
THE RUSSIAN WAY OF WAR
FORCE STRUCTURE, TACTICS, AND MODERNIZATION OF THE RUSSIAN GROUND FORCES
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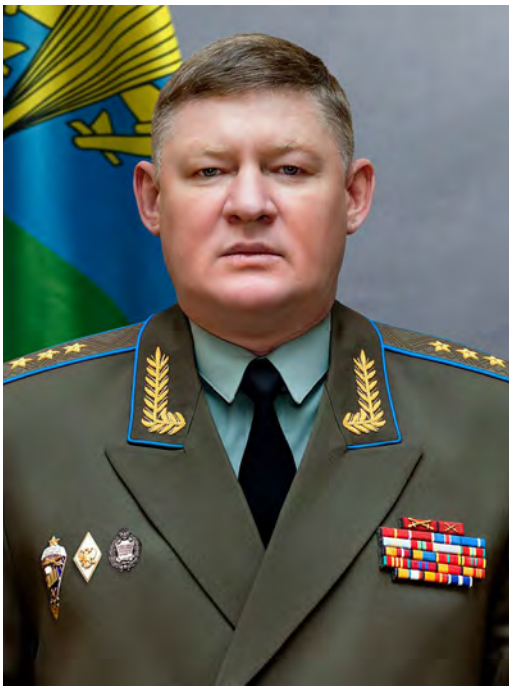
Chapter 8
Other Tactical Considerations

Airborne (VDV)



Colonel General Andrei Serdyukov
VDV Commander-in-Chief
Image Courtesy: Russian Ministry of Defense

Although the Russian Airborne, and to similar extent Naval Infantry, are not a part of the Russian Ground Forces, they are significantly different than their Western counterparts and have much in common with their land-based brethren. Structurally, the Russian Airborne is a heavily mechanized force and is divided between parachute and air assault units. In terms of function, the Russian VDV fulfills many of the same roles as those in the West, but also fills another niche not filled by Western airborne forces, that of a reliable enforcer for politically sensitive operations. This role began in Soviet times, with the Soviet invasion of Hungary in 1956 to quell the Hungarian uprising. VDV units began quietly occupying Hungary weeks before overt Soviet action began, and after the commencement of hostilities they gained a reputation for quickly and efficiently seizing objectives in an urban battle space to which conventional Soviet commanders were not accustomed.[1] Although exact details have yet to emerge, reportedly VDV units were involved in operations in Crimea, and if previous behaviors are indicators of the operational tactics in the recent campaign, it will likely be discovered that the VDV elements began arriving there well before masked gunmen started showing up on the streets of Crimea.[2] It is also likely that the vast majority of "polite people" and "little green men" seen in Crimea were VDV and Naval Infantry troops, not special operations forces as many analysts have speculated. In terms of training, Russian experts estimate that around 40 percent of specialties require significantly more training than elsewhere in the Russian military, increasing the requirement for contract personnel.[3] In the Russian system, the best and brightest often vie for careers in the VDV, and not in the various spetsnaz units.

[1] In all, 1710 Soviet paratroopers were decorated in the Hungarian campaign, including four recipients of the Soviet Union's highest award, the Hero of the Soviet Union. In total, the VDV garnered 18% of the total medals awarded for the campaign, despite only having 6 percent of the troops. The VDV actions in Hungary set a precedent in the Soviet Armed Forces of using the VDV as special operation forces are used in the West, namely to enter an area of operations discretely and then begin conducting operations. This pattern played out again in the 1968 Czech uprising, when the VDV flew into the Prague Airport in commercial aircraft and then began fanning out through the city with commandeered vehicles in order to secure Czech command and control and communications infrastructure quickly. This role of the VDV in Soviet times has undoubtedly been inherited by today's Russian VDV.
Steve Zaloga, *Inside the Blue Berets: A Combat History of Soviet and Russian Airborne Forces, 1930-1995*. Novato, CA: Presidio, 1995.

[2] Ivan Petrov and Ivan Stolnikov," Among the Military in Crimea They Managed to See a Chechen Battalion and Airborne Troops from Ulyanovsk," *RBK Daily* Online, 6 March 2014, <http://top.rbc.ru/politics/06/03/2014/909718.shtml>, accessed 17 March 2014.

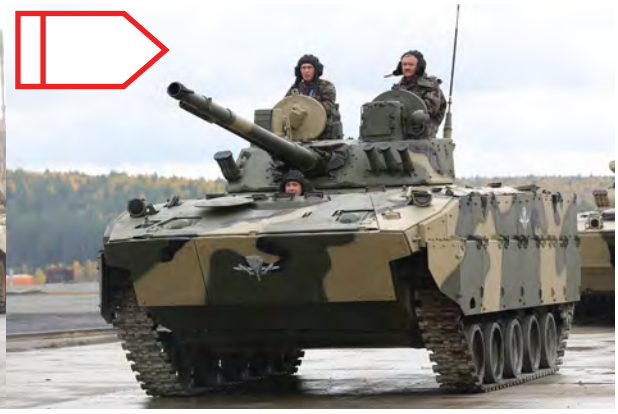
[3] Charles K. Bartles & Roger N. McDermott, "Russia's Military Operation in Crimea: Road-Testing Rapid Reaction Capabilities," *Problems of Post-Communism*, Vol. 61, No. 6, November–December 2014, 51-52.
See: Rod Thornton, "Organizational Change in the Russian Airborne Forces: the Lessons of the Georgian Conflict," SSI: US Army War College, December 2011.

Airborne Dispositions

The Russian Airborne (VDV) has been one of the biggest beneficiaries of the Russian Federation's efforts to increase conventional military capabilities. The VDV's 38th Signal and 45th Spetsnaz regiments have been upsized to brigades; a third parachute/air assault regiment will be added to each division; and a new maneuver brigade (345th Air Assault Brigade) will be created; and there are plans to reactivate the 104th Air Assault Division. This increase in forces is in addition to current plans to add a tank battalion to each division and brigade.

BTR-MDM

BMD-4M



Images Courtesy: Vitaly Kuzmin

Airborne Equipment and Modernization

2S25 "Sprut-SD"

Image Courtesy: Vitaly Kuzmin

The VDV is a mechanized force for several reasons. The Soviets believed in the concept of "deep battle" which required high levels of mobility, leaving no place for any infantryman without vehicle transportation. Other reasons stem from the lethality of the modern battlefield, and NBC protection, which the Soviets believed would be a factor in any conflict with NATO. Today, Russia still believes in the importance of battlefield field mobility, and has all infantryman mounted on wheeled or tracked vehicles, including its special operations forces and airborne infantryman. But, in order to be "airmobile," and mechanized, the VDV has had to utilize substantially lighter vehicles. The VDV's newest 13.5 ton Infantry Fighting Vehicle (BMD-4M) and 13 ton Armored Personnel Carrier (BTR-MD) weigh several tons less than their cousins in the Ground Forces. In order to maintain an airmobile tank capability, the VDV has fielded light tanks capable of being transported, and air dropped with crew, by the IL-76 transport aircraft. (As mentioned earlier, the VDV is also now fielding non-airmobile T-72B3s). The amphibious 2S25 Sprut-SD is a 125mm tank turret mounted on a BMD chassis. The Sprut-SD has a three-man crew, and is equipped with an autoloader, capable of firing 4-6 APFSDS, HE-Frag, HEAT and ATGM per minute. Reportedly, new versions of the Sprut (Sprut-SDM1) will be placed on a BMD-4M chassis, and be equipped with new electronics, targeting, and fire control capabilities that will give the Sprut roughly the equivalent firepower of a T-90 tank. The Russian Federation was also developing another "big gun on a little chassis," the 2S36 "Zauralets" artillery system. The Zauralets was intended to replace the 2S9 Nona-S, reportedly being capable of functioning as a field gun, howitzer, and mortar, and was chambered in 120 and 152 millimeter versions. Development of the Zauralets system has been suspended in favor of a similar system known as the "Lotos." The amphibious and air droppable Lotos will be capable of being mounted on a BMD-4M or a wheeled armored car (Volk-3) chassis. In general, airmobile operations require vehicles of lighter weight, the VDV has faced this reality, as the BTR-MD, BMD-4M, Sprut-SD, Zauralets, and Lotos exemplify, by sacrificing lots of armored protection, but very little lethality.[4]

2S36 "Zauralets"

Image Courtesy: Vitaly Kuzmin

[4] Charles K. Bartles, "Russia's Multipurpose and Airmobile 'Zauralets' Artillery System: A Big Gun on a Little Chassis," *OE Watch* Online, November 2015.
"The 'Zauralets' Self-Propelled Artillery System Has Completed Preliminary State Trials," *Lenta* Online, 5 October 2015, <http://lenta.ru/news/2015/10/05/zauralets/>, accessed 13 October 2015.
Nikolay Grishchenko, "The New Self-Propelled Weapon for the Airborne Troops Has Been Named 'Lotos,'"

Coastal Defense Troops

The Russian Coastal Defense Troops consist of two separate organizations, the Coastal Defense Artillery Troops and the Naval Infantry. In terms of command and control, the Coastal Defense Troops are part of the Russian Navy. The Navy's command and control of these forces is exercised through the four fleets and one flotilla, where the commander of the Coastal Defense Troops units in each of these commands serves on the fleet (flotilla) staff.

Lieutenant General Alexander Kolpachenko
Coastal Defense Troops Commander-in-Chief
Image Courtesy: Russian Ministry of Defense

Naval Infantry

The Naval Infantry garners much less coverage in the Russian media than the Russian Ground Forces and VDV, but still is a major beneficiary of efforts to reform and modernize the Russian Armed Forces. The Naval Infantry is undergoing an overhaul to improve equipment and training and has recently expanded the Third Naval Infantry Regiment of the Pacific Fleet and the Sixty-First Naval Infantry Regiment of the Northern Fleet into full-fledged brigades.[5] It is important to note that the Russian Naval Infantry is not the United States Marine Corps (USMC), having only an estimated 8,000-9,000 personnel. Since the Naval Infantry is much smaller than the USMC, and is subordinated to fleets/flotilla, the Naval Infantry is only capable of coastal defense missions and offensive missions at a tactical level, not large-scale (operational level) missions. Other differences involve the Naval Infantry's close relationship to the VDV. This relationship dates back to the Second World War, when certain Naval Infantry units were commanded by VDV officers.[6] These close ties continue today: Naval Infantry units have select units on jump status, and naval infantrymen routinely train at the VDV training center in Ryazan. The current commander of the Coastal Defense Troops, Major-General Aleksandr Kolpachenko, is a career VDV officer.[7] The Naval Infantry likely has a far different doctrine for amphibious landings than the USMC. Although Russia does have an impressive array of armed hover and landing craft, Russian doctrine for amphibious assault likely involves using aviation assets to air assault or parachute initial forces into a contested area to first neutralize coastal defenses and secure a beachhead for the landing of heavier follow-on forces, as each Naval Infantry brigade has an airborne/air assault battalion. The Russian

Rossiyskaya Gazeta Online, 14 June 2016, <https://rg.ru/2016/06/14/novuiu-samohodku-dlia-vdv-nazvali-lotos.html>, accessed 20 June 2016.

[5] Naval Infantry Brigades to be Reestablished in Pacific, Northern Fleets" *RIA Novosti* Online, 27 November 2013, <http://rian.ru/>, accessed 17 March 2014.
Russian Federation Ministry of Defense Website, "Navy Coastal Defense Troops Chief Major-General Aleksandr Kolpachenko Tells of the Development of the Coastal Defense Troops and Naval Infantry," 1 January 2014, <http://www.mil.ru>, accessed 17 March 2014.

[6] Steve Zaloga, *Inside the Blue Berets: A Combat History of Soviet and Russian Airborne Forces, 1930-1995*. Novato, CA: Presidio, 1995.

[7] Russian Wikipedia website: <ru.wikipedia.org/wiki/Колпаченко,_Александр_Николаевич>, accessed 17 March 2014.

Naval Infantry Dispositions

Naval Infantry is a heavily mechanized force, and has much in common with the Russian Ground Forces and VDV in terms of tactics, doctrine, and equipment, including the fact that it does not possess its own organic aviation assets, relying on the Russian Aerospace Troops (Air Force) for all aviation support. These similarities make the practice of detaching units from one of these services, and attaching them to another, a routine practice in the Russian Armed Forces. The Russian Naval Infantry is considered an elite force in the Russian Armed Forces, regularly training and operating with the Russian Airborne Forces. Although the Naval Infantry are mostly formed into brigades, these brigades are significantly smaller, and subsequently have far less combat power than Ground Forces, and even Airborne brigades.

Coastal Defense Artillery Troops

The Coastal Defense Artillery Troops are responsible for manning fixed and mobile missile and tube artillery systems and protecting the State borders along Russia's 38,000 kilometers of coastlines. This unique mission has had a great impact on the Coastal Defense Artillery Troops' equipment and vectors for future development. Unlike the Ground Forces, Airborne, and Naval Infantry, the Coastal Defense Artillery Troops generally prefer wheeled vehicles (to more quickly traverse the vast coastlines) and artillery systems that provide good long distance stand-off capabilities. Many Russian artillery systems have specially modified versions for coastal defense use, such as the Koalitsiya-SV self-propelled howitzer and the BM-21 Grad 122mm MLRS. Although the Coastal Defense Artillery Troops protect ports, harbors, and other shore based facilities, it's most interesting capability is naval area denial, which is provided by tactical-operational missiles. Russia is currently fielding several tactical-operational missile systems, the Iskander surface-to-surface missile system is operated by the Russian Ground Forces, but the Bal and Bastion coastal missile defense systems are operated by the Coastal Defense Artillery Troops. One advantage of coastal missile defense systems,

is that they are not subject to the Intermediate-Range Nuclear Forces Treaty (INF Treaty) that limits the Iskander and other surface-to-surface missile systems to a less than a 500 kilometer range.

The Bal is equipped with eight Kh-35 missiles with an approximately a 130 kilometer range. There are typically four systems in a battery. Interestingly, the same missile system used on the road-mobile Bal, may also be operated from a standard sized shipping container. Russia sells this "shipping container" missile system as the Club-K on the export market. The Russian Federation has recently increased the range of the Kh-35 to 300 kilometers (The Club-K can fire a variety of Kh-35 and 3M-54 missile types). Russia has been keen to tout the new range and concealability of the Kh-35 and the Club-K, and makes it very apparent that this system is intended to negate some of the U.S. Navy's overmatch of weaker navies. The modular design of the system allows for the missiles to be fired using their internal sensors for targeting, or they may use a similarly "containerized" C2/Radar system, or they may be directed from other target acquisition systems (AWACS, another vessel, etc.). Undoubtedly, an extended range Kh-35 and Club-K combo that can "hide-in-plain-sight," should be of some concern in increasingly crowded sea-lanes. Promotional materials for the Club-K also mention the possibilities of deploying the system on rail or on the back of a flatbed truck, a possibility that turns any common shipping container into a possible threat.[8]

"Bal-E" Coastal Defense Missile System

Image Courtesy: Vitaly Kuzmin

The "Bastion" coastal missile defense system was developed by the Machine-Building Science and Production Association for the 3M55 Onyx missile. (export designation Yakhont, NATO classification SS-N-26 Strobile). The Onyx is Russia's latest anti-ship missile that has a range of approximately 600 kilometers. The Bastion comes in two variants, the fixed-position "Bastion-S", and the mobile "Bastion-P". The Bastion-P is comprised of four mobile launchers (two missiles per launcher), a command vehicle, and loader/transporter vehicles. Vehicles mounted with the "Monolit-B" radars may also be employed to enhance targeting. The Onyx (Yakhont for exported systems,

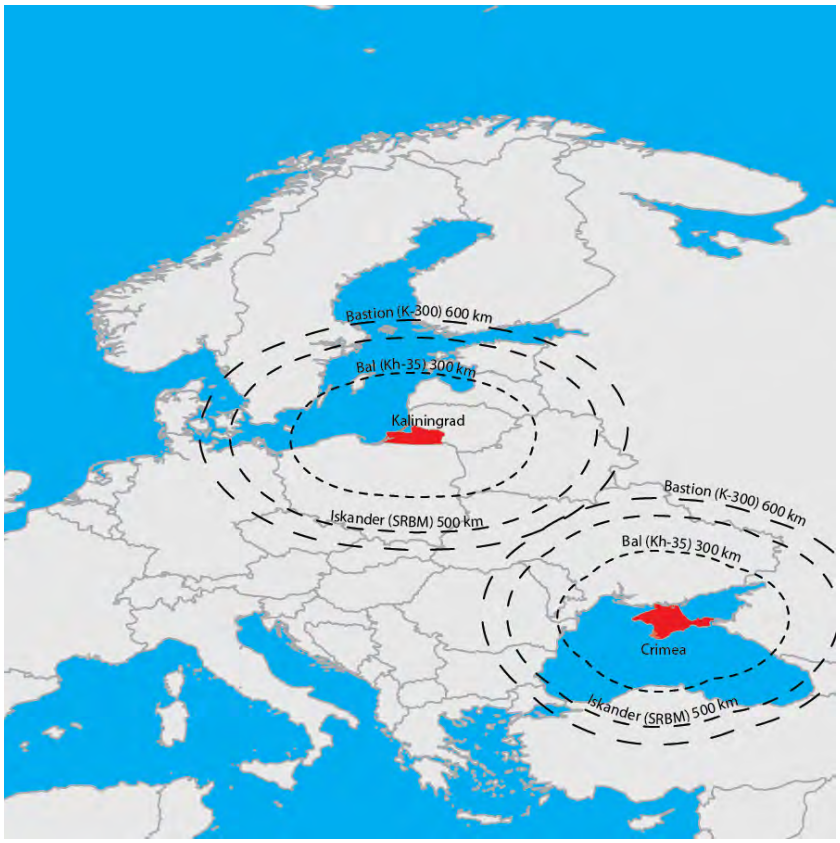
"Bastion" Coastal Defense Missile System

Image Courtesy: Russian Ministry of Defense

[8] Charles. K. Bartles, "Russia Puts US Navy on Notice with Improved 'Shipping Container' Missile," *OE Watch* Online, June 2015.

with a 300 kilometer range) missile is a supersonic homing anti-ship missile developed to destroy surface ships of all classes, particularly vessels comprising: surface strike groups, carrier battle groups, amphibious assault forces, and convoys. The system can be situated up to 200 kilometers inland, and is capable of protecting a stretch of coastline measuring in excess of 600 kilometers against potential enemy amphibious landing operations. The manufacturer purports the time between receipt of a call for fire mission and full deployment of the system is five minutes, and that the system can remain in firing position 72-120 hours, depending on available fuel reserves.

Area Denial Capabilities



The Onyx/Yakhont anti-ship missile is stored inside a hermetically sealed transport and launch container. The missile is fully combat ready when it leaves the manufacturing plant, and is stored, transported, and mounted on the launcher inside this container. The missile's diagnostics can be monitored without opening the container. The Onyx uses a ramjet engine with a solid-propellant booster, allowing the missile to reach a cruise velocity of Mach 2.0-3.5 at an altitude of up to 20,000 meters. One of the Onyx missile's most interesting characteristics is its guidance system. The guidance system can purportedly work in tandem with other missiles, and can allocate and classify targets based on their importance, and then select an appropriate attack scheme. Following the destruction of the primary target, the remaining missiles attack other ships, so no target is attacked by more than one missile. After an initial target lock is achieved, the Onyx shuts down its radar and descends to a low altitude (5 to 10 meters), below the operational level of most air defense radars. Once the missile emerges from beneath the radar horizon, the missile radar is reactivated and locks back on to the target. This feature, in conjunction with the Onyx's high rate of speed, greatly complicates adversarial air defense and electronic warfare countermeasures.[9]

[9] Charles K. Bartles, "'Bastion' Coastal Defense System Increases Area Denial Capabilities," *OE Warch* Online, December 2015.

Military Police

The institution of a Military Police Corps is a relatively new concept in the Russian Armed Forces. The route security duties of U.S. Military Police are performed by Commandant Service or Road Commandant units in the Russian military, but the Russian military has never had a dedicated internal security apparatus until 2012. During Soviet times, the commander of a subunit or a unit had the authority to send subordinates to the local guardhouse (jail) for discipline infractions. This practice was subsequently abolished by the Russian Federation after the collapse of the Soviet Union, the reasoning being that only a judge had the right to imprison someone. Commanders were unhappy with this reform because according to the new rules, there is a required court proceeding, and only after due process could he send the soldier to jail. Since months could elapse between the discipline infraction and the punishment, few commanders were interested in pursuing charges. This reform left commanders without their most effective method for dealing with discipline problems. Only commanders that could find other means to enforce unit discipline maintained order. Some officers attributed the loss of their jailing authority as a reason that "*dedovshchina*", or brutal hazing, became more problematic in the aftermath of the collapse of the Soviet Union. In order to impose discipline and decrease the number of embarrassing hazing and corruption problems, the establishment of a Military Police Corps was proposed by both civilian and the military authorities.[10]

Military Police Badge

Image Courtesy: Russian MoD

The path to the establishment of a Military Police Corps in the Armed Forces has been a long one. In 1992, the Russian Prosecutor General's Office proposed the creation of a Military Police Corps to conduct criminal investigations and combat economic crimes, but the State Duma did not pass the bill. In 1996, due to some embarrassing corruption incidents, the State Duma Committee for Defense again proposed the establishment of a Military Police Corps outside of the military's chain of command, but the proposal encountered resistance from the military and was eventually dropped to due to funding concerns. In 2005, Human Rights Commissioner Vladimir Lukin suggested creating a Military Police Corps to combat hazing, and in 2006 the high profile case of Private Andrey Sychev, a conscript who lost his legs from a severe hazing incident, caused President Vladimir Putin to back the idea. After a few more false starts, in 2012, former Chief of the Russian General Staff, General Nikolay Makarov announced that by December 1, 2012, Military Police units would begin operations, and that a Defense Ministry main directorate and units in the military districts and the fleets had already been established. In 2015, the charter defining the Military Police's structure, functions, and tasks

[10] Aleksandr Khramchikhin, "Legacies of Peter's Trade Unions: Russian Military Police Must Handle the Most Serious Tasks," *Argumenty Nedeli* Online, 22 December 2010, <http://argumenti.ru/vpk/n269/88381>, accessed 1 May 2016.
Roman Kretsul, "They are Inquiring: Authorities of the Military Police have been Expanded," *Vzglyad* Online, 25 June 2014, <http://www.vz.ru/society/2014/6/25/692720.html>, accessed 1 May 2016.

was confirmed by Presidential Edict No. 161 on 25 March 2015.[11]

Military Police Officer

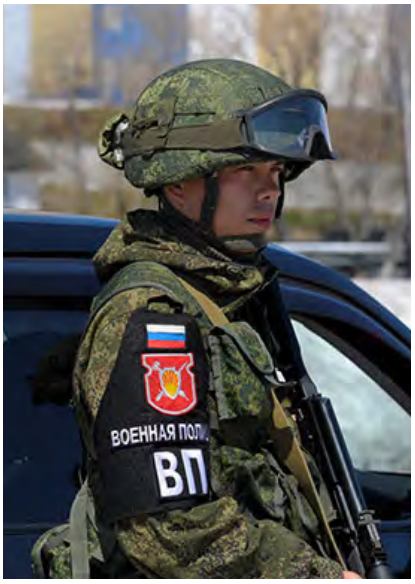


Image Courtesy: Russian MoD

In terms of function, Russian Military Police are intended to uphold law and order, provide physical security, conduct investigations into acts of disciplinary and general criminal misconduct, operate military jails, and ensure general traffic safety, but they do not provide route security.[12] In certain situations, the Military Police provide protection for victims, witnesses, and other participants in criminal proceedings such as service personnel, military court judges, and military prosecutors. The Military Police have assumed control of Ministry of Defense disciplinary units and garrison guardhouses (jails). Russian Military Police are also considered an agency of inquiry in the Armed Forces, which gives them the authority to conduct inquests. In the past, when commanders wanted to conduct an investigation, they appointed one of their subordinate officers as an investigating officer for the matter. Usually these officers have no investigative or legal experience, and would have to conduct an investigation with little guidance. Now, when an investigating officer is appointed, he may request assistance from the Military Police, with the eventual goal that all investigations in the Armed Forces will be conducted by the Military Police. Although this practice will relieve the commander of some administrative burdens, there is reporting that the intent of this reform is to remove any commander influence, to ensure a fair and thorough investigation. The approximately 10,000 strong Military Police Corps operates under the authority of the Russian Armed Force's Prosecutor General and his subordinate military prosecutors. This command relationship allows the Military Police to cordon off or blockade military garrisons and areas without consulting the unit commander.[13]

[11] "Putin Approves Charter for Russian Military Police," *Ministry of Defense of the Russian Federation* Online, 27 March 2016 <http://function.mil.ru/news_page/country/more.htm?id=12011886@egNews>, accessed 1 May 2016.
"Putin Signs Law on Military Police," *RIA Novosti* Online, 4 February 2014, <http://ria.ru/defense_safety/20140204/992897811.html#ixzz2sMiubPrC>, accessed 1 May 2016.
Ivan Safronov and Viktor Khamrayev, "Anatoliy Serdyukov Has Prepared Bill 'On Military Police,'" *Kommersant* Online, 10 October 2012, <http://www.kommersant.ru/doc/2041082>, accessed 1 May 2016.
"Three of Five Penal Battalions Disbanded in Russian Armed Forces," *Interfax*, 21 September 2011.
[12] Yuriy Gavrilov, "Eastern Military District Military Police Equipped with Nonlethal Weaponry," *Rossiyskaya Gazeta* Online, 29 June 2014, <http://www.rg.ru/2014/06/29/policia-site.html>, accessed 1 May 2016.
Yuriy Gavrilov, "Jailhouse Handed Over to Police," *Rossiyskaya Gazeta* Online, 27 January 2014, <http://www.rg.ru/2014/01/25/police-site.html>, accessed 1 May 2016.
"Military police will become involved in guard, patrol service in Russian army," *Interfax*, 10 December 2012.
[13] Aleksandr Khramchikhin, "Legacies of Peter's Trade Unions: Russian Military Police Must Handle the Most Serious Tasks," *Argumenty Nedeli* Online, 22 December 2010, <http://www.arumenti.ru/vpk/n269/88381/>, accessed 1 May 2016.
Yuriy Gavrilov, "Appointing Police Officers: Officers Unsuitable for Headquarters and the Field Could Be Called to the New Military Body," *Rossiyskaya Gazeta* Online, 18 October 2010, <http://www.rg.ru/2010/10/18/police.html>, 1 May 2016.

Arms Procurement Process

The Russian Federation has demonstrated an impressive capability to design and rapidly field new large end items such as tanks, BTRs, and BMPs, a process which takes substantially longer in the U.S. One example is the fielding of Russia's T-14 tank mounted on the Armata chassis. In March of 2016, Sergey Chemezov, head of the Russian state corporation Rostec, announced that the T-14 tank had already begun serial production.[14] If this statement is accurate, the T-14 and its Armata chassis have entered serial production less than five years after the May 12, 2011 announcement in *Rossiyskaya Gazeta* that Russia had abandoned development of the T-95 (object 195) tank in favor of the development of the Armata chassis and associated T-14 tank.[15]

Skorpion 2MB

Image Courtesy: Vitaly Kuzmin

The fielding of the Armata chassis appears not to be the exception, but the rule, as it apparently takes about five years from the beginning of the Russian design process until serial production begins for most major Ground Forces/Airborne end items, if the initial prototype is deemed viable. The Ground Forces' 2S35 Koalitsiya-SV howitzer (replacement for the Msta-S 2S19 howitzer), the Russian Airborne's 2S36 Zauralets-D mortar/howitzer (replacement for the 2S9 Nona) and the 2S25 Sprut-SD light tank have all took about five years to get from the issue of requirement/ initial design concept to the serial production phase.[16] Problems delaying the production of Russian armaments are usually in regard to the state's financial resources, and not due to bureaucratic, production, or parliamentary constraints.

The Russian Federation is able to enter serial production quicker than the U.S. due to a much different arms development cycle. Capability development questions are settled in the Russian General Staff with inputs from the branch chiefs (far fewer bureaucratic hurdles in the Russian system). There also appears to be no bidding process. A manufacture is simply assigned, and they build a few prototypes, if the prototype is unacceptable, the manufacture returns to the design phase. Innovations are accepted or rejected at the prototype phase, many designs make it no further than this phase. If the prototype is acceptable, improvements are made, and a test batch (approximately a battalion set) of vehicles is

[14] "Tanks A Lot: Russia's Advanced Armata T-14 'Already in Serial Production,'" *Sputnik* Online, 14 March 2016, <http://sputniknews.com/russia/20160314/1036238101/russia-armata-production.html>, accessed 20 March 2015.

[15] Semen Zverev, "They Have Given Up on T-95" *Rossiyskaya Gazeta* Online, 12 May 2011, <http://www.rg.ru/2011/05/12/tank.html>, accessed 14 March 2016.

[16] "Zauralets self-propelled artillery weapons to enter service in Russian Airborne Troops in 2019," *Interfax*, 6 October 2014.
"The 'Zauralets' Self-Propelled Artillery System Has Completed Preliminary State Trials," *Lenta* Online, 5 October 2015, < http://lenta.ru/news/2015/10/05/zauralets/>, accessed 14 March 2016.

produced for field testing.[17] This field testing takes approximately a year or two, after which, the product is further refined and put into full serial production. If the initial prototype is deemed viable, serial production of a major end item can begin approximately five years after the receipt of requirement and the design process begins. This appears to be the case with the Armata. Prototypes of the Armata chassis (as a BMP and tank) participated at the May 9, 2015 Victory Parade. On November 17, 2015 *Interfax* announced that *UralVagonZavod* was producing a test batch of 20 T-14s for government trials, and on February 29, 2016 *Interfax* announced these that 20 T-14s were undergoing state trials. Full serial production of the Armata was expected in 2017-2018, but the announcement that serial production had already begun in March 2016, earlier than anticipated, may have been due to many of the design problems being worked out during the course of the T-95 (object 195) project, which shares many features with the Armata, and likely had the same design team.[18]

Tigr-M SPN (with remotely operated 30mm cannon)

Image Courtesy: Vitaly Kuzmin

Another reason that Russia is able to reach serial production quickly is the emphasis on interoperability and modularity.[19] All new Russian designs for BTRs and BMPs (Armata, Kyrganets, Atom, BTR-82, BMD-4M) are manufactured to accept BMP-3 turret specifications. Manufactures only have to design for the weapon capability and turret specification. (mobility characteristics are determined by the chassis selected.) In situations where the chassis is not sufficient (such as ground pressure issues resulting from heavier loads), instead of developing a new chassis, the existing chassis are heavily modified. For example, the BMD-4M chassis had additional road wheels mounted to support the heavier components of the 2S25 Sprut-SD light tank, and the Armata chassis can have the engine situated in the front (BTR/BMP) or rear (tank) as needed. Russia's unified design standards make many combinations of turrets and chassis possible, despite being produced by different manufacturers, a beneficial situation for the export market. It appears that cost (both production and operation/maintenance) is a key factor that is considered from the very beginning of development. Innovations that are deemed too costly are weeded out early, the

[17] Sergey Mikhaylov, "The Armed Forces Are on the Upswing," *Stoletiye* Online, 7 October 2014, <http://www.stoletie.ru/obschestvo/armija_na_podjeme_129.htm>, accessed 14 March 2016.

[18] "Russian tank maker supplying over 20 new Armata tanks to army", *Interfax-AVN* Online, 17 November 2015. Dave Majumdar "Surprise: Russia's Lethal T-14 Armata Tank Is in Production," The National Interest Online, 13 March 2016, <http://nationalinterest.org/blog/the-buzz/surprise-russias-lethal-t-14-armata-tank-production-15480>, accessed 14 March 2016.
Matthew Bodner, "Russia's New Armata Tank 'Invisible,' Says Manufacturer," *Moscow Times* Online, 4 August 2015, <http://www.themoscowtimes.com/business/article/russia-s-new-armata-tank-invisible-says-manufacturer/526974.html>, accessed 14 March 2016.

[19] 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 14 March 2016.

design must not only be combat effective, but also feasible in terms of cost.

In order to develop new technologies and control costs, Russia appears to pursue the incremental "evolutionary" approach, as opposed to "revolutionary" approach to development and design. Many of the design elements of the T-95 tank prototype are found in the T-14, to include the gun (2A82 125-mm smoothbore gun/ ATGM launcher), active defense system (Afganit), engine (Chelyabinsk A-85-3A X-diesel engine), and several other systems.[20] Russia can apparently overcome any proprietary issues and may "plug-n-play" options and features from different manufactures as desired. Although Russia will experiment with new innovations (such as double barreled howitzers), they will usually build these innovations on the backs of known and trusted components. For instance the 2S35 Koalitsiya-SV howitzer has a completely automated turret (new innovation) with plans to reduce the crew to two-three personnel, but this turret is on the same chassis that has reliably served Msta-S for many years. (there are plans that Koalitsiya-SV will eventually be on an Armata chassis) This system assures that Russian weapons manufacturers never really "start-from-scratch" and allows for the efficiency of smaller production runs. Russia is also pursuing this evolutionary strategy in terms of robotization. Instead of attempting to develop robotic combat vehicles from scratch, Russia is incrementally adding robotic capabilities (autoloaders, unmanned turrets, computerized steering, etc.) to existing systems and reducing crew sizes, with the desired end state of eventually eliminating the entire crew for some combat vehicles, including the T-14.[21]

One advantage that likely allows a quicker run to serial production is Russia's use of only a few manufacturers. Russia's primary manufactures of combat vehicles are *UralVagonZavod* (T-72,T-90, Armata) and *KurganMachineZavod* (BMP-1, BMP-2, BMP-3). These production lines may be kept "warm" through the steady production of new combat vehicles and the refurbishment of old combat vehicles. *UralVagonZavod* is currently conducting "frame-off" upgrades of Russia's entire T-72 fleet, converting them into T-72B3s. Russian manufacturers have also touted the capabilities of new computer software that more quickly facilitates production than traditional paper plans and have recently introduced 3D printing technology that has also sped development.[22]

[20] Yaroslav Vyatkin, "Next Is the T-14: Newest Russian Tank Demonstrated to a Very Small Circle," *Vzglyad* Online, 26 September 2013, <http://www.vz.ru/society/2013/9/26/652197.html>, accessed 14 March 2016.

[21] Charles K. Bartles, "Modularity Facilitates Russian Armored Vehicle Innovations," *OE Watch* Online, October 2015.

Charles K. Bartles, "The Russian Approach to Robotization: Evolution Not Revolution," *OE Watch* Online, February 2016.

[22] "Technological Breakthrough: Russia to Debut 3D Printed Armata Tank," 2 February 2016, *Sputnik* Online, <http://sputniknews.com/military/20160206/1034346115/russia-3D-printed-armata.html>, accessed 20 March 2015.

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 14 March 2016.

UAV Development

UAV development is being pursued in the Russian Federation by all of the main and lesser branches (including the airborne forces) of the Ministry of Defense, in a variety of sizes ranging from smaller models, similar to the US "Raven," to larger models similar in size and purpose to the US "Predator." As for the Russian Ground Forces (GF) in particular, GF officials have mentioned that the UAVs will be used for communications, intelligence and electronic warfare tasks. [23] In practice, the Russian GF appear to be focusing on the use of UAVs as artillery spotters. Russia has fielded several models for this purpose (Granat, Eleron, Takhion, Orlan and Zastava), with maximum ranges of about 40 kilometers, appropriate for Russian artillery systems.[24]

In 2014, Russia added almost 200 UAVs to its inventory and activated 14 UAV companies, with plans that each of Russia's motorized rifle brigades will gain a dedicated UAV company in the next few years. The Russian Ministry of Defense has also announced plans to field its first UAV regiment and set up an inter-ministerial UAV training center.[25] At present, the Russian Federation has no capability for placing a weapon system on a UAV, but there are plans for the introduction of such a weapon in the next few years.[26]

[23] Charles K. Bartles, "Russian Federation Ground Forces and UAVs," *OE Watch* Online, May 2013.
"Ground Troops Will Receive New Unmanned Aerial Vehicles into the Inventory," *Voyenno-Promyshlennyy Kuryer* Online, 21 February 2013, <http://vpk-news.ru/news/14584>, accessed 20 July 2015.
"Typhoon-5 Lightweight UAV Being Tested as Repeater-Processor," *Interfax*, 27 March 2013.
[24] Charles K. Bartles, "Ground Forces Integrate UAVs into Artillery Reconnaissance Units," *OE Watch* Online, September 2014.
Yuriy Gavrilov, "Western Military District Servicemen Test New Drones," *Rossiyskaya Gazeta* Online, 5 July 2014, <http://www.rg.ru/2014/07/05/bespilotniki-site.html>, accessed 20 July 2015.
Central Military District Artillerymen Destroyed 200 Camouflaged Targets," *RIA Novosti* Online, 2 July 2014, <http://ria.ru/defense_safety/20140702/1014408009.html#ixzz38G3Wj9bx>, accessed 20 July 2015.
Vasilisa Yegorova, "Drone in Inventory of Russian FSB Spotted Over Ukraine," *Novyy Region* Online, 24 July 2014, <http://nr2.com.ua/hots/ATO_Donbass/Nad-Ukrainoy-zasekli-bespilotnik-kotoryy-nahoditsya-na-vooruzhenii-u-FSB-Rossii-76754.html>, accessed 20 July 2015.
[25] Charles K. Bartles, "Russian Armed Forces UAV Developments in 2014," *OE Watch* Online, February 2015.
"Russia To Set Up UAV Regiment In Crimea," *RIA Novosti* Online, 14 January 2015, <http://ria.ru/defense_safety/20150114/1042532956.html>, accessed 20 July 2015.
"Russian Defense Ministry Bought Nearly 200 Spy Drones in 2014," *Interfax* Online, 12 January 2015, <http://www.militarynews.ru/>, accessed 20 July 2015.
Aleksandr Stepanov, "Defense Ministry Began Centralized Training of Military Drone Operators," *Moskovskiy Komsomolets* Online, 24 December 2014, <http://www.mk.ru/politics/2014/12/24/minoborony-nachalo-centralizovannuyu-podgotovku-operatorov-voennykh-dronov.html>, accessed 20 July 2015.
"The Russian General Staff's UAV Center Will Determine Its Three Year Agenda," *RIA Novosti* Online, 26 Dec 2012, <http://ria.ru/defense_safety/20121226/916286337.html>, accessed 20 July 2015.
"Russian Industry Today Can Create Pilotless Systems for the Army -- the Ministry of Defense," *Interfax*, 26 December 2012.
[26] Charles K. Bartles, "Capabilities of Russia's "Predator" UAV," *OE Watch* Online, April 2015.
Ilya Shchegolev, "Dozor-600 UAV Will Overtake MQ-1 Predator," *Rossiyskaya Gazeta* Online, 17 February 2015, <http://www.rg.ru/2015/02/17/dozor-site.html>, accessed 20 July 2015.

Organization and Structure of Russian Ground Forces' UAV Units

There have been conflicting reports about how these assets would be controlled. Some reports have stated that UAVs would be considered a brigade-level asset and assigned to the brigade's reconnaissance company or intelligence support platoon (attached to subordinate units as required); other reports state these particular UAVs (artillery spotters) would be organic to the artillery companies' reconnaissance platoons. In the last few years this issue has apparently been resolved. Russia has decided the best way to organize its UAV fleet is by putting all of a brigade's UAVs in a single company. The companies are divided into platoons based on the size and range of the UAVs they operate. For instance, the "mini-platoon" operates the hand launched Granat-1, while the "short-range platoon" operates the larger Orlan-10 and Granat-4 airframes. One UAV company mentioned had six platoons, but this may be atypical as the unit was located at the 201st Motorized Rifle Division base in Tajikistan, and may have had a larger complement due to its unique status of serving a division in a geographically disparate location.[27] Russia likely places all of its UAVs in a single company and splits the companies into platoons based on size instead of function to more easily facilitate C2 and maintenance of these high value and limited assets. Since there is mention of "payloads" on the UAVs, there appears to be some capability for repurposing of mission if needed (artillery reconnaissance, electronic warfare, and communications, etc.). The Orlan-10 is used for both artillery reconnaissance and electronic warfare missions.[28]

UAV Company Personnel

In 2013, the Russian Air Force Academy accepted its first UAV class. Russian UAV officers will be trained in 4-5 year academies, which would resemble a combination of a U.S. service academy and an initial officer basic course for occupational training. Upon completion of the academy, graduates will be commissioned as lieutenants and be sent to their gaining units. Although the program is located at the Russian Air Force Academy, it would not be unusual for a Russian Ground Forces officer to attend such a program, as it is not uncommon for service members from other branches of service and even ministries to attend other service academies for certain "low-density" specialties such as UAV officer.[29] Since the first 62 graduates of the academy do not graduate until 2018, current UAV unit officer vacancies are being filled by officers from other branches with other specialties, with a preference for artillery officers. These "shake-n-bake" UAV officers are sent to the Russian Defense Ministry Interbranch Center for Unmanned Aviation in Kolomna, where they receive a short course on UAV operations.[30]

[27] Andrey Bondarenko and Igor Shcherbakov, "General Tubol's Winged Artillery," *Uralskiye Voyennyye Vesti*, 15 November 2014, accessed 20 July 2015.

[28] Charles K. Bartles, "Russia's Use of Unmanned Vehicles as Electronic Warfare Platforms," *OE Watch* Online, August 2015.
"Russian Servicemen in Tajikistan Improve UAV Skills," *Interfax*, 28 March 2014.
Yuri Gavrilov, "Electronic Warfare Units in Far East Will Get Leer-3 Drones," *Rossiyskaya Gazeta* Online, 28 June 2015, <http://rg.ru/2015/06/28/leer-site.html>, accessed 15 July 2015.

[29] Charles K. Bartles, "Russian Air Force Academy Welcomes First UAV Class," *OE Watch* Online, October 2013.
"Preparation of UAV Specialists Starts in Russia," *ITAR-TASS*, 4 September 2013, <http://www.itar-tass.com/>, accessed 20 July 2015.

[30] Andrey Bondarenko, "Drones for Gods of War," *Krasnaya Zvezda* Online, 25 October 2014, <http://www.redstar.ru/index.php/2011-07-25-15-55-32/item/19538-bespilotniki-dlya-bogov-vojny>, accessed 20 July 2015.

Orlan-10

Image Courtesy: Vitaly Kuzmin

Range: 50 - 120 km
Flight Duration: 10 hours
Maximum Takeoff Weight: 15 kg
Maximum Payload: 5 kg
Wingspan: 3.1 m
Length: 1.8 m
Speed. 75-170 km/h
Maximum Altitude: 6000 m
Fuel: A-95 Gasoline
Operating Temperature: -35C to + 40C
Takeoff: Catapult
Landing: Parachute

It appears that enlisted personnel operate most UAVs, but officers do fly certain missions. Russia does practice a conscription system, but all UAV operators are "contract NCOs" that attend the UAV operator course at the Inter-Branch Center for the Training of Specialists for the Ground Troops in Kolomna, Russia. Conscripted soldiers do serve in the UAV companies, but they serve in support roles such as wheeled vehicle drivers.[31]

Artillery Spotting

Since artillery systems have ranges well beyond the line of sight, (the Russian Msta-S self-propelled howitzer has a range of 29-36 km) they rely on forward observers to find targets and adjust fire. In the Russian system, on the offensive, the artillery battalion commander's headquarters is collocated with the maneuver commander leading the offensive. The battalion commander's senior deputy (roughly equivalent to a chief of staff) is located with the artillery CP. In the batteries, the battery company commanders are in a forward observation posts directing fires, while the senior battery officer (roughly equivalent to an executive officer) is located with the battery.

The use of UAVs for artillery spotting significantly supplements forward observation capabilities, a very important technological development for an artillery-centric post-Soviet army. For artillery purposes, UAV support is provided by the "mini" and "short-range" UAV platoons.[32] Although Russia is experimenting with a number of airframes, the mini-class "Granat-1" and short-range "Orlan-10" are most frequently mentioned. It is clear from various video segments and articles that the UAVs do not usually directly communicate with the fire direction centers of the batteries.[33] Apparently, the UAV operators determine target

[31] Viktor Litovkin, "They Installed UAVs behind a Desk: Reporting from the Inter-Branch UAV Center," *Nezavisimoye Voyennoye Obozreniye* Online, 6 December 2013, <http://nvo.ng.ru/forces/2013-12-06/1_drones.html>, accessed 20 July 2015.
Gennadiy Miranovich and Aleksandr Khvastov, "138th On the Up: Special Reportage from the Separate Guards Motorized Infantry Brigade," *Krasnaya Zvezda Online* in Russian 1 April 2015, <http://redstar.ru/index.php/newspaper/item/22792-138-ya-nabiraet-vysotu>, accessed 20 July 2015.

[32] Andrey Bondarenko and Igor Shcherbakov, "General Tubol's Winged Artillery," *Uralskiye Voyennyye Vesti*, 15 November 2014, accessed 20 July 2015.

[33] "Enemy's Gun Posts Destroyed by Artillerymen in Primorskiy Kray With Aid of Reconnaissance and Strike Complex," *Interfax*, 14 January 2015.

coordinates and relay that information to forward observers on the Artillery Reconnaissance Vehicles (ARVs), who in turn relate the information to the fire direction centers[34]

Due to differing ranges, it is likely the Orlan-10 operators are collocated with the batteries and their accompanying ARVs. There have been some discrepancies about the range of the Orlan-10. The specifications list the range as 50-120 kilometers, while articles referring to use for artillery spotting mention 40-50 kilometers. This variance may have to do with the UAV's broadcast range of its gyro-stabilized Full Motion Video (FMV), which may not be possible with current capabilities at distances that exceed 50 kilometers.[35] Due to the relatively short range of FMV transmission for the Granat-1 (10 kilometers), it is very likely the Granat-1 operators are collocated with the battalion's forward observation post or battery COP. In addition to targeting, it was also mentioned the Granat-1 had a role in providing information for damage assessments.[36]

Methods of Target Acquisition

On July 7 2015, *TASS* news service published an article about the training of officers in the use of the Orlan-10 UAV for artillery spotting purposes. The following day, a Russian blogger posted his theory of how artillery spotting can be conducted with UAVs, and observed the Orlan-10 is only capable of conducting the two simplest methods of artillery spotting. (see graphic) The blogger appears quite knowledgeable about Russian UAV capabilities and the modern battlefield, and his observations agree with observed Russian artillery procedures as viewed on various online videos.

Although the Orlan-10 and Granat-1 are not capable of the more advanced methods of artillery spotting, they can still be quite effective. Although less desirable than some other methods, the capability to fix a target's location by relative terrain feature (method 1) is sufficient for many Russian artillery purposes. Russian artillery batteries and battalions annihilation and destruction missions make precise target information useful, but unnecessary. In addition, the Russian Federation has a strong cartographic tradition, undoubtedly any Russian serviceman referencing terrain features for targeting purposes would have access to high quality, large scale, digital maps of most places within the former Soviet Union. Although current UAV artillery spotting capabilities may be adequate for current purposes, these capabilities are very likely to continue to develop.[37]

UAV Granat-1 in artillery units, published 19 January 2015, <https://www.youtube.com/watch?v=Vu2baqAexCU>, accessed 20 July 2015.

[34] Taras Rudyk, "In Reconnaissance with a Takhion: Unmanned Aerial Vehicles Permit the Spetsnaz to Observe the Enemy from Siberia in Online Mode," *Krasnaya Zvezda* Online, 21 May 15, <http://redstar.ru/index.php/newspaper/item/23777-v-razvedku-s-takhionom>, accessed 20 July 2015.

[35] Complex «Leer» With Unmanned Aerial Vehicle «Orlan-10», *Bastion-opk*, 17 April 2012, <http://bastion-opk.ru/orlan-10/>, accessed 20 July 2015.

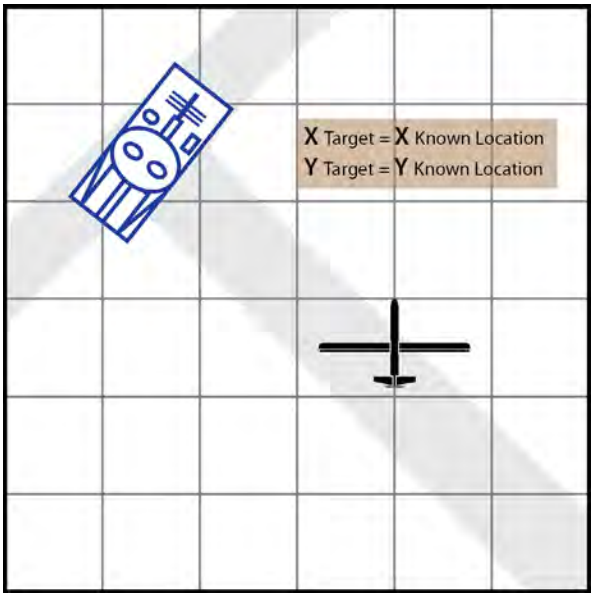
Oleg Zheltonozhko, "The Reconnaissance and Target Designation System: the Priority is on Qualitative Parameters," *Uralskiye Voyennyye Vesti*, 1 June 2013.

[36] Andrey Bondarenko and Igor Shcherbakov, "General Tubol's Winged Artillery," *Uralskiye Voyennyye Vesti*, 15 November 2014, accessed 20 July 2015.

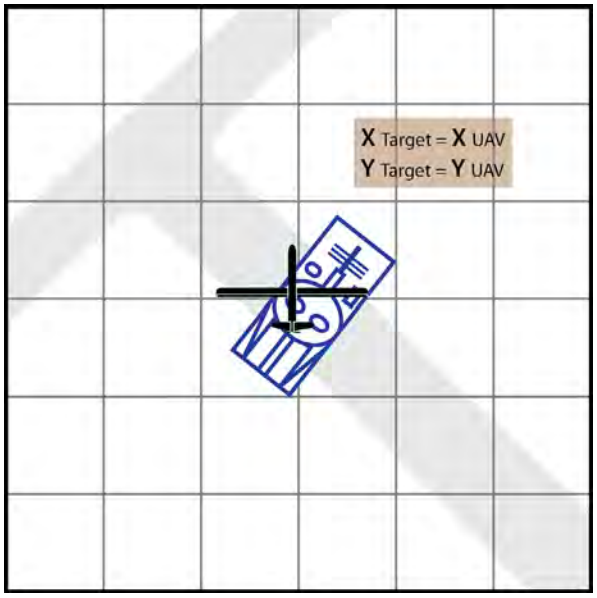
[37] Charles K. Bartles, "The Orlan-10 and Artillery, Let's Ponder How They Work Together…" *OE Watch* Online, August 2015.

"Officers of Western Military District Adjusts Fire with Help of the Orlan-10 in 3D," *Tass* Online, 7 July 2015, <http://

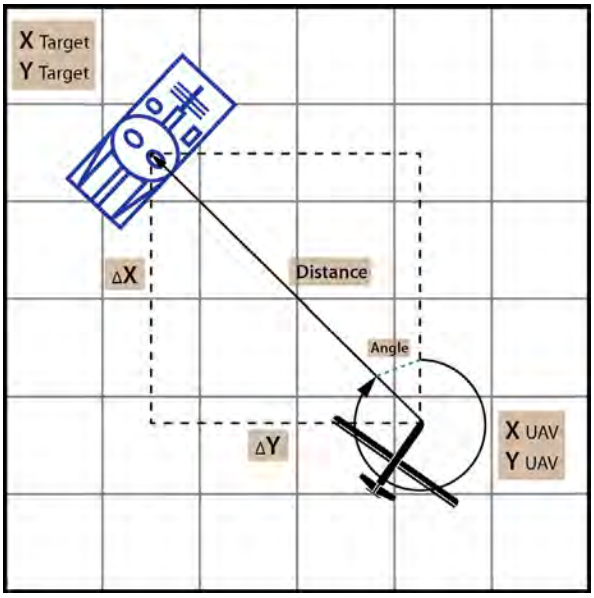
Artillery Spotting Methods for UAVs



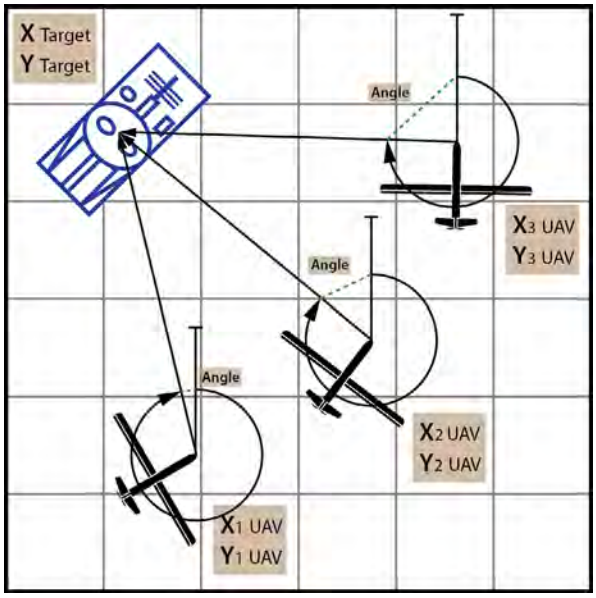
1st Method- Use of a reference point. This method can be used if the coordinates of a given reference point (landmark or intersection) are known. The disadvantage of this system is that the coordinates of the reference point must be known with certainty, requiring detailed maps and/or GIS data. In addition, target accuracy diminishes the farther the target is from the reference point. Conclusion: This method works, but is the least suitable for artillery spotting.



2nd Method- Fly above the target. The UAV flies above the target and its position is recorded. Target accuracy depends on the accuracy of the UAV's navigation system. The disadvantage of this is method is that it requires flying over the target, meaning that only a limited number of targets may be acquired and that the UAV is extremely susceptible to enemy fire. Conclusion: This method works, but is most suitable for less organized adversaries, such as insurgents.



3rd Method- Use of range finder. Requires a gyro stabilized electro-optical system with a laser rangefinder. The coordinates of the target are calculated using basic trigonometry. The accuracy depends on the accuracy of the UAV's navigation system and rangefinder. This method provides good accuracy and the capability to acquire many targets, sufficient for several batteries or battalions. The disadvantage of this is method is the use of an active sensor (the laser) which can be easily detected by modern military equipment. Conclusion: This method is very effective, but requires a sophisticated UAV and would be more susceptible to enemy fire.



4th Method- Use of multiple azimuths. The UAV takes several azimuths on a given target, while in flight. Trigonometry is than used to calculate the position of the target. This method provides good accuracy and the capability to acquire many targets. This method requires a sophisticated UAV, but is completely passive, an advantage that can significantly increase the UAV's life expectancy above the modern battlefield. Conclusion: this is preferred method for UAV artillery spotting.

Orlan-10 Launching **Orlan-10 Landing**

Images Courtesy: Russian Ministry of Defense

Artillery Spotting at Night

Russian UAVs reportedly have a night-targeting capability that operators regularly practice.[38] This capability is most likely provided by thermal imagers that are found in many short-range Russian UAVs, including the Orlan-10.[39] Thermal imagers are probably the most common since there was only one report of an infrared sensor, and no reports have mentioned or implied any radar capability.[40] Since terrain association with a thermal imager would be difficult at best, and the risk of the UAV being shot down at night is significantly reduced, it is likely the UAV operator uses the "fly-over-the-target" method (2nd method in the above graphic) to fix the target. Target acquisition with a thermal imager is also significantly more difficult due to the reduced spatial resolution of the technology in comparison to video. There is likely not much difference in signature between a BTR and a SUV when viewed through the type of thermal imagers that can be mounted to a small UAV. Since determining what exactly the imager is viewing is much more difficult, the acquisition of the wrong target is much more likely. Although identification of the wrong target is problematic, the Russian military does not have a "Zero Defect" view of various indiscretions, and any errors made in a combat situation with such a method of targeting would likely be looked upon as an accident

tass.ru/armiya-i-opk/2099301>, accessed 1 August 2015.
Blog post from lopatov_45, "The Orlan-10 and Artillery, Let's Ponder How They Work Together…" *Livejournal.com*, 8 July 2015, <http://lopatov-45.livejournal.com/30166.html>, accessed 1 August 2015.
Alexander Krivorechek, "The Federal Security Service Will Adopt 80-Megapixel Cameras for Reconnaissance," *Izvestiya* Online, 27 December 2013, <http://izvestia.ru/news/563168#ixzz2oy9AxUUc>, accessed 20 July 2015.
UAV Granat-1 in artillery units, published 19 January 2015 <https://www.youtube.com/watch?v=Vu2baqAexCU>, accessed 20 July 2015.

[38] "Artillery Troops of Russian Military Base in Abkhazia Learn to Strike Targets Using UAVs," Ministry of Defense of the Russian Federation, 3 July 2014, <http://function.mil.ru/news_page/world/more.htm?id=11965188@egNews>, accessed 20 July 2015.

39 Taras Rudyk, "In Reconnaissance with a Takhion: Unmanned Aerial Vehicles Permit the Spetsnaz to Observe the Enemy from Siberia in Online Mode," *Krasnaya Zvezda* Online, 21 May 2015, <http://redstar.ru/index.php/newspaper/item/23777-v-razvedku-s-takhionom>, accessed 20 July 2015.
"Russia to set up UAV Regiment in Crimea," *RIA Novosti* Online, 14 January 2015, <http://ria.ru/defense_safety/20150114/1042532956.html>, accessed 20 July 2015.

[40] Yuriy Gavrilov, "Eagle-Eyed. Deliveries of State-of-the-Art Unmanned Air Vehicles to the Field Have Increased Fourfold," *Rossiyskaya Gazeta* Online, 16 December 2014, <http://www.rg.ru/2014/12/15/bespilotniki-site.html>, accessed 20 July 2015.

Granat-1

Range (Full Motion Video): 10 km
Range (Camera): 15 km
Flight Duration: 75 minutes
Maximum Takeoff Weight: 2.4 kg
Payload: Camera or Video
Wingspan: 82 cm
Speed. 60 km/h
Maximum Altitude: 1500 m
Fuel: Electric
Operating Temperature: -35C to + 40C
Takeoff: Catapult or Hand Launched
Landing: Parachute

Image Courtesy: Russian Ministry of Defense

due to the "fog of war."

Outlook for UAVs and Russian Artillery Spotting

Undoubtedly, Russia will continue to improve its UAV artillery spotting capabilities. Russia is heavily investing in UAVs in general, and have claimed they will spend 9.2 billion US dollars on the technology and overtake the U.S.'s position as the preeminent UAV power in the next few years.[41] The Russian Federation is also looking at ways of reducing prices for UAV technologies, and has expressed interest in using 3D printers to "bake" the next generation of Russian UAVs.[42] The most likely advancement will be the integration of the UAV directly into one of the new Russian C2 systems under development, the most likely of which is the "Andromeda" (the Russian version of FBCB2). Russia has made frequent comments about the need to "unify the information space" and the integration of UAVs into that space would be in furtherance of that goal. How likely this is to occur is anyone's guess, unsurprisingly marrying up differing technologies (Andromeda, the UAV, and the existing artillery fire control system) is difficult, time consuming and costly. One aspect of Russian artillery spotters that is not likely to change, is their size. Since the Orlan-10 and its cousins are attached to the units they serve and their ranges are more than adequate for the missions they support, developing larger airframes for fire control purposes would not be advantageous, as any requirement for a takeoff/landing area would be prohibitive.[43]

[41] Charles K. Bartles, "Russian Armed Forces UAV Developments in 2014," *OE Watch* Online, February 2015.
[42] Charles K. Bartles, "3D Printers Will "Bake" Future Russian UAVs," *OE Watch* Online, July 2015.
Yuriy Zaynashev, "The 'Baking' of Russian Unmanned Aerial Vehicles is Planned to be Put into Production," *Vzglyad* Online, 4 Jun 2015, <http://www.vz.ru/economy/2015/6/4/749145.html>, accessed 20 July 2015.
[43] Dr. Lester W. Grau and Charles K. Bartles, "Integration of Unmanned Aerial Systems within Russian Artillery," *Fires Bulletin* Online, July-August, <http://sill-www.army.mil/FiresBulletin/2016/jul-aug/jul-aug.pdf>, accessed 20 July 2016.

Robotics in the Russian Armed Forces

MRK Robotic System

Image Courtesy: Vitaly Kuzmin

The Russian military, as many other militaries, is now seriously considering the role of robotics and artificial intelligence on the modern battlefield. Despite references to the Terminator® franchise, Russia does not appear to see a future, in the near term, where combat is conducted solely by autonomous robots. Instead remote controlled and semi-autonomous robotics will be integrated into conventional units, serving in the most dangerous roles as fire fighters, mine clearers, EOD technicians, armed sentries, and as the accompanying articles describe, cannon fodder for the initial assaults on fortified positions. In keeping with these functions, and unlike many of the robots in Terminator®, Russian robots have a distinctively "mechanized" appearance, with most systems being found on tracked chassis. In fact, just as much discussion of robotics deals with automating existing platforms (such as the Armata, Kurganets, and even T-72 chassis) as with creating new systems. Russia's newest generation of light track chassis, the Kurganets, reportedly utilizes a Sony PlayStation® like controller for steering. Apparently, designers think that Russian soldiers of the future will be much more comfortable with this scheme of maneuver, than steering levers and a manual transmission. But these sorts of novel designs will also more easily facilitate the installation of automated control systems.[44]

In general, The Russian Federation has adopted an evolutionary, as opposed to revolutionary, approach to robotization. In practice, this means that instead of trying to develop completely new systems, a majority of Russian efforts in this area have focused on grafting robotic capabilities on to existing platforms. These efforts have not only included experimenting with remote controlled and semiautonomous heavy tracked platforms (such as the Armata, Kurganets, T-90, and even T-72 chassis), but have also included fielding small robotic turrets on traditional (manned) heavy and light chassis. These developments mesh well with Russia's considerable experience fielding auto loading tanks and self-propelled artillery systems, a necessity for fielding any robotized weapons platform. In general, most Russian robotics developments, and other "incremental"

"Crossbow-DM" Remote Controlled Turret

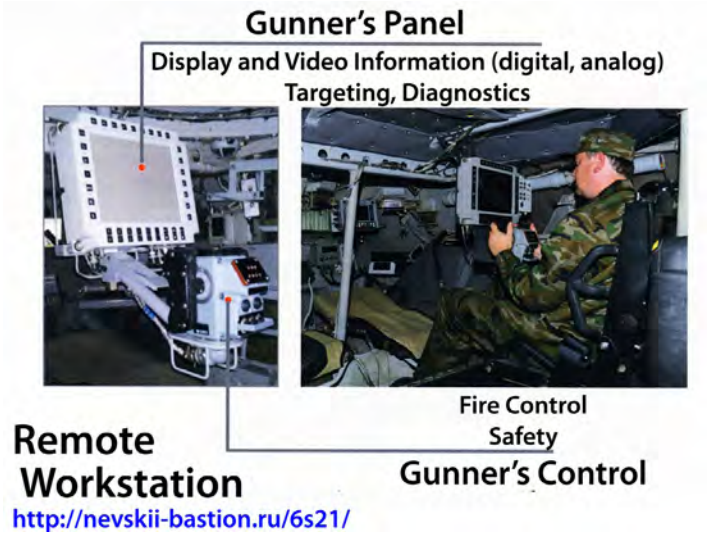
Image Courtesy: Vitaly Kuzmin

[44] Charles K. Bartles, "Theorist Proposes a Doctrinal Usage for Russian 'Combat Robots,'" *OE Watch* Online, January 2016.
Leonid Orlenko, "Breakthrough Robots," *Voyenno-Promyshlennyy Kuryer* Online, 23 September 2015, <http://www.vpk-news.ru/articles/27159>, accessed 1 June 2016.

technology advancements are useful not only for future robotic platforms, but also for current systems, supporting Russia's line of effort, to do more, with less personnel.[45]

Robotics utilization is not limited to unmanned platforms in the Russian Federation. The Russian Armed Forces is also developing small automated turrets for placement on manned armored personnel carriers, armored cars, support vehicles, and even used as secondary weapons on large weapon systems such as self-propelled artillery pieces. Russia believes that the era of the manned turret has come to an end, and is now fielding unmanned turrets. These turrets are not only viewed as beneficial for crew protection, but also from an Intelligence, Surveillance, and Reconnaissance (ISR) perspective. These Remote Controlled Turret Modules (DUBM) are equipped with a variety of sensors which far exceed the capabilities of the human eyes and ears of a manned turret. Other reports about these systems have touted their ability to engage low flying and low speed aircraft. This capability may be a result of the Russian belief that the battlefield of the future will increasingly involve more UAVs controlled by both state and nonstate actors. A limited ability for air defense, such as these Remote Controlled Turret Modules, would be a great benefit in such an environment. Most DUBM configurations involve the use of a a 12.7-mm 6P49 "Kord" machine gun, a rough equivalent to the U.S. Browning .50 caliber machine gun. If Remote Controlled Turret Modules become common place in the Russian military, even Russian armored cars and support vehicles would be equipped with about the same firepower as most U.S. Army Strykers, as Strykers are most often equipped with a .50 caliber machine gun as their main armament.[46]

Controlled Turret Module Workstation



[45] Charles K. Bartles, "The Russian Approach to Robotization: Evolution Not Revolution," *OE Watch* Online, February 2016.
Aleksey Ramm, "Strike, Another Strike: Three types of robotic combat machine are being built on a common platform," *Voyenno-Promyshlennyy Kuryer* Online, 23 December 2015, <http://www.vpk-news.ru/articles/28600>, accessed 15 January 2013.

[46] Charles K. Bartles, "Unmanned Turrets to Increase ISR Capabilities, and Lethality," *OE Watch* Online, November 2015.
Dmitry Fedyushka, "Secrets of a Deserted Tower," *Voyenno-Promyshlennyy Kuryer* Online, 7 October 2015, <http://vpk-news.ru/articles/27399>, accessed 15 June 2016.

Cold Weather and Arctic Combat

Russia has hard winters and the Russian military has long trained for and fought during the winter. A large portion of Russia lies north of the Arctic Circle and Russia is preparing seriously for conflict in this region. The land areas approaching and within the Arctic Circle provide unique challenges to military operations. In the Arctic, there are permanent ice and snow-covered areas, but much of this area is devoid of snow and cold during the summer thaw and movement and combat during the thaw can be quite difficult and requires different techniques and equipment.[47]

Significant, large-scale combat has taken place in the higher latitudes. The terrain, weather and limited infrastructure impose severe difficulties on untrained and non-acclimated soldiers. The prime concerns are mobility and shelter. Tactics and force structure require modifications and adjustments. Equipment does not run as efficiently and may require special lubricants, garaging, fuels and support. Everything takes more time.

On 30 November 1939, the Soviet Union attacked Finland in the Winter War that lasted until 20 March 1940. It was a short, brutal war that cost the Red Army 65,384 KIA or died of wounds, 14,142 MIA, 186,584 WIA, 5468 POWs and 9614 cold-weather casualties.[48] Finnish casualties were lower (some 26,662 dead and 39,886 wounded), but Finnish forces were much smaller and the Soviets won the 105-day war. Some of the fighting occurred on the Kola Peninsula within the Arctic Circle, but the main fight occurred in south and central Finland.[49] The Finnish forces were able to withstand the Soviet onslaught for as long as they did due to their specialized training, acclimation and familiarity with winter movement.

Ski Training

Image Courtesy: Russian Ministry of Defense

In October 1944 the largest Arctic ground operation in history occurred in Northern Finland and Norway between the Soviet 14th Army and the German 20th Mountain Army. The 133,500 men of the Soviet Army, supported by the Soviet Northern Fleet, faced some 45,000 *Wehrmacht* and German allies. The Soviet Petsamo-Kirkenes offensive forced the German Army to withdraw and captured the crucial Finnish nickel mines in Pechanga/Petsamo. The Soviets massed ski troops, naval infantry, artillery and tanks, supported by 30 engineer battalions, horse and reindeer transport companies and significant airpower. The Soviet advance was successful but limited by the retreating German destruction of the meager road

[47] This section is extracted from Lester W. Grau, "A Cold, Soggy, Boggy Slog: Ground Forces in Higher Latitude Combat", *Infantry*, April-July 2016.

[48] The Secret seal is lifted: Casualties of the Armed Forces of the USSR in war, combat actions and military conflicts [Гриф Секретности Снят: Потерн вооруженных сил СССР в войнах, боевых действиях и военных конфликтах], Moscow: Voyenizdat, 1993, 99.

[49] Carl Van Dyke, *The Soviet Invasion of Finland 1939-1940*, London: Frank Cass, 1997 provides a good overview of the war, mostly from a Soviet perspective.

network.[50] Soviet losses were 21,233 (6084 KIA and 15149 WIA) in the 23 days of fighting.[51] Soviet sources estimate German losses at 18,000 KIA and 713 POW.[52]

Arctic Sniper

Image Courtesy: Russian Ministry of Defense

In the northern sector during the Winter War and the Soviet-Finnish/German Continuation War, fought from 25 June 1941 –19 September 1944, the fights were in the forests and on the tundra for possession of the few east-west roads in the region. Down south on the Karelian Peninsula, defensive lines were continuous and tied in. Further north, open flanks were common by necessity and the fights were attempts to turn a flank while maintaining pressure along the road. Soldier survival was of paramount importance and, in winter, required nearby warming stations and living accommodations to keep soldiers alive. During the Continuation War, the Finnish efforts were directed to restoring territory lost to the Soviets during the Winter War, maintaining border integrity and interdicting Soviet railroad lines. Railroad was the most reliable means of transport in the far north and, along with the roads and population centers, represented key terrain.

Mobility and Maneuver

Vast swampy tundra, mountains, rivers, large quantities of boulders and limited roads complicate mobility and maneuver in the higher latitudes. It is a difficult region for even simple engineering projects, and, in winter, deep snow drifts, polar night and low temperatures add to the difficulty. Weather is always a complicating factor and radio communications are often interrupted by metrological conditions. The Russians consider

DT-30 Articulated Winter Vehicle

Image Courtesy: Vitaly Kuzmin

[50] David M. Glantz and Jonathan M. House, *When Titans Clashed: How the Red Army Stopped Hitler*, Lawrence: University Press of Kansas 1998 provides a concise summation of this operation. James Gebhardt, *The Petsamo-Kirkenes Operation: Soviet Breakthrough and Pursuit in the Arctic, October 1944*, Fort Leavenworth: Leavenworth Press, 1989 is the most comprehensive study of this operation in the English language.

[51] *The Secret seal is lifted: casualties of the Armed Forces of the USSR in war, combat actions and military conflicts*, 210.

[52] Kh. Khudalov, "Petsamo-Kirkenes Operation," *Military History Journal*, No. 10 (October 1969), 116.

March/April through October as the best time for maneuver in the north. The snow melt starts in the spring and the "white nights" allow 24-hour observation.[53] Russia prefers the warmer weather with nearly 24-hour visibility, a reduced requirement for warming-up stations during operations, lessened chances of blizzards and other incapacitating weather for the trade-off of more difficult cross-country and road mobility. They build their wheeled and tracked vehicles with high-clearances for use in their native terrain. Their track width is usually broader than similar US tracked vehicles. Military advances and retreats normally follow roads, rivers, beach and trails across the tundra. Military objectives are frequently villages, road intersections, defiles, isolated heights, mountain passes, river crossing sites and water-landing points. Tracked vehicles are often optimum for movement, but they can tear up the rather delicate earth surface and create their own obstacles.

Amphibious landings and raids are often a major component of Arctic ground maneuver.[54] During the spring and summer, rivers and lakes provide the ability to move and maneuver using shallow draft boats with low overhead clearance. However, navigation of glacier-fed waterways can be treacherous due to the shifting channels, sand or gravel bars and other obstructions.

High-latitude combat is seldom settled over a single season. Simple tasks take longer in the higher latitudes and complex tasks may become impossible. The primary concern of high-latitude combat is to keep one's soldiers alive, disciplined and capable of coordinated combat.

Arctic Sledding

Image Courtesy: Russian Ministry of Defense

The critical component of arctic and subarctic combat is keeping the force alive and motivated. Snow and cold dictate a heating plan, establishing winter garrisons, warming stations and countering thermal and smoke detection sensors. Warming and maintaining warmth in normal tents requires inordinate amounts of fuel and are readily identifiable to heat sensors. Engineer support in constructing troop shelters is complicated by the cold and wind, reducing their effectiveness some 30%-50%.[55]

Eating, drinking, field sanitation and prevention of cold-weather injuries are difficult in the arctic, particularly for soldiers not trained and accustomed to working there. Poor morale and psychotic behavior can also break out quickly. Aggressive small-unit leadership can prevent or mitigate problems in these areas, but ground units need to plan frequent rotation of ground units to keep them combat effective.[56]

[53] V. Kuselev and I. Vorobyev, "The Offensive in Northern Regions," *Army Digest*, February 2013, 2-3.

54 Viktor Leonov, *Blood on the Shores: Soviet Naval Commandos in World War II*, Annapolis, Naval Institute Press, 1993, 63-127.

[55] V. K. Shamshurov, *Engineer Combat Support in Special Conditions,* Moscow: Voyenizdat, 1985, 193.

[56] Kuselev and Vorobyev, 3.

Ground combat in the Arctic often begins with the contending forces not in direct combat, and the depth of the objectives can be significant. This requires combined-arms task organization blending tanks, mobile infantry, mortars, artillery and engineers. If the region has lakes, amphibious vehicles may be needed in the summer, whereas skis will do as well in the winter. Flanking detachments frequently work with air assault forces to seize road junctions and bridges. Planning considerations for the scheme of maneuver include swamps, regions of deep snow pack, order of march, flank and rear security and increased combat support. Movement across snow may require marking the way with dye, coal dust or oil. Naturally, flank and rear attacks are better than frontal attacks. Ground combat may require movement during polar night, blizzards, fog, and snow storms. Most of this movement will be directed by compass azimuth or satellite signal. In many areas of the arctic, compasses and satellite signals are not reliable. Keeping units warm, intact and moving will be a challenge.[57]

[57] Kuselev and Vorobyev, 3.

Close Air Support

During World War II, Britain, the United States and Germany placed a great deal of confidence and resources backing the theory of the decisive nature of strategic bombing. Strategic bombing failed to deliver decisive victory. The terrorized urban populations did not overthrow their governments and demand peace at any price. Instead, the populations of England and Germany learned to survive bombing attacks and bonded closely to their governments until victory or the bitter end. The Soviet Union did not conduct a strategic bombing campaign although the Soviets had the world's largest multi-engine bomber fleet at the start of the war. Their experience in the Spanish Civil War convinced them that tactical air attack was far more effective than strategic. The Soviets believed that the war would be won by ground power and that air power could make its significant contribution by supporting ground operations. The Red Army Air Force was not an independent air arm, as were the Royal Air Force and the Luftwaffe, but, like the US Army Air Corps, the Red Army Air Force was an auxiliary of the Red Army and an essential part of the ground-air team. Air units were always subordinate to ground-force commanders, although there was a separate air force chain of command for administration, personnel, training and logistics.[58]

Colonel General Viktor Bondarev
Aerospace Forces Commander-in-Chief
Image Courtesy: Russian Ministry of Defense

The Soviet Air Force became a separate service after World War II. Nuclear weapons were a major concern and long-range aviation and air defense aviation aircraft became a priority in the Soviet Union. Air defense became a separate service in 1949, combining aircraft, antiaircraft artillery and air defense missiles into strategic air defense and tactical air defense branches. The Soviet Air Force had a long range aviation branch, military transport branch and an aviation of the front branch. The aviation of the front branch provided close air support to ground forces and had the largest number of aircraft in the Soviet Air Force-particularly as missiles took over as the primary nuclear weapons delivery means. Long-range aviation shrunk in importance after the Strategic Rocket Forces were formed in 1959. Aviation of the front assets included fighter bombers and army aviation. Army aviation were helicopters and Su-25 *Frogfoot* close air support aircraft

Mi-24PN

Image Courtesy: Vitaly Kuzmin

[58] John T. Greenwood, "The Great Patriotic War, 1941-1945", *Soviet Aviation and Air Power: A Historical View* (edited by Robin Highham and Jacob W. Kipp), London: Brassey's, 1978, 70.

Mi-28N

Image Courtesy: Vitaly Kuzmin

flown by Air Force pilots. In the 1980s, the Soviet Union had the largest military aviation force (air force plus air defense force) in the world (some 10,000 aircraft).

In 2015, the Russian Aerospace Defense Troops and Russian Air Force were combined into a new branch of service called the "Aerospace Forces" branch. In the Russian system, the Aerospace Defense Troops are considered "troops," roughly a lesser branch of the Armed Forces, and are responsible for strategic air defense and the operation of military space assets. The Air Force is a considered a full branch of service, but has struggled in recent years to maintain operational control of its army aviation (ground attack aircraft and helicopters) and transport aviation from the Russian Ground Forces and Airborne (VDV), which have long desired to integrate these capabilities as organic assets into their own organizations. The "ground-centric" Russian Armed Forces consists of three branches – the Aerospace Forces, the Ground Troops, and the Navy; and two types of troops–the Strategic Missile Troops (RVSN) and Airborne Troops (VDV). Although the benefits of putting air force, strategic air defense, and space assets under a single unified command covering "air and space" are obvious, this reorganization also significantly weakens the position of the Aerospace Forces in the Ministry of Defense. It increases the probability that the Aerospace Forces could lose its ground aviation and some transport aviation assets, retaining operational control of relatively few assets.[59]

[59] Charles K. Bartles, "Air Force and Aerospace Defense Troops Will Be Combined," *OE Watch* Online, December 2014.

Air Support of Ground Troops

Su-25SM

Image Courtesy: Vitaly Kuzmin

Aviation attack is closely integrated with artillery planning and priorities. Target priorities remain nuclear delivery systems, conventional artillery and air defense, attack groupings or defensive strong points, command and control, enemy air assault forces and assets, enemy penetrations, enemy reserves and logistics and illumination. Artillery remains the 24-7, all-weather primary fire support, but given sufficient visibility, the speed, flexibility, range and accuracy of aircraft can be decisive during a high-speed advance, particularly if artillery is unable to keep up. High-performance aircraft belonging to the aviation of the front will be involved in air superiority and interdiction missions, but will also provide close air support for difficult missions such as air assault, river crossings or breakthroughs. The helicopters and close air support aircraft of army aviation will routinely provide close air support.

During planning, aircraft are given point targets and missions for seeking out those targets outside of artillery range or not located with sufficient accuracy for an artillery strike. Fixed-wing aircraft attack deep targets while helicopters operate over their own force or the forward line of contact. Helicopters may also go deeper during meeting battles, air assaults or the pursuit. Helicopters are commonly employed in flank protection missions.
Coordination between ground and air is always a concern. The Russians address this through:

- shared frequencies and radio systems: This has long been a strength of the Soviet and Russian joint air-ground system. The ground soldier and the aircraft pilot can talk to each other directly over common radio systems and frequencies.
- liaison: Artillery, air and air defense staffs maintain close cooperation. The Russians primarily have ground FACs and some air FACs. Ground FACs are found at maneuver brigade and battalion level and are experienced pilots. The ground FAC controls both fixed and rotary-wing assets. Russians have employed air FACs, however, they consider that the ground FAC has much better situational awareness and understands the ground commander's intent more clearly.
- separation: Artillery, fixed wing and rotary-wing assets can be employed simultaneously in the same area. The strikes will coincide in time, however different target sectors will be assigned to each type of asset.
- "weapons tight": Ground-based air defense assets may be constrained in select sectors or along designated flight corridors during air missions.[60]
- minimum safe distances: The minimum safe impact distances of aerial ordnance near friendly forces are 1,000 meters for free-flight rockets, 500 meters for helicopter cannon and 300 meters for helicopter machine guns.[61]

[60] Conversations with Charles Dick and Jacob Kipp.
[61] The Russian General Staff, *The Soviet-Afghan War: How a Superpower Fought and Lost*, (translated and edited by

Mi-26

Image Courtesy: Vitaly Kuzmin

The aviation preparation of the attack begins with joint planning at the Army or Military District level, with the second and third parts of the air strike planning conducted at maneuver brigade and battalion level. In the course of the air preparation of an attack, strikes are delivered at the targets chosen beforehand at designated times, either simultaneously or consecutively. In actions on predetermined targets, aviation units and combat control bodies are given the necessary time for a thorough preparation of crews and aircraft to strike after receiving mission assignments. Optimal means of destruction for specific targets and combat equipment are selected, the composition of an attack group is determined, as well as the method of attacking the target, the assigned direction and height of target approach, maneuvers in the vicinity of the target, and other key tactical options. The composition of support groups is also decided. The strike and support groups use various flight formations along the route and near the target, depending on the combat actions, conditions and tactical situation.

On call fires in the course of the aerial support of an attack deal with newly-discovered targets and are initiated by FACs. These are first serviced by available aircraft circling in an airborne alert area. If these are not available, the FAC contacts a duty officer at an airfield, preferably one with a 5 to 15-minute readiness standby unit. For on-call fires, army aviation units are usually only given information on the probable area of action and type of target. The strike group (usually a couple or a squadron of helicopters) act without support groups. Take-

Lester W. Grau and Michael A. Gress), Lawrence: University Press of Kansas, 2002, 215.

Ka-52

Image Courtesy: Vitaly Kuzmin

off is made on command from the control post. If the helicopters are circling on aerial alert and are within the control area of the FAC, the command to attack is given by the combat actions control group or by a forward air controller upon target acquisition. The forward air controller corrects the targeting trajectory of helicopter gunships right up to the moment of target detection by the group leader.

Other missions of army aviation include air assault, mine laying and mine clearing from the air, control and communications assurance, correction of artillery fire, electronic countermeasures, resupply, as well as guarding troop rear areas, illumination, search and rescue and medical evacuation.[62]

Fighter bombers from the Aviation of the Front can effectively deliver ordnance in close air support. Minimum safe distances are increased over helicopter and Su-25 distances. In Afghanistan, fighter bomber pilots began dropping bombs and firing rockets on the same pass. They learned to make multiple passes with multiple planes from multiple headings. They learned to attack difficult targets in the mountains by developing diving attacks, pitch-up bombing and the carousel attack.[63] Support of ground forces remains a key mission of Russian military aviation. UAV are beginning to supplement this effort, however the Russians have been slow to arm their UAVs, using them primarily as reconnaissance and BDA assets.

[62] A. S. Budnik, "Army Aviation Helicopters in Local Wars and Armed Conflicts" *Military Thought* Volume 1 2016, 01 January 31 March 2016, 53-54.

[63] Recommended readings include Lester W. Grau, Aviation on the Other Side of the Northwest Frontier: Flying the Unfriendly Skies of Afghanistan during the Soviet-Afghan War", *From Fabric Wings to Supersonic Fighters and Drones: A History of Military Aviation on both sides of the North-West Frontier*, (Brian Cloughley, Lester W. Grau & Andrew Roe), Solihull: Helion & Company Limited, 2015, 162-180 and Viktor Markovskiy, The Hot Skies of Afganistan [Жаркое Небо Афганистана], Moscow: Tekhnika-Molodezhi, 2000.