



# THE RUSSIAN WAY OF WAR

FORCE STRUCTURE, TACTICS, AND MODERNIZATION OF THE RUSSIAN GROUND FORCES



DR. LESTER W. GRAU

CHARLES K. BARTLES

FOREIGN MILITARY STUDIES OFFICE (FMSO), FORT LEAVENWORTH, KS

# Chapter 6

## Branches of Arms

## Motorized Rifle Troops

*Although I love the cavalry madly, although I am a horse soldier from my cradle, every time I watch the infantry advancing at a sure, firm pace, with fixed bayonets and menacing drum-roll, I feel an emotion which has something of both reverence and dread. I don't know how to express it. All that comes to mind at the sight of a formation of hussars or uhlans flying past is the thought of what gallant lads they are, how well they ride, how dashing they cross sabers! Woe to the enemy, and this woe usually consists of more or less dangerous wounds or captivity, and nothing more. But when the columns of infantry rush toward the enemy with their rapid, smooth, disciplined motion, there are no more gallant lads, that's all over: these are heroes who bear inevitable death or go to inevitable death themselves—there is no middle ground. The cavalryman gallops up, gallops away, wounds, rushes past, turns back again, and sometimes kills. But his every motion is eloquent of mercy for the enemy: all this is merely the harbinger of death. But the infantry formation is death itself, dreaded inevitable death.*

-Nadezhda Durova, *The Cavalry Maiden*, 1836

The Motorized Rifle Troops is the largest of the Branch of Arms in the Ground Forces, providing the foundation of the Ground Forces. In conjunction with Tank Troops, they perform the following tasks:

- In the defense – retain occupied areas, lines and positions, repulse the enemy's attacks and defeat its attacking groups
- In the offense– break through the enemy's defense, destroy enemy troop units, capture important areas, lines and objects, cross water obstacles, and pursue the retreating enemy
- In meeting engagements and battles – act as part of amphibious and airborne assaults and tactical landings.

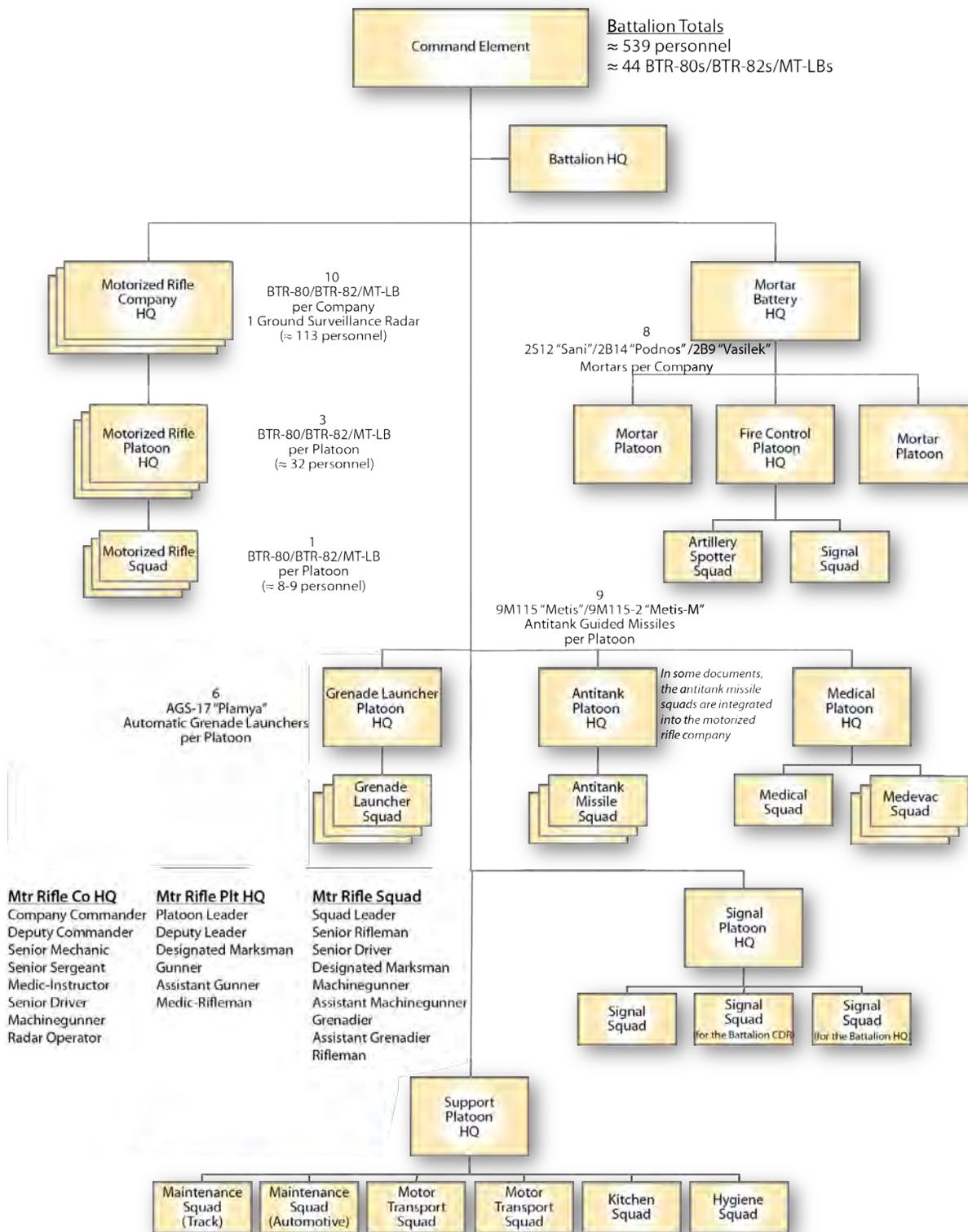
The epitome of the Motorized Rifle Troops is represented by the motorized rifle brigades, with their high operational autonomy, versatility and firepower. They are able to conduct day/night combat under conventional and weapons of mass destruction conditions in different physical environments. They can quickly perform marches over long distances, rapidly deploy into combat formations, break through the enemy's defenses (prepared or hasty), conduct a broad variety of maneuver on the battlefield, develop the offensive rapidly and advance to significant depths, ford water barriers, strengthen and retain captured lines, and quickly transition to a stable defense.

In terms of modernization and capability development, the Motorized Rifle Troops will increase their capabilities for airlift deployment; conducting independent, high maneuver combat in remote areas; transitioning rapidly from one form of warfare to another; rapidly changing directions and areas of action; and rapidly concentrating and dispersing units.<sup>1</sup>

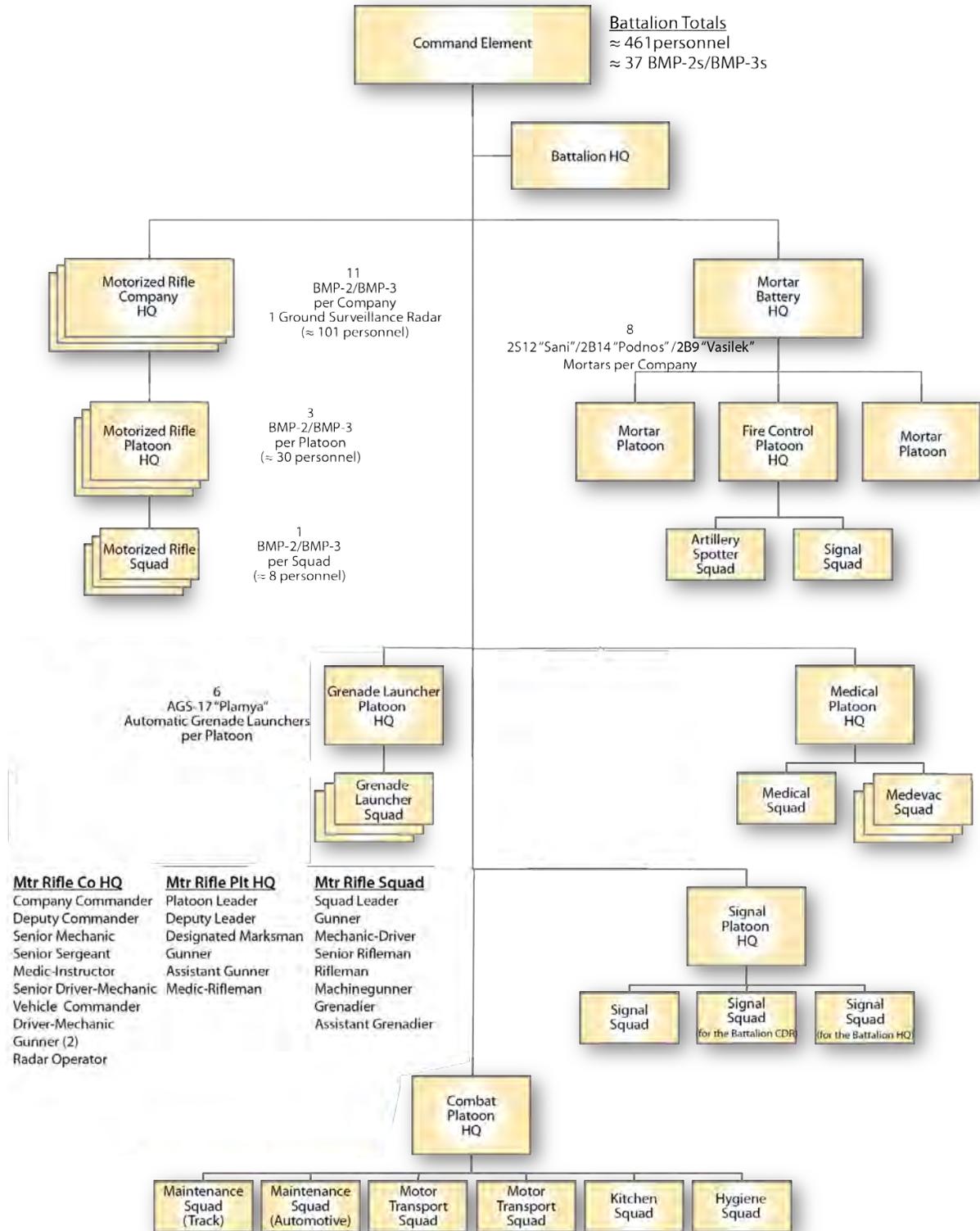
In general, each motorized rifle brigade has three motorized rifle battalions, based upon a BMP, BTR, or MT-LB chassis (in tank brigades, there is one motorized rifle battalion). Motorized rifle battalions based upon BTRs and MT-LBs are slightly larger than units based upon BMPs. These units are larger because they have dedicated antitank units, a capability battalions based upon BMPs do not require, because of the BMPs greater firepower. The accompanying

<sup>1</sup> "Motorized Rifle Troops," Ministry of Defense of the Russian Federation Website, <<http://eng.mil.ru/en/structure/forces/ground/structure/motorised.htm>>, accessed 1 May 2016.

## Motorized Rifle Battalion (on BTRs)



# Motorized Rifle Battalion (on BMPs)



graphics illustrate the differences between the two motorized rifle battalion types.

Russia is strong and respected when it has a strong, respected ground force and a strong, charismatic leader. Historically, Russian infantry has been the foundation of its ground force and has a long history of toughness, endurance and discipline. Modern Russian infantry is shaped by the concepts of reliable transport, tactical drills, terrain appreciation, and overmatching fire.

### **Reliable Transport**

The vast Russian landmass has few high-capacity, all-weather roads and little year-round navigable terrain. Infantrymen are of little value if they are late to the battle, tired when they arrive, hungry and short of ammunition, unable to keep up with the tanks or committed piecemeal. During the 1930s, the Soviet Union realized the value of moving ground forces to the battlefield and having them arrive fit and provisioned to fight, but World War II broke out before it was able to implement its military motorization program fully. The Soviets were quick to grasp the value of the tank and the truck, which, coupled with the railroads and river barges, could move impressive combat power across the plains and marshes of Russia and beyond. Although during World War II Russian infantry rode on trucks and tanks when it could, most of Russian infantry was foot mobile and slow to mass and disperse. The Soviet Army began mounting its infantry on armored personnel carriers in the 1950s and succeeded in creating a 100% motorized ground force. This continues to this day. Even airborne, air assault, and special purpose (spetznaz) infantry are all mechanized forces. Airborne, riverine, amphibious and airmobile insertions include purpose-built infantry carriers, assault guns, artillery and transport. There is no light infantry in the Russian Army; it is all mechanized or motorized, in the Russian vernacular. In fact, in the Russian Army, Infantry is referred to as Motorized Rifle Troops and all these forces ride to combat in tracked or wheeled infantry fighting vehicles and armored personnel carriers.

### **Tactical Drills**

The Russians expect motorized rifle subunits to perform to a standard and to produce a quantifiable amount of combat power that can produce a mathematical certainty of success when applied correctly. Too much combat power is a waste of effort and resources and too little is a guarantee of defeat. How does one train to a standard to produce a quantifiable amount of combat power? The answer is tactical drills. Football teams and SWAT teams use drills to speed up the orders process and to make complicated tasks quick and simple. Every U.S. Army infantryman knows how to do the four-man stack to enter a room. The Russian Ground Forces have a series of such tactical drills that they practice over and over and over until they become embedded muscle memory. The drill may be as simple as exiting a combat vehicle and going into an assault line. The continued practice of these drills makes them swift and smooth and gives the soldier something to focus on in the midst of the noise, confusion and terror of the battlefield. The drills replace thought when the soldier is cold, tired, hungry, and frightened, and perhaps is a reservist mobilized 15 years after his initial service.

The Russian commander is aided by these drills and a collection of tactical calculations and nomograms, which help him mathematically determine the length and duration of a

march, the time it will take to cross a river, the time it will take to catch up to a retreating enemy, fuel consumption of a column, degree of destruction expected from an artillery strike, the optimum duration of fire before weapons should switch firing positions, and so on. These formulae and nomograms speed up planning and execution. They also add a tactical predictability (and rigidity) that provides operational flexibility. During World War II, German tactical units were more effective than comparable-sized Soviet (and US) units, but the Soviets were far more effective at the operational level and the Germans were never able to shift their operational reserve in time to block the Soviet penetration. The variety of battle drills available to the Russian commander allows sufficient flexibility to not disclose his game plan, while providing a quantifiable amount of combat power that can produce a mathematical certainty of success. The Russians use military history as operations research and have developed a mathematical system of comparing opposing forces and war-gaming courses of action. The study of the Correlation of Forces and Means determines the combat power of friendly and enemy weapons systems based on a selected Russian weapons system, which becomes the measurement standard. The system is assigned a value, and other similar friendly and enemy systems are rated against this measurement standard based on weapons, armor, on-board munitions, speed, range, and the like. Dissimilar systems (e.g., an infantry fighting vehicle versus the measurement-standard tank) are also compared and assigned values based on the standard measurement. These values are rolled into TO&Es to find the combat power of a unit. This is good as long as the fight is between equally-trained and experienced units fighting on a featureless plain. Variables ("K" values) are then entered to adjust the combat powers to reflect the terrain, the state of unit training, the number of days of combat experience that the unit has, maintenance standards, logistics support, the nationality and ideological/religious fervor of the soldiers, and whether the unit is fighting on its own or foreign soil. This system was developed during Soviet times and has been upgraded and revamped to take advantages of improved computer capabilities and the introduction of new weapons systems, improved electronic warfare (EW), and improved weaponry.

### Terrain Appreciation

Much of the terrain on which Russia has fought its major wars is open plain, woodland and marshland intersected by large and small rivers. Maneuvering over this terrain has given the Russian commander a good eye for finding high ground and concealed avenues of approach. During World War II, German commanders frequently commented on the almost fanatical zeal that Russian forces displayed in order to seize a seemingly inconsequential piece of high ground. High ground is like a magnet to the Russian commander. This terrain has influenced Russian equipment design. Tanks and infantry fighting vehicles have much lower silhouettes than their Western counterparts. Tracks are much wider and vehicle clearance is much higher. Most vehicles are fitted with a self-recovery system. Most vehicles have an amphibious or fording capability. This terrain has also influenced Russian warfighting. Russian military history emphasizes large turning movements, highly mobile operations in the enemy depth, use of massed artillery fires in areas where the impacts cannot be observed to be adjusted, use of rivers as barriers and lines of communication and the use of winter for decisive actions.

SBR-3 Ground Surveillance Radar



Image Courtesy: Vitaly Kuzmin

### Overmatching Fire

Americans enjoy the tradition of the frontiersman and his Kentucky rifle, who boasted of “one shot, one kill.” Although marksmanship is a recognized sport in Russia, suppression of enemy small-arms fire is valued over accuracy. At the start of World War II, the Russian infantry was armed with the Model 1891, five-shot, 7.62mm Mosin-Nagant bolt-action rifle. It could kill at over 800 meters and was accurate to 500 meters. It could fire a maximum of ten rounds per minute (rpm). The problem was that the Germans brought the MG-34 7.92mm machine gun (800-900 rpm), the 9m MP-40 submachine gun (500-550 rpm) and the M1898, five-shot, 7.92mm Mauser bolt-action rifle (12 rpm) to the infantry fight. The rates of fire of the MG-34 and MP-40 kept the Soviet infantrymen’s heads down while the M1898 picked them off. The Soviets needed to suppress the German rates of fire. Their answer was to develop and issue their own 7.62mm submachine guns, the PPD-40 and the PPSH-41. They could fire over 900 rpm, but were only accurate out to 100 meters. The Mosin-Nagants were pulled out of infantry units as the submachine guns became available. Now the Soviets had infantry weapons that could provide suppressive fire while they advanced close enough to kill the enemy. The problem was that if the enemy was over 100 meters away, the infantry could get badly hurt while trying to get into range. The Soviets began reissuing the Mosin-Nagants - this time with improved optics and an effective range of 1000 meters.

The Russians believe in suppressive fire. The famous Kalashnikov selector switch goes from safe to automatic to semiautomatic. Automatic is the preferred mode of fire. The US M16 selector switch goes from safe to semiautomatic to automatic, reflecting the US belief in marksmanship. Despite this, both armies fire thousands of small-arms rounds to inflict a single casualty. This Russian preference for suppressive fire extends to artillery, where massed artillery fires still hold a major place in maneuver warfare planning.

### Small Arms Characteristics

	Makarov Pistol	AK-74 Automatic Rifle	RPK Machinegun	PKM Machinegun	RPG-7 Grenade Launcher	SPG-9 Recoilless Rifle	AGS-17 Grenade Launcher
Caliber (mm)	9	5.45	7.62	7.62	40	73	30
System Weight (kg)	.81	3.6	6.8	15.5	6.3	47	31
Max Effective Range (m)	50	500	1000	1500	300	1300	800
Rate of Fire (per min)	30	650	600	650	4-6	6	350-400
Initial Velocity (m/s)	315	900	745	825	300	700	185
Rounds per magazine	8	30	40; 75	100-200	3	6	29
Cartridge Weight (g)	10	10.2	16.2	21.8	2200	4400	350
Armor Penetration (mm)	—	—	—	—	260	400	—
Crew	—	—	—	—	2	4	2

### Small Arms

The venerable AK-74 is available in quantity and will be the standard for years to come. Still, there is competition, as the AK-12, A-545 and AN-94 look to replace this 42-year-old weapon. The AK-74 is part of the Kalashnikov family of small arms. A lineal descendant of the 7.62X39mm AK-47 and AKM, the AK-74 joined the small bullet craze introduced by the Colt M-16 during the Vietnam War. The 5.45x39mm cartridge fires a lightweight, high velocity bullet at the rate of 600 rpm

AK-74 Automatic Rifle



Image Courtesy: Vitaly Kuzmin

and is effective out to 500 meters, although the maximum range is over 3000 meters. It is not particularly accurate, but since its primary role is suppressive fire, it is suited to its role.

The RPK squad automatic weapon is a rugged veteran performer that has been around since the 1960s. It has a longer, heavier barrel than the standard Kalashnikov and fires the 7.62x39mm round effectively out to 1,000 meters. Squad engagements normally extend from 10 to 800 meters, so the RPK covers the gap between the suppressive fire of the AK-74 (effective to about 300 meters at burst rate) and the limits of normal squad engagements. The Russians have also fielded an RPK-74, which fires the 5.45X39mm, which has the same improved range and accuracy of the RPK, but the effectiveness of the lighter bullet falls off significantly over 500 meters, so the older 10-pound RPK remains in active service.

RPK Machinegun



Image Courtesy: <http://www.defenselink.mil/>

PKP Machinegun



Image Courtesy: Vitaly Kuzmin

The PKP Pecheneg 7.62X54mm medium machine gun may be issued in lieu of the RPK squad automatic weapon. Like the RPK, it has a bipod, but it has an increased effective range of 1500 meters and a carrying weight of 18 pounds.

The RPG-7V2 is the most widely used anti-armor weapon in the world. Its ruggedness, simplicity, low cost, and effectiveness have kept it in the Russian motorized rifle squad and elsewhere since 1961. It has a HEAT, tandem HEAT, fragmentation and thermobaric round, with an effective range of 200 meters and a maximum range of 920 meters.

RPG-7 Grenade Launcher



Image Courtesy: U.S. Airforce

The round detonates at 920 meters - a feature that has even enabled it to be used as an air defense weapon.

The Dragunov SVD-63 is a semi-automatic sniper/ designated marksman rifle that is chambered for 7.62x54mm ammunition and is found in the scout platoon. It was originally designed as a squad support weapon because the squad's long-range engagement ability was lost when submachine guns and assault rifles (which are designed for close-to-medium-range, rapid-fire combat) were issued as the primary infantry weapon. The Dragunov is accurate to 800 meters. The Soviet TO&E had a sniper per platoon, but the "sniper" was really a designated marksman. The scouts are also designated marksman. Russia has world-class snipers and world-class sniper weapons in the military and state security *spetsnaz*, internal security forces, river police and the new presidential guard. Some of their newer weapons are replacing the Dragunov in motorized rifle forces.

Dragunov SVD-63



Image Courtesy: Vitaly Kuzmin

### Combat Gear and Load-Bearing Equipment

Dismounted troops carry too much weight. The Russians have introduced new load-bearing equipment and combat gear. The new combat gear (Ratnik) is an integration of protection, destruction, life support, and energy supply systems. Ratnik envisions the use of a total of more than 150 components. A variety of helmets and body armor, combat overalls, a headset with a hearing protection system, protective glasses, and a knee and elbow joint protection set are included. One can use a grenade launcher, an assault rifle, or a sniper rifle. Ammunition, a combat multifunction knife, standard reconnaissance instruments, small binoculars, a light signal flashlight, a shock-resistant and waterproof watch, winter and summer two-sided camouflage kits, and standardized optical and thermal-imaging gun sights supplement the new gear. There is also an autonomous heat source, assault pack, individual water filter,

Ratnik Equipment Display



Image Courtesy: Vitaly Kuzmin

### Soldier Wearing Ratnik Kit

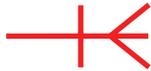


Image Courtesy: Vitaly Kuzmin

and lung protection, decontamination, and first aid equipment. Ground Troops Commander-in-Chief General Oleg Salyukov stated that the Ratnik (Warrior) system has reduced the weight of individual equipment by nearly 1.5 times, from 34 to 24 kilograms (75 pounds to 53 pounds). Furthermore, the effectiveness of the small arms that are part of Ratnik (the A545 assault rifle) has increased by 1.2 times. The designers have doubled the protection of the integrated body armor. However, perhaps the main thing is that they have managed to integrate the new combat gear's command and control system and communications systems with its other elements. This will permit soldiers to accomplish combat missions at any time of day and under various climactic conditions. Experts expect that the effectiveness of their actions will increase by at least 1.5-2 times.

### Crew-Served Weapons

The AGS-17 automatic grenade launcher (Plamya) fires linked 30mm grenades from a tripod or vehicle mount to a maximum range of 1700 meters. The maximum effective range is 800 meters and it fires at the rate of 400 rpm (practical rate of fire is 50-100 rpm). It is used for direct and indirect fire and fires fragmentation and smoke rounds. It weighs a hefty 31 kilograms (68 pounds) and is being replaced by the AGS-30, which weighs 16 kilograms (35 pounds) and has a maximum range of 2100 meters.



AGS-17 Grenade Launcher



Image Courtesy: Vitaly Kuzmin

PKM Machinegun



Image Courtesy: Vitaly Kuzmin



9M115 Metis

The PKM machine gun fires the 7.62x54mm round at a rate of 600 rpm (250 practical rpm) to a distance of 3800 meters, with a maximum effective range of 1500 meters. It has a bipod and tripod mount. The weapon is found throughout the motorized rifle battalion. The vehicle mounted variant is the PKT.

The 9P151 antitank wire-guided missile launcher fires the 9M115 Metis (AT-7 Saxhorn) or the Metis-M 9M131(AT-13 Saxhorn-2) missile. It has an engagement range of 40-1000 meters and can engage targets traveling up to 37 miles per hour. It carries a HEAT warhead. The weapon is found in the motorized rifle antitank platoon.

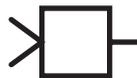


Image Courtesy: Vitaly Kuzmin

### Portable ATGM Characteristics

	9M111 "Fagot"	9M113 "Konkurs"	9M115 "Metis"	9M115-2 "Metis-M"	9M133 "Kornet"
NATO Designation	AT-4 Spigot	AT-5 Spandrel	AT-7 Saxhorn	AT-13 Saxhorn-2	AT-14 Spriggan
Caliber (mm)	120	135	93	130	152
Maximum Range (m)	2,000	4,000	1,000	2,000	5,500
Minimum Range (m)	70	70	40	80	UNK
Armor Penetration (mm)	400	600	460	1000	1300
Guidance System	SACLOS	SACLOS	SACLOS	SACLOS	SACLOS
Launcher Weight (kg)	22.5	22.5	10.2	10.5	26
Rocket Weight (kg)	11.5	14.6	6.3	13.8	29
Crew	2	2-3	2	3	UNK
Unit of Fire	8	UNK	8	UNK	UNK

### BTRs and BMPs

Motorized riflemen ride into combat on the wheeled BTR-80 or BTR-82, the tracked BMP-3 or, in the northern latitudes, the MT-LB. The BTR-80 is an 8x8 wheeled amphibious armored personnel carrier, and is the most common chassis found in the Russian Ground Forces, entering service in 1986. It has a crew of two and carries a motorized rifle squad of eight. It has a turret-mounted KPVT 14.5x114mm heavy machine gun (.57 caliber) with a coaxial 7.62-

54mm PKT machine gun. The KPVT has a maximum effective range of 3000 meters and a range of 4000 meters. Seven firing ports enable the squad to fire from within the vehicle. It has a top speed of 50 mph and a combat radius of 375 miles. Some models mount the 30mm 2A72 automatic cannon, which fires the 30x165mm round to an effective range of 4000 meters. It fires HE-T and AP-T rounds up to 550 rpm. The infantry squad exits the BTR-80 through the roof hatches or from the two side doors. This arrangement has been criticized, since the squad is exposed to fire while dismounting, vice dismounting through (nonexistent) rear doors.

The BTR-82 is an upgraded version of the BTR-80. It was first fielded in 2011 and now can be found in the Russian Ground Forces, Naval Infantry, and Airborne. It is manufactured at the 81st Armored Vehicle Repair Plant in Armavir, Russia, and differs from the BTR-80 due to a 300-hp engine in place of the BTR-80's 260-hp engine, and a number of design features to protect the crew from mines and small-arms fire. The bottom of the vehicle is designed with a new two-level system for absorbing blasts, and all internal parts of the armored body are covered

**BTR-80**



Image Courtesy: Vitaly Kuzmin

**BMP and BTR Characteristics**

	BMP-2	BMP-3	BTR-80
System Weight (t)	14	18.7	13.6
Crew	3	3	2
Dismounts	7	7	8
Autocannon	2A42 30mm	2A70 100mm 2A72 30mm	—
Machinegun	PKT 7.62mm	PKT 7.62 (2)	PKT 7.62mm KPV 14.5mm
ATGM	9M111 “Fagot”	9M117 “Bastion”	—
Land Speed (kph)	68	70	90
Water Speed (kph)	7	10	10
Maximum Range (km)	600	600	600
Horsepower	402	494	256

by a special spall liner to provide better protection from shrapnel and other projectiles. These modifications reportedly give the BTR-82 a twenty percent higher survival rate than the BTR-80.

Versions of the BTR-82 are equipped with air conditioning, digitally-encrypted R-168 radios, and the Trona-1 topographic navigation system. Although Russia will field the new wheeled “Bumerang” BTR in the next few years, the BTR-82 will likely still be in production for the foreseeable future, as its designation refers to not only newly produced vehicles, but also BTR-80s that have been upgraded to the BTR-82 standard. (The BTR-82 is also finding success on the export market; versions of it can be found in found in the armies of Azerbaijan, Kazakhstan, and Syria.)

**BTR-82A**



Image Courtesy: Vitaly Kuzmin



**Armored Personnel Carrier (BTR)**

BTR-82 include the BTR-82A, armed with a 30-mm cannon and coaxial 7.62-mm machine gun; the BTR-82AM, designation of a BTR-80 after upgrade to the BTR-82A standard; the BTR-82A1, equipped with an unmanned turret that has a 30-mm cannon and coaxial 7.62-mm machine gun; and the Taifun-M reconnaissance vehicle, developed as an escort vehicle for intercontinental ballistic missile launchers. Russian efforts to build and/or modernize the BTR-82/BTR-80 line, while simultaneously fielding a new system (the “Bumerang” BTR), parallel Russia’s modernization of the T-72 line of tanks while fielding the T-14 tank. Russia sees no need to completely change out its inventory of older vehicles, and

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instead has adopted a hybrid approach towards modernization. The Russian Armed Forces have chosen to approach institutional modernization by modernizing older platforms, while simultaneously fielding new platforms. This practice allows them to significantly enhance their combat power through wide-scale modernization, while developing new technologies at a sustainable cost. This approach is far from perfect, but it appears to be a long standing practice, instituted well before the time of current financial difficulties.<sup>2</sup>

The MT-LB was originally designed as an armored, amphibious artillery tractor. It has excellent marsh and snow mobility and has become a motorized rifle carrier (BTR), particularly for brigades in the northern latitudes. It has a crew of 2 and can carry up to 11 passengers. The squad mounts and dismounts through two rear doors. Some MT-LB carry the 12.7x108mm (.50 caliber) NSVT heavy machine gun, which has a rate of fire of 780 rpm and a maximum effective range of 1500 meters.

MT-LB



Image Courtesy: Vitaly Kuzmin

BMP-3



Image Courtesy: Vitaly Kuzmin

The BMP-3 is an amphibious, tracked infantry fighting vehicle that is fitted with a low-velocity 2A70 100 mm rifled gun, which can fire conventional shells or 9M117 ATGMs (AT-10 Stabber). It also has a 2A72 30 mm dual feed and a 7.62mm PKT machine gun. These are all mounted coaxially in the turret. There are also two 7.62mm PKM bow machine guns. The BMP-3 is capable of engaging targets out to 5000–6000 meters with its ATGM weapon

system 9K116-3 “Basnya.” The BMP-3 has a crew of three and carries a motorized rifle squad of seven. The squad dismounts out of the vehicle rear doors. It has a top speed of 45 mph and a combat radius of 370 miles.



Infantry Fighting Vehicle (BMP)

<sup>2</sup> Charles K. Bartles, “The BTR-82 and the Implementation of Modernization,” *OE Watch Online*, August 2016. “BTR-82: Armored personnel carrier” as found on the website *Military-Today* <[http://www.military-today.com/apc/btr\\_82.htm](http://www.military-today.com/apc/btr_82.htm)>, accessed 1 May 2016. Igor Melnikov, “Military Motor Transport Operator Day” *Voyenny Vestnik*, 24 May 2014. “Baltic Fleet Naval Infantry is Mastering the New BTR-82A Armored Personnel Carrier,” *Ministry of Defense of the Russian Federation*, 11 June 2013, <<http://structure.mil.ru/structure/okruga/west/news/more.htm?id=11773465@egNews>>, accessed 1 May 2016.

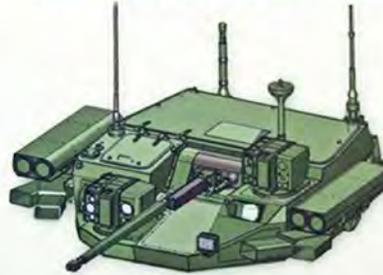
**Modernization and Modularity**

In Western Armies, the term “motorized” refers to wheeled vehicles and units, while “mechanized” refers to tracked vehicles and units. In the Russian Army, “motorized rifle” refers to any infantry unit mounted on tracked or wheeled vehicles. Russia’s modernization and standardization efforts have included the creation of not only the Armata tracked heavy chassis, but also the Kurganets-25 tracked utility chassis and the Bumerang wheeled chassis. Interestingly, these three chassis types, made by three different manufactures, are all designed to accept the same turret, the “universal combat module” known

New Russian BTRs with “Epoch” Module

“Epoch” Universal Module

**UNIVERSAL COMBAT MODULE  
«BUMERANG-BM» or «EPOCH»**



**Armaments**  
30mm Automatic Cannon  
4 «Kornet» Missiles  
7.62mm PKT Machine Gun

**Maximum Range (meters)**  
«Kornet» (antitank) 8,000  
«Kornet» (guided) 10,000  
Automatic Cannon 4,000



Bumerang



Kurganets-25



T-15 Barbaris (on Armata chassis)



Kyrganets-25



Bumerang



T-15 Barbaris (on Armata chassis)

Images Courtesy: Russian Ministry of Defense

at the “Epoch” or “Bumerang-BM,” made by a fourth company. (The universal combat module consists of a 30mm automatic cannon, four “Kornet” antitank missiles, and a 7.62mm PKT machine gun.)

This level of interoperability is unheard of in Western defense industries, where proprietary technology and financial considerations would make the pursuit of such an effort difficult. The imposition of such a standard must have been implemented several years ago, as some reports have implied the BTR-82A (armored personnel carrier) and BMD-4 (infantry fighting vehicle for the Airborne) have already entered service, and may also be capable of mounting the “universal combat module.” Russia has put great stock in the concepts of interoperability and modularity. Russian media have reported that the “Armata” chassis (and likely the other two as well) will serve Russia throughout the 21<sup>st</sup> century. Russia appears to believe that although the chassis may be suitable throughout the 21<sup>st</sup> century, the weapons systems which it carries will not. After these three chassis are fielded, Russia will likely

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pursue capability improvements through upgrading the turrets for the foreseeable future (not by the purchase of completely new vehicles). Other more novel innovations involve giving the Kurganets-25 vehicles a Sony PlayStation-like controller for steering to ease driver training and facilitate future automation. Aside from the obvious cost savings due to the economies of scale and the ability to relatively quickly repurpose equipment as needed, this development will also likely spur innovation. Weapons manufactures will now only have to design for one turret specification, which could lead to significant cost savings. This could be especially significant if these chassis enter the export market, as they likely will. The Russian military and Russia’s export customers will be able to “plug-n-play” a variety of capabilities, based upon turret design, with their particular desired chassis type. Perhaps one of the most interesting implications of these universal chassis and turret specifications is that manned vehicle turrets may be a thing of the past, and the terms “infantry fighting vehicle” (IFV or BMP) and “armored personnel carrier” (APC or BTR) may become unimportant when describing these vehicles, as the only difference is the turret type.<sup>3</sup>

**Barrel-Launched ATGM Characteristics**

	9K116 "Kastet"	9K116-1 "Bastion"	9K116-2 "Sheksna"	9K116-3 "Basnya"	9K119 "Svir"	9K119M "Refleks"
NATO Designation	AT-10 Stabber	AT-10 Stabber	AT-12 Swinger	AT-10 Stabber	AT-11 Sniper	AT-11 Sniper-B
Caliber (mm)	100	100	115	100	125	125
Penetration (mm)	500-550	500-550	500-550	500-550	900	900
Range (m)	5,500	5,500	5,500	5,500	5,000	5,000
Guidance	Laser	Laser	Laser	Laser	Laser	Laser
Platform	MT-12	T-55	T-62	BMP-3	T-72B/T-72S/ 2A45 Sprut	T-80B/T-80U/ T-90/T-72B3

\*The 9K119M "Refleks" ATGM system may fire missiles designed for the 9K119 "Svir," but not vice versa

**T-90SM**



**T-80U**



Images Courtesy: Vitaly Kuzmin

<sup>3</sup> Charles K. Bartles, "Modularity Facilitates Russian Armored Vehicle Innovations," *OE Watch* Online, October 2015. "BTR 'Kurganets-25': The Little Brother of the New Infantry Fighting Vehicle," *Interpolit* Online, 9 September 2015, <[http://interpolit.ru/blog/btr\\_kurganec\\_25\\_mladshij\\_brat\\_novoj\\_boevoj\\_mashiny\\_pekhoty/2015-09-12-5605](http://interpolit.ru/blog/btr_kurganec_25_mladshij_brat_novoj_boevoj_mashiny_pekhoty/2015-09-12-5605)>, accessed 1 May 2016. Yuriy Belousov, "Only an Armata is More Awesome than an Armata," 3 July 2015, *Krasnaya Zvezda* Online, in Russian 03 July 2015, <<http://redstar.ru/index.php/newspaper/item/24718-kruche-armaty-tolko-armata>>, accessed 20 September 2015.

## Tank Troops

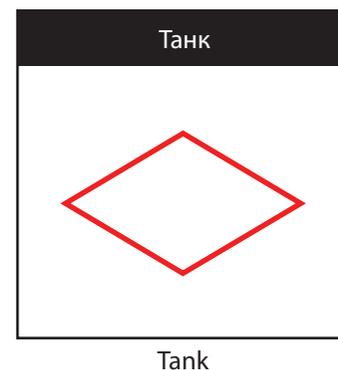
Tank Troops are a Branch of Arms, and the main strike force of the Russian Ground Forces. They are used in conjunction with the motorized rifle units and perform the following tasks:

- In the defense – direct support of the motorized rifle units in repelling the enemy's offensive and the conduct of counterattacks and counterstrikes
- In the offence – deep strikes, development of success, and defeat of the enemy in meeting engagements and battles.

**Tank Characteristics**

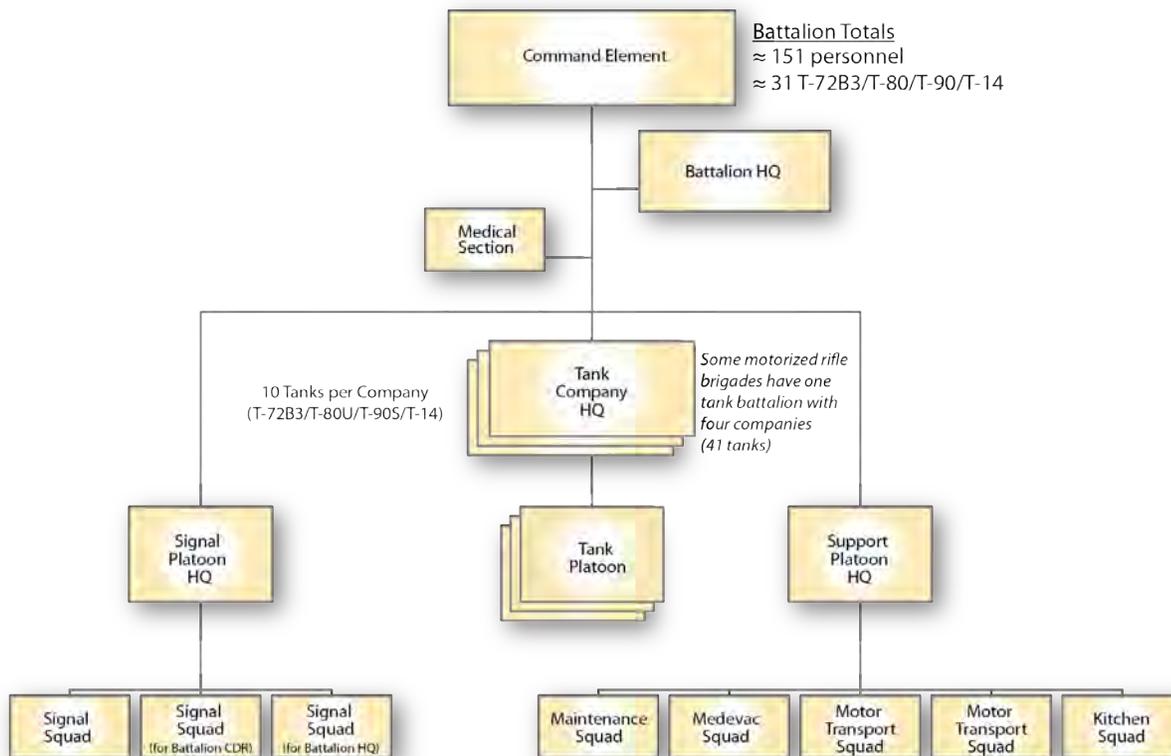
	T-72B	T-72B3	T-80U	T-90
System Weight (t)	41	45	46	46.5
Crew	3	3	3	3
Main Gun (mm)	125	125	125	125
Main Gun Ammo Load	39	45	45	43
Machinegun	PKT 7.62mm KPV 14.5mm	PKT 7.62mm KPV 14.5mm	PKT 7.62mm KPV 14.5mm	PKT 7.62mm KPV 14.5mm
ATGM	9M119 "Svir" (AT-11 Sniper)	9M119 "Svir" or 9M119M "Refleks"	9M119 "Svir" or 9M119M "Refleks"	9M119M "Refleks" (AT-11 Sniper-B)
Land Speed (kph)	60	70	70	60
Maximum Range (km)	500	500	335	550
Horsepower	840	1140	1250	840

Russian Tank Troops are found in tank brigades and divisions, and in the tank battalions of motorized rifle brigades. Armor units are resistant to the effects of nuclear weapons, provide good firepower and protection, and have high mobility and maneuverability. Russian armor capabilities enable them to lead active combat operations, day and night, independent of other elements. They can also overcome NBC-contaminated areas and surmount water barriers, and are able to quickly form a solid defense to successfully resist enemy attacks. In terms of modernization and capability development, Russia is improving organizational issues by continuing the development of combined arms doctrine using armor, enhancing the firepower, protection, and maneuver capabilities of existing weapons platforms (primarily T-72), and developing new systems.<sup>4</sup> It is important to note that Russians



<sup>4</sup> "Tank Troops," Ministry of Defense of the Russian Federation Website, <<http://eng.mil.ru/en/structure/forces/ground/structure/tank.htm>>, accessed 1 May 2016.

## Tank Battalion



do not view future war solely as counterinsurgency, counterterrorism and area control, but also consider high-intensity maneuver warfare as an equally likely form of future war. Despite economic difficulties since the collapse of the Soviet Union, the Russians have developed three new tanks and are fielding two (T-90 and T-14). In terms of the maneuver brigades, there is one tank battalion (31 tanks) in each motorized rifle brigade, and three tank battalions in each tank brigade. Some motorized rifle brigades have one tank battalion with four companies (41 tanks).

### The Armata Chassis and T-14 Tank

Russia has been experimenting with a common heavy tracked chassis for tanks, armored personnel carriers, infantry fighting vehicles, and other tracked vehicles standard in the Russian Ground Forces TO&E. The Russian Ground Forces took its first deliveries of T-14 tanks and T-15 heavy BMPs (mounted on the Armata chassis) early in 2015, and there have been unsubstantiated claims that the Armata entered serial production in March 2016.<sup>5</sup> If the Armata chassis proves successful,



Image Courtesy: Vitaly Kuzmin

<sup>5</sup> "Tanks A Lot: Russia's Advanced Armata T-14 'Already in Serial Production,'" *Sputnik Online*, 14 March 2016,

T-14



Image Courtesy: Vitaly Kuzmin

it could become the basis of many other Russian vehicle types.<sup>6</sup> Russia is considering the following Armata based variants:

- T-14 Tank
- BMP-T (T-15) infantry fighting vehicle
- BREM-T recovery vehicle
- USM-A1 general-purpose mine-laying system
- 2S35 Koalitsiya-S 152-mm self-propelled howitzer
- BMO-2 transport vehicle for shoulder-fired rocket-propelled flamethrower operators
- TOS BM-2 launch vehicle in a system for heavy rocket-propelled flamethrowers
- TZM-2 support vehicle in a system for heavy rocket-propelled flamethrowers
- MIM-A multipurpose engineer vehicle
- MT-A armored bridge layer
- UMZ-A general-purpose minelayer and obstacle clearer
- SPM special firefighting vehicle
- PTS-A amphibious transport vehicle.

<<http://sputniknews.com/russia/20160314/1036238101/russia-armata-production.html>>, accessed 20 March 2015.

<sup>6</sup> Charles K. Bartles, "Russia Considers Standardized Chassis for Most Tracked Vehicles," *OE Watch Online*, March 2015.

"Uralvagonzavod to deliver 20 new tanks and heavy infantry fighting vehicles in Feb-March," 28 January 2015, <<http://www.interfax.com/>>, accessed 1 May 2016.

Aleksandr Kurennoy and Aleksey Naryshkin: "Vyacheslav Khalitov, Deputy Director of the Uralvagonzavod Science and Production Corporation Open Joint-Stock Company for Specialized Technology," transcript of *Arsenal* radio program posted on *Ekho Moskvy Online*, 26 January 2015, <<http://m.echo.msk.ru/interview/detail.php?ID=1480668>>, accessed 1 May 2016.

The Russian Armed Forces consider the T-14 tank, a medium tank, as it weighs approximately 50 tons, but it has a chassis that supports approximately 65 tons, likely to allow for future modifications. The road wheels are reportedly based upon the T-80 tank. They were used because they were significantly lighter than the T-72 wheels (120 kilograms vs. 194 kilograms, resulting in an approximately one-ton savings in weight). The T-14 tank will be equipped with an adjustable suspension capable of adapting to varying relief, terrain type, and vehicle speed, resulting in increased speed while moving in columns, as well as over rugged terrain. The suspension system will also alleviate crew fatigue, while assisting the fire control system to deliver accurate fire while on the move. Unlike previous Soviet/Russian vehicles, crew safety (survivability) and comfort appear to be a concern. The crew is in an armored capsule that is somewhat roomy, compared to other Soviet/Russian tanks. The composite multilayered passive armor protection of the T-14 tank is built with steel made by electroslag remelting and is combined with new composites to protect it against the most advanced modern weaponry. It also has the Afganit active protection complex, capable of intercepting shaped-charged grenades, antitank missiles, and subcaliber projectiles.

**Tank Gun Characteristics**

	L/55 Rheinmetall	2A82-1M	2A83
Caliber (mm)	120	125	152
Tube Length (calibers)	55	56	52
Tube Length (mm)	6,250	7,000	7,200
Weight (kg)	3,200	2,700	>5,000
Tube Pressure (atm)	7,000	—	7,700
Muzzle Energy (mj)	12.7	15.24	>20
Muzzle Velocity (m/s)	1,700	—	1,980
Effective Range (m)	4,000	4,700	5,100
Sabot Penetration (mm)	800	1,000	1,100
ATGM Penetration (mm)	800	950	1,400
Effective ATGM Range (m)	8,000	8,000	20,000
Rate Of Fire (rounds/min)	6-8	12	15
Ammo Load	42	45	40
Auto Loader	No	Yes	Yes

The tank's main armament is the 2A82-1M 125mm smoothbore cannon, capable of firing high-powered munitions, including armor-piercing discarding sabot, guided missile, and shaped-charge, as well as other types. There are also plans to equip versions of the T-14 with the 2A83 152mm gun. This gun can fire a heavier projectile that has greater range, and is more powerful in terms of explosive and kinetic energy; and allows the firing of a larger barrel launched antitank guided missile (ATGM), which most modern Russian tanks and infantry fighting vehicles (BMPs) can fire.<sup>7</sup> The T-14 is equipped with the Chelyabinsk A-85-3A X-diesel engine capable of producing up to 1500 hp. The tank also has a Tank Information Control System (TICS), which monitors all assemblies and components, diagnoses malfunctions, and controls onboard systems, and will receive a new protection system.<sup>8</sup> One interesting

<sup>7</sup> Vladimir Tuchkov, "The Armata Penetrates One and a Half Meters of Armor," *Svobodnaya Pressa* Online, 24 November 2016, <<http://svpressa.ru/war21/article/161227/>>, accessed 19 December 2016.

<sup>8</sup> Charles K. Bartles, "Technical Specifications of Russia's T-14, 'Armata' Chassied Tank," *OE Watch* Online, March 2015.

"Can't Touch This! Russian Armata Tanks to Get New Active Protection System," *Sputnik* Online, 15 March 2016, <<http://sputniknews.com/military/20160315/1036302986/armata-active-protection-system.html>>, accessed 1 May 2016.

Sergey Ptichkin, "The Tank Maintains a Circular Defense: New T-14 Tank will Become the Sensation of the Year," *Rossiyskaya Gazeta* Online, 03 February 2015, <<http://www.rg.ru/2015/02/02/tank.html>>, accessed 1 May 2016.

## Tank Characteristics Comparison

	T-72	T-72B3	T-90
Entered service	1973	2013	1993
Crew	3 men	3 men	3 men
<b>Dimensions and weight</b>			
Weight	41 t	~ 45 t	46.5 t
Length (gun forward)	9.53 m	9.53 m	9.53 m
Hull length	6.86 m	6.86 m	6.86 m
Width	3.46 m	3.46 m	3.46 m
Height	2.19 m	2.2 m	2.23 m
<b>Armament</b>			
Main gun	125-mm smoothbore	125-mm smoothbore	125-mm smoothbore
ATGW		9M119 Svir or 9M119M Refleks	9K119M (AT-11 Sniper-B)
Machine guns	1 x 7.62-mm, 1 x 12.7-mm	1 x 7.62-mm, 1 x 12.7-mm	1 x 7.62-mm, 1 x 12.7-mm
Elevation range	- 5 to + 14 degrees	- 5 to + 14 degrees	- 6 to + 14 degrees
Traverse range	360 degrees	360 degrees	360 degrees
<b>Ammunition load</b>			
Main gun	39 rounds	45 rounds	43 rounds
Machine guns	2 000 x 7.62, 300 x 12.7	2 000 x 7.62, 300 x 12.7	2 000 x 7.62, 300 x 12.7
<b>Mobility</b>			
Engine	V-46 diesel	V-92S2F diesel	V-84MS diesel engine
Engine power	780 hp	1130 hp	840 hp
Maximum road speed	60 km/h	~ 70 km/h	60 km/h
Range	500 km	~ 500 km	550 km
<b>Maneuverability</b>			
Gradient	60%	60%	60%
Side slope	40%	40%	40%
Vertical step	0.85 m	0.85 m	0.8 m
Trench	2.8 m	2.8 m	2.85 m
Fording	1.2 m	1.2 m	1.2 m
Fording (with preparation)	5 m	5 m	5 m

<http://www.military-today.com/>

development is that plans to affix a tethered UAV to the T-14 tank. Due to the T-14's main gun having a range of up to 8km, but only a sighting capability of up to 5km, the advantages of the T-14 are not fully realized. A tethered drone would provide a field of view of up to 10km, and would allow the tank to sit in covered positions while surveying the battlefield. This line of development is in sync with other Russian developments to provide improved and decentralized C4ISR assets. These UAVs are also likely intended to be networked together to augment the "netcentric" warfare concept that the Russian Armed Forces are pursuing.<sup>9</sup> Russia plans on attaining 2,300 vehicles on Armata chassis by 2025, a prospect that seems unlikely considering past procurement endeavors and the state of the Russian economy.<sup>10</sup>

### Modernization of the T-72

Although there has been much hype about the introduction of the Russian T-14 tank, the bulk of Russia's armored power will still reside in the T-72 series of tanks.<sup>11</sup> This means that when considering the Russian Ground Forces' combat power, one should primarily focus on modernized T-72s, not T-14s, for the foreseeable future. Although Russia is adopting the T-14, at no time has it stated the desire to completely



Image Courtesy: Vitaly Kuzmin

<sup>9</sup> Aleksey Moiseyev, "They Will Equip the Armata with a Reconnaissance Drone," *Izvestiya Online*, 18 November 2016, <<http://izvestia.ru/news/645502>>, accessed 19 December 2016.

<sup>10</sup> Sergey Ishchenko, "Assault Tanks Will Support the Armata," *Svobodnaya Pressa Online*, 15 December 2016, <<http://svpressa.ru/war21/article/162629/>>, accessed 27 December 2016.

<sup>11</sup> Russia does have T-80s and T-90s in its inventory, but the vast majority of Russian tanks are T-72s.

replace its tank fleet with T-14s, and there have been pronouncements that the T-14s would only be found in the 1st Tank Army and the 20<sup>th</sup> Combined Arms Army. Although the T-72 will still be the backbone of most Russian maneuver formations. Current Russian T-72s are much different than the ones that rolled off the assembly lines when the system was first produced in the early 1970s. Russia has embarked on a massive modernization program for the venerable T-72 that involves a frame-off refurbishment of the chassis and the additions of new cannons, engines, machine guns, optics, stabilization systems, reactive armor, and electronics. After this modernization the T-72 is redesignated a "T-72B3," and is essentially a new tank. In terms of characteristics, the T-72B3 has much more in common with the T-90 than with older T-72s, and it is almost certain that that many T-72s can be refurbished for the price of one T-14.<sup>12</sup> The Russian media reported that Russia had upgraded approximately 1,000 T-72Bs to the T-72B3 standard, and there are plans to upgrade 300 more.<sup>13</sup>

### **Tank Combat Support Vehicle (BMPT)**

Russians consider tanks essential to warfighting, but in order for tanks to dominate the future battlefield, they must survive. One idea is that the BMPT Terminator could be reborn, but this time on an Armata chassis.<sup>14</sup> Despite the closeness of the acronyms, the BMPT is not classified by Russia as an Infantry Fighting Vehicle (BMP), but instead as a Tank Combat Support Vehicle (BMPT) [боевая машина поддержки танков (БМПТ)]; it is also sometimes referred to as a Combat Fire Support Vehicle (ВМОП) [боевая машина огневой поддержки (БМОП)].<sup>15</sup> The concept of a Tank Combat Support Vehicle is not a new one in the Soviet/Russian experience.

In theory, mechanized infantry, self-propelled artillery, and armored forces are mutually supporting. Artillery rains destruction onto the front and flanks as infantry personnel carriers and dismounted infantry protect tanks from enemy antitank systems and enemy infantry. Simultaneously, tanks protect the personnel carriers and dismounted infantry from enemy tanks and strong points. In practice, personnel carriers have problems keeping up with

<sup>12</sup> Charles K. Bartles, "More Bang for the Buck: The Modernized T-72," *OEWATCH* Online, February 2016. "Oldies but Goodies: Upgraded 'Invulnerable' T-72 Tanks Join Russian Army," *Sputnik* Online, 20 December 2015, <<http://sputniknews.com/russia/20151220/1032041217/russia-tanks-upgrades.html>>, accessed 15 January 2015. Oleg Valentinov, "With Tank Through Life: Servicing of Arms and Military Equipment Remains A Big Problem," *Voyenno-Promyshlennyi Kuryer* Online, 28 October 2015, <<http://www.vpk-news.ru/articles/27722>>, accessed 1 May 2016.

Dave Majumdar, "Russia's Cold War T-72 Tank Set for a Big Upgrade," *The National Interest*, 31 March 31, 2016, <[http://www.realcleardefense.com/2016/03/31/russia039s\\_cold\\_war\\_t-72\\_tank\\_set\\_for\\_a\\_big\\_upgrade\\_280588.html](http://www.realcleardefense.com/2016/03/31/russia039s_cold_war_t-72_tank_set_for_a_big_upgrade_280588.html)>, accessed 1 May 2016.

<sup>13</sup> "On the Order of a Thousand T-72B3 Tanks have been Modernized by 'Ulralvagonzavod,'" *RIA Novosti* Online, 9 September 2016, <[https://ria.ru/defense\\_safety/20160908/1476388731.html](https://ria.ru/defense_safety/20160908/1476388731.html)>, accessed 1 October 2016.

"The Armed Forces Will Receive More than 300 Modernized T-72B3 Tanks," *RIA Novosti* Online, 9 September 2016, <[https://ria.ru/defense\\_safety/20160909/1476498530.html](https://ria.ru/defense_safety/20160909/1476498530.html)>, accessed 1 October 2016.

<sup>14</sup> Expert "Alexei Xlotov: The Syrian War, The BMPT [Tank Combat Support Vehicle] and BAM [Combat Artillery Vehicle] on the Armata Chassis," *MyInforms* Online, 2 April 2016, <http://myinforms.com/ru-ru/a/16171669-ehkspert-aleksejj-khlopotov-o-sirijskojj-vojjne-bmpt-i-bam-na-baze-platformy-armata/>, accessed 1 May 2016. "Russia Unveils 'Terminator-2' Tank Support Vehicle" *Sputnik News* Online, 25 September 2013, <<http://sputniknews.com/military/20130925/183720985.html>>, accessed 10 April 2015.

<sup>15</sup> Lev Romanov, "Recall the 'Terminator,'" *Oborona*, March 2015, <<http://www.oborona.ru/includes/periodics/armament/2015/0216/180015213/detail.shtm>>, accessed 1 May 2016.

fast-moving tanks, their armor protection is too thin to survive at the point of the attack, and battle drills between tanks and mechanized infantry frequently break down due to the lack of sufficient team training prior to combat. Artillery fire may be on or off target, or too early or too late. The bottom line is that there is often too great a gap between the tanks and the mechanized infantry at the crucial point, and artillery may not bridge that gap.<sup>16</sup>

Despite the impressive technology and tactics, tanks still tended to separate from BMPs and artillery during the advance. The 1973 Arab-Israeli War proved the value of the RPG and antitank guided missile (ATGM) to the defender. Tanks had to fight as a combined arms team to survive, but could not afford to slow down and lose the momentum of the attack. The answer appeared to be better combined arms training. In the late 1980s, the Soviets began forming combined arms battalions, which had organic tanks, BMPs, and artillery. The combined arms battalion allowed units to train for mutual support continuously, instead of only during scheduled exercises. However, the combined arms battalion required seasoned commanders who could deal with the training, supply, and maintenance demands of this complex unit. Soviet junior officers were usually younger and less experienced than their Western counterparts when they commanded at various levels, although they tended to command longer during a career. The combined arms battalion experiment initially failed due to its complexity, internal turmoil in the army, and leadership challenges, but is now a well established institution in the Russian Armed Forces, being the most common formation type battling in Eastern Ukraine.



Image Courtesy: Vitaly Kuzmin

The proliferation of rocket-propelled grenade RPG-7 antitank grenade launchers and antitank missiles has complicated the task of tanks and mechanized infantry working together. The Soviet-Afghan War and the Chechen Wars emphasized the tactical gap for the Soviets and the Russians. The enemy was not modern, nor mechanized, nor arrayed in a defense in-depth. His RPG gunners knew where the soft spots were on the various Soviet/Russian vehicles.<sup>17</sup> The terrain worsened the problem of the tactical gap and, in the areas where the tanks could go, tanks and BMPs were often separated and unable to support each other. In the mountains of Afghanistan, tanks were often left behind and BMPs, and BTRs had to accomplish an independent mission they were not designed for. The Russians decided that the tactical gap between tanks and mechanized infantry is almost inevitable. The battle of Grozny on New Year's Eve 1994 provided the impetus to develop a heavily armored close combat system. The Russians discovered that the thinly armored ZSU 23-4 self-propelled anti-aircraft gun was the

<sup>16</sup> Lester W. Grau, "Preserving Shock Action: A New Approach to Armored Maneuver Warfare," *Armor*, September-October 2006, < <http://fmso.leavenworth.army.mil/documents/Preserving%20Shock%20action.pdf> >, accessed 10 April 2015. Much of the following seven paragraphs has been extracted from that article.

<sup>17</sup> Lester W. Grau, "Russian-Manufactured Armored Vehicle Vulnerability in Urban Combat: The Chechnya Experience," *Red Thrust Star*, January 1977.

Tank Combat Support Vehicle (BMPT) "Terminator-2"



Image Courtesy: Vitaly Kuzmin

optimum system for tank support in city fighting, but its vulnerability offset the efficiency of its four 23mm automatic cannons.<sup>18</sup>

To ensure the survivability of tanks, they needed a new system that was built like a tank, but provided mutual close combat support. The new system had to provide protection against enemy antitank weapons, infantry, strong points, helicopters, and fixed wing aviation.

It needed to be an integral part of the armored unit, but it could not be a modern T-35 with five turrets and multiple weapons. The Russian answer was the BMPT tank support vehicle.<sup>19</sup> It was not an infantry fighting vehicle (BMP), and the Russians were not discounting the value of mechanized infantry in the combined arms team. They were recognizing that the mechanized infantry may not be at the critical point at the critical time to support tank operations in traditional and urban combat roles. Russia's first BMPT was nicknamed the "Terminator," due to the anti-personnel capabilities of the system. It was built upon a T-72 or a T-90S tank chassis.<sup>20</sup> The BMPT has the armored protection, maneuverability, and ruggedness to maneuver directly with the tank platoon, has laminated and reactive armor, weighs 47 tons and carries a 5-man crew with a low-profile turret, housing a 30mm automatic cannon with a coaxial AG-17D grenade launcher, an AT-14 Kornet ATGM, and a 7.62mm machine gun.<sup>21</sup>

The most recent version of the BMPT has been renamed as a Combat Fire Support Vehicle (BMOP) and nicknamed the "Terminator-2." Despite the name change, the Terminator-2 fulfills the same role as originally intended, and was also built upon the T-72 or T-90S chassis. However, Russian Deputy Prime Minister Dmitry Rogozin, who oversees the Russian defense industries, suggests that the Terminator-2 could also be built upon Russia's newest heavy chassis platform, the Armata.<sup>22</sup> The Terminator-2 is primarily intended to destroy personnel, antitank grenade launchers and antitank missiles, but also has capabilities to destroy lightly armored vehicles, tanks, BMPs, fortified structures, and low flying aircraft. The system is equipped with dual 2A42 30mm automatic cannons with 1700 rounds of ammunition

<sup>18</sup> Dmitriy Litovkin, "Battlefield Combine. Tank Support Combat Vehicle to Enter Service Soon," *Izvestia Online*, 15 March 2005, <<http://izvestia.ru/news/300570>>, accessed 10 April 2015.

<sup>19</sup> Sergey Severinov, "Homeland Armor," *Red Star Online*, 10 September 2005, <[http://old.redstar.ru/2005/09/10\\_09/1\\_01.html](http://old.redstar.ru/2005/09/10_09/1_01.html)>, accessed 10 April 2015.

<sup>20</sup> Sergey Mikhaylov, "The Armed Forces Are on the Upswing: Marginal Polemical Notes on the Speech by CINC RF Ground Troops Colonel-General Oleg Salyukov," *Stoletiye Online*, 8 October 2014, <[http://www.stoletie.ru/obschestvo/armija\\_na\\_podjeme\\_129.htm](http://www.stoletie.ru/obschestvo/armija_na_podjeme_129.htm)>, accessed 10 April 2015.

<sup>21</sup> Russian Ministry of Defense, pp. 208-213. The Russians have developed a variety of thermobaric munitions for bunker busting, minefield clearing and artillery preparation. See, Lester W. Grau and Timothy Smith, illustrated by John Richards and Ivan Pavlov, "A Crushing Victory: Fuel-air Explosives and Grozny 2000," *Marine Corps Gazette*, August 2000, pp. 30-33.

<sup>22</sup> "Russia Unveils 'Terminator-2' Tank Support Vehicle" *Sputnik News Online*, 25 September 2013, <<http://sputniknews.com/military/20130925/183720985.html>>, accessed 10 April 2015.

capable of destroying lightly armored vehicles and low-speed air targets (2500 meters) and ATGM systems, personnel, and other unarmored objects (4000 meters); a PKTM 7.62mm coaxially mounted machine gun with remote loader and 2100 rounds of ammunition capable of destroying personnel and unarmored targets (1600 meters);<sup>23</sup> and two AG-17D automatic grenade launchers with 600 rounds of ammunition capable of destroying lightly armed targets (1400 meters). The BMPTs antitank capability comes from four Ataka-T guided missiles with general purpose (9M120-1F) and antitank (9M120-1) warheads (5000 meters).<sup>24</sup> These weapons can reportedly clear the enemy from a city block at a distance of three kilometers.<sup>25</sup> The Terminator-2 has a five-man crew consisting of a vehicle commander, gunner, driver-mechanic, and two grenadier gunners. It is designed to let the crew fight from the safety of the vehicle, and does not require any exiting for any weapons operation or routine reloading. All weapons systems are remote controlled, and there is an optical system to assist the weaponeers with target acquisition. The vehicle has an aerosol capability (presumably smoke) to obscure its location from target acquisition systems, and when lased, the commander's panoramic sight will acquire the offending laser to readily direct fires. The vehicle's chassis will also permit the vehicle to be mounted with mine or obstacle plows to facilitate maneuver.

Hopes for fielding the BMPT were dashed in 2010, when the Russian MoD announced that funding for it had been cancelled. Despite this setback, the manufacturer, *Uralvagonzavod*, did not give up and began to look for customers in the export market. In 2012, Kazakhstan, a country with a post-Soviet Army that somewhat resembles the Russian military in force structure and tactics, signed an agreement to purchase nine BMPTs on T-72 chassis, with deliveries starting in 2013.<sup>26</sup> Apparently, the BMPT was perceived as a great success, and in April 2014 Kazakhstan signed another contract with *Uralvagonzavod* to produce the BMPT in Kazakhstan under a licensing agreement.<sup>27</sup> In 2013, Rogozin's statement that the Terminator-2 could be built on the Armata chassis may be seen as evidence that the BMPT program was not cancelled by Russian MoD, but was instead put on indefinite hold until a new universal chassis was put into production.<sup>28</sup>

<sup>23</sup> Anatoli Antipov, "Tanks Need Support," *Red Star Online*, 22 December 2004, <[http://old.redstar.ru/2004/12/22\\_12/7\\_03.html](http://old.redstar.ru/2004/12/22_12/7_03.html)>, accessed 10 April 2015.

<sup>24</sup> "Russia Unveils 'Terminator-2' Tank Support Vehicle" *Sputnik News Online*, 25 September 2013, <<http://sputniknews.com/military/20130925/183720985.html>>, accessed 10 April 2015.

<sup>25</sup> Dmitriy Litovkin, "Battlefield Combine. Tank Support Combat Vehicle to Enter Service Soon," *Izvestia Online*, 15 March 2005, <<http://izvestia.ru/news/300570>>, accessed 10 April 2015.

<sup>26</sup> Kazakhstan Purchased Unique Tank Combat Support Vehicles from Russia, *Interfax-Kazakhstan Online*, 5 May 2012, <[http://tengrinews.kz/kazakhstan\\_news/kazakhstan-zakupil-rossii-unikalnyie-boevyie-mashinyi-195486/](http://tengrinews.kz/kazakhstan_news/kazakhstan-zakupil-rossii-unikalnyie-boevyie-mashinyi-195486/)>, accessed 10 April 2015.

<sup>27</sup> "In 2015, Kazakhstan will build BMPT 'Terminator,'" *Meta.kz Online*, 10 April 2014, <<http://meta.kz/novosti/kazakhstan/879813-v-2015-godu-v-kazahstane-nachnut-sborku-bmpt-171terminator187.html>>, accessed 10 April 2015.

<sup>28</sup> Anton Valagin, "Terminator on Armata Chassis Will Be Armed with Two Guns," *Rossiyskaya Gazeta Online*, 23 November 2016, <<https://rg.ru/2016/11/23/reg-urfo/terminator-na-baze-armaty-vooruzhat-dvumia-pushkami.html>>, accessed 19 December 2016.

Dr. Les Grau and Charles K. Bartles, "New System Preserves Armor Dominance of Future Battlefield: BMPT 'Terminator-2'" *Armor Online*, April-June, <[http://www.benning.army.mil/armor/eARMOR/content/issues/2015/APR\\_JUN/Apr-Jun\\_2015\\_edition.pdf](http://www.benning.army.mil/armor/eARMOR/content/issues/2015/APR_JUN/Apr-Jun_2015_edition.pdf)>, accessed 1 May 2016.

## Artillery Troops

The Missile and Artillery Troops is a Branch of Arms in the Ground Forces, which is the primary means of destroying the enemy by conventional and nuclear fires during conduct of combined arms operations. They are designed to perform the following main tasks:

- achieve and maintain fire superiority
- defeat of the enemy's means of nuclear attack, manpower, weapons, military and special equipment
- disrupt troops and command and control, reconnaissance, and EW systems
- destroy permanent defense installations and other infrastructure
- disrupt the enemy's operational and tactical logistics
- weaken and isolate the enemy's second echelons and reserve
- destroy enemy tanks and other armored vehicles that breach the defense
- cover open flanks and junctions
- participate in the destruction of enemy aircraft and the amphibious assault forces
- conduct remote mining operations
- provide illumination to troops maneuvering at night
- provide smoke screens and blind enemy targets
- distribute propaganda materials.

### Self-Propelled Artillery Characteristics

	2S5 "Giatsint-S"	2S1 "Gvozdika"	2S19 "Msta-S"	2S3 "Akatsiya"	2S9 "Nona"
Caliber (mm)	152.4	122	152.4	152.4	120
Max Range (km)	28.4-33	15.2	29	17.3-20	12.8
Rate of Fire (min)	5-6	4-5	7-8	3-4	8-10
Shell Weight (kg)	46	14.1-21.8	42.9-43.6	43.6	17.3
System Weight (kg)	28,200	15,700	42,000	27,500	8,000
Crew	5	4	5	4	4
Chassis	Object 123	MT-LB	T-80/T-72	Object 123	BRDM
Ammo Load	30	40	50	45	40
Set Up Time (min)	3	.3	2-2.5	.5	—
Unit of Fire	60	80	50	60	80

## Towed Artillery Characteristics

	2A18 "D-30"	2A65 "Msta-B"	2A19 "MT-12 Rapira"	2A36 "Giatsint-B"
Caliber (mm)	122	152.4	100	152.4
Maximum Range (km)	15.3	8.1	3	28.3
Direct Fire Range (m)	870	2130	1850	1530
Armor Penetration (mm)	450	350	400	350
Traverse	360°	54°	52°	50°
System Weight (kg)	3200	3100	2750	9500
Set Up Time (min)	2.5	1	2-2.5	4
Rate of Fire (min)	8	6	7	6
Tow Vehicle	Ural	MT-LB	KrAZ	KrAZ
Tow Vehicle Range	850	500	800	800
Crew	6	6	6	8
Unit of Fire	80	80	60	60

The Missile and Artillery Troops consist of missile, rocket, and artillery brigades, including high-power mixed units (tube and rocket), artillery battalions, rocket artillery regiments, and separate artillery reconnaissance battalions, as well as artillery units of combined arms brigades and military bases. In terms of modernization and capability development, the Missile and Artillery Troops will increase their capabilities by creating reconnaissance-fire units, including on interim basis; ensuring defeat of targets in real time; fielding more precision weapons; and increasing weapons' firing ranges, the power of the ammunition, and the automation of the processes for preparation and firing.<sup>29</sup>

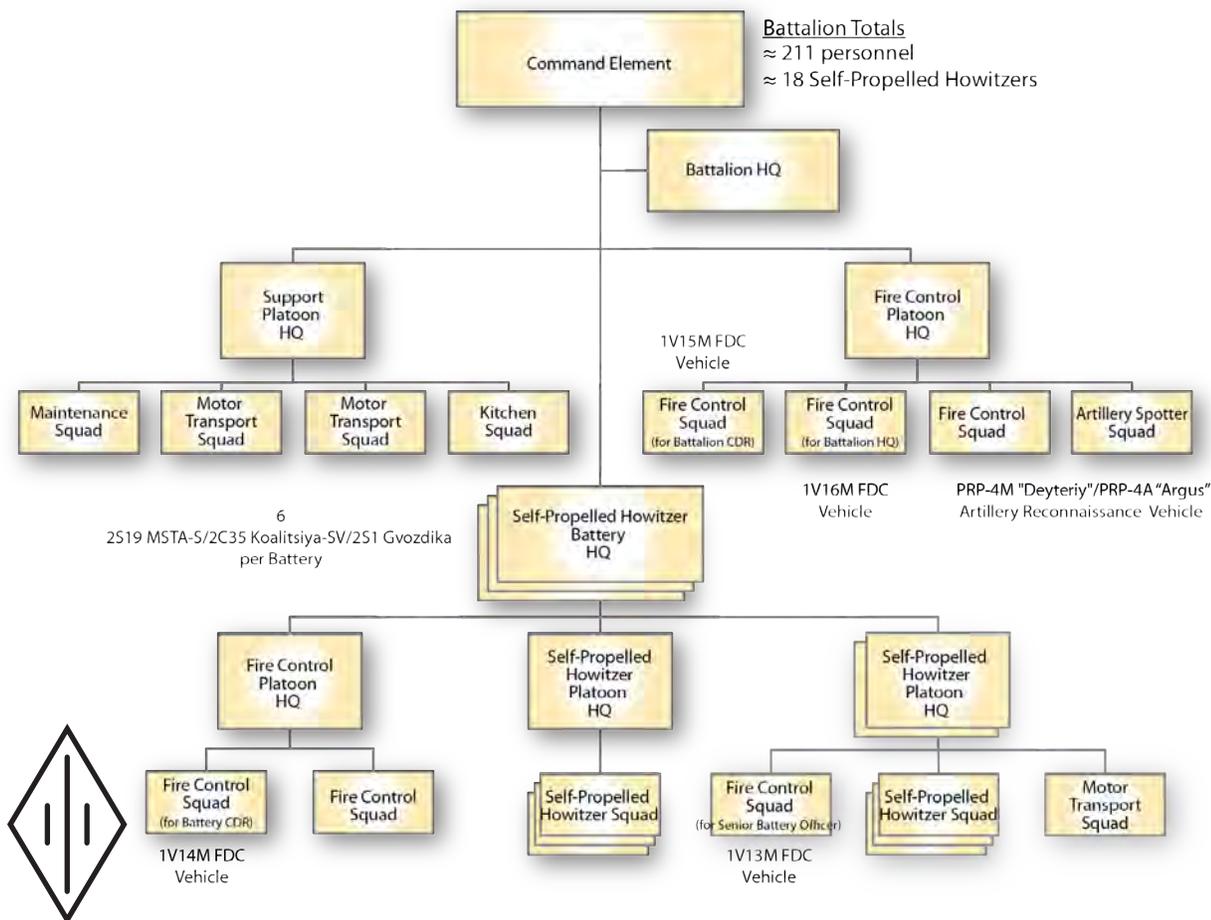
### Maneuver with Fire and Maneuver by Fire

Artillery has always held pride of place in the Russian and Soviet Armies. Imperial Russian Artillery officers enjoyed a reputation for intellectual and professional excellence above the other branches.<sup>30</sup> The Soviet Army was an artillery army with many tanks. The Soviets

<sup>29</sup> "Missile Troops and Artillery," *Ministry of Defense of the Russian Federation Website*, <<http://structure.mil.ru/structure/forces/ground/structure/rvia.htm>>, accessed 1 May 2016.

<sup>30</sup> Top graduates of the Artillery School were commissioned with seniority over graduates of the Infantry school and the Aristocratic Corps of Pages. Count Leo Tolstoy, the author of *War and Peace*, was a professional artillery

## Self-Propelled Howitzer Battalion



Msta-S



Image Courtesy: Vitaly Kuzmin

structured their army around artillery.

The Russian Army is also artillery-centric. Fire and maneuver is a common concept among militaries, as artillery fire removes or suppresses opposing enemy groupings, which allows the supported maneuver element (infantry or tanks) to advance simultaneously without incurring heavy casualties. The artillery is lifted and shifted shortly before the maneuver element closes with the enemy being pummeled by artillery

and direct fire.

Maneuver by fire is a Russian concept whereby fire is shifted from one target, line or sector without moving the firing positions of the artillery pieces. It is used in battle to cause mass destruction of important targets in a short period of time. All of the fires can be conducted officer who served in the Caucasus and at Sevastopol during the Crimean War. He authored technical papers on artillery issues as well as his more-famous literary works.

against one target simultaneously or conducted against that target and then other targets one after another. Maneuver by fire may also be used to redirect fire from one axis of advance to another.<sup>31</sup> In this way, the physical effects of artillery destruction may be maneuvered to achieve the effects of a maneuver force. Maneuver by fire is used to achieve fire superiority rapidly over an enemy while putting one's own artillery at risk; therefore, it is a massed artillery gambit. The Russian Army still believes in the efficacy and effectiveness of massing the effects of massed artillery fire to achieve maneuver and to support maneuver.

2S1 "Gvozdika"



Image Courtesy: Vitaly Kuzmin

### Brigade and Battalion Artillery

The post-Soviet Russian Army has undergone the most sweeping reform in over a century. The new-model Russian Army has restructured around the brigade. A motorized rifle (mechanized infantry) or tank brigade has four maneuver battalions, four artillery battalions, two air defense battalions, a logistics battalion, a maintenance battalion, a signal battalion, an engineer battalion, an electronics warfare company, an unmanned aerial vehicle (UAV) company, an NBC company and a medical company. The artillery battalions are two howitzer battalions, a Multiple Launch Rocket System (MLRS) battalion and an antitank artillery battalion.

Thirty-six 2S19 Msta-S 152mm self-propelled, tracked howitzers form the firing base of the modern brigade's howitzer battalions (eighteen in each battalion). The 2S19 was introduced into the Ground Forces in 1989, just before the collapse of the Soviet Union. It has seen action in the Second Chechen War and in the current fighting in Eastern Ukraine. It is built on the T-80 tank chassis and is powered by the T-72 tank engine. It has an automated fire control system, automatic loader, NBC protection system, passive night vision device for the driver, wading kit, dozer blade, smoke generator and 81mm smoke launchers and a generator. The

2S3 "Akatsiya"

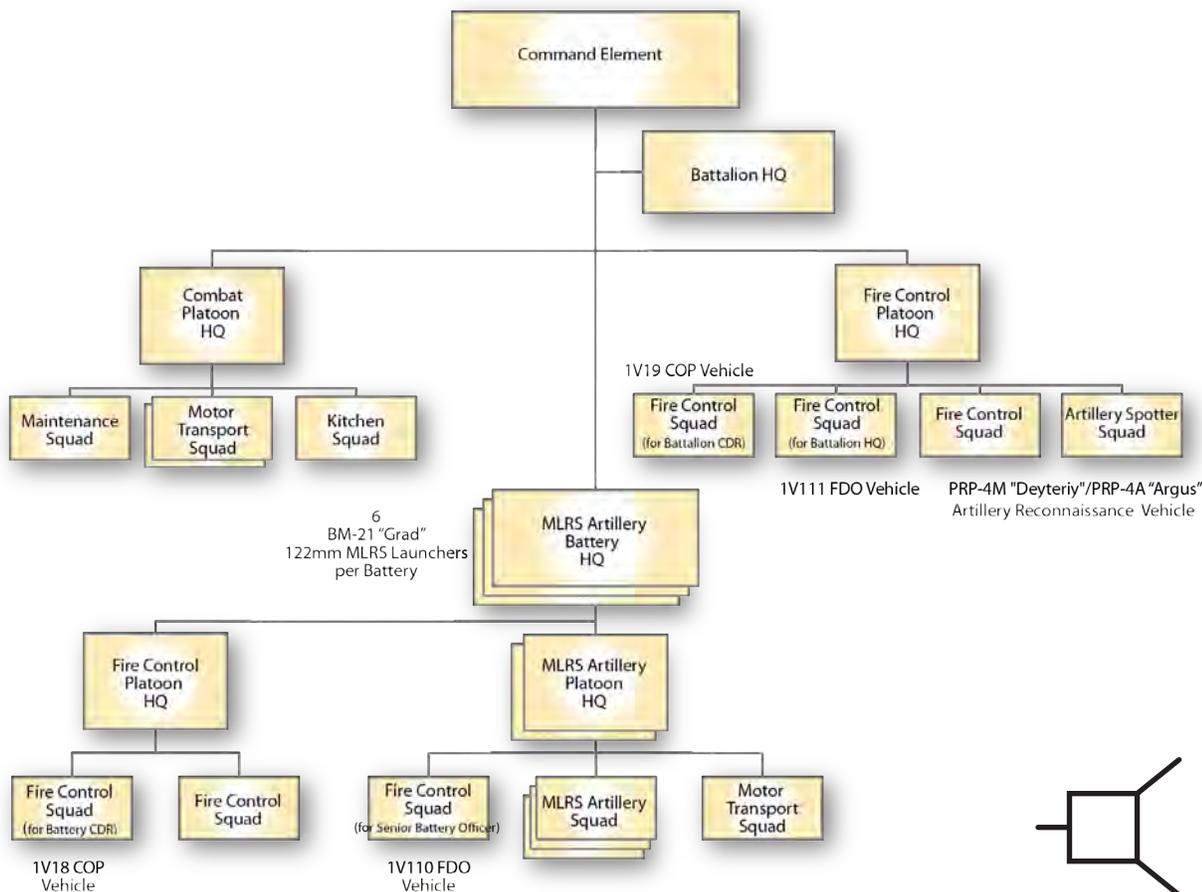


Image Courtesy: Vitaly Kuzmin

152mm barrel fires HE, HEAT-FS, HE-BB, HE-RA, smoke, chemical, nuclear, illumination and improved conventional munitions (ICM) rounds, as well as the laser-guided "Krasnopol" round. The 2S19 has been upgraded several times since its introduction, and is also produced in a towed, wheeled and export variant. It has a range of 29 kilometers (18 miles) using standard base-bleed ammunition and 36 kilometers (22 miles) using rocket-assisted ammunition. It can fire

<sup>31</sup> Institute of Military History of the Russian Federation Ministry of Defense, *Military Encyclopedic Dictionary* in two volumes [Военный Энциклопедический Словар в двух томах], Volume II, Moscow: Ripol classic, 2001, 27.

## MLRS Battalion



**BM-21 "Grad"**



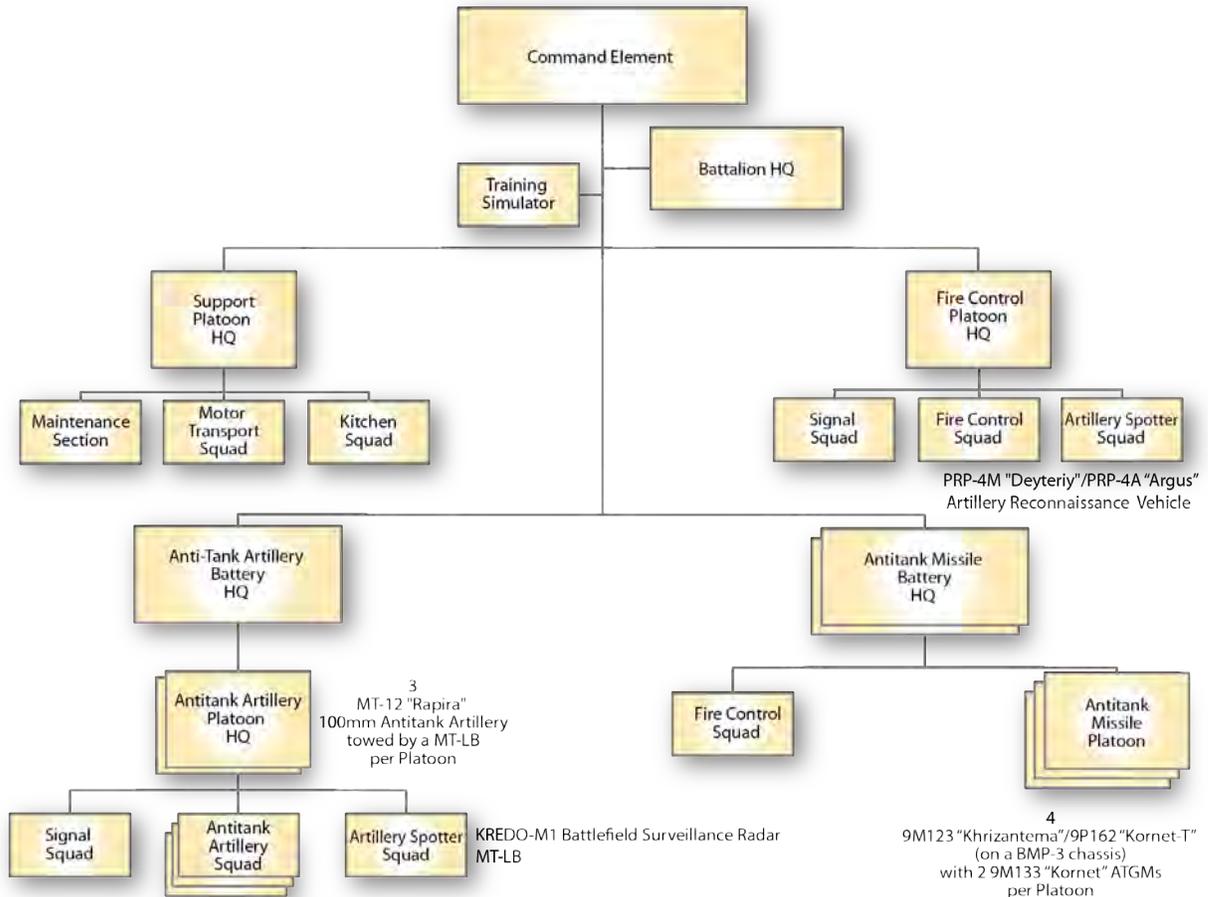
Image Courtesy: Vitaly Kuzmin

6-8 rounds per minute and has a main gun elevation of 4° to +68° and a 360° weapon's traverse. Some brigades may still have the older 2S3 self-propelled 152mm howitzers.

Eighteen truck-mounted BM-21 122mm MLRSs form the firing base of the brigade's MLRS battalion. Each one of these Grad launchers carries 40 122mm rockets, which can be launched individually or in salvo. The original rockets are capable of engaging targets up to 20 kilometers, and a 720 rocket battalion salvo impacts an area of approximately

10 square acres. The BM-21 is an old design that first appeared in the Soviet Army in 1963, and it is a veteran of combat from Vietnam to Ukraine. Russia has engaged in a number of improvements to enhance its capabilities. A new generation of rockets have increased ranges, are GPS/GLONASS-capable, and field a variety of warheads, including High Explosive (HE), smoke, radio jamming, mines, and cluster munitions. Some new rockets for the BM-21 Grad reportedly have a range of up to 45 kilometers.

## Antitank Battalion



The brigade MLRS battalions are being refitted with the 9A52-4 Tornado, built upon a Kamaz-63501 chassis, which will reportedly be able to launch rockets/missiles of any of the three Russian MLRS calibers. The BM-27 220mm Uragan rockets carries HE-FRAG, chemical, ICM or scatterable mine warheads out to 35 kilometers (22 miles). The BM-30 300mm Smerch rocket carries HE-FRAG, antitank and antipersonnel ICM and thermobaric warheads out to 90 kilometers (56 miles). The Tornado will, for the first time, use guided missiles, instead of unguided rockets, which will improve capabilities significantly.

The brigade's fourth artillery battalion is the antitank artillery battalion. It has an antitank artillery battery of six MT-12 Rapira antitank cannons and two ATGM batteries of six each 9M123 Khризantema or 9P162 Kornet-T tank destroyers, both of which mount two 9M133 Kornet ATGM launchers. The towed MT-12

9M123 "Khризantema"



Image Courtesy: Vitaly Kuzmin

antitank cannon fields a 100mm smoothbore cannon that has a six-man crew (commander, driver of the towing vehicle, gun layer, loader, and two ammunition handlers). When the MT-LB is used as the tow vehicle, 20 rounds are typically carried (10 APFSDS, 4 HE-Frag, 6 HEAT). The standard equipment consists of the panoramic PG-1M sight for indirect fire and an OP4M-40U telescope for direct fire. The APN-5-40 or APN-6-40 night sight is used for direct fire. The gun can be fitted with the LO-7 ski gear for travel across snow or swampy ground. The armored, tracked, amphibious Krizantera or Kornet-T antitank destroyers' 9M133 Kornet ATGM rails have a range of 100-10,000 meters. The Kornet is a laser-beam rider with a HEAT warhead designed to defeat reactive armor and a thermobaric round designed to defeat bunkers.

Each motorized rifle battalion has its organic artillery battery of eight 2S12 Sani towed 120mm mortars. In the Russian Army, mortars belong to the artillery and so all the mortar battery are branched artillery. The 2S12 has a range of 0.5 (.31 miles)-7100 meters (4.4 miles). It fires HE, smoke, illumination and incendiary rounds, as well as a laser-guided round and a rocket-assisted round which fires over 13 kilometers (8 miles). A trained crew can fire 15 rounds per minute.

2S12 "Sani"



Image Courtesy: Vitaly Kuzmin



### Mortar Characteristics

	2S12 "Sani"	2B14 "Podnos"	2B9 "Vasilek"
Caliber (mm)	120	82	82
Maximum Range (m)	7100	4270	4270
Minimum Range (m)	460	87	800
Traverse	10°	360°	60°
System Weight (kg)	210	42	662
Set Up Time (min)	3	1.3	2
Rate of Fire (min)	12	24	Cyclic
Base	Gaz-66	Portable	Gaz-66
Crew	5	4	4
Unit of Fire	48	120	300

2B14 "Podnos"



Image Courtesy: Russian Ministry of Defense

2S9 "Nona"



Image Courtesy: Vitaly Kuzmin

The 2S9 Nona tracked, lightly armored, amphibious, breech-loading 120mm mortar/cannon is incorporated in some motorized rifle battalions instead of the 2S12 Sani. The Nona also comes in a wheeled BTR chassis variant (2S23 Nona-SVK) and in a towed version (2B16 Nona-K). The system is unique in that this mortar/cannon has a direct-fire capability and has an antitank round available for it. When used as a cannon, it has a range of 13 kilometers (8 miles). The Nona may be replaced by the 2S31 Vena, which has been designed and tested but not put into full production. There is some speculation that the system is intended for the export market.

2B9 "Vasilek"



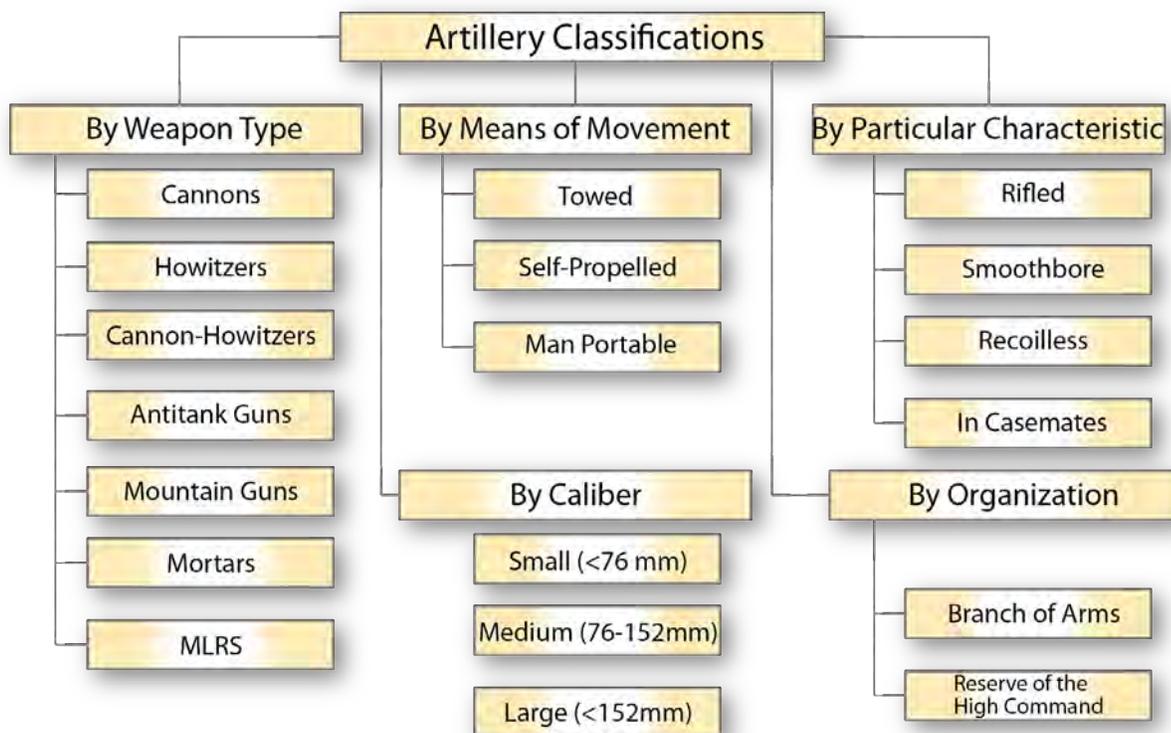
Image Courtesy: Russian Ministry of Defense

The advent of UAVs heralds a new age of Russian artillery, providing real-time, accurate targeting, fire adjustment and post-strike assessment. The UAV is an enabler, while artillery remains the all-weather means of Russian destruction and maneuver support. Currently the Russian Army is assigning a UAV company to each maneuver brigade. The brigade has four artillery battalions, but organic artillery can be reinforced with attached, reinforcing or supporting artillery from artillery or MLRS brigades from an Army Group. The UAV company is not assigned to any of the artillery battalions, but is a separate brigade unit, since the UAV company has several types of short- and medium-range UAV systems and a variety of UAV missions, including artillery support, EW and communications retransmission. A more detailed discussion can be found in chapter eight, "Russian UAV Developments."

MT-12 "Rapira"



Image Courtesy: Vitaly Kuzmin



**Russian Artillery Classifications**

**Artillery Terms and Concepts**

Although the Russians have precision-guided munitions for their artillery, they still believe in the effectiveness of massed artillery fire. Tactical EW systems may jam or prematurely detonate electronic VT fuses, but the mechanical fuses of conventional artillery rounds cannot be jammed by electronic signals. There are occasions that call for the use of surgical, precision fires, but massed artillery fires carry a mathematical probability of kill with which it is easier to predict tactical success. Artillery missions include annihilation, destruction, neutralization/suppression and harassment of a target. Missions are assigned according to the nature of the target, overall mission and type of target.

BM-30 "Smerch"



Image Courtesy: Vitaly Kuzmin

Annihilation [уничтожение] inflicts such losses or damage on a target that it completely loses its combat effectiveness. In the annihilation of unobserved targets, fire is conducted until a mathematically determined number of rounds are expended that assures a 70-90% kill probability of individual targets or the mathematical expectation of 50-60% of targets destroyed in a group target. The implication is that the target is so damaged that it cannot be reconstituted and is incapable of even token resistance.

Destruction [разрушение] puts a target into an “unfit” condition. It is so damaged that it cannot be reconstituted without a significant expenditure of time and resources, and is capable of only sporadic, uncoordinated resistance.

Neutralization/suppression [подавление] inflicts such losses and creates such conditions that the target is temporarily deprived of its combat effectiveness, its maneuver is restricted or prohibited or its control is disrupted. In neutralizing an unobserved group target, the expenditure of a norm of rounds assures the mathematical expectation of 30% of the targets destroyed. The implication is that the target is severely damaged, but would be capable of eventual coordinated resistance once the suppressive fire is lifted.

Harassment [изнурение] involves a limited number of artillery tubes and a specified number of rounds fired within a prescribed time to exert moral-psychological pressure on enemy personnel in defensive positions, in assembly areas, at control points or in logistics areas. Firing platoons or batteries normally conduct harassing fire from temporary firing positions or positions previously occupied by a larger artillery unit.<sup>32</sup>



Image Courtesy: Vitaly Kuzmin

Much of the terrain in which Russia may fight is fairly flat; consequently, it is difficult to get forward observers into good positions to spot artillery targets. Hence, Russian artillery planning involves the expenditure of significant amounts of artillery ammunition. Annihilation artillery missions against unobserved targets involve the physical removal of hectares. However, the availability of a UAV company may significantly diminish artillery ammunition expenditure. UAVs can identify targets, adjust artillery fire and perform post-strike damage assessments.

Artillery fire is further classified as fire against an individual target, fire concentration, standing barrage fire, defensive rolling barrage fire, successive fire concentration, offensive rolling barrage fire, and massed fire.<sup>33</sup> UAV support will prove most effective in supporting the first two classifications, since the rest are predetermined and fired against a schedule.

One of the problems with Soviet artillery was that it was not always able to conduct split-battery fires, since the battalion fire direction center could only conduct a limited number of fire missions simultaneously. Now, with improved communications and computer technology, split-battery fire is possible and common. Each battery now has its own fire direction center (FDC).

<sup>32</sup> G. E. Peredel'skiy and M. P. Pankov, *The Artillery Battalion in Combat* [Артиллерийский Дивизион в Бою], Moscow: Voenizdat, 1989, 20-21.

<sup>33</sup> Ibid.

### Positioning of Artillery

In the offensive, a howitzer battalion is commonly attached to or put in support of a maneuver battalion.<sup>34</sup> Howitzer battalions are also incorporated into Brigade Artillery Groups (BrAG), which include gun and multiple rocket launcher battalions. Surface-to-surface missile battalions (Iskanders and Tochkas) are not incorporated into BrAGs, but remain in support of the Army Group. In the defense, artillery battalions are more often placed in support of forward maneuver battalions.<sup>35</sup> Gun and howitzer batteries are positioned astride armored axes of approach in order to employ their direct fire capability. Mortar batteries and multiple rocket launcher batteries are located in areas inaccessible to tanks. Firing positions are located away from prominent features which would aid the enemy in registration. Intervals of 20-40 meters are maintained between guns, howitzers and mortars, while a 50-60-meter interval is maintained between multiple rocket launcher platforms.<sup>36</sup>



Image Courtesy: Vitaly Kuzmin

An artillery battalion has one primary and one or two alternate positions. A battalion may have a temporary firing position in the security zone, in defending a forward position, when conducting fire against distant targets or when acting as a roving battalion. Each battery has a primary and one or two alternate positions in a battalion area. In addition, a battery may have a temporary firing position when serving as a roving battery or duty battery.<sup>37</sup> Batteries normally shift positions following a fire mission.<sup>38</sup>

Artillery reconnaissance is conducted from the battalion artillery command/observation post (COP) and the battery COPs. Normally the artillery battalion commander collocates

<sup>34</sup> Attached artillery [приданная артиллерия] is directly subordinated to the commander of the force to which it is attached. Attached artillery is normally exclusive and fires only those missions assigned by the force commander. In an emergency, fire missions for a senior commander may be fired. Supporting artillery [поддерживающая артиллерия] is under the command of the senior artillery commander and fires assigned missions established by the combined arms commander. Thus, a supporting artillery battalion may be in support of several maneuver battalions, whereas an attached artillery battalion will fire exclusively for one maneuver battalion/brigade. Usually a supporting artillery battalion will be in support of one specific maneuver unit and will collocate its headquarters with that of the maneuver unit, but will take its firing mission from the senior artillery commander. V. Y. Lebedev, *Field Artillery Officer's Handbook* [Справочник Офицера Наземной Артиллерии], Moscow: Voenizdat, 1984, 8. UAV will doubtless be attached or supporting to artillery units in the same manner.

<sup>35</sup> Peredel'skiy, 10-11.

<sup>36</sup> Ibid, 18-19.

<sup>37</sup> Ibid, 194-195. A roving battery is used to engage targets of opportunity without disclosing the location of the main battalion firing positions. It moves after firing. It uses the battalion FDC and battalion and battery forward observers. Logically, it will use a UAV in a supporting role. A duty battery is the fire unit designated to return enemy artillery H & I fire, engage enemy reconnaissance efforts and ground probes, conduct harassing fire and serve as first responder when artillery is needed.

<sup>38</sup> Lester W. Grau, "Soviet Artillery Planning in the Tactical Defense," Soviet Army Studies Office, Fort Leavenworth, Kansas, September 1990, 11.

himself and his COP with the maneuver battalion command post. Battery commanders are often collocated with maneuver company commanders. The artillery battalion may also establish forward and lateral observation posts to provide complete observation. With sufficient time, artillery observation posts and supporting vehicles are dug in with overhead cover. Radio intercept and radar intercept provide target intelligence to the artillery. Sound-ranging platoons and ground reconnaissance patrols provide target locations as well.<sup>39</sup> The battalion FDC is located near one of the artillery batteries. The battalion chief of staff controls the battalion's fires, since the battalion commander is forward at the COP. Ideally the UAV operator control station for the medium-range Orlan-10 would be located with the battalion FDC, if its electronic signature does not attract enemy fire. The UAV operator control station for the short-range Granata-1 will probably be located with the battery COP.

### Revitalization and Downsizing the Reconnaissance-Fire Group

In the mid-1980s, the Soviets developed and fielded a first-generation reconnaissance-fire complex - a tactical range system linking a real-time reconnaissance/target designation/vectoring system with an intelligence fusion center and an FDC. In turn, this was linked to dedicated, precision weaponry which could destroy the target in near-real time. The targets were tactical nuclear delivery systems, self-propelled artillery and mortar batteries, FASCAM (family of scatterable mines) delivery systems, command posts, reconnaissance systems, aircraft parked on airfields and carrier decks and other high-value targets.<sup>40</sup> The reconnaissance-fire group (разведывательно-огневая группа) consisted of several artillery battalions, a dedicated artillery reconnaissance platoon, a group headquarters and often a helicopter. The assets normally came from division assets. With the brigade as the primary maneuver unit, this mission would now become a brigade mission. The UAV capability should greatly enhance the reconnaissance element for the BrAG.

2S4 "Tulpan" (240mm mortar)



Image Courtesy: Vitaly Kuzmin

### Artillery Fire Planning

On a map or plotting screen, Russian maneuver forces are depicted in red, enemy forces in blue and Russian artillery in black. Russian artillery planning initially identifies targets and plots them as artillery concentrations on the map or screen. The artillery concentration identifies the firing batteries and number and type of rounds required for each concentration. Then the concentrations are connected by lines. In the attack, these lines are fired consecutively to insure that no identified targets are missed or that they are fired at out of turn, giving the survivors the opportunity to recover and fight advancing maneuver forces. Artillery fire is further classified as fire against an individual target, fire concentration, standing barrage fire, defensive rolling barrage fire, successive fire concentration, offensive rolling barrage fire, and massed fire.<sup>41</sup>

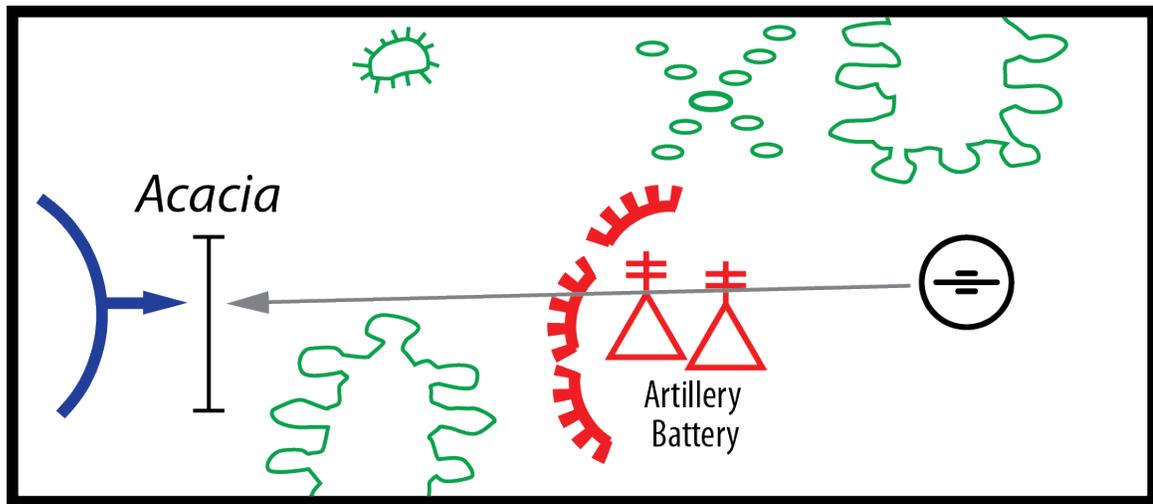
<sup>39</sup> A. I. Kirillov, V. P. Kuznetsov, V.I. Agafonov, *Preparation of the Reserve Officer* [Подготовка офицера запаса], Moscow: Voenizdat, 1989, 250.

<sup>40</sup> Ibid, 15.

<sup>41</sup> Peredelskiy, 10-11. Remainder of Artillery Fire Planning section is extracted from Peredelskiy, 20-32.



## Standing barrage fire

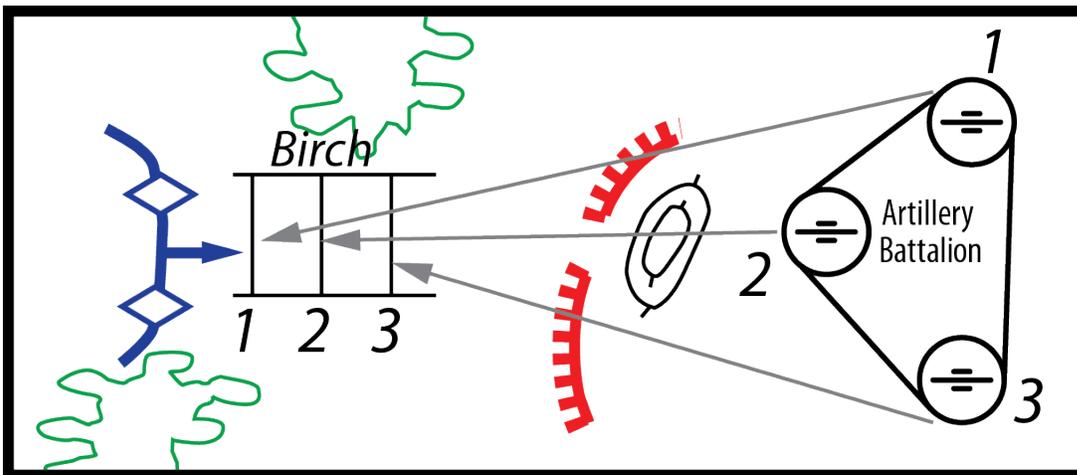


(Above) Standing barrage fire is a single wall of fire planned on an enemy axis of advance or counterattack axis. It is designed to inflict such casualties on the enemy so as to stop his advance, destroy his combat formation and create the conditions to facilitate the destruction of his antitank systems. Standing barrage fire is planned on avenues of approach and placed where it can be observed from command and observation posts. Sometimes, by necessity during the course of combat, they must be planned outside of direct observation. Standing barrage fires are fired by howitzer and cannon artillery, since the desired effect is a curtain of fire, not an area of destruction. The accompanying figure shows a standing barrage fire Acacia (standing barrages are named after flowers or trees) that is conducted by an artillery battery against an enemy axis of advance. A standing barrage fire is normally planned no closer than 300-400 meters in front of forward defending Russian soldiers, and its width is usually no wider than 50 meters per participating artillery piece. Thus, an 18-gun artillery battalion could have a standing barrage of up to 900 meters.

Protecting one's own troops from friendly artillery is an important planning factor. Charges are selected which provide minimum dispersion, mixed ammunition lots are not fired in the proximity of friendly troops and fragmentation rounds are fired in lieu of HE when close to friendly troops.

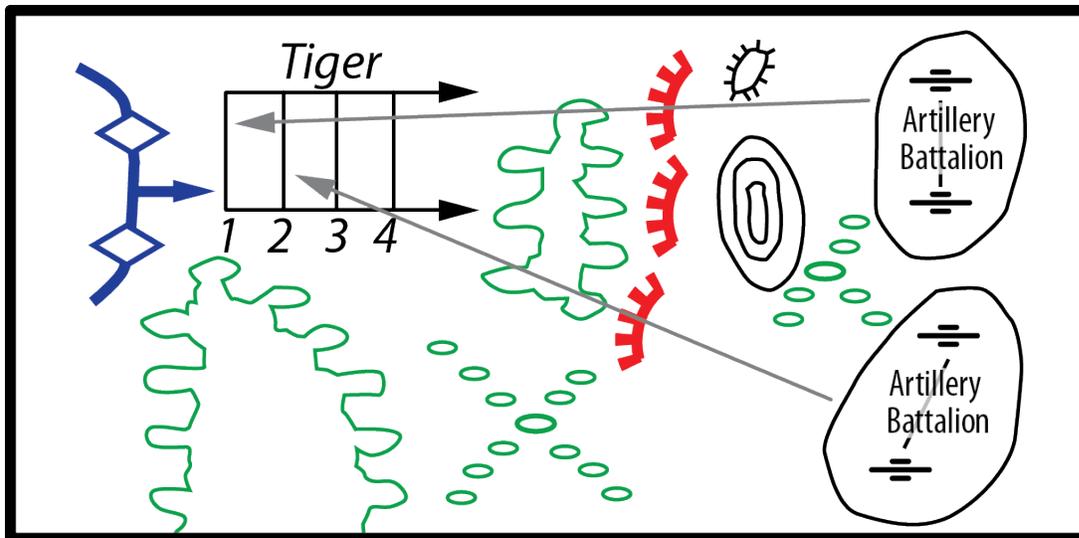
The Russians do not plan standing barrages along tree lines, hill crests, trench lines or the outskirts of populated areas, since an enemy approach to these features may not be detected and 60 -70 seconds will pass from detection to first round impact, allowing the enemy to advance 120-150 meters past these features. Consequently, standing barrage lines are planned 150-200 meters from these features. A standing barrage can consist of more than one line.

**A deep standing barrage**



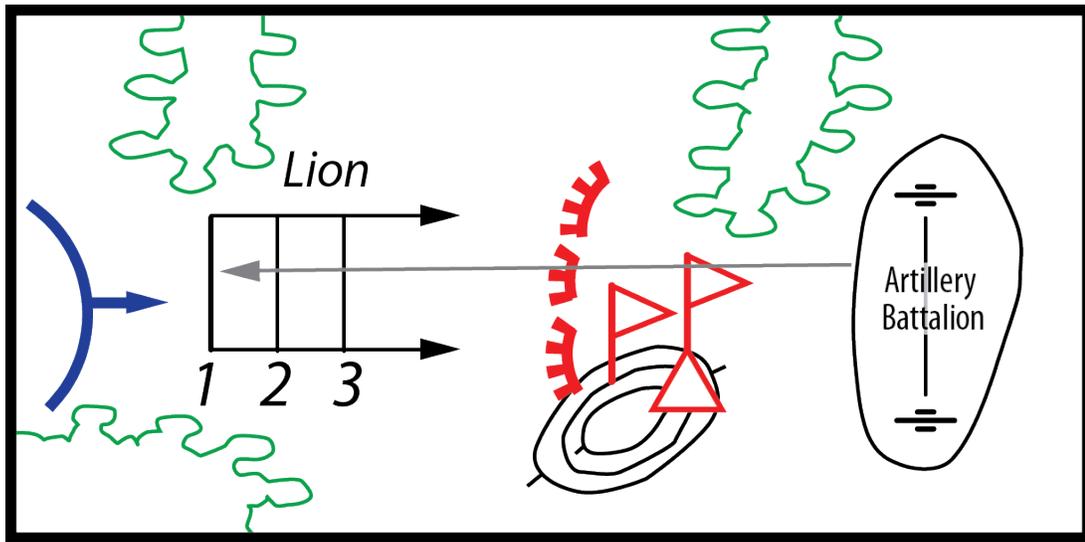
(Above) A deep standing barrage can be fired by a single howitzer battalion on a narrow approach (300 meters with an 18-gun battalion) or by several battalions on a regular approach. All the lines of the deep standing barrage are fired simultaneously and continuously throughout the duration of the fire mission. Line three is planned 300-400 meters from forward defending Russian soldiers. The deep standing barrage is named after a tree. The accompanying figure shows a defending artillery battalion firing a narrow deep standing barrage against an enemy on an armor axis of advance. Each battery is firing a separate line within the standing barrage.

**A double moving barrage**



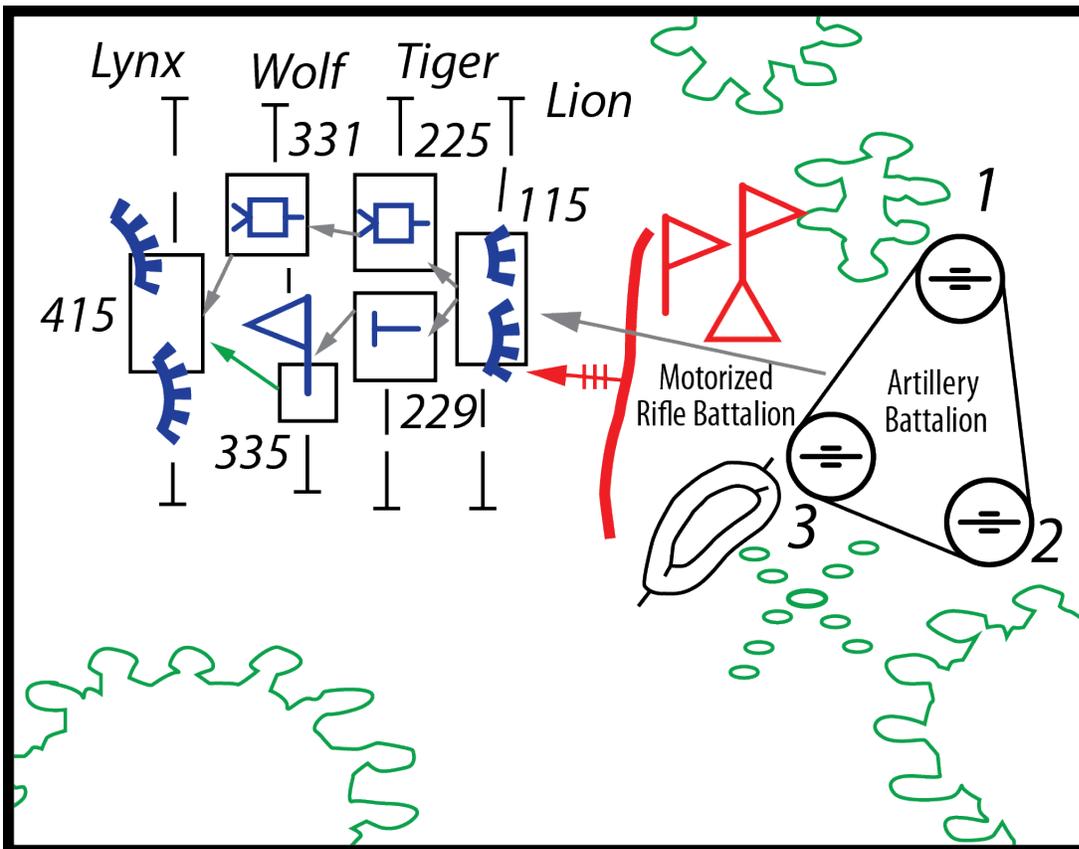
(Above) A double moving barrage may be planned, particularly on enemy armor avenues of approach. Figure 6 shows two howitzer battalions positioned to fire the Tiger moving barrage. As the enemy approaches Tiger, one artillery battalion will fire Tiger 1 and the other will fire Tiger 2 simultaneously. This will continue until the enemy column is exiting Tiger 1 or the enemy column is approaching Tiger 3. The lead battalion commander lifts and shifts the fires from Tiger 1 to Tiger 3. The second battalion commander will then follow his lead and shift to Tiger 4. Tiger 4 may become a standing barrage, reinforced with the fires of the lead defending motorized rifle or tank battalion. Both battalions are laid out for direct fire should the enemy penetrate the forward defenses.

## Moving barrage



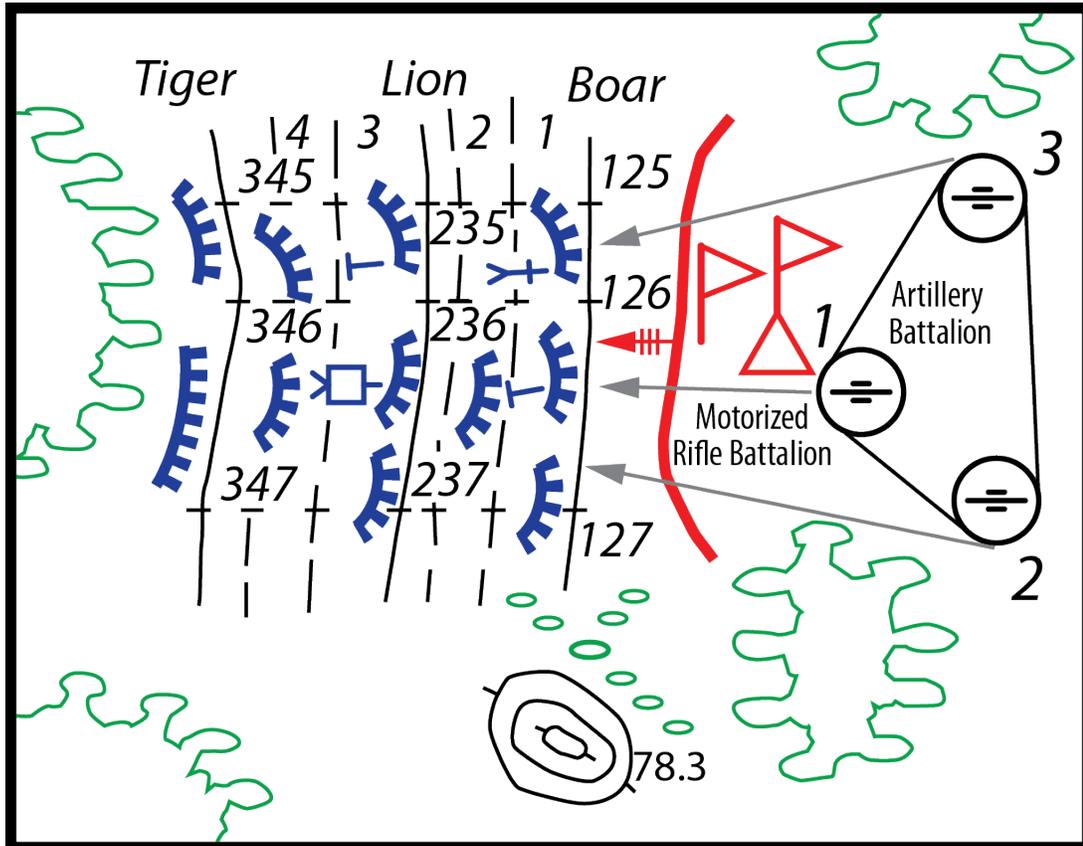
(Above) A moving barrage is located on an enemy axis of advance and named after a predatory animal. The lines are fired sequentially ("Lion 1", "Lion 2", "Lion 3"). The first line is 2-4 kilometers from the forward edge of one's own troops. At this point, the attacking enemy is expected to be moving in platoon column. The second line is 700-1000 meters from the forward edge of one's own troops at the point where the attacking enemy is expected to move from platoon column to attack formation. The last line is 400-600 meters from the forward defense and is that point where the enemy infantry will probably dismount for the assault. Danger close is 300 meters from one's own troops dug into prepared positions and 400 meters from one's own troops in a hasty defense. MLRS is not planned closer than 1000 meters from one's own troops. The moving barrage may have a standing barrage fire line positioned at the end of the moving barrage, or the last line of the moving barrage may become that standing barrage. The accompanying graphic shows moving barrage Lion planned on an enemy avenue of approach. The artillery battalion is positioned on line so that it can shift to direct fire in case of an enemy breakthrough. There is no standing barrage line at the end of the moving barrage, so Lion 3 will become the standing barrage line.

Successive concentrations of fire



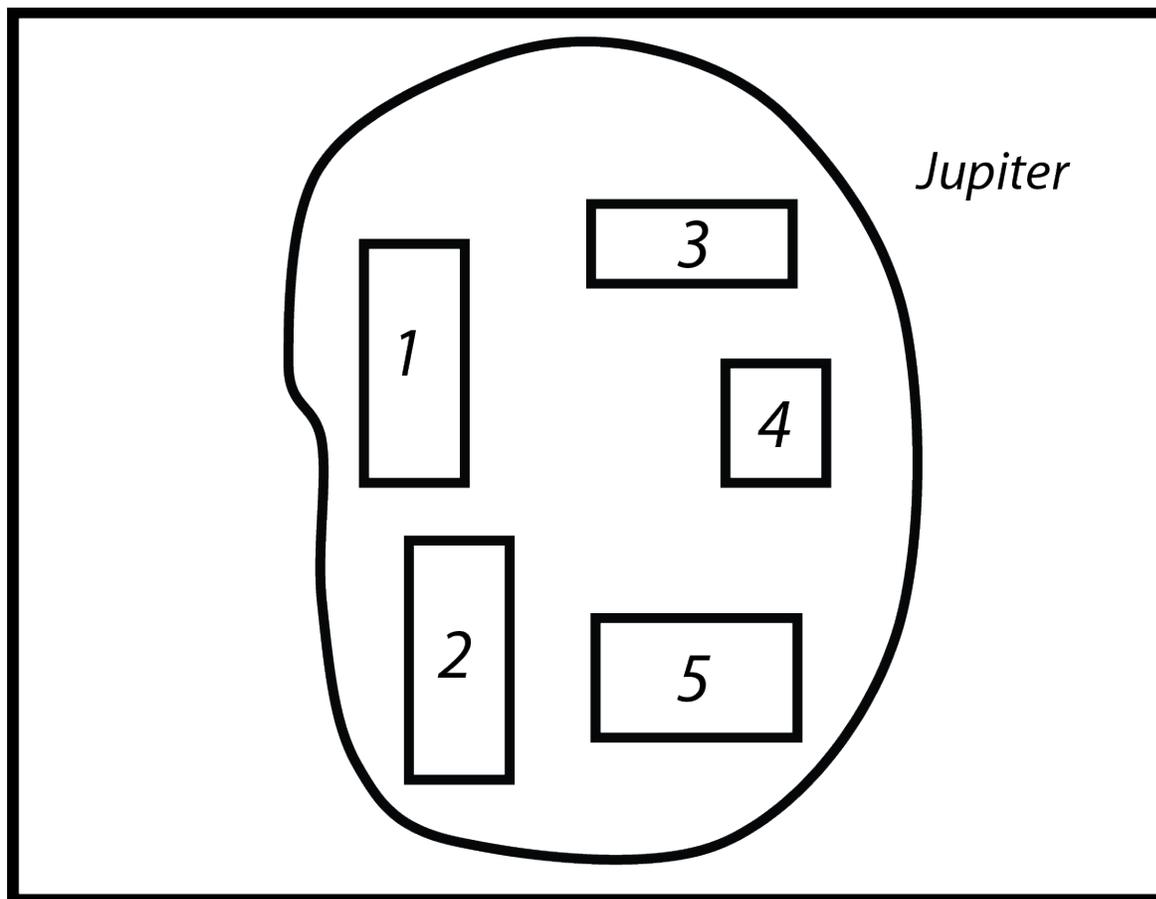
(Above) Successive concentrations of fire are planned on the axis and flanks of a Russian attack. Artillery planners plot artillery concentrations on defending enemy positions and systems and link them in firing lines. Each concentration is numbered and each firing line is named after a different predatory animal. The accompanying graphic shows an artillery battalion attached to a motorized rifle battalion attack. The artillery battalion will first destroy defensive positions in concentration 115 on Line Lion. It will then attack an ATGM position (concentration 225) and machine gun position (concentration 229) on Line Tiger. Subsequently it will attack another ATGM position (concentration 331) and a command post (concentration 335) on Line Wolf, and then attack company reserve positions (concentration 415) on Line Lynx. Targets that are discovered during the attack will be addressed during the course of the attack.

## Offensive rolling barrage



(Above) The offensive rolling barrage is used to support a Russian attack when the enemy is in a strong point defense or a fortified region that is well dug in, with ample trenches, communication trenches, bunkers and fortified fighting positions. The density of the defense hinders precisely determining the location of strong points. The offensive rolling barrage is a solid curtain of fire shifted ahead of attacking maneuver subunits to neutralize enemy personnel and weapons. One or two lines of fire can be fired simultaneously. The first line is planned along the first trench of the enemy defense. Intermediate lines are planned to neutralize the enemy located between the primary lines and to prevent his maneuver along communication trenches. The distance between intermediate lines (named after predatory animals) is 100-300 meters apart, depending on the enemy strength, positions, geography and expected rate of advance. The barrage is walked forward by incremental extensions of range. Each battery has a numbered section of the moving barrage that it is responsible for firing. Each artillery piece has a frontage of 15-25 meters, depending on its caliber. The barrage moves at least 500 meters in front of friendly forces and is designed to destroy the enemy in his positions. MLRS fire is conducted beyond the first wall so that it is no closer than 1000 meters to its own troops. The maneuver commander shifts the primary firing line when his troops reach the troop safety line. The artillery commander shifts the intermediate line at the end of the prescribed time for fire, which is normally 2-3 minutes. Due to the restricted frontages and anticipated ammunition expenditure, the offensive rolling barrage is normally an artillery brigade mission. This figure shows an artillery battalion supporting a motorized rifle battalion with a single rolling barrage where the enemy has a dense trench network. Artillery fire planners usually assign sector lines, which are solid black arrows to mark the area of fire and planning responsibility for the artillery unit. Black interrupted arrows depict additional areas of fire and planning areas that may be assigned under certain contingencies.

**Massed fire**



*(Above) The massed fire graphic is used to plan a simultaneous massed fire strike against an area target executed in a short period of time. Usually battery or battalion concentrations are plotted within the area of massed fire and the concentrations are numbered to correspond to the battalion (battery) assigned to the mission. Cannon/howitzer targets are indicated by rectangles and MRLS targets by squares. The massed fire graphic is designated by a planetary name. Number and type of rounds to be expended and the duration of the strike are assigned to each firing unit. This graphic is not widely used today, but can still be expected against high-value targets whose exact locations are unknown. This graphic shows a simultaneous fire strike by five cannon/howitzer battalions and an MRLS battalion. This massed fire strike is designated "Jupiter".*

## Artillery Fire Control

The Russian and Western systems for the command and control of artillery differ substantially. In the Russian system, the artillery commanders do not sit with their artillery pieces. Instead, artillery battalion and battery commanders are typically collocated with the supported maneuver commander in order to relay calls for fire to the artillery; or they are on the battlefield, calling for fire on targets of opportunity. Artillery commanders have Command Observation Post (COP) vehicles with appropriate communications, navigation, and sighting gear to fulfill this function.<sup>42</sup> The fire control for artillery units is provided by the chief of staff for battalions, and senior battery officer (the senior platoon leader) for batteries. These officers, not the commanders, are the ones actually collocated with the artillery, providing them with fire solutions. They man Fire Direction Center (FDC) vehicles to fulfill this function.<sup>43</sup> The FDC vehicles are similarly equipped as the COP vehicles, but are designed to function as FDCs, and so they usually have less or no sighting equipment, more fire control equipment, and may be on a chassis more suitable to functioning as a FDC, than a COP that is conducting artillery reconnaissance on the battlefield. The Russian Armed Forces use a variety of artillery fire control systems, but they all generally follow this described scheme, the following three systems, and their derivatives, are most common in the Russian Ground Forces.

### 1V12 “Kharkov” Artillery Fire Control System

The 1V12 Kharkov artillery fire control system is based upon the MT-LBu chassis, and is primarily designed to service self-propelled howitzer units. A battalion level set consists of eight vehicles: three 1V13 battery FDC vehicles, three 1V14 battery COP vehicles, one 1V15 battalion COP vehicle, and one 1V16 battalion FDC vehicle. The 1V12M Faltset artillery fire control system is a modernized version of the 1V12 Kharkov, and its constituent vehicles follow the same naming convention as the 1V12 Kharkov system, except with an “M” suffix (IV13M, IV14M, IV15M, IV16M).

IV13M Fire Direction Center Vehicle



Image Courtesy: Vitaly Kuzmin

The IV13 functions as the FDC for the battery, and is manned by the senior officer of the battery (typically the first platoon leader). It has direct radio communications with the battery COP (IV14), the battalion COP (IV15), and the battalion FDC (IV16).

The IV14 functions as the COP for the battery. The IV14 is typically collocated with the COP of

<sup>42</sup> Antitank artillery units typically do not align to this command and control scheme. This difference is likely due to the different role that antitank units fill in the Russian Armed Forces, and the fact that the antitank artillery does not need as sophisticated system for command and control since targets are generally within line of site. In terms of reconnaissance assets, most antitank artillery units have portable ground surveillance radars instead of artillery reconnaissance vehicles. These radars are appropriate for the antitank units’ primary mission, securing enemy high-speed avenues of approach.

<sup>43</sup> One of the differences between NATO-standard and Russian designed fire computation is that the NATO-standard circle has 6400 mils, while the Russian-standard has 6000 mils. The computing results of each will differ slightly due to this basic difference in standards.

the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery, or is on the battlefield calling for fire. It has direct radio communications with the battery FDC (IV13), the battalion COP (IV15), and the battalion FDC (IV16).

The IV15 functions as the COP for the battalion. The IV15 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery, or is on the battlefield calling for fire. It has direct radio communications with the battery FDCs (IV13), the battery COPs (IV15), and the battalion FDC (IV16).

The IV16 functions as the FDC for the battalion, and is manned by the battalion's chief of staff. It has direct radio communications with the battery FDCs (IV13), battery COPs (IV14), and the battalion COP (IV15).

### **1V17 "Mashina-B" Artillery Fire Control System**

The 1V17 artillery fire control system was developed to service towed and MLRS artillery units. Unlike the 1V12 system that has all vehicles built upon one chassis (MT-LBu), the IV17 uses several different chassis types. The BTR-60 chassis is used for the COP vehicles, the GAZ-66 chassis for the battery FDC vehicles, and a ZIL-131 chassis for the battalion FDC. In most units, these chassis have likely been upgraded to newer BTR-80, KamAZ, or Zil chassis as appropriate. A battalion level set consists of eight vehicles: three 1V110 battery FDC vehicles, one 1V111 battalion FDC vehicle, three 1V18 battery COP vehicles, and one 1V19 battalion COP vehicle.

The IV110 functions as the FDC for the battery, and is manned by the senior officer of the battery (typically the first platoon leader), on a BTR-60/BTR-80 chassis. It has direct radio communications with the battery COP (IV18), the battalion COP (IV19), and the battalion FDC (IV111).

The IV111 functions as the FDC for the battalion, and is manned by the battalion's chief of staff, on a Zil-131 chassis. It has direct radio communications with the battery FDCs (IV110), battery COPs (IV18), and the battalion COP (IV19).

The IV18 functions as the COP for the battery. The IV18 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery, or is on the battlefield calling for fire. It is built upon a GAZ-66 chassis, and has direct radio communications with the battery FDC (IV110), the battalion COP (IV19), and the battalion FDC (IV111).

The IV19 functions as the COP for the battalion, The IV16 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery. It is built upon a GAZ-66 chassis, and has direct radio communications with the battery FDCs (IV110), the battery COPs (IV18), and the battalion FDC (IV111).

IV110 Fire Direction Center Vehicle



Image Courtesy: Vitaly Kuzmin

**1V126 “Kapustnik-B” Artillery Fire Control System**

The 1V126 artillery fire control system was developed to service a variety of artillery systems for the domestic and export markets. The 1V152 is the designation for the battalion and battery COP vehicles, and is often mounted on a BTR-80 chassis. The 1V153 is the designation for the battalion and battery FDC vehicles, and is often mounted on a Ural-4320 chassis. The battalion COP and FDC vehicles can support up to four batteries, while the battery COP and FDC can support up to eight artillery pieces. The 1V126M Kapustnik-BM (1V152M, 1V153M) is a modernized version of the 1V126 Kapustnik-B. The 1V127 Kapustnik-C modification is designed for self-propelled artillery systems.

**Model of the IV126 Artillery Fire Control System**



Image Courtesy: Vitaly Kuzmin

The IV153 functions as the FDC for the battery, and is manned by the senior officer of the battery (typically the first platoon leader). It has direct radio communications with the battery COP (IV152), the battalion COP (IV152), and the battalion FDC (IV153).

The IV153 functions as the FDC for the battalion, and is manned by the battalion’s chief of staff. It has direct radio communications with the battery FDCs (IV153), battery COPs (IV152), and the battalion COP (IV152).

The IV152 functions as the COP for the battery. The IV152 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery, or is on the battlefield calling for fire. It has direct radio communications

with the battery FDC (IV153), the battalion COP (IV152), and the battalion FDC (IV153). The IV152 functions as the COP for the battalion. The IV152 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery. It has direct radio communications with the battery FDCs (IV153), the battery COPs (IV152), and the battalion FDC (IV153).

### **1V118 Reostat/1V119 Spektr Artillery Fire Control System**

The 1V118 Reostat/1V119 Spektr artillery fire control system was developed to service self-propelled, towed, and MLRS artillery and mortar units in Airborne (VDV) and Naval Infantry units. This system is built upon BMD-1 chassis. The 1V118 Reostat is the COP vehicle, while the 1V119 Spektr is the FDC vehicle. The 1V118-1 Reostat/1V119-1 Spektr is a modernized version of the 1V118 Reostat/1V119 Spektr artillery fire control system. The Russian Armed Forces are



Image Courtesy: Vitaly Kuzmin

currently testing the “Zavet-D” system as a possible replacement.

The IV119 functions as the FDC for the battery, and is manned by the senior officer of the battery (typically the first platoon leader). It has direct radio communications with the battery COP (IV118), the battalion COP (IV118), and the battalion FDC (IV119).

The IV119 functions as the FDC for the battalion, and is manned by the battalion’s chief of staff. It has direct radio communications with the battery FDCs (IV119), battery COPs (IV118), and the battalion COP (IV118).

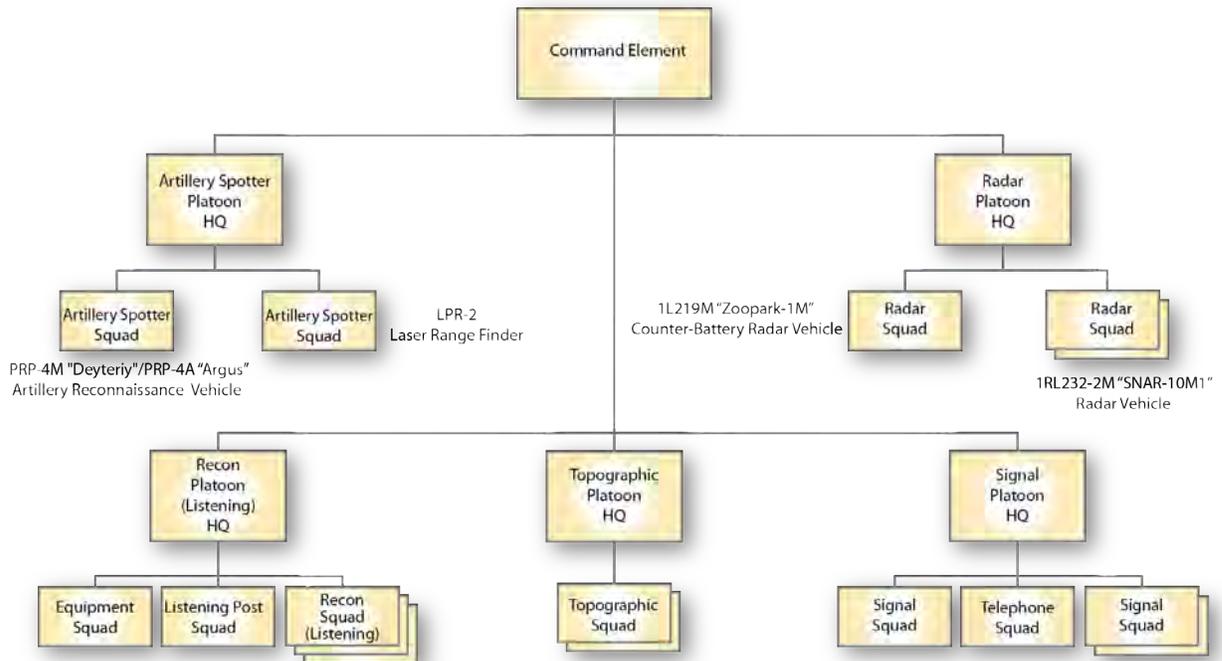
The IV118 functions as the COP for the battery. The IV118 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery, or is on the battlefield calling for fire. It has direct radio communications with the battery FDC (IV119), the battalion COP (IV118), and the battalion FDC (IV119).

The IV118 functions as the COP for the battalion. The IV118 is typically collocated with the COP of the supported maneuver unit commander so targets can be relayed from the supported unit to the artillery. It has direct radio communications with the battery FDCs (IV119), the battery COPs (IV118), and the battalion FDC (IV119).

### **Brigade-Level Artillery Fire Control & Reconnaissance Systems**

Maneuver brigades usually have a deputy commander for artillery. The brigade’s fire control battery [батарея управления и артиллерийской разведки] is commanded by, or reports to this officer. As would be expected, the fire control battery contains assets for detecting, determining coordinates, and the transmission of targeting data and orders. The typical configuration for brigade-level fire control batteries include platoons for: artillery spotting (PRP-4A Argus), radars (1RL232-2M SNAR-10M1 and 1L219M Zoopark-1), listening posts, geodesy, and communications. UAVs now regularly supplement artillery fire control, for a detailed discussion of this issue, see the “UAV Development” section in *Chapter 9*.

## Fire Control Battery



### PRP-4A "Argus" Artillery Reconnaissance Vehicle

Weight (tons)	14
Max speed on paved roads (kph)	65
Travel range along a paved road (km)	550
UTD-20S1 Engine (horsepower)	300
Optical-electronic detection range of a tank type target (km):	
During the day	≥8
At night	≥3
Detection range of a cool, tank type target under a camouflage net (km)	≥2
Radar detection range of a moving, tank type target (km)	≥12
Median error of target coordinates (m):	
Optical-electronic instruments	≤20
Radar	≤40
Set-up time (min)	2



Image Courtesy: Vitaly Kuzmin

The PRP-4A Argus artillery reconnaissance vehicle is used to conduct artillery reconnaissance of point and mass, fixed and moving, and open and camouflaged targets, and process, store and transmit this data to artillery units. It is equipped with optical, electro-optical, and radar sighting devices, a GLONASS enabled navigation system, and radios. The PRP-4A has two workstations and an equipment set for a remote observation post.<sup>44</sup>

<sup>44</sup> Yuriy Avdeyev, "The New Capabilities of Artillery Reconnaissance," *Krasnaya Zvezda Online*, 7 November 2016, <<http://www.redstar.ru/index.php/news-menu/vesti/tablo-dnya/item/31079-argus-neusypnyj-strazh>>, accessed 20 December 2016.

### 1RL232-2M “SNAR-10M1” Radar Vehicle

Weight (ton)	12.7
Crew	4
Field of view:	
Range (km)	2-40
Azimuth (degrees)	12-360
Moving target detection range:	
Personnel (km)	15
Tanks (km)	35
Shell/mortar detonation- ground surface (km)	10
Shell/mortar detonation- water surface (km)	20
Median error for moving target coordinates:	
Range (m)	10
Azimuth (degrees)	.12



Image Courtesy: Vitaly Kuzmin



The SNAR-10M1 is a battlefield surveillance radar vehicle used to locate moving ground and sea-surface targets. The SNAR-10M1 is designed to locate convoys, ground targets, sea-surface targets, and low-flying aircraft and UAVs. The system is also used to locate shell bursts in order to adjust friendly artillery fire. The SNAR-10M1 is equipped with modern radios and communications systems to facilitate the automated data transmission. It also has a GLONASS enabled navigation system and digital terrain map.<sup>45</sup>

### 1L120 “Kredo-M1” Portable Radar

Field of view:	
Range (km)	2-32
Azimuth (degrees)	12-180
Elevation (degrees)	±18
Detection range for moving targets:	
Personnel (km)	≤15
Tanks (km)	≤30
Trucks (km)	≤32
155mm shell detonations	≤10
Median error for moving target coordinates:	
Range (m)	25
Azimuth (degrees)	.3
Weight (kg)	51



Image Courtesy: Vitaly Kuzmin

The Kredo-M1 Portable Radar is designed for the detection of moving surface targets. It is also used to adjust friendly artillery fire, especially for antitank units. The Kredo-M1 is a man-portable system capable independent operation, but it can be networked with other systems.<sup>46</sup>

<sup>45</sup> “Russian SNAR-10M1 battlefield surveillance radar,” as found at: *Army Recognition*, <[http://www.armyrecognition.com/weapons\\_defence\\_industry\\_military\\_technology\\_uk/new\\_snar-10m1\\_1rl232-2m\\_battlefield\\_surveillance\\_radar\\_unveiled\\_at\\_oboronexpo\\_2014\\_in\\_russia\\_1408145.html](http://www.armyrecognition.com/weapons_defence_industry_military_technology_uk/new_snar-10m1_1rl232-2m_battlefield_surveillance_radar_unveiled_at_oboronexpo_2014_in_russia_1408145.html)>, accessed 20 December 2016.

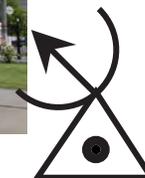
<sup>46</sup> “Kredo-M1,” as found at *Almaz-Antey* [The manufacturer’s website], <[http://www.almaz-antey.ru/en/catalogue/military\\_catalogue/1219/1242/1331](http://www.almaz-antey.ru/en/catalogue/military_catalogue/1219/1242/1331)>, accessed 20 December 2016.

## 1L219M “Zoopark-1M” Counter-Battery Radar Vehicle

Scanning Range (degrees)	90
Number of Targets Simultaneously Tracked	12
Set-up/Tear-down time (min)	5
Detection of Launch Position Range (km):	
Mortars	20
Field Artillery	15
MLRS	30
Tactical Missiles	40
Fire Correction Range (km):	
Mortars	22
Field Artillery	20
MLRS	35
Tactical Missiles	40



Image Courtesy: Vitaly Kuzmin



The Zoopark-1 counter-battery radar vehicle is designed to determine the coordinates of enemy artillery positions (field artillery, MLRS, mortars,) and tactical missile launch positions in order to provide targeting information for counterbattery missions, and to adjust friendly artillery fire. The Zoopark-1 can reportedly determine the coordinates of 60 batteries in a minute, and the position of a concealed mortar in an urban environment. The Russians consider the Zoopark-1 to be an equivalent of the AN/TPQ-36.<sup>47</sup>

## 1L271 “Aistenok” Portable Counter-Battery Radar

Field of view:	
Range (km)	.2-20
Azimuth (degrees)	360
Median error, subject to positioning deviance of no more than 3-5m (m):	
Mortar (ascending path)	30
Mortar (descending path)	200
Mortar (Point of impact)	30
Moving ground targets	40
Artillery shell burst	40
Minimum range for target detection (m):	
Mortar firing positions	750
Moving ground targets	200
Weight (kg)	135



Image Courtesy: Vitaly Kuzmin

The Aistenok is primarily a counter-battery radar designed to determine the coordinates of 81–120mm mortar firing positions and monitoring their flight trajectories. It is also capable of monitoring 122–155mm artillery shell bursts, and determining the coordinates of “tank” type moving surface targets.<sup>48</sup>

<sup>47</sup> Sergey Ptichkin, “Our Army Has the Best Artillery Reconnaissance Complexes in the World, but Cannot Effectively Utilize Them,” *Rossiyskaya Gazeta* Online, 2 October 2008, <<https://rg.ru/2008/10/02/zoopark.html>>, accessed 20 December 2016.

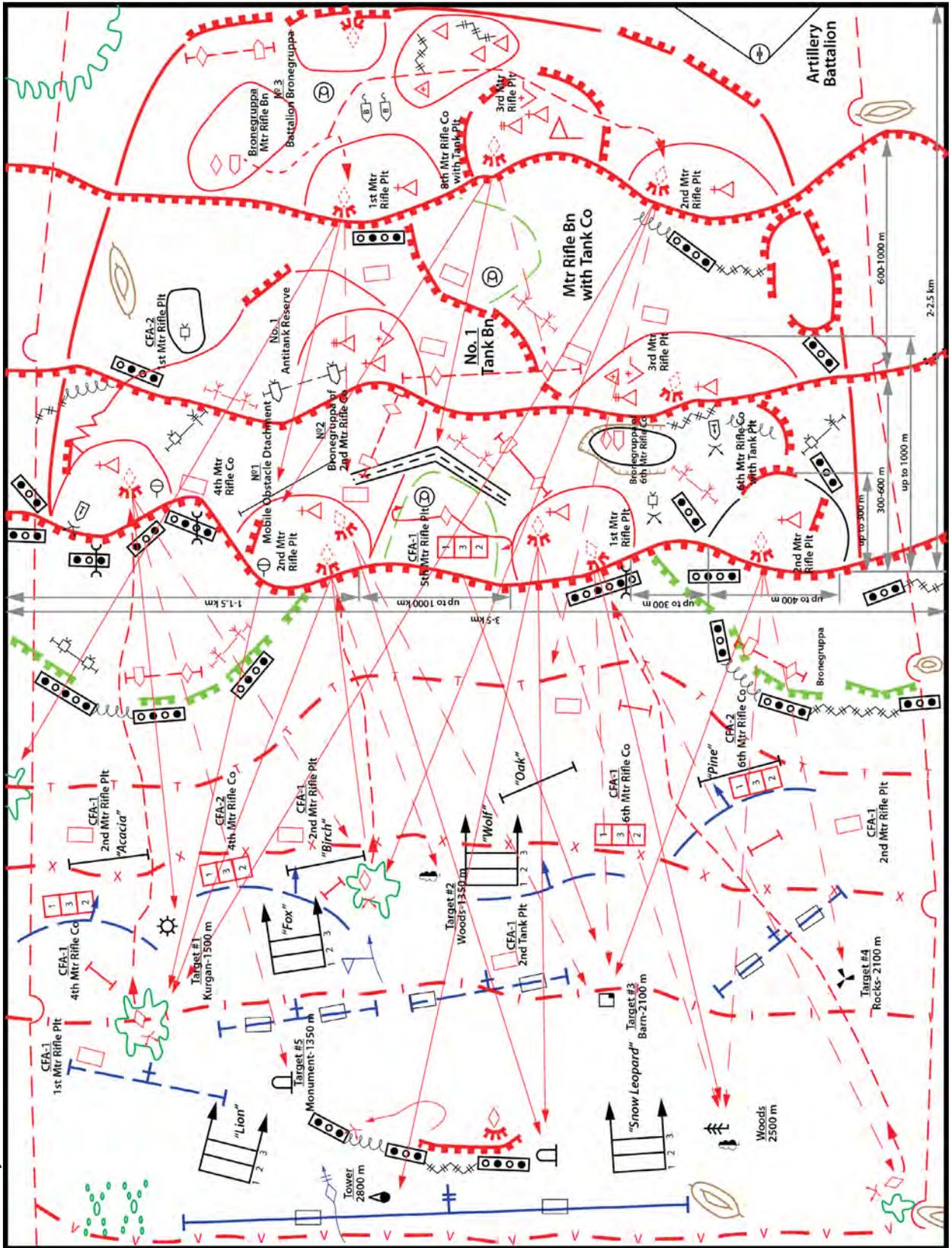
<sup>48</sup> “Syrian Army Receives Advanced Mobile Radar System from Russia,” as found at *SouthFront*, <<https://southfront.org/syrian-army-receives-advanced-mobile-radar-system-from-russia-photos/>>, accessed 20 December 2016.

*(Right) The graphic on the facing page shows a motorized rifle battalion in the defense, with the battalion scheme of fire and artillery plan incorporated on the same map. The planners have determined the coordinates and distance to various visual benchmarks within the security zone. These are used to determine company sectors of fire, as well as reference points for designated weapons systems that can engage them or nearby targets. The green positions are deception positions designed to disguise the true front-line trace and in-depth positioning. The deception front-line trace is held by a minefield, temporary positions for the AGS-17 grenade-launcher platoon, the bronegruppa, the antitank reserve and the reserve. The mortar battery is temporarily forward to cover the forward position in the forward defensive zone.<sup>49</sup> The battalion is defending, with two motorized rifle companies forward and one back. There is an attached tank company which has attached a platoon to each of the forward motorized rifle platoons and has a platoon in the security zone. This last platoon will join the bronegruppa upon withdrawal. Artillery planning has determined several possible enemy axes of advance throughout the security zone. The planners expect the enemy to move from company to platoon column at the limits of the security zone and have plotted some artillery concentration boxes on the expected deployment line. The battalion has the second echelon company forward holding the forward position in the security zone. The forward position is protected by a minefield and obstacles. The artillery planners have plotted moving barrages Lion and Snow Leopard on the flanks of the forward position to assist in its withdrawal.*

*The artillery planners have plotted artillery concentrations on the lines where they expect the enemy platoons to move from platoon column to platoon line. Concentrations for tank fire platoons are also plotted in red. The final dashed blue lines are where enemy troops are expected to dismount and form into assault lines. Moving barrages Fox and Wolf are plotted before and after this line. Sectors of concentrated company fire (divided into platoon sections) are plotted before the expected dismount lines. The artillery planners have plotted standing barrage lines Acacia, Birch, Oak and Pine between the expected assault lines and the forward deception positions. Behind the deception positions is the third minefield and forward edge of the defense. Should the enemy penetrate the forward defense, there is an antitank ditch, antitank reserve, bronegruppa, and the reserve firing lines, as well as a firing line from the brigade's tank battalion. At this point, the artillery will be firing missions within the fallen defensive area and may be deployed in a direct fire role. The artillery may also deploy to alternate or reserve firing positions.*

<sup>49</sup> This graphic shows a forward position in a rather shallow forward defensive area. The Russians prefer having a security zone of at least 15 kilometers depth. With a deep security zone, the mortar battery would deploy into it and have at least three firing positions. Artillery firing platoons or roving guns would also deploy into the security zone.

Artillery Fire Plan for the Defense



### **Artillery Modernization**

In the U.S. military, the infantry is often referred to as the “Queen of Battle,” but in the artillery-centric Russian Army, the artillery is often referred to as the “God of War.” In keeping with this theme, Russia has put a great emphasis on the modernization of artillery pieces to project combat power more effectively. In terms of tube artillery developments, Russia is pursuing two lines of effort. The first is the creation of a new howitzer, the 2S35 Koalitsiya-SV 152mm self-propelled howitzer. The Koalitsiya-SV is a new howitzer design, with an unmanned turret, capable of firing 16 shells per



Image Courtesy: Vitaly Kuzmin

minute, allowing each Koalitsiya-SV to achieve the same effects as an artillery battery (with 6 howitzers) using older guns. Although it is currently mounted on a T-90 based chassis, there are plans for it to also be fielded on the Armata chassis. As with other technological innovations, it will be modified and used by other branches of service, namely the Navy’s Coastal Defense Troops. The Coastal Defense Troops are considering a wheeled variant that the Ground Forces is testing for use by “mountain” designated units. This capability, to be mounted on different chassis, suggests the Koalitsiya-SV is following the same design pattern as other Russian military combat vehicles, i.e., the turret may be attached to a variety of tracked and wheeled chassis, likely an innovation furthered for the benefit of the Russian Defense Ministry, but also as a selling point on the lucrative international arms export market.

Another Russian artillery combat vehicle innovation pattern is fielding a small number of new systems, while conducting a major refurbishment of existing systems. Unlike the U.S. system, Russia does not find a need to retire functioning equipment, but rather prefers to refurbish this equipment at a fraction of the price of purchasing new systems. Although these refurbished systems have less impressive capabilities as newly purchased systems, these refurbished assets are a great bargain and deliver more “bang-for-the-buck.” This institutional practice allows Russia to upgrade existing capabilities for a majority of the force, while buying a few expensive new technologies. Since Russia pursues a more “evolutionary” than “revolutionary” approach to arms procurement and utilizes only a few equipment manufacturers, there is substantial overlap in parts and components that are used in new and refurbished vehicles. This use of a combination of refurbished and brand new equipment does not cause the logistical headaches which would be expected from the increased production load list required for brand new systems using different parts and components. Thus, while Russia is preparing to field the Koalitsiya-SV, it is also modernizing its predecessor, the 2S19 (Msta-S) 152mm self-propelled howitzer, which reportedly boasts a firing rate of 10 rounds per minute and is designated the Msta-SM after refurbishment. Russian commentators have mentioned the possibility of these systems being capable of functioning in a “simultaneous fire assault” mode, a practice where both types of howitzers fire at different trajectories on the same target, causing the rounds to land on the target at

BM-27 "Uragan"



9A53 "Uragan-1M"



Images Courtesy: Vitaly Kuzmin

the same time. Russia's efforts to modernize tube artillery are in sync with efforts to develop a "reconnaissance-fire delivery system," a system for the rapid integration of targeting, fire control, and fires. As with other Russian developments, current innovations focus upon modularity and interoperability. The 9A53 Uragan-1M, a modernized version of the Uragan, has recently passed state trials. Instead of a rack of 16 rockets that the Uragan sports, the Uragan-1M has 2 pods of 6 rockets each. This pod system is intended to increase firing rates by speeding the replenishment process. The Uragan-1M will be reloaded by removing an empty pod and replacing it with a full one, which is presumably quicker than loading one rocket at a time. In addition, a pod system will allow the "Uragan-1M" to fire rockets of varying calibers. This pod system is being incorporated into Russia's next generation of MLRS launchers, the "Tornado" family. One member of this family, the 9A52-4 Tornado, built upon a Kamaz-63501 chassis, will reportedly be able to launch pods of any of the three caliber types, albeit of fewer number for the larger caliber rockets.

Russian capability improvements have not stopped at material improvements, but also include doctrinal improvements. The Russian Army has been experimenting with the use of MLRS systems in direct fire roles and has recently changed doctrine (field regulations) for engaging observable targets from unprepared positions.<sup>50</sup> Russia is not only modernizing tube and MLRS platforms, but also pursuing modernization plans for automated command and control and fire control systems, with a keen interest in the integration of UAVs.

9A52-4 "Tornado"



Images Courtesy: Vitaly Kuzmin

<sup>50</sup> Charles K. Bartles, "Russia Increasing Already Robust MLRS Capabilities," *OE Watch Online*, January 2016. Sergei Ptichkin, "A Younger Katyusha," *Rossiyskaya Gazeta Online*, 20 November 2014, <<http://www.rg.ru/2014/11/20/katyusha.html>>, accessed 15 December 2014.

Ilya Shchegolev, "Bi-caliber MLRS "Uragan-1M" Passed State Tests," *Rossiyskaya Gazeta Online*, 24 August 2015, <<http://www.rg.ru/2015/08/24/uragan-site-anons.html>>, accessed 15 December 2015.

"Troops in Western Russia to be reinforced with 50 MLRS systems by year end," *Interfax-AVN*, 2 December 2015.

**MLRS Characteristics**

	BM-21 "Grad"	BM-27 "Uragan"	BM-30 "Smerch"
Caliber (mm)	122	220	300
Number of Rockets	40	16	12
Maximum Range* (km)	20.7	34	70
Minimum Range* (km)	—	—	20
Minimum Time To Fire All Rockets (s)	20	20	38
Rocket Weight (kg)*	66	280	800
System Weight (kg)	10,700	20,000	30,000
Crew	3	4	4
Chassis	Ural-375A	Zil-135	Maz-543A
Vehicle Speed (kph)	75	65	90
Reload Time (min)	3	3	2
Unit of Fire	120	48	24

\* With Standard Rockets

The end state of these endeavors is to acquire targets more rapidly and appropriately task decisive fires.

Another interesting aspect of Russian artillery developments is the topic of relative cost. Consider the Russian 152mm GPS/GLONASS-enabled artillery shell in relation to the U.S./NATO 155mm M982 Excalibur artillery shell. Reportedly, the Russian shell costs about \$1000, while the U.S./NATO shell costs about \$80,000 to manufacture. Issues of cost and affordability have always been top concerns in the Soviet, and later Russian, arms production cycles. In the Russian system, the cost of a given technology is one of the first criteria checked for feasibility, not the last. For Russia, it would be far better to use a less capable technology that can be used as desired than a more capable technology seldom used due to cost issues.<sup>51</sup>

<sup>51</sup> Charles K. Bartles, "Innovation, Cost, and Compromise Regarding the 'God of War,'" *OE Watch Online*, June 2016. "Advanced Self-Propelled Russian Rifle Gets Satellite-Navigated Shells," *Sputnik Online*, 24 April 2016, <<http://sputniknews.com/russia/20160424/1038522310/russiagunmissilesatellite.html>>, accessed 20 May 2016. "Fast and Accurate: Best-Kept Secrets of Russia's 'Sniper' Howitzer Revealed," *Sputnik Online*, 20 December 2015, <<http://sputniknews.com/russia/20151220/1032044882/russiahowitzerdetailsvideo.html>>, accessed 20 May 2016.

### The 9K720 Iskander System

Although Russian maneuver brigades do not have organic Short-Range Ballistic Missile (SRBM) systems, they can be expected to support maneuver brigade commanders in high intensity conflict situations. The Missile and Artillery Troops operate these systems in dedicated missile brigades at the Army Group level. The Iskander missile system is a significant improvement over its predecessors (Tochka and Oka) and fills an important niche in Russian force projection. Tactical and theater ballistic missiles are far more important for Russia than for the U.S./NATO. In general, Russia believes that the U.S./NATO will maintain air superiority, and so has heavily invested missile technologies to fill a niche that air power fills for the U.S./NATO. For similar reasons Russia has also heavily invested in EW and air defense capabilities.

In terms of capabilities, the Iskander missile system has little in common with its predecessors. The system is capable of not only transporting and launching two missiles, but also firing two different types of missiles. The Iskander, which Russia classifies as a tactical-operational missile system, can fire two SRBMs (SS-26 Stone) or two ground-launched cruise missiles (referred to as the R-500 or Iskander-K in Russian), and possibly could fire a combination of these missiles. These missiles can carry a variety of payloads weighing 480-700 kilograms, including cluster warheads (antipersonnel/antimateriel), fragmentation submunitions, area denial submunitions, HE, thermobaric, high explosive earth penetrators for bunker busting, and electromagnetic pulse, decoy, and nuclear warheads. The Iskander's missiles are reportedly compliant with the 1987 Intermediate-Range Nuclear Forces (INF) Treaty, but there are allegations that these missiles could be easily modified to violate the 500-kilometer lower limit of the treaty.<sup>52</sup>

Perhaps the biggest difference between the Iskander and its predecessors, is its accuracy. While the Circular Error Probability (CEP) of the Iskander's predecessors was often estimated in hundreds of meters, the Iskander reportedly has a CEP of 10-30 meters. The warheads have an inertial unit with a terminal guidance electro-optical seeker and topographic data for finding targets. Some versions reportedly have guidance systems capable of GPS/GLONASS satellite navigation and active radar and/or infrared imaging seekers. A CEP of 10-30 meters may not seem impressive in the days of GPS, but it is important to note that Russians believe that GPS/GLONASS signals will not be available (jamming, spoofing, or other denials of service) in a conflict with a peer such as the U.S. or China. Although the warheads equipped with GPS/GLONASS systems are likely to have a better CEP than their non-GPS/GLONASS-equipped brethren, Russia appears to be betting that these types of systems will only be feasible in an engagement with a less capable opponent.

Russia touts the capability of the Iskander's missiles to evade missile defense systems by being able to vary their flight paths and deploy various countermeasures. Russia has stated on several occasions that one purpose of the Iskander missile system is to destroy U.S.

"Packing a Punch: A Self-Propelled Gun That's Worth a Whole Battery," *Sputnik Online*, 22 November 2015, <<http://sputniknews.com/military/20151122/1030528826/russiakoalitsiyaartillery.html>>, accessed 20 May 2016.

<sup>52</sup> One of the Iskander's predecessors, the Oka, was decommissioned due to the provision of the INF Treaty that the missile range is limited to 500-5500 kilometers.

9K720 "Iskander"



Image Courtesy: Russian Ministry of Defense

strategic missile defense assets at their launch sites which are located in Eastern Europe. The first combat use of the Iskander was during the 2008 Russo-Georgian War. Iskander SRBMs armed with cluster and high-explosive warheads reportedly destroyed most of a tank battalion and an ammunition depot. The Iskander is forward deployed in the Kaliningrad enclave in Eastern Europe and has also been deployed to Syria.



Iskander brigades consist of three Iskander battalions, with each battalion having two Iskander batteries. Each Iskander battery has two transporter erector launcher (TEL) vehicles, two reload vehicles, a command and control vehicle, a maintenance vehicle, and a support vehicle. In total, an Iskander brigade has 51 vehicles, consisting of 12 launchers, 12 transporter-loaders, 11 command and control vehicles, 14 support vehicles, 1 servicing and maintenance vehicle, and 1 information preparation vehicle.<sup>53</sup>

Iskander is a tactical-operational artillery asset that can support the maneuver brigade through long-range fires and interdiction, but it also has a nuclear capability, which raises issues of area denial and possible conflict escalation whenever it is employed.

<sup>53</sup> Mikhail Barabanov, "Iskander the Great," *Moscow Defense Brief*, Issue #4, 2008.

Charles K. Bartles, "Russia Touts Roles, Capabilities, and Possible Targets for the Iskander," *OE Watch Online*, January 2015.

"America in Shock: All Europe in Iskander-M's Sights," *Zvezda Online*, 13 November 2014, <<http://tvzvezda.ru/news/forces/content/201411121543-iiyl.htm>>, accessed 1 May 2016.

## **Conclusion**

The Russians have continued to upgrade their artillery systems and bring new systems on line. Many of the improvements have been in the range, type and lethality of artillery ammunition. The Russians appreciate the potential for surgical strikes with precision munitions and have developed their own precision systems. However, they also believe that massed artillery fires will continue to hold pride of place in future maneuver combat and are effective when precision fires are not. Improvements in EW and the need to establish fire superiority at war's onset confirm their belief that quantity has a quality of its very own. Florent-Jean de Vallière (1667-1759), Director-General of the Battalions and Schools of Artillery, standardized French artillery sizes, making it less expensive and more abundant. On his largest cannon, the 24-pounder, was inscribed the Latin phrase "Ultima Ratio Regum." The Russians subscribe to this thought: artillery remains the "Last Argument of Kings."

**9K720 "Iskander" Conducting Launch Operations**



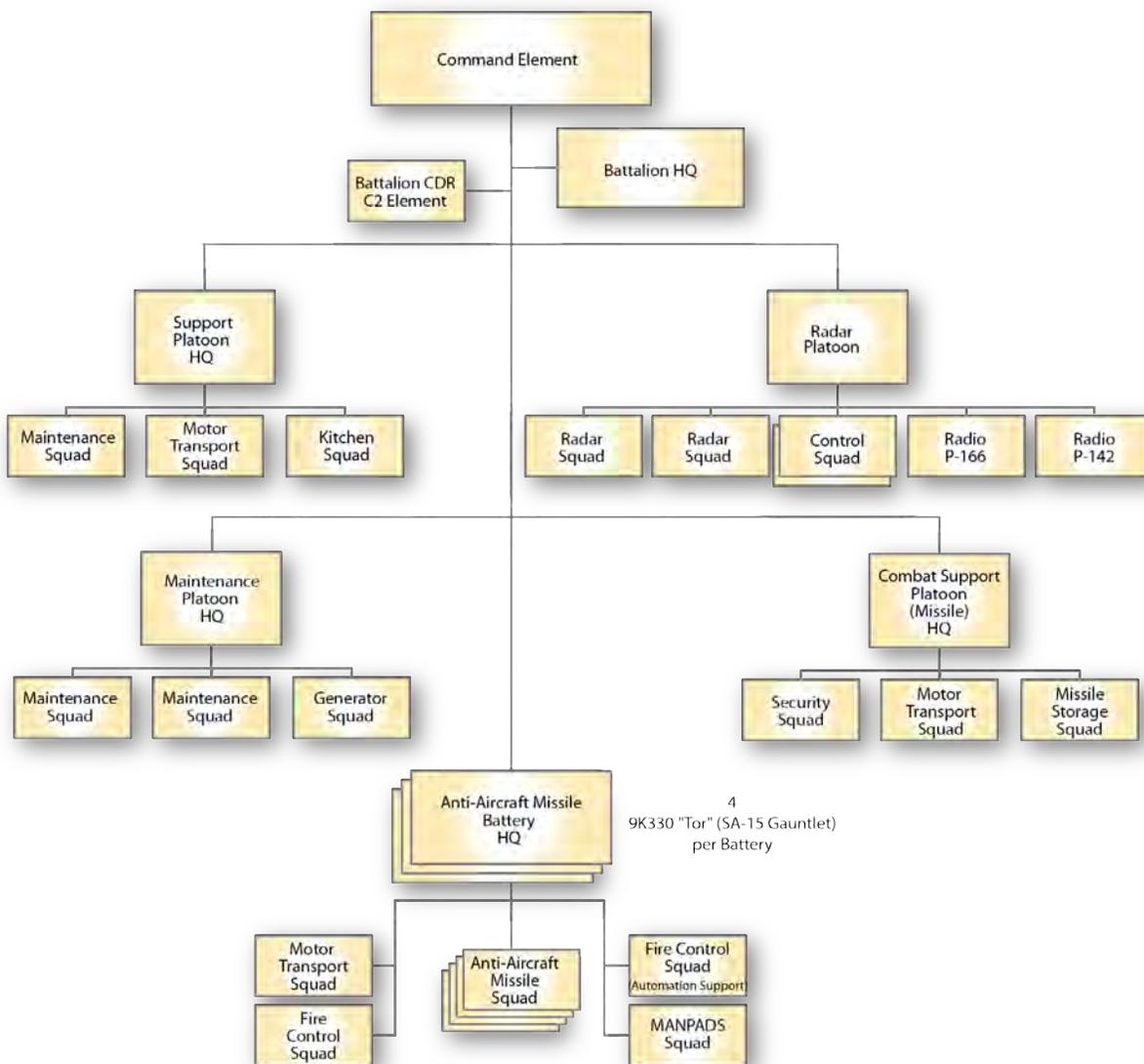
Image Courtesy: Russian Ministry of Defense

## Air Defense Troops

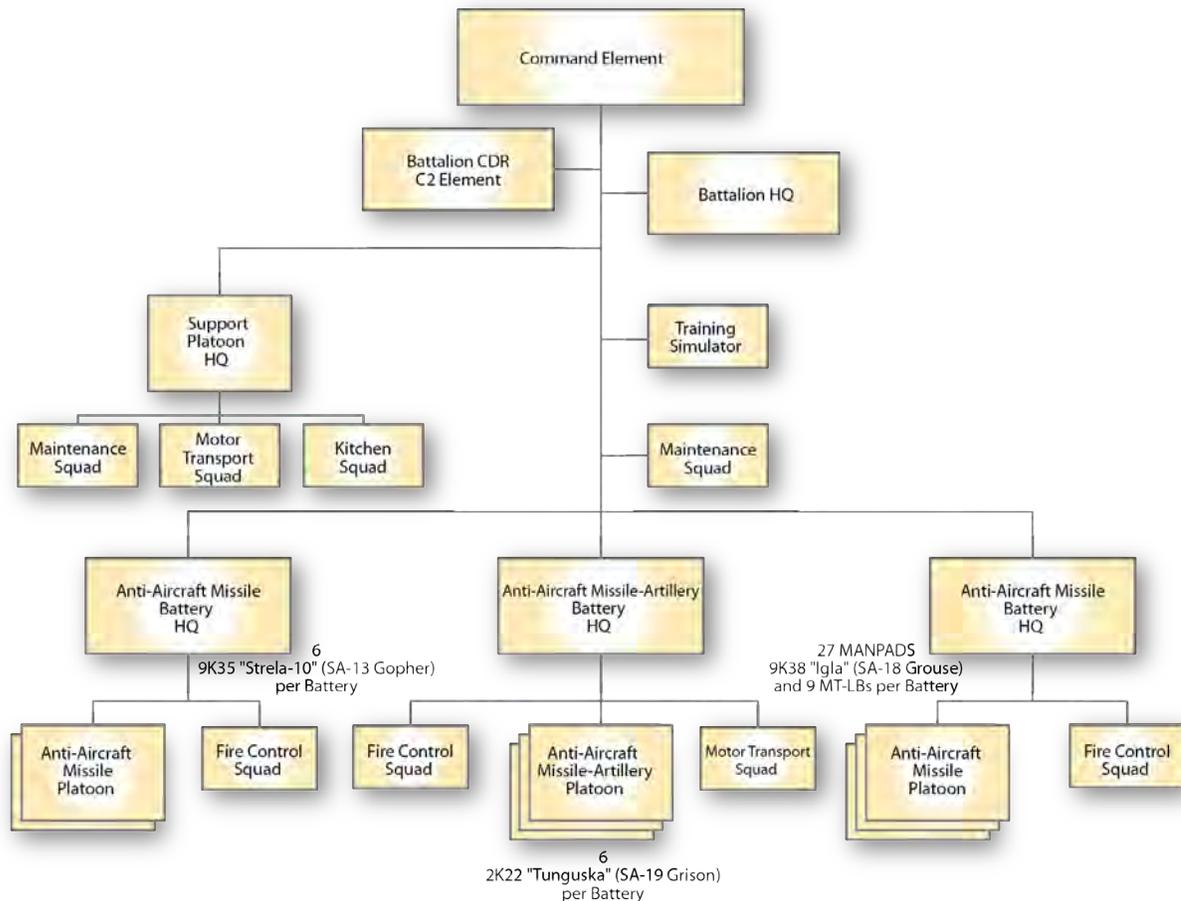
The Air Defense Troops are a Branch of Arms of the Russian Ground Forces. They are intended to protect troops and facilities from different means of air attack (strike aviation, cruise missiles, UAVs) in a combined arms combat environment and on the march. They perform the following tasks:

- air defense combat
- detection of enemy aircraft and warning the troops covered
- destruction of the means of an enemy air attack
- theater missile defense support.

## Anti-Aircraft Missile Battalion



## Anti-Aircraft Missile-Artillery Battalion



Organizationally, the Air Defense Troops consist of military control bodies, command points, anti-aircraft missile (rocket-artillery) and radio-technical formations, military units and subunits. They are capable of destroying enemy means of air attack throughout the range of altitudes: extremely low (up to 200 m), low (200-1000 m), medium (1000-4000 m), high (4000-12,000 m), and in the stratosphere (above 12,000 m), and at different flight speeds. The Air Defense Troops are equipped with anti-aircraft missiles, anti-aircraft artillery, anti-aircraft gun-and-missile systems and portable anti-aircraft missile systems. These systems have differing ranges, channeling ability and means of missile guidance. Depending on the range of destruction of aerial targets, they are divided into the systems of near range (up to 10 km), short range (up to 30 km), medium range (up to 100 km), and long range (more than 100 km). In terms of modernization and capability development, the Air Defense Troops are interested in improving mobility, survivability, covertness of operation, degree of automation, fire efficiency, expansion of denial areas, reduction of response times, and improvement of the weight and size characteristics of missiles.<sup>54</sup>

<sup>54</sup> "Air Defense Troops," Ministry of Defense of the Russian Federation Website, <<http://eng.mil.ru/en/structure/forces/ground/structure/vpvo.htm>>, accessed 1 May 2016.

Although there has been much discussion of Russia's long-range operational/strategic air defense assets (S-300, S-400, S-500, etc.) found in the Aerospace Defense Forces, the vast majority of Russian air defense assets are of the short-/medium-range variety and are found in the Air Defense Troops of the Russian Ground Forces. Russia has long been a strong proponent of Air Defense at all levels, due to fears of U.S./NATO air superiority. It has continued this tradition into the present and has expanded air defense capabilities to counter not only hostile airplanes and helicopters, but also cruise missiles and UAVs. The Russian Ground Forces have medium- and short-range air defense assets in dedicated air defense brigades, but maneuver brigades also have significant organic short-range air defense capabilities. These capabilities reside in the maneuver brigade's two air defense battalions, with four different air defense systems that provide the brigade an overlapping zonal defense. Although these capabilities are formidable, they are not the sole means of air defense for the brigade. Russian maneuver brigades have substantial EW capabilities that complicate attack aviation targeting, and Russia has touted the abilities of its "Vikhr" and "Ataka" missiles to hit relatively low- and slow-flying aircraft. In addition, Russia's fielding of small, unmanned turrets, which will be mounted as secondary weapons on heavy weapon platforms and as the primary weapon on armored cars and support vehicles, will also have a limited air defense capability for low- and slow-flying aircraft.<sup>55</sup>

### **Commonly Found Organic Air Defense Assets in a Maneuver Brigade**

The 2K22 Tunguska (SA-19 Grison) is a short-range missile-gun heavy tracked, lightly armored system that has twin 2A38M (30 mm) guns and 8 short-range missiles designed to engage low-flying aircraft and cruise missiles at a distance of up to 8 km and flight ceiling of 3.5 km. The twin 2A38M (30 mm) guns are useful for engaging extremely close targets, where the expenditure of a missile would be uneconomical (such as a small UAV), targets that have EW protection capabilities (that missiles cannot engage), and, when necessary, ground targets. Each maneuver brigade typically has six launcher vehicles within a battery of the air defense missile-artillery battalion. Russia is now planning on developing a successor to the Tunguska, equipped with a 57mm autocannon.



Image Courtesy: Vitaly Kuzmin

<sup>55</sup> Charles K. Bartles, "Flying the Unfriendly Skies: Air Defense in the Russian Ground Forces," February 2016.

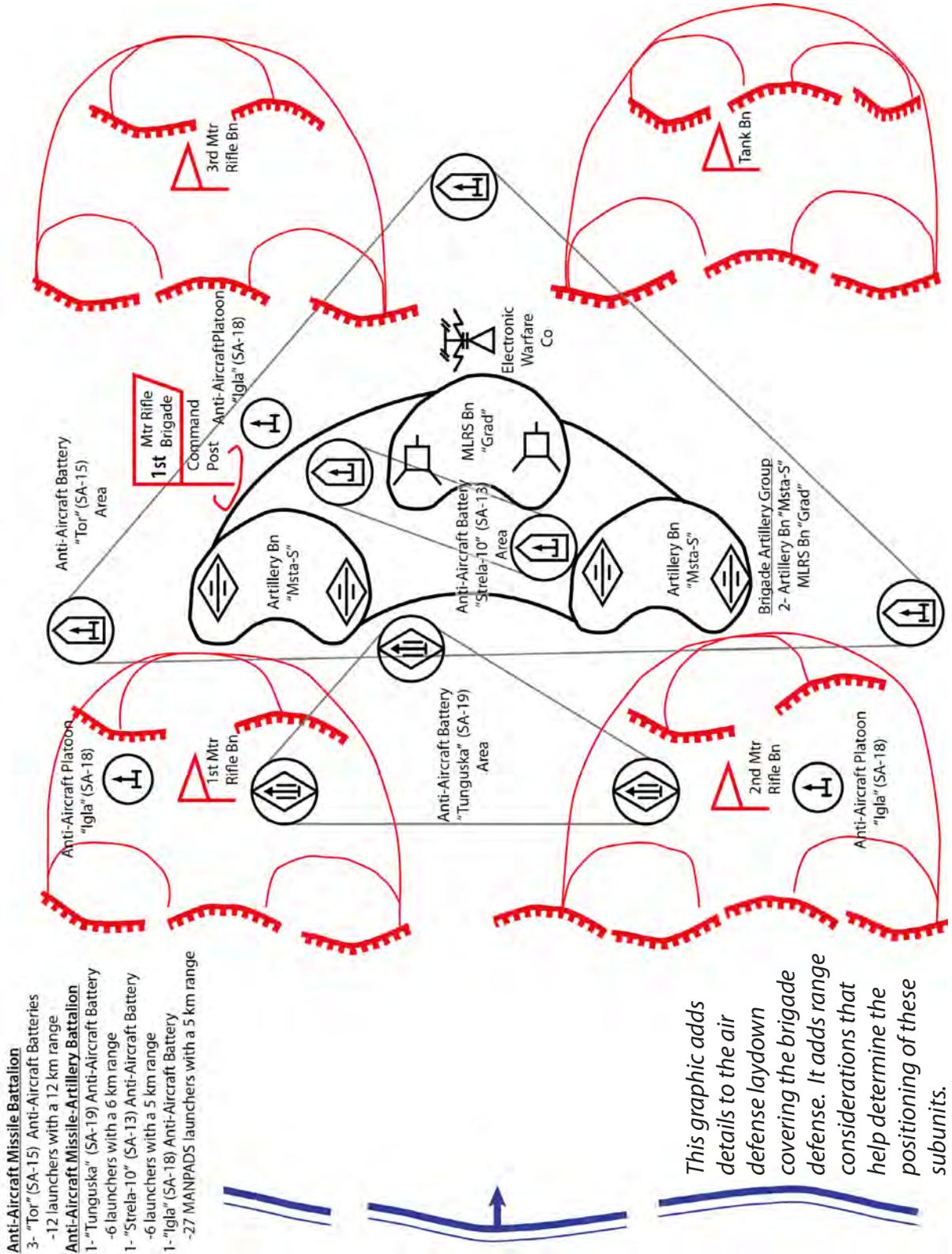
Charles K. Bartles, "Unmanned Turrets to Increase ISR Capabilities and Lethality," *OE Watch Online*, November 2015.

Dmitry Fedushka, "Secrets of a Deserted Tower," *Voyenno-Promyshlennyy Kuryer Online*, 7 October 2015, <<http://vpk-news.ru/articles/27399>>, accessed 1 May 2015.

Aleksandr Luzan, "The Fight above the Forwardmost Defensive Positions- Part I," *Voyenno-Promyshlennyy Kuryer Online*, 18 November 2015, <<http://vpk-news.ru/articles/28054>>, accessed 1 May 2016.

Aleksandr Luzan, "The Fight above the Forwardmost Defensive Positions- Part II," *Voyenno-Promyshlennyy Kuryer Online*, 25 November 2015, <<http://www.vpk-news.ru/articles/28156>>, accessed 1 May 2016.

The Brigade's Organic Air Defense Units



*THE RUSSIAN WAY OF WAR: FORCE STRUCTURE, TACTICS, AND MODERNIZATION OF THE RUSSIAN GROUND FORCES*

The 9K35 Strela-10 (SA-13 Gopher) is a close- (very short) range missile system, usually built upon a MT-LB (light tracked) chassis. It has four close-range, visually sited missiles capable of engaging targets at a distance of up to 5 km and flight ceiling of 3.5 kilometers. The system was reportedly designed to complement the Tunguska, as the Strela-10 costs less and is much less susceptible to EW countermeasures, due to its targeting system. Each maneuver brigade typically has six launcher vehicles within a battery of the air defense missile-artillery battalion.

9K35 "Strela-10"



Image Courtesy: Vitaly Kuzmin



9K310 "Igla"

Image Courtesy: Vitaly Kuzmin

The 9K310 Igla (SA-18 Grouse) is a close- (very short) range, man-portable air-defense system (MANPADS), capable of engaging targets at a distance of up to 5 kilometers and flight ceiling of 3.5 kilometers. Each maneuver brigade typically has 27 MANPADS within a battery of the air defense missile-artillery battalion. It is being replaced by the 9K333 Verba, which has similar characteristics as its predecessors, but has a better guidance system and increased abilities to circumvent EW countermeasures.

The 9K330 Tor (SA-15 Gauntlet) is a short-to-medium-range heavy tracked, lightly armored, platform that packs 8 missiles that are primarily designed to engage cruise missiles and other precision guided weapons at a distance of up to 12 kilometers and flight ceiling of 6 kilometers. It is being replaced by the Tor-M2, which sports 16 missiles with an increased flight ceiling (10 kilometers) and can engage up to 4 targets simultaneously, while firing on the move. Each maneuver brigade typically has 12 launcher vehicles within the batteries of the air defense missile battalion.

9K330 "Tor"



Image Courtesy: Vitaly Kuzmin

### Modernization of Russian Ground Force's Air Defense Assets

Russian Ground Forces are in the midst of a mass modernization of air defense systems. These upgrades include systems that carry more missiles, have better radar and C2 capabilities, and have missiles with greater ranges and better abilities to circumvent EW countermeasures. These modernizations include:

The 9K330 Tor (SA-15 Gauntlet): The Tor is being replaced by the Tor-M2, which sports 16 missiles with an increased flight ceiling (10 kilometers) and can engage up to 4 targets simultaneously, while firing on the move.

The 2K22 Tunguska (SA-19 Grison): The 96K6 Pantsir-S1 (SA-22 Greyhound) was initially thought to be the successor to the Tunguska, as it has a similar missile-gun combination, but is armed with 12 short-range missiles designed to engage low-flying aircraft and cruise missiles at a distance of up to 20 kilometers and flight ceiling of 15 kilometers. Despite similar appearances, the Pantsir-S1 does not appear to be the successor to the Tunguska. Instead, The Pantsir-S1 is being used to protect strategic (long-range) air defense assets of the Aerospace Defense Forces, such as the S-300 and S-400. The role of the Pantsir-S1 as a strategic protection asset may be one reason that the system can be provided on a wheeled chassis. Russia is now planning on developing a successor to the Tunguska, equipped with a 57mm autocannon.

The 9K35 Strela-10 (SA-13 Gopher): The Strela-10 is being replaced by the Luchnik-E, which has 8 missiles with a 6-kilometer range and 3.5-kilometer flight ceiling, with the most important capability improvements being the addition of all weather and day/night firing capabilities. There are also reports that the Strela-10 could be replaced with the Sosna that has twelve Sosna-R missiles with a 10-kilometer range and 5-kilometer flight ceiling.



Image Courtesy: Vitaly Kuzmin

- The 9K310 Igla (SA-18 Grouse): a close- (very short-) range MANPADS, capable of engaging targets at a distance of up to 5 kilometers and flight ceiling of 3.5 kilometers. It is being replaced by the 9K333 Verba, which has similar characteristics as its predecessors, but has a better guidance system and increased abilities to circumvent EW countermeasures.

- The 9K37 Buk (SA-11 Gadfly): is not a part of Ground Forces maneuver units, but is instead found within the Ground Forces' air defense artillery brigades. It is a short-to-medium-range missile system on a heavy tracked platform that has 4 missiles with a range of up to 30 kilometers and flight ceiling of 14 kilometers. It is being replaced with the 9K317M Buk-M3 (SA-17 Grizzly), which is equipped with 6 missiles that have ranges of up to 70 kilometers and flight ceiling of 35 kilometers. The most interesting purported capability is being able to engage not only air targets, but also ground targets.