Russian Artillery Fire Control for Large-Scale Combat Operations

LESTER GRAU
CHARLES BARTLES

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Authors Backgrounds

Dr. Grau has published over 200 articles and studies on tactical, operational and geopolitical subjects. His book, The Bear Went Over the Mountain: Soviet Combat Tactics in Afghanistan, was published in 1996. The Other Side of the Mountain: Mujahideen Tactics in the Soviet-Afghan War, co-authored with Ali Jalali, was published in 1998. The Soviet-Afghan War: How a Superpower Fought and Lost was published in 2001. The Red Army's Do-It-Yourself, Nazi-Bashing Guerrilla Warfare Manual and Passing It On: Fighting the Pushtun on Afghanistan's Frontier were published in 2011. Operation Anaconda: America's First Major Battle In Afghanistan and Mountain Warfare And Other Lofty Problems: Foreign Ideas On High-Altitude Combat, co-authored with Charles K. Bartles, were also published in 2011. Fangs of the Lone Wolf: Chechen Tactics in the Russian-Chechen Wars 1994-2009, co-authored with Dodge Billingsley, was published in 2012. Afghanistan: Preparing for the Bolshevik Incursion into Afghanistan and Attack on India, which is a translation of General Snesarev's 1921 classic work, was published in 2014. From Fabric Wings to Supersonic Fighters and Drones: A History of Military Aviation on Both Sides of the North-West Frontier, with Brian Cloughley and Andrew Roe, was published in 2015.

Charles K. Bartles is an analyst and Russian linguist at the Foreign Military Studies Office at Fort Leavenworth, Kansas. His specific research areas include Russian and Central Asian military force structure, modernization, tactics, officer and enlisted professional development, and security assistance programs. Chuck is also an imagery officer and Major in the Army Reserve at the Joint Functional Component Command for Integrated Missile Defense (JFCCIMD). He has deployed to Afghanistan and Iraq, and has served as a security assistance officer at embassies in Kyrgyzstan, Uzbekistan, and Kazakhstan. Chuck has a BA in Russian from the University of Nebraska-Lincoln, an MA in Russian and Eastern European Studies from the University of Kansas, a certificate in Geospatial Information Systems from the University of Missouri-Kansas City, and certificates in Database Administration and Computer Programming from Johnson County Community College.

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Russian artillery fire control for large-scale combat operations

By Lester Grau and Charle Bartles

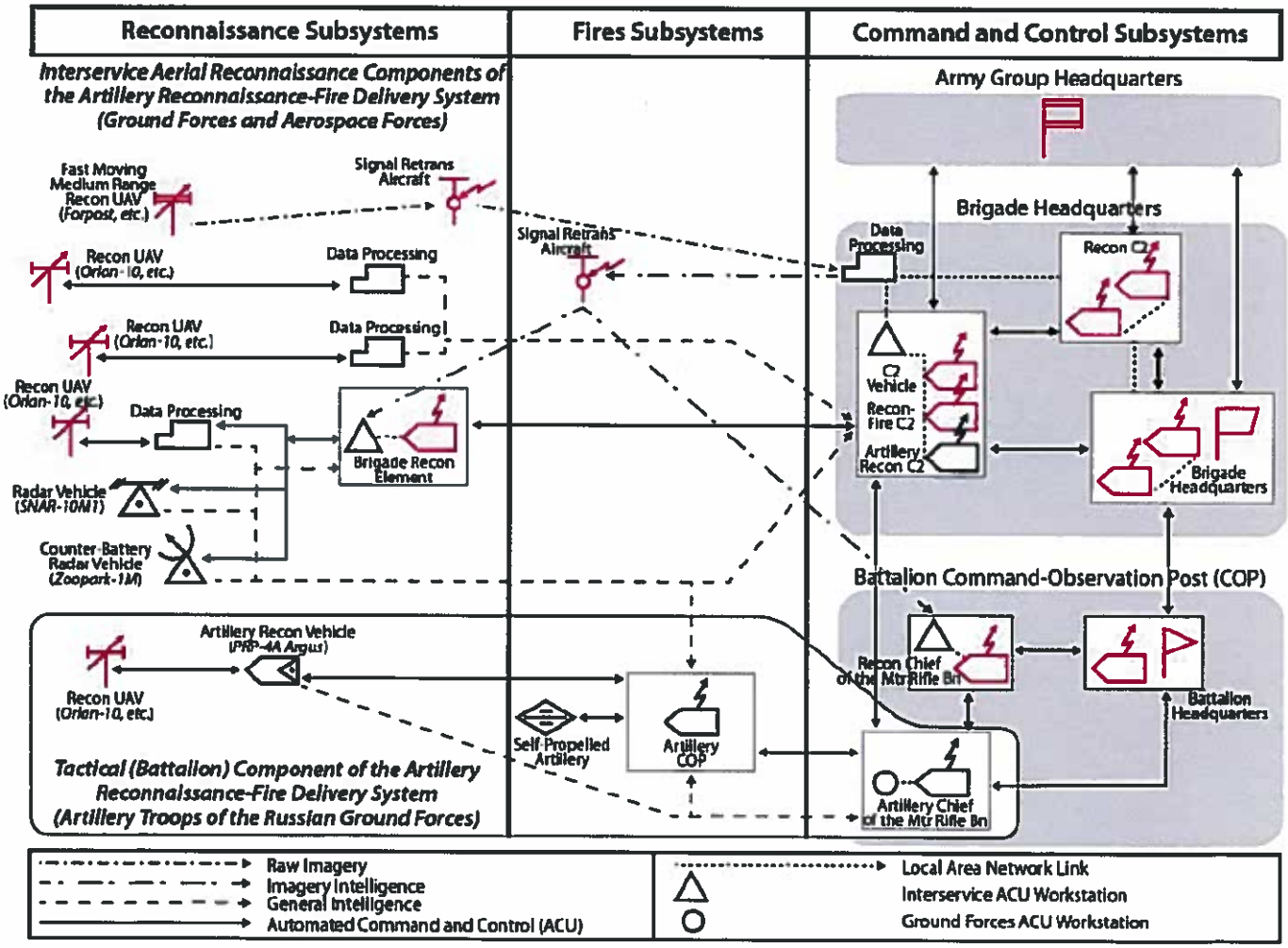
Armed conflict begins with reconnaissance. Experience shows that without reconnaissance- there is no information, without information- command and control is impossible, and without command and control- victory is impossible.[1]

Theory of implementation: The Reconnaissance-Fire System

The Soviet Union, and now Russia, have long worked on the development of twin concepts for the detection and assured destruction of high-value targets in near-real time. The Reconnaissance-Strike Complex (RYK) was designed for the coordinated employment of high-precision, long-range weapons linked to real-time intelligence data and precise targeting provided by a fused intelligence and fire-direction center.

1 *Lieutenant Colonel A. Artemyev and Lieutenant Colonel (ret) O. Kharchenko, "Aerial Reconnaissance: The Emergence of Aerial Photography as a Means of Supporting Combat Operations," Armeyskiy Sbornik [Army Digest], August 2018. Army Digest is the authoritative tactical journal of the Russian Ministry of Defense.*

Figure 1. The tactical reconnaissance-fire system where (at the top) the reconnaissance data from a variety of UAVs and radar are fed into the maneuver brigade headquarters (Courtesy illustration).



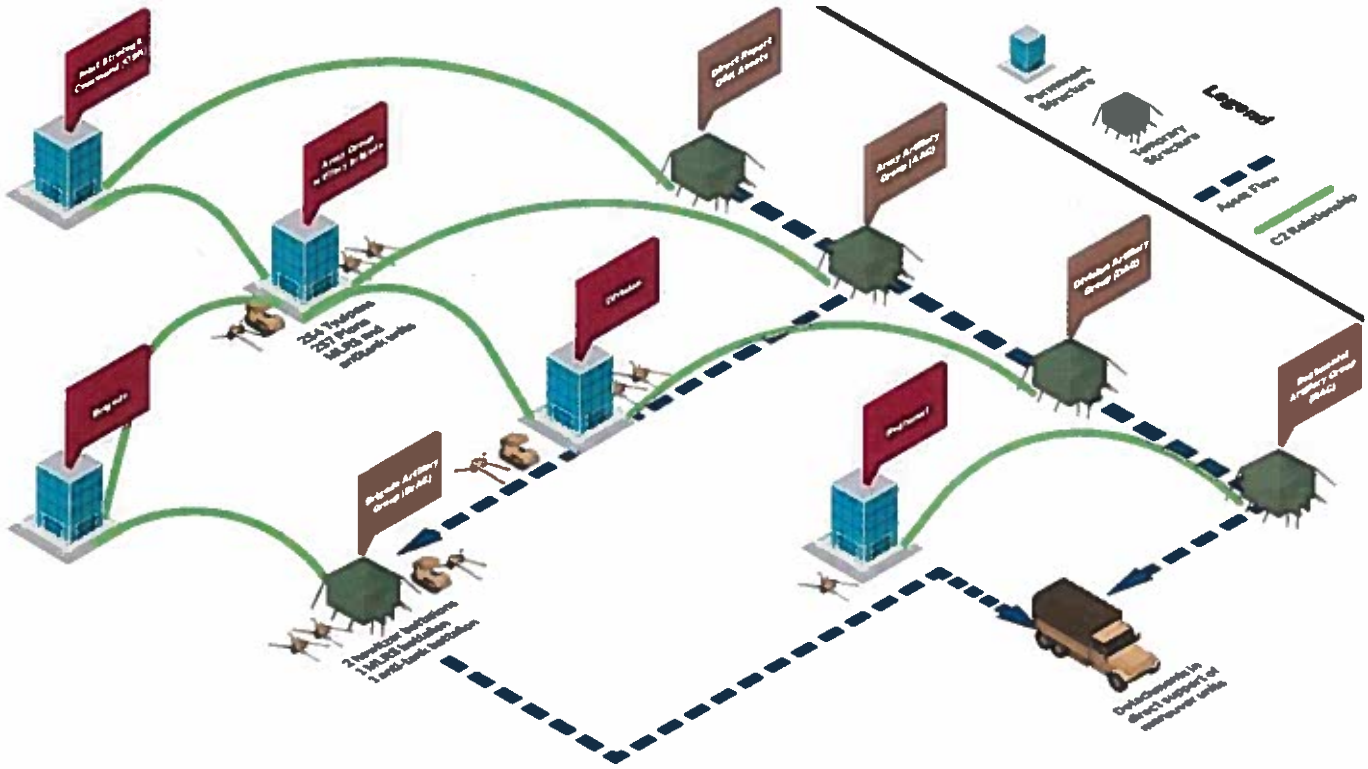


Figure 2. The Russian Artillery Group System (Rick Paape/Courtesy information).

The RYK functioned at operational depths using surface-to-surface missile systems and aircraft-delivered "smart" munitions. The Reconnaissance-Fire Complex (RYK) was the tactical equivalent. It linked intelligence data, precise targeting, a fire-direction center, and tactical artillery to destroy high-value targets in near-real time. The Soviets were making good progress in the development of both systems before the Soviet Union collapsed. After a period of chaos and adjustment, Russia is back on track and modernizing her armed forces. Part of that modernization is the fielding of a functioning and renamed reconnaissance strike system (RYS) and reconnaissance fire system (ROS). The Reconnaissance-Fire System has now been successfully deployed, and battle tested. RYS not only includes tube and rocket artillery, but also ballistic and cruise missiles; strike aviation; and ship and coastal naval Fires. This centralized system permits tasking Fires at all levels of combat, from front line artillery to deep strike aviation, through rear area missile strikes, at both the tactical and operational depths. If the ROS proves to be successfully implemented by way of the improved Strelets reconnaissance, command and control, and communications system (KRUS), the Russian Federation will gain a significant capability for directing Fires at both the tactical and operational levels of war.

The army group to which the brigade belongs also provides data from reconnaissance aircraft and satellites to its subordinate brigade (See Figure 1). The brigade processes this data and passes data for immediate fire engagement to the artillery battalion (bottom). The artillery battalion also has its radar and UAV reconnaissance to provide targeting data.

Task organization and the artillery group system

Perhaps the most interesting aspect of how the Russians organize Fires is how they conduct the command and control of their artillery assets. In garrison, artillery assets are assigned to their respective units, as typically depicted in standard line-block charts, but when engaged in combat, Russian units typically form 'Artillery Groups.' Artillery Groups can be formed at the Army group (combined arms armies, tank armies, and army corps) through regimental-level and consist of the unit's organic artillery, in addition to attachments from higher, but minus detachments to lower echelon units. Artillery groups are a doctrinally defended asset and are typically protected by air defense and electronic warfare assets. In terms of command and control, the unit's deputy commander for artillery or senior artillery unit commander typically commands the artillery group. The Joint Strategic Commands possess tactical artillery assets (heavy MLRS) but do not form artillery groups, so they pass their assets directly to the Army Artillery Group (AAG), or Division Artillery Group (DAG)/Brigade Artillery Group (BrAG) if no AAG was formed. As a rule, assets are usually only pushed down to the

next lower level. Of particular note, the Iskander-M SRBMs/GLCMs (SS-26 Stone/SSC-7) are not part of the artillery groups. These high-value assets are likely a special reserve for the army group commander, and so are not put under the command of the artillery group.

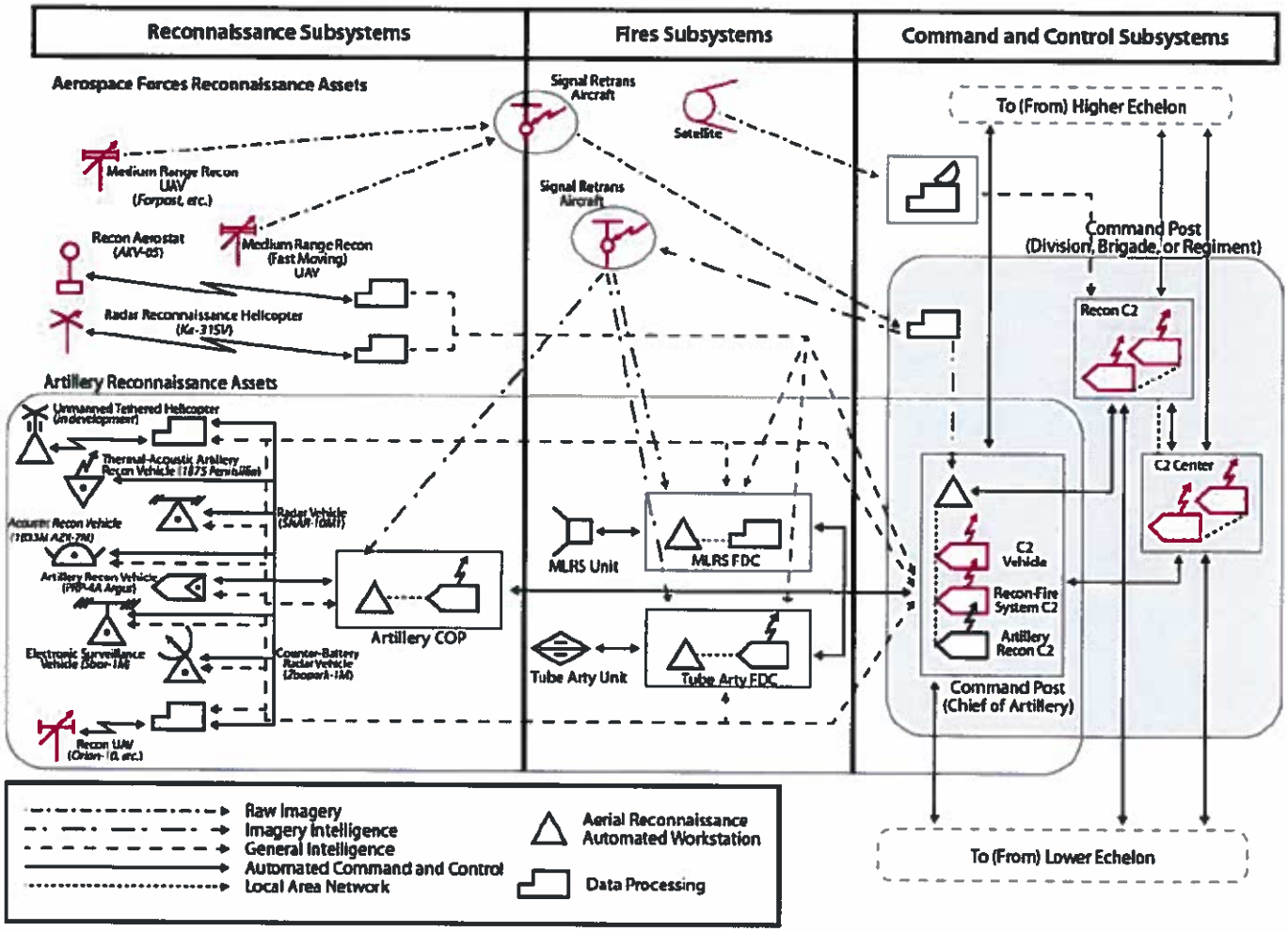
Also, the range of the Iskander (500km), allows it to remain much farther in the rear, so there is no need to have it physically located with the other artillery assets, which puts it at less risk of an enemy strike. At the brigade and regimental level, detached assets are put under the direct control of motorized rifle and tank battalion commanders in direct support of their missions. The artillery group system is essential for understanding Russian tactical and operational-level Fires, as it explains how assets are subordinated.

Proposed Army group-level artillery fire control

The aggregated Reconnaissance-Fire Systems (ROS) of the combined arms armies are equipped with advanced systems of Fires, reconnaissance, automated command and control, and support for conducting operational strikes and tactical Fires. These can be integrated into a common combined arms automated command and control system, a hybrid Reconnaissance Destruction System (RPS) for real-time effective fire engagement of the enemy. The Artillery Troop's ROS has a modular configuration within the combined arms force. The module includes command and control elements and forces that are capable of performing relatively independent fire engagement missions against enemy targets. The ROS modules at each level of combined arms command (combined arms army, tank army, army corps, division, brigade, regiment or battalion tactical group), include an artillery command post linked to a reconnaissance command post or artillery reconnaissance command post and the ROS command and control center. These elements likely interface through the Strelets reconnaissance, command and control, and communications system (KRUS), which will be discussed in greater detail. Organic and attached formations are linked by the KRUS as well.

The ROS command post is in-

Figure 3. The Tactical Module of the Artillery Troops' Reconnaissance-Fire System (ROS) in the Reconnaissance Engagement System (RPS) (Courtesy illustrations).



cluded in the command post of the chief of artillery for the combined arms force at each level. Its real-time missions include: receipt and analysis of target data, status of subordinate force elements, terrain data, hydro-meteorological data on the target areas and other information necessary for the execution of missions; planning and coordination of the actions of forces and means of engagement; and command and control of strikes and fire. At the same time, forces and assets of organic and attached artillery are integrated horizontally (among themselves at the same level of command and control in the module) and vertically (among forces and assets of different echelons of command and control among modules of different combined-arms force elements), forming reconnaissance, command and control, fire engagement, and support subsystems of the combat arm's ROS. These forces and assets of ROS subsystems must be integrated with similar forces and assets of other branches and combat arms by a common interbranch RPS of the combined arms combined formation. Proposals on the layout of the reconnaissance fire system and its modules are of great importance in the conception of the ROS configurations. The layout of the ROS and its modules depict their composition and structure, i.e., the aggregate of elements and established ties between them. Figure 3 shows the formation and ROS tactical modules organizationally included in the RPS.

Figure 3 shows the information integration of reconnaissance data from satellites, aviation, operational and tactical UAVs, radar, communications and equipment signature intercept, and other sensors. The integrated data provides an integrated threat picture which allows commanders at different levels to determine their most dangerous threats, and target them in real time or systematically. Tactical and operational weapons are provided their targeting data, meteorological data and priority to engage the identified targets. Post-strike analysis and retargeting data are provided by directed reconnaissance. Resupply of munitions and missiles are conducted to newly-occupied firing sites when needed. This depiction differs from Figure 1 in that it is a proposed solution to ensure that reconnaissance strike and reconnaissance fire systems have access to the same integrated threat picture and that no critical targets are ignored due to lack of overlaps in distance reconnaissance and priorities of tactical and operational planning. Figure 1 is a depiction of the tactical reconnaissance strike system as it is currently configured. Figure 3 does not wholly address the integration of aviation and possible strategic missile targeting in the proposed RPS structure. Further, there is no discussion on who or what determines assets are not wasted by duplication in the event operational and tactical planners both decide to attack the same target in real time.

The main subsystem of the proposed RPS will be the ROS due to the preponderance of tactical missions and the presence of multiple, detected, immediate threats. Based on historical experience, artillery will handle 50 to 70 percent or more of the overall fire missions. In the combined arms army, the ROS includes the systems of its subordinate combined arms elements. For example, the ROS of a combined arms army, tank army, or army corps includes the ROS of its subordinate combined arms divisions and brigades. In turn, each ROS of the combined-arms division artillery includes several ROSs of the division's combined arms regiments. Structurally the ROS of the combat arm of combined-arms force elements consists of generic modules:

- ROS of Army group (combined arms army, tank army, army corps artillery) – The Army group module and several divisional, brigade, regimental, and battalion modules;
- ROS of division artillery – The divisional module and several regimental and battalion modules;
- ROS of brigade (regimental) ar-

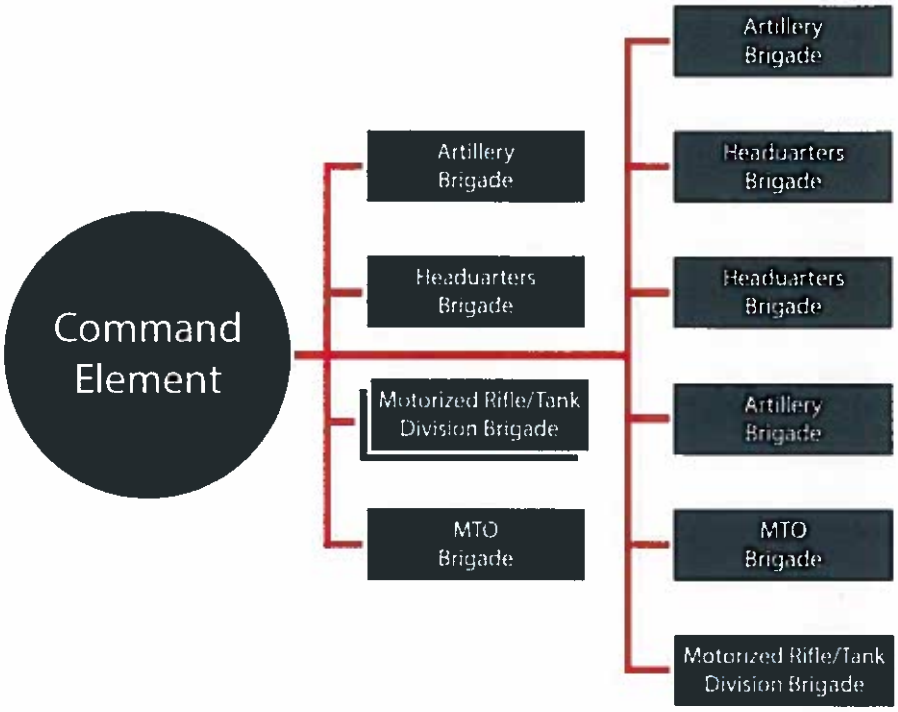


Figure 4. The Army Group Structure (Rick Paape/Courtesy information).

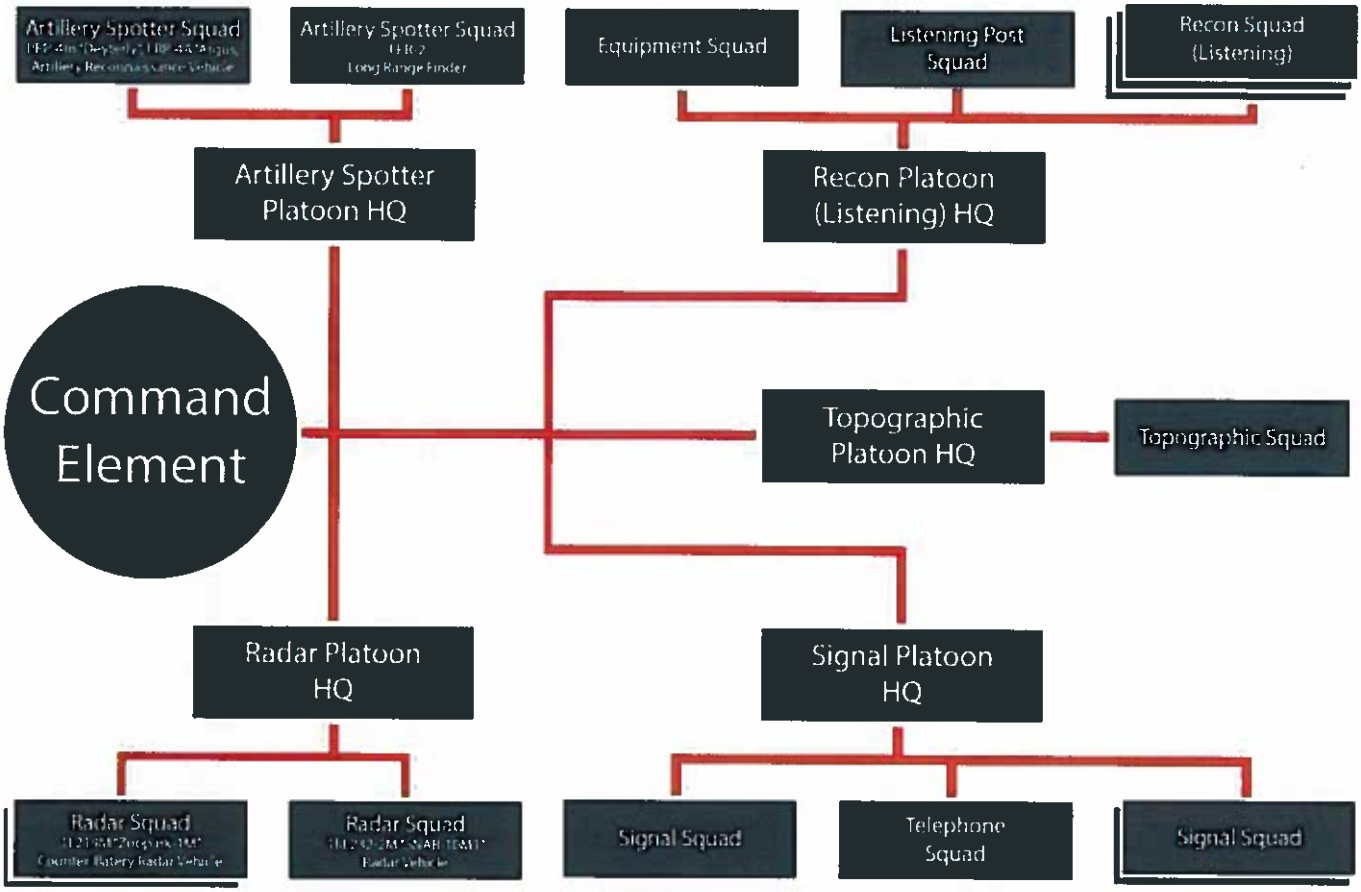


Figure 5. Division/Brigade Fire Control Battery (Rick Paape/Courtesy information).

tillery – The brigade (regimental) module and several battalion modules.

Analysis of the present-day order of battle of artillery groupings, tables of organization, and force modernization suggests that the RPS will not be fully implemented until 2020-2025. At that time, the ROS capability should be at full strength and totally integrated based on a unified KRUS. Therefore, at present, transition-period modules can be created for the ROS. Automated Control System would encompass only those artillery elements equipped with advanced and state-of-the-art armaments and automated command and control equipment systems, and this structure can function in a reconnaissance fire mode. During the initial phase, for the operational-level module, the following elements should be included in the automated command and control system: the Iskander-M missile brigades, Smerch or Tornado-S MLRS brigades and army artillery reconnaissance elements. In the future, the operational module will be able to engage enemy targets up to 500 kilometers from the line of contact with precision missiles. Therefore, in addition to artillery reconnaissance assets (reconnaissance depth up to 70 kilometers), aerial reconnaissance assets of the Aerospace Forces should function in this module (reconnaissance depth 150-500 kilometers). As new artillery and rocket systems enter the force, this process will undergo further modification and improvement.

Increasing Army group-level artillery Fires capabilities

The army group's artillery capabilities, except assets in the maneuver divisions and brigades, are contained in the Iskander-M missile brigade and artillery brigade. Typically, the artillery brigade has had no systems that could not be found in the maneuver divisions and brigades, it just merely provided more firepower. The Soviets had fielded large-caliber artillery, such as the 2S4 Tyulpan 240 mm mortar and the 2S7 Pion 203 mm howitzer, to suppress lines of communication; destroy enemy headquarters, tactical nuclear weapons, logistic areas, and other critical targets; and to destroy urban areas and field fortifications in the equivalents of their artillery brigades, but after the end of the Cold War, the Russian Federation placed most of these large caliber artillery systems into long term storage depots. At the time, this was seen as sensible because these large caliber systems were intended to deliver nuclear, as well as conventional, munitions. (The end of the Cold War meant that a long-range tactical nuclear weapon delivery was no longer needed). Furthermore, better

tube (2S19M Msta-SM) and missile (MLRS/SRBM/GLCM) systems, such as new 300 mm MLRS platforms, the Iskander-M missile system, and the 2S19M Msta-SM 152 mm howitzer, allowed Russia fulfill many of the same tasks as large-caliber artillery to varying degrees.

The Russian Federation is now taking these large caliber artillery pieces out of storage, modernizing them, and placing them into Russia's (only) 45th Heavy Artillery Brigade, and the Army groups' artillery brigades. Typically, large caliber artillery systems are organized into battalions with eight to 12 tubes (2 to 3 batteries) per battalion and use the same artillery command and control systems (such as the 1V12M Kharkov Artillery Fire Control System) that are found in standard artillery battalions. Interestingly, although there has been much discussion about the capabilities of large caliber artillery pieces, there has not been a mention of why they are being returned to service. Since there is little need for a tube-based nuclear artillery delivery system, and there are efforts to equip the systems with laser-guided munitions, it is likely that these systems are envisaged to pulverize urban areas and field fortifications, tasks which are difficult for standard Russian 122 mm and 152 mm artillery pieces.

Another possibility these systems are being reintroduced is concerns about the number of missiles in Russian depots (magazine depth). Although missile artillery systems such as the Iskander-M and new 300 mm MLRS platforms have greater ranges and may be more capable of performing specific tasks better than the 2S4 or 2S7, Russia's industrial base and financial resources to rapidly replenish sophisticated and expensive missiles at a level needed for large-scale war may be in question. (The production of 2S4 and 2S7 shells is much faster and cheaper than the production of any missile.) In short, new missile artillery systems may be better, but the 2S4 and 2S7 give Russian planners a more sustainable and economical way of conducting heavy Fires, and their use would allow the missile artillery to focus upon more specialized targets.

Brigade (division/regiment)-level artillery fire control

Maneuver division, brigades and regiments usually have a deputy commander for artillery. The brigade's fire control battery 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 includes platoons for artillery spotting (PRP-4A Argus), radars (1RL232-2M SNAR-10M1 and 1L219M Zoopark-1), listening posts, geodesy and communications.

Increasing brigade and division artillery Fires capabilities

Brigade (Division) artillery potential may soon increase. Russia has announced plans for a 'pocket' Iskander-M, a small, (likely) Ground Launched Cruise Missile (GLCM) system, known as the Precision Guided Tactical Missile System (VTRK). Just as the Army group (Combined arms army, Tank army, Army corps) commander has an Iskander-M system, brigade and division commanders will have a VTRK. The VTRK is intended to give brigade and division commanders an organic capability to conduct deeper strikes to the full extent of the tactical depth (approximately 100 km). Currently, these commanders' organic artillery assets (howitzers and 122 mm MLRS) can only hit targets out to approximately 20-60 km, depending on the equipment types and availability of extended range munitions. Unlike the Iskander-M, which is mounted on a heavy multi-axle chassis, the VTRK will be mounted on a two-axle utility vehicle similar to a U.S. Humvee. Since UAVs with 120 km range are already found at the brigade and division level, these units already can provide necessary targeting data to the VTRK, thereby creating a substantial deep strike capability. The deployment of this system to the brigade and division level demonstrates the Russian confidence in the up-down and down-up integration of the ROS and their ability to communicate in an electronic warfare and cyberwar environment.

Battalion-level artillery fire control

The Russian and Western systems for the command and control of artillery differ. 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 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. The battalion-level COP is typically linked with the command post of the chief of artillery of the higher headquarters (battalion, regiment or division).

Interestingly, the actual fire control for artillery units is provided not by the unit commander, but by the chief of staff for battalions and senior battery officer (the senior platoon leader) for batteries. These officers, not the commanders, are collocated with the artillery, providing them with fire direction. They staff fire direction center (FDC) vehicles to fulfill this function. 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 an FDC, than a COP that is conducting artillery reconnaissance on the battlefield. Russian artil-

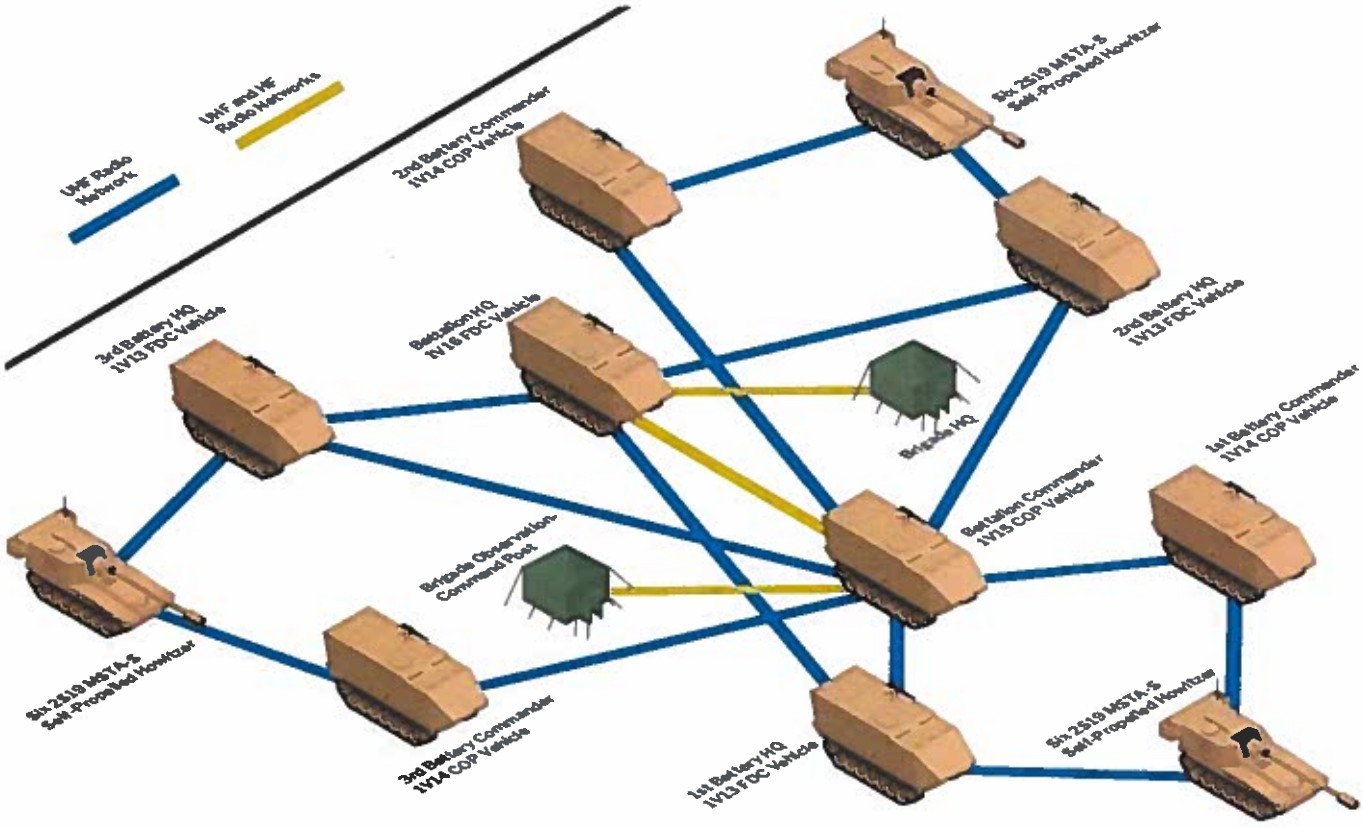


Figure 6. The 1V12 Kharkov Artillery Fire Control System (Rick Paape/Courtesy information).

lery battalions normally function as part of a DAG, RAG or BrAG, but are developing the capability of becoming a temporary ROS in support of the higher echelon. The Russians are now developing a system where artillery battalions may become temporary ROS systems when adequately equipped and linked. The Russian Armed Forces use a variety of artillery fire control systems, but they all generally follow the accompanying description of the 1V12 Kharkov Artillery Fire Control System.

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, and IV16M).

The IV13 functions as the FDC for the battery are 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 are 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 (IV13), the battalion COP (IV15), and the battalion FDC (IV16).

The IV15 functions as the COP for the battalion are 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 are 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).

Implementation of the Reconnaissance-Fire System

In practice, ROS is being implemented through the Strelets reconnaissance, command and control, and communications system (KRUS). The Strelets was developed in 2007 but was only fielded in large numbers beginning in 2011. It has undergone several modifications and hardware upgrades, and its use by Russian Forces in Syria is well publicized. The 'targeting' component of the Strelets is primarily used by the Ground Forces, Airborne and Naval Infantry, and GRU Spetsnaz; and consists of a small tablet

computer that can be worn on a tactical vest. The Strelets (likely based on the Linux operating system), reportedly can interface with legacy Soviet and Russian intelligence collection equipment and can interface with a variety of sensors (azimuth determination, radar, electro-optical, thermal-imaging, acoustic, target designation and sighting, et. al.), to include UAV based sensors. Russia's next generation of man-portable short-range reconnaissance radar, the 1L277 Sobolyatnik, and the 1L111 Fara-VR, appear to have been designed from the outset to integrate with it. The Strelets can also interface with other Russian Automated Command and Control Systems (ACUs) to include the Aerospace Defense Forces (VKS) Metronom strike-aviation ACU, and the Airborne Troops (VDV) Andromeda-D ACU.

The Strelets reportedly allows a service member to annotate the position of a target on digitized maps contained in the Strelets. The targets' coordinates are then transferred in real time to command posts, artillerymen, and pilots, reportedly halving the amount of time needed to lay Fires. The Strelets has several levels of accessories, the base variant is for each service members, up to squad leader. The next accessory level is intended for platoon leaders and company commanders, having a powerful computer and multifunction keyboard. The highest-level accessory package is for battalion and brigade commanders. The Strelets has an organic communications capability to communicate with other Strelets systems up to 1.5 kilometers away, and can retransmit communications from other Strelets transmitters. Presumably, it can also be integrated into existing communications networks for longer distance communications. The Strelets also has an organic GLONASS satellite receiver for navigation, and can likely use U.S. GPS signals as well, and has an inertial navigation capability that is automatically activated in satellite navigation denied or degraded environments. Perhaps one of the more interesting features is the 'friend-or-foe' recognition system, with the range depending on the specifications of the sensors to which the Strelets is interconnected. The Strelets sends a query to the unrecognized object, if the object is a 'friend' then the serviceman hears an audible notification in the earpiece. If quiet, The Strelets defines the object as 'foe.' There have also been reports of Strelets being used for medical evacuation (MEDEVAC) purposes.

Initially, the Strelets was only designed to direct artillery and aircraft Fires, but the system has reportedly been upgraded to allow the direction of naval Fires, namely the Kh-35 Zvezda (AS-20 Kayak/ SS-N-25 Switchblade/ SSC-6 Sennight), 3M-54 Kalibr (SS-N-27 Sizzler), P-800 Oniks (SS-N-26 Strobile), and presumably the forthcoming 3M22 Tsirkon (SS-N-33) hypersonic cruise missile. The real value of the Strelets is signified by much more than the fielding of a computer tablet that allows the rapid direction of Fires. The real value of Strelets is the behind-the-scenes infrastructure that creates the conditions for a network-centric C4ISR system that successfully integrates operators, reconnaissance assets, command elements, and very different Fires systems to include ground-based tube artillery and rocket artillery, ballistic and cruise missile, strike aviation, and ship and coastal naval Fires. If Strelets indeed functions as described, the Russian Armed Forces will need only one system to task Fires rapidly at all levels of battle, from front-line artillery to deep-strike aviation, through rear-area missile strikes, truly fielding a unified Reconnaissance-Fire System that facilitates Fires at both the tactical and operational depths.

Conclusion

Technological advances in the fields of computer technology and communications have finally allowed Russia to field a true Reconnaissance-Fire System (ROS) as was envisioned in Soviet times. If the ROS proves to be successfully implemented by way of the Strelets reconnaissance, command and control, and communications system (KRUS), the Russian Federation will gain a significant capability in directing Fires at both the tactical and operational levels of war. Furthermore, this architecture should significantly enhance situational awareness for Russian commanders and the resilience of Russian Fires, as most sensors are networked. In the past, if the 'eyes' and 'ears' of the artillery battalion were neutralized, the artillery battalion would be 'blind' and 'dumb,' now this artillery battalion would theoretically be able to leverage other ground forces (Army) and Aerospace Forces (Air Force) sensors to engage the enemy. In sum, although still under development, the Reconnaissance-Fire System is an emerging capability worthy of attention and further study.

Dr. Les Grau is a retired infantry officer, Russian EAO and research director of the Foreign Military Studies Office. He has published 15 books and 250 articles for professional journals. He and Chuck Bartles published The Russian Way of War: Force Structure, Tactics and Modernization of the Russian Ground Forces https://community.apan.org/wg/tradoc-2/fmso/.

Charles Bartles is a researcher and Russian linguist at the Foreign Military Studies Office. His research areas include Russian and Central Asian military force structure, modernization, tactics, and officer and enlisted professional development. Bartles is also a major, imagery and space operations officer in the Army Reserve.