrounds;
- optical and radar systems (MKT-3LR);
- optical, thermal and radar assets (light-weight radio-dispersing camouflaging sets: Volchitsa-KR-L and Volchitsa-KR-LG – against summer vegetative, Volchitsa-KR-P – desert/steppe and Volchitsa-KR-C – snowy backgrounds).

Composition

Typical camouflage sets consist of 6-12 standard 3x6m sheets joined with quickly undone seams made of stitched cords. Standard sheets comprise a kapron netlike base with 50x50mm mesh size, backlined with a 3-5mm diameter kapron cord along the perimeter.

The net base holds different items interweaved in accordance with distortion-painting pattern:

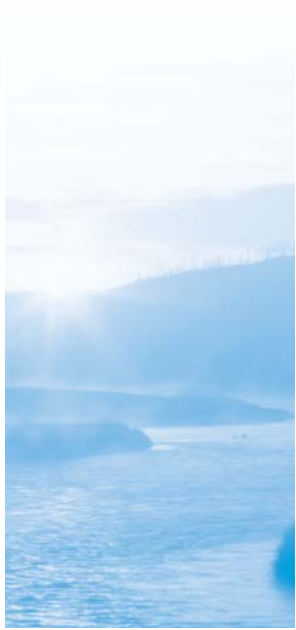
- MKT-2L (P,C,3L) 50x220mm strips/festoons made from dyed in mass and matted polyethylene film;
- MKT-3LR festoons made from two-side conducting, dyed in mass and matted polyethylene film;
- Volchitsa-KR 50x220mm strips or festoons from metallized two-side painted polyethylene terephtalate film.

The above sets provide the following advantages:

- resistance to water (moisture), fuel/lubricant (petrol, diesel fuel, oil) and detergent effects;
- operability in a wide temperature range from -40°C to +50°C;
- self-extinguishing cover material (without residual smouldering);
- adaptability to camouflaging structures of different size and configuration;
- availability of spare part kits for in-field repairs;
- convenient deliver packages (in covered rolls with spare parts and documentation).

Basic specifications

	MKT-					Volchitsa-KR-			
	-2L	-2P	-2C	-3L	-3LR	-L	-P	-C	-LG
Number of coloration taints	2	3	1	3	4	3	3	1	3
Covered area, sq. m	216	216	216	216	216	216	216	216	216
Set weight, kg	60	60	80	80	180	60	60	80	80
Continuous operation life, yrs	2	2	1	3	3	3	3	3	3
Masking spectral range, microns	0.4-1.1	0.4-1.1	0.3-1.1	0.4-1.1	0.3-1.1	0.4-1.2	0.4-1.2	0.3-1.2	0.4-1.2
						3-5,	3-5,	3-5,	3-5,
						8-14,	8-14,	8-14,	8-14,
centimetres					0.3-30	0.8-4.0	0.8-4.0	0.8-4.0	0.2-30
Reflected radar signal attenuation, not less than, dB	-	-	-	-	-16	-10	-10	-10	-15...-20
Deployment time, min	10	10	15	20	20	15	15	15	20



AIR DEFENCE SYSTEMS

TEST RANGE EQUIPMENT

KAMA-N

Radar

Mission

The Kama-N radar is designed to determine current coordinates of air/spacecraft (aircraft, missiles, projectiles, pilot-balloons, satellites, etc.) when operating within measuring systems and independently.

The radar operates in one of the two modes:

- on response signal of the on-board transceiver;
- on reflected signal.

Measurement data is stored in the computer long-term memory in real time.

Basic specifications

Operating range, km:	
on transponder response (P_{pulse} = 100 W)	2,500
on echo from aircraft (RCS = 1 sq.m)	50
Total RMS aircraft track measurement errors:	
slant range (response/reflection), m	not more than 15/8
azimuth and elevation, ang.min	not more than 5
Precise aircraft coordinate measuring limits:	
azimuth, deg	0-360
elevation, deg	-3...+87
Deployment time, hrs	not more than 12
Out-of-action and preparation to shipping time, hrs	not more than 12
Operators	4
Total primary power consumption (3-phase 380 V, 50 Hz), kW	56

Composition

- KN-1 antenna post
- KN-2 equipment cabin
- K22M primary voltage converter
- ED-60 electric powerplant
- cable sets, waveguides, calibrators, and an SPTA set

VERESK

Mobile Electro-Optical System

Mission

The Veresk mobile electro-optical system is designed to perform trajectory measurements, data processing and transmission in real time, to automatically track air targets (fixed/rotary-wing aircraft, missiles, bombs, etc.) and determine their polar and Cartesian spatial coordinates with high precision from mobile and stationary instrumentation posts.

Composition

- electro-optical theodolite (weight is less than 1,000 kg)
- data processing and control equipment
- Ural-type truck fitted with a platform and a cover for the theodolite, and a box body for the control equipment
- ED-16 mobile diesel electric powerplant
- remote optical viewing device

The Veresk system is operated by a crew of two. The crew can deploy the system from travelling to operational configuration within four hours. It is capable of continuously working and carrying out all relevant measurements for at least eight hours a day.

The system is powered by a 3-phase 220/380V, 50Hz AC power source, and consumes 10 kW. The Veresk can steadily operate at temperature ranging from -25°C to +50°C. The system is capable of performing 1,000-km marches at a speed of up to 20 km/h on unpaved roads and up to 40 km/h on highways.

Basic specifications	
Coordinate control system:	
azimuth angular speed, deg/s	up to 100
elevation angular speed, deg/s	up to 30
TV measuring system:	
field of view angle	1°33'/7°44'
operating spectral range, micrometre	0.6-0.9
IR measuring and tracking system:	
field of view angle	1° - 4.5°
operating spectral range, micrometre	3.0 - 5.0 ±0.1
Laser rangefinder:	
emission wavelength, micrometre	1.064
RMS range tracking error, m	3
RMS angular coordinates measurement error, ang.sec	5

Dan

Aerial Target System

Mission

The Dan drone aircraft is designed to train pilots and crews of air defence missile and artillery systems in firing air-to-air/surface-to-air missile and artillery weapons.

The Dan target is reusable. It takes off from its ground-based launcher with the assistance of the powder booster and lands by parachute. The target can fly in any season by day and night, either autonomously (according to a preset programme) or under remote control of the ground operator.

Dan is a low-observable highly manouevrable target drone maximising the similarity of crews' training to real combat environment.

Composition

The Dan target drone mounts the following equipment:

- flight control system;
- telemetry equipment;
- missile miss distance measuring equipment.

The following systems are used for flight servicing:

- general-purpose ground equipment: launcher vehicle, loader/transporter vehicle, ground automated testing system, sustainer starter, auxiliary equipment set;
- all-round surveillance radar, trajectory measuring radar, radio control station.

Basic specifications	
Launch weight, kg	395
Max airspeed, km/h	710
Operational altitude range, m	50 – 9,000
Flight endurance, min	40
Engine type x thrust, kgf	MD-120 turbojet x 120
Dimensions, m:	
length	4.6
height	0.815
wing span	2.683

E-95

Ground-Launched Small-Size Air Target System

Mission

The E-95 air target system is designed to launch and control the drone simulating subsonic remotely-piloted aircraft, cruise missiles, glide bombs, helicopters, and attack aircraft.

The E-95 air target system is intended to support practice firings of air defence missile/artillery systems controlled by radar, optical and optronic target acquisition and tracking systems, as well as for firing tests of prototype air defence weapons.

Composition

- aerial target
- ground control station
- launcher
- mobile repair vehicle

Basic specifications	
Max level flight speed, km/h	300-400
Flight altitude, m	200-3,000
Max cruising endurance, min	30
Max mission radius, km	50
Radio control system operating range, km	25
Radar cross-section, sq.m:	
conventional design	0.15
with Luneberg lens	7.5
with angle reflector	0.8-1.2
Fuselage length, m	2.1
Wing span, m	2.4
Launch weight, kg	70
Life time, flights	up to 10
Crew	5

BOBR

Air Target Imitator Drone System

Mission

The Bobr drone system is designed to launch the 9F839 air target imitator to simulate characteristics of air strike assets in the radar and IR spectrums, and to support air defence unit practice and test firings.

The air target simulates kinetic and radar reflection parameters, as well as heat emission of existing manned and unmanned aircraft.

The drone system is developed on the basis of the 122mm Grad Multiple Rocket System.

Basic specifications	
Drone flight range, km	up to 10
Drone flight altitude, km	up to 2.5
Drone airspeed in the firing zone, m/sec	200 – 320
Launch elevation, deg	10 – 45
Radar cross section, sq. m	up to 1
Tracer output power (at 3-5 micron wavelength), W/average:	
in head-on pass	100 – 280
in tail-on pass	70 – 150
Tracer burning time, sec	up to 40
IR-flares load, pcs	4
IR-flare launch rate	single or salvo, 2 pieces a time at 0.5-3.5 sec interval
9F839, 9F839-1/9F839-2 drone weight, kg	74.5/77.8
Drone length, mm	3,350
Launcher weight, kg	245
Launch panel weight, kg	7

Composition

- 9P334 portable launcher, comprising a tripod and a launch tube (the Grad MRS launch vehicle can be used optionally)
- 9F839 air target imitator
- 9U14 launch panel with a 60-m electric cable

The drone uses two types of warheads:

- with IR-tracer (9F839, 9F839-1) and optional IR-flare dispenser;
- with radar reflector and tracer (9F839-2).

9F691 SAMAN

Drone System

Mission

The 9F691 Saman drone dystem is designed to launch 9F841/9F841M air target simulators imitating piloted aircraft, cruise missiles, remotely piloted vehicles and components of precision-guided weapon systems at extremely low, low and medium altitudes in the radar and infrared wavebands.

The Saman drone system is used for practice firing by air defence units, as well as for operational testing of air defence missile/artillery systems under development.

Composition

- 9A33BM3(2) combat vehicle of the Osa-AK ADMS
- trajectory generation device
- 9F841, 9F841M air target simulators
- ground support equipment

The 9F841/9F841M drones are derived from the 9M33M2 surface-to-air missile of the Osa-AK/Osa-AKM ADMS.

Modified are 9M33M2 ground-to-air missiles with expired warranty period. The modifications include:

- installation of a radar angled reflector and a self-destruction unit instead of RF proximity fuse;
- upgrading of rocket motor;
- modification of electrical circuits with installation of additional switching and time-delaying modules;
- dismantling of the warhead.

The 9F841M air target simulator is a modified 9F841 with increased radar cross section.

The drone is delivered in the transport-launch container. Drone launching is controlled from the control panel coupled to the combat vehicle that requires no modification.

Basic specifications	
Number of drones on the CV	up to 6
Drones launch interval, sec	5
Number of flight trajectories	unlimited
Elevation/azimuth launch envelope, deg	0-60/360

Basic specifications of drones		
Drone main parameters:	9F841	9F841M
Length, mm	3,158	2,899
Weight, kg	124.7	124.5
Flight range (ballistic), km	up to 22 (up to 14)	up to 20 (up to 11)
Flight altitude, m	50 – 13,000	50 – 13,000
Guidance system	programmed, radio-command	programmed, radio-command
Radar cross section, sq.m	0.35-0.51	0.56-1.03
Flight endurance, sec	up to 110	up to 100
Airspeed in operating zone, m/sec	550-200	500-150

M6/M6T

Airborne Small-Size Target

Mission

The M6/M6T airborne small-size target is designed to simulate an aerial target for heat-seeking and radar-guided weapon systems.

The airborne target can be used to evaluate combat effectiveness of different air defence systems and air-to-air guided missiles, as well as to support training of air defence and air force personnel.

Composition

- target body
- parachute system
- IR-emitting source
- radar reflector

This decoy is airdropped from carrier-aircraft. The air target is simulated during the M6/M6T descent on the parachute thanks to reflections of radars' electromagnetic energy and heat/light generation for heat-seeking missiles.

The M6/M6T small-size target can be detected and tracked in flight visually and with radars and cine-theodolites.

Basic specifications	
Tracking range by radar, km	up to 40
Tracking range by cine-theodolite (of the burning plume), km	up to 35
Airdropping altitude, km	2.5 - 17
Plume burning time near ground, min	not less than 3
Plume luminous power at ground, candelas x 10^6	more than 2
Plume descending rate, m/s	4 - 15
Outer diameter, mm	280
Total length, mm	1,167
Flight weight, kg	98

FALANGA-M

Aerial Target System

Mission

The Falanga-M aerial target system is designed to launch small-size aerial targets simulating hostile air attack assets for the purposes of:

- practice firing as part of combat training of land forces short-range air defence weapon system crews;
- testing of newly developed air defence missile/artillery systems and surface-to-air missiles;
- inspection of surface-to-air missiles, in particular to extend their service life.

The Falanga-M aerial target system enables operators of the Strela-10M ADMS and Strela-2M/Strela-3/Igla MANPADS and other AD systems to effectively acquire, lock on and track the aerial target within the permitted firing envelope.

Composition

- launching system
- various versions of air target simulators

Launching system

The launching system is designed to launch various types of air target simulators and control their functions in flight.

It comprises a launcher, a target launch equipment, a control panel, connecting cables, and a 24V DC battery.

Aerial target

The air target simulator is an expendable unrecoverable target made from the Falanga anti-tank guided missile by its retrofitting. The air target simulators are fitted with self-destruct device activated in flight by radio command transmitted from the ground control panel.

Launcher specifications	
Target pre-launch test time, s	3
Target launch time, s	3
Launcher elevation, deg.	15-30
Launcher weight, kg	85

Air target simulator specifications	
Max speed, m/s	230
Flight altitude, m	up to 2,000
Flight range, m	up to 6,000
Flight endurance, s	at least 30
Calibre, mm	142
Length (without the nose tracer unit), mm	1,165
Weight, kg	up to 30