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Defence industries in Russia and China:
players and strategies

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FOREWORD

Following on the *Chaillot Paper* on 'Defence industries in Arab states: players and strategies' published in March 2017, this multi-authored Report shifts its focus to the West's two main strategic competitors – Russia and China. However different in their trajectory and ambition, both have recently narrowed the industrial and technological gap with the European armaments sector and are now openly challenging the West's traditional superiority in this domain. This poses a number of fresh challenges – in both economic and strategic terms – that are likely to shape the prospects for war and peace in our time at regional as well as global level.

With this publication, coordinated by Richard Bitzinger and Nicu Popescu, the EUISS completes its mini-survey of developments in the international defence industry, in the hope of having offered a comprehensive critical overview of a fast-changing landscape (and market) which will inevitably have an impact on the future evolution of Europe's own defence industrial and technological base (EDTIB). This is all the more relevant at a time when its hitherto relatively stagnant currents seem to have started flowing in a more cooperative and forward-looking direction.

Antonio Missiroli
Paris, November 2017

INTRODUCTION

Richard A. Bitzinger and Nicu Popescu [1]

One of the first major publications published by the Institute for Security Studies, then under the aegis of the Western European Union, was entitled 'Nationalism, Internationalism, and the European Defence Market'.[2] Like most papers on European defence industries and technologies published over the last couple of decades, it was mostly concerned with intra-European issues: how should EU member states' defence industries cooperate and integrate, and what pan-European institutions could help that process? And when it came to 'external' aspects, it mostly referred to interaction with the US armaments industry. Since then, much has been achieved, but much remains to be done to boost defence industrial cooperation and integration within Europe. But that is not the concern of this Report. Rather, this volume deals with defence industrial base issues and problems beyond the European and transatlantic spheres.

Putting the US and European defence industries aside, this Report turns the spotlight on two other major players in the global defence industry: Russia and China. For decades, Europe and the United States have maintained a decisive military-technological edge over these two countries, but in the years to come this superiority may prove to be increasingly unsustainable. While both countries in general still lag behind the West, in a few critical sectors China and Russia have become near-peer competitors, and in others they may even have a technological edge over their American and European counterparts.

Any significant loss of this military-technological superiority could have a serious impact on the West's ability to deter or counter Russian or Chinese threats. Such a situation would not only have significant security and defence implications, but it could also have far-reaching economic repercussions, as it would likely affect the global map of defence trade patterns and security relationships around the world.

At the same time, the Russian and Chinese defence industries are both very different, as are their respective global footprints when it comes to arms exports. For its part, Russia retains its place as the number two player in the global arms industry by virtue of its position as the world's second-largest arms exporter and in terms of the wide range of arms it can produce. As the direct descendant of one of the two superpowers during the Cold War, the Russian Federation inherited a wide

1. The editors would like to acknowledge the contribution of Jan Joel Andersson who was one of the initiators of this project.

2. William Walker and Philip Gummet, 'Nationalism, Internationalism and the European Defence Market', *Chaillot Paper* no. 9, WEU Institute for Security Studies, Paris, September 1993.

array of defence technologies and arms industries. At the same time, however, the USSR's bloated defence sector is one of the factors that provoked the collapse of the Soviet economy, the political system, and ultimately the Soviet state itself. Yet, in terms of defence technologies, it has also bequeathed to post-Soviet Russia plenty of know-how, industrial capacity, and global brand recognition, thereby ensuring that the country remains a key arms exporter in the world almost three decades after the dissolution of the USSR. However, this position is increasingly shaky. In an industry that is more and more defined by cut-throat global competition and changing international power alignments, Russia can hardly afford to rest on its laurels. Instead, it must continue to plough money and manpower into maintaining its military-technological edge.

China's military-industrial complex faces a different set of challenges. Technologically speaking, the Chinese defence industry does not possess the range or high degree of technological proficiency exhibited by Russia (let alone Europe or the United States). Nor is China about to overtake Russia as a sizeable arms exporter (in value terms) anytime soon. At the same time, the growth of China's domestic capacity in the armaments industry has been staggering. For the past 20 years, China has been engaged in a massive, concerted effort to modernise and upgrade its arms industry. It has dramatically ramped up military spending and invested aggressively in new defence technologies. And these efforts have paid huge dividends in recent years, in terms of better and more capable military systems. Correspondingly, China's ability to raise its profile in the international arms markets has also been increasingly felt. At the same time, critical weaknesses remain. China's defence industry still appears to possess only limited indigenous capabilities for cutting-edge defence R&D, and Western armaments producers continue to outpace China when it comes to most military technologies.

Bearing these considerations in mind, this Report will examine recent trends and developments in Russian and Chinese defence industries and technologies and the implications of these developments for Europe. The Report is thematically organised according to three sets of concerns: (i) the domestic outlook for the Russian and Chinese defence industries; (ii) Russian and Chinese arms exports; and (iii) the implications of stronger indigenous defence industries for Russian and Chinese strategic plans and imperatives, and, ultimately, for Western security in general and for Europe's defence industries in particular.

The first section of this Report deals with Russia, and the second section with China; at the same time, both sections mirror each other. Each section begins with a chapter addressing these countries' respective defence industries and defence technology bases; in this case, Andrey Frolov and Kenneth Boutin investigate and assess the domestic situation of the Russian and Chinese arms industries and defence technologies respectively: how they perform, how they balance autarky and international cooperation, how much they are affected by Western sanctions, and how successful

they have been at plugging the gaps in their needs through domestic production of components and equipment formerly imported from external suppliers.

The Report then looks at how Russia and China are faring as arms exporters. Cyrille Bret (focusing on Russia) and Richard A. Bitzinger (focusing on China) look at the key data and the main trends in defence exports, at Russia and China's best-selling weapons and best-buying partners. They explain the current slump in Russian arms exports, and how China came to be the third-largest global arms exporter through a combination of high-quality niche products, 'friendship pricing' and ruthless competitive practices, affecting Russia, as well as Europe and the United States. At the same time, the road ahead in maintaining their current status as leading arms exporters is not automatically smooth for either country.

The third set of chapters in Sections 1 and 2 addresses how Russia's and China's defence industries fit into these countries' foreign policy and military strategies. Gustav Gressel and Michael Raska look respectively at the link between strategic goals and the character and strengths and weaknesses of the Russian and Chinese defence industries. The chapter on Russia, for example, delves into the military reforms undertaken in the past few years, and how the domestic arms industry is trying to meet Russia's needs when it comes to land, air and naval-warfare reforms. The chapter on China looks at how Chinese arms exports tie in with Beijing's foreign policy goals, and particularly how China's emergence as a leading arms exporter is affecting the ongoing arms race in Southeast Asia.

The third and final section of the Report focuses on Europe. Complementing the earlier chapters which bring to light how rising Chinese and Russian defence industries affect the European security environment, Zoe Stanley-Lockman looks at the implications for the European defence industry itself. Her chapter examines the trilateral dynamic of cooperation and competition between Europe, Russia, and China, particularly focusing on how defence industrial interactions between the three blocs impact on the competitiveness and future direction of the European defence industrial base. By exploring the changes incurred in the past three to five years, due largely to the imposition of sanctions on Russia and a shift in policies under President Xi in China, the chapter comments on how these changes are likely to affect the European defence industry in an increasingly globalised context. Finally, the concluding chapter by Richard A. Bitzinger and Nicu Popescu examines how the Russian and Chinese defence industries present different, but equally compelling, challenges for Europe.

Section 1

RUSSIA

I. DEFENCE TECHNOLOGIES AND INDUSTRIAL BASE

Andrey Frolov

Introduction

The Russian defence industry is at the heart of the country's political system and central to its global aspirations. Its role is to ensure that Russia remains secure, sovereign, able to exert autonomous power in world affairs, but also to be a driver of technological development and innovation. The National Security Strategy adopted in 2015 notes, *inter alia*, that 'the development of the state's military organisation is carried out on the basis of [...] building up the defence capability, equipping the Armed Forces with modern weapons, military and specialist hardware, and the innovation-based development of the Russian Federation's defence-industrial complex.'[1] President Putin has argued that Russia 'faces the task of developing military capabilities in the framework of the containment strategy and at the level of defence sufficiency. (...) The most important priority of Russia's state policy for the future will remain the issues of ensuring the dynamic development of the Armed Forces, the atomic and space industry, and the defence-industrial complex.' In the same article he states that 'the objectives for the defence industry include an increase in the supply of modern weapons and the introduction of a new generation of equipment, the acquisition of advanced scientific and technological capabilities, and the development and mastery of critical technologies for the manufacture of competitive military products'.[2]

The Russian defence-industrial complex (DIC) also represents a large share of the country's economy as a whole. As of 2014, the DIC included 1,339 organisations and companies, employing 1.3 million people. If we examine the volume of output, taking into account the fact that the volume of production (including R & D) generated by the Russian Defence Ministry alone in 2016 amounted to almost 1.8 trillion rubles (if all other security agencies are included, the figure is probably almost 2 trillion rubles), overall expenditure on military equipment and R&D amounted to almost 3 trillion rubles (€42 billion), or 3.4% of GDP. This does not include the expenditure of the Ministry of Industry, as well as exports (estimated to be worth $15 billion annually, equivalent to almost 1 trillion rubles).

1. Russian National Security Strategy, December 2015. Available at: https://rg.ru/2015/12/31/nac-bezopasnost-site-dok.html
2. Vladimir Putin, 'Быть сильными: гарантии национальной безопасности для России' ['Be strong: the guarantee of Russian national security'], *Rossiyskaya Gazeta,* 20 February 2012. Available at: https://rg.ru/2012/02/20/putin-armiya.html

The Russian defence-industrial complex is structurally composed of the following industries:

- The aviation and space-rocket industry;
- Shipbuilding;
- The production of artillery and small arms;
- The armaments industry;
- Instrument-making and radio electronics;
- The nuclear weapons complex.

Between autarky and interdependence

Like most great military powers, Russia's defence-industrial complex retains a significant capacity to autonomously produce the equipment that its military needs, but also has a certain degree of exposure to cooperation and (inter)dependence with foreign suppliers of specific niche technologies, with Ukraine, Belarus and certain Western European countries having formerly been its principal trading partners in this regard.

On the whole, the Russian defence industrial complex can fulfil the bulk of the orders placed by the Ministry of Defence and security agencies, in some cases even without the use of imported components. Such examples include the infantry fighting vehicle BMP-3, in which 100% Russian components are used (and in some versions electronic products from Belarus, which forms a Union State with Russia). Also the products of the nuclear weapons complex are entirely Russian-manufactured. In other areas, imported components are present in the products, but either they are gradually replaced within the framework of the import substitution programme, or their use is not critical, and their analogues can be easily purchased in the open civilian market.

At the same time, the relative weakness of Russian industry means that it is not possible to fully meet all the needs of the Armed Forces. So, the experience of the period prior to 2014, when cooperation with the West was not yet limited, showed that the Russian military required not only certain materials and components, but also ready-made platforms. This was the reason for the purchase of Eurocopter AS350 (AS550) and AS355 (AS555) light helicopters, Mistral amphibious assault ships, and armoured vehicles of the MRAP class Iveco 65E19WM (LMV). In the last two cases there were no mass-produced analogues available in Russia.

A similar situation has developed regarding the supply of electronic components, where the dependence on imports does not seem to be decreasing.

This problem was most acute in the military-industrial sphere in the period 2010-2014, since in the production of a significant number of Russian combat systems imported components, units or materials were used. Accordingly, depriving Russia of access to these called into question the feasibility of the then-existing State Armament Programme for the period 2011-2020 (GPV 2011-2020).[3]

The situation was further complicated by the fact that during the thaw in relations between Russia and the West in the 2000s, the Russian defence industry began to be actively involved in production cooperation with Western suppliers. This was caused, on the one hand, by the collapse of cooperation within the former USSR and the Warsaw Pact countries, and on the other hand, by export customers' requirements that some imported components and systems be integrated into Russian combat platforms. During the so-called 'New Look' reform of the armed forces under Defence Minister Anatoly Serdyukov, the Russian army even began to buy ready-made Western platforms entirely or, alternatively, opted for the semi knock-down (SKD) assembly of imported parts in Russia.

However, the potentially negative effects of the latter solution were somewhat mitigated by Anatoly Serdyukov's resignation at the end of 2012. Under Sergey Shoigu, the military department did not enter into new contracts, continuing to implement only existing agreements, such as the import from Italy of 358 Iveco 65E19WM (LMV) armoured vehicles in addition to the previously delivered ones, or financing the completion of two amphibious assault ships of the Mistral type at the STX France shipyard. However, imported products accounted for only a small proportion in the total volume of new purchases.

But the greatest challenge concerned cooperation in the supply of a number of critical units and components for Russian platforms. As it turned out, such units and components existed widely in various types of military equipment used by the Russian military, and it made the task of replacement very difficult. The overall picture was presented in the summer of 2015 – according to the Ministry of Defence, between 2014 and 2025, at least 826 types of weapons and military equipment, formerly purchased from foreign suppliers, are scheduled for import substitution.

Back to basics

Even though the drive towards import substitution became unavoidable (and made headlines) after the imposition of Western and Ukrainian sanctions on Russia in 2014, Moscow's quest to reduce dependence on foreign suppliers of technologies

3. *Gosudarstvennaya Programma Vooruzheniya, GPV 2011-2020* [Russian State Armament Programme, 2011-2020].

predates the crisis over Ukraine. A number of import substitution measures were taken even before the events of 2014. For example, Government Decree no. 1224 of 24 December 2013 established a ban and restrictions on the purchases of goods originating from foreign countries destined for the needs of the country's defence and security sector.

But the trend towards greater defence industry autonomy could already be discerned in acquisition and production decisions taken well before 2014. The main reasons for that were not political but industrial and military common sense. After 1991, despite the reduction of the military budget for procurement and R & D, the development of new weapons systems continued in Russia. Although many of them were based on Soviet designs, in which, naturally, cooperation with former Soviet Republics was envisaged, the country's leadership and the Defence Ministry took steps towards completely 'Russianising' products. For example, engines developed in the Dnepropetrovsk-based Yuzhnoye Design Bureau (in Ukraine) were used in the R-39UTTX Bark ballistic missile, designed for the new strategic missile submarine cruisers of Project 955. Its tests failed and cooperation was terminated in favour of the development of the new P-30 Bulava system. Although the presence of foreign components in the P-30 missile has never been mentioned as the reason for the closure of the programme, the Bulava has become much more 'import-independent', together with its cognate intercontinental ballistic missile (ICBM) Topol-M. Therefore, in the choice of its nuclear weapons Russia already preferred weapons it could produce on its own, without being dependent on countries like Ukraine.

This trend began to gain momentum already in the period 2005-2010 when mass development of new weapons systems began. Thus, when work on the new heavy liquid ICBM Sarmat was initiated in 2011, Defence Minister Anatoly Serdyukov unequivocally excluded the possibility of Ukrainian enterprises (the Yuzhnyi Machine Building Plant and the Yuzhnoye Design Bureau, both based in Dnepropetrovsk) participating in this project. He, however, hinted that 'individual specialists' from Ukraine could receive private proposals from Russia to work on a new liquid-propellant ICBM.[4]

A similar approach was used regarding the AI-222-25 turbojet engine developed by PJSC Motor Sich (based in Zaporizhia, in Ukraine), in partnership with Russian gas turbine engineering and research production centre Salyut (Moscow) and the Omsk engine building plant (which became a branch of Salyut in 2011). After 2002, the parties produced engines within the framework of cooperation, sharing the work approximately on a 50/50 basis (with a more complicated 'hot part' of the engine being built in Ukraine), but by 2015 production was completely localised in Russia.

4. 'Министр обороны РФ допускает участие украинских специалистов в разработке новой ракеты для РВСН' ['Russian Defence Minister admits possible participation of Ukrainian specialists in the development of a new missile for the Strategic Missile Forces'], *ITAR-TASS,* 27 February 2011.

But as Russia was reducing its dependence on suppliers from former Soviet republics – often deemed unreliable, and with a steadily deteriorating military-industrial capacity – it also started to increasingly use Western technologies in its defence industry in a bid to improve and modernise its weapons system in 2010-2014. According to the State Armament Programme 2011-2020, adopted in late 2010, Russia was supposed to develop and produce large quantities of brand new hardware and equipment – a goal which, given that it was based on the use of exclusively Russian resources and capabilities, was practically unrealistic. Paradoxically, with each year of the implementation of the GPV-2011, as the supply of new equipment to the troops increased, the dependence on imports only deepened. It is difficult to estimate the volume of European supplies to Russia. In terms of armaments, the volume of contracts between Russia and the EU countries in the period 2011-2013 was estimated at €75 million, and exports of dual-use goods and technologies were much larger – about €20 billion per year.[5]

In early 2014, just before Russian-Ukrainian and Russian-Western relations hit rock bottom, Russia was estimated to import some 700 different types of products and components from Ukraine and another 860 component units from NATO countries. Given that most of those supplies were jeopardised by the sanctions over the crisis in Ukraine, in July 2014 the import substitution programme was approved by the country's President Vladimir Putin.

The 2014 crisis

The decision on import substitution (on the scale of the entire Russian economy) was made at the highest level. To coordinate state efforts in this area, on 4 August 2015 the Government of Russia issued Decree no. 785 establishing a state commission on import substitution. It was composed of two sub-commissions: one dealing with civilian sectors of the economy and the other with issues pertaining to the defence-industrial complex. The latter was headed by Deputy Prime Minister Dmitry Rogozin.

The most difficult situation concerned the replacement of Ukrainian products. At the time relations between the two countries started to sharply deteriorate, military cooperation between Russia and Ukraine was at a very high level. The Russian Ministry of Defence was purchasing Ukrainian An-140 and An-148 aircrafts (produced from Ukrainian kits at Russian plants, so formally 'Russian-manufactured'), conducting joint development of the An-70 medium-range military transport aircraft, and planned to develop local air defence systems in cooperation with Kiev. Moreover, a homing head was developed and manufactured in Ukraine for a long-range air-to-air R-74 missile to be used by a fifth-generation air fighter.

5. Jarosław Ćwiek-Karpowicz and Stanislav Secrieru (eds.), *Sanctions and Russia*, Polish Institute for International Affairs, Warsaw, 2015, p. 85.

In 2010-2014 the volume of 'pure' (excluding dual-use goods and services) military exports from Ukraine to Russia was estimated at $50-65 million, although in fact it was actually much more: for example, in 2012 exports of rocket and space equipment alone totalled $260 million. The number of aircraft engines imported in 2010-2014 increased from 404 units to 653, i.e. the sum of deliveries was in excess of $500 million (it is interesting to note in this context that the volume of engine imports from Ukraine exceeded the annual production of helicopters, indicating that Russia was building up a stock of engines).

The most well-known example of the impact of sanctions on the implementation of Russian arms procurement programmes is connected with Ukraine. This concerns the use of gas turbine units for the construction of frigates *Admiral Butakov* and *Admiral Istomin* (project 11356) and *Admiral Golovko* and *Admiral Isakov* (project 22350). In both cases, the lack of gas turbines led to the suspension of the construction of four ships which had already been laid down. The construction of these frigates cannot be completed at least until 2018 when the first Russian gas turbine is expected to be produced.[6] There are other examples of production being held up due to delays incurred by the replacement of Ukrainian products – for example, floating waterproof cables (although work on this item began in Russia even before 2014 due to the decline in the quality of Ukrainian products).

As things stand, an independent expert evaluation of the import substitution programme in the field of the defence-industrial complex will in all likelihood be provisional and incomplete. Officials have reported the results of their work in this area several times. So, in 2014 Defence Minister Sergei Shoigu ordered the indigenous production in 2015 of 695 types of weapons and equipment out of the 1,070 items which were previously developed jointly with Ukrainian enterprises. However, some time later, other figures were announced. In the first half of 2015, only 57 Ukrainian components were replaced out of the total of 102 planned. This accounted for 55% of the annual target. The discrepancy in figures may be explained by different methods of calculation being applied. Probably, these components are the highest-priority types, which need to be replaced most urgently.

At the same time, the results for the NATO and EU countries' production were not so encouraging: during the same period, import substitution for the full cycle was performed for only seven out of the 127 planned types. As of October, the results improved somewhat: substitution of Ukraine products was implemented for 65 types (64% of the targeted number), and 55 types for NATO and the EU (43 %). At the same time, Russia built up stocks of critical components to avoid production difficulties and shortages down the line.

Regarding the final deadlines for the implementation of the plan, as of December 2015 it was reported that 2018 was established as a deadline for Ukraine, while 2021

6. 'Рыбинское «ОДК – Сатурн» подвело итоги 2016 года' ['Rybinsk "ODK-Saturn" summed up the results of 2016'], Press release of Joint-stock company United Engine-Building Corporation, 4 July 2017.

was the deadline set for the countries of NATO and the EU – but these account for less than 1% of the equipment to be replaced. The bulk – 90% of the entire nomenclature –was planned to be replaced before the end of 2018.[7] It is interesting that in July of 2015, the deadline for import substitution programmes was changed to 2025.

Sanctions introduced in 2014 with respect to the supply of military and dual-use goods to Russia had a serious impact on the Russian defence-industrial complex. Their effects began to be felt in 2015-2016 when Russian reserves and stocks became depleted, and when contracts signed with Western countries prior to the introduction of sanctions expired. However experience has shown that the position of Western countries in this matter is not uniform, as some terminated cooperation (for example, Germany's Rheinmetall Defence Electronics decided not to proceed with the planned construction of a military training ground in the Nizhny Novgorod region), while others opted to continue (Italy went on supplying kits for assembling Lynx armoured vehicles). Besides, the negative consequences were minimised by the fact that a relatively small number of Western-made platforms was in use in the Russian army, as well as by the fact that several import substitution programmes were initiated in Russia for various reasons long before the 2014 crisis.

The most difficult issue was the replacement of products and components from Ukraine, due to their large number, and also because of the Kiev government's strict compliance with the ban on the supply of this category of goods to Russia. However, despite this, a certain level of interaction persisted in this area. For example, Ukrainian-manufactured aircraft engines continue to be supplied to Russia. Despite a number of difficulties, Ukrainian components are supplied for Russian weapons and equipment destined for export – for example, marine gas turbine units (GTUs]) were delivered, albeit late, for two frigates under construction as part of the Vietnamese navy project 11661E.

The development of a wide range of products within the framework of the import substitution programme is a serious challenge for Russia's domestic industry, but also represents an opportunity to increase production capacities against a backdrop of military budget cuts in the coming years. Another drawback is the need to incur costs in advance in order to ensure timely delivery of the required products. The established deadline for development of almost 90% of the entire list of critical products is 2018, and it is very likely that planned targets will not be achieved in full.

At the same time, one of the main problems with import substitution is the lack of a modern machinery base for the production of goods to replace those previously acquired from abroad. This is emerging as one of the most important issues, especially under the current restrictions on obtaining new machine tools suitable for the production of military products and dual-use goods.

7. 'Рогозин: гособоронзаказ в этом году будет исполнен на 96%' ['Rogozin: state defence order this year will be executed at 96%'], *TASS*, 3 December 2015.

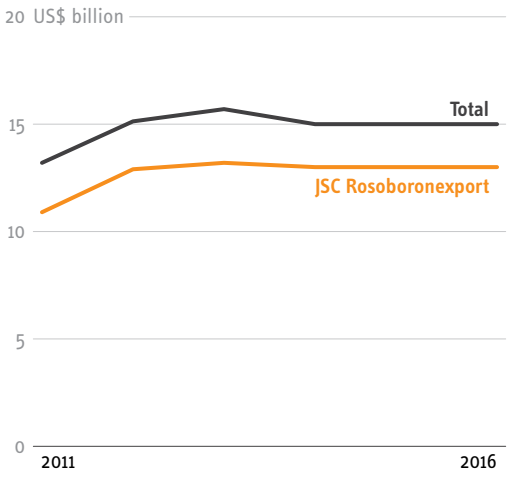
Plateauing exports

While Russian defence exports are analysed in detail in the next chapter, an important trend worth noting is that Russia's traditional second place in the hierarchy of arms exporters (both in terms of contracting and supply volumes) is increasingly under question. In the past few years there have been signs that Russia could be overtaken by France. For the first time in many years, in 2016 the volume of new Russian contracts amounted to less than $10 billion ($9.5 billion compared to almost $26 billion a year earlier) while the figure for French exports has reached, according to various estimates, €14-20 billion (the figure varies due to different approaches on the accounting of the contract between France and Australia for the construction of 12 non-nuclear submarines). This will allow France to outstrip Russia in terms of the volume of delivered products.

In 2016, Russia exported military products worth $15 billion, and the volume of new contracts reached $9.5 billion. The order portfolio is estimated at $50 billion, which is an average volume for Russian exports in recent years.[8] Military-technical cooperation is conducted with 52 countries around the world.

Regarding the prospects for Russia's arms exports, the following should be noted. Russian defence exports seem to have reached a plateau which it will be very difficult to transcend unless *force majeure* circumstances arise. For the Russian defence-industrial complex, exports traditionally play a very important role in stabilising finances, since export orders are characterised by higher prices in foreign currency, and the terms of financing by the customer are much more attractive than those offered by the government agencies in Russia. At the same time, given the reduction in the scope of the new GPV-2025, export may become a kind of 'insurance' against the decrease in internal orders, although most defence companies do not expect to be able to rely on exports alone to generate sufficient profits.

Figure 1: The total volume of exports of arms and military equipment and supplies of JSC Rosoboronexport



Source: *Eksport vooruzheny* magazine, 2011-2016

8. 'Путин доволен возможностями отечественного оружия' ['Putin is satisfied with the capabilities of domestic weapons'], *TASS,* 22 March 2017.

Given the growing competition in the arms market and the emergence of new players, Russia's main concern is to preserve its already existing position. In part, the market launch of new models of weapons means that Russia can count on this. So, in 2016, the export debut of the Su-35 fighter took place, as well as of the operational-tactical missile system Iskander-E. Although in the latter case, the customers are likely to be Russia's closest allies, the first shipments of the Su-35 to China open the way for this fighter to enter the export market and can facilitate negotiations for its purchase by new foreign customers, for example, Indonesia and Algeria. Among the signed contracts for the supply of new-generation weaponry, attention should be paid to the expected signing of a contract with Algeria to supply the Su-32 (Su-34) front-line bomber, and Algeria is likely to become the launch customer for this aircraft. In the near future we may also expect the first export contracts for Il-76MD-90A military transport aircraft, Project 20382 corvettes, Project 21632 small missile ships (corvettes), as well as a number of other systems previously not exported.

Conclusion

The Russian military-industrial complex is a pivotal element of Russian technological prowess and Russian security endeavours. Russia's ability to produce and upgrade military hardware gives the country potential leverage to act as a first-class military power. Sometimes its military and technological achievements yield obvious political gains, such as in Syria. Moreover, the Russian military-industrial complex is one of the main sources of R&D in Russia.

The restrictions imposed by the EU, US and Ukraine on the supply of military and dual-use products to Russia in 2014 have clearly had a serious impact on the Russian defence industry. Although the process of substitution has not been completed, sanctions imposed by both Ukraine and the EU have not undermined Russian military efforts and Russia is managing to keep up the pace in its rearmament programme. Nevertheless Russia is still too dependent on Belarusian-manufactured components and it is now obvious that substituting Belarusian imports with indigenously-produced components will be the next step in the drive towards full independence in the production of military hardware.

Russian military exports, which were vital for Russian industry in the 1990s, are still very important, but their relative value has diminished. After a dynamic boom during the first 15 years of the new millennium, the volume of Russian military exports hit a plateau in 2013-2015 ($14-15 billion per year) and it seems doubtful whether export levels will rise again on a sustainable basis.

The war in Syria has had a mixed impact on the Russian armaments industry. On the one hand, the war has served as a testbed and as a showcase for new Russian military equipment. On the other hand, the high cost of the war has led to cuts in

the Russian military budget and a reduction in the number of weapons acquired by the Russian Ministry of Defence.

The future of the Russian defence industry does not look bright. The sector will have to contend with a new emphasis on diversification and 'conversion' towards the production of civil goods, as well as the 'leaner', scaled-back armament programme for 2018-2025. Moreover, some of the leading companies in Russia's military-industrial complex, such as Uralvagonzavod and Kurganmashzavod, are burdened with high levels of indebtedness, which may also threaten Russian military production in the years to come.

II. ARMAMENTS EXPORTS

Cyrille Bret

Introduction

With an estimated global market share of 23%[1] in 2016, Russia maintained its position as the second-largest arms exporter in the world after the United States. Since 2010 the volume of Russian arms exports has soared, spurred by both domestic and global factors.

Domestically, Russia has increased its defence spending in the framework of the State Armaments Programme launched by President Medvedev in 2009 and sustained by President Putin. Russia spent $61 billion on military expenditure in 2015, representing 3.7% of GDP. As for 2016, estimates range from $46.6 billion to 69.2 billion. These domestic efforts bolstered investments in the defence technological and industrial base (DTIB), thus enhancing Russian export capabilities.

Globally, Russia has profited from a boom in international defence markets, especially in Asia and in the Middle East where the USSR and subsequently the Russian Federation have been very active. According to the Kremlin, Russia delivered $15 billion worth of defence products in 2016 in current prices, mainly to long-standing customer countries: India, China, Algeria and Vietnam.

Those figures, published both by the Russian government[2] and by independent institutions,[3] are not sufficient in and of themselves to assess the true trends of Russian arms exports and to draw a clear line between myth and reality. This chapter will thus address two distinct but intertwined series of questions, firstly concerning facts and trends, and secondly focusing on the interplay between arms exports and the (geo)politics behind them.

1. SIPRI Arms Transfers Database. See: https://sipri.org/research/armament-and-disarmament/arms-transfers-and-military-spending/international-arms-transfers.
2. Federal Service for Military-Technical Cooperation. See: http://www.fsvts.gov.ru/eng12.html.
3. SIPRI https://sipri.org/ and CAST http://cast.ru/eng/

Facts and trends

Fostered and shaped by a centralised state organisation and a stable customer base partly inherited from the Soviet era, Russian international arms trade has soared since 2010, particularly in the aviation sector and for air defence systems.

Russia's status as the world's second arms exporter seems secure: the share of Russian arms exports was 24% in 2007-2011 and remained at the same level or so (23%) in 2012-2016. If compared with the levels of the previous decade, the increase in the delivery value is spectacular: in 2003, Russia exported only $5 billion worth of military equipment. From 2010-2014, Russian defence exports grew by 37% in total and benefited from a steady growth in orders, investments and innovations – not to mention the Russian defence budget itself which grew by 8% a year in real terms from 2005 to 2015, doubling its size and reaching 4% of GDP.

However, the soar in exports is not as spectacular as it might seem. In current prices, the value of Russian arms deliveries was consistent in 2015 and 2016 at $15 billion (estimated just below at $14.5 billion for 2016), but if we use 2011 inflation adjusted constant prices, the amount is actually diminishing: $14.6 billion in 2013, $14.3 billion in 2014 and $13.8 billion in 2015. Furthermore, the value of new contracts shrunk from $56 billion in 2015 to $50 billion in 2016, with the value of new contracts dropping from $26 billion to $9 billion over the same period.[4]

On a global scale, the 4.7% increase in Russian arms exports from 2012-2016 pales in comparison to the global increase of 8.4% over the same period. In other words, Russia managed to benefit from the market growth but did not fare better than its competitors, notably China.

The institutional backdrop

One of the main strengths of the Russian DTIB in the international marketplace is its centralised organisation where the executive branch plays a key role, far beyond the administrative and political support provided by most other governments to their national industries. Within the well-organised structure, the major players work together (with a degree of internal competition) under the surveillance of the presidential administration.

The legal framework has been updated on a regular basis to further centralise defence exports, especially since the implementation of the State Armaments Programme. Notably, in 2016 President Putin amended the programme to grant integrated companies the right to sign foreign arms trade contracts.

4. 'Russian defence export contracts hit USD 9 billion in 2016', *IHS Janes Defence Industry*, April 2017. See: http://www.janes.com/article/69530/russian-defence-export-contracts-hit-usd9-billion-in-2016.

Indeed the presidential grip on arms exports matters has been reinforced over the past decade. Since 2009, after the 2008 war in Georgia accelerated Russian military modernisation, the Russian president has chaired biannual meetings with the goal of reviewing arms exports prospects and issues related to the Russian armed forces.[5] In 2014 President Putin declared his intention to assume 'manual control' over the DTIB in general, signalling a drastic recentralisation of the decision-making process to stimulate efficiency gains. To that effect, he created and chairs the Military-Industrial Commission of the Russian Federation as the highest institution in charge of defence issues. In addition to the central role of the executive branch, the Ministries of Trade and Industry and Foreign Affairs are also tasked to support defence exports and control DTIB firms.

Of further importance – both for commercial and military products – is the state-owned enterprise Rostec Corporation[6] and its subsidiary, Rosoboronexport**.** Rosoboronexport, originally set up by President Putin in 2000, is responsible for 85-90% of Russian arms exports. This market is an oligopoly: 22 other companies make up the remainder of arms exports. MiG, NPO Mashinostryeniya, Almaz Antey, Russian Helicopters, KBP, KBM and the other 16 companies are permitted to directly export defence products without going through Rosoboronexport – particularly to implement contracts signed before Rostec was created in 2007.

Best sellers and best buyers

Russia's best-selling products in 2015 were aircrafts (46%), air defence systems (22%), ground weapon systems (18%) and naval systems (10%). In the aviation sector, Rosoboronexport considers combat aircrafts as 'key components' of military exports: Sukhoi and MiG fighter jets along with equipment produced by Russian Helicopters reputed in international markets. The anti-missile and anti-aircraft defence systems S-300, S-400 and *Pantsir* S-1 and their variants account for one third of the international market, and are in high demand in regions under the US THAAD shield. Regarding ground weapons systems, T-90 main battle tanks are a worldwide success: in addition to long-standing customers of the T-90, India plans to acquire up to 2,000 tanks by 2020 and Algeria received around 100 T-90SA units from Russia in 2016, becoming the first tank importer in the world that year.

The composition of the Russian customer base is rooted in the USSR geostrategic heritage and in US bans. Rosoboronexport benefits from relations with more than 116 countries and Russian military equipment can be found in more than 100 countries. In the past five years, Russia has been the top supplier to various

5. Mathieu Boulegue, 'Disentangling the ups and downs of Russia's military-industrial complex', *The National Interest*, 27 June 2017. Available at: http://nationalinterest.org/blog/the-buzz/entangling-the-ups-downs-russias-military-industrial-complex-21348

6. Федеральный закон от 23 ноября 2007 года N 270-ФЗ «О Государственной корпорации «Ростехнологии», ['Federal Law no. 270-F3 of 23 November 2017 on the state corporation 'Rostechnologies'].

countries: from 2012-2016, India imported 68% of its defence equipment from Russia, China 57%, Algeria 60%, Vietnam 88%, Venezuela 74%, Azerbaijan 69% and Kazakhstan 76%. Russian exports thrive mostly in regions where demand is strong: in 2012-2016, 53% of the country's exports went to the Asian market.

Russian arms exports are also concentrated among a small group of clients: in 2012–16, 70% of its arms exports went to four countries: India received 38% of the Russian defence exports followed by China (11%), Vietnam (11%) and Algeria (10%). It is not a coincidence that these countries are also among the world's largest arms importers and that they are long-standing customers of Russian equipment.

India and China remain strikingly dependent on Russia for helicopters, armoured vehicles, warships and aircraft engines. India's position as the principal Russian client for years to come is assured. Comparing 2012-2016 to the previous five-year period, India increased Russian imports by 43%, largely attributed to 6 Project 636M Kilo submarines, 13 Project 11356 Talwar frigates, and 6 MiG-29K/KUB carrier-based fighter jets. Furthermore, in October 2016 Russia and India signed three agreements to supply five batteries of the S-400 air defence system and four Project 11356 frigates, for an estimated total value of $10.5 billion. In addition, they announced a new Russo-Indian joint venture to produce Ka-226T multirole helicopters in India in exchange for the leasing of another Russian multirole nuclear submarine (Project 971).

Ties with China have been also strong since the creation of the Shanghai Cooperation Organisation (SCO). For instance, in 2016, China accounted for 16% of the total portfolio of orders. Main deals include the supply of eight Kilo-class conventional submarines, two Amur-class submarines, radars and Su-35 fighter jets. In 2015, 57% of Chinese aircraft engine imports came from Russia. However, the Russian DTIB is becoming increasingly wary of China, as it is emerging as a major competitor in international markets, sometimes with products copied (retro-engineered) from Russian imports.

Although Russia's strong suit is maintaining traditional clients rather than gaining new strategic ones, in recent years the country has shown an interest in increasing its presence in the international markets and gaining market shares in Asia, Africa and South America, in part as a result of the impact of the economic sanctions imposed by the US and EU. Comparing 2012-2016 to the previous five-year period, Vietnam doubled its defence imports and imported six Kilo-class conventional submarines from Russia for $6 billion. More recently, in 2016, arms trade with Iran resumed after a decade of tension over the non-delivery of an S-300 PMU-1 antimissile system: in 2016 Russia delivered four S-300 PMU-2 batteries to Iran for $1 billion. In 2016 as well, the importance of Latin America in the Russian arms market rose: today it represents 9% of the total portfolio ($4 billion) and 2% of the new orders. On a smaller scale, in 2015 and 2016, the Russian authorities approved many loans to

foreign countries (Sri Lanka, Burma/Myanmar, Malaysia, and Indonesia) in order to make them able to sign deals with Rosoboronexport.

Goals, influence and challenges

As was the case during the Soviet era and again since 2000, Russia often exports arms to develop, reinforce or reaffirm its geopolitical footprint. Economic considerations are often secondary. Even if the trends are favourable for Russia, the DTIB currently faces many challenges in the medium term.

Russia's goal is to remain a first grade military power thanks to a global reputation for technological and industrial excellence driven by exports. The military doctrine adopted in December 2014 and the 2016 government programme on the development of the DTIB have emphasised international cooperation as a tool to ensure high-quality products and continuity in the domestic market.

In the case of the two main Asian actors, India and China, Russia's geopolitical goals are obvious. The Kremlin wants to keep up with the regional superpowers in key geopolitical hotspots. Relative to India, Russia exploits a series of market advantages: a long-standing trade relationship, New Delhi's preference for diversifying arms imports sources, and ability to capitalise on joint ventures and technology transfers to build local industry. For example, Russia supported India in the joint development of the BrahMos missile. Moscow's aim is also to supply a rival of China, a main source of military equipment for Bangladesh and Pakistan, in order to maintain the balance of power in South Asia. As for China, arms exports accounts for only one aspect of the strategic partnership between Moscow and Beijing in the face of a Western-led global order. However, Russian concerns about China can also be detected: Moscow's distrust concerning Chinese retro-engineering is explicit, especially in the case of fighter jets (the Russian Su-27SK has largely 'inspired' the Chinese Shenyang J-11). In addition to wanting to preserve the balance of power in South Asia, Russia seeks to mitigate the influence of the Chinese hegemon by exporting arms to South East Asian countries such as Vietnam and Indonesia.

Defence exports also frequently convey Russia's geopolitical stance. For example, the exports of air defence systems to Iran show the strength of the alliance sealed on the Syrian front. The exports of air defence systems and ground weapons systems to Syria, the main importer last year, attest to the importance of the Syrian theatre to the Russian aim of rebuilding influence in the Middle East. Killing two birds with one stone, arms sales complement the military aid provided by the Kremlin to the Al-Assad regime on the ground and showcase Russia's military capabilities and stature in the region.

Russian defence exports are also aimed at bolstering an ailing and structurally unbalanced domestic economy. Indeed, the Russian GDP has been shrinking since the

Ukrainian crisis: close to 0% in 2014, the growth rate has been negative in 2015 (-3.5%), 2016 (-0.6%) and will be limited for 2017 (projected at around +0.5 %). In a context where the national currency has undergone a drastic devaluation, oil and gas exports have dropped and the currency reserves are under stress, defence exports are a shot in the arm for the Russian economy. The arms trade also provides employment in the industrial sector: the DTIB produces around 20% of the total industrial output of Russia.

That said, the economic importance of defence exports should not be overestimated for Russia's economy as a whole. The share of arms trade is limited in total Russian exports: it ranges from 2.5% in 2011 to 4.19% in 2015. The relative increase does not reflect a growth of arms exports, but rather the declining value of other Russian exports as a result of Western sanctions and falling commodity prices. Foreign sales are nonetheless critical to the health of the Russian aerospace industry, as they provide Rostec and its aerospace subsidiaries with a fresh intake of currencies and hence lay the groundwork for investment. Defence exports also help to rebuild and modernise the DTIB itself. Deprived of a strong civilian industrial base, defence production is vital to maintaining the employment and expertise of its three million-odd employees at a time when domestic orders are set to stall.

Conclusion

Far from being an expanding sector, Russian defence exports are a traditional pillar for Russian international influence and trade. Although perhaps not yet in jeopardy, Russian arms exports do currently face serious challenges.

President Putin himself highlighted some of these challenges in his address to the Military-Industrial Commission of the Russian Federation on 22 March 2017, when he acknowledged that domestic demand boosted by the 2009 military modernisation plan absorbs a large part of the country's defence manufacturing output. The risk is failing to deliver exports, which would also tarnish Russia's reputation as a reliable source of military equipment internationally. Efforts are to be renewed in order to meet international demand. Moreover, cooperation with international partners might be jeopardised by the bad experience with the Chinese copy of the aircraft fighter: Russia may be put on the defensive to protect its market shares and safeguard intellectual property rights. Last, Russia has to find substitution imports as a consequence of the sanctions.

Two additional challenges are to be noted. The first is attracting and signing new contracts. Aggregate data from media reports show only $3.6 billion worth of new defence contracts in 2016 – the lowest figure in recent years. In particular, the aircraft sector did not register any new confirmed contract for new combat planes. At this stage, there are only rumours on a contract with Algeria for 12 Su-32 tactical

bombers worth $600 million and a surplus contract with Serbia on 6 MiG-29 fighters. Despite its efforts, Russia is currently finding it difficult to acquire new orders.

Second is the competition landscape. In recent years, Russia has lost several competitions against newcomers: Russia lost out to China in a new corvette tender in Algeria, and also lost out to South Korea in the Indonesian market. Furthermore, the Indo-Russian defence relationship cannot last forever: India knows that it cannot reach the status of a regional power without building its own military industrial capabilities. In that respect, the Russian DTIB must upgrade the quality of its products since India can afford top-quality aircraft.

Benefiting from strong state support, historically large market shares, an excellent international reputation, and its status as an alternative source of supply to the US, the structural strengths of Russia's DTIB remain intact. However, recent trends call into question how prepared Russia is for the medium-to-long term. New domestic and international orders are increasingly rare, and finding a solid new customer base is not an easy task. Between the myth of booming Russian arms sales and the reality of a strong but challenged sector, it seems likely that in the coming years the gap will only widen.

III. STRATEGY AND CHALLENGES

Gustav C. Gressel

Introduction

Russia's military aggression against Ukraine and its subsequent international isolation has fundamentally altered the premises underpinning Russia's armament and defence policy. The 'New Look' reform of the Russian army, conducted from 2007 to 2011, was relatively successful in preparing Russia for the type of military intervention it conducted in Ukraine in 2014 and after. But now Russia faces a completely new set of military challenges: its expeditionary warfare in Syria and wider confrontation with NATO is a very different proposition from invading a relatively weak post-Soviet neighbour. Moscow now has to balance its stated ambition of behaving as a truly 'global actor', including in the military sense, with the reality of the limitations of its armed forces and the danger of significantly depleting its own economic resources in its drive to modernise its military capabilities. The same is true for Moscow's confrontation with NATO. It might be useful in stoking nationalism and a 'rally-behind-the-leader' effect in domestic politics, but it also raises the spectre of Russia talking itself into a new Cold War it cannot possibly win. So far President Putin has not indicated how he intends to reconcile these conflicting requirements. Russian propaganda states that Russia can achieve it all – and the only thing we know for sure is that that will not be the case.

Serdyukov's reforms

In 2007-2011, the then defence minister Anatoly Serdyukov spearheaded a reasonably successful reform of the Russian military. Under his aegis, the level of ambition for the Russian armed forces was scaled down: reforms and arms procurement were focused on making the armed forces capable of dealing with those scenarios judged most likely, while neglecting more ambitious contingencies. The 'New Look' reform focused on those aspects of defence modernisation Russia could tackle without having to invest resources beyond the capacity of its national economy into the defence apparatus: transforming the army from a reserve-based army into a standing high-readiness force, introducing new management practices, cutting armed forces structures and reserve forces down to a size Russia could handle with current stocks of equipment and manpower, streamlining logistics and curbing bureaucratic inefficiency.

The reforms targeted above all organisational and professional deficiencies of the Russian land forces inherited from the Soviet army, and aimed to increase professionalism among cadres, and optimise readiness and deployability. To overcome Ukrainian or Belarusian armed forces, Russia could rely on Soviet legacy combat systems like the T-72/T-90 main battle tank, the BMP-3 infantry fighting vehicle and the BTR-80 armoured personnel carrier, if they were upgraded with new night-vision devices, communication equipment and command-and-control (C^2) systems, as well as new munitions and plug-on armour. Equipment did not have to be perfect, it just had to be slightly better than that of Russia's immediate post-Soviet neighbours. Much more important was to embed these upgraded systems into faster, more effective and better-led formations.

The previous defence reform also took place in a relatively stable and predictable environment. Russia's main goal was regional dominance. The primary scenario that the Russian armed forces were designed and trained to deal with was the quick invasion of either Ukraine or Belarus (especially the former) and deterring the West from intervening in any possible Russian-Ukrainian war. Hence the reform and rearmament focused on the land forces in particular, with the airforce relegated to a supporting role. Modernisation of the navy was postponed apart from those maritime forces needed to protect ballistic missile submarines (which in turn were needed to deter the US). The armed forces prepared therefore for a limited set of contingencies.

That all changed in 2014. While the occupation of Crimea and the swift military build-up on Ukraine's borders in February and March 2014 proved the 'New Look' reforms a success, Russia stopped short of a full invasion of Ukraine. Instead Moscow opted for a 'hybrid' invasion of the Donbass.

The intervention in Syria has added another portfolio of military operations to the tasks of the Russian armed forces, one which they were never designed or equipped to undertake: military intervention beyond the immediate neighbourhood. More than two years after it intervened in the war in Syria, the limitations of Russia's military apparatus operating far away from home bases and infrastructure have become obvious. The Kremlin wants to reassert itself as a great power by displaying its military might. But the Russian armed forces are ill-equipped to sustain this image.

The other issue is the renewed political confrontation with NATO. Until 2014 the Kremlin was able to benefit from the fact that NATO did not regard Russia as a potential major adversary, concentrating instead on international peace missions. Moscow could develop niche capacities that would greatly hinder any military reaction by NATO countries to its activities in the Eastern neighbourhood (so-called A2/AD systems), while on the other hand neither Western European nor the US armed forces would consider developing systems to counter the Russian threat. This perception gap has ended.

Land warfare

While on paper the modernisation of land forces received less funding than the upgrading of the navy and airforce in the Russian state armament programme GPV-2020,[1] Russia's military thinking always revolved around a land war in Europe and consequently the land forces enjoyed *de facto* priority over other elements of the armed forces.[2] The land forces were most radically reformed during the 'New Look' reforms.[3] As the Russian airforce is numerically inferior to Western airforces, and would be preoccupied with maintaining air superiority in any potential conflict, the Russian ground forces have to rely on their artillery for combat support. Both Russian gun artillery as well as multiple rocket-launched systems have achieved remarkable levels of effectiveness. Having retained the destructive firepower of Soviet-era weaponry, these systems were augmented with new command and control systems, artillery observation radars and (land-vehicle based) electronic surveillance platforms and ground-launched tactical drones (usually smaller than 30kg). This enables the Russian artillery to detect and strike artillery and command posts deep in the territory controlled by the adversary. Ukrainian servicemen who have been rotated through the Donbass can testify to the effectiveness of the Russian artillery.

But the Russian way of warfare met its limits under the new strategic circumstances encountered after 2015. Both in Syria and the Donbass, even upgraded Russian legacy systems could be penetrated by older Western munitions supplied to rebels or newer locally produced Ukrainian munitions. The heavy reliance on artillery for fire support and ground-based sensors is a liability in expeditionary warfare. In a theatre such as Syria, the hostile, guerrilla-infested environment and poor infrastructure hinder the use of artillery and other ground-based weapons. The indiscriminate destruction caused by artillery is also an impediment in the propaganda war. This is just one of the myriad of instances in which it becomes clear that Russian armed forces, despite having undergone a successful reform, have not been designed to conduct major operations far away from the country's borders.

Since 2016 Russia has again deployed divisions on its western borders with the formation of new 'tank armies'. But much of this has been a cosmetic exercise. Old brigades were re-named divisions, effectively retaining their brigade size due to the

1. All figures in this chapter relating to results achieved under the previous state armament programme GPV-2020 are based on: Richard Connolly and Cecilie Sendstad, 'Russian rearmament: an assessment of defense-industrial performance', in: *Problems of Post-Communism*, October 2016, pp. 1–18.
2. Aleksandr V. Rogovoy and Keir Giles, 'A Russian view of Land Power', Strategic Studies Institute and U.S. Army War College Press, April 2015.
3. For an overview of these reforms see: Colby Howard and Ruslan Pukhov (eds.), *Brothers Armed: Military Aspects of the Crisis in Ukraine* (Minneapolis, MA: East View Press, 2014); Dmitry Boltenkov, Aleksey Gayday, Anton Karnaukhov, Anton Lavrov and Vyacheslav Tseluiko, 'Russia's New Army', Centre for Analysis of Strategies and Technologies, Moscow, 2011, available at www.cast.ru/files/book/NewArmy_sm.pdf; and Gustav C. Gressel, 'Russia's Quiet Military Revolution', ECFR Policy Brief, October 2015.

lack of available manpower to fill all ranks.[4] But as these 'divisions' were created at the Ukrainian and Belarussian borders, they are in effect pre-deployed arms depots to be activated once a contingency with one of the countries arises. The Russian armed forces successfully experimented with pre-deployed stocks of tanks and military hardware in the Donbass. Since November 2015, they only rotate men in and out of the Donbass, while the heavy equipment remains there, thus minimising logistical efforts and difficulties.

Modernisation of the airforce

The Russian airforce officially receives 3.4 trillion rubles or 24% of the procurement budget under the GPV 2020 armaments plan. High priority was attached to the modernisation of the airforce and – measured by the benchmark of the GPV – the modernisation programme attained most of its targets. While the introduction of the next generation of combat aircraft (fifth generation fighters and bombers) is behind schedule, Russia has been able to procure larger quantities of fourth-generation aircraft to modernise its airforce. Since 2011, roughly 50 new combat aircraft have been added to the fleet of the Russian airforce each year. New logistical structures have also increased the operational readiness of air assets and improved Russia's ability to conduct sustained operations, as demonstrated by Russia's air campaign in Syria. While air-to-ground cooperation has improved compared to Soviet times, it has not yet reached Western standards. But again, the success of the modernisation of Russia's airforce was above all due to concentrating all efforts on likely scenarios in the neighbourhood while omitting other tasks and capabilities not deemed essential. In the event of a war with Ukraine, the Russian airforce's task would above all be to secure air superiority, neutralise the Ukrainian airforce and deter the West from intervening. Hence Russia's airforce is primarily trained and equipped for air-to-air combat. Air-to-ground capabilities are limited, as strikes would be restricted to the opponent's strategic command and control infrastructure as well as air defence installations. Russia never acquired large stocks of precision-guided munitions. Many platforms are still specialised in their nuclear strike or air superiority role, having very limited conventional air-to-ground capabilities – i.e. being restricted to dropping 'dump bombs'. The extensive collateral damage inflicted by Russian air strikes in Syria is a result of that.

Furthermore the Russian airforce has few airborne command and control, or reconnaissance and intelligence-gathering resources. In a war in the Russian neighbourhood it would hardly have been worth investing in such expensive assets as intelligence and situation awareness was to be provided by the intelligence services and ground-based sensors. However in expeditionary warfare, these capabilities are lacking. One reason why Russia conducted few strikes against Daesh in Syria – besides

4. The International Institute for Strategic Studies, *Military Balance 2017*, London, pp.184-86.

lack of will and other strategic priorities – was because it could identify few targets beyond the immediate frontline.

Naval construction and build-up

In the state armament programme GPV 2020 most funds (5 trillion rubles or 25% of the procurement budget) were allocated to naval build-up and modernisation. However the results are mediocre. The Russian navy finally overcame the problems encountered with the Borei class SSBN and the Bulava missile – the first vessel was commissioned in 2013. But the development of the next generation of conventional submarines and surface combatants produced little progress, ultimately being delayed due to the war in Ukraine and the imposition of sanctions. Without Ukrainian gas turbines or German diesel engines, Russian surface combatants do not go very far. Russian shipbuilding was in crisis even before that war. Much of the Soviet Union's expertise in shipbuilding declined after the Cold War, or remained concentrated in Ukraine. Unlike Ukraine, Russia could not develop a civilian shipbuilding industry that would preserve and expand that knowledge. The last large surface combatants of the Soviet Union were built using outdated techniques and at high cost. Then they are costly to maintain, and the Russian procedures for refuelling and rearming vessels at sea are outmoded – they still recall the practices learned from German-Soviet military cooperation in the 1930s.

Until 2014-2015, there was no need to invest in extensive naval construction beyond ballistic missile submarines. Russia is not a maritime nation, nor is it dependent on overseas trade. In the event of a local war, the Russian navy would be tasked with smaller amphibious operations in the immediate neighbourhood and support tasks for the army – as happened in Georgia in 2008 and Ukraine in 2014. In the case of a war with NATO, the navy's air assets and submarines would protect Russia's ballistic missile submarines based in the 'brown and green waters' of Russia's northern shores and thereby maintain a second-strike capability. Corvettes would patrol the littorals equipped with long-range cruise missiles capable of striking deep into NATO territory. Only submarines would survive the vastly superior allied navies in the open ocean. Smaller corvettes and frigates for patrolling the littorals could be produced and maintained with little effort. In the 2000s Russia could augment its navy with smaller warships it needed for limited warfare, without putting too much strain on the defence budget.

But Putin was eager to show Russian navy flags in Syria, Libya, Algeria, Egypt, and even off the coast of Australia during the G20 summit in Brisbane, where an impressive naval task-force was deployed to accompany President Putin's attendance at the summit. To pull off this display of naval might the Russian navy had to resurrect old Soviet-era vessels that were accompanied by tugboats in case of breakdown or emergency. If Russia intends to project itself as a strong naval power in the

Mediterranean and the Middle East, it would need to invest massively in building up its navy, which it can hardly afford to do given current economic constraints.

The spoilers: nuclear forces, A2/AD and asymmetric warfare

While prior to 2014 the main aim of Russia's armed forces was to maintain regional dominance, deterring a Western intervention in a regional conflict was part of that strategy.[5] To achieve this deterrent effect, Russia relied on its nuclear forces and special A2/AD assets that were designed to attach high risks to any Western intervention in the post-Soviet neighbourhood. Modernisation of Russia's strategic missile forces continued even throughout the 1990s. To maintain strategic parity with the US, Russia tried to preserve the inherited arsenal of Soviet missiles as long as possible. While the end of Russian-Ukrainian defence cooperation put the production of the next heavy intercontinental ballistic missile (heavy-ICBM) at risk or at least delayed its introduction for many years, Russia will nevertheless be able to uphold a meaningful second strike capacity, having put about 130 MIRV-tipped land and sea-based ballistic missiles into service between 2011 and 2015.[6] These were derivations and further developments of the Topol missile (specifically the Topol-M, Yars, and Bulava missiles) where Russia controlled the full production chain. The modernisation of the non-strategic nuclear arsenal has become an even higher priority for Russia in recent years, as these weapon systems can be used to selectively intimidate European NATO members while not threatening the US directly. Such an intimidation tactic might well split the alliance when facing a selective nuclear threat, thereby preventing the West from preserving a united front and confronting Russia.[7] Russia has inherited about 5,000 tactical nuclear warheads from the stocks of the Soviet Union, however very little is known about the actual number of deployed or deployable warheads. But by the end of the Soviet Union the seeds of the next generation of delivery means were already sown, especially new cruise missiles that by the 2010s could be launched from various platforms. In 2010 the navy's Tu-22M3 medium-range bombers were transferred to the airforce to serve as a dedicated theatre nuclear strike platform. The bomber has since been used in various show-of-force exercises, including simulating a nuclear attack on Stockholm in 2013. Even small conventional submarines and corvettes were equipped with the Kalibr-NK missile system, also capable of launching nuclear-tipped cruise missiles with a range of roughly 2,500km. Kilo-class submarines in particular are hard to detect when operating in littoral waters and the possibility of even a few submarines

5. On the connection between nuclear deterrence and hybrid war in the neighbourhood, see Jacek Durkalec, 'Nuclear-Backed "Little Green Men": Nuclear Messaging in the Ukraine Crisis', Polish Institute for International Affairs, Warsaw, 2015.

6. Connolly and Sendstad, op. cit. in note 1.

7. On the evolving role of non-strategic nuclear weapons in Russia's military thinking, see Stephen J. Blank (ed.), *Russian Nuclear Weapons: Past, Present, and Future*, US Army War College, Strategic Studies Institute, 2011; Marcel H. Van Herpen, 'Russia's Embrace of Tactical Nuclear Weapons – Its Negative Impact on US Proposals For Nuclear Arms Reductions', Cicero Foundation Great Debate Paper, no. 11/04, September 2011.

escaping NATO's detection systems would mean that European capitals would be directly at risk of a nuclear strike.

Impeding Western air operations over its own land and naval forces was a key concern for the Soviet armed forces. Soviet R&D placed a high priority on developing means to counter superior Western airforces and carefully analysed their performance at war. The S-300 air defence system deployed in the 1980s incorporated lessons learned in the Vietnam War and the Middle East. The S-400 then incorporated observations and lessons learned about Western air operations in the Gulf-War 1990/91 and thereafter – particularly the necessity to track and engage low observable airplanes through a network of different sensors including low frequency radars. Russia's electronic warfare capabilities greatly benefited from the commercial computing revolution (computers available on the free market surpassed the classified and restricted systems of the Cold War era by far) and the boom in the Russian IT sector in the 1990s. Russia has developed jamming devices for almost the entire spectrum of Western electronic sensor systems – from artillery fuses to reconnaissance aircraft like the J8 JSTAR. While Russian hacking activities on political and civilian infrastructure frequently make the news headlines, similar efforts are undertaken to break military communication codes and infiltrate military data networks – although the results of Russia's action in these fields are not known publicly.

Russia has improved its A2/AD capabilities over the last decade and tried to adapt to technological progress made by the West in terms of air and electronic warfare. While Russian capabilities are not the *Wunderwaffe* that Russian propaganda claims, they would greatly complicate any Western military reaction to a Russian aggression and increase the cost in terms of men and materiel needed to counter Russian military moves. In local theatres, such as the Baltic states, these systems could seal off the theatre of operations from any Western reinforcements and provide the Russian armed forces with time to overwhelm inferior local forces. And as they are based on Russian soil (Kaliningrad), they would force NATO to attack Russia proper in order to regain access to the Baltic countries – increasing the political and strategic stakes in such a conflict.

Another field that Russia is at least exploring is the field of missile defence and anti-satellite weapons. Under the designation A-235 Nudol, the country is working on a kinetic exoatmospheric interceptor, which has already been tested in 2015 and 2016 respectively.[8] From a Russian perspective, adding an anti-satellite capacity would alter its asymmetric A2/AD capabilities, as the US relies heavily on satellites for intelligence, communication, navigation, and employment of precision weapons. In fact satellites are easier targets than missiles, so Russia would need a less ambitious (and costly) programme compared to the United States if anti-satellite use were the main purpose.

8. See: http://freebeacon.com/national-security/russia-flight-tests-anti-satellite-missile/

Industrial and technical constraints

Much of Russian defence modernisation efforts date back to Soviet times. The Borei class submarines and T-14 Armata tank family were conceived in the late 1980s. The current generation of Russian combat aircraft has evolved from Soviet aircraft designed after Vietnam. Russia mostly improved these weapons systems and applied recent lessons learned from other conflicts. While the 1990s are portrayed as an era of decline and disarray in Russia, in fact it provided a window of opportunity for the defence industry to catch up in sectors where the Soviet industry traditionally lagged behind. The computing revolution increased the availability of commercially available hardware, allowing Russia to modernise legacy systems with advanced electronics, sensors, and communication equipment. This has been the core of Russia's modernisation efforts of the last two decades.

Russia could develop a wide array of specialised 'spoilers' – weapon systems that are specifically aimed at diminishing much of the technological advantage acquired by the West**.** This was facilitated by NATO not attaching sufficient importance to Russia as a potential adversary. In the last 25 years the Western defence industry was busy developing weapons systems and munitions for expeditionary warfare and asymmetric military confrontation. The reason why the deployment of the S-400 system in Syria practically imposed a no-fly-zone on US and allied aircraft over Western Syria was because the West failed to develop a weapon system to counter this threat. Because conventional warfare against a peer competitor was judged unlikely, Western armies abandoned many capabilities – particularly air defence for armoured formations – needed in a conflict with Russia. Regarding armoured manoeuvre warfare, few Western armies today have combat systems that exceed the capabilities of 1989. But after the events of 2014 this might change.

Western responses

The Russian defence industry took advantage of the post-Cold War era of *détente* and disarmament to close the gap with the West in terms of armoured manoeuvre warfare capacities. Russia needed 25 years to catch up. But in doing so, and using its newly found military prowess with increasing frequency, Moscow is setting in motion powerful incentives for NATO and the EU to recommit to military modernisation.

Germany and France are developing a next generation tank. The US, Germany, Sweden and the UK are developing new 'stand-off' munitions to engage Russian long-range air defence systems and electronic warfare systems. The US and Germany are developing new air-defence capabilities to defend forward-deployed armoured formations – particularly from reconnaissance drones. European militaries in particular are trying to reduce their dependence on satellite communication and navigation.

Russia has already experienced delays and cost-overruns with many of its next generation weapon systems. The T-14 Armata tank family, the Kurganets and Bumerang armoured vehicle families, or the PAK-FA fighter are still in pre-production phase and will enter service in the Russian armed forces only after 2020. The West faced similar problems with many of its 'future' weapons systems, as they are increasingly complex and expensive machines. However the Russian systems introduced in the near future will mean that Russia will achieve parity with the West's post-Cold War generation of weapon systems. Can Russia then again leap forward when the West introduces its next generation of land systems, combat aircraft and naval vessels in the 2030s? Will Russia stay ahead of the West in adapting its A2/AD systems to the counter-measures and new munitions the West is developing? This remains in question – especially as the Russian economy suffers from structural stagnation and a dearth of innovation due to 'brain drain' and the emigration of Russian scientists and engineers. As the complexity and costs of the next generation weapons systems increase, it will become increasingly difficult for medium-sized powers to keep pace with the superpowers (the United States and China). France has already adapted to this reality, deepening cooperation on the European continent to share costs and tap into the wider European industrial base. But that is not the Russian way.

So far Russia is prioritising independence over efficiency. Given the nature of the Kremlin's foreign policy and its reluctance to engage in deepened cooperation with other states, Russia has failed to build a permanent and structural partnership with any other international player. If Moscow were to deepen its defence ties with China now, Russia would become a subcontractor of the Chinese military-industrial complex – something Moscow is keen to avoid. India on the other hand wants to diversify its armament suppliers and R&D cooperation away from Russia.

For now, the Kremlin seems to have opted to finance R&D efforts focused on future generations of military systems through export revenues. The Russian defence industry's customers are not only states that cannot buy Western military systems for political reasons (like Iran). In Asia and the Middle East, countries are interested in preparing for similar contingencies to those envisaged by Russia – a high-intensity war in the immediate neighbourhood for the control of limited areas. Hence they are satisfied with Russian weapons that offer the capabilities needed for these contingencies at a lower price than the Western competition, while the limited usefulness of these systems in an expeditionary environment does not matter. However, countries in Asia – particularly India – and the Middle East are increasingly demanding local shares in production and R&D to boost their own arms industry with a view to becoming strategically independent. That diminishes the financial returns of arms deals in the short term. In the long run, Chinese, Indian, and Turkish products will compete for similar segments of the export market, putting a question mark over the future of Russia's current strong position in arms exports.

Strategic outlook

The biggest problem the Russian defence industry is facing is the overburdening of the country's military apparatus and military-industrial complex. The success of Russia's recent defence reforms rested on the assumption that Russia could prepare for a limited set of military contingencies, while refraining from taking on other tasks. Thus the Russian armed forces prepared for a conventional war against a neighbour in which the West would be deterred from intervening.

However, the gap between Russian rhetoric and diplomatic ambitions on the one hand and military capabilities on the other is increasingly exposed. If Russia wants to engage in power games in the Middle East and other world regions far from Russia's own borders, the Russian armed forces and military systems will have to address new demands regarding deployability, strategic mobility, interoperability, lethality and precision. This would necessarily involve naval modernisation and the creation of a true blue-water navy, amphibious capacities, and an expansion of the airforce. None of which comes cheap.

At the same time, if Russia were to act out its aggressive offensive rhetoric against NATO and prepare for more than a limited confrontation over Belarus, in the Baltics or the Black Sea, this would mean stepping up the current efforts to modernise its land forces, air- and space-defence systems as well as non-strategic nuclear weapons. As European NATO nations (those which Russia would encounter in the first day of a confrontation) are accelerating their modernisation and in particular starting to field weapons systems and munitions designed to take on their Russian counterparts, the costs of being a peer-competitor with NATO will increase.

Having achieved the relatively easy goals of military posturing in Ukraine and Syria, Russia is now entering a more problematic phase. Its leadership will soon need to decide what kind of military it needs to build for the future, with what capabilities, and ultimately what kind of power and country they want Russia to become. Russia's next state armament programme, GPV 2025, might provide some hints in this direction. But what is also clear is that achieving the triad of maintaining regional dominance, being a peer competitor with NATO and an interventionist power is clearly beyond current Russian capabilities. But this is no guarantee against future military crises.

Section 2

CHINA

IV. DEFENCE TECHNOLOGIES AND INDUSTRIAL BASE

Kenneth Boutin

Introduction

This chapter examines the key features of China's defence technological and industrial base (DTIB). It considers China's defence-industrial requirements, the factors shaping defence-industrial development in China, the strengths and weaknesses of its DTIB, and its prospects over the long term. China's DTIB faces particular obstacles as it strives to meet the materiel requirements of the People's Liberation Army (PLA). The capacity of the DTIB to support the modernisation of the PLA is improving as the restructuring of the state industrial sector progresses and the contribution of the non-state industrial sector grows. China's DTIB can be expected to remain highly resilient, providing it with considerable scope to develop and produce arms in the face of weapons sanctions.

China's defence-industrial requirements

China's DTIB is unique in a number of respects. It is shaped by China's distinctive industrial structure, key features of which are determined by industrial security requirements, as well as the materiel requirements of the principal consumer of its products and services, the PLA. China's defence-industrial agenda is quite complex due to the need to address imperatives that conflict in important respects.

China's defence-industrial requirements are typical in their focus on meeting the materiel requirements of the defence establishment, but are atypical in terms of how this is pursued. The demands placed on China's DTIB are more complex and challenging than elsewhere due to the sheer size of the PLA and the late point at which it embarked upon a programme of defence modernisation. This programme has been underway for some time but has a long way to go in meeting its ambitious objectives, which correspond to those commonly associated with the Revolution in Military Affairs. Modernisation constitutes something of a moving target for the PLA as it seeks to develop capabilities on a par with other major powers such as the United States and Russia. The demands on China's DTIB are increasing as the pace of defence modernisation in China accelerates.

The Chinese government requires the DTIB to provide the full range of armaments operated by the PLA. China moved quickly to develop arms production capabilities following the establishment of the People's Republic in 1949 and effectively focused

on import substitution in the wake of its political break with the Soviet Union in 1960, which ended China's access to Soviet arms and highlighted the importance of industrial security in the form of defence-industrial autonomy. Defence-industrial self-reliance is regarded as indispensable to China's security. This drives determined defence research and development (R&D) efforts as well as indigenous production of a comprehensive range of arms, and China is self-sufficient in every category of conventional and unconventional arms required by the PLA. China's DTIB meets the quantitative requirements of the PLA, but falls short where its qualitative requirements are concerned. The autonomy of China's DTIB has been achieved at the expense of technological progress, which has failed to keep pace with the rate of progress in the states that provide its developmental benchmarks. This is manifest in the extent to which defence technological advances in China continue to depend on original R&D undertaken elsewhere.

Defence-industrial autonomy remains a key facet of China's industrial security, despite its less critical post-Cold War security situation. While China is an archetypical techno-nationalist state in terms of the extent to which national security concerns drive the promotion of autonomy in technological development and production,[1] it has developed a unique approach to autonomy. This takes the form of seeking to ensure the integrity of key defence-industrial processes while exploiting the opportunities provided by engaging offshore industry. Deepening engagement of offshore industry through transnational industrial processes involves the diffusion of advanced technologies and manufacturing processes through commercial arrangements. This has materially benefited China's aerospace industry.[2] In addition, Chinese defence-industrial programmes are directly drawing on offshore industrial resources in an effort to accelerate the development and production of advanced arms. It is considered crucial that the supply chains for arms produced for the PLA be strictly national in scope, with foreign-sourced components, sub-components, and complete systems such as aircraft engines incorporated only as a temporary expedient in exceptional cases, to offset particular weaknesses in national defence-industrial capabilities. While great importance is attached to indigenous innovation, technological autonomy is regarded as less crucial than autonomous production processes. As a result, Chinese authorities are much more open to drawing on offshore industry for advanced technologies and its contribution to China's DTIB is greatest in these terms.

The transformation of China's DTIB

Recognition of the shortcomings of the DTIB is driving a process of defence-industrial reform in China. This transformation, which was initiated in the 1990s, is intended

1. See Richard A. Bitzinger, *Arming Asia: Technonationalism and Its Impact on Local Defense Industries* (London: Routledge, 2017), pp. 6-7.
2. Roger Cliff, Chad J.R. Ohlandt and David Yang, *Ready for Takeoff: China's Advancing Aerospace Industry* (Santa Monica, CA: RAND Corporation, 2011), pp. 35-37.

to support defence-industrial development without threatening state control of key assets. The restructuring that is central to this transformation involves the liberalisation of the state-owned enterprises (SOEs) which constitute the central pillar of China's DTIB. This encompasses the closely-related facets of self-management, corporatisation, and commercialisation (or marketisation). SOEs are encouraged to be proactive and have been granted greater operational autonomy, including in terms of developing collaborative arrangements with other enterprises. Corporatisation involves the progressive consolidation of SOEs into larger, more capable conglomerates. China's DTIB is now dominated by ten conglomerates, including the Aviation Industry Corporation of China (AVIC) and China North Industries Corporation (NORINCO). The state defence-industrial sector is being commercialised through the selective introduction of market mechanisms, with SOEs expected to be more efficient and competitive.[3]

The other key facet of the transformation of China's DTIB is the emergence of a non-state defence-industrial sector. This is an unintended – if belated – consequence of China's economic reforms, with the emergence of non-state enterprises undertaking defence R&D and production occurring long after their emergence in other fields. The incremental pattern of policy development in this area testifies to the unexpected nature of this trend as well as its sensitivity. The contribution of non-state defence enterprises such as Shaanxi Baoji Special Vehicles to state sector-led R&D and production processes continues to grow. While these enterprises cannot necessarily be treated as extensions of SOEs, in a number of cases they support state defence R&D and production programmes. Prominent high-technology enterprises such as Lenovo and Huawei collaborate closely with the state sector, for example.[4]

The development of a more hybrid structure for China's DTIB, with features commonly associated with both state- and market-based industrial structures, has important consequences for China's industrial security. This comes at a high cost in terms of state control and the autonomy of critical defence-industrial processes, the importance of both of which is likely to remain high. Tension between the requirements of defence-industrial progress and defence-industrial autonomy will remain until such time as the development of China's state defence-industrial sector reaches the point where the non-state sector and foreign industry cease to play such an important role.

3. See Tai Ming Cheung, 'An Uncertain Transition: Regulatory Reform and Industrial Innovation in China's Defense Research, Development, and Acquisition System,' in Tai Ming Cheung (ed.), *Forging China's Military Might: A New Framework for Assessing Innovation* (Baltimore, MD: Johns Hopkins University Press, 2014), pp. 57-61; see also J.D. Kenneth Boutin, 'Arms and Autonomy: The Limits of China's Defense-Industrial Transformation,' in Richard A. Bitzinger (ed.), *The Modern Defense Industry: Political, Economic, and Technological Issues* (Santa Barbara, CA: Praeger Security International, 2009), pp. 216-18.

4. See Shaun Breslin, *China and the Global Political Economy* (Basingstoke: Palgrave Macmillan, 2013), pp. 48-49; and David Shambaugh, *China Goes Global: The Partial Power* (Oxford: Oxford University Press, 2013), pp. 193-95.

The strengths and weaknesses of China's DTIB

China's unique defence-industrial strategy involves particular strengths and weaknesses. The extent of state control over crucial R&D and production ensures that the DTIB is highly responsive to its requirements, particularly in the short term. The DTIB is well-situated to supply arms in quantity to the PLA on relatively short notice on highly favourable terms, as has been demonstrated by its success in supplying the PLA with arms over many decades.

No less significant a strength is the autonomy of China's DTIB. China is one of a select group of states that is in a position to produce the full range of arms required by its defence establishment, without having to draw on foreign firms for components, sub-components, or complete systems. While a number of Chinese production programmes include such inputs at the present time, this is more a case of convenience than necessity. Alternative products of Chinese origin are available, albeit at some cost in qualitative terms. Foreign technological inputs are much more important to Chinese industry, particularly over the long term. These can be dispensed with, however, if the Chinese government is prepared to compromise on the timeframe in which the PLA will be able to field new generations of some categories of arms. The degree of autonomy attained by China's DTIB renders it highly resilient in the face of exogenous economic trends and developments and politically-driven arms sanctions.

China's DTIB suffers from a number of significant weaknesses, however. It is not notably dynamic, which has important implications for the development and production of the advanced arms required by the PLA. Despite the impressive progress registered by China's DTIB over the past four decades, both its capacity to innovate and to match the qualitative production standards attained by other major arms producers remain wanting. Of these, the former constitutes the most fundamental issue. There is an established pattern of underinvestment in R&D by the state industrial sector. China's struggle to narrow the technological gap with the other major powers is complicated by the pace of technological progress set during the Cold War, which has yet to abate. As a result, China continues to rely on foreign states for developmental benchmarks in many categories of arms and there is enduring concern about the quality of the arms produced by Chinese industry. The differing rates at which technological frontiers are advancing and the uneven defence-industrial progress that has resulted from this means that China is better positioned in some sectors than others. China's DTIB is strong in areas such as shipbuilding and armoured fighting vehicles, but notably weaker where aerospace is concerned.

The prospects for China's DTIB

There is every indication that capability development of China's DTIB will continue. The Chinese government regards this as crucial to the security of China and it

has demonstrated its readiness to sustain the effort required. It is not necessarily the case that China will succeed in attaining its ambitious developmental objectives, or that development of the DTIB will be achieved as quickly as planned, however. This will depend in large part on the transformation of the DTIB.

Restructuring of the state defence-industrial sector is unlikely to entirely address its inherent shortcomings. The privileged position of SOEs can be expected to continue to impede efforts to encourage greater dynamism. The sole-source nature of most defence procurement in China limits the scope for encouraging greater efficiency on the part of SOEs, as continued state support and orders are not dependent on this. It similarly is the case that SOEs will remain disadvantaged where technological progress is concerned by their relative isolation, as they generally are poorly situated to exchange ideas with other state and non-state enterprises.

The underperformance of the state industrial sector is offset to some extent by the non-state sector. The development of the non-state sector will contribute greatly to the qualitative development of China's DTIB as non-state enterprises are in a much stronger position to engage offshore industry. Recognition of their capacity to do so explains the efforts now being made to encourage and support their participation in state-led R&D and production programmes.

China faces significant political obstacles in its pursuit of defence-industrial development. A number of states seek to restrict Chinese access to defence-related technologies, components, sub-components, and the firms that produce them. This involves both general national technology control regimes and investment review processes such as the Committee on Foreign Investment in the United States, and targeted measures instituted with the objective of prompting policy change in China, such as the arms sanctions introduced by the United States and other countries in the wake of the Tiananmen Square incident in 1989. These barriers will continue to impede China's efforts to offset the weaknesses of its DTIB by drawing on offshore industry. The impact of defence-industrial restrictions on China is being tempered by their porous nature. A number of states continue to provide components, sub-components, and complete systems to China.[5] This often takes the form of items supplied for what ostensibly are civilian production programmes, but increasingly occurs through the integration of Chinese industry into transnational production and R&D processes, which are difficult for states to monitor and control due to their nature.

It also is the case that China is engaging in industrial espionage in an effort to circumvent restrictions imposed by sanctions and national export control regimes. Industrial espionage enables Chinese industry to overcome developmental obstacles, speeding up the development process, and is more cost-efficient than developing

5. Reuben F. Johnson, 'Foreign know-how continues to help Chinese R&D catch up,' *Jane's Defence Weekly,* vol. 51, no.24, 11 June 2014, p. 27.

technologies locally.[6] The extent and impact of industrial espionage is difficult to quantify due to its nature, but this is probably less important to China's defence modernisation efforts than legitimate commercial ties, which now are quite extensive and which will grow as industrial development in China sees high-technology state and non-state enterprises progress further up the value chain.

China's defence-industrial relationship with Russia merits careful consideration. Russia constitutes the single most important foreign partner of China where the development and production of arms is concerned. This is the case despite Russian misgivings over unauthorised Chinese copying of Russian designs and over contributing to the development of a defence-industrial competitor.[7] Sino-Russian defence-industrial collaboration is extensive and is crucial to Chinese efforts to develop and produce advanced arms. China has access to components, sub-components, and systems of a 'dual-use' nature. The contribution of Russian industry is greatest in the aerospace sector, with modern Russian engines such as the RD-93 and AL-31 addressing the gap resulting from shortfalls in China's engine development programme, for example.[8] The importance of Russia to China's DTIB derives as much from the lack of political conditionality on Russia's part as the capacity of its industry to provide crucial assistance. The willingness of Russia to provide defence-industrial support helps China to offset politically-driven restrictions on support from Western states.

The extent to which China continues to draw on inputs from Russian industry demonstrates the failure of Chinese defence-industrial progress to meet expectations, both in terms of reaching crucial milestones and the pace at which Beijing is attaining developmental and production targets. The revelation that the WZ-10 attack helicopter is based on a design from Russia's Kamov design bureau from the 1990s is symptomatic of China's ongoing struggle for defence-industrial development.[9] China will continue to require assistance from states such as Russia, particularly where R&D is concerned. This need will be greatest in sectors such as aerospace where the pace of technological progress is comparatively rapid, due to the formidable structural obstacles which confront China's efforts to develop its DTIB.

China's efforts to overcome the shortcomings of its defence technological and industrial base through engaging offshore industry has important implications for the development of its DTIB over the long term if this practice continues. An undue reliance on offshore industry for advanced technologies discourages applying

6. Larry M. Wortzel, *The Dragon Extends its Reach: Chinese Military Power Goes Global* (Washington, DC: Potomac Books, 2013), pp. 143-44 and pp. 170-71.

7. Reuben F. Johnson, 'Russian Official Confirms S-400 Sale to China', *Jane's Defence Weekly,* vol. 52, no.16, 22 April 2015, p. 21; and Keri Wagstaff-Smith, 'Russia Stalls on Deal to Supply Engines to China', *Jane's Defence Weekly,* vol. 47, no. 28 , 14 July 2010, p. 12.

8. Reuben F. Johnson, 'Shenyang Continues Prototype Development of FC-31,' *Jane's Defence Weekly,* vol. 54, no. 19, 10 May 2017, p. 8; and Robert Hewson, 'Fighter Club', *Jane's Defence Weekly,* vol. 47, no. 28 , 14 July 2010, p. 73.

9. Reuben F. Johnson, 'WZ-10 Revelations Put Spotlight on China's R&D Skills', *Jane's Defence Weekly*, vol. 50, no. 12, 20 March 2013, p. 16.

resources to R&D, potentially undermining efforts to develop the innovative capacity of Chinese industry, particularly in high-technology sectors.

Engaging offshore industry also has significant implications for its industrial security. Drawing on foreign firms for important inputs threatens China's defence-industrial autonomy. Even if this is approached as a temporary measure, to be employed only until such time as Chinese industry is in a better position to develop and provide equipment that meets the requirements of the PLA, this still has the potential to create dependence, which the Chinese government is anxious to avoid. The tension arising from this may lead China to restrict the scope for engaging offshore industry in crucial high-technology industrial sectors, particularly where perceived rivals such as the United States are concerned.

V. ARMAMENTS EXPORTS

Richard A. Bitzinger

Introduction

China has regularly been listed as being among the world's top five arms exporters for the past 20 years, along with such traditional leading suppliers as the United States, Russia, France and the United Kingdom. The best data we have regarding China's place in the international arms marketplace come mainly from two sources: the Stockholm International Peace Research Institute (SIPRI) and the US Congressional Research Service (CRS). SIPRI data for 2012-2016 shows China to be the world's third-largest arms exporter, with 6.2% of the global market. This performance places it behind the United States (the number one arms exporter, with 33% of the international arms market), and Russia with 23%, and slightly ahead of France (6%), Germany (5.6%), and the United Kingdom (4.6%).[1]

Congressional Research Service data covers a slightly different timeframe but tells a similar story. According to CRS, China was fifth in terms of arms deliveries for the period 2012-2015 (valued at US$9.6 billion), capturing about 5% of the overall international arms market. In 2015 alone, it was fourth in terms of arms deliveries, worth US$2.9 billion. In comparison, the United States accounted for nearly one third of total international arms deliveries for the period 2012-2015, while Russia was second at nearly 20%.[2]

In terms of arms sales *agreements*, Chinese overseas arms sales have averaged more than $3.6 billion a year for the period 2008-2015; this compares quite favourably with the country's experiences as an arms exporter during the 1990s, when Beijing averaged less than $1 billion annually in arms exports. In 2015 alone, China concluded $6 billion worth of arms sales.

Nearly all of China's arms transfers are to developing countries, and in this arena the Chinese defence industry has emerged as a formidable competitor to Western and Russian arms exporters. China's main arms markets are in Asia and the Middle East, and about three-quarters of its weapons exports go to countries in these regions. In addition, China has become a leading arms supplier to Africa; in 2012-2015, in fact, China was the single largest supplier to Africa, capturing nearly one-third of the

1. Aude Fleurant, Pieter D. Wezeman, Siemon T. Wezeman and Nan Tian, *Trends in International Arms Transfers, 2016* (Stockholm: SIPRI, February 2017), Table 1, p. 2.

2. Catherine A. Theohary, *Conventional Arms Transfers to Developing Nations, 2008-2015* (Washington DC: Congressional Research Service, 19 December 2016), p. 27.

continent's overall arms market, drawing customers away from Europe, Russia and the United States. Major customers for Chinese arms include Algeria, Bangladesh, Egypt, Iran, Burma/Myanmar, Nigeria, Pakistan, Sri Lanka, Sudan, Tanzania, Zimbabwe and Zambia. More recently, Venezuela has become a significant customer for Chinese arms, giving China a toehold in Latin America.

Many of China's arms deals have been done at 'friendship prices', that is, selling arms at a discount. Such agreements have been made either for political purposes (i.e. cementing alliances or promoting cordial relations) or, increasingly, to secure links with oil-and mineral-rich nations, such as Nigeria, Sudan and Zimbabwe.

Recent Chinese arms export activities

Leading Chinese arms exports include:

- **Yuan-class submarines:** This submarine features a modern teardrop hull and carries both torpedoes and ASCMs, and it may even be equipped with an as-yet-unidentified system for air-independent propulsion. China recently sold eight *Yuan*-class submarines to Pakistan and three to Thailand.

- **Unmanned aerial systems and armed drones:** China has quite recently become one of the world's largest manufacturers of all kinds of unmanned aerial vehicles (UAVs), ranging from the very small, hand-held types, all the way up to very large high-altitude, long-endurance (HALE) drones. In particular, China has so far exported at least two types of armed drones, the *Caihong* and the *Wing Loong* (also called the Pterodactyl). The *Wing Loong* has been sold to Egypt, the United Arab Emirates and Saudi Arabia. A larger version, the *Wing Loong* II, is also available. The *Caihong* (Rainbow) has been sold to Nigeria, Egypt and Iraq. It has already been used in military operations in Africa against Boko Haram militants, while Iraq has employed the *Caihong* in attacks on ISIS targets.

- **JF-17 Thunder fighter jets:** The JF-17, also known as the FC-1, is a lightweight multi-role combat aircraft similar in design to the U.S. F-20 *Tigershark*. The JF-17 was co-developed with Pakistan, which is currently producing the fighter for its air force; estimates are that Islamabad could buy up to 250 of the aircraft. The aircraft is being specifically marketed to developing countries who need to replace ageing MiG-21, F-7, or F-5 fighters. Burma/Myanmar is rumoured to be acquiring 16 JF-17 fighters, and Nigeria could buy three planes.[3]

3. 'Myanmar first country to purchase JF-17 Thunder from Pakistan', *Dunya News*, 9 July 2015; Jeremy Binnie, 'Nigeria waiting for US to approve Super Tucano sale,' *Jane's Defence Weekly*, 7 June 2016.

- **C-801/C-802 antiship cruise missiles (ASCMs):** These missiles, also known as the YJ-8 and YJ-82 (YJ stands for *Yingji*: 'Eagle Strike'), respectively, are similar to the very effective French Exocet (the C-802 version being equipped with a solid rocket booster for extended range). These ASCMs can be launched from ships, land, or aircraft. Recent customers for these missiles include Algeria, Bangladesh, Indonesia, Iran, Burma/Myanmar, Pakistan and Thailand.[4]

- **K-8 trainer jets:** China has had great success in selling the K-8 lightweight trainer/attack jets, exporting over 300 of these planes since 2000. Its biggest client has been Egypt, which bought 120 K-8s, most of which were assembled locally from kits; Burma/Myanmar plans to license-assemble up to 50 of these aircraft. Other customers include Bolivia, Ghana, Namibia, Pakistan, Sri Lanka, Sudan, Tanzania, Venezuela, Zambia and Zimbabwe.

- **F-7MG fighter jets:** This aircraft is the export version of the People's Liberation Army (PLA) Air Force's F-7E, itself an upgraded adaptation of the MiG-21. The F-7MG features a larger wing and, reportedly, a British radar. China has sold more than a hundred of these fighters to Bangladesh, Namibia, Nigeria, Pakistan, Sri Lanka, and Tanzania, according to the SIPRI Arms Transfers database, since the mid-1990s.

- **WZ-551 armoured personnel carrier:** Although not a particularly high-tech system, the WZ-551 is notable for being sold widely around the world, including to countries like Argentina, Gabon, Kenya, Kuwait, Nepal, Oman, Sri Lanka, Sudan and Tanzania.

It is also worth noting that China has sold several types of small and medium-sized transport aircraft, mostly to African states. These include the Y-12 (to Kenya, Nepal, Uganda, and Zambia) and the MA-60 (to Ghana, Nepal, and Zambia).

In addition, China is producing many new types of armaments that could find a niche in the global arms market, such as drones. Other military items with considerable export potential include two locally manufactured combat aircraft, the J-10 and the J-31 fighter jets. The J-10 is roughly equivalent in capability to the US F-16C. Development of the J-10 began in the mid-1980s and it entered service with the People's Liberation Army Air Force (PLAAF) in the early 2000s. The J-31 is a putative 'fifth-generation' combat aircraft currently under development, closely resembling the US-designed F-35 Joint Strike Fighter. It first flew in October 2012.

In fact, there has been considerable speculation that the Chinese might try and flood the global arms market with the J-10 and the J-31. Both these combat aircraft could potentially be stiff competition for Western or Russian fighter jets – especially

4. Stockholm International Peace Research Institute (SIPRI), *SIPRI Arms Transfers Database* (accessed 10 March 2017).

if offered at cut-rate prices – the J-10 competing against smaller, single-engine aircraft such as the Swedish *Gripen*, and the J-31 going up against the *Typhoon*, *Rafale*, or the F-35. Pakistan has reportedly agreed to buy 36 J-10s, and Iran is rumoured to be interested in the fighter as well.[5]

Other potentially marketable products include the YJ-7/C-701 short-range antiship cruise missile (ASCM) (already sold to Iran and, reportedly, Hezbollah[6]), the FN-6 man-portable surface-to-air missile (SAM) (exported to Malaysia and Peru, among other countries), and the KS-1A SAM missile (sold to Burma/Myanmar and Thailand).

Finally, a large chunk of Chinese arms exports includes small arms and ancillary equipment, such as trucks, uniforms, and field equipment. Particularly when it comes to sub-Saharan Africa, China has become a leading supplier of assault rifles, ammunition, mortars, and the like. In one case, UN inspectors found that high-explosive incendiary cartridges, ostensibly Chinese in origin, were used in Darfur in the early 2010s. At the same time, Beijing has stymied UN efforts to investigate arms flows into Africa.[7]

A tenuous standing?

Despite recent glowing sales figures, China's current position in the global arms marketplace remains tenuous nevertheless. In the first place, China remains pretty much a niche player in the global arms market: it sells most of its weapons to a very small number of countries. According to SIPRI, during the period 2012-2016, nearly two-thirds (63%) of Chinese arms went to just three countries: Pakistan, Bangladesh, and Burma/Myanmar.[8] This figure is down somewhat from the period 2011-2015, when 71% of all Chinese arms sales went to these three customers;[9] nevertheless, China is still highly dependent on sales to just a few countries.

In fact, China faces a continual challenge of remaining competitive in the highly cut-throat business of international arms transfers. China continues to struggle with remaining technologically competitive with the West, particularly when it comes to developing and manufacturing more advanced types of weaponry – such as supersonic combat aircraft, precision-guided weapons, airborne early warning aircraft, and long-range air-defence systems. Armed drones, antiship cruise missiles

5. Siva Govindasamy, 'Pakistan signs deal for Chinese J-10 fighters', *Flight International*, 13 November 2009; Zachary Keck, 'Get ready, Israel: China to sell Iran advanced fighter jets,' *National Interest*, 5 August 2015.
6. *SIPRI Arms Transfers Database*.
7. Colum Lynch, 'China's arms exports flooding into sub-Saharan Africa', *Washington Post*, 25 August 2012.
8. Fleurant, et.al., op. cit. in note 1.
9. Aude Fleurant, Sam Perlo-Freeman, Pieter D. Wezeman, and Siemon T. Wezeman, *Trends in International Arms Transfers, 2015* (Stockholm: Stockholm International Peace Research Institute, February 2016), Table 1, p. 2.

and submarines aside, China can for the most part still offer only a handful of advanced weapons systems that are competitive on the global arms market. For example, Beijing has won very few orders for its most advanced fighter jets, particularly the JF-17 and the J-10. The only definitive sale of the JF-17 has been to Pakistan – and only because Pakistan is producing the plane jointly with China; not even the PLAAF has acquired the JF-17, in fact. In addition, as of 2016 no export order for the J-10 (to Pakistan or any other airforce) has yet been signed.

Moreover, even when countries have purchased Chinese weapons systems, they often throw out Chinese components and replace them with Western systems. This is because China's defence industry is still very weak when it comes to key technologies such as jet engines and electronics. For example, Algeria acquired corvettes from China but subsequently outfitted them with Western-made radar, fire-control, and communications gear. Pakistani JF-17 jets use a Russian engine, while Thailand turned to Saab to upgrade its Chinese-built frigates.[10]

A second challenge for China is to continue expanding its customer base. For the most part, Beijing has mainly sold military equipment to countries either too poor to buy Western or Russian armaments (such as sub-Saharan African states and Burma/Myanmar), or who have been subjected to arms embargoes (such as Iran and Venezuela). Few wealthy, big-spending arms importers (such as the oil-rich Gulf states) have ever been interested in Chinese arms, other than a handful of low-end items[11] (notable exceptions: both the United Arab Emirates and Saudi Arabia have recently acquired armed drones from China). Iran used to be a major consumer of Chinese arms, but it has not placed a new order with Beijing in several years. Similarly, China has found relatively few takers for its arms in Latin America, Eastern Europe, or Central Asia. A $3.4 billion deal to sell air defence missiles to Turkey collapsed under pressure from Ankara's NATO allies.[12]

The emerging China-Russia arms export competition

Chinese overseas arms transfers have even begun to put a dent into Russian arms export efforts. China competes directly with Russia for arms markets in the developing world, particularly Africa, South and Southeast Asia, and Latin America. Beijing has captured sales in countries that used to be major customers for the Soviet Union/Russia, such as Algeria (frigates, ASCMs, and artillery systems), Cambodia (helicopters and man-portable SAMs), Egypt (combat aircraft and UAVs), Ethiopia (armoured personnel carriers and SAMs), Iran (ASCMs and SAMs), Iraq (UAVs),

10. Ridzwan Rahmat, 'Algeria commissions second Chinese-build C28A corvette', *Jane's Navy International*, 16 March 2015; Edward Wong and Nicola Clark, 'China's arms industry makes global inroads', *New York Times*, 20 October 2013.

11. Bahrain, for instance, has bought multiple rocket launchers (MRLs) from China; Kuwait, artillery systems and armored personnel carriers (APCs); and Oman, MRLs and APCs. *SIPRI Arms Transfers Database.*

12. Keith Bradsher, 'Red flags over Turkey-China arms deal', *The Hindu*, 24 March 2016.

and Venezuela (combat aircraft, multiple rocket launchers, SAMs). China has also scored some minor deals with Russian client states such as Kazakhstan, Syria and Turkmenistan.

That said, Russia's most important arms buyers remain unassailable by Chinese arms industries. India (which accounted for 38% of all Russian overseas arms deliveries during the period 2012-2016) and Vietnam (11%) have inimical relationships with Beijing and thus would probably never buy arms from China. Ironically, China continues to be one of Russia's biggest arms buyers, acquiring more than US$3.6 billion worth of arms from Russia during 2012-2016. Consequently, China accounted for 11% of Russian arms transfers during this period.[13]

Impact of Chinese arms exports on Europe

China will continue to be an important arms exporter, albeit with limitations. It is unlikely, for instance, that Chinese weaponry will constitute much of a threat to European arms manufacturers/exporters. Many of Europe's key customers will probably remain reluctant to buy Chinese armaments, for a variety of reasons. They may have acrimonious or even hostile relations with China and so would not wish to employ or be dependent on Chinese armaments. Conversely, countries may purposely acquire European armaments to strengthen political-military relations with Europe, which they may value more than similar ties with China.

Arms buyers may also prefer European (or other Western or Russian) armaments because they view these weapons as being more reliable and more capable than their Chinese counterparts. The J-10, for example, may be a very good aircraft, but since its performance and reliability cannot be independently confirmed, many countries may not want to take a chance on it. Moreover, countries do not necessarily buy the cheapest weapon systems available – other attributes often count more, such as military effectiveness and after-sales support. This is especially so when it comes to military products; many countries – particularly the best customers on the global arms markets – given the choice, will still pay a premium price to get a premium product.

That said, there are a few areas where more advanced Chinese weapons systems could give European arms exporters a run for their money. These include diesel-electric submarines (potentially affecting French, German and Swedish submarine producers), antiship, surface-to-air, and antitank tactical missile systems (potentially affecting companies like MBDA, Saab Dynamics, and Thales), and (increasingly) UAVs and armed drones (such as the Dassault nEUROn or the Airbus Barracuda) – all segments where China already has a demonstrated expertise and has secured prior export sales. Potential *future* areas of competition could include fighter aircraft, defence electronics (such as radar systems), and surface combatants. In this

13. Fleurant et al, op. cit. in note 1.

regard – and including small arms – Chinese arms-sales successes *vis-à-vis* their European competitors would probably lie mostly at the low end, i.e., poorer countries for whom money is definitely an issue.

More significantly, the proliferation of Chinese-made arms may have an adverse impact on European security. Chinese weaponry has already spread to countries or sub-state actors who are hostile to the West, including Iran, North Korea, Venezuela, Hezbollah, and Daesh. In particular, these actors could use such systems as drones and man-portable SAMs to deadly effect against European militaries.

Chinese arms sales: how certain a bet?

China is still extremely constrained when it comes to potential customers, the types of arms they may want to buy, and the types of arms it can sell. China will not be supplanting or joining Europe (or the United States or Russia) as a large supplier of sophisticated arms anytime soon. Yet, Beijing will increasingly promote its arms on the global market and in the process it will score some coups when it comes to overseas sales. Certainly, expanding arms exports continues to be a key business strategy for Chinese defence firms, but as much as it is for almost every arms manufacturer around the world. Given the global overcapacity in armaments production and economic pressures to keep factories open and preserve jobs, everybody wants to get in on the arms-export business.

VI. STRATEGY AND CHALLENGES

Michael Raska

Introduction

China's global geopolitical aspirations, backed up by growing economic clout, shape its military-technological choices, which reflect Beijing's strategic interest in strengthening its position on global arms markets. Over the past decade, China has gone from being a large arms importer to a major exporter, with the potential to become one of the world's leading arms exporters; particularly by offering low-cost, affordable service and upgrade packages without any political conditionality attached. Chinese defence companies are increasingly expanding their bids for weapons contracts, which are often aligned on or complement Beijing's economic, trade and military-technical cooperation packages with certain developing countries in Asia, Africa and the Middle East. At the same time, however, China is using arms exports as an instrument of its foreign policy to project power and influence, enabling it to create strategic dependencies in areas that are vital to China's interests, for example in Southeast Asia.

China's increasing presence on global arms markets inherently reflects the relative progress of the Chinese defence, science, technology, innovation, and industrial base in terms of developing and manufacturing new, relatively advanced military platforms and technologies. These have been evident in the gradual, dual-track military modernisation trajectory of the People's Liberation Army (PLA), characterised by upgrading the existing arsenal of legacy weapons systems and platforms, while experimenting with the next generation of design concepts. The PLA has introduced a range of qualitatively modern weapons platforms and technologies, including reconnaissance-strike complexes comprised of advanced ballistic and cruise missiles, air defence systems, submarines, surface combat vessels, as well as experimental prototypes of unmanned aerial vehicles, hypersonic vehicles, and fifth-generation multi-role combat aircraft. These include, for example, the introduction of the next generation of supercomputers, aviation prototypes such as the J-16, J-20, J-31, new helicopters, UAVs, to the ongoing construction of a second aircraft carrier, as well as a record number of commissioned ships such as Type 054A, 056 frigates and 052C destroyers. At the same time, the PLA embarked on a series of major military reforms, lauded as the most far-reaching since China's foundation in 1949, which attempt to leverage the PLA's military-technological modernisation with comprehensive institutional, organisational, and conceptual transformation.[1]

1. Major PLA reforms, announced since 2016, include a new command structure with one Joint Staff Department under the Central Military Commission (CMC); inauguration of three new services – PLA Ground Forces

Under the Xi Jingpin administration, the main thrust of these reforms is focused on resolving on what is known in China as 'the two gaps': a general lack of PLA capabilities compared to advanced global peers or technologically-superior adversaries, and the inability of the PLA to align its capabilities with China's changing strategic requirements.[2]

Resolving both gaps also depends on the modernisation of the Chinese defence industry and its ability to provide weapons platforms, systems and technologies that will meet the PLA's changing operational requirements. Only a decade ago, most Chinese weapons systems were at least a generation or two behind comparable military equipment being produced at the time in the West or in Russia, and there were recurrent problems with quality and reliability.[3] Moreover, the industry lacked sufficiently capable R&D and capacity to develop and produce highly sophisticated conventional arms. Confronting these challenges, China has progressively introduced a series of medium-and long-term defence industrial strategies, plans, and institutional reforms that have generally set two broad strategic objectives:

- to catch up with the global military-technological state-of-the-art base by fostering indigenous innovation, mitigate foreign dependencies on technological transfers and arms imports, while leveraging civil-military integration to overcome entrenched barriers to innovation;

- to provide advanced weapons platforms, systems, and technologies that would enable the PLA's transformation into a fully 'informatised' fighting force – one capable of conducting sustained joint operations, military operations other than war, and missions related to China's strategic deterrence to protect China's core national security interests beyond national borders.[4]

China's defence industrial strategy

In the twenty-first century, China's strategy to achieve these objectives has focused on civil and military convergence.[5] In particular, since 2003, the conceptual umbrella

(PLAGF), PLA Rocket Forces (PLARF) and PLA Strategic Support Forces (PLASSF); revamping major Chinese military commands – from the previous seven 'Military Regions' to five joint Theatre Commands: East, South, West, North, and Central; and revamping human resource management and training. For a comprehensive overview of PLA reforms see: Phillip C. Saunders and Joel Wuthnow, 'China's Goldwater-Nichols? Assessing PLA Organizational Reforms,' *Joint Force Quarterly* no. 82, July 2016.

2. Michael S. Chase, Jeffrey Engstrom, Tai Ming Cheung, et.al. *China's Incomplete Military Transformation Assessing the Weaknesses of the People's Liberation Army* (Washington D.C.: RAND Corp., 2015), p.69.

3. Richard Bitzinger and Michael Raska, 'Capacity for Innovation: Technological Drivers of China's Future Military Modernization', in Roy Kamphausen and David Lai, (eds.), *The Chinese People's Liberation Army in 2025* (Carlisle, PA: U.S. Army War College Press, 2015), pp.129-62.

4. You Ji, *China's Military Transformation: Politics and War Preparation* (Cambridge: Polity Press, 2016).

5. Tai Ming Cheung, 'The Chinese Defense Economy's Long March from Imitation to Innovation', *Journal of Strategic Studies*, vol.34, no. 3, 2011, pp.343-44.

for leveraging civil-military integration (CMI) became known as *Yujun Yumin* – 'locating military potential in civilian capabilities', signifying the transfer of commercial technologies to military use, and calling upon the Chinese arms industry not only to develop dual-use technologies, but also actively promote joint civil-military technology cooperation. *Yujun Yumin* has been prioritised in the 2004 Defence White Paper, subsequent Five-Year Defence Plans, as well as in the 2006-2020 Medium- and Long-Term Defence Science and Technology Development Plan (MLP). Select dual-use technology development areas, for example, included microelectronics, space systems, new materials (such as composites and alloys), propulsion, missiles, computer-aided manufacturing, and particularly information technologies.[6] Initially, China's political establishment envisioned civil-military integration as institutional arrangements paving the way for a new round of associated management reforms in the defence industry, including allowing select civilian private sector firms to engage in defence work. These in turn would enable expanding linkages and collaboration between China's military-industrial complex and civilian high-technology R&D sectors.

In 2016, however, President Xi Jingping elevated CMI into a national-level strategy, noting that 'the integration of civilian and defence development will involve multiple fields and enable economic progress to provide a "greater material foundation" for defence construction, while the latter offers security guarantees for the former.'[7] In other words, CMI has been projected not only as a key enabler of the PLA's military-technological modernisation, but more importantly, as a strategy for China's long-term sustainable growth, efficiency and productivity gains, as well as mitigating internal socio-economic and environmental challenges. Currently, CMI as a national strategy expands the integration of state-owned defence research, development and manufacturing enterprises, government agencies under the State Council, universities, and private sector firms in order to advance the PLA's military modernisation, while supporting China's economic growth.[8] At the same time, China's CMI places strategic importance on foreign acquisition of dual-use technologies, resources, and knowledge in selected priority areas identified in recent defence science & technology plans – such as the '13th Defence Science and Technology (S&T) and Industry Five-Year Plan'; '2025 Defence Science and Technology Industry Plan'; and the 'Made in China 2025' advanced manufacturing plan. According to the 2015 *China Military Strategy*, 'China will work to establish uniform military and civilian standards for infrastructure, key technological areas and major industries, explore the ways and means for training military personnel in civilian educational

6. Tai Ming Cheung, (ed.), *Forging China's Military Might: A New Framework for Assessing Innovation* (Baltimore: Johns Hopkins University Press, 2013).

7. Xinhua News, 'China Focus: China Targets Better Integrated Military, Civilian Development', 21 July 2016. Available at: http://news.xinhuanet.com/english/2016-07/21/c_135530920.htm.

8. Greg Levesque and Mark Stokes, *Blurred Lines: Military-Civil Fusion and the 'Going Out' of China's Defense Industry* (Washington D.C.: Pointe Bello, 2016. Available at:http://www.pointebello.com/s/122016_MCF-Report_Pointe-Bello-nzf6.pdf.

institutions, developing weaponry and equipment by national defence industries, and outsourcing logistics support to civilian support systems.'[9]

China's long-term strategic military programmes also yield evidence of deep integration with China's advancing civilian science and technology base, which in turn is increasingly linked to global commercial and scientific networks. In this context, China is continuously benchmarking emerging technologies and similar high-tech defence-related R&D programmes in the United States, Russia, India, Japan, Israel and other countries.[10] The key aim is to accelerate China's 'absorptive capacity' to recognise, assimilate, and utilise external knowledge in the development of China's advanced technologies in both civil and military domains.[11] China calls this strategy 'indigenous innovation' – first set out in the '2006-2020 Medium- and Long-Term Defense Science and Technology Development Plan.' By pursuing 'indigenous innovation', China aims to circumvent the costs of research, overcome international political constraints and technological disadvantages, and 'leapfrog' China's defence industry by leveraging the creativity of other nations. This includes exploitation of open sources, technology transfer and joint research, the return of Western-trained Chinese students, and, of course, industrial espionage, both in its traditional form (human intelligence) and, increasingly, cyber-espionage.[12]

The evolving strategy of indigenous innovation in a broader context of civil-military integration constitutes a principal pathway for China's long-term strategic competition.[13] By pursuing this strategy, China continues to seek niche technological developments that could potentially revolutionise the PLA's military operations by providing a credible asymmetric edge in regional flashpoints in East Asia: i.e. anti-ship ballistic missiles (ASBMs), anti-satellite ballistic missiles (ASBMs), hypersonic cruise missiles, and systems converging cyber and space capabilities. Notwithstanding military-technological trajectories, China's military effectiveness will be increasingly influenced by its ability to align its political and strategic goals with technological advancements. This includes China's ability to alter strategic alliances and balances of power through international arms exports, technology transfers, and military cooperation.

9. Information Office of the State Council of the People's Republic of China, *China's National Defense in 2015*, 26 May 2015. Available at: http://eng.mod.gov.cn/Database/WhitePapers/index.htm.

10. DOD Defense Science Board, *Task Force Report: Resilient Military Systems and the Advanced Cyber Threat*, (Washington DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2013).

11. Tai Ming Cheung, 'The Chinese Defense Economy's Long March from Imitation to Innovation', *Journal of Strategic Studies*, vol.34, no. 3, 2011, pp.343-344; Scott Kennedy, 'Made in China 2025', Center for Strategic & International Studies, 1 June 2015. Available at: https://www.csis.org/analysis/made-china-2025

12. Jon Lindsay and Tai Ming Cheung, 'From Exploitation to Innovation: Acquisition, Absorption, and Application', In Jon Lindsay, Tai Ming Cheung, and Derek Reveron (eds.), *China and Cybersecurity: Espionage, Strategy, and Politics in the Digital Domain* (New York, NY: Oxford University Press, 2015), p.66.

13. Tai Ming Cheung, Eric Anderson, and Fan Yang, 'Chinese Defense Industry Reforms and Their Implications for US-China Military Technological Competition', *Research Brief - Study of Innovation and Technology in China,* University of California Institute on Global Conflict and Cooperation, 4 January 2017. Available at: https://escholarship.org/uc/item/43m5m3gp

As a result, the product range, technological advancement, and relative quality of the catalogue of Chinese-made arms offered for exports, particularly in areas such as aerospace, have made significant progress relative to the archaic offerings of the late 1990s. China introduced two fourth-generation fighters into mass production stage – the FC-1/JF-17 (developed jointly with Pakistan) and the J-10. It increased its presence in international aerospace and defence markets, promoting its new combat trainers (FTC-2000, L-15, K-8); fifth-generation fighter (J-31), missile systems (anti-ship, anti-tank, and man-portable); SAMs (HQ-9); radars (YLC-8B, SLC-2E); transport aircraft (MA60, Y-20); helicopters (Z-9G, Z-10, Z-11, Z-15, Z-19E); UAVs (Pterodactyl WJ-1, CH-4); new versions of the Type 90 tank (VT-3, VT-4, VT-5); a new generation of light armoured vehicles (VN-4); self-propelled and towed artillery (PLZ45, PLZ52); multiple rocket launchers (A-100), trucks (CS/VN3), ships (Type 053, 054A, 056), and submarines (S26T/Type 039A).

By narrowing the technological gaps with leading Russian and Western suppliers, China has been able to enter new markets with new-generation military technologies, including Saudi Arabia, Morocco, Venezuela, Ecuador, Peru, Mexico, Nigeria, Kenya, Thailand and Indonesia. In doing so, China's current arms export strategy reflects varying 'competitive' paths: in the developing countries of Latin America, Africa, and even Central Asia, China is trying to position itself as an alternative to Russian arms exports, while counterbalancing the influence of Western powers. Chinese defence contractors compete on price, while providing greater flexibility when negotiating the financial terms of arms contracts. At the same time, however, China is using arms exports as an instrument of its foreign policy to project power and influence to create strategic dependencies in areas that are vital to China's interests, for example in Southeast Asia. For example, China's recent major arms exports contracts with Thailand (S26T submarines) and military assistance to the Philippines may disrupt traditional linkages with the United States. Conversely, countries in the region may seek Chinese defence contracts to solidify security and economic ties with China.

According to recent data by SIPRI, Chinese exports of major arms increased by 74% between 2012-16, and China's share of global arms exports rose from 3.8 to 6.2%, making it the third-largest supplier in the world, following the United States and Russia. The geographic spread and number of recipients of Chinese weapons exports have also increased. In 2012-16, China delivered major arms to 44 countries – more than 60% of China's exports went to Pakistan, Bangladesh and Burma/Myanmar and another 22% went to Africa. China also delivered major arms to ex-Soviet states for the first time, including the 2016 delivery of surface-to-air missile (SAM) systems HQ9 (FD-2000) to Turkmenistan. Meanwhile, China has become less dependent on arms imports, which decreased by 11% during 2012-16. While China was the largest importer globally by a wide margin in the early 2000s, it dropped to fourth place in 2012-16. In this context, however, China remains dependent on imports of key weapons systems and advanced components, including aerospace engines such as the Russian Al-31FN and RD-33 engines used on the J-10 and

FC-1 fighters, respectively. From 2012-16, for example, aircraft engines accounted for 30% of China's arms imports, delivered from Russia (57%), Ukraine (16%), and France (15%).[14]

Strategic implications

These trends represent an ongoing shift in Beijing's position *vis-à-vis* global arms markets underpinned by the increasing technological, organisational, and financial capabilities of China's military industrial complex as well as China's growing global geostrategic interests. Notwithstanding the much improved technological capabilities, however, the potential of the Chinese defence industry is still constrained in its continuing historical and structural path dependencies. The prevailing challenges include overlapping planning structures, widespread corruption, bureaucratic fragmentation, and most importantly, no real internal competition. Other barriers to innovation include difficulties in ensuring structural strength, quality control and process standardisation, evident for example in the development of engines required for next-generation aircraft. In the long term, the question is whether China will manage to transform its defence industries into leading critical technological innovators of major weapons platforms and systems comparable in sophistication to those produced by global defence industrial powers? While such a major shift is unlikely in the short term, in the long term China will continue to seek niche technological developments that could potentially revolutionise not only the PLA but also global defence markets by providing next-generation advanced weapons systems. Ultimately, as China becomes more technologically advanced, its defence industrial trajectories will be increasingly shaped by the country's ability to align its strategic goals with technological advancements. These, however, must be viewed in the relative and comparative context of other countries' technological developments.

Taken together, China's cumulative political, economic and military rise is reshaping global as well as regional geopolitics, including strategic alliances and the balance of power in East Asia, in ways that are inherently detrimental to established great powers, i.e. US interests and those of its regional strategic partners and allies. While the US continues to maintain superior military-technological advantages and regional presence, its ability to underwrite stability in the Asia-Pacific region is increasingly challenged by China. The resulting Sino-US strategic competition, reflected for example in the emerging US Third Offset Strategy, in turn compels smaller and medium-sized states in Southeast Asia to accelerate military modernisation, particularly that of naval and air forces, to keep vital sea lanes open, conduct intelligence missions, and perhaps most importantly, provide strategic options to respond to the Sino-US competition. The result is a regional 'arms competition', characterised by incremental, often near-continuous, upgrades of existing

14. Aude Fleurant, Pieter Wezeman, Siemon Wezeman and Nan Tian, 'Trends in International Arms Transfers, 2016', *SIPRI Fact Sheet*, February 2017. Available at: https://www.sipri.org/sites/default/files/Trends-in-international-arms-transfers-2016.pdf.

capabilities, as well as in a mix of cooperative and competitive pressures, continued purchases of advanced weapon platforms, including the introduction of new types of arms and, therefore, unprecedented military capabilities.

China has a growing capability to shape the direction and future trajectory of the arms competition – not only through its military-technological development and diffusion of arms exports, but more importantly, through its strategic choices which influence the evolution of strategic alliances and the balance of power in different geographic areas. Accordingly, the ongoing struggle for dominance by the region's two major powers (China and Japan); the future of the Korean Peninsula; intra-regional competition in territorial disputes in the East China Sea and South China Sea; and perhaps most importantly, the contours of long-term regional strategic competition and rivalry between China and the United States, will be inherently shaped by China's defence industrial strategies aligned with Beijing's geopolitical and economic aspirations.

Section 3

EUROPE

VII. TRIANGULAR INDUSTRIAL TRAJECTORIES

Zoe Stanley-Lockman[1]

Introduction

Debates on the future of defence industrial competition, whether considering if Russia will continue to have sufficient capital to fund its defence industrial activities or when China will be able to develop higher quality control for reliable and precise armament production, rest on an underlying assumption: that no defence industry exists in isolation. Defence industries, as is true of other sectors, have increasingly globalised supply chains, require minerals and metals often unavailable at home and are evolving to accommodate futuristic technologies like artificial intelligence which are transnational in nature. In turn, this assumption provides a basis for examining the European defence industry in relation not only to traditional partners, but also Russia and China.

Understanding the defence industrial relationships between Europe, Russia and China is vital to enhance the efficiency and competitiveness of the European armaments industry in a globalised defence industrial context – and furthermore is also relevant to European strategic aims, including strategic autonomy and security of supply. Structured in four parts, this chapter explores how the European Defence Technological and Industrial Base (EDTIB) is impacted by Russian and Chinese investment in their respective DTIBs.

The Russo-European and Sino-European defence industrial relationships have different pasts, as well as different trajectories today. But in both cases, the dynamics have clearly shifted in the past five years. After touching upon the trends that have emerged over the past decade, this chapter will highlight how the imposition of sanctions in response to the illegal annexation of Crimea in 2014 and the election of President Xi Jinping in 2012 had different repercussions for the way in which Russian and Chinese DTIB developments impact European industry.

Next, EDTIB dependencies on Russian and Chinese metals and minerals alike are reviewed together with the goal of identifying potential supply chain vulnerabilities.

In conclusion, the chapter examines heightened competition for third markets. Perhaps the most significant change looming for Western defence industries in the coming years is the prospect of parity with Russia and China, be it in terms of

1. The author would like to thank Tzveta Dryanovska for providing background research on Bulgarian military equipment.

quality of armaments or influence over/relationships with export destinations. As a supplement to the individual chapters on Russian and Chinese arms exports in this Report, an EDTIB-centric perspective is offered in conclusion.

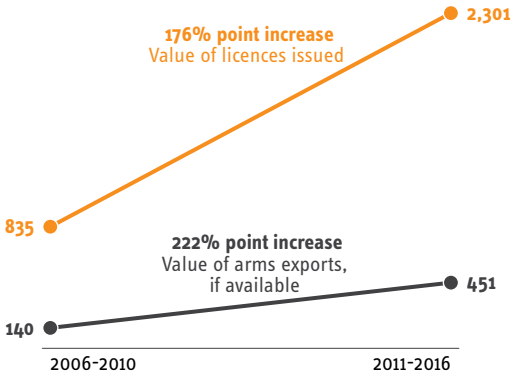
Russo-European defence industrial relationships

The illegal annexation of Crimea in March 2014 marked a clear turning point for Russo-European defence industrial relations. While much ink has been spilled on the impact of sanctions on energy, financial, automotive and the food and agriculture sectors, relatively less analysis focuses on DTIBs. Sanctions applied by the US and EU are intended to affect the Russian defence industry in two ways: (i) by prohibiting the transfer of goods, technology, technical know-how and financial assistance for Russian military use; and (ii) by placing financial sanctions on arms-producing and defence services companies themselves.

Rather than assessing the effectiveness of sanctions in hampering Russian DTIB capabilities, sufficiently covered elsewhere in this Report, this chapter evaluates the ways in which trends in recent years impact the EDTIB.

Home to one of the most autarkic defence industries in the world, Russia has only anecdotally acquired platforms from foreign sources. With the notable exceptions of Israeli unmanned aerial vehicles, French amphibious assault ships and Italian light multi-role vehicles, almost all major contracts signed by the Russian armed forces to fill capability gaps in the past decade have been granted to domestic or Ukrainian firms.

Figure 1: EU member states' arms exports to Russia (€ million)



Data: 9th-18th Annual Report on EU Arms Exports.

NB: The increase in licensing from 2014 onward is partially attributed to changes in the French reporting system.

Yet Russo-European defence industrial ties had already shifted independently of the imposition of sanctions. When Sergey Shoigu became defence minister in 2012, technology transfers and local sourcing became stronger prerequisites for entering the Russian defence market, largely aimed at disciplining Russian industry on price, schedule and performance. Thus, the trend towards less reliance on Western suppliers of defence technologies predates the crisis that broke over Ukraine in 2014. For example, already in 2013 Russia ended its cooperation with the Italian firm Iveco for light multi-role vehicles to increase

localisation of production – further demonstrating the Russian approach to cooperation as a means to the end of plugging capability gaps rather than developing long-term prospects.

Table 1: Select Russo-European defence industrial partnerships (pre-2014)

	European partner	Dates	Notes
Land	France (Renault)	Sep. 2013 – May 2014	Collaboration with Russia's UralVagonZavod on ATOM armoured infantry fighting vehicle (cancelled due to pressure from Volvo (Sweden)); ASTAIS-VBL light amphibious armoured vehicle programme with Renault components also cancelled
	France (Thales)	Feb. 2001 onward	Defence electronics (Catherine FC thermal imaging cameras) for T-90 tanks in India
	Germany (Rheinmetall)	Nov. 2011 – March 2014	Strategic partnership with JSCo Oboronservis to construct army centre for training, simulation and evaluation with facilities for military operations in urban terrain
	Italy (Iveco)	Dec. 2011 – Jan. 2013	Assembly of Iveco M65 *Rys/Lynx* light multirole vehicles. 358 delivered based on 2011 contract, with Russia deciding to not continue production of up to 1,775 planned
Naval	France (DNCS, Sagem)	Jan. 2011 – Aug. 2015	Contract for *Mistral* amphibious assault ships (helicopter carriers) initially including local assembly options for follow-on vessels [NB: platform level, but inclusive of French defence electronics such as the VAMPIR NG infrared search-and-track system]
	Italy (Fincantieri)	2005 – July 2014	Joint venture with Rubin Naval Design for S1000 diesel submarine with Italy installing German air-independent propulsion technology [halted independently of sanctions for lack of customers, then reportedly temporarily unfrozen in 2013 before being disbanded]

	European partner	Dates	Notes
Aerial	France (Thales)	1990s onward; 2006 – 2014 for defence electronics	Various defence electronics (including thermal imaging cameras, targeting pods and navigation systems) for Ka-52 helicopters, MiG-AT training aircraft and Su-30 fighter aircraft
	France (Safran)	2003 onward	Defence electronics for Sukhoi and MiG export models dating back to early 2000s
		2011 onward	Joint venture with three Russian companies (Rosoboronexport, Russian Technologies State Corporation and ZAO Inertial Technologies of Technokomplex) to co-develop LINS-100RS inertial navigation systems for military aircraft, including Ka-52 helicopters
		2009; 2012 onward	Indigenous MRO for Ka-62 and Ka-226T helicopters (following 2009 agreement to develop helicopter engines)
	Austria (Diamond Aircraft)	2013 (started)	Assembly plant for DA42 aircraft, including tech transfers to Russia for UAV engines
	UK/Italy (AgustaWestland)	Aug. 2013	Co-development of single-engine helicopter announced in 2013; also extensive spare part inventory for AW139 parts and components
Space	Europe (EADS/Airbus)	June 2005 – 2013+	Joint venture 'RS Alliance' with SYNERTECH to develop civil and military satellites, communications payloads and associated military equipment, which in 2013 developed into Starsem in an apparently more civilian and ISS focus
	France/ Italy (Thales Alenia Space)	Feb. 2013 (started)	Co-development of *Express*-4000 satellites with Information Satellites Systems

Sources: EUISS analysis; *Jane's Defence Weekly*, vol. 51, no. 32 (6 August 2014)

Therefore the greatest impact on Western European defence industries comes at the level of parts and components production rather than platform development. This explains the steady increase in EU-28 arms exports to Russia as relations thawed in the years leading up to the imposition of sanctions. According to the Annual EU Arms Exports report, arms exports from EU member states more than tripled between 2011-2016 compared to the previous five-year period.

As summarised in Table 1, European defence industrial cooperation extensively ramped up from 2011-2013. While naval and land cooperation is more platform-specific, the prevalence of defence electronics and components for aerial systems make them most prone to disruption due to sanctions. Furthermore cooperation between Russia and Italy – be it for helicopters or submarines – is distinct due to a tendency on Italy's part to regard Russia as a more equal partner rather than just a market entry point.

Technology transfers aside, these examples of cooperation do not necessarily translate into access to European defence equipment for Russian end-users. Oftentimes cooperation for parts and components targets third markets rather than Russia itself: for example, while the Russian government expressed interest in the *Damoclès* targeting pod from Thales, it was only licensed for Russian aircraft operated by the Malaysian Air Force after plans to produce the *Damoclès* under licence failed to bear fruit.

Whereas the EDTIB heavyweights have interacted with the Russian defence industry primarily for parts and components co-production, Central and Eastern Europe directly predicate their defence industries on Soviet-era legacy equipment. As such Central and Eastern European armaments industries are connected to the Russian DTIB insofar as follow-on business – from the provision of spare parts and components to 'add-on, add-up' capabilities – is concerned.

One issue, long-standing although brought to the forefront since 2014, is the unavailability of spares and subassemblies. Long used to the lack of after-sales support from Russia, post-Soviet and Soviet-customer states have specialised in sustaining and upgrading equipment. This ranges from licensed production – for example Bulgaria produces a variety of originally Soviet man-portable anti-tank systems (MANPATS) operated also by fellow EU member states Croatia, Hungary and Poland – to actually upgrading Russian equipment. This has been done notably by Poland, whose armed forces hold 64 9K33 *Osa* (SA-8 Gecko) surface-to-air missile (SAM) systems, and whose firm Wojskowe Zakłady Uzbrojenia (WZU) Nr 2 is authorised by the original Russian manufacturer to modify the SAMs themselves.

But an associated issue, exacerbated by worsening Russo-European relations since the illegal annexation of Crimea, is the fact that many of these spare parts only traverse borders via smugglers.

Sanctions may also therefore be leading more and more Western countries to step up their investment in military acquisitions. Indeed several European states have cited Russian aggression as a driver for hiked defence budgets and complementary measures to support defence industries. Citing the 'regional, geopolitical context', Romania cancelled €250 million worth of debts on 15 defence companies, then passed a new law in November 2015 to employ emergency funds to subsidise defence industry salaries.

Table 2: EU member states' dependencies on Soviet/Russian military equipment
quantity of units

Category	BG	HR	CY	CZ	EE	FI	EL	HU	LV	LT	PL	RO	SK	SI
Combat aircraft	16	13	--	--	--	--	--	8	--	--	50	26	12	--
Trainer aircraft	--	2	--	--	--	--	--	--	--	--	--	12	--	--
Transport aircraft	--	--	--	--	--	--	--	--	--	--	25	--	--	--
Attack helicopters	6	--	11	17	--	--	--	11	--	--	28	--	15	--
Multirole helicopters	--	11	--	5	--	--	--	7	--	--	25	--	13	--
SAR helicopters	--	--	--	--	--	--	--	--	--	--	2	--	--	--
Main battle tanks	80	75	82	123	--	--	--	30	3	--	505	250	30	14 + 32 in store
Infantry fighting vehicles	90	--	43	283	--	94	--	120	--	--	1,268	--	239	--
Armoured personnel carriers	120	15	--	20	15	142	--	328	--	--	--	--	79	--
Other military land vehicles	+	--	1	13	--	15	--	--	--	8	337+	--	--	--
Missile systems	+	+	+	+	--	--	+	+	--	--	+	+	+	+
Artillery/SALW	+	--	+	--	+	+	+	+	--	+	+	+	+	--
Patrol and coastal combatants	9	1	--	--	--	--	--	--	--	--	--	3	--	--
Principal surface combatants	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Landing craft and other vessels	9	--	--	--	--	--	--	--	--	--	--	--	--	--
Radar	--	3	--	--	--	--	--	26	--	--	--	--	--	+
UAVs	+	--	--	--	--	--	--	--	--	--	--	--	--	--

+ indicates unspecified quantity; Source: International Institute for Strategic Studies, *Military Balance 2017*.

BG = Bulgaria, HR = Croatia, CY = Cyprus, CZ = Czech Republic, EE = Estonia, FI = Finland, EL = Greece, HU = Hungary, LV = Latvia, LT = Lithuania, PL = Poland, RO = Romania, SK = Slovakia, SI = Slovenia

The same 'regional, geopolitical context' can also act as a driver for increased European defence cooperation and investment in the EDTIB. Table 2 demonstrates the range of equipment with ties to Soviet and/or Russian firms. These legacy systems

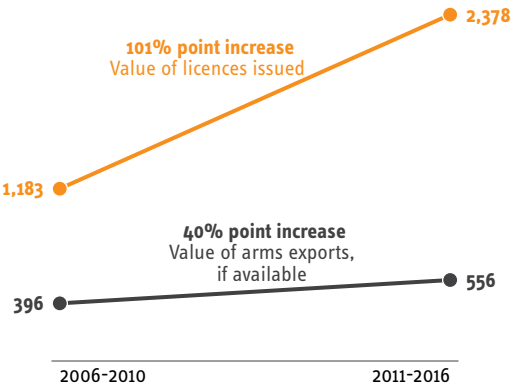
have created defence industrial opportunities in Europe in the form of maintaining, overhauling and upgrading equipment in Central and Eastern European home markets. With Soviet or Russian equipment used by half of the EU member states, the deteriorating geopolitical situation may divert even more business away from Moscow and lead fellow Europeans with the capabilities to sustain and upgrade equipment, or, when affordable, replace it. Despite protestations from Moscow that the activity is unauthorised, Poland has serviced and modernised Bulgarian MiG fighter jets to reduce its dependencies on Russia. Other countries – particularly those operating MiGs – have also looked to retire the jets and to opt for either US or European replacements.

Sino-European defence industrial relationships

An increasingly capable Chinese DTIB poses a different, longer-term threat to Western defence industries. While there are even more supply chain dependencies on China than on Russia, the biggest challenges come in the form of intangible technology transfers below the threshold of traditional defence industrial cooperation. This is largely attributed to the arms embargo on China dating back to 1989 – as well as paradigmatic shifts in the nature of defence innovation favouring more dual-use and 'spin-in' technologies.

The arms embargo did not halt all arms transfers from Europe to China. According to the annual EU arms exports report, member states have increased both licence issuances and arms exports every year consecutively since 2009.[1] Historically, most important to the development of the Chinese defence industry are joint ventures with foreign partners, several of which are European. As discussed elsewhere in this Report, Sino-foreign ventures are leveraged to gain access to design and production procedures as well as governance and management techniques. Furthermore localisation policies, often including premiums for Chinese state-owned enterprises, are pre-conditions of market access.

Figure 2: EU member states' arms exports to China (€ million)



Data: 9th-18th Annual Report on EU Arms Exports

NB: The increase in licensing from 2014 onward is partially attributed to changes in the French reporting system.

1. The European External Action Service makes available the annual reports on arms exports at: https://eeas.europa.eu/headquarters/headquarters-homepage/8472/annual-reports-on-arms-exports-_en.

Chinese shipyards have long benefited from cooperation with Europe, as demonstrated by the partially German-owned Shanghai Edward Shipyard, Danish joint production of engines and turbines and reported designs from the Spanish shipbuilder Bazan to help China develop its own carriers. Equally civilian in nature, cooperation in the aerial domain also dates back to the 1990s – including the provision of French and Italian aircraft components which China is now capable of developing independently.

Under President Xi, 2012-13 marked a turning point, when Beijing ceased demanding that the EU lift its arms embargo on China, instead opting to work within the framework of the existing export controls regime to maximise benefits from European industries. Infamous industrial espionage and the theft of intellectual property rights (IPR) from foreign firms predate this shift and remain prevalent today, but crackdowns on IPR violations and other illicit activity have also given rise to other means of accessing Western IPR and technology transfers.

Strategic investments going 'under the radar'

In addition to technology transfers and illicit activities, another method has become increasingly prevalent since China stopped asking for the EU arms embargo to be lifted in 2012. This turning point coincides with a seven-fold increase of Chinese investment flows to Europe between 2010 and 2014, from €2 to €14 billion, leading up to a monumental leap to €200 billion in 2016.[2] Recent successful transactions include the Chinese acquisition of the Finnish video game company Supercell for €6.7 billion, the German robotics maker KUKA for €4.4 billion and the German industrial machinery producer KraussMaffei Group for €925 million.

China's interest in European heavy manufacturing and information and communications technology (ICT) sectors is in line with Beijing's $300 billion 'Made in China 2025' programme. As the European Council on Foreign Relations recently noted, six of the ten priority areas – new advanced information technology, machine tools and robotics, aerospace and aeronautics, maritime equipment and high-tech shipping, new energy vehicles and new materials – qualify as dual-use.[3] European and US officials and business groups have expressed concern over the programme, part of which seeks to make China self-sufficient in burgeoning industries – the technologies of which often have military applications – by buying up market shares now.

Unlike the US, which assesses and can block investment in strategic sectors via the Committee on Foreign Investment in the United States (CFIUS) process, some

2. Thilo Hanemann and Mikko Huotari, 'Preparing for a new era of Chinese capital: Chinese FDI in Europe and Germany', Rhodium Group and Mercator Institute for China Studies, June 2015, pp. 13-14. Available at: https://www.merics.org/fileadmin/user_upload/pdf/COFDI_Chinese_Foreign_Direct_Investment_EN.pdf

3. Mathieu Duchâtel and Mark Bromley, 'Influence by default: Europe's impact on military security in East Asia', European Council on Foreign Relations, 16 May 2017. Available at: http://www.ecfr.eu/publications/summary/influence_by_default_europes_impact_on_military_security_in_east_asia_7288

officials worry that there is no Europe-wide security-screening system. In addition to calls from political leaders in Europe, the problem of foreign acquisitions is recognised in the Joint Communication on elements for a new EU strategy on China – and recently Commissioner Tajani called for the obstruction of a Chinese bid for the Dutch cable maker Draka. That is not to say that member states (and the US, via extra-territorial judicial authority from CFIUS) do not make efforts to safeguard sensitive industries individually. As seen in Table 3, a number of such processes exist but are enforced according to national prerogatives despite the acceleration of foreign takeovers of dual-use technology manufacturers.

Table 3: EU member states' investment security screening practices

Country	FDI security screening practice
Restrictions directly related to defence	
Austria	Approval for non-EEA investors acquiring at least a 25% stake in firms in certain sectors (defence, power, telecommunications, transportation and other industries)
Denmark	Approval of foreign investments resulting in ownership of more than 40% or voting rights exceeding 20% in defence firms
Finland	Restrictions on foreign acquisition of influence in defence firms
France	Review of acquisitions in certain sectors (related to public order, public safety, national defence interests including aerospace construction, nuclear energy, communications interception and detection, cryptology, arms, munitions and war materials, gambling and casinos and other industries) above defined thresholds
Germany	Review of acquisitions resulting in 25% or greater ownership, with possibility to block if such transactions constitute a threat to the security or public policy of Germany
Italy	National security screening system for national defence, energy, transport, and communications sectors 'in cases where an acquisition or other form of transaction triggers a threat of severe prejudice to essential interests of the State'
Lithuania	Prohibition of foreign investment in state security and defence sectors (with possible exceptions for EU and NATO countries)
Slovenia	Prohibition of foreign firms producing or trading in armaments
Spain	Requirement of government authorisation for foreign investment in defence-related companies
Sweden	Requirement of government permit for foreign-controlled enterprises to produce war munitions

Country	FDI security screening practice
UK	Review of investments in aerospace, energy and maritime sectors; Security of State may intervene in merger deals that could affect national security or public interest considerations
Other restrictions (including critical infrastructure protection)	
Cyprus	Restrictions for mass media, property and construction sectors (mandatory security review process abandoned)
Poland	Requirement of government approval for real estate in border areas and airport management enterprises
Portugal	Transportation and telecom ('sensitive areas') regulated by industry-specific agencies (no formal national security review)

Source: Rhodium Group and Mercator Institute for China Studies

Some of the main investments that have gone unnoticed by regulatory authorities in the US and Europe alike are in key burgeoning areas such as virtual reality, facial recognition, image detection and LiDAR sensors technologies. If IPR fallout from illegal Chinese activity is any indication, it follows that these legal, strategic investments also pose a threat to the 'E' in EDTIB. In line with debates on European strategic autonomy, safeguards for sensitive industries must be considered.

Russia, China and EDTIB supply chain security

It is unavoidable that European aerospace and defence industries depend on certain minerals and metals from China and Russia. Both countries have leveraged their extensive natural reserves to attract technology transfers and research and development for composites and associated advanced manufacturing. To date this has bred mutual dependencies – yet the looming threat of trade wars or political counter-measures is also a risk watched closely by EDTIB operators.

Palpable political tension has sparked some fears that aerospace and defence supply chains could fall victim to trade wars, a problem not yet foretold in Russia. Rare earth and raw materials such as thallium, potash, germanium, diamond, chromium and aluminium must be taken into account for security of supply roadmaps and reviews at the policy level, and are also among the materials monitored by the private sector to mitigate supply chain vulnerabilities. Advanced materials and composites from Russian titanium are consistently in high demand for the duopolistic Airbus and Boeing.

Nonetheless, because of the import dependencies on Russian and Chinese materials, the control over materials needed for advanced technology products is a vital component to supply chain safeguards.

Impact on the international arms marketplace

Both Moscow and Beijing demonstrate strong political will to advance their respective defence industries, but their financial and economic positions yield one key difference for their arms exports: while exporting is a question of survival for Russia, it is a way to thrive for China. In other words, because China consistently fills its own order books, it can afford to align arms exports with strategic imperatives in a way that Russia cannot.

The impact of this robust Chinese demand on arms exports should not be underestimated: whereas export markets compensate for the relatively small, unstable Russian markets (with the Russian defence budget approximately the same size as the French in 2016 according to the International Institute for Strategic Studies) – and indeed for fragmented European markets – the sheer size and stability of the Chinese market mean the economic benefits of exporting arms are just a bonus. Far more important are the techno-nationalist and strategic imperatives.

As Russian and Chinese DTIBs gather momentum in capabilities matching those of the US and European DTIBs and encroach on traditionally Western customer nations – as has been seen for example with Chinese UAVs in the Gulf – the EDTIB will either be eclipsed or will have to adjust. As summarised by US officials, the challenge of having 'fast followers' is becoming a 'faster leader'.

VIII. SHRINKING GAPS AND STRATEGIC CHALLENGES

Richard A. Bitzinger and Nicu Popescu

Both the Russian and Chinese defence industries are currently doing robust business. As noted throughout this Report, these two countries are progressively closing the (once quite considerable) military-technological gap with the West. Moreover the loss of this military-technological edge could severely undercut the West's ability to counter direct Russian or Chinese military threats, while also entailing greater competition for European defence industries, thus reshaping the global arms trade (which itself could affect security relationships around the world). At the same time it is worth noting that, when it comes to European security, the Russian and Chinese defence industries present different, but equally compelling, challenges.

The rebirth of the Russian defence industry

The Russian defence industry represents a critical segment of the country's economy, employing at least 2.5 million workers, and accounting for 20% of all manufacturing jobs. The arms industry suffered considerably after the collapse of the Soviet Union in the early 1990s and subsequent years of neglect due to a precipitous drop in military expenditure. The resulting plunge in Russian defence procurement spending meant that the Russian arms industry had to find overseas customers or else face extinction. By the early 2000s, therefore, the Russian arms sector reportedly relied on arms exports for up to 80% of its income, and securing overseas buyers was absolutely critical to the survival of the Russian defence industry.

Today, the Russian arms industry is experiencing something of a renaissance. By the end of the first decade of the new millennium, Russian defence spending had begun to rise again, and the defence sector has grown, despite the impact of plummeting oil prices and Western sanctions (imposed after Moscow's annexation of Crimea in 2014) on the overall Russian economy. Domestic military procurement spending is up considerably, reaching US$69 billion in 2016. At the same time, overseas arms sales have remained strong, amounting to approximately US$30 billion over the 2012-16 period, according to the Stockholm International Peace Research Institute (SIPRI). Russia's aircraft and air-defence (missile) sectors have been particularly strong performers. For example, Russia's United Aircraft Corporation (UAC, which incorporates the Sukhoi, Mikoyan, Ilyushin, Yakolev, Beriev, Irkut, and Tupolev aircraft firms), has achieved remarkable success in recent years, both in terms of the number of aircraft produced and in terms of sales. UAC produces about 200 aircraft a year, both military and civilian, although 80% of UAC's revenues currently come from military sales. Most of its output used to be exported, but currently purchases

by the Russian military account for 80% of UAC's income (mostly Su-27/-30/-35 fighters, as well as upgrades of MiG-29s).

Even so, this recovery is tenuous. The perilous state of Russia's economy could easily lead to new defence spending cuts. Despite prior assurances by Putin that the defence budget would be shielded from planned 10% government-wide spending reductions, the decline in world oil prices and the impact of Western sanctions could lead to a change in policy. Western sanctions on Russia could also soon affect the defence industry. These restrictions have halted not only Western military exports (which help fill critical gaps in Russia's defence capabilities) but also commercial high-tech transactions that could have dual-use military applications.

The Russian defence industry faces critical structural challenges as well, including inflation, high levels of debt, and the loss of qualified personnel. For example, inflation, currently running at around 15% – and it is alleged that in certain weapon categories the figure is closer to 30% – has eaten up much of Russia's military procurement budget. Many defence firms are still struggling to achieve profitability. More importantly perhaps, the manpower base within the Russian defence industrial sector is ageing rapidly; the average age of its scientists and engineers is now around 50, meaning that, in a few years, the Russian defence industry could face a severe shortage of technical staff and expertise.

These longer-term issues aside, the rebirth of the Russian arms industry presents a direct military challenge to Europe. Under Putin, the Russian armed forces have begun to climb back from the nadir reached in the 1990s and 2000s. While the modernisation and transformation of the Russian military is still far from complete, it is on a distinct trajectory of becoming once again a force to be reckoned with. These advances are manifest in the regional insecurity that is increasingly gripping the countries of Western and Central Europe.

In addition, the Russian arms industry still craves and pushes export sales, directly competing with Western arms suppliers. Besides being a source of foreign hard currency and additional profits, overseas arms sales serve as a hedge against future possible downturns in Russian military procurement. In its efforts to secure increased overseas arms sales, certain factors are in Russia's favour. Russian arms are reliable and relatively easy to operate. In addition, the Russian defence industry is now keen to emphasise after-sales servicing, so MRO (maintenance, repair, and overhaul) and upgrades are increasingly on hand. Most importantly of all, perhaps, Moscow offers many types of highly capable weapons systems (such as the Su-30 multi-role fighter and the S-300/-400 air-defence missile) with few restrictions and at very competitive prices. At the same time, Russia is continuing to develop the kinds of products that could find a welcome niche in the global arms market, even though many of these systems are being developed for local requirements. Moscow, for example, could easily market its T-50 fifth-generation fighter as a cheaper alternative to the US F-35 Joint Strike Fighter.

China: a successful arms exporter

China, for its part, possesses great power aspirations that drive much of its requirements for a modern military, particularly when it comes to projecting sustained power beyond its borders, delivering firepower and precision-strike capabilities, and dominating the information battlespace. Beijing, for example, seeks to gain 'hard' power commensurate with growing 'soft' (i.e., economic, diplomatic, and cultural) power. These goals are clearly apparent in China's increasingly assertive, even belligerent, behaviour in the South China Sea and in the Indian Ocean region, building up and fortifying bases and operational access points. China is keen to build its expeditionary forces so as to be capable of projecting sustainable military power throughout the whole of the Western Pacific and into the Indian Ocean. In particular, this goal has led Beijing to shift priorities away from ground forces in favour of building up the naval, air and missile forces of the People's Liberation Army (PLA). According to its 2015 White Paper, the PLA will continue to de-emphasise land operations, all but abandoning the People's War (except in name and in terms of political propaganda), particularly with a view to giving new stress and importance to seapower and force projection: 'The traditional mentality that land outweighs sea must be abandoned, and great importance has to be attached to managing the seas and oceans and protecting maritime rights and interests.'[1] As a result, the PLA Navy (PLAN) 'will gradually shift its focus from "offshore waters defence" to a combination of "offshore waters defence" and "open seas protection",' an evolutionary development from what was announced in the 2006 White Paper, which proclaimed that the 'Navy aims at gradual extension of the strategic depth for offshore defensive operations.' This will require a 'combined, multi-functional and efficient marine combat force structure. The PLAN will enhance its capabilities for strategic deterrence and counterattack, maritime maneuvers, joint operations at sea, comprehensive defense and comprehensive support.'[2]

Overall, China has been engaged in an ambitious, concerted, and methodical transformation of its armed forces since the late 1990s. China's recent military acquisitions, as well as its current R&D efforts, particularly its emphasis on 'trump card' weapons for asymmetric warfare, have been critical developments in the upgrading of its war-fighting capabilities. At the same time, the PLA has made considerable progress over the last 15 years in enhancing the professionalism of its military personnel, and in expanding its training and making it both more oriented towards realistic conflict scenarios and more capable of conducting joint interservice operations. Consequently, China has noticeably improved its military capabilities in several specific areas – especially missile attack, precision-strike, power projection at sea and in the air, and joint operations. In particular, the Chinese have made significant

1. 'Section IV: Building and Development of China's Armed Forces', *China's Military Strategy* (Beijing: State Council Information Office of the People's Republic of China, May 2015). See also Dennis J. Blasko, 'The 2015 Chinese Defense White Paper on Strategy in Perspective: Maritime Missions Require a Change in the PLA Mindset', *China Brief*, 29 May 2015.

2. Anthony H. Cordesman and Steven Colley, *Chinese Strategy and Military Modernization in 2015: A Comparative Analysis* (Final Review Draft) (Washington DC: Center for International and Strategic Studies, 10 October 2015), p. 41.

advances in exploiting informatisation, in order to promote the development of advanced weaponry, accelerate the pace of military modernisation, and create new levers of military power for the PLA.

This transformation of the PLA initially relied heavily upon arms imports and technology transfers from Russia. Since the middle of the last decade, however, China has reduced its dependency on Russian imports and increased its reliance upon the local arms industry to supply it with modern weaponry. Overall, the Chinese defence industrial base has made impressive advancements over the past decade and a half in terms of developing and manufacturing new, relatively modern military systems.

At the same time, there still exist critical shortcomings in the Chinese defence industry. In particular, it remains woefully deficient in the area of propulsion systems, including gas turbine engines for its destroyers, marine diesel engines for its diesel-electric submarines, and, above all, turbofan engines for its combat aircraft. The country still lacks the ability to build a suitable jet aircraft engine, and it must continue to purchase engines from Russia to power its indigenous fighter jets.

Nevertheless, China has become a successful arms exporter, increasingly competing with Western arms producers for critical overseas markets. In 2016, Beijing transferred over US$2 billion worth of arms, according to SIPRI. Moreover, SIPRI data for the period 2012 to 2016 showed that China was the world's third-largest arms exporter, accounting for 6.2% of the total arms market. China is increasingly securing arms sales to countries that were traditionally captive markets of the West, such as the oil-rich Gulf states and certain countries in Latin America. Some Chinese arms are highly competitive *vis-à-vis* their Western or Russian counterparts, including unmanned aerial vehicles and armed drones, anti-ship cruise missiles (ASCMs), shoulder-fired surface-to-air missiles, and lightweight trainer jets. Other areas where China could increasingly pose a threat to Western arms exporters include submarines and modern fighter aircraft.

Chinese military spending has been much stronger than Russia's over the past 20 years, and as a result its domestic defence industry has been able to maintain a much more robust pace of development and modernisation. One result has been a marked decrease in Chinese arms purchases from Russia. China could even begin to cut into Russian arms exports; Beijing has begun to sell arms to countries – including Algeria, Nigeria, Indonesia, Turkmenistan, and Venezuela – that were once steady customers for Moscow.

While a modern Chinese military does not directly threaten the security of Western and Central Europe, it does pose a long-term problem to global security. A more militarily powerful China is more likely to challenge the traditional post-World War II international order; indeed, this is already happening in the western Pacific Ocean. China is also increasingly expanding its security footprint in the Indian Ocean region, and its One Belt One Road (OBOR) initiative seeks to create a network of

ports, bases and other infrastructure stretching from 'Quanzhou in the Fujian province' to 'the northern Mediterranean Sea.' Increasingly, therefore, the Chinese military is making its presence felt in Europe.

Conclusion

While the Russian and Chinese defence industries are clearly pursuing different trajectories, the increasing sophistication of Russian and (especially) Chinese arms presents both growing opportunities and challenges to the European defence technology and industrial base (EDTIB). The three-way (Europe-Russia-China) competition for third-party arms markets will likely grow. As many regional arms markets – in Southeast Asia, in Africa, and in Latin America – become more open and more contested, the pressures to compete rather than cooperate could become dominant. Overall, the global business of producing arms is likely to become more competitive, with more and newer players producing a wider range of sophisticated weapons systems, increasingly turning armaments into a commodity – thereby leading to a situation in which there exists less and less meaningful differentiation between competing products, and where they are instead sold increasingly on the basis of price. If the EDTIB fails to maintain its military-technological superiority and the 'commoditisation' of arms continues, then the European arms industry will struggle not to lose ground to new competitors.

ANNEX

ABBREVIATIONS

A2/AD	Anti-access/Area denial
ASCMs	Anti-ship cruise missiles
CFIUS	Committee on Foreign Investment in the United States
CMI	Civil-military integration
DIC	Defence Industrial Complex
DTIB	Defence Technological and Industrial Base
EDTIB	European Defence Technological and Industrial Base
GDP	Gross Domestic Product
ICBM	Intercontinental ballistic missile
IPR	Intellectual Property Rights
LMW	Light Multirole Vehicle
NATO	North Atlantic Treaty Organisation
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
R & D	Research and Development
SALW	Small Arms and Light Weapons
SAM	Surface-to-air missile
SAR	Search and Rescue
SCO	Shanghai Cooperation Council
SOEs	State-owned enterprises
UAC	United Aircraft Corporation
UAVs	Unmanned aerial vehicles
UN	United Nations
USSR	Union of Soviet Socialist Republics

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