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Russia in the Precision-Strike regime

– military theory, procurement and operational impact

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Summary

This is a report about Russian thinking on the use of conventional high-precision weapons. It explains how this debate has developed in Russia since its inception in the mid-1980s, and analyses what Russian military theory has to say about high-precision weapons today and what their significance is likely to be for future warfare. Russian military and military analysts were in fact some of the most important pioneers internationally in this regard. Their problem was that they had little chance to implement their ideas in their own armed forces. Because of the fall of communism and the Soviet Union, Russia entered an economic crisis that meant there was no money for arms purchases. In addition, political relations with the West in the 1990s and early 2000s were good. This meant that in terms of Russian security there was not that much need for high-precision weapons. There were programs for the development of such weapons throughout this period, but the Russian armed forces started to actually achieve operational conventional cruise missiles only in 2010.

Today, however, the situation has changed radically. This is mainly for two reasons. First, Russia experienced high economic growth in the 2000s. This growth gave financial room for returning to higher levels of spending on the armed forces. The funding for the State Armaments Program 2011–2020 tripled compared to previous programs. Second, relations with the West deteriorated during Putin's rule. After the annexation of Crimea in 2014, and the support in instigating an anti-Kiev rebellion in Eastern Ukraine the same year, relations have grown very cold. In combination, these two changes gave a new boost to the Russian development of high-precision weapons. In 2017 the Russian Defence Minister Sergei Shoigu promised that the quantity of such weapons in Russia would increase 30 times by 2020.

In the future, conventional high-precision weapons may come to play an important role both in defence of the country, especially in terms of deterrence, and in bilateral conflicts with other countries where Russia wants to force its will through. In general, the Russian debate on these weapons is more preoccupied with defensive than with offensive scenarios. Some Russian analysts see these weapons as adding an extra layer of deterrent capability in addition to nuclear weapons, whereas others suggest that they in the future may even supplant the nuclear weapons as a deterrent.

Although offensive use is less frequently discussed than defensive use, there is a debate in Russia also of this aspect. Three points are often raised: (1) that conventional high-precision weapons are likely to increase the role of military force in foreign policy generally around the world; (2) that for Russia they may be particularly efficient in conflicts with highly developed states, since these states are highly vulnerable because of their high concentration of critical stationary installations; and (3) that these weapons may be particularly efficient in combination with other capabilities. In Russia these capabilities are first of all seen to be special and airborne forces.

However, the report also points out that there are a number of considerations that may limit the future use of conventional high-precision weapons. These weapons are likely to remain especially costly to produce, and Russian production capacity is not unlimited. In addition, their efficiency in terms of Russia reaching its political goals will be very dependent on both how they are used and in what contexts they are used.

Sammendrag

Denne rapporten analyserer russisk tenkning rundt bruk av konvensjonelle presisjonsvåpen. Den beskriver hvordan tenkningen har utviklet seg siden russiske militære på midten av 1980-tallet begynte å skrive om denne typen våpen, og den tar for seg hvordan russiske militære analytikere i dag skriver om presisjonsvåpen og disse våpnenes betydning for krigføring. Russiske militære og militære analytikere var faktisk noen av pionerene på dette området. Deres problem var at de i liten grad fikk anledning til å sette ideene ut i livet når det gjaldt egne væpnede styrker. Kommunismens og Sovjetunionens fall førte til en økonomisk krise som innebar at Russland ikke hadde råd til å kjøpe nye våpen. På 1990- og 2000-tallet var også forholdet til Vesten godt, og det sikkerhetspolitiske behovet for presisjonsvåpen var derfor heller ikke prekært. For eksempel fikk det russiske forsvaret ikke tilført operative kryssermissiler med konvensjonelle stridshoder før i 2010.

Dette bildet forandret seg imidlertid radikalt på grunn av to forhold. For det første opplevde Russland sterk økonomisk vekst på 2000-tallet. Denne veksten gav finansielt rom for igjen å satse på forsvaret. I våpenprogrammet for årene fra 2011 til 2020 ble utgiftene til nytt militærmateriell tredoblet sammenlignet med tidligere våpenprogram. For det andre ble forholdet til Vesten gradvis dårligere under Vladimir Putins styre. Etter at Russland annekterte Krim-halvøya i 2014 og bidro til å initiere et væpnet opprør i Øst-Ukraina samme år, har forholdet vært på frysepunktet. Samlet ga disse utviklingstrekkene en ny giv for utviklingen av russiske presisjonsvåpen. Forsvarsminister Sergej Shoigu har lovet at antallet slike våpen i de russiske arsenalene skal øke 30 ganger fram til 2020.

Russland kan i framtiden komme til å bruke slike våpen både i forsvar av landet og i bilaterale konflikter der Russland mer offensivt ønsker å presse sin politiske vilje gjennom. Generelt preges debatten i russiske fagtidsskrifter mer av defensive enn offensive problemstillinger. Enkelte russiske analytikere ser på disse våpnene som en mulighet til å etablere en avskrekkingskapabilitet mot andre og særlig vestlige land, som kommer i tillegg til og tidsmessig virker forut for atomvåpnene. Andre har også tatt til orde for at konvensjonelle presisjonsvåpen med tiden kan komme til å ta over for atomvåpnene når det gjelder avskrekking.

Det skrives mindre om eventuell offensiv bruk at disse våpnene i regionale scenarioer, men også her foregår det en debatt på russisk side. Det er særlig tre faktorer som trekkes fram: (1) at konvensjonelle presisjonsvåpen vil være med på å gi bruk av militærmakt en mer framtredende rolle generelt i staters utenrikspolitikk i framtiden, (2) at disse våpnene kan være særlig egnet for Russland i konflikter med høyt utviklede land på grunn av den store konsentrasjonen av mål som er kritiske for at disse landene fungerer, og (3) at slike våpen kan være særlig effektive i kombinasjon med andre kapasiteter. For Russlands vedkommende er slike kapasiteter først og fremst spesialstyrker og luftlandestyrker.

Rapporten peker imidlertid også på en rekke faktorer som kan bremse Russlands militære og politiske nytte av konvensjonelle presisjonsvåpen. Slike våpen vil trolig fortsatt være dyre å produsere, og den russiske produksjonskapasiteten har også sine begrensninger. I tillegg vil den eventuelle politiske effekten av å bruke slike våpen antakelig være sterkt påvirket av hvordan og i hvilke scenarioer de brukes.

Content

1 Introduction

The development of precision-strike capabilities has given the West, and in particular the USA, a military-technological edge in comparison with most other international actors since the early 1990s. This lead, however, is now eroding. Both state and non-state actors are currently busy trying to acquire this capability.

The present study analyses Russia's entry into the precision-strike regime. It is to some extent a paradox that Russia is only now fully entering this regime, since one of the pioneers in thinking about the revolutionary character of precision-strike was the late Soviet Marshal Nikolai Ogarkov in the mid-1980s. Soviet engineers were at that time working on designs for a first generation of domestic precision-strike weapons, but the fall of Communism and the Soviet Union meant that development was seriously delayed. Thus, for example, Russia did not have cruise missiles with conventional warheads for land attack operational until 2010. Now, however, precision-strike capabilities are at the forefront both in the military theory and in the procurement plans. A combination of strong economic growth in the 2000s and seriously deteriorating relations with the West, especially since the annexation of Crimea in 2014, seem to be two of the main drivers.

The study is roughly divided into two parts. The first part, chapters 2 through 5, tells the story of how Russia has entered the precision-strike regime, and discusses its implementation and how it is finding its role within the overall Russian military architecture. The second part, chapters 6 and 7, are more forward looking. They analyse how Russian military and defence intellectuals envision the role of high-precision weapons in defensive and offensive operations respectively in the future. Much of the detailed planning for the use of precision-strike weapons will obviously be classified. Those two chapters are therefore based on a mix of open source Russian military writings on how high-precision weapons may be used, and on the authors' rational-choice inspired expectations of what dilemmas Russian decision makers may face when deciding on the potential use of these weapons. Finally, the main findings are summarised in a concluding chapter.

2 Russia's Historical Interest in High Precision Weapons

Moscow's interest in developing high-precision conventional strike capability is not new. The current priority assigned to the further introduction of such systems in the Table of Organization and Equipment (TO&E) as part of Russia's on-going military modernization represents a distinctive evolution within a specifically Russian military and strategic context. To understand this at a deeper level requires some sense of historical developments, advances in Soviet and Russian military theory and reference to the concepts involved. It is crucial to recognize that there are terminological differences between Russia and the USA and NATO in this regard.

Precision-Guided Weapons or Precision-Guided Munitions originated as Western concepts which entered Russian military parlance due to translation of the Western terms.[1] The correct Russian usage of the term referring to systems broadly designed to accurately strike an enemy target at distance is High-Precision Weapons (*Vysokotochnoye Oruzhiye* –VTO). We will use this Russian abbreviation in the rest of this study. The official defence ministry definition of the term is as follows:

> The current VTO system is complex systems and combat support systems and resources, including: the intelligence system, communication channels, control centres, computer facilities, means of delivery and guided munitions. Depending on the management structure and the type of ammunition the VTO could solve tactical, operational-tactical, operational and strategic objectives. By the VTO system are: reconnaissance and strike and reconnaissance-fire complexes; air- and sea-launched cruise missiles; some types of short-range missiles; anti-aircraft and anti-missile systems; aircraft guided missiles, cartridges and bombs; separate samples of artillery systems and ASW complexes.[2]

In Russian military reference to high-precision weapons, since the 1990s the key developmental and conceptual terms were: reconnaissance-strike complex (*razvedyvatel'no-udarnnyy kompleks* – RUK) or the reconnaissance-fire complex (*razvedyvatel'no-ognevoy kompleks* – ROK). These are the areas into which such weapons would more readily fit. In the early 2000s Russian military scientists had added the reconnaissance-strike system (*razvedyvatel'no-udarnaya sistema* – RUS), the reconnaissance-fire system (*razvedyvatel'noognevaya sistema* – ROS), and the reconnaissance-fire operation (*razvedyvatel'no-ognevaya operatsiya* – ROO) to augment the RUK and ROK concepts.[3] It is unsurprising, therefore, to see reference to ROK in the official defence ministry definition of the VTO system.

The later Soviet interest in these systems evolved alongside shifts in Soviet military theory and their consideration of the strategic environment and particularly future warfare and deterrence theory. A number of Soviet military specialists, consequently, noted the actual origin of the state interest in high-precision conventional strike capability as a response to developments within the US military, especially the use of precision weapons in the latter part of the Vietnam conflict. Moreover, as US advances continued in this area in the aftermath of the Vietnam War, Soviet military theorists began to see that conventional systems might take on strategic value in certain situations. They came to realise that by advances in technology, these weapons could in the future be perceived on a par with nuclear weapons in terms of the danger presented by their use.[4]

At the forefront of such strategic thinking was the late Marshal Nikolai Ogarkov, an advocate of military transformation, known as the Revolution in Military Affairs (RMA). Soviet and later Russian interest in VTO is inseparable from this intellectual inheritance. Ogarkov's contribution to stimulating state level interest in VTO is unparalleled and his writings in the 1970s and 1980s serve as guidelines even today for further advancement in high level conventional capability. A

[1] The problem of defining precision-guided weapons is addressed in: Vitaly Tsymbal, 'The Growth of the Strategic Role of Highly Intelligent Weapons and the Problems of Controlling their Growth and Proliferation, Nuclear Control, June – July 1997, pp. 39 – 43.
[2] 'Vysokotochnoye Oruzhiye –VTO,' Mil.ru, http://xn--d1abichgllj9dyd8a.xn--90anlfbebar6i.xn--p1ai/encyclopedia/dictionary/details_rvsn.htm?id=12896@morfDictionary, Accessed 17 February, 2017.
[3] S. N. Razin'kov, Ye. A. Reshetnyak, A. M. Chernyy, 'Radioelektronno-informatsionnoye obespecheniye voysk radioelektronnoy bor'by Vooruzhennykh Sil Rossiyskoy Federatsii,' Voennaia Mysl', No. 12, 2015; Andrey Yevdokimov, Narine Karapetyan, Mikhail Rutman, Mikhail Yakovlev, 'Strelyayem Moshchno. No Chasto Mimo,' Zashchita i bezopasnost', 30 June 2016.
[4] F. Dmitriev, 'High-Precision Weapons of the USA and NATO,' *Zarubezhnoye Voyennoe Obozrenie*, No. 8, 1984.

generation of Soviet and Russian military theorists were influenced by Ogarkov's RMA; and this trend seems set to continue.[5]

In Ogarkov's RMA, conventional warfare was undergoing a *revolution* in its means and methods. This fact had important messages for Soviet strategy. The country could no longer rely solely upon nuclear deterrence. Increasingly in Ogarkov's work and among his supporters there was reference to achieving progress towards non-nuclear deterrent capability. One commentary on Ogarkov notes: 'He stressed the impact of new technologies associated with automated command and control, electronic warfare, precision strike, and weapons based on new physical principles upon the conduct of war.'[6] The profound impact of Ogarkov not only on Soviet and subsequent Russian strategic planning, but also on the creation of new capabilities in the US militaries, should certainly not be underestimated.[7]

The idea of a conventional strike capability had become embedded already by the early 1990s. A statement issued by the Presidium of the Russian Federation Supreme Soviet *On Priorities in Russian Federation Military Policy*, dated 1 April, 1992, reads as follows, 'Forces with *high-precision weapons* and delivery systems for them should become the main factor of deterring large-scale conflicts and local wars from breaking out against Russia and the other CIS member states.'[8]

If Soviet interest in such weapons systems was triggered by US usage in Vietnam and its potential strategic implications for Soviet defence planning, the next catalyst for late Soviet and Russian military officers and theorists was provided by the US and coalition use of precision weapons in the 1991 Persian Gulf War. The impact of this war on Russian military theory, however, was to some extent delayed by the hegemony of traditionalist Russian military analysts. This in particular concerns the work of the Army-General (retired) Makhmut Gareev. Gareev was in his analysis more guided by practise than military theory. He came to effectively represent the conservative military thinking of the Soviet military hierarchy. Gareev's 1983 book on combine-arms warfare is a monolithic tribute to Soviet military conservatism.[9] Other theorists such as Army-General I.E Shavrov and Colonel-General M.I. Galkin, were seeking to incorporate a philosophy of knowledge into their analysis and work; military exercises for them were more than mere training but an opportunity to test and refine concepts. Equally, Shavrov and Galkin paid closer attention to war games and field testing equipment.[10]

In the 1990s and early 2000s, however, a group of Russian military theorists provided ground-breaking studies that contributed to the development of *military systemology* (*voyennaya sistemologiya)* in military science. This was a new discipline, relying on modelling and cybernetics to establish a relevant theory of combat systems among other forecasting

[5] See: Jacob W. Kipp, *The Russian Military and the Revolution in Military Affairs: A Case of the Oracle of Delphi or Cassandra?* (Fort Leavenworth, Kansas: U.S. Army Foreign Military Studies Office, June 1995); Jacob W. Kipp, 'Confronting the RMA in Russia,' *Military Review* (May-June 1997) pp. 49 – 55; Mary Fitzgerald, 'The Soviet Military and the new air war in the Persian Gulf,' *Airpower Journal* (Winter 1991) pp. 64 – 78.
[6] 'Ogarkov, Nikolai Vasilevich,' Encyclopedia of Russian History, http://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/ogarkov-nikolai-vasilevich, 2004.
[7] See: Mary C. Fitzgerald, 'The Russian Image of Future War' *Comparative Strategy*, XIII, No. 2, Spring, 1994, pp. 167–180; Jacob W. Kipp, 'Barbarossa, Soviet Covering Forces and the Initial Period War: Military History and Airland Battle,' *Soviet Army Studies Office*, Ft. Leavenworth, KS, 1987.
[8] See: Security, Disarmament, Conflicts, RAU, Moscow, 1992.
[9] M. Gareev, *Obshche-voynskiye ucheniye*, Voenizdat: Moscow, 1983.
[10] I. E. Shavrov and M. I. Galkin, 'Methodology of Military-Scientific Knowledge,' [Metodologiya voyenno-nauchnogo poznaniya], Voenizdat: Moscow, 1977.

techniques.[11] The late Major-General Viktor Riabchuk's article in *Voennaia Mysl'* in 2001, is a case in point, under the title: 'The Theory and Praxis. The Theory of Military Science and the Methodology of Military Science,' [*Voyennaya teoriya i praktika. Voyennoye naukovedeniye i metodologiya nauki*].[12] Riabchuk was arguing against the accepted norms of the military establishment and like him, Major-General Vladimir Slipchenko and Captain Edvard Shevelev became devout proponents of military systemology, which offered a greater role to information management in command and control. They advocated cybernetics and the RMA, arguing that the infusion of information systems into weapons had wrecked the traditional analyses of correlation of forces as a means of resolving combat outcomes in war gaming. They had modelled the US-led coalition operation to liberate Kuwait in 1991 (Desert Storm), and achieved the correct outcome, although they wrongly anticipated greater coalition losses.

Slipchenko's work in this area cannot be overestimated. As early as 1999 he argued that science and technological developments are the key variables which determine the type of warfare being conducted at any given time. He classified wars into six categories: from ancient wars (first-generation) to the use of advanced conventional precision weapons having the destructive potential of tactical nuclear weapons (sixth-generation).[13] He suggested that sixth-generation wars would be denoted by offensive aerospace operations, led by UAVs preceded by electronic warfare (EW) operations, and only a supporting role for ground forces. This development might render nuclear weapons obsolete, since operational and strategic objectives could be achieved by massive precision bombings.[14]

Slipchenko noted in October 2002 that: 'Any future war will be a non-contact war. It will come from the air and space. Guidance and control will come from space, and the strike will be conducted from the air and from the seas using a large quantity of precision weaponry.' [15] Following the US-led intervention in Iraq in 2003, Slipchenko was a leading advocate of Russia adopting *network-centric warfare* (*setetsentricheskaia voina*) capability, using the term *bezkontaktnaia voina* (non-contact warfare).

An interconnected development in Russian military thinking since the RMA, was expounded in detail by former Deputy Defence Minister Andrei Kokoshin, coining the phrase 'non-nuclear deterrence,' (*neyadernogo sderzhivaniya*) or 'pre-nuclear deterrence,' (*pred'iadernoe sderzhivaniya*) which in 2010 entered the lexicon of Russia's Military Doctrine (see discussion below).[16] Thus, any realistic assessment of Russia's continued and future interest in VTO must take account of the historical intellectual context in which it emerged. The country was and is

[11] V. D. Ryabchuk, 'Nauka, obrazovanie, reforma,' Voyennaya mysl', No. 2 (February 1994), pp. 39 – 41; V. D. Ryabchuk et al., Elementy voyennoy sistemologii primenitel'no k reshenyu problem operativnogo iskusstva i takitiki obshchevoyskobykh ob'edineniy, soyedineniy i chastey: Voyenno-teoreticheskiy trud, (Moscow: Izdatel'stvo Akademii, 1995).
[12] Viktor Ryabchuk, 'The Theory and Praxis The Theory of Military Science and the Methodology of Military Science,' [Voyennaya teoriya i praktika. Voyennoye naukovedeniye i metodologiya nauki], Voennaia Mysl', November 2001, pp. 32 – 36.
[13] Vladimir I. Slipchenko, Voyna Budushchego (Future War), Scientific Reports edition 88 (Moscow: Social Science Foundation, 1999).
[14] Ibid.
[15] 'Major-General Vladimir Slipchenko Views Possible US 'Non-Contact' War on Iraq,' Vremya Novostei, 5 October, 2002.
[16] See: Andrei Kokoshin, *O sisteme neyadernogo sderzhivaniya v oboronnoi politike Rossii* [On the System of Non-Nuclear Deterrence in Russia's Defence Policy]. Moscow: Moscow University Press, 2012. V.I. Poletayev and V.V. Alferov, 'O neyadernom sderzhivanii, ego roli i meste v sisteme strategicheskogo sderzhivaniya,' Voennaia Mysl', No. 7, July 2015, pp. 3–10; A.N. Bel'skiy, D.A. Pavlov and O.B. Klimenko, 'Aktual'nye voprosy obezpecheniya voyennoy bezopasnosti Rossiiskoy Federatsii,' Voyennaia Mysl', No. 1, January 2015, pp. 3–10; *Voyennaya Doktrina Rossiiskoy Federatsii'* [Military Doctrine of the Russian Federation], 2014, https://rg.ru/2014/12/30/doktrina-dok.html , Section 12, point G; and Section 21, point M; V.A. Sobolevskiy', A.A. Protasov and V.V. Sukhorutchenko, 'Planirovanie primeneniya strategicheskikh vooruzhenii,' Voyennaya Mysl', No. 7, July 2014, pp. 9–27; V.V. Matvichuk and A.L. Khryapin, 'Sistema strategichsekogo sderzhivaniya v novikh uslovyakh,' Voyennaya Mysl', No. 1, January 2010, pp. 11–16; A.V. Nedelin, V.I. Levshin and M.E. Sosnovsky, 'O primenenii iadernogo oruzhiya dlya deeskalastii voennikh dyestvii,' Voyennaya Mysl', No. 3, May–June 1999, pp. 34–7.

ultimately driven by concern over maintaining strategic deterrence and developing new capabilities to meet modern warfare challenges through a range of potential conflicts.

3 Conventional Strike Capability Examples

Entirely consistent with Russia's long standing interests in VTO, following its lengthy hiatus in serious procurement for the Armed Forces in the 1990s, more consistent steps were taken to introduce and build a viable conventional strike capability in the 2000s. These are present across the service arms and branches providing air, land and sea capability to deliver high-precision strikes on enemy targets. There are some notable examples of VTO, such as the land attack cruise missiles (LACM) (Kh-101, Kh-55) with ranges of up to 2.500 – 3.000 km, or the 3M-55 Oniks P-800 anti-ship cruise missile, or among air-defence assets the older generation S-300PMU SAM (Favourite) in its land and sea-based variants, or the newer S-400 (Triumf). Its high-technology successor, S-500, however, remains at design and testing phases but is scheduled for introduction in 2018 – 20.

For the purpose of deeper analysis, three key examples of Russia's VTO are discussed here, in order to illustrate the nature of their systems and the extent of the capability development. These are the 9K720 Iskander, 3M-54 Kalibr cruise missile and the S-400.[17] While each of these offer impressive capability, taken together and folded into an 'air-defence bubble' they are even more impressive. This was what happened during Russia's military operations in Syria. What emerges from the combination is not only a formidable system offering anti-access/area denial (A2/AD) and force protection, but also a significant advance toward command, control, communications, computers, intelligence, surveillance and reconnaissance (C^4ISR) non-contact or network-centric capability. Moreover, as already noted, such VTO systems mark an increasingly credible conventional element in Russia's overall deterrence strategy.

3.1 9K720 Iskander

The Iskander belongs to a set of tactical-operational missiles in the Ground Forces. It was in its design stage since 1995, under the direction of the KBM Kolomna, and entered service in 2007. The first use in combat reportedly occurred during the Russia – Georgia War in 2008. Iskander is a highly mobile system designed for covert preparation and application, for semi-guided ballistic missile strikes deep into the operational formations of enemy forces (range up to 500 km). It is a dual use system designed to deliver both conventional and nonstrategic nuclear strikes.[18] It is a modernized version of the Soviet Oka tactical missile system, and is earmarked

[17] For the purposes of this study the Russian designations of the VTO systems are used rather the NATO designation, as the effort to consider how Russia's General Staff might think about these systems and capabilities. However, it can be noted that S-400 is designated by NATO as SA-21 (Growler), Iskander as SS-26 (Stone) and the Kalibr as SS-N-27 (Sizzler).

[18] Aleksandr Sharkovskiy, 'Desyat' naiboleye vazhnykh sobytiy 2016 goda,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/realty/2016-12-23/1_931_events.html, 23 December 2016; Oleg Vladykin, 'Ukrainskaya armiya sginet pri popytke atakovat' Rossiyu,'*Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/realty/2016-09-16/1_ukraina1609.html, 16 September, 2016; Oleg Vladykin, 'Nedelya v armii. Otrepetirovany udary po udalennym tselyam za predelami yugo-zapadnykh rubezhey,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/week/2016-09-11/11_army.html, 11 September, 2016.

to replace all existing Tochka-U systems by 2020. The Iskander is mounted on a truck (transporter erector launchers) TEL each carrying two missiles capable of firing one minute apart. The system can also be armed with cruise missiles reportedly extending its strike range up to 2,600 km, or use alternative warheads including cluster munitions, fuel-air explosive, tactical earth penetrator for bunker-busting and an EMP (electro-magnetic pulse).[19]

The Iskander missile uses an erratic flight pattern to help avoid detection, flying mostly at 50 km altitude. Its missile uses GLONASS for navigation until it detects the target, and after locking on the warhead descends at Mach 6-7; it performs evasive manoeuvres in its terminal flight phase and releases decoys to help overcome enemy missile defences. Its optical head offers protection against enemy EW. Enhancements in 2011 resulted in its CEP (circular error probable) of 5m, making it highly precise in striking its target.[20] Since its introduction in 2007, the Iskander features in Russia's operational-strategic exercises, and its presence appears to support President Putin's adherence to the 'escalate to de-escalate' nuclear strike under certain circumstances. Putin also frequently refers to the Iskander during his speeches on defence issues.[21] More recently its role in such exercises, as well as in separate brigade level exercises, has been to rehearse 'pre-emptive' strikes on enemy targets.[22] While the system plays a greater role in military exercises, reflecting its gradual advance to fully replacing the Tochka-U, it is also featuring in exercises in Crimea with some reports indicating it will feature permanently in defence of the peninsula and to extend Russia's A2/AD across a large swathe of the Black Sea.[23] Based upon publicly available information, it is not known whether the Iskander has identifiable system vulnerabilities.

It is worth noting, that work on the Iskander began in the mid-1990s, at a time when VTO proponent Andrei Kokoshin was First Deputy Minister of Defence. Kokoshin did much to keep the domestic defence industry functioning with orders for new weapons systems and foreign

[19] 'Raketnyy kompleks Iskander (9K720),' http://militaryarticle.ru/raketnoe-i-bombovoe-vooruzhenie/20434-raketnyj-kompleks-iskander-9k720, Accessed, 14 January, 2017; Viktor Litovkin, 'Akademicheskoye bespokoystvo, *Nezavisimoye Voyennoye Obozreniye*, http://militaryarticle.ru/nezavisimoe-voennoe-obozrenie/nvo-2008/17896-akademicheskoe-bespokojstvo, 25 February, 2008; Oleg Klochkov, 'Sekrety Novogo iskandera,''*Nezavisimoye Voyennoye Obozreniye*, http://militaryarticle.ru/nezavisimoe-voennoe-obozrenie/nvo-2004/17064-sekrety-novogo-iskandera, 6 February, 2004.

[20] 'Ogranichen I Realistichen Po Resurgem,' *Vozdushno Kosmicheskaya Oborona*, http://militaryarticle.ru/voenno-kosmicheskaya-oborona/2012/12701-ogranichen-i-realistichen-po-resursam, No. 1, 2012; Vasiliy Sychev, 'Padeniye pered vzletom?' *Voyenno-Promyshlennyy Kuryer*, http://vpk-news.ru/articles/7963, 27 July, 2011; Veronika Ushakova, 'Gordost' i schast'ye Sergeya Nepobedimogo, *Voyenno-Promyshlennyy Kuryer*, http://vpk-news.ru/articles/8122, 7 September, 2011.

[21] Oleg Odnokolenko, 'Putin prikazal: 'Ne rasslablyat'sya!'' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-12-22/2_6893_putin.html, 22 December, 2016.

[22] One commentary noted an intensification of RV&A training in Western Oleg Vladykin, 'Na zapade strany aktivizirovalis' raketchiki i artilleristy,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/nvoevents/2017-02-17/2_937_news.html, 17 February, 2017; 'Devyatyy brigadnyy komplekt raketnykh kompleksov 'Iskander-M,'' http://www.arms-expo.ru/news/vooruzhenie_i_voennaya_tekhnika/devyatyy_brigadnyy_komplekt_raketnykh_kompleksov_iskander_m/?sphrase_id=11930604, 1 December, 2016; 'Dva komplekta Iskander-M dlya osnashcheniya raketnykh brigad postupyat v voyska v etom godu,'http://www.arms-expo.ru/news/armed_forces/dva_komplekta_iskander_m_dlya_osnashcheniya_raketnykh_brigad_postupyat_v_voyska_v_etom_godu/?sphrase_id=11930604, 19 July, 2014; 'NPK «KBM» zavershila postavki «Iskander-M» za 2013 god,' http://www.arms-expo.ru/news/archive/npk-kbm-zavershila-postavki-iskander-m-za-2013-god15-11-2013-10-45-00/?sphrase_id=11930604, 15 November, 2013.

[23] Oleg Vladykin, 'V armii. Voyennaya aktivnost' Rossii vspoloshila Ameriku,'*Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/week/2016-08-28/7_army.html, 28 August, 2016; Oleg Odnokolenko, 'Ukraina stanovitsya dlya Rossii strategicheskim protivnikom,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-07-29/1_ukraina.html, 29 July, 2016; 'Shoygu: V YUVO sformirovany 4 divizii, 9 brigad i 22 polka,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-07-28/2_army.html, 28 July, 2016; Oleg Odnokolenko, 'Na zapadnom napravlenii prodolzhayetsya igra v 'boyevyye shakhmaty,''*Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-06-29/2_shoigu.html, 29 June, 2016; Nikolay Poroskov, 'Sekret neprevzoydennosti 'Iskandera' i 'Verby,''*Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/armament/2016-06-24/6_sekret.html, 29 June, 2016.

arms sales. In particular he pushed the development and eventual procurement of the Iskander. Kokoshin also sponsored work on other types of VTO, EW and advanced computer systems.[24]

It should also be noted that, as with most of the other systems discussed in this study, the Iskander is expensive. Based on unconfirmed data, the cost of one unit was estimated to slightly more than 123 million roubles in 2009 (in the excess of 4 million USD at the time). In the years 2013 to 2015, 24 units were delivered to the armed forces each year, but in 2016, despite planes for an additional 24 units, only 12 were delivered.[25]

3.2 3M-54 & 3M Kalibr

All versions of the Kalibr cruise missile family (3M-54, 3M-14), deployable on submarines and surface vessels are launchable from vertical launch system (VLS) tubes and can be launched from ground, air and sea platforms. Moreover, some Western sources note with anxiety the existence of the shipment container launch version of the Kalibr, which enables it to be fired from a container presumably handled by military officers aboard a Russian Navy auxiliary ship. Designed in 2012 by Novator Design Bureau, the missiles have satellite navigation and can be supplied with targeting information using either satellite or airborne platforms.[26] Against ships Kalibr uses a sea skimming approach and conducts evasive manoeuvres reaching a terminal speed of Mach 3 to overcome shipboard defences.[27] Estimates of the costs for Kalibr missiles vary wildly in the Russian press, from 750,000 USD a piece to 6.5 million USD.[28]

Reportedly, the Kalibr has a range of up to 1,500 km, while its CEP is 5 m, meaning that its accuracy is very high. It can carry conventional warheads up to 400 kg as well as EMP warheads, or be nuclear armed with a range of up to 2,600 km. The launches of this system in 2015, 2016, and 2017 against targets in Syria provided an important testing ground for these examples of Russian cruise missiles (see below).[29] Despite its high profile due to its use in Syria, as well as representing a credible advance in Russia's cruise missile technology, there are still a number of potential weaknesses that could be exploited to some extent by a technologically advanced adversary. These weaknesses include the detectable nature of its launch to provide warning and possible targeting; the fact that its targeting requires data-link or radio input, the missile radar is detectable in the terminal phase of the flight; and a submarine

[24] Mikhail Rostovskiy, 'Andrei Kokoshin: Chelovek, kotoryi spas oboronu,' *Moskovskiy komsomolets*, 26 October 2015.
[25] Data from **http://militaryrussia.ru/blog/topic-832.html,** downloaded 19.07.2017.
[26] 'Krylatyye rakety Kalibr budut ustanavlivat' na podlodki proyekta 971,' TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/0321/105534041/detail.shtml, 21 March, 2016.
[27] Aleksandr Sharkovskiy, 'Pal'miroy pozhertvovali radi polnogo osvobozhdeniya Aleppo,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/wars/2016-12-16/1_930_palmira.html, 16 December 2016; Nikolay Poroskov, 'Oruzhiye pryamogo popadaniya,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/armament/2016-11-25/8_927_weapon.html, 25 November, 2016; Its operational use in Syria also naturally resulted in greater interest in purchasing its export versions. Oleg Odnokolenko, 'Siriyskiye islamisty popali pod Kalibry,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-11-16/1_6860_.html, 16 November, 2016; Oleg Vladykin, 'Dlya chego nuzhny podlodki u beregov Sirii,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-10-31/1_6849_siria.html, 31 October, 2016; 'Indiya namerena obratit'sya k RF s pros'boy o prodazhe krylatykh raket «Kalibr», sposobnykh porazhat' nazemnyye tseli,' TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/0901/103036768/detail.shtml, 1 September, 2016.
[28] Solopov, Maksim and Artemev, Aleksandr, 2015, "Rassledovania RBK: skolko tratit Rossia na voinu v Sirii", *RBK*, 28 October, http://www.rbc.ru/investigation/politics/28/10/2015/562f9e119a79471d5d7c64e7
[29] 'Svodka boyevykh deystviy VKS Rossii v Sirii za 8 dekabrya,' TsAMTO, http://www.armstrade.org/includes/periodics/news/2015/1209/164032600/detail.shtml, 9 December, 2015.

launch would need to be conducted at periscope depth to collect targeting data to avoid exposing its acoustic signature and possible risk to the submarine.[30]

Like other examples of Russian cruise missiles, however, the Kalibr family represents marked progress in developing and procuring modern examples of VTO.[31] In April 2016, Admiral William E. Gortney, United States Navy Commander, United States Northern Command and North American Aerospace Defence Command highlighted the growing Russian capability in this area: 'Last year I stated that Russia is progressing toward its goal of deploying long-range, conventionally armed cruise missiles comparable to Western systems. In 2015 these efforts came to fruition, as Russia employed heavy bombers, surface vessels, and a submarine to launch advanced conventional cruise missiles at targets in Syria. These operations served as a proof-of-concept for weapons systems and tactics ultimately intended to provide flexible deterrent options in a future crisis.'[32]

3.3 S-400 Triumf

The S-400 Triumf is Russia's most advanced deployed air defence system. It is a significant improvement over the older S-300PMU. The S-400 was developed by Almaz Central Design Bureau, and is manufactured by the Fakel Machine-Building Bureau, and entered service in 2007. It has been introduced to fully equip air defence units in Southern Military District and is advancing toward similar goals in the other MDs. It provides air defence for Moscow and the Moscow region, and more recently for Crimea. Despite the claims that the S-400 has a maximum range of 400 km, its long-range missile has never been seen in public nor has the system ever displayed a longer canister required for firing the missile; it is highly unlikely that the 40N6 is operational, suggesting the S-400 currently only has a range of up to 210 km. Still, its reputation is such that a number of countries, including Turkey and China, have expressed an interest in purchasing the system.[33]

The S-400 can engage a variety of aerial targets within a range of 210km at an altitude of up to 30km. The S-400 system integrates multifunction radar, alongside autonomous detection and targeting systems, anti-aircraft missile systems, launchers, and its command and control centre. It is intended to be capable of firing four types of missiles (40N6, range 400km (not operational); 48N6E3, range 210 km; 9M96E2, range 100km; 9M96, range 40 km) to create an effective multi-layered air defence. So far, however, Russia seems limited to utilizing just the 40N6 and 48N6 family of missiles. The 9M96s are, according to Russian sources, so far having

[30] 'Glavnuyu zadachu v Sirii amerikantsy vypolnili,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/editorial/2016-10-24/2_6842_red.html, 24 October, 2016; 'V Genshtabe rasskazali, kak Chernomorskiy flot ne pustit vraga v Krym,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-09-14/100_obzor140916_2.html, 14 September, 2016; 'Kalibr zamenit atomnuyu bombu,' *Voyenno Promyshlennyy Kuryer*, http://www.vpk-news.ru/articles/34694, Accessed 10 February, 2017.
[31] 'Sergey Shoygu otmetil sbalansirovannoye razvitiye vidov i rodov voysk Vooruzhennykh sil,' TsAMTO, http://www.armstrade.org/includes/periodics/news/2017/0112/130039045/detail.shtml, 12 January, 2017; 'Modernizirovannyye BPK proyekta 1155 budut vooruzheny krylatymi raketami Kalibr i Oniks,' TsAMTO, http://www.armstrade.org/includes/periodics/news/2015/0701/150029971/detail.shtml, 1 July, 2016; 'V khode gosispytaniy korabl' Dagestan vpervyye proizvel raketnuyu strel'bu kompleksom Kalibr-NK,' TsAMTO, http://www.armstrade.org/includes/periodics/news/2012/0525/095013062/detail.shtml, 25 May, 2012.
[32] Statement of Admiral William E. Gortney, United States Navy Commander, United States Northern Command and North American Aerospace Defence Command, Before the House Armed Services Committee Strategic Forces Subcommittee, Washington, DC, 14 April, 2016.
[33] 'Rossiyskiye korabli prigotovilis' zashchitit' Krym ot ukrainskikh raket,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-12-01/100_obzor011216.html, 1 December, 2016; Vladimir Mukhin, 'V Krymu nerushima 'Utesov' gryada,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/realty/2016-11-25/1_927_krim.html, 25 November, 2016.

a problematic development cycle.[34] The Triumf's battle management system (BMS) includes a command post supported by the all-altitude battlefield acquisition radar 91N6E, which can support up to six fire units (FUs); these FUs may be deployed up to 100km from the BMS.[35]

The S-400 is usually deployed in brigades or regiments with up to 72 TELs and a varying number of missiles depending on type. Despite its highly credible reputation, the S-400s acquisition radars, as all radars, must still emit in order to detect and designate targets. Moreover, its radars can track up to 100 objects simultaneously, but for strike it is limited to the tracking of six. Support and resupply of missiles would prove to be an immensely demanding logistical achievement. Nonetheless, like the other systems described above, Moscow deployed these in support of its operations in Syria, to create effective though untested A2/AD.[36]

Russian authorities do not officially share information on the costs of the S-400, but according to other Russian sources Turkey was offered to by the system at the price of 500 million USD per division (fire unit) in May 2017.[37] This price is likely to be somewhat lower for domestic customers. Since 2012 the Russian armed forces have received two to four complete regiments a year, with a record delivery of 5 complete regiments in 2016.[38]

4 Priorities in Acquisition and Technology Development

At the forefront of the drive toward increased high-precision strike capability in Russia's Armed Forces are the Missile and Artillery Troops (*Raketnyye Voyska i Artilleriya* – RV&A). The RV&A is a Branch of Arms in the Ground Forces, and acts as the primary means of destroying the enemy by conventional and nuclear fires during the conduct of combined arms operations.[39] They are tasked with the following:

> Achieve and maintain fire superiority; defeat of the enemy's means of nuclear attack, manpower, weapons, military and special equipment; disrupt troops and command and

[34] Authors' discussions with Israeli defence experts.
[35] 'Novyy Triumf vstal na zashchitu moskovskogo neba,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/photorep/2017-01-11/100_pvo1101.html, 11 January, 2017.; Oleg Odnokolenko, 'Putin prikazal: Ne rasslablyat'sya!' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/armies/2016-12-22/2_6893_putin.html2, 2 December, 2016; Oleg Vladykin, 'V armii. Noveyshiye samolety i rakety nadezhno zashchityat nebo strany,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/week/2016-12-11/8_6882_armyweek.html, 11 December, 2016.
[36] 'Novyy polkovoy komplekt ZRS S-400 zastupil na dezhurstvo v Podmoskov'ye,' *Voyenno Promyshlennyy Kuryer*, http://www.vpk-news.ru/news/34671, 11 January, 2017; Anna Potekhina, 'Stolichnyy Triumf,' *Krasnaya Zvezda*, http://redstar.ru/index.php/component/k2/item/31883-stolichnyj-triumf, 12 January, 2017; Oleg Odnokolenko, 'Rossiya otkalibrovala' islamistov v Sirii,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/realty/2016-11-18/1_926_siria.html, 18 November, 2016; Zakhar Gel'man, 'Yesli zavtra voyna – tret'ya livanskaya,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/wars/2016-10-21/12_923_livan.html, 21 October, 2016.
[37] Amalia Zatari, "Triumf dlia strany NATO", *Gazeta.ru*, 2 June 2017.
[38] «Sistema S-400 / 40P6 Triumf, complex 98Zh6 - SA-21 GROWLER», http://militaryrussia.ru/blog/topic-593.html, 8 March 2017.
[39] See: Kombat-bvoku.com, http://kombat-bvoku.com/publ/voennye_prazdniki/raketnye_vojska_i_artillerija/6-1-0-52, Accessed 3 February, 2017; 'Istoriya prazdnika dnya raketnykh voysk i artillerii,' Mywebs.su, http://mywebs.su/blog/army/6872/, Accessed, 30 January, 2017.

control, reconnaissance, and EW systems; destroy permanent defence installations and other infrastructure; disrupt the enemy's operational and tactical logistics; weaken and isolate the enemy's second echelons and reserve; destroy enemy tanks and other armored vehicles that breach the defence; cover open flanks and junctions; participate in the destruction of enemy aircraft and the amphibious assault forces; conduct remote mining operations; provide illumination to troops manoeuvring at night; provide smoke screens and blind enemy targets; distribute propaganda materials.[40]

The official defence ministry definition of the role of the RV&A provides some clues as to the role of VTO in Russian military planning, but it is equally important to understand where the VTO fits into the Russian command and control system.[41] As shown in Figure 1.1, the missile troops are an integral part of the Ground Forces, and serve to strengthen the land warfare component of the Russian Armed Forces.

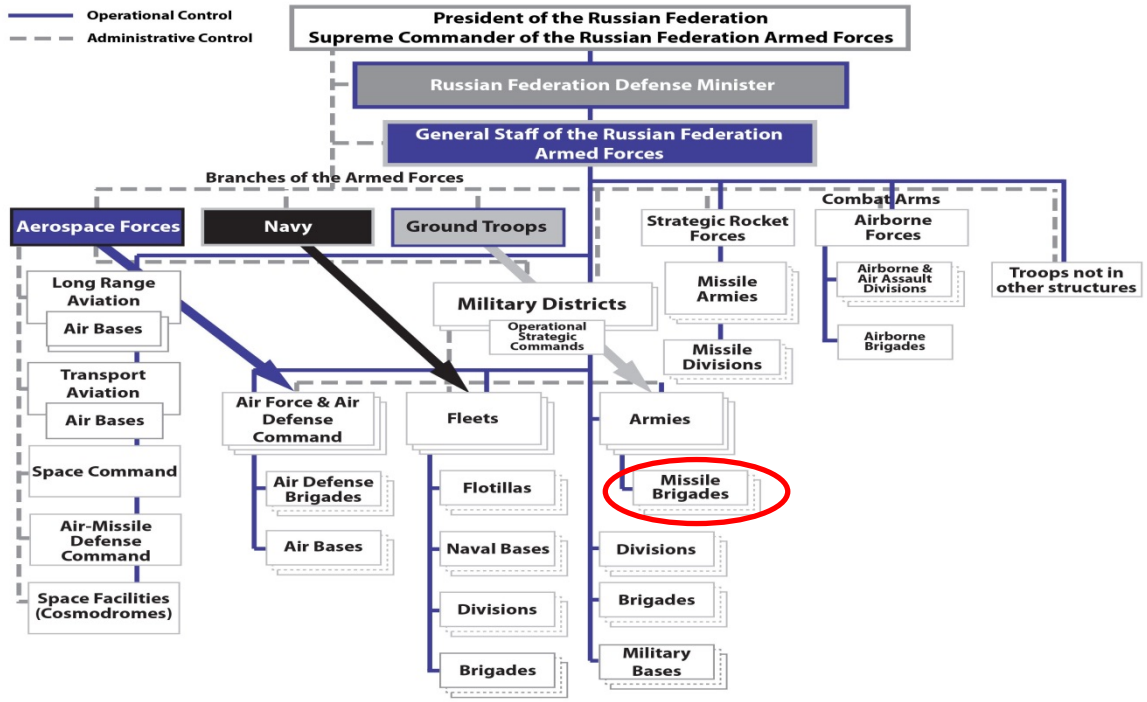

Figure 1.1 RV&A (Missile Brigades) in the Structure of Russia's Armed Forces[42]

RV&A constitutes missile, rocket, and artillery brigades, including high-power mixed units (tube and rocket), artillery battalions, rocket artillery regiments, and separate artillery reconnaissance battalions, additionally artillery units in combined arms brigades and military bases. The RV&A are being increasingly strengthened with the Iskander-M. They will

[40] 'Missile Troops and Artillery,' *Ministry of Defense of the Russian Federation* Website, http://structure.mil.ru/structure/forces/ground/structure/rvia.htm, accessed 20 January, 2017.
[41] 'Raketnyye voyska i artilleriya (RViA),' Militaryarms.ru, http://militaryarms.ru/armii-mira/raketnie-voyska/#h2_3, Accessed 30 January, 2017; 'Den' raketnykh voysk i artillerii v Rossii,' *RIA Novosti*, http://crimea.ria.ru/society/20161119/1108081563.html, 19 November, 2016.
[42] The authors wish to express gratitude to Captain Charles K. Bartles, Foreign Military Studies Office, Fort Leavenworth, Kansas for kindly assisting with these graphics.

reportedly also strengthen their capabilities by creating reconnaissance-fire units. These units should ensure the destruction of targets in real time; field more VTO; and increase weapons' firing ranges, power of ammunition, and the automation of the processes for both preparing and firing.[43]

According to official sources, by 2020, the RV&A brigades (locations in Figure 1.2) will be fully outfitted with brigade sets of Iskander-M. They were already used by the Kremlin to make threats in response to US missile defence as part of a strategy of 'asymmetric responses.' For example, in November 2011, the then President Dmitry Medvedev referred to Iskander as a retort to US BMD, stating: 'If the enumerated measures are insufficient, the Russian Federation will deploy in the country's west and south modern strike weapons systems which guarantee the destruction of [the US BMD] European component. One such step will be the deployment of the 'Iskander' missile system in the Kaliningrad special region.'[44] Shortly afterwards, a commentary in the Russian daily *Kommersant* noted the problems inherent to using Iskander-M to make such threats: 'The problem is by virtue of its limited range (several hundred km) Iskander missiles can only threaten [Russia's] neighbouring states, but in no way the US MD system as a whole, and on this level, they have little influence on the strategic balance as such. Moreover, the Russian military has promised to begin deploying Iskander systems widely since 2007, but since then the deadlines for their delivery to the army has been postponed more than once.'[45] If the Iskander-M is fully introduced by 2020 it will mark 25 years since its design, and if this timescale is anything to go by the emergence of new technologies in this area will remain a distant prospect.

Figure 1.2 Ground Forces' Missile Brigades.

[43] Vladimir Gundarov, 'Innovatsii v raketnykh voyskakh i artillerii,' http://nvo.ng.ru/nvoevents/2016-11-25/2_art.html, *Nezavisimoye Voyennoye Obozreniye*, 25 November, 2016.
[44] President Dmitry Medvedev, 'Zayavleniye Prezidenta v svyazi s situatsiyey, kotoraya slozhilas' vokrug sistemy PRO stran NATO v Yevrope,' Kremlin.ru, http://kremlin.ru/events/president/news/13637, 23 November, 2011.
[45] Aleksandr Gabuyev, 'Strategicheskiye yadernyye soobrazheniya,' *Kommersant*, http://kommersant.ru/doc/1822901, 24 November, 2011.

While the Russian political-military leadership has frequently referred to this system as an asymmetric response to the US and NATO, Russian strategic and arms control experts are more sceptical. Major-General Vladimir Dvorkin, former director of the Russian Defence Ministry's Fourth Central Research Institute, noted their use would signify the beginning of war with NATO on which Moscow would never embark.[46] The relative delay to fully equip the RV&A with Iskander-M reflects the limited capacity of its manufacturer. It is produced at Votkinsk, which is also tasked with the production of strategic nuclear weapons including Yars and Bulava. Despite these defence industry challenges, the Russian Federation has gradually implemented its plans in the GPV to 2020 to fully outfit the RV&A with modern Iskander-M systems.

Statements in November 2016 and January 2017 by the Commander of the RV&A, Lieutenant-General Mikhail Matveevsky, highlighted the centrality of VTO in force development. Matveevsky spoke of the RV&A reaching a higher level of capability and becoming a *reconnaissance-strike system* (*razvedyvatel'no-udarnaya sistema* –RUS). He added that by 2021 this would yield an increase in combat capability of 1.5 to 2 times and placed this in the context of units equipped with a highly effective system of automated command and control and intelligence.[47] Matveevsky confirmed the brigade sets of Iskander-M for his force and completion of the target for 100 percent outfitting with this system by 2020.[48] Crucially, the commander contextualized this in terms of the full creation of the long talked about *reconnaissance-strike system*, minimizing the cycle of 'intelligence-kill' that greatly reduces the time from target detection to destruction. He added that the innovative system was tested during Kavkaz-2016. This was elaborated in terms of the concept of combat in a 'single information space,' with supporting information exchange systems, intelligence, communications and management.[49]

Matveevsky's comments on the priorities of the RV&A to 2021 are certainly important, not least in establishing the ongoing interest in procuring VTO, but also as far as it confirms the construction of an actual *reconnaissance-strike system*, functioning within a Russian C^4ISR network. This was no doubt tested during Kavkaz-2016, as he noted, but it also drew upon the experience of the Russian operation in Syria.[50] As such, these interconnected developments have vital implications for Russia's military strategy and its future 'expeditionary capability.' Matveevsky considers the Iskander as an effective strike system, which should offer reliable capability through 2030 at least. But he also believes the RV&A has greatly benefited from the introduction of automated command and control, as well as other examples of modernized weaponry and investment in infrastructure.[51]

[46] Andrey Lipskiy, 'Ugrozy net. Otvetnyye mery bessmyslenny,' *Novaya Gazeta*, https://www.novayagazeta.ru/articles/2011/11/24/46949-ugrozy-net-otvetnye-mery-bessmyslenny, 25 November, 2011.
[47] 'Video: Minoborony pokazalo sposobnosti raketnykh voysk i artillerii,' RG.ru, https://rg.ru/2016/11/19/video-minoborony-pokazalo-sposobnosti-raketnyh-vojsk-i-artillerii.html, 19 November, 2016.
[48] 'Moshch' Raketnykh voysk i artillerii VS Rossii udvoyat k 2021 godu,' http://www.arms-expo.ru/news/vooruzhenie_i_voennaya_tekhnika/moshch_raketnykh_voysk_i_artillerii_vs_planiruetsya_udvoit_k_2021_godu/, Arms-expo.ru, 8 January, 2017; 'Russia intends to double the combat capabilities of its ground forces by 2021,' UAWIRE, http://uawire.org/news/russia-intends-to-double-the-missile-troops-and-artillery-combat-capabilities-of-its-ground-forces-by-2021, 7 January, 2017.
[49] 'S prazdnikom, poveliteli ognya!' Milportal.ru, http://milportal.ru/2016/11/18/s-prazdnikom-poveliteli-ognya/, 18 November, 2016.
[50] Ibid.
[51] Oleg Vladykin, 'V armii. Minoborony delayet stavku ...", op. cit; Oleg Vladykin, 'V armii. Sukhoputnyye voyska poluchayut supersovremennoye oruzhiye,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/week/2016-10-02/8_army.html, 2 October, 2016.

Of course, for numerous reasons, the Iskander system has featured prominently in Western coverage of such issues, especially given the Kremlin's threats over US BMD. Since the decision to permanently station the system in Kaliningrad, rather than restrict its deployment to operational-strategic exercises, speculation had grown concerning Moscow's intentions.[52] Iskander-M, as already noted, constitutes in itself a formidable system, yet the option to enhance its range by introducing a cruise missile as part of its capability has long been feared. NATO capitals wrongly believed that the now defunct 1987 INF treaty might serve as an impediment.[53]

Indeed, some Russian analysts have argued that the testing and possible deployment of the new missile is part of an effort to force the US to enter discussions linked to the INF, where Moscow would raise its objections concerning US violations of the treaty.[54] Since tests were conducted on a cruise missile system compatible with Iskander-M since 2008, and success was achieved in 2014, this concern has increased. The cruise missile system in question, known only as '9M729,' has a range of up to 5,500 km. Were it to be deployed in Kaliningrad, this would place most of continental Europe within its strike range.[55]

3K-22 and 3M-22 Tsirkon: New Generation Hypersonic Cruise Missiles

While Russia's defence ministry sets high priority on the completion of brigade sets of Iskander-M for the RV&A and more Kalibr cruise missiles for the Navy, there are additional indicators of the extent to which the range and accuracy of such systems feature in Moscow's defence planning. Despite the challenges encountered, in recent years the 3K-22 and 3M-22 Tsirkon have passed state trials and represent a significant boost to acquire new generation cruise missiles. Tsirkon is a strategic high-precision strike system designed to hit targets at distances of several thousand km. It follows in the traditions of other anti-ship missiles, but can also be used against ground targets. Tsirkon is designed to fly at the boundary between the Earth's atmosphere and outer space. In terms of targeting it is designed to overcome enemy air defences, including BMD, and cope with electronic counter-measures. Moreover, it is entirely consistent with Russian military theoretical thinking on the use of VTO. It is important not only in offering an additional layer of strategic deterrence, but moving toward the adoption of network-centric warfare capability. However, its main innovation is having both a radar tracker seeker and an optical-electronic complex to trace and detect targets at hypersonic speed. Its introduction into the Russian Navy will boost conventional strike capability on both nuclear-powered cruisers and the fifth generation Husky-class submarines.[56]

The Tsirkon will reportedly commence serial production in 2018, and be procured in large numbers by the Navy in 2018 – 20. In the absence of official information, the advanced technical characteristics of the Tsirkon remain speculative. Both Deputy Defence Minister Dmitry Rogozin and Commander-in-Chief of the Russian Navy, Admiral Viktor Chirkov, see

[52] (Editorial), 'Perestanut li NATO i Rossiya pugat' drug druga,' http://www.ng.ru/editorial/2016-12-09/2_6881_red.html, *Nezavisimoye Voyennoye Obozreniye*, 9 December, 2016.
[53] 'Kalibr pretenziy SShA: pochemu otsutstviye Rossii na yadernom sammite tak rasstroilo Obamu,' Eadaily.com.ru, https://eadaily.com/ru/news/2016/04/03/kalibr-pretenziy-ssha-pochemu-otsutstvie-rossii-na-yadernom-sammite-tak-rasstroilo-obamu, 3 April 2016.
[54] Mikhail Barabanov, 'Yakoby razvernuta, budto by narushila,' Lenta.ru, https://lenta.ru/articles/2017/02/17/no_such_missile, 17 February, 2017.
[55] 'SShA obvinyayut Rossiyu v razvertyvanii krylatoy rakety 9M729,' Livejournal, http://bmpd.livejournal.com/2433526.html, 15 February, 2017.
[56] TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/0906/130536859/print.shtml, 6 September, 2016; TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/0809/101036392/print.shtml, 9 August, 2016; TsAMPO, http://www.armstrade.org/includes/periodics/news/2016/0729/140036243/print.shtml, 29 July, 2016; TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/0318/141534022/print.shtml, 18 March, 2016; TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/0317/105533987/print.shtml, 17 March, 2016.

the missile as a breakthrough for the defence industry. [57] It is now earmarked for deployment on the heavy nuclear-powered missile cruiser the Admiral Nakhimov in 2018 and by 2022 aboard the Pyotr Velikiy.

In 2014, Rogozin, often given to hyperbole in his pronouncements on Russian military systems, claimed that developments in hypersonic missiles represented a scientific and technical breakthrough comparable to the creation of the atomic bomb. More circumspect comments by Admiral Chirkov, indicted that by 2020 the Navy would be equipped with high-precision long range weapons, contributing to 'strategic non-nuclear deterrence.' Defence ministry sources also confirmed that as part of the ongoing modernization of heavy nuclear-powered missile cruisers the Tsirkon would be deployed alongside Kalibr and Oniks cruise missiles, while an adapted version of Tsirkon will be produced for deployment on the new-generation Husky-class submarines.[58] The Tsirkon's status as a cutting edge missile is reportedly tied to its capacity to surpass existing systems including Oniks and Kalibr. The Tsirkon may reach 5 – 6 times the speed of 2,000 m/s, though some Western sources suggest it might reach Mach 5. It is reportedly likely to have a range in excess of 5,000 km.[59]

Despite the secrecy of its development, the reported issues and delays as well the priorities involved in producing the Tsirkon cruise missiles reveal much in terms of wider acquisition priorities. The earliest reference to the Tsirkon was in 2011, with a report by the Strela Production Association in Orenburg which produces the Oniks P-800 for the Navy, noting that the creation of a technical base for the new Tsirkon missiles would be a high priority. Also, in 2011, the Granit-Electron Concern, a leading developer and manufacturer of specialist naval equipment, announced it was working on radars and inertial navigation aspects of the Tsirkon. Tactical Missiles Corporation in the same year worked on the radio altimeter and automatic direction finder for the Tsirkon. Granit-Electron is part *of NPO Mashinostroeniya*, whose 2012 report confirmed work on the new system. After this, most reporting tailed off which may reflect problems encountered at the design stage.[60] In the summer of 2012, state trials were conducted with a Tu-22M3 bomber armed with hypersonic cruise missiles at the State Flight and Research Center in Akhtubinsk. Some of the test launches failed, and this may have been intended as an air-launched version of the Tsirkon.[61]

By September 2013, the Head of the Tactical Missile Armaments Corporation, Boris Obnosov, stated that work continued on developing hypersonic cruise missiles and referred to a test product in existence. In late 2015, reference to the new missile was made in the context of the modernization of the Nakhimov, with detail concerning plans to outfit the cruiser with vertical launcher tubes capable of use for both the Oniks and the Tsirkon missiles.[62] Around the same time, another test launch failed. This took place at the 21st State Central Multi-Purpose Range in Nenoksa, Arkhangelsk region, which is the main test range for cruise missiles and sea-based ballistic missiles. Trials resumed in 2016. It appears that work on the Tsirkon stalled and may have been reviewed in 2013 –14, with some shortcuts to produce the prototype. Based upon the

[57] Vladimir Mukhin, 'Rossiyskiye 'Tsirkony' legko preodoleyut amerikanskuyu PRO,' *Nezavisimoye Voyennoye Obozreniye*, http://www.ng.ru/politics/2016-04-25/1_zircon.html, 25 April, 2016.
[58] TsAMTO, http://www.armstrade.org/includes/periodics/news/2016/1005/100037403/print.shtml, 5 October, 2016.
[59] Vladimir Mukhin, 'Rossiyskiye 'Tsirkony'…", op. cit.
[60] Aleksey Ramm, Dmitriy Kornev, ''Tsirkon:' v pyati Makhakh ot tseli,' *Voyenno-Promyshlennyy Kuryer*, http://vpk-news.ru/articles/29966, 29 March, 2016.
[61] 'Kompleks 3K-22 Tsirkon/Tsirkon-S, raketa 3M-22,' Militaryrussia.ru, http://militaryrussia.ru/blog/index-917.html, 8 February, 2013.
[62] Dmitriy Grigoryev Kreyser Admiral Nakhimov vernetsya v ekspluatatsii do 2020 goda,' *Rossiyskaya Gazeta*, https://rg.ru/2017/01/13/reg-szfo/krejser-admiral-nahimov-vernetsia-v-stroj-do-2020-goda.html, 13 January, 2017; 'Nazvany sroki nachala proizvodstva giperzvukovykh raket 'Tsirkon,'' Lenta.ru, https://lenta.ru/news/2016/04/19/zirkon/, 19 April, 2016.

available evidence it is probable that the missile was designed based on existing technology using tested technical solutions. High priority was assigned to increasing its flight speed, which involved overcoming challenges in relation to the stability of the missile, as well as its accuracy and targeting flexibility.

Nonetheless, a word of caution is in order here. All these developments may offer a misleading insight into the current or future capability of the Russian Navy, whose problems and challenges are well documented. Equally, it may provide a misleading perspective on the condition and the potential capacity of the Russian domestic defence industry. The development of missile systems – both nuclear and conventional – has long been a high priority, and investment and expertise in this area far exceeds the capacity in many other areas of the Russian defence industry. Continued delays in commissioning the Admiral Gorshkov are tied to the underperformance of an advanced state-of-the-art SAM system for the ship's air defence. Originally touted by the defence ministry as an answer to Aegis, with the Poliment-Redut air defence system possessing four phased array antennas to track 16 targets simultaneously, its tests of the longer range missile (150 km) have revealed serious flaws. Trials in 2014 showed the Redut was incapable of hitting targets beyond 15 km due to the dysfunctional radar used. In July 2016, the defence ministry suspended the trials of the longer range missile due to its test failures after only three seconds of flight.[63] Yet, the advances marked by the plans to introduce the Tsirkon cruise missile in the Russian Navy do reinforce the impression that the General Staff attaches great significance to efforts to boost conventional strike capability.

5 From Theory to Practise: Operational Experience in Syria

Russia's military operations in Syria involved VTO systems. One central aim was to test their performance in a theatre of operations. The tests revealed how Russia can shore up air defence for force protection, how they create a particular multi-layered air defence system in an operational environment, and how the General Staff sees the utility of stand-off strategic strike systems.[64] A few observations about Russia's high profile military intervention in the Syria conflict are needed before proceeding to the future role of VTO in Russian defensive and offensive operations.

First, while generally successful, the Russian military operation was relatively small. It never involved more than about 4,500 personnel, with the bulk of the operational activity conducted by the Aerospace Forces (*Vozdushno Kosmicheskikh Sil* – VKS). Second, the relatively low scale intervention was mostly well planned and executed, but the vast majority of VKS sorties in Syria did not involve using high-precision weapons. It involved remarkably well orchestrated combat service support to maintain the limited forces in the theatre of operations, and the logistical accomplishment to open and utilize air and sea lines of supply facilitated the overall

[63] Aleksandr Mozgovoy, 'Gonka za 'Liderom' i kolpak, polnyy blokh,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/realty/2016-09-09/12_leader.html, 9 September, 2016.
[64] Aleksey Ramm, 'Debyut v siriyskom nebe,' *Voyenno Promyshlennyy Kuryer*, http://www.vpk-news.ru/articles/2827, 2 December, 2015.

success of the mission. Third, Moscow also had multiple and complex aims as part of its military operations in Syria, and it is unclear as to how much their operations impacted the course of the conflict, though it is widely recognized that they avoided embroilment in the Civil War and exploited their role in the conflict diplomatically. Fourth, a *sine qua non* of Russia's military operations in Syria was the extent to which it provided an invaluable opportunity to test systems and approaches to warfare in combat. Indeed, in addition to testing various platforms and experimenting with the application of force through network-centric capability, they also used the operations as a training opportunity. Fifth, the use of Russian military power and its tests and experiments during these operations was applied against a low technology adversary. Because of this, the Russian operations do not necessarily provide deeper insight into the wider capabilities and readiness of Russia's Armed Forces.[65]

Nevertheless, some features of the Russian military operations linked to experimentation and especially involving the use and deployment of VTO reveal a great deal about how the General Staff view these systems. The first of these, the construction of the 'air defence bubble,' has important implications for Russia's A2/AD capability. While the second, how they deployed and used strategic stand-off weapons, offer real insight in the critical area of experimentation during the operations. In the case of the strengthening of air defence for deployed forces in Syria, supporting air operations and protecting the Khmeimim airbase in Latakia and Russia's naval logistical facility at Tartus, this was not in place until long after the initial deployment of combat forces. In fact, it appears to have been one of the major flaws in the operational planning.[66] Equally, the use of air and sea-launched cruise missiles to strike enemy targets has been criticized on the basis that the operational environment did not demand such use of stand-off strikes. However, these points need to be explored in turn.

5.1 Air Defence

The introduction of advanced long-range SAM to strengthen the ground based air defence assets during the operations in Syria happened in November 2015, as a response to the Turkish Air Force shooting down a Russian Su-24M tactical bomber. By the end of November 2015, Russia had added an S-400 battery to protect its airbase in Latakia, and augmented this by sending the battle cruisers *Moskva* and the *Varyag* to the harbour in Latakia equipped with S-300F surface-to-air missiles; the Moskva had been in the Mediterranean Sea as part of the Russian naval group.[67]

Also, by late November 2015, a joint Russian-Syrian air defence force was formed. This sophisticated multi-layered air defence consisted of an array of tactical and strategic strike systems and EW assets:

- Pantsir-S1 close-in SAM/AA systems;
- Osa-AKM;
- S-125 Pechora-2M short-range (SHORAD) SAM systems;

[65] Vladimir Vashchenko, 'Armiya Sirii nastupayet iz poslednikh sil,' Gazeta.ru, http://www.gazeta.ru/army/2015/12/09/7944227.shtml, 9 December, 2015; 'Razveddannyye vcherashney svezhesti,' *Novaya Gazeta*, http://www.novayagazeta.ru/columns/71094.html, 9 December, 2015.
[66] 'Verkhovnyy Glavnokomanduyushchiy Vooruzhennymi Silami Rossii Vladimir Putin prinyal uchastiye v rabote rasshirennogo zasedaniya Kollegii Minoborony,' Mil.ru, http://function.mil.ru/news_page/country/more.htm?id=12071638@egNews, 11 December, 2015; 'Vladimir Putin pognal voynu,' *Kommersant*, http://www.kommersant.ru/doc/2876389, 11 December, 2015.
[67] M. Yu. Shepovalenko (Ed.), *Siriyskiy Rubezh*, CAST: Moscow, 2016, p. 114.

- Buk-M2E medium-range SAM systems;
- S-200VE Vega;
- S-400 Triumf long-range SAM systems.
- In addition, the Krasukha-4 electronic warfare (EW) systems were deployed in Hmeymim to protect it from hostile air and space reconnaissance assets.[68]

Less reported in Russian sources was the decision to deploy the Iskander-M to Latakia to further strengthen the developing A2/AD capability. Moreover, throughout 2016 the Russian defence ministry continued to add to the air defence of its deployed assets in Syria. Rather than interpreting this as overkill, it seems likely that they were experimenting with the correct mix in response to theoretical scenarios, again using the operation as a training opportunity. However, it was always unlikely that the Turkish Air Force would challenge the VKS in Syrian airspace, or that similar threats might appear from Western forces active in Syria. Commentators interpreted the build-up of the Russian-Syrian air defence force including assets such as the S-400 as strategic messaging to other powers.

5.2 Stand-off Strikes

In October 2015, Russia's Navy launched cruise missiles for the first time in combat operations. This set a precedent which soon became a pattern in the course of the operations conducted in Syria with the VKS also launching cruise missile strikes in November 2015.[69] On 7 October, 2015, the Caspian Flotilla launched 26 3M-14T Kalibr high-precision cruise missile against 11 targets in Syria at distances of around 1,500 km. The *Dagestan* guided missile ship, and the *Grad Sviyazhsk*, *Velikiy Ustyug* and the *Uglich* fast attack guided missile ships were involved in the stand-off strikes. By 20 November, these same vessels repeated their launches, on this occasion launching 18 Kalibr missiles. In December 2015, the *Rostov-na-Donu* diesel-electric submarine launched four missiles. During a combined air and naval operation on 17-20 November, the VKS conducted 112 sorties using long-range aviation (Tu-160, Tu-95MS, and Tu-22M3) involving 83 air-launched cruise missiles (Kh-101 and Kh-555), while the Navy used 18 sea-launched 3M-14T Kalibr cruise missiles against various ground targets in Syria.[70]

Such stand-off strikes against ground targets in Syria by the VKS and the Navy exposed disparity in the reporting of these operations between Russian and Western coverage. While the former celebrated and praised the first use of cruise missiles in combat making Russia the second power in the World along with the United States to use cruise missiles during operations, the latter tended to present a skeptical interpretation about the military value of choosing to use these systems.[71] However, the question arises as to whether the use of VTO in the operations marked any change in Russian military operational strategy. The answer appears to be a resounding affirmative.

[68] 'Three layers of Russian air defense at Hmeymim air base in Syria,' *TASS*, http://tass.com/defense/855430, 12 February, 2016.
[69] Oleg Odnokolenko' 'Armii Sirii nuzhna tol'ko pobeda,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/wars/2015-11-20/1_siria.html, 20 November, 2015; Aleksandr Sharkovskiy, 'Neotvratimost' vozmezdiya,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/realty/2015-11-20/1_nemesis.html, 20 November, 2015.
[70] 'Turetskiy seyner vynudil rossiyskiy storozhevik otkryt' ogon' v Egeyskom more,' http://www.kp.ru/daily/26470.7/3340041/, Kp.ru, 13 December, 2015.
[71] 'Kalibr: Russia's Naval System Upping Cruise Missile Game,' http://www.strategic-culture.org/news/2016/05/24/kalibr-russia-naval-system-upping-cruise-missile-game.html, 7 October, 2015.

By piecing together the elements of the strikes conducted using high-precision weapons, albeit by no means representative of the overall bombing statistics, with respect to the assets involved and the command and control elements as well the exact combat support systems utilized during these operations it is certainly possible to conclude that the Russian military employed an innovative approach.[72] In addition to the high-precision strike systems used, exploiting various platforms with highly sophisticated targeting and supporting roles assigned to UAVs for reconnaissance, it is clear that something akin to non-contact or network-centric warfare took place. It marks a move away from the platform-centric to the network-centric in Russian military operations.[73]

During the Syria war, Russia's Armed Forces certainly experimented with aspects of network-centric, featuring experimental combat use of advanced air assets, and precision strikes from naval platforms using Kalibr cruise missiles. The experimental side of the network-centric dimension in Russia's operations in Syria deepened after its renewal of the assault on Aleppo, strengthening the naval grouping in the Mediterranean Sea and stepping up the integrated and networked-approaches to operations.[74]

An important dimension of this feature of Russian operations in Syria is the extent to which it uses inter-service precision strikes using air and naval platforms. An insightful assessment of these operations appeared in November 2016 in *Voennaia Mysl'* (Military Thought), the professional journal of the Russian General Staff. Its author, O. V. Tikhanchev, reviews the effort to develop and use RUK (*razvedital'nie udarnye kompleksy* – reconnaissance strike complexes) in the conflict.[75] The author notes: 'It is the creation of interservice reconnaissance and attack systems (RAS) that is the most realistic way to increase the fire damage efficiency. This is done by combining different reconnaissance and attack complexes, and by basing this combination on modern automated control systems. Using flexible customizable automation tools as an integrating backbone for the interservice RAS should guarantee a significant increase in the SF efficiency, attributed to: adapting the RAS to the particularities in composition and structure of targets for destruction, belonging to the adversary's group of troops, in order to provide efficient fire effect over every specific asset in different operation types, both in large-scale armed conflicts and in conflicts of a different nature; flexibly taking into account the adversary group of troops' capabilities to counter the fire damage realized by own troops (forces).'[76]

Tikhanchev's article highlights the role of inter-service reconnaissance and fire complexes in Syria. This includes aircraft and missiles launched by naval platforms. This would seem to imply network-centric fires and strikes. The author also highlights the use of UAVs to aid target selection and collect immediate bomb damage assessment (BDA) as a key part of the complex. Although the network-centric experiment and testing in Syria has been quite limited, it is worth noting that only a few years ago this would have been impossible in Russia's Armed Forces.

[72] Roger McDermott, 'Russia Tests Network-Centric Air Operations in Syria,' *Eurasia Daily Monitor*, Volume 12, Issue 184, 13 October, 2015.
[73] Roger McDermott, 'Russia's Network-Centric Warfare Experiment in Syria,' *Eurasia Daily Monitor*, Volume 13, Issue 76, 19 April, 2016.
[74] Ibid.
[75] O. V. Tikhanychev, 'O roli sistematicheskogo ognevogo vozdei'stviya v sovremennykh operatsiiakh,' *Voennaia Mysl'*, No. 11, November 2016, pp. 16 – 20.
[76] Ibid, p.44.

The idea of network-centric or stand-off capability has been preserved as a key driver in the conventional military modernization.[77] For the top brass and defence planners in Moscow, this also involves 'learning by doing,' and they therefore pay close attention to the experimental use of networked operations in the Syrian theatre to better understand how this may be furthered in future planning and subsequent shaping of the internal military structure and modernization priorities. Russian military theorists examining US experience of network-centric operations, conclude that the American variant is designed to defeat weaker opponents. They caution against the Russian defense leadership pursuing such a strategy. This reinforces the perspective that Russian theorists and practitioners see network-centric capability as an asymmetric tool to use against a stronger instead of a weaker opponent.[78]

Thus, following several years of experimentation with network-centric approaches and what this means for force structure, education, training, and operational tactics, Russian top brass and theorists are in broad agreement that the concept may be used to inspire, shape and drive the defence industry's work to modernize the country's Armed Forces. Network-centric is not an end in itself, avoiding what some Russian theorists describe as a 'mental trap,' but a method to achieve a 'factor of power,' in the state's future warfare capability.[79]

However, the experimentation in Syria has brought the Russian military one step closer to addressing Slipchenko's work on non-contact warfare, and this nascent capability will have important implications in the future. It is arguably more significant in the non-contact realm than for strategic deterrence, though these are clearly interlinked. It seems that the General Staff do not view the various VTO systems separately, but as part of an emerging integrated C^4ISR capability reflecting the level of interest in 'force multipliers,' and has some notable results. This emerging capability will consolidate and exponentially widen the gap in Russia's favour as the pre-eminent military power in the post-Soviet space. Moreover, it strengthens deterrence – especially the non-nuclear element and poses a highly capable strike system against a potentially high-technology adversary.

6 The Role of High-Precision Weapons in Defensive Operations – Protecting Russia

Plans to strengthen the combat capability of the Missile and Artillery Troops by 2021 by, among other factors, increasing the ratio of VTO in their armoury are an important factor in seriously activating the idea of the 'pre-nuclear' deterrence conventional component proposed by Andrei Kokoshin. In February 2017, Colonel-General (retired) Vladimir Shamanov, the head of the Duma defence committee and former Commander of the Airborne Forces said that the conventional element of the pre-nuclear or non-nuclear deterrence would depend on

[77] Yu. Ye. Donskov, S. V. Golubev, A. V. Mogilev, 'Model' podgotovki spetsialistov radioelektronnoy bor'by k vypolneniyu zadach po informatsionnomu obespecheniyu voyennykh (boyevykh) deystviy,' *Voennaia mysl'*, No. 4, 2015.
[78] A. Bogdanov, Colonel S. Popov, Colonel M. Ivanov, 'Perspektivy Vedeniya Boyevykh Deystviy S Ispol'zovaniyem Setetsentricheskikh Tekhnologiy,' *Voennaia Mysl'*, No. 3, 2014, pp. 3 – 12.
[79] V. Kovalov, G. Malinetskiy, Y. Matviyenko, 'Kontseptsiya 'setetsentricheskoy' voyny dlya armii Rossii: 'mnozhitel' sily' ili mental'naya lovushka?' *Vestnik Akademii Voyennykh Nauk*, No.1, (50), 2015.

'quadrupling' the RV&A and specifically referred to high-precision weapons. In Shamanov's view this would lessen Russia's dependence on nuclear deterrence against a conventional attack.[80] This was a follow up to Defence Minister Sergei Shoigu's statement in January 2017 that 'the development of high-precision weapons may allow us to leave nuclear deterrence in favour of conventional deterrence.[81]

6.1 Pre-Nuclear Deterrence

Understanding the concepts to which Shamanov referred necessitates awareness of innovative though theoretical developments in Russia's military doctrine, how these concepts are used and the role they play in the wider context of Russia's overall strategic deterrence. To do this, it is also necessary to understand the role played by tactical nuclear weapons in Moscow's efforts to deter an adversary. A critical role in Russian nuclear capability and deterrence is played by sizeable numbers of Tactical Nuclear Weapons (*Takticheskoye Yadernoye Oruzhiye* – TYaO). Consequently, Moscow has proved disinterested in overtures by Washington to discuss the complex issues related to a possible reduction or elimination of such weapons. Their numbers and locations on Russian territory are secret.[82] TYaO capability in Russia's military is inexorably linked to the development in late 1990s of the unofficial doctrine of 'de-escalation,' meaning use of tactical or battlefield nuclear weapons to prevent further escalation. In Russia it is frequently referred to as 'escalate-to-de-escalate,' since it involves perhaps a single first use of low yield nuclear weapons. Although there is no clear support for this de-escalation strike principle in Russia's recent military doctrines, either in 2010 or its updated version of 2014, there are no grounds to conclude that the Putin regime has abandoned this idea.[83]

The de-escalation strike doctrine emerged in response to the NATO bombing of Serbia in 1999. That out-of-area operation raised concerns in Russian security circles about how the US and its allies might regard the second Chechnya War. Russian policy makers to date remain heavily influenced by these events, reinforced by the recent history of other Alliance out-of-area operations.[84] The military exercise Zapad 1999, with its 'demonstration strike' rehearsing a nuclear assault on alliance territory, embodied the whole concept of nuclear first use to 'demonstrate' intent to the adversary and coerce a solution. This has remained a feature of Russia's strategic military exercises. Russian sensitivity to a sudden foreign attack is rooted in the historical events of June 1941 and rekindled by NATOs air campaign in 1999 in the Balkans. Vostok 2010, for example, witnessed rehearsed use of nuclear landmines to stop rapidly advancing formations.[85]

[80] 'K 2021 godu neyadernyye sily v RF smogut polnost'yu zamenit' yadernyye v voprosakh sderzhivaniya – Shamanov,' http://militarynews.ru/story.asp?rid=1&nid=442450, *Interfax*, 20 February, 2017.
[81] Aleksei Nikolskiy, "Rossiya gotova k neiadernomu miru", *Vedomosti*, 13 January, 2017.
[82] 'Russia Will Not Disclose Tactical Nuclear Weapons' Quantities or Location,'Interfax, February 3, 2014.
[83] *Voyennaya Doktrina Rossiyskoy Federatsii* (Military Doctrine of the Russian Federation), February 5, 2010, http://kremlin.ru/supplement/461 ; The Russian Federation National Security Strategy Until 2020, Approved by Russian Federation Presidential Edict No. 537, May 12, 2009, http://www.ieee.es/Galerias/fichero/OtrasPublicaciones/Internacional/2016/Russian-National-Security-Strategy-31Dec2015.pdf ; On the recent development of Russian security and foreign policy see: Marcel de Haas, Russia's Foreign Security Policy in the 21st Century: Putin, Medvedev and Beyond, Routledge London, 2010.
[84] 'Major-General Vladimir Slipchenko Views Possible US 'Non-Contact' War on Iraq,' *Vremya Novostei*, October 5, 2002; Vladimir I. Slipchenko, *Voyna Budushchego* op.cit.; Vladimir I. Slipchenko, 'Information Conflict in Non-Contact Wars,' Obozrevatel, December 15, 2001; Colonel (Ret.) V. V. Zhikhaskiy, 'On the Issue of Wars of the Future,' *Military Thought*, No. 4, July – August 2000.
[85] Oleg Falichev, 'Vostok - 2010: Nachalo, Kulminachia, Epilog,' (East - 2010: Beginning, Culmination, Epilogue), *Voyenno Promyshlennyy Kuryer*, No. 29, July, 28 – August 3, 2010, http://vpk-news.ru/articles/6103 ; 'NATO's Belated Emotional Outburst Over Exercises Initiated By Ill-Wishers-View,'

Russian security documents, military exercises, or even analyses in the leading military journals shed little light on how the leadership might approach these issues during a real crisis. This concerns both the issue of how early or late the nuclear option may be sanctioned, and where the pressures within the system could stem from to adopt such measures. These issues are consciously clothed in secrecy and obscurity. The Iskander-M platform is key, not only in terms of tactical nuclear weapons delivery, but also in relation to its potential use to asymmetrically respond to US BMD. While some analysts express scepticism that the Iskander is nuclear capable, there can be no doubt that it is in fact a dual use system.[86] Indeed, the All-Russian Automation Science and Research Institute (VNIIA) under Rosatom are tasked with being the developer of nuclear warheads for the S-400 SAM system and the Iskander tactical missile. Reportedly, the engineering designs for the nuclear missile for Iskander were worked on by Elektropribor, another leading company in the nuclear weapons industry.[87]

The TYaOs value is further increased due to a Russian perception of conventional and C^4ISR weakness in confrontation with hypothetical adversaries on the Western and Eastern strategic flanks. There is a special concern about lack of sufficient progress on developing and introducing high-tech precision-strike systems and advanced C^4ISR.[88] Moscow, therefore, regards these weapons very differently than do other nuclear powers. In addition to their political value, they are seen as a way to counterbalance conventional weaknesses and in extreme cases TYaOs are considered to be operational systems.[89]

Moreover, the possible use of tactical nuclear weapons in combat has long featured in courses in the former Frunze Academy, now the Combined-Arms Academy in Moscow. This is important since the academy teaches operational art rather than strategy, providing further evidence that such weapons are assigned an operational role in the Russian military.[90] That senior officers in Russia's Armed Forces are schooled in the use of tactical nuclear weapons is additionally borne out by analytical articles from artillery officers. For example, Colonel-General V. N. Zaritskiy, former Chief of Missile Troops and Artillery, writing in *Voyennaya Mysl'* in 2007 referred to a classified document developed in the late 1990s, *Kontseptsiya primeneniya takticheskogo yadernogo oruzhiya* (The Concept for Using Tactical Nuclear Weapons), which in his view underpinned a number of artillery and missile troops publications in the mid-2000s, used by the Mikhaylov Military Artillery Academy.[91]

In recent years, an innovative element in Russia's military doctrine is reference to non-nuclear or pre-nuclear deterrence. This has evolved from its earliest reference in the 2010 version to become more codified in the 2014 iteration. The concept is seen as a mixture of military and non-military mechanisms to convince an adversary that further escalation would entail too much risk. The concept has, at its heart, a conventional component, mixed with diplomatic, legal,

ITAR-TASS, November 18, 2009; 'Poland's 'Nervous' Reaction to Russian Army Exercises Intended To Alert NATO,' Polityka, 18, 2009; Jacob W. Kipp, 'Ten Years of Anti NATO Military Exercises by Russian and Belarusian Armed Forces,' *Eurasia Daily Monitor*, September 29, 2009.

[86] Ilya Kedrov, 'Asimmetrichnyy zapusk Iskandera,' *Voyenno Promyshlennyy Kuryer*, http://www.vpk-news.ru/articles/5354, 7 June, 2007.

[87] Aleksandr Stukalin, 'Russian Nuclear Weapons Industry: Alive and Kicking,' *Moscow Defense Brief*, December 2012.

[88] For an overview of the issues involved and an outline of the 'Baltic approach' to an arms control regime for sub-strategic nuclear weapons see: Fredrik Lindvall, John Rydqvist, Fredrik Westerlund, Mike Winnerstig, *The Baltic Approach: A next step? Prospects for an Arms Control Regime for Sub-strategic Nuclear Weapons in Europe*, Swedish Defense Research Agency (FOI): Stockholm, February 2011.

[89] On US nuclear modernization see: Lawrence J. Korb and Adam Mount, Setting Priorities for Nuclear Modernization (Washington, D.C.: Center for American Progress, February 2016), www.americanprogress.org , accessed 28 June, 2016.

[90] Author interviews with retired Russian military officers, Moscow, July 2016, October 2010.

[91] V.N. Zaritskiy, 'New Methodology of Effective Engagement Planning in Combat Operations,' *Military Thought*, Vol.1, 2007.

information and other features. However, Russian defence specialists have expressed concern that the doctrine of pre-nuclear deterrence would not be credible in the estimation of a potential adversary unless its conventional element itself is credible: here, the reference is to VTO.[92]

Long before these references appeared at a doctrinal level, the leading Russian defence intellectual Andrei Kokoshin had expressed deep anxiety about over-reliance on nuclear deterrence. In 2003, Kokoshin published a book on nuclear conflicts in the twenty-first century that addressed strategic stability and the likely evolution of nuclear deterrence.[93] He examined the risk of conflict among new members of the nuclear club, and explored tensions on nuclear issues between the three main nuclear powers: Russia and the United States and the United States and China. Turning to the development of advanced conventional high-precision weapons, which could have an impact similar to nuclear weapons, Kokoshin concluded that there exists clear limits to nuclear deterrence and called for the Russian state to invest in the future development of a credible 'pre-nuclear deterrence.'[94] Yet, Kokoshin did not see this as a fully-fledged alternative to nuclear deterrence. He simply wanted to add an extra layer of deterrence in order to buy time during a crisis and avoiding further escalation. Elsewhere, Kokoshin reiterated his warning that excessive reliance upon nuclear deterrence could prove harmful or dangerous. By developing pre-nuclear deterrence based on conventional high-precision strike systems this would act as a 'last resort,' before nuclear use, and would be an important factor in preventing escalation dominance by the opponent.[95]

6.2 Pre-Nuclear Deterrence in Escalation Dominance

A number of factors appear to indicate that the Russian General Staff, though increasingly convinced of the need for pre-nuclear deterrence, do not believe they have developed this to credible levels. The first factor is the constant reference to nuclear deterrence throughout the Ukraine crisis in order to send a strategic message. The second factor is that if it is fully developed, there would be no underlying need to boost the VTO component of the RV&A. In addition, though Russian defence specialists have marketed the idea of pre-nuclear deterrence, there is no clear sense of where this fits into Russia's wider deterrence strategy; especially in terms of escalation during a crisis and the need to maintain escalation dominance.

Other than patterns in Russian strategic military exercises, involving recourse to rehearsal of 'de-escalation' strikes or the 'pre-emptive' use of Iskander-M, there is little to offer guidance on Russian perspectives on escalation. One exception is Sergey Brezkun, Professor in the Academy of Military Sciences, who attempted to address the lack of clear theoretical guidelines for the political leadership in relation to the risk of nuclear use during escalation. A similar lack of theory underlies the role of pre-nuclear deterrence. Brezkun outlined the work of the nuclear analyst, Herman Khan, in the mid-1960s who examined the possibility of nuclear conflict by framing an 'escalation ladder,' consisting of 44 steps and seven stages. Brezkun ridiculed that

[92] Dmitry Adamsky, 'Cross-Domain Coercion: The Current Russian Art of Strategy,' Proliferation Papers 54, IFRI, Paris, November 2015, p. 31.
[93] A. A. Kokoshin, *Iadernye konflikty v XXI veke.* (Moscow: Media-Press, 2003). The book was the product of the Svechin Seminar held by the Institute of International Security of the Russian Academy of Sciences in October 2002 in Moscow. English language copy of Manuscript copy provided to this author by Kokoshin.
[94] *Ibid*., p. 90.
[95] A.A. Kokoshin, *Problemy obespecheniya strategicheskoi stabil'nosti. Teoreticheskie i prikladnye voprosy* [The Issues of Providing Strategic Stability: Theoretical and Applied Dimensions], Moscow: KRASAND, 2011, pp. 28, 70 – 79.

conceptual approach, but suggested that the Russian leadership needs a 'de-escalation ladder,' to help shape its decision making.[96] It is important to note, in passing, that the Russian General Staff may not in reality think or react in terms of a 'ladder of escalation,' more likely proving to be adaptive to the unique contours of a given crisis and seeking to control its escalation.

Brezkun returns to the theme of the 'demonstration strike,' which has resonance for the likely use of conventional systems as part of deterrence and escalation control, and he argues that it must have the following features:

- The strike must be nuclear;
- Minimize the risk of immediate or long-term catastrophic consequences (environment);
- It should be clearly interpreted by the other side and must be psychologically effective;
- It must demonstrate the willingness of the Russian leadership to further escalate the nuclear conflict, if necessary.[97]

The de-escalation strike's effectiveness would depend on a number of factors, including how well the adversary is known, how their psychological reaction might influence decision making, and others. The author argues that a demonstration strike close to Russia's borders, and in response to perceived aggression, would mean that the strike would be more acceptable to the international community. For the purposes of considering the de-escalation ladder, Brezkun suggests that this occurs in response to non-nuclear aggression against Russia by either a nuclear or non-nuclear state; its initial phase engages Russia's Armed Forces by non-nuclear means. The demonstration strike, which the author believes could follow within a period of only a few hours, would target enemy formations or aim to degrade the adversary's military-economic potential.[98] It is highly unlikely that de-escalation using conventional high-precision weapons as the preferred option would substantively differ.

Brezkun believes that there is no set of guidelines governing the potential demonstration strike to help guide Russia's political decision-making apparatus in the event of such a crisis. The only caveat is that the political leadership may be more familiar with the wargaming of these scenarios than Western counterparts. He suggests that such a framework is needed, but many of the themes arising from the de-escalation strike apply to pre-nuclear deterrence. Talk of ladders of escalation as a model in use by the Russian General Staff appears two dimensional. It is also unknown how Russia's leadership or a future leadership would act in circumstances when it is judged that the conflict escalation dominance is lost.[99]

The future credible emergence of Russia's pre-nuclear deterrence will undoubtedly have important strategic implications, not least if it actually lessens dependence upon nuclear deterrence and in turn results in shift in policy over tactical nuclear weapons or the de-escalation strike issue. Moreover, it may have implications for future arms control negotiations, and raises the issue as to how far Moscow might be willing to go in such a process, especially after considerable investment in design and development of conventional high-precision weapons with increased range and accuracy.

[96] Sergey Brezkun, 'Rossii nuzhna 'lestnitsa' ne eskalatsii, a deeskalatsii,' *Nezavisimoye Voyennoye Obozreniye*, http://nvo.ng.ru/concepts/2015-11-27/1_stairway.html, 27 November, 2015.
[97] Ibid.
[98] Ibid.
[99] Mikhail Khodarenok, 'Stsenariy tret'yey mirovoy,' *Voyenno Promyshlennyy Kuryer*, http://www.vpk-news.ru/articles/24284, 16 March, 2015; Anton Lavrov, 'Russian Again: The Military Operation for Crimea,' Colby Howard and Ruslan Pukhov, (Eds), *Brothers Armed: Military Aspects of the Crisis in Ukraine*, (East View Press, 2014), 157 – 186.

There are also a whole swathe of questions that emerge from the Russian pre-nuclear deterrence theory applied in an escalating conflict. At what point does this come into play? Is the use of conventional high-precision weapons seen by both sides as a 'last resort' warning of nuclear escalation to follow? How is the detectable launched missile perceived by the adversary, with minutes to decide on a response how is the adversary to determine if the warhead conventional or otherwise? Is this a single launch, like a demonstration strike, or would it be part of a wider campaign to target enemy C4ISR? If so, how is the adversary to know that the intent to go nuclear is missing from the unfolding escalation?

7 The Role of High-Precision Weapons in Offensive Operations – Enforcing Russia's Will

Clausewitz made a distinction between full and limited war. In the latter, the purpose is only to 'occupy some of the opponent's frontier districts so that we can annex them or use them for bargaining at peace negotiations.'[100] The aim is not the destruction of the enemy, neither his armed forces nor any other aspect of him, but to force him to give in to your demands on one or more political issues. In Clausewitz's time, temporary occupation of enemy territory was an important tool for achieving these types of goals. Today, especially after the introduction of long range VTOs, there are more options on the table.

This chapter investigates from two angles how Russia may use VTOs in regional conflicts where the country wants an opponent to change its policy on one or more topics. The first angle is what the Russian military themselves write about these issues. The second angle is the authors of this report's own rational-choice inspired expectations of which pro and con arguments that would likely be discussed in the Russian leadership if it was to contemplate such operations. While Russia may choose to use VTOs against a wide variety of regional opponents, the discussion here is limited to the potential use of such weapons in a bilateral conflict with a NATO country. The probability of collective NATO response has consequences of its own for the Russian strategic calculations that are different from what would be the case with non-aligned countries.

The Russian literature on VTOs is dominated by the questions raised in the previous chapter. For example, in terms of cruise missiles, Dennis Gormley points out that while US specialists tend to focus on the tactical strike capabilities of cruise missiles, the Russian specialists tend to prioritize their strategic strike capabilities.[101] Still, some of the Russian writings are also concerned with how Russia could use VTOs in regional settings. In fact, the head of the Russian Center for Military and Political Studies at MGIMO University, Alexei Podberezkin, thinks that 'the arrival of new non-nuclear arms (PGW) first of all means that the whole approach to military force as an instrument of foreign policy is changing. Military force is again about to become a more normal and 'usable' foreign policy instrument. Furthermore, this is true, first of

[100] Clausewitz, Carl von, *On War*, 1989, (eds.) Michael Howard and Peter Paret, Everyman's Library, London, p. 69.
[101] Gormley, Dennis M, 2016, *The offense/defense problem: How missile defense and conventional precision-guided weapons can complicate further deep cuts in nuclear weapons*, Deep Cuts Working Paper, http://deepcuts.org/images/PDF/DeepCuts_WP6_Gormley_UK.pdf, p.6.

all, in regional and even 'local' conflicts.'[102] Thus, Podberezkin predicts both that the resort to military forces for political purposes becomes more prevalent because of the availability of VTOs, and, in contrast to much of Russian writing on the issue, he emphasizes their particular relevance in regional and local conflicts. In a similar vein, V.I. Litvinenko and I.P. Rusanov argue that if you fight the enemy's forces in order to impose your will upon him, VTOs make it much easier to strike against the right mix of military and civilian targets at different locations within his territory.[103]

Podberzkin's thinking echoes statements made by Western scholars. Thomas H. Mahnken, for instance, argues that 'because invasion and conquest are becoming increasingly difficult, wars in a mature precision-strike regime will likely focus on coercion and limited political objectives. In this world, the ability to punish an adversary to force him to concede – what Thomas Schelling dubbed the 'power to hurt' – is likely to become an increasingly popular theory of victory.'[104] Why go through the strains and complexities of putting your soldiers on enemy ground, as Clausewitz envisaged, when you are at least as likely to achieve your political goals vis-à-vis this enemy by using or threatening to use VTOs from afar?

In Russia, the awareness of the possibilities that come with VTOs has been there for a long time but their availability has not. As discussed above, the idea of precision-strike has had a prominent place in Russian military writings, and was in particular further developed by the late General Vladimir Slipchenko. Despite this constant military-theoretical focus, the actual development of Russian VTOs in post-Soviet times was slow. Several programmes for development were initiated in the 1990s and 2000s, but, according to Dmitry Kornev, Russia up until 2010 had no cruise missiles with conventional warheads in service.[105] After that, however, it took only five years from their procurement until their first use in Syria in the autumn of 2015.

Still, even now that Russia has acquired this capability, there will remain a number of questions concerning their usefulness for offensive regional political purposes. These uncertainties in particular concern such issues as targeting, costs and production capacity, and when and how they are most likely to lead to the desired political outcome. In addition, the Russian leadership will also have to consider the pros and cons of VTOs against the pros and cons of other military capabilities at hand for achieving the same goals.

7.1 Targets

Two targeting issues are of particular importance with regard to the effect of using VTOs in bilateral conflicts. First, it is a question of whether one should give priority to military or civilian targets, and second, it plays a big role whether one needs to engage targets that are stationary or mobile. The latter are a magnitude harder to hit than the former.

[102] Podberezkin, A. I., 2014, 'Evraziyskaia VKO: rol strategicheskikh neiadernykh vooruzhenii', *Vozdushno-Kosmicheskaia Oborona*, p. 30.
[103] Litvinenko, V. I and Rusanov, I. P., 2014, 'Osnovnye tendentsii ognevogo porazhenia v sovremennykh operatsiakh (boevykh deistviyakh)', *Voennaia Mysl*, No. 10, p. 21.
[104] Mahnken, Thomas G., 2014, 'Weapons: The growth and spread of the precision-strike regime', in Thomas G. Mahnken and Joseph A. Mailo, *Strategic Studies – A Reader*, Routledge, Oxford, p. 351.
[105] Kornev, Dmitry, 2016, 'Russian High-Precision Weapons in Syria', *Moscow Defence Brief*, No. 3, p. 15.

Slipchenko was very clear that civilian targets would be the main priority in future war.[106] This was both because they tend to be stationary, thus easy to hit, and because they potentially could have even greater effect on the political will of the opponent than military ones. This latter point may of course vary with the opponent. Leaders of some countries may be less averse to civilian losses than the leaders of other countries, but it seems fair to assume that the leaders of most NATO countries will be very averse. Slipchenko's convictions on this point continue to feature in the Russian military debate. S. G. Chekinov and S. A. Bogdanov, for example, emphasize the expanded opportunities VTOs give to 'strike in a selective and measured way a wide range of targets of the opponent's economic and military infrastructure.'[107]

Mobile targets, however, represent a far more difficult challenge than stationary ones. The former can also be taken out by VTOs. However, as pointed out by Davit Watts, the successful destruction of mobile targets demands effective battle networks that 'have proven extraordinarily difficult to establish and sustain under actual combat conditions.[108] While there is now little doubt that Russia possesses several types of VTOs, the country is at least as likely as the USA to struggle to establish and sustain the battle networks necessary for these munitions to successfully strike mobile targets. This is probably true despite the Russian advances in system integration with the help of the GLONASS system recently demonstrated in Syria.[109] Some observers compare the Russian first use of cruise missiles in 2015 to the US use of similar missiles in the first Gulf war, and draw the conclusion that Russia roughly is on the technological level in this area that the USA was in 1991. If the USA in 2013 still found it challenging to establish and sustain effective battle networks for use against mobile targets, it is reasonable to assume that this currently is even more difficult for Russia.

7.2 Costs and production capacity

Because of their price, many VTOs, and in particular cruise missiles, are likely to continue to be a capacity in limited supply, even for great powers. Russian Defence Minister Sergey Shoigu has promised that Russia will increase its stock of VTOs thirty times by 2020,[110] but Barry D. Watts writes that 'even in the case of very inexpensive PGMs, resource constraints and institutional preferences can confront even a major power with the prospect of running out during high-intensity operations.[111] If this is true for the USA, it is, despite Shoigu's promises, most likely true also for Russia. It is a question both of costs and production capacity.

The prices of most military items in Russia are secret, and that is of course also the case for VTOs. Still, to continue with the *Kalibr* cruise missile as an example, as mentioned before, the unauthorized price estimates in the open press range from 750,000 USD a piece to 6.5 million USD.[112] The US equivalent, the Tomahawk, according to *The Economist*, costs about 1.5 million USD.[113] This is a high price, also for the US military, and efforts are under way to find cheaper high precision options in order to use the Tomahawks mostly for very high value

[106] Slipchenko, Vladimir, 2006, *Voiny novogo pokolenia – Distantsionnye i bezkontaktnye*, Olma-Press, Moscow, p. 94.
[107] Chekinov, S. G and Bogdanov, S. A., 2017, 'Evoliutsia sushchnosti i soderzhania poniatia voina v XXI stoletii', *Voennaia Mysl*, No. 1, pp. 36 – 37.
[108] Watts, Barry, D., 2013, *The Evolution of Precision Strike*, Center for Strategic and Budgetary Assesments, http://csbaonline.org/uploads/documents/Evolution-of-Precision-Strike-final-v15.pdf, p. 12.
[109] Nikolskiy, Aleksey, 2017, 'Siriiskaia pobeda GLONASS', *Vedomosti*, 1 March 2017.
[110] Butowski, Piotr, 2014, 'All missiles great and small: Russia seeks out every niche', *International Defence Review*, 26 August.
[111] Watts, Barry, D., 2013, *The Evolution of…*, op.cit, p. 23.
[112] Solopov, Maksim and Artemev, Aleksandr, 2015, 'Rassledovania RBK: skolko tratit Rossia na voinu v Sirii', *RBK*, 28 October, http://www.rbc.ru/investigation/politics/28/10/2015/562f9e119a79471d5d7c64e7
[113] 'Rockets galore – Modern warfare is expensive. But it is to become less so', *The Economist*, 29 September, 2012.

targets. Russia, with much smaller resources, will have to think in similar terms even if the most conservative estimate of 750,000 USD per Kalibr unit should be correct.

Furthermore, this same missile, has only one producer, *Novator* in St. Petersburg. According to military observer Sergei Ischenko, in the first six months of 2016 *Novator* was able to provide the Russian armed forces with 47 *Kalibr* missiles. The same author has calculated that with the current plans for naval platforms to carry *Kalibr* missiles, Russia will need about 1,500 missiles ready for service at any time. That number should further be multiplied by three or four in order to have enough missiles for testing and training.[114] Thus, if Russia will need about 5,000 *Kalibr* missiles to fully supply all naval platforms that are supposed to carry this weapon, then a production rate of between 50 and 100 a year is not much. Of course, Russia may decide to expand the capacity of *Novator* or branch out production also to other facilities, but that will take resources away from other procurement plans.

Ischenko's calculations may not necessarily be accurate, and other companies in the Russian arms industry also produce cruise missiles of similar use, but the main point here is that both price and production restrictions will be part of the calculations when Russia decides where and how to use such VTO weapons in regional conflicts. The use of these missiles in the Syrian conflict should not necessarily be seen as a blue-print of what is to come. Their deployment in that fight was not justified first and foremost by their military impact on that particular conflict. Instead, the main reasons for their use were probably to combat test the missiles themselves, and to attempt to boost Russian great power status.

Much will of course depend on the character of the regional opponent. If, as in the case of rebel groups in Syria, the opponent is without air and missile defence, and without powerful allies that may come to his rescue, then a relatively minor number of missiles may be enough to achieve the political goals. However, if the opponent has some capacity for defence against VTOs, and if there is a chance that the conflict will escalate through the involvement of the opponent's allies, then the calculations become very different. In this case, Russia will need to be able and ready to spend enough missiles to overwhelm the opponent's anti air and missile capabilities, while at the same time keep enough in reserve to be ready for possible conflict escalation. This situation puts a much higher price on the use of such missiles in the types of conflict discussed here than was the case in Syria.

7.3 Political effects

To what extent the use of VTOs is likely to result in Russia achieving its political goal(s) in any particular regional conflict is, as discussed above, dependent both on the character of the opponent and the conflict. One can question the cost-benefit ratio of the cruise missile strikes against anti-Assad forces in Syria. The missiles may well have been efficient in terms of destroying their targets, and it is also possible that they caused some serious damage to these forces' *ability* to continue to fight, but their effect on these forces' *willingness* to continue the fight is questionable. Decentralized, relatively low tech opponents with a high readiness to sustain losses may not be the best targets for the use of high cost VTOs. A similar point has

[114] Ischenko, Sergei, 2016, 'Slishkom krupnyi 'Kalibr', *Svobodnaia Pressa*, 8 September, http://army-news.ru/2016/09/slishkom-krupnyj-kalibr/

been raised with regard to then President Obama's use of Tomahawk cruise missiles against ISIL in Eastern Syria in 2014.[115]

On the other hand, regional opponents with a high number of stationary high value targets are more promising. The US use of cruise missiles in the initial stages of the 2003 Iraq war may be an example here. Especially, opponents with a much lower acceptance of both material and human losses than terrorist groups such as ISIL, would be ideal. In this sense, advanced NATO countries may provide far more promising targets for the use of high cost VTOs than opponents similar to the anti-Assad forces in Syria.

Such reflections can also be gleaned from the Russian debate on VTOs. Chekinov and Bogdanov see European countries as especially vulnerable in this regard. This is because they 'contain an especially high density of targets that are essential for their societies to function.'[116] Here, these authors in particular include systems of civilian and military governance, major industrial and energy-related facilities, critical communication objects and targets that can create considerable damage if hit, such as nuclear and chemical plants.[117] Litvinenko and Rusanov follow up by pointing out that the aims of such attacks are not necessarily to create as much destruction as possible, but instead to 'crush the opponent's morale and willingness to fight back by finding just the right targets.[118]

An issue here is also whether surprise attacks or threats of attacks would be the best option. A surprise attack is obviously likely to be the most military destructive, but it may not be the best option in terms of 'crushing the opponent's morale.' In case of surprise, damage precedes negotiations, and this is likely to incur in the opponent a desire for revenge. While Russia's opponent still has to fear further attacks, especially because there will no longer be any reason to doubt the attacker's willingness to use these means, the outrage in the target country about what has already take place may be stronger than the fear of new attacks.

It is furthermore not entirely clear what the effects of a surprise attack with VTOs may be on allies if the target country is a NATO country. On the one hand, damage has already been done, and alliance guarantees cannot undo that. If allies then conclude that further attacks are unlikely, they may find that there is little they can do about the situation and decide against intervening. On the other hand, the target country is not likely to give in to the political demands unless the surprise attack is followed up with threats of more attacks. In that case allies will most likely get engaged, since use of force has already taken place, and more may come.

Alternatively, if Russia instead of surprise only threatens with the use of VTOs, the opponent will have time to make preparations that will reduce the impact of the attack. Thus, the potential damage is reduced. If the opponent has military allies, these may also mobilize. This means that the downsides for Russia of starting by only threatening to use VTOs are both that the potential military effects of their use may be reduced, and that the opponent's allies will have time to mobilize. Together, these two factors substantially increase the potential costs of this kind of aggressive behaviour. On the other hand, the certainty that allies will come to the rescue of the attacked country may be smaller than in the case of a surprise attack. Military action has not yet

[115] Juan Cole, 'What is it with US Presidents and Tomahawk Cruise-Missile Strikes?", *The Nation*, 7 April 2017.
[116] Chekinov, S. G and Bogdanov, S. A., 2017, 'Evoliutsia…, op.cit, pp. 21 – 22.
[117] Chekinov, S. G and Bogdanov, S. A., 2017, 'Evoliutsia…, op.cit, pp. 21 – 22.
[118] Litvinenko, V. I and Rusanov, I. P., 2014, 'Osnovnye tendentsii ognevogo porazhenia v sovremennykh operatsiakh (boevykh deistviyakh)', *Voennaia Mysl*, No. 10, p. 20.

taken place, and allies may conclude that there is still room for a political settlement. Thus, they may put the target country under substantial political pressure to reach a settlement in order avoid escalation. The extent to which allies may engage in such behaviour is of course dependent on the character of the Russian political demands. The more these are seen as unreasonable, the less likely allies are to pressure the government of the target country, and the more likely they are to initiate military preparations for assistance.

It is not clear from this discussion whether surprise attack or threats of attack would be the best option for Russia. It is further interesting to note that discussions of this dilemma also seem rather absent from the Russian military literature on the use of VTOs. At least, that is the case for the open source literature that has been available to the authors of this study.

7.4 Alternative military capabilities

Instead of VTO 'contactless' warfare, it is of course also possible to use the old fashioned *temporary control of enemy territory* mentioned by Clausewitz at the outset of this chapter, in order to force through a political settlement favourable to Russia. This is for example exactly what Russia is trying to do in Ukraine today, although there the intervention is partly disguised as a Ukrainian civil war.[119] If Ukraine concedes to the Russian demands for federalization of the country and declaration of neutrality (i.e. no to joining NATO), Russia will most likely pull out the troops and advisors it now has in Donbas. The fact that this use of limited war was possible to partially disguise as a civil war, was probably one of the main reasons for the choice of this particular type of warfare. This means that boots on the ground is more suitable for Russia in some settings than in others, when it comes to the choice of military means for the achievement of political goals.

Moreover, Russian theorists and senior officers tend not see VTO 'contactless' warfare and boots on the ground as in any way mutually excluding. To the contrary, several writers see a combination of the two as especially promising in situations where Russia is in need of military force to achieve political ends.

It should be noted, that there seems to be an increasing trend in the Russian military literature to question the usefulness of 'boots on the ground.' In fact, several authors in contemporary Russian military literature emphasise the likely diminishing role of this type of warfare. For example, Litvinenko and Rusanov write that 'one of the main tendencies in contemporary warfare is the relative decline in the importance of traditional land forces, and the rise of VTOs and others weapons based on new physical principles',[120] and Chekinov and Bogdanov state that 'such measures as seizure and holding of enemy territory will no longer always be necessary. That strategy will be reserved only for those cases where the political gains can be achieved with minimal military losses, or where the strategic goals cannot be otherwise achieved.'[121] These writings do not at all suggest that seizure and control of enemy territory is rendered obsolete by VTOs in the contemporary Russian military literature, but they do suggest that VTOs are emerging as a very significant alternative to land seizure for pressuring foreign governments.

[119] This is not to deny that there is a significant element of civil war in the Donbas conflict. Indeed it is, but the shots are still called in Moscow, and the rebellion would most likely by now have been defeated by the Ukrainian military unless held up by Russia, including with the on and off use of regular Russian troops.
[120] Litvinenko, V. I and Rusanov, I. P., 2014, 'Osnovnye..., op.cit, p. 20.
[121] Chekinov, S. G and Bogdanov, S. A., 2017, 'Evoliutsia…, op.cit, p. 21.

If Russia was to use land forces instead of VTOs to get its way in a regional conflict, speed would probably still be of the essence. Outpacing the enemy is almost always an advantage, and this is especially the case where there is a significant chance that the conflict could escalate through the involvement of enemy allies. The faster Russian troops could establish a *fait accompli* on the ground, the more likely is it that potential allies may have second thoughts about getting involved. In terms of NATO members, any uninvited Russian boots on the ground would be a cause for allied assistance under article five, but such assistance is never automatic. In particular, one could imagine at least three conditions under which allies may be reluctant to forward such assistance:

a) If the Russian political demands to some degree were seen as justified by allied countries.
b) If Russia stated clearly and convincingly that no further use of force is contemplated.
c) If Russia established anti-access capabilities (A2/AD) around its military presence that significantly increased the potential military costs of allied engagement.

The question is then what military capabilities, other than VTOs, Russia would find best suited to succeed with such an operation. The rather obvious answers would probably be Special Forces, if we are talking about a limited object or a range of objects, or the Airborne Forces if we are talking about a larger object or piece of territory.

Russian special forces, and in particular the newly formed Special Forces Command *Sil Spetsialnykh Operatsii* (SSO), would be ideal for limited operations of this kind. In fact, one of the main reasons for the establishment of the SSO was to give Russian politicians a highly potent military instrument to defend Russian interests in situations where some military force is needed, but where the likelihood of further military engagements is relatively limited.[122] However, these forces do not have much capacity for self-defence if engaged, and, given enough time, their defeat would probably be within reach of many countries. Thus, successful use of Special Forces alone in a limited war scenario would be the best option mostly in situations where the target country needs to find a solution to the political problem faster than it can bring its own forces to the theatre of operations.

Another possibility for the use of Special Forces, discussed in the Russian literature, is to combine the use of such forces with VTOs. This includes both their role in pre-combat reconnaissance, in aiding VTOs to their targets, and their ability to enforce the opponent's feeling of being attacked everywhere at the same time.[123] Chekinov and Bogdanov point out that simultaneous use of VTOs and sabotage-reconnaissance groups on enemy territory may be a particularly efficient way of demonstrating to the opponent country that opposing Russian demands has serious consequences.[124]

For larger, but still limited, operations, the Airborne Forces are a very relevant capability. According to the British expert Rod Thornton, these forces are likely to 'form the vanguard for any interventionary operation beyond Russia's border.[125] According to Russian officers O. S.

[122] Nikolskiy, Aleksey, 2013, 'The Olympic Reserve: Why Russia Has Created Special Operations Command', *Moscow Defence Brief*, No.4, p. 22.
[123] Kiselev, V. A. and Vorobiev, I. N., 2016, 'Vozdushnye (aeromobilnye) desanty v sovremennoi voine', *Voennaia Mysl*, No. 2, p. 19.
[124] Chekinov, S. G and Bogdanov, S. A., 2017, 'Evoliutsia…, op.cit, p. 21.
[125] Thornton, Rod, 2011, *Organizational Change in the Russian Airborne Forces: The Lessons of the Georgian Conflict*, Strategic Studies Institute, http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=1096, p. III.

Tanenia and V. N Uriupin, the Airborne Forces' main roles, independent of whether they operate alone or as part of a lager operations, are:

- Destruction of the opponents' ability to perform governmental and military functions.
- Destruction of important military, economic or communication objects.
- Prevent the movements of strategic and operational reserves, and others.[126]

Under Colonel-General Vladimir Shamanov (2009-2016) the Russian Airborne Forces were supplied with capabilities that made them more able to conduct operations on their own than previously. At the same time, I. I. Vorobiev and V. A. Kiselev point out that despite their increased strength, these forces are still mostly a military tool for conflicts with significantly weaker opponents. In conflicts with peer-like opponents, especially if these possess advanced fighter aircraft and strong air defences, the use of the Airborne Forces is less advisable.[127] This fact, for some time led the Russian General staff to suggest that the Airborne Forces first of all should be an anti-insurgency instrument.[128] However, in 2012 General Shamanov firmly stated that 'the argument that the airborne forces first of all should be used against irregular formations – militants and partisans – has no foundation in reality. Our enemy is as before, regular, well-armed and well trained troops. Independent of who they belong to.'[129]

This means that the Airborne Forces most likely will continue to have a significant role in Russian doctrines for how to fight in regional conflicts. Their main advantage over a VTO attack would be that they could, if successfully deployed, establish the necessary political pressure on a target government with at least initially very little destruction. Contrary to the situation with the use of VTOs, it would be up to Russia's opponent to initiate combat. This was in essence what happened in Crimea in 2014. A combination of Special Forces, Airborne Forces and other support elements took control over the peninsula in a surprise attack, and the Ukrainian government in the end decided not to fight. In the case of a surprise VTO attack, on the other hand, the target government will not have the possibility to avoid serious damage by choosing not to fight. Such damage has already taken place. They will of course have the option of avoiding further damage by accepting Russian demands, but that is still a very different situation from having the possibility of avoiding damage more or less entirely. Accepting Russian demands will be more tempting in the latter case.

Furthermore, as in the case with the Special Forces, Russian military analysts also here see the combination with VTOs as especially potent. O. S. Tanenia and V. N. Uriupin emphasise this as one variety of an operational concept they call 'all-round support of VDV operations.'[130] It may be, however, that these considerations are mostly valid in scenarios where significant conflict has already commenced, and not in the context discussed here, where Russia tries to use limited force very quickly in order to gain political concessions and at the same time avoid further military escalation.

[126] Tanenia, O. S. and Uriupin, V. N., 2016, 'Nekotorye voprosy primenenia vozdushnykh desantov v sovremennykh usloviakh', *Voennaia Mysl*, No.7, p. 18.
[127] Kiselev, V. A. and Vorobiev, I. N., 2016, 'Vozdushnye…, op.cit., p. 19.
[128] Nuriakhmetova, Ekaterina, 'Vladimir Shamanov zashchitil boievuiu mashinu desanta', *Izvestia*, 10 October, 2012.
[129] Ibid.
[130] Tanenia, O. S. and Uriupin, V. N., 2016, 'Nekotorye…, p. 24.

8 Conclusions

As demonstrated by this study, Russia has long considered high-precision weapons an indispensable element of modern warfare. In fact, some of the pioneer thinking on how these weapons would impact future combat was done by Russians. Marshal Nikolai Ogarkov is considered the father of this school, but also later Russian military theorists such as Major-General Viktor Riabchuk, Major-General Vladimir Slipchenko and Captain Edvard Shevelev made important contributions. Their problem was that they were thinking on behalf of a country that fell apart. The economic collapse of the 1990s, combined with strongly improved relations with the West, made the indigenous development of VTOs both financially difficult and politically less necessary. However, the ascent of the Putin era gradually changed this situation. Russia experienced strong economic growth throughout the 2000s because of high oil prices, and the country's relations with the West gradually deteriorated. In 2011 Russia tripled the funds set aside for military procurement, and in 2014 Russia annexed Crimea and instigated an armed rebellion in Eastern-Ukraine. These aggressive acts took place after the Euromaidan had led to a pro-Western change of power in Kiev. The assault on Ukraine constitutes a negative watershed in Russian-Western relations.

In the post-Maidan world, high-precision weapons are a main priority in Russian military modernization. As referred to in the study, Defence Minister Sergei Shoigu has promised to increase the amount of VTO weapons in Russian arsenals thirty times by 2020. While neither the production capacity, nor the technological sophistication, are currently at Western standards, there is little doubt that the Russian arms industry is able to deliver at least a considerable amount of what the military desires in terms of VTOs. Nevertheless, VTOs are expensive to produce, also in Russia. As discussed in this study, no country, including major powers, is going to have an unlimited supply of these weapons any time soon. This means that in most contingencies considerations of cost and availability will have to figure in the discussions of how and when to use VTOs.

Furthermore, as shown in this study, the role of VTOs is still subject to ongoing experimentation and discussion within the Russian military. They may be used alone, but more likely their utility in future conflicts will be calculated based upon how they blend into a force mix tailored to suit the needs of the operational environment in question. Thus, their role as force multipliers has been accentuated by several Russian theorists. In particular, their use in combination with Special Forces and the Airborne Forces has been emphasised.

In 2015, Russia for the first time used long-range cruise missiles in combat. The sea and air-launched missiles used against targets in Syria demonstrated to the world that Russia both had and was willing to use this capacity. Their military utility in that particular conflict has justly been questioned. Russia could easily, and much cheaper, have destroyed the same targets with its own fighter aircraft stationed in the area. However, as a demonstration of the new capacity they did their job. Russian sources suggest that in this case the Russian political leadership itself was impressed by the performance. Sergei Ischenko indicates a certain *Kalibr*-fetishism in Russia after the launches against Syria.

Thus, based on the above, it should be no surprise that VTOs currently figure prominently in Russian military thinking. They now have a prominent place in the plans for the defence of the country, and as stated above, Defence Minister Shoigu has even alluded to the possibility that they in the future may supplant nuclear weapons as the main means of deterrence. This is not at

all an immediate prospect, and nuclear weapons are still the mainstay of Russian deterrence, but the fact that this possibility has been publicly proposed says something about how important these weapons are seen in Russia today.

For the foreseeable future, however, the VTOs will mainly provide Russia with what in the Russian literature is called a 'pre-nuclear' deterrence capability. This is basically just another layer of deterrence in addition to the nuclear weapons, but still seen as being of vital importance by the Russian military. The 2008 Serdiukov military reforms to a large extent singled out the nuclear weapons as more or less the only deterrent against the West. This strategic choice was never very popular with the officer corps. They thought that overreliance on nuclear weapons would limit Russia's room for manoeuvre in a potential conflict with the West to an unacceptable degree. To put it starkly, if a conflict should occur, Russia would have the choice of doing nothing or start Armageddon. This was the reason why conventional deterrence was reintroduced in the new edition of the military doctrine in 2014. In this context, VTOs fit very well into the renewed emphasis on conventional deterrence.

In fact, the VTOs role in strategic deterrence to a large extent dominate the Russian military literature on this issue. As pointed out by Bruce Watts, this is to some extent in contrast to the thinking on VTOs in the USA, which tends to be more occupied with their tactical than strategic utility. However, the Russian military literature also to some extent discusses the tactical side of VTOs, and here we may talk about a more offensive use of these weapons. The Russian military analysts who write about the tactical aspects in particular propose that:

- With the advent of VTOs the use of military force may again become a more normal and usable instrument of foreign policy (Podberezkin).
- VTOs may be particularly efficient in conflicts with highly developed countries because of their high number of targets critical for the functioning of their societies and because of their loss-averseness (Chekinov and Bogdanov, and Litvinenko and Rusanov).
- VTOs may be efficient in local conflicts on their own, but their combination with others forces, first of all Special Forces or the Airborne Forces, would probably be better.

Still, as discussed in the last chapter of this study, there are likely to be many dilemmas in terms of targeting, timing and cost-benefit analysis that make the potential use of VTOs in regional conflicts far from straight-forward.

We have in this study analysed Russian thinking on the role of VTOs in future combat, we have given examples of such weapons and discussed their priority in military procurement, and we have tried to estimate how their introduction is likely to impact future Russian military operations – both defensive and offensive. While Russia's entry into the precision-strike regime is a frequent topic in the international military literature, especially after the Russian use of cruise missiles in Syria, we know of no other English language study so far that in a similarly comprehensive way has examined this topic. Many of the questions raised will undoubtedly be in need of further research, and the conclusions presented in need of further refinement, but our hope is that this study will provide one useful point of departure for such investigations and revisions.

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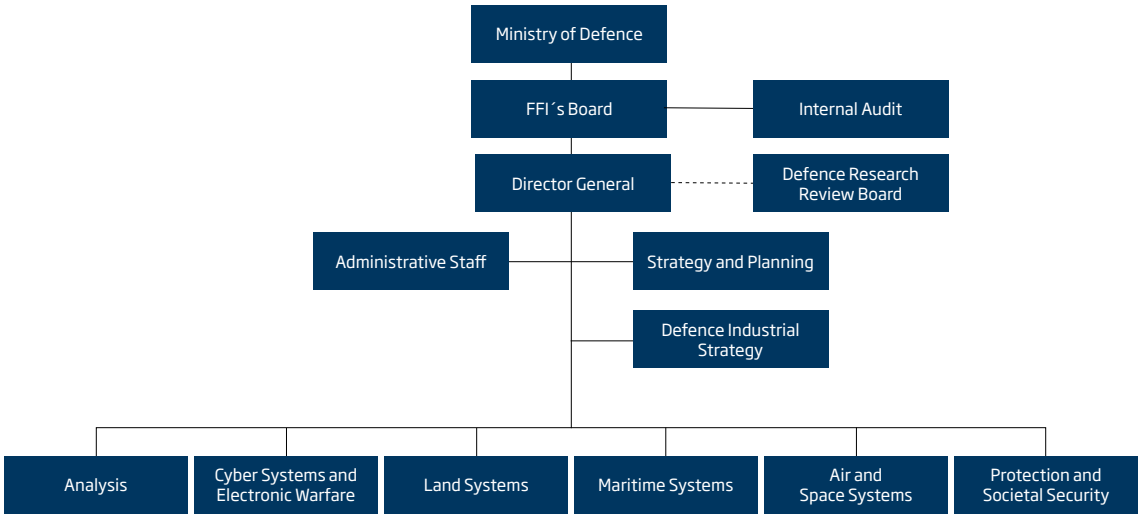

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