

НОВЫЙ
ОБОРОННЫЙ ЗАКАЗ
СТРАТЕГИИ

№ 1 (72) 2022

NEW DEFENCE ORDER STRATEGY



DUAL
PURPOSE



STRENGTH AND POWER AT SEA

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Dual Purpose

Diversification is a steady trend in the Russian defence industry. The government has set the goal of increasing the share of civilian products up to 50% by 2030.

The goal of this big project, in which all defence enterprises and corporations must participate, is to ensure economic security of the industry and increase the enterprises' profitability. The defence industry is changing all over the world. Most of the innovative technologies are dual-use. Boundaries are blurring both between applications and between industries.

In this situation, new opportunities emerge for effective use of the defence industry potential to manufacture high-tech civilian products in demand in domestic and foreign markets. The readiness of the Russian defence industry complex to generate competitive offers will increase due to development of new dual-use products and components within the framework of import substitution, as well as owing to digitalization of the main production processes and transition to a single product life cycle.

The Russian Ministry of Industry and Trade, the Industry Development Fund, and the Russian Export Center are constantly developing and improving a set of steps to support measures to diversify the production of defence enterprises. The Industry Development Fund offers preferential loans. The Russian Export Center has developed a mechanism of subsidizing expenses of defence enterprises for participation in exhibition events.

An important role in building up technological and economic potential is assigned to the development of cooperation with partner countries. Production localization, partner projects in diversified areas, and joint development of high-tech dual-use products are priority marketing strategies for the development of the Russian defence industry. ♦

EDITOR-IN-CHIEF
Alexandra Grigorenko



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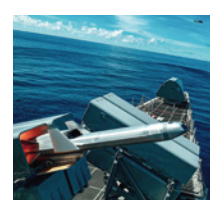
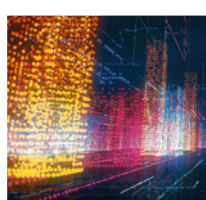
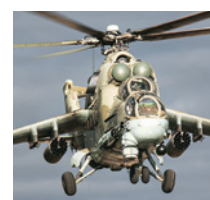
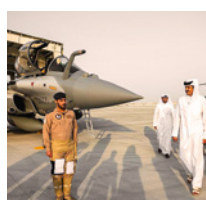
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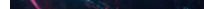
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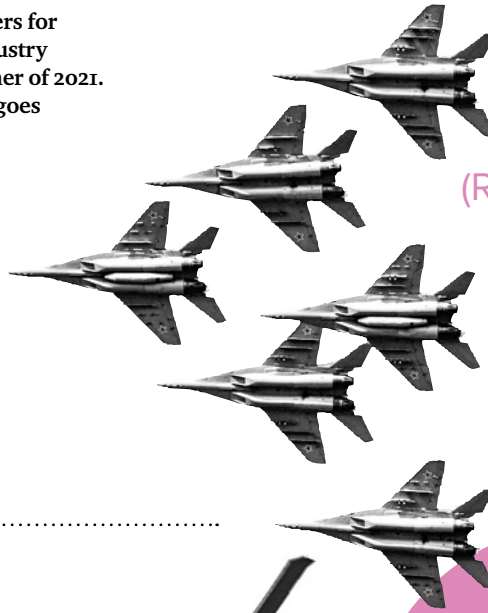


\$52
BILLION



The portfolio of orders for Russian defence industry products as of summer of 2021. 50% of this amount goes to combat aviation

\$3.4
BILLION
(RUB 265 BILLION)



The amount of contracts and letters of intent signed during the 15th International Aviation and Space Salon MAKS 2021

The share of Russian arms exports that went to India between 2016 and 2020. The second place is occupied by China (18%) followed by Algeria (15%), according to SIPRI

23%



\$10
BILLION



Despite the difficulties caused by the pandemic, Russia's cooperation with its partners and customers has been sustainable and constructive. The volume of new contracts signed in 2021 exceeded \$10 billion, said the Russian Minister of Defence

The Forum ARMY 2021 was attended by representatives of 117 foreign countries who sent their official military delegations, of which 36 were high-level ones. The total number of foreign military departments' representatives exceeded 500 people

117
COUNTRIES



United Shipbuilding Corporation and India

The authorities of Australia, the United Kingdom, and the United States announced the foundation of a strategic partnership block called AUKUS on September 15, 2021. The first item in the cooperation plan is giving Australia access to nuclear submarine fleet technology and the subsequent construction of at least eight nuclear attack submarines for the Australian Navy. The fact that a country that is not a member of the unofficial nuclear club and has no nuclear power will receive state-of-the-art naval weapons is, in effect, a declaration of the openness of the nuclear submarine market.

Author Dmitry Boltenev

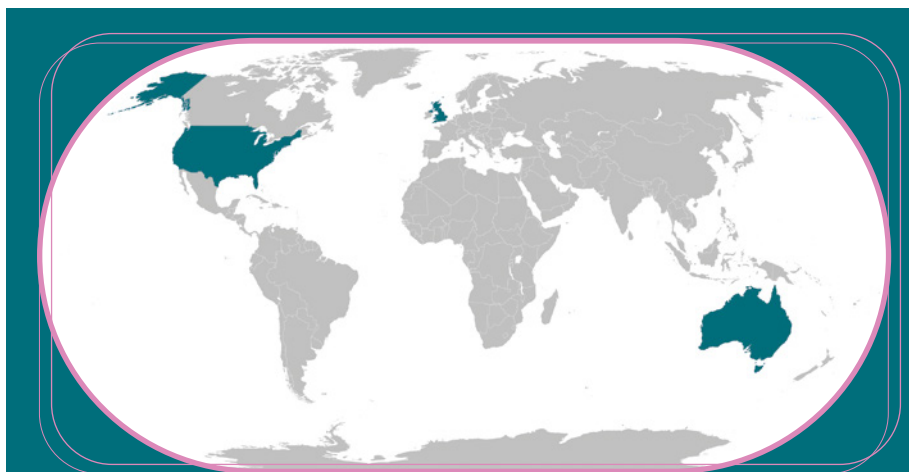
Such allowances on one continent could indirectly spur activity on another, in particular through increased naval cooperation between Russia and India. India has already leased nuclear-powered submarines twice. The first time (in 1988–1991), a Project 670 K-43 boat called Chakra served in the Indian Navy. The second time (from 2012 to 2021), a Project 971I nuclear submarine K-152 Nerpa was on lease, also in the Navy, and was also called Chakra. The K-152 was the penultimate submarine to be completed from the Soviet legacy¹. Russia made about \$650 million on this lease.

In October 2016, a preliminary agreement was signed to lease another nuclear-powered submarine to India after the K-152 has returned home. The final inter-governmental agreement was concluded in March 2019. It is planned that one of the submarines currently under repair at the Zvezdochka Center in Severodvinsk will be upgraded to Indian requirements and handed over to the Indian Navy by 2025. It is likely to be a Project 971 Samara or Bratsk submarine. The cost of the submarine modernization and leasing payment will amount to about \$3.3 billion. The media reported that India was going to lease one of the Project 885M submarines under construction at Sevmash. However, the application was rejected due to the Russian Navy's urgent need for such submarines.

In December 2019, India's ANI news agency reported on plans to expand In-

dia's submarine fleet to six nuclear-powered multi-purpose submarines and 18 non-nuclear submarines. After the conclusion of the AUKUS agreement, the number of Russian-Indian contracts in the development of the Indian nuclear submarine fleet is expected to grow. The only constraint will be the capabilities of

the only Russian enterprise which produces nuclear submarines, Sevmash². The machine-building company is currently implementing extensive Russian plans to build fourth-generation nuclear-powered submarine cruisers. Therefore, one can assume that Russia will offer India several more Project 971 submarines from those



AUKUS (an acronym for Australia, the United Kingdom, and the United States) is a trilateral defence alliance formed by Australia, the United Kingdom, and the United States. The announcement was published on September 15, 2021. As part of the alliance, the Australian Navy will be able to build nuclear-powered submarines for the first time. According to observers, the pact is aimed at countering China's influence in the disputed waters of the South China Sea

¹ The last nuclear-powered submarine from the Soviet legacy was the special-purpose Belgorod, which is currently being completed.

² Under the Soviet Union, the construction of nuclear submarines was carried out at four plants.



Project 971 atomic submarine K-152 Nerpa

undergoing refurbishment at the Zvezdochka Center in Severodvinsk.

In addition to developing a nuclear submarine fleet, India has plans to increase and upgrade its non-nuclear submarine force. The Indian Navy possesses eight Project 877EKM³ boats built in the late 1980s and early 1990s in the USSR and Russia⁴ and four German Project 209/1500 submarines built between 1986 and 1994. The Republic of India is also building non-nuclear Scorpene type submarines under French license, two of which joined the Navy in 2017 and 2019. In total, the Indian military plan to include six such boats in the fleet. Scorpene has been under construction in Indian shipyards for about 10 years.

Project 877EKM submarines have already undergone one or two medium repairs at Russian enterprises. Indian mariners are actively operating these ships and Zvezdochka specialists gained tremen-

dous experience working with this class of submarines and used it in the repair of three similar ones for the Russian Navy.

In 2008, Indian authorities announced a tender for the construction of six modern non-nuclear submarines. One of their requirements was the ability to strike ground targets with missiles. The tender itself is called "Project 75I" and estimated at about \$6 billion. The boats are to be built in Indian shipyards with the transfer of construction technologies.

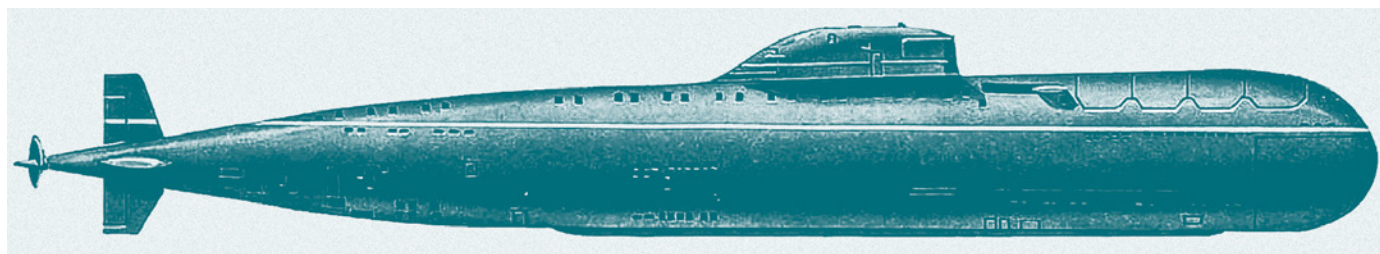
In general, Indian tenders for supply of arms and weapons, when there is a choice between several suppliers, take a very long time and sometimes end in a very unexpected manner. For example, India's long-running tender for the purchase of more than 100 combat fighters (so that about 18 are to be supplied by the winning country and the rest assembled in India) has so far only led to the purchase of Mig-29s from Russia out of the

Russian Air Force inventory and to the delivery of additional kits for the assembly of Su-30MKI⁵ in India.

At the same time, India's current submarine force is rapidly aging⁶. Russia has already expressed willingness to transfer three Project 877 submarines from the Russian Navy's inventory to India, and repair three Indian boats at its shipyards. India's attempt to overhaul Project 877EKM on its territory with the help of Russian specialists has not been successful so far. Only one boat has been repaired in 10 years; Zvezdochka plant carries out similar repairs in three years.

The strength of Russian proposals under Project 75I is the joint design of a non-nuclear submarine based on Project 677 and Amur 1650 with the maximum possible transfer of construction technologies. The other participants are in no hurry to offer similar or at least comparable terms of partnership integration. One

Project 670 K-43 submarine



⁵ If there is no choice between several suppliers, India makes a decision fairly quickly. This was demonstrated by the purchase of Russian S-400 long-range air defence systems and American P-8I Neptune base patrol aircraft. No one else in the world offers analogues of these weapons.

⁶ Most of India's non-nuclear submarines are at least 20 years old and clearly need to be replaced in the coming years.

³ India received a total of 10 such subs, but one was lost due to an accident on board and another was transferred to the Myanmar Navy.

⁴ Between 1969 and 1976, the USSR delivered eight Project 641I submarines to India. This project was the first domestic purpose-built submarine project for export.



Project 877 submarine

INDIA'S ATTEMPT TO OVERHAUL PROJECT 877EKM ON ITS TERRITORY WITH THE HELP OF RUSSIAN SPECIALISTS HAS NOT BEEN SUCCESSFUL SO FAR. ONLY ONE BOAT HAS BEEN REPAIRED IN 10 YEARS; ZVEZDOCHKA PLANT CARRIES OUT SIMILAR REPAIRS IN THREE YEARS



Project 677 submarine

more strong point of Russian proposals is the existence of the BrahMos cruise missile, a joint Russian-Indian venture, that may be used on the boats of this project. The lack of a ready-made air-independent power plant is cited as a weakness of the project. In general, the United Shipbuilding Corporation (USC) has good prospects for cooperation with India in the submarine fleet, both nuclear and non-nuclear.

Russia's and India's experience in cooperation in the segment of surface warships is no less impressive than what has been previously mentioned so far. Between 1976 and 1988, India built five 61ME destroyers based on the Soviet Project 61 big anti-submarine ship. In contrast, the 61ME was capable of permanently deploying a helicopter aboard and equipped with anti-ship missiles. The Indian Navy still has three such ships in service. This project was the first major export of domestic warships.

The Soviet Union also provided Indian shipbuilders with advisory and technical assistance and supplied various types of ship armament, including missile systems⁷. As a result, the Indian Navy was supplied with rather interesting Godavari frigates,

similar in appearance to the British Leander, but equipped with Soviet weapons and avionics. Subsequently, with the help of Russian specialists and on the basis of the unrealized Soviet Project 11000 destroyer, six Project 15 Delhi and Project 15A Kolkata destroyers were built in India in 1987–2016.

In the early 1990s, Severnoye PKB specialists developed and offered to importers the frigate 11356 based on the Soviet Navy's Project 1135 patrol ship. Between 1999–2004 and 2007–2013, two series of these ships were built for the Indian Navy, each with three units, manufactured by Baltiysky Zavod in St. Petersburg and the Kaliningrad-based enterprise Yantar. Export made it possible to retain specialists and sustain technical capabilities of Russian shipbuilding enterprises, which did not have orders from the Russian Navy at that time.

An important effect of Russian-Indian cooperation in weapons development was that combat systems developed for India were subsequently supplied to the Russian Army and Navy. This happened with the Su-30MKI fighter jet and Project

11356 frigates. From 2010 to 2017, the Yantar company built three such frigates for the Russian Navy's Black Sea Fleet. Due to the complete cessation of military and technical cooperation between Russia and Ukraine in 2014, the ships became 'stuck' at the plant as Ukraine refused to hand over the gas turbine units that had already been manufactured. India developed a design for the frigate Shivalik based on Project 11356 with the help of Russian specialists, and three such ships were built in India between 2001 and 2011.

In October 2016, an agreement was reached with India to complete two of the three frigates remaining at Yantar and to build two more in India. This made it possible to obtain from Ukraine two sets of propulsion systems that had already been manufactured and to get back the money spent on them. According to the contracts concluded by 2018, the completion of two frigates at Yantar is estimated at about \$1.2 billion, and Russian participation in the construction of two frigates in India, about \$500 million⁸. The frigates Tushil and Tamala, now under construction at Yantar, will be handed over to India in

⁷ And in the 21st century, Russia supplied India with large batches of Uranium and Club missiles.

⁸ Figures are based on the materials of the Center for Analysis of Strategies and Technologies.



Vikramaditya Aircraft Carrier



Shivalik Indian Frigate



Project 11356 Frigate

2022–2023 and the ships laid in India in 2021 will join the Indian Navy in 2026⁹.

Another Indian tender for minesweepers has been dragging on for years. The Indian Navy has no such ships, and now it intends to acquire three or four minesweepers on short notice from other navies or decommissioned ships that could be re-equipped for Indian Navy requirements before handing them over. So far, there is no talk of acquiring new destroyers. Russia might transfer naval minesweepers of Project 266M, now being withdrawn from the Indian Navy. Fortunately, the Indian Navy had 12 export versions of the same project minesweepers in service. In the future, it might be possible to offer India export versions of Project 12770 minesweepers under construction in Russia.

In the next few years, India may need to replace Project 1241RE class missile corvettes that remain in service. Five of these ships were built in the USSR, and six more corvettes have been assembled in India. Russia may propose the project of small missile ships 22800E, which will be armed not with Kalibr missiles, but with the BrahMos system.

From 2005 to 2017, Russia's share in the Indian military equipment market was 45% at an estimated cost of \$38.7 billion. During that period, in the naval sphere, India received from Russia a fully modernized aircraft carrier Vikramaditya (the former Soviet heavy aircraft carrier Admiral Gorshkov), a nuclear submarine Chakra, and three Project 11356 frigates. Moreover, a number of Indian non-nuclear submarines were repaired.

Today, the Indian government is developing the defence industry under the 'Make in India' initiative. Russia is ready to support its partner both by transfer of military technologies and joint development of armaments and military equipment. Good examples are the BrahMos missile system and the Su-30MKI multirole heavy fighter.

At the same time, Indian industry is not yet able to fully develop and produce the entire range of naval equipment, so USC should be ready for direct deliveries of modern warships and submarines in export versions, both those built specifically for India and those currently in service with the Russian Navy. ♦

⁹ In October 2020, it became known that a buyer was found for the last frigate of the project, unfinished for Russia.



CSTO Countries as Suppliers of Military Equipment

Author Olesya Zagorskaya

Russia, as a country with a well-developed defence industry, is the main supplier of armaments, military and special equipment for the needs of the Collective Security Treaty Organization (CSTO) member states. However, challenges and threats associated with the deteriorating situation in Afghanistan require a rapid increase of capabilities to secure the CSTO borders, and for this purpose, the military-industrial complexes of Belarus and Kazakhstan will also be involved in the military products supply to the CSTO member countries. This statement was made by Deputy Prime Minister of the Russian Federation and Chairman of the CSTO Interstate Commission for Military and Economic Cooperation (ICMEC) Yuri Borisov.



The Collective Security Treaty was signed on May 15, 1992 in Tashkent. On May 14, 2002, the Collective Security Treaty Organization (CSTO) was established. On October 7, 2002, in Chisinau, the CSTO Charter was adopted, according to which the main objectives of the organization are: strengthening of peace, international and regional security and stability, collective protection of the independence, territorial integrity, and sovereignty of the member states, and in achieving all of these the member states use political means as the priority.

Currently, the CSTO includes six member states – Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, and Tajikistan. The Collective Rapid Deployment Force of the Central Asian Region (CRDF), the Collective Rapid Reaction Force (RRF), the Peacekeeping Forces (PF) and the Collective Air Force (CAF) of the CSTO are formed within the organization. CSTO carries out its activities in cooperation with various international and regional organizations.

According to the Russian Ministry of Foreign Affairs



The issues of improvement of military-technical cooperation and integration of military-industrial systems of CSTO member states have been raised long ago. In 2009, Nikolay Bordyuzha, Secretary General of CSTO, noted that the issue of military-technical cooperation was becoming one of the main issues in the activities of the Organization. Now it seems that words have moved to action: the September meeting of the ICMEC and the session of the CSTO Collective Security Council resulted in an announcement not only of the involvement of Minsk and Nur-Sultan military-industrial complexes (MIC) in strengthening the Tajik-Afghan border, but also of the formation of a joint budget of the CSTO members for conducting research and development in the military sphere. “This is a new direction. We are starting to move from simple verbal coordi-

nation to a more serious integration,” Yuri Borisov commented.

UNEQUAL OPPORTUNITIES

The level of development of the military-industrial systems, scientific and technological reserves and the military-technical potential of the CSTO member states, and therefore the contribution they will be able to make to the organization’s joint projects, are not equal and even not comparable.

After the collapse of the Soviet Union, the bulk of the design bureaus and industrial enterprises that produce finished products were concentrated in Russia, and the cooperation chains with the MIC of the former Soviet republics were broken. During the difficult years of the formation of sovereign states, development of the defence industry actually dropped out of sight, and some en-

terprises, whose products were no longer in demand when they had found themselves in a difficult economic situation, ceased to exist. Today, the situation has generally improved, but the peculiarities of the defence industry of the CSTO countries are still conditioned by the “local areas of specialty” that took shape in the Soviet years.

The Russian defence industry remains the undisputed leader in the CSTO, not only is it capable of providing its own armed forces with modern types of weapons and military and special equipment, but also it ranks second in terms of arms exports in the world. At the same time, Tajikistan, whose economy is based on agriculture, has virtually no industrial base, let alone the defence industry. Armenia and Kyrgyzstan have facilities that can repair armaments and even produce simple items for their own needs, but it would be strange to talk about ambitions of these states to act as exporters in the global arms market. Belarus and Kazakhstan, although they have a fairly developed defence industry and even export a significant amount of military products, are not always able to produce weapons, military and special equipment as the final product themselves and are quite limited in the range of manufactured items.

But each of these countries has the tasks of military construction and ensuring its military security. Therefore, of course, they are interested both in the purchase of weapons from Russia through the CSTO (because for the equipment of national formations included in the collective forces, there are supposed supplies of weapons, military and special equipment on special terms, at the lower, “clubby” prices, effective in purchasing for the Russian Army, with the same military characteristics) and in the integration of defence industry within the organization to develop their own industrial capabilities and even export joint products to third countries.

However, the CSTO countries are no less interested in building military-technical relations on a bilateral basis. And the Russian Federation is not necessarily one of the parties to these interactions. Also, it is not always about the import of weapons, military and special equipment.

IN THE TOP-20

Belarusian MIC was an important component of the defence industry of the Soviet Union. By 1991, about 120 defence enterprises and organizations, including 15 design bureaus and research institutes were located on the territory of the republic. According to experts, many of them were



saved thanks to the right management decisions. Due to its location on the western border, the country had practically no enterprises producing finished products – traditionally, the Belarusian defence industry produced components for weapons systems and military equipment. An important component of the Belarusian defence industry has been, and remains to be, plants for repair and modernization of armaments and military equipment, which provide an opportunity to earn money from maintenance and upgrading of Soviet-made equipment. All this has determined the specifics of Belarus as a supplier of military products and services.

According to the Stockholm International Peace Research Institute (SIPRI), Belarus ranked 17th in the world in total exports of conventional weapons from 1991 to 2020. The list of specific transfers cited by SIPRI is generally confirmed by data from the UN Register of Conventional Arms (UNROCA), which compiles its databases based on reports submitted by countries.

From these sources we know that in the 1990s Belarus supplied two Su-24 bombers and 25 MiG-29 fighters, including six MiG-29UB trainers from Russia to Algeria; six BM-21 Grad MLRSs to the Democratic Republic of Congo; 40 T-55 tanks and two Mi-24/Mi-35 helicopters to Ethiopia; four Mi-24/Mi-35 helicopters to Rwanda, two of those to each Serbia and Uganda, and two more (of the four) to Sierra Leone. In addition to all that there were eight Mi-24/Mi-35s, Sudan received nine T-55s and another 60

such tanks in the early 2000s. One hundred T-72M1 tanks were supplied to Hungary and one hundred T-72B tanks to Morocco. Peru received X-25 and X-27 anti-radar missiles (100 each), X-58U (25 each), 18 MiG-29 and Su-25 missiles, more than 250 R-60 short-range air-to-air missiles and 70 R-27 medium-range air-to-air missiles. Angola got 21 BMP-1 and 62 BMP-2 armored infantry fighting vehicles, one Su-24 bomber, seven Su-22 and seven MiG-23 fighters, two Su-27C, 12



DMITRY PANTUS,
CHAIRMAN OF THE STATE
MILITARY INDUSTRIAL
COMMITTEE OF THE REPUBLIC
OF BELARUS

For obvious reasons, different CSTO countries have different potential for military-technical cooperation. At the moment, one of our key goals is to create a joint product using the competences and experience in military-technical cooperation that the CSTO member states possess



BEIBUT ATAMKULOV,
MINISTER OF INDUSTRY
AND INFRASTRUCTURE
DEVELOPMENT OF
KAZAKHSTAN

Today, the defence industry complex of Kazakhstan has a considerable export potential and occupies a certain niche in the economy of our country; contemporary models of Kazakhstani military hardware exhibit a high level of competitiveness. Kazakhstan has developed a modern space infrastructure, with satellite communications and remote sensing systems capable of providing communication services, as well as images of the Earth's surface monitoring from space

2S7 Pion self-propelled guns, 24 BM-21 Grad MLRS, 12 D-30 howitzers, 62 T-55AM-2 tanks and 22 T-72M1 tanks. Pakistan has probably received 1,920 9M119 anti-tank missiles for the T-80UD.

In the early 2000s, Minsk supplied 10 D-30 howitzers to Armenia, and in the same years 30 similar howitzers were supplied to Azerbaijan, as well as 60 T-72M1 tanks and 12 2S7 Pion self-propelled guns. Cote d'Ivoire also received 10 2B11 transportable mortars, An-12 transport aircraft, four Su-25 assault aircraft, two Mi-24/Mi-35 and one Mi-8T helicopter, 13 BMP-1 and the same number of BRDM-2, six BM-21 Grad MLRSs and the same number of BTR-80 armored personnel carriers. Djibouti received two Mi-24s/Mi-35s and Nigeria received the same number of vehicles. Eritrea received two S-125 Pechora SAMs and 70 B-601 SAMs for them and nine BM-22/9P140 Uragan MLRSs. Iran received 37 T-72M1 tanks (probably re-exported from Russia) and seven Vostok-E radars, while Nepal received two Mi-8MT/Mi-17 helicopters. Once again, Sudan accounted for a large volume of deliveries: 12 BM-21 Grad MLRS, 24 D-30 howitzers, 10 2S1 Gvozdika SAUs, nine BMP-2, two BTR-70, 39 BRDM-2 and 15 Su-25 attack aircraft. Syria was supplied with 300 Igla MANPADs and 33 MiG-23 fighters. Uganda received 10 T-55AM-2 tanks and four Mi-24/Mi-35 helicopters, and two more helicopters were delivered in 2010s. Yemen received 27 T-72B tanks, 92 T-80 tanks and 68 GTD-1000 tank engines.

The 2010s saw as many exports of weapons, military and special equipment from

Belarus as the previous ones. Four Mi-24/Mi-35 were exported to Afghanistan, 20 Vostok-E radars (probably produced in Vietnam under license) and five S-125T Pechora-2T air defence systems – to Vietnam. Angola received 22 2S7 Pion self-propelled guns, 18 D-20 howitzers, 54 2S1 Gvozdika self-propelled howitzers and 12 2S3 Akatsiya self-propelled howitzers, 12 BM-21 Grad MLRSs and four BM-22/9P140 Uragan MLRSs. Azerbaijan received 11 Su-25, 93 T-72M1 tanks, two Buk-1M air defence systems, 26 howitzers 2A36 Hyacinth, six Polonez air defence systems (jointly developed by Belarus and China) and 300 missiles A200 to them. China received five Il-76 transport aircraft, Cote d'Ivoire received four BTR-70 armored personnel carriers and eight Cayman armored personnel carriers. Iraq received nine Su-25s and Libya four Mi-24s/Mi-35s. Myanmar received two similar helicopters, and two Kvadrat-M air defence systems and 100 SAMs 3M9 to them. Seven Mi-24/Mi-35 helicopters, three Mi-8Ts, 76 BTR-70s, eight Su-24s and four Su-25s were supplied to Sudan. Four (of eight) MiG-29Cs were delivered to Serbia – a batch of eight units is to be completed in 2021. Four Karakal anti-tank systems and 10 BM-21 Grad MLRSs were supplied to Turkmenistan, and 22 T-72B tanks, to Uganda. There were also reports of deliveries of equipment to the UAE, Sweden, Slovakia, Poland, South Korea, and Oman.

All of the above is a large volume of supplies, but it is mostly equipment that was left in the republic after the collapse of the Sovi-

et Union – a 'garage sale.' At the same time, such a content of military-technical cooperation does not fully reflect the structure of Belarusian military exports. Today it is dominated by high-tech products of domestic production – electronic warfare (EW) and reconnaissance systems, automated control and guidance systems, satellite equipment, optoelectronic products, strike drones, and new light armored vehicles. Venezuela, China, the UAE, India, and Chad cooperate with Belarus in these areas. It is not only about the purchase of finished products, but also about organization of joint and licensed productions, where Minsk acts as a supplier of technology.

Deliveries through the CSTO are also a significant volume of Belarusian military exports. A number of systems are being upgraded for Kazakhstan, some products are supplied to Kyrgyzstan and Tajikistan, and non-lethal weapons may be supplied to Armenia in the future, experts say.

Russia is also a big consumer of Belarusian defence industry products. According to some estimates, Russia accounts for 25–30% of the country's military exports, and the



NURSULTAN NAZARBAYEV, THE FIRST PRESIDENT OF KAZAKHSTAN

As for the further development of closer ties, we should develop more joint ventures, including those in the military-industrial complex. The territory is ready, you have an overabundance of everything – let's go there, we will produce for Russia and for ourselves, and develop industry



share of Belarusian supplies in the Russian State Defence Order is up to 15%. A number of items are critical for Russian defence enterprises. Among the main imported items there are multi-axle chassis, optical instruments, navigation systems, and thermal imagers. Joint research and development projects are underway, and integration and cooperation projects for the defence industry are being discussed and implemented, including those within the framework of the Union State.

At the same time, Minsk is working to diversify contracts and expand the geography of supplies. In 2017, Belarusian-made materiel was supplied to 69 countries, in 2018 – to 76 countries, in 2019 – to 97 countries already. In part, Belarus is trying to move away from dependence on Russian supplies and Russian contracts, but as the international situation becomes more complicated and the domestic political situation stagnates, it will be harder to do so.

IN THE TOP-50

Kazakhstan is not yet a significant supplier of military products, but it has the potential to become one. According to SIPRI, in 1991–2020 Nur-Sultan was in the top-50 suppliers of materiel and became 48th in the world ranking of arms exporters.

With the collapse of the USSR, Kazakhstan's MIC inherited more than 50 enterprises evacuated to the republic during the Second World War. These enterprises mainly produced equipment and weapons for the

navy, and in terms of some items Kazakhstan covered up to 90% of the needs of the USSR Navy. The republic's MIC also produced radio-electronic equipment for aviation needs, radar stations, missile systems, weapons for tanks, small arms, and certain components of air defence systems.

In the first years of independence, under conditions of sharp reduction of financing and lack of demand for the MIC products due to their narrow specialization and fragmentation, entire industries were shut down. At the same time, the necessity to form national armed forces still set a task of their technical equipment, i.e. providing them with weapons, military and special equipment. In many respects this problem was and is being solved thanks to profitable deals through the CSTO. However, Kazakhstan is looking for new opportunities and creates conditions to provide for the needs of defence and security agencies on its own – both by reforming and modernizing existing enterprises and by building advantageous military-technical relations with foreign partners.

At the doctrinal level, Kazakhstan has declared establishment of joint enterprises with foreign partners on its territory with technologies transfer for production of materiel and diversification of military-technical ties as a priority area of military-technical cooperation. Turkey, Israel, South Africa, France, and Russia have become Nur-Sultan's traditional partners in this area.

In 2010, an exhibition of weapons, military and technical equipment "KADEX-2010" was visited by the Turkish President Abdul-

lah Gul, and in 2011 the joint venture 'Kazakhstan Aselsan Engineering' was launched to manufacture electro-optical devices. Under the contract, the Turkish company Aselsan provided Kazakhstan with technical documentation, materials and equipment for production of components in the interests of the defence industry of Kazakhstan. The company has also set up production of SARP remotely piloted combat modules for the Arlan armored infantry fighting vehicle. A joint venture was established with the Turkish company Otokar for production of Cobra armored infantry fighting vehicles, which were already in service with the Armed Forces of Kazakhstan in 2012.

In 2015, Kazakhstan Paramount Engineering, a joint venture with Paramount Group (South Africa), began production of armored wheeled vehicles in Kazakhstan. The company produces Arlan, Alan, Nomad, and Barys armored personnel carriers. So far this equipment is used for domestic needs, but the company has already been visited by delegations from Kuwait, Turkmenistan, Tajikistan, Serbia, Afghanistan, Uzbekistan, India, Germany, and Russia. The possibilities of cooperation were discussed in detail with Russian KAMAZ.

With the participation of Israeli companies Soltam systems and IMI, production of MLRS Naiza, as well as modernization of Semser self-propelled howitzers and Aybat mortars have been organized in Kazakhstan. A joint venture company, Eurocopter Kazakhstan Engineering, was established with the French Airbus Helicopters, it as-

sembles, sells and services a line of Airbus helicopters, and also trains technicians and pilots in the CIS and Central Asia. Also, the National Company Kazakhstan Garysh Sapary together with Airbus Defence and Space launched a Spacecraft Assembly and Testing Complex (SATAC) in order to create a base for design, manufacture, assembly and testing of spacecraft, payload components and space equipment elements in the republic. The SATC is operated by the Falam joint venture. Tales Kazakhstan Engineering is working with France's Thales to assemble radars, and with Spain's Indra Sistemas – on manufacturing radars and other military radio-electronic products. Negotiations on technological cooperation were conducted with representatives of Poland, Japan, Germany, and the USA. A number of projects are being implemented with Ukrainian enterprises.

Of the CSTO countries, the closest cooperation has been established with the defence industries of Belarus and Russia. For example, cooperation on the development, manufacturing and supply of various automated control systems has been agreed with the Belarusian company Agat; modular staff vehicles are being jointly produced with Midivisana; a joint venture for the production of anti-aircraft missile and radio equipment is being considered with the Tetraedr Research and Production Enterprise. Among the joint projects with Russia there are organization of large-scale assembly of Russian Helicopters' equipment in Kazakhstan; establishment of the joint venture KAMAZ

Engineering with KAMAZ; negotiations on projects to upgrade and produce anti-aircraft equipment for the ground forces with the Machine-Building Design Bureau (KBM); and joint production of heavy military equipment with Uralvagonzavod.

All of the military-technical projects listed above are currently aimed at meeting Kazakhstan's domestic needs. But all this increases the republic's export potential – on the one hand, the defence industry is developing and becoming more competitive, and on the other hand, Nur-Sultan will have something to offer in the world arms market.

Kazakhstan also works according to a more traditional scheme – selling off the 'Soviet heritage' in the form of unclaimed excess articles of armaments and military equipment. However, judging by official statements, this is done not so much to make money from exports, but to prevent uncontrolled storage and use of military equipment in the republic. In 2018, it was once again announced that Kazakhstan intended to modernize Soviet-made military equipment at the facilities of Kazakhstan's defence industry and then export it – to exclude shadow exports within the country. According to Beibut Atamkulov, then Kazakhstan's Minister of Defence and Aerospace Industry, what cannot be repaired and modernized should be scrapped.

It was this traditional form of military-technical cooperation that became the basis for SIPRI and UNROCA databases formation. According to these sources, in

1991–2020 Kazakhstan exported the following: four BM-21 Grad MLRSs, 28 D-30 howitzers, and 24 M-46 howitzers were supplied to Angola. Three BM-1 Grad MLRSs were supplied to Congo (it is supposed that the recipient could be the DRC). Ethiopia received 106 howitzers, including 100 D-30s and six M-46s. Kyrgyzstan and Nepal each received two Mi-8T/Mi-17 transport helicopters. Serbia received 226 Igla man-portable air defence systems and Sri Lanka received four An-24 transport aircraft. North Macedonia received 12 BTR-80 armored personnel carriers, Azerbaijan – eight MiG-25 fighters, India – 15 53-65 anti-ship missiles, Georgia – 758 9M114 anti-tank missiles and 5,552 C5K-pV missiles. There are data on the transfer of two armored vehicles to the UAE, 53 T-72 tanks to Belarus, and about 150 BMPs (infantry fighting vehicles) to Slovakia.

North Korea has received 24 anti-aircraft guns KS-19, four gun laying radars SON-9 for KS-19 and about 30 units of MiG-21. A scandal erupted over MiG deliveries to North Korea – Kazakhstan was going to supply Pyongyang with more units, but under pressure from the U.S. State Department the deal was terminated and Nur-Sultan has not received any money for the 30 aircrafts already delivered.

It is known that Kazakhstan in the first years of independence continued supplies of materiel to China under contracts signed back in the Soviet Union, presumably, we are talking about torpedoes. In later years, Nur-Sultan was engaged as a contractor for Russian export contracts.



ALEXANDER ALESIN,
MILITARY EXPERT

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The UN practices themselves are based on certain registers, which were compiled many years ago and include the traditional types of weapons, so to speak, heavy ones. These are artillery and aviation systems, tanks, armored vehicles and so on. Much of what Belarus produces and sells does not fall into these categories



ARMENIA, KYRGYZSTAN, AND TAJIKISTAN

As part of the Soviet Union, Armenian military-industrial complex did not produce any finished goods and was specialized mostly in research work and production of components for military purposes. Even then, the events in Nagorno-Karabakh demanded that the republic should start producing some basic necessities – weapons and ammunition – and build its own repair and maintenance facilities.

Armenia relies heavily on arms supplies through the CSTO, mostly from Russia. The republic does not receive any weapons, military and special equipment as military-technical assistance, but buys them for money. However, questions sometimes arise about the expediency of purchasing certain armaments or military equipment.

The possibility of setting up enterprises to service wheeled and airborne vehicles and armored vehicles was discussed with a number of Russian companies. Assembly plants are currently being organized in the country. One of the most important projects is localization of production of AK-103 Kalashnikov automatic rifles in Armenia. While the first stage of localization will involve assembling from imported Russian components, the second stage supposes creating a complete production chain.

The opportunities Armenia has in connection with Russian military-industrial complex will be used to meet domestic needs. It is especially important now, as it has become clear that the military construction system as a whole requires serious reforms. Judging by the statements of some official representatives of Yerevan, the country has export ambitions, but it is unlikely that they will be fulfilled in the near future.

Kyrgyzstan and Tajikistan within the CSTO are also counting on military and technical assistance, mainly in the form of gratuitous supplies of weapons, military and technical equipment. However, such assistance is provided not only by Russia, but also by other states outside the CSTO that are interested in regional security, such as China and India. The inability to provide for their own needs is due to the same peculiarities of the Soviet military-industrial complex.

Tajikistan was and remains to be an agrarian country with an underdeveloped economy and therefore relies mainly on foreign assistance to provide its armed forces with everything they need. Obviously, there is no need to talk about any exports of materiel.



The situation in Kyrgyzstan is somewhat different. In fact, in addition to repair facilities, the country had only one production facility for finished goods: the Dastan plant, which produced Shkval torpedoes. Despite its underdeveloped military-industrial complex, Kyrgyzstan, according to SIPRI data for the period 1991–2020, was not too far behind Kazakhstan in terms of performance and ranked 52nd in the list of exporters of materiel. It is known that several Mi-24s were supplied to Sudan, 15 Mi-24s/Mi-35s, 19 MiG-21 trainers and 36 SET-65 Raccoon-2 torpedoes to India – probably the latter were produced under license in India. Crete received four MiG-21s, previously upgraded in Romania, and six Mi-8T helicopters were leased to a Canadian company. It is possible to export other armaments and military equipment inherited from the Soviet Union that are not in demand by the Kyrgyz Armed Forces.

At the same time, the CSTO countries are interested in the republic's own ability to provide for its needs, at least in terms of military equipment, communications equipment, ammunition, and the repair of weapons, military and technical equipment. The CSTO countries with a more developed military-industrial complex, such as Russia, Belarus, and Kazakhstan, might be able to provide assistance to Kyrgyzstan in this regard.

CONCLUSIONS

The main task of integrating military-industrial systems of the CSTO member countries, which is regularly declared at the ICMEC meetings, is organization of joint ventures to repair and maintain the weapons, military and technical equipment systems in service and to provide them with necessary spare parts in due time. However, the experience of military-industrial complexes and competencies of at least half the members of the Organization make it possible to expect much wider use of the existing potential.

First, we are talking about saturating the collective forces with modern types of weapons and military and technical equipment, developed and produced in cooperation. Export deliveries through the CSTO are not commercially attractive for defence industry organizations, because they are just as unprofitable as domestic contracts under state defence orders. Joint efforts and joint contribution to the development of new products will reduce time and cost of development and production, as well as enrich experience and competence of MICs of all parties involved in such a cooperation. This work becomes more relevant against the background of the decision to accelerate implementation of the CSTO interstate target program to strengthen sections of the Tajik-Afghan border as well as the approval

of the Plan to equip the CSTO CORF with modern weapons and equipment.

Secondly, it is possible to talk about creation of export models of weapons and military and technical equipment that will be offered as joint developments to the markets of third countries. Experts believe that this is also a promising area of cooperation between defence industries of the CSTO countries. And since the Organization pays great attention to advertising and exhibition activities, national exhibitions of weapons military and special equipment in the CSTO countries could become a beautiful showcase and a useful tool for promoting such products.

In Kazakhstan's experience, these new tasks can be solved through organization of joint ventures. We already have a success-

ful experience – this is the interstate financial and industrial group Defence Systems founded in 2000 which at the first stage included Russian and Belarusian companies later joined by some Armenian companies, and now participation of Kazakh and Kyrgyz companies is being studied. However, a sincere interest of countries and companies to participate in such projects is a prerequisite for success, rather than formal allied obligations and blind adherence to declared goals and objectives of the Organization.

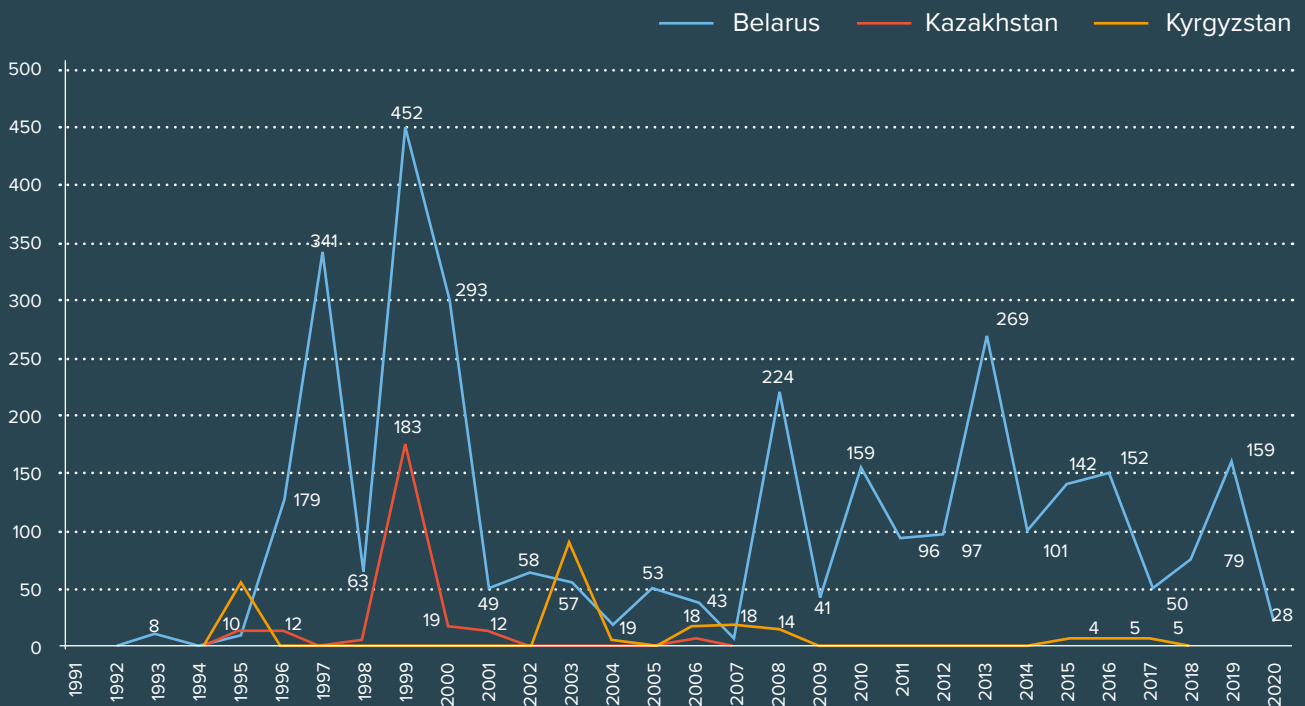
The export success of Belarus, Kazakhstan and even Kyrgyzstan with third countries can only be rejoiced. And this experience of military-technical cooperation should be deeply analyzed and comprehended. It should also be taken into account in the process of development of the interstate

system of cataloguing supplies for the armed forces in the CSTO format, the work on which is currently underway. This will make it possible to establish new and restore lost ties between MICs of the CSTO countries, speed up development and production time, and reduce costs of weapons, military and special equipment and their components.

All of this could combine to make activities of CSTO suppliers of materiel more effective and strengthen relationships within the organization. ♦



EXPORTS FROM BELARUS, KAZAKHSTAN AND KYRGYZSTAN. SIPRI TREND INDICATOR VALUES (TIVS*), IN MILLIONS



SIPRI statistics on arms transfers refer to actual shipments of major conventional arms. The SIPRI Trend Indicator Values (TIVs) method does not reflect the real value of exported weapons and military and technical equipment, but allows to identify general trends of the global arms market development.

More about SIPRI's methods: <https://www.sipri.org/databases/armstransfers/sources-and-methods>

Russian Shipbuilding in the World Market

Prospects and Opportunities

Author Sasha Makarov

The world armaments market is gradually changing towards more competition, mainly due to the emergence of new exporters and the policy of diversification of overseas suppliers pursued by major importers like India. There is also an increasing demand from Asian and Arab buyers to create their own military-industrial infrastructures by buying technology and localizing production. This situation can become a good opportunity for increasing the number of Russia's partners in the world market of arms and military equipment, especially in the segment of naval shipbuilding.

Military-technical cooperation (MTC) generates annually essential cash flows for the defence industry (more than \$15 billion) and has also the highest margin (in comparison with the State Armament Program and consignment of civilian products). For the period of 20 years – from 2000 to 2020 – the Rosoboronexport (ROE) supplied weapons and military equipment worth more than \$180 billion to foreign customers. According to General Director of Rosoboronexport Alexander Mikheev, aircraft building products accounted for the main volume of deliveries – over \$85 billion, and more than \$30 billion for each air defence and equipment for land forces. The volume of weapons and military equipment for the Navy was about \$28 billion (Fig. 1).

As it follows from Rosoboronexport's data, in terms of exports the naval equipment segment still lags behind the aviation, air defence, and ground forces.

At present, the structure of the orders' portfolio for Russian-made weapons and military equipment is as follows: at the end of 2020, the total volume amounted to \$53.8 billion. The volume of orders for naval products reaches \$5.5 billion, which is equivalent to about 10.2% of the total portfolio. There are contracts for supply and joint construction of ships and submarines, as well as supply of various weapons for them, coastal support equipment, and infrastructure projects.

There is information on one contract for warship construction: four modernized frigates of project 11356 worth \$3.08 billion, two of which will be produced at Yantar Shipyard

by 2023 and the other two – at Goa Shipyard Limited, India. Thus, about 44% of the naval portfolio may be formed at the expense of ship borne armaments, coastal facilities, etc.

The strong point of the domestic shipbuilding industry is its high scientific and technical potential and its fuller implementation, including joint projects with foreign partners. This can lead to a considerable growth of sales in the field of military-technical cooperation. There are other serious prerequisites for development. First of all, we should note the favorable price-quality ratio offered for foreign customers and their willingness to transfer technology, as well as the high brand recognition, in particular, that of the world bestseller – the Varshavianka.

An equally important factor for increasing exports is the favorable market environment for the next decade. GlobalData analysts estimate the Compound Annual Growth Rate (CAGR) of the world market of naval ships and surface ships in 2021–2031 to be 3.49%: the volume will increase from \$34.1 billion to \$48.7 billion. Frigates will become leaders in terms of purchases' volume with a share of about 32.7% in the following 10 years (Fig. 2). It should be noted that the highest growth rate of this segment is expected in India, with a CAGR's of 6.4%.

One of the opportunities favorable to Russian shipbuilders is to focus on meeting the growing demand for frigates imports, including orders from India.

GlobalData experts also expect an active development of the global submarine market. According to their forecasts, the CAGR

in 2021–2031 will reach about 4.36% and the volume will increase from \$20.8 billion to \$31.9 billion (Fig. 3).

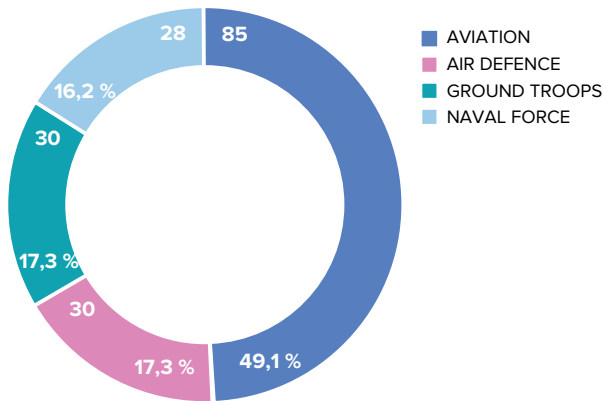
India will also be one of the main buyers of submarines. It is estimated that New Delhi can spend about \$23.5 billion over the next 10 years to acquire nuclear and diesel-electric submarines. At that, 63% (\$14.8 billion) will presumably be spent on submarine programs and 37% (\$8.7 billion), on nuclear submarines.

The Indian government announced a tender for the construction of six non-nuclear Project-75I submarines worth \$5.4 billion. The Defence Ministry's request for proposals was sent to two Indian companies: Mazagon Dock Shipbuilders Limited (MDL) and Larsen & Tubro (L&T).

The Russian United Shipbuilding Corporation (USC) competes with four global players: German TKMS, French Naval Group, Spanish Navantia, and South Korean DSME. The competition is going to be serious: the tender accounts for almost a quarter of India's total planned expenditure on submarines over the next 10 years. USC's main trump cards are its successful experience in building naval equipment for India and its readiness for extensive cooperation under the "Make in India" program.

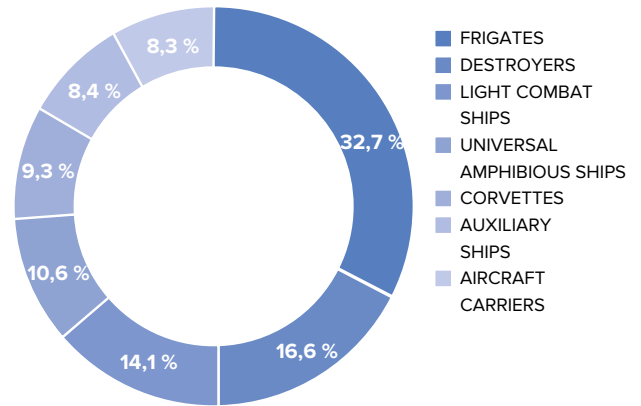
If the holding can create a quality offer in the frigates and submarines segment and focus on the Asia-Pacific region, and India in particular as a key geographic area, winning the tender for Project-75I submarines will become the first step towards building a large order book and increasing cash flow from exports. ♦

Figure 1.
SHARE OF RUSSIAN-MADE ARMS AND MILITARY EQUIPMENT EXPORTS BY GROUPS IN 2000–2020
(US DOLLARS BILLION)



Source: GlobalData Aerospace, Defence and Security Intelligence Center

Figure 2.
PROPORTION OF WORLD SURFACE SHIP PURCHASES IN 2021–2031 (BY SEGMENT)



Source: Rosoboronexport

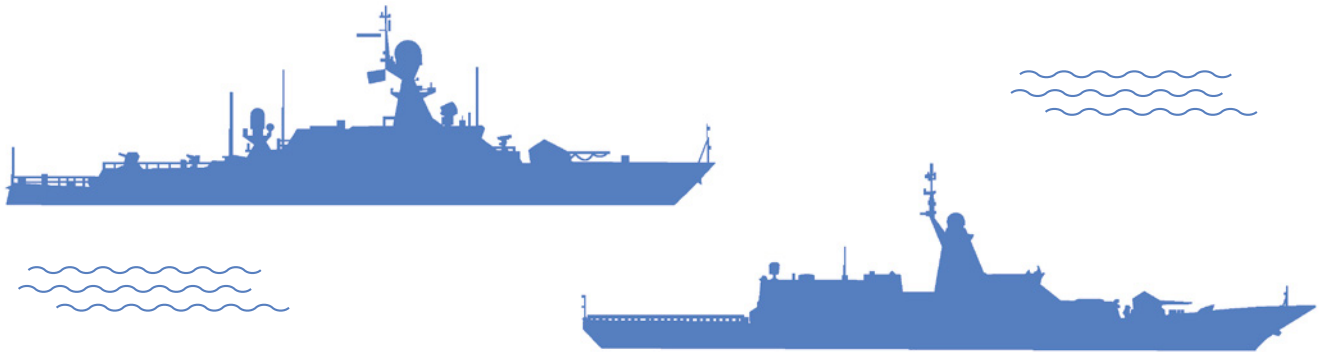
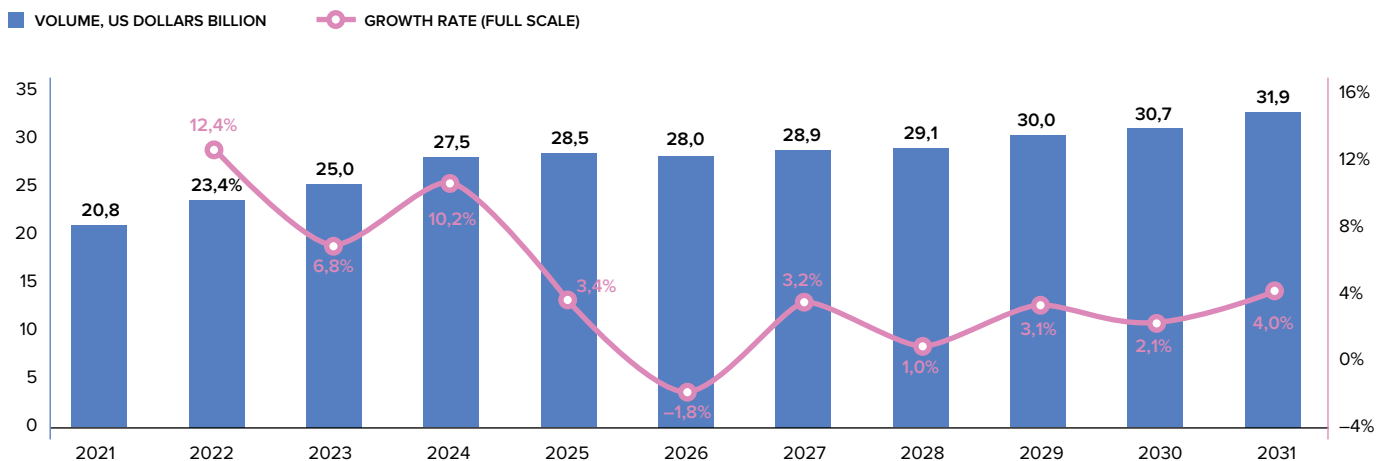


Figure 3.
GLOBAL SUBMARINE MARKET FORECAST FOR 2021–2031



Source: GlobalData Aerospace, Defence and Security Intelligence Center



The ARMY FORUM



August 2021 witnessed the seventh International Military-Technical Forum ARMY-2021 that was hosted on the territory of Patriot Convention and Exhibition Center, Alabino test site, and Kubinka airfield. Once again, the Forum has succeeded to impress both guests and exhibitors with the monumental scale of opportunities offered and the top notch quality of organization and military technology presented. In 2021, the event was attended by more than 1.7 million people, including delegations from 117 countries.



Between August 22–28, 2021, the Forum hosted an impressive array of static expositions at the central exhibition site of the Patriot Convention and Exhibition Center, Alabino test site, and Kubinka Airfield with a total area of 330,000 square meters. Overall, 1,489 companies offered over 28,000 technology samples in the static display. As part of the static display, the Russian Ministry of Defence presented 300 units of serial weapons as well as military and special equipment.

The scientific and business program of the Forum in 2021 was, as always, rich. The total number of events included in the program amounted to 211, including 138 round tables,

38 conferences, 21 meetings, and 14 briefings – an increase of about 12% compared to the sixth edition of the Forum. The events of the scientific and business program were not limited to the territory of Patriot Convention and Exhibition Center, but also took place in several military districts and in the Northern fleet.

Representatives of 22 delegations of foreign departments of defence partook in the scientific and business program as well. In total, 41 state contracts have been concluded with 27 industrial enterprises from different sectors: aviation, shipbuilding, space, radio-electronic, and heavy engineering, for a total amount of more than 500 billion ru-



bles (\$67.6 million). The Russian Ministry of Defence expects to receive more than 1,300 samples of weapons and equipment in the near future.

ARMY-2022

The next edition of the forum, VIII International Military-Technical Forum ARMY-2022, will be held from August 15 to 21, 2022, on the territory of the Patriot Convention and Exhibition Center, Kubinka Airfield, and Alabino Test Site. Each participant of the Forum will have a unique opportunity not only to show their developments, but also to demonstrate their effectiveness in action.

The event will include three main clusters: aviation, land, and water. New aircraft industry innovations will be presented at the Kubinka airfield, as well as demonstration performances of aerobatic teams. On the territory of the Alabino test site, participants and visitors will be shown the possibilities of land and water equipment.

Within the framework of the scientific and business program, it is planned to hold the III Congress “Diversification of the Military-Industrial Complex,” which is designed to ensure the organization of work on implementation of the decree of the President of Russian Federation to increase the share of high-tech civil products in the defence in-

dustry to 50% by 2030. A separate pavilion “Diversification of the Military-Industrial Complex” was built in 2021 to demonstrate production of defence industry enterprises on the territory of the Patriot Convention and Exhibition Center.

In this year’s edition of the ARMY Forum, special attention is to be paid to development of artificial intelligence, radio electronic, and information technologies. Deputy Minister of Defence of the Russian Armed Forces Ruslan Tsalikov notes that “Russia has every opportunity to become a leader in the field of artificial intelligence – this is necessary to ensure security of the country.” The second Congress on this topic will be held in 2022.

The ARMY-2022 will present production of enterprises of Russia’s military-industrial complex. The exhibition is a highly respected platform for demonstrating advanced ideas and developments not only for the Armed Forces of the Russian Federation, but for foreign states also.

The Forum offers unique opportunities to hold effective negotiations, exchange experiences and cooperate with foreign specialists in military and technical areas. It creates new prospects for strengthening scientific-technical and industrial cooperation ties and facilitates export of Russian high-tech military products. ♦





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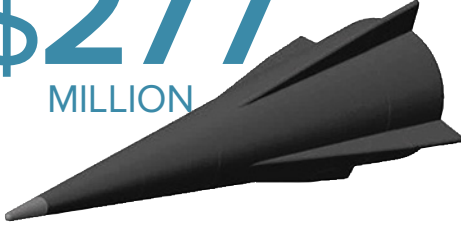
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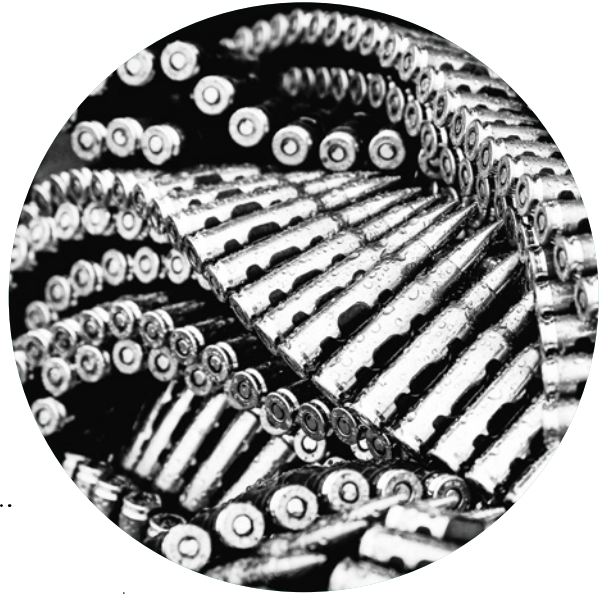
\$277
MILLION



Allocated by U.S. Missile Defence Agency for developing Hypersonic and Ballistic Tracking Space Sensor (HBTSS)

Sales of arms and military services by the world's 100 largest companies in 2020, marking the sixth consecutive year of growth. An increase by 1.3% compared with 2019

\$531
BILLION

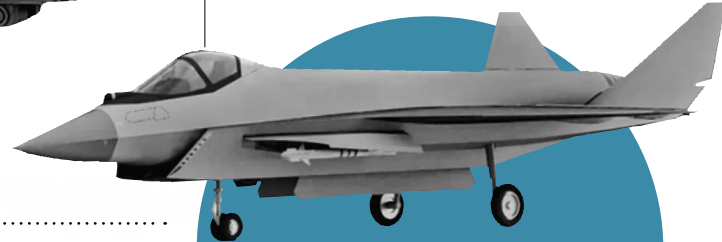


3-4
SECONDS



Response time of S-500 Prometheus surface-to-air (SAM) and anti-ballistic missile system, in comparison to 9-10 seconds of S-400 Triumph

The base price of the Su-75 Checkmate light tactical aircraft compared to the US-made F-35 Lighting II joint strike aircraft with the cost of US \$82.4 million per item



\$30
MILLION



200,000
SERVICEMEN

Participated in the Joint Strategic Exercise, Zapad-2021, a large military training event focused on Russia's Western Military District and Belarus, involving at least 15 training ranges in Russia and six in Belarus



Qatar's Defence Procurement and Its Relevance for The Persian Gulf Security

Author Justine Mazonier



By 2024, Qatar will obtain an unprecedented number of military gears and aircraft. The volume of its air force will reach 96 aircraft by 2024. Development of this arsenal correlated to the 2017 Gulf diplomatic crisis. With the recent détente in diplomatic relations with its regional counterparts, Qatar found itself with an impressive arsenal and very little staff to use it. How will Qatar utilize these forces and are they efficiently used to confront real security threats in the Persian Gulf region?

The Qatari military equipment is to increase exponentially over the next few years. Qatar has implemented a spectacular procurement plan for its air forces. Its Army and Navy are following the same path. In the wake of the diplomatic resolution with its regional enemies, Qatar must find a new way to effectively absorb this arsenal.

The Qatari defence procurement has tremendously increased over the last two decades. Pieter Wezeman, a Senior Researcher on the arms and military expenditure program at the Stockholm International Peace Research Institute (SIPRI), depicted the Qatari military force as a “complete transformation from very small armed forces – as can be expected from a small country – to the armed forces which will be amongst the largest in size and technology and most capable per capita compared with any country in the world.”

With only 2 million people spread on 11,000 km², Qatar is one of the smallest countries in the Persian Gulf region. However, the little nation ranks 82 in terms of military power (according to the GFP review). It relies mainly on the imports of expensive military technologies. Its geographic weakness and absence of strategic depth have led to further increasing its spending on military equipment to protect its territory from regional adversaries. Territorial disputes with its neighbours (Bahrain, Saudi Arabia, and Iraq) have increased its armaments procurement. The small country was particularly shocked by the Iraqi invasion of Kuwait and the absence of protection from Saudi Arabia. Qatar, particularly, had a confrontation with Bahrain and Saudi Arabia that have allegedly attempted a coup against Emir Hamad bin Khalifa Al Thani in 1996. Since then, the Qatari leadership went on to assume that Saudi Arabia was a threat to such a small territory.

However, this threat did not encourage Qatar to adopt the same direction as Bahrain in the GCC region but, on the contrary, the



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These games of thrones and divisions within the GCC and Arab world have allowed Iran's Al Quds force to use, train and assist personnel, limited arms shipments, provision of Iranian volunteers and support of the Lebanese Hezbollah to have far more impact than should ever have been the case. Like the failure to properly provide and target aid to the weaker Arab states, and the slackness in the effort to fight extremism, they have done immense damage to the Arab world



country took on more assertive and independent defence and foreign policies. Qatar has invested massively in its foreign policy and supported the Arab Spring movements in 2011 with the advent of the Muslim Brotherhood. In 2014, this stance triggered the first diplomatic crisis with Saudi Arabia and the UAE, threatened by the active Qatari policy in Libya, Syria, and Egypt. Its bold diplomatic stance correlated with its large military build-up plan, supported by its Western counterparts and Turkey.

“In terms of [armaments] deliveries, Qatar has gone from a minor arms importer before 2014 to a significant one in the years since, based on a series of major contracts signed over the past two years. It is expected that its arms imports will be even higher in the coming years,” Pieter Wezeman emphasized.

In 2017, the GCC-Qatari crisis fostered a new phase of Qatari arms procurement. The diplomatic crisis spurred a wide armament program with the help of the USA, the UK, France, and Turkey. Qatar increased its air force to reach 96 fighter jets and went on to order more since then. Billions of dollars were spent on the protection of its small territory.

According to Gawdat Bahgat, Professor of national security at the Near East South Asia Centre for Strategic Studies of the National Defence University, “the reason for the Qatari military build-up is mainly the perception, rightly or wrongly, that Saudi Forces (probably with support from other allies) were going to invade Qatar in 2017 and engineer a ‘regime change’.” The diplomatic crisis stems from the Qatari-Saudi rivalry. The catalysts were the Qatari national and powerful media channel, Al Jazeera, and its relations with Turkey. Anthony Cordesman, the Arleigh A. Burke Chair in Strategy at the Centre for Strategic and International Studies, added that “the growing Qatari role as a US ally, the expulsion of thousands of Qatari tribesmen of Saudi origin over the past two years [from Qatar] and Qatar’s growing anger at Saudi Arabia’s hegemony and domination in the GCC” were also stumbling blocks in the Saudi-Qatari relations. These tensions culminated with the Qatar’s blockade and the suspension of its diplomatic ties with the Saudi-UAE-Egyptian block.

The Qatari defence procurement is not ready to stop. The natural resources of the small nation provide enough money to pay for costly technology from Western partners. Qatar has the highest GDP per capita in the



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Despite low oil prices, countries in the region continued to order more weapons in 2016 perceiving them as crucial tools for dealing with conflicts and regional tensions

world. According to CIA reports, Qatar’s oil resources would have the same production level for the next 23 years. The same report states that the Qatari natural gas resources are the third-largest in the world and are shared with Iran. Qatar recently entered a phase of military modernization to compete with its regional rivals.

However, the way Qatar will absorb such a quantity of military equipment remains obscure. In 2017, the defence procurement in Qatar was so massive that there was not enough national military or operational ground to operate it. In the wake of the Al Ula GCC Summit, Qatar and Saudi Arabia solved their diplomatic clash and Qatar “suddenly found itself with a lot of gear and no clear path forward,” as Riad Khawaji put it.

In 2017, the Qatari forces integrated 12 more Mirage 2000, 18 transporter aircraft, and 46 new helicopters. In the same year, Qatar also ordered a new wave of equipment including 36 F-15QA jet fighters and 24 Apache helicopters from the US, 24 Eurofighter Typhoon warplanes from Great Britain, 28 NH-90 helicopters from Italy, and 36 Rafales from France. With the delivery of the ordered weapons, the Qatari fleet will double in size



by 2024. There still needs to be determined the reason why such amounts were set and whether it is appropriate regarding the regional security issues.

I. INTERNATIONAL INTEROPERABILITY AS THE OPERATIONAL INTERFACE

The Qatari strategy to absorb military procurements is to rely on external interoperability. This concept allows for theoretically obtaining better training for more operational situations by sharing its military equipment and knowledge to intensify its military force with coordinated nations. It also gives Qatar an opportunity to build a long term defence diplomacy with foreign powers acting as security guarantees for the small state.

Interoperability is enshrined in the Qatari doctrine of Joint Military Building coined in 1996. The aim is to demonstrate that Qatar is not alone in the region and its regional adversaries cannot attack it without jeopardizing their relations with the USA, France, and the UK or risking a confrontation with Turkey. Yezid Sayegh, a senior fellow at the

Carnegie Middle East Centre think tank reported that “for decades, GCC states have concluded massive arms deals with the US and other leading western countries as a form of premium insurance: the GCC helps keep western defence industry jobs, and in return, the West protects the GCC states from external threats.” Qatar wants to obtain the same benefits by its military cooperation with its foreign partners.

At a practical level, Qatar welcomed a permanent foreign military presence on its territory; the American deployment on the Qatari ground was the base of their defence cooperation. The ratification of the Defence Cooperation Agreement in 1992 allowed high-level military cooperation between Qatar and the USA. The American troops could accede to the Qatari military facilities in 2002, at the Camp As Sayliyah in Doha, as the headquarters for the CENTCOM forces and then to the Al Udeid airbase, the biggest American foreign base in the Middle East, where 8,000 American troops have been stationed, participating in operations in Iraq, Syria, and Afghanistan and during Operation Inherent Resolve. Al Udeid airbase has been strategic for the American operations due to the fact that 80% of the refuelling took place in it.

With increasing tensions with Iran, American troops deployed more military force such as F-22 combat aircraft in Al Udeid

base. The 2019 US-Qatari strategic dialogue extended the previous security cooperation with the expansion of the Al Udeid base with Qatari funding and export of more American weapons approved by the US Department of State. The deployment of American forces on the Qatari ground helped the latter's forces to increase Qatar's military, limited to 12,400 men (reserves included).

Qatar's security hinges particularly on the American presence on its territory, playing the role of security insurance, a strategic deterrent against a potential military attack from Saudi Arabia. Another advantage is the massive training, exercise, and planning experience shared with the Qatari forces. This American experience is also communicated to other regional neighbors paving the way for potential regional interoperability. According to Anthony Cordesman, “the GCC states also gain from access to sophisticated US command and control, communications, intelligence, surveillance, and reconnaissance systems that they cannot afford even collectively, and from US warfighting experience in actually using such systems in combat.”

The massive armaments procurement helps Qatar to maintain a high level of defence cooperation. The deployment of Western militaries on its territory provides necessary training for imported weapons. Qatar has participated in American joint exercises,

increasing its integration into operations led by one of its defence partners. These relations and arms procurement would help Qatar to benefit from the military force of its defence cooperatives and to be able to answer to more military threats and act as a powerful deterrent. On paper, this strategy seems fine. In reality, it can be extremely costly and politically tricky.

One of the main challenges of this policy is the balancing between different defence partners. Qatari foreign policy is a delicate equilibrium between divergent partners and interests. According to Anthony Cordesman, “Qatar's position remains precarious because its strategy depends on the careful balancing of many competing forces – religious extremism, the West, the GCC, Iran, and its population. Qatar's future trajectory is a function of how well it manages to chart its course without allowing any of these forces to get in the way. How well Qatar can maintain these contradictions without any of them getting beyond control, however, remains an outstanding uncertainty.”

The Qatari leadership dramatically increased its relations with Turkey since 2012. The alliance with a regional power sharing the same rivalry with Saudi Arabia and the UAE and a common ideological views, helped Qatar to overcome its diplomatic isolation during the crisis in 2017. According to Gawdat Bahgat, “the only way to address



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Qatar should find the way to absorb the military advanced technology that it's going to acquire in the coming years into an effective armed forces in order to complete its military modernization. Qatar is planning to spend billions of dollars to increase its military power, particularly its air force capabilities, but it suffers from staff shortage





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The perceived threat of other Gulf states waging military action against Qatar is probably one reason why Doha signed a defence agreement with Ankara at the end of 2014. The 2017/2018 GCC crisis, however, has given Doha the chance to accelerate its massive military build-up, mainly focusing on high-tech weapons and advanced air, naval, and land capabilities

this threat was also to ally with another major regional power – Turkey.” Turkish troops are present on the Qatari ground since October 2015 with the building of the Tariq Bin Ziyad military base operated by Turkey in Doha. And 5,000 Turkish troops were stationed in Qatar following the diplomatic crisis. The Turkish defence industry also benefited from its cooperation with Western defence industries and developed a stronger defence industrial base there. Qatar has also ordered plenty of new weapons from Turkey since 2017: 100 tanks, 585 armored combat vehicles, 25 self-propelled howitzers, and six armored unmanned air vehicles (UAVs).

Recently, Qatar has allegedly reached an agreement with Turkey regarding the temporary deployment of its 36 warplanes (such as Rafales and Mirages) on the Turkish territory. In parallel, Qatar has also signed deals to train its operatives in the USA and in Italy to manage new aircraft (M-346 and Leonardo T-346). These parallel deals with divergent counterparts can be very challenging at the political level. France, one important military ally, could oppose the deployment of French aircraft in Turkey at a time of negotiations on similar warplanes in Greece and India. Despite the absence of real technical risks with the deployment, these delicate balancing moves between different allies could put at risk the interoperability policy of Qatar through its trying to cooperate with too divergent partners in the military field.

II. DEVELOPMENT OF NATIONAL CAPABILITIES

The Qatari leadership is trying to cash in on its defence cooperation with Western powers to increase its national capabilities and its skills to operate its weapons and maximize its potential. The 2017 crisis demonstrated to the Qatari leadership the need to develop its national military power and to act more independently of its foreign allies.

The first step taken by the Qatari leadership was increasing its military reserves. Qatar has implemented mandatory military service for men between ages 18 and 35 and opened military careers for women. However, the low number of Qatari citizens could not provide for the needs to operate all the Qatari gears. So, 85% of the Qatari military is composed of non-citizens from Sudan, Somalia, Yemen, and Pakistan. This trend is also visible in the Qatari society where Pakistani, Iranian, and Indians comprise a majority in the country. This imbalance raises the issue of the Qatari dependency on mer-

cenaries or private military contractors, or another form of foreign support.

According to Anthony Cordesman, “Qatari training and readiness are good for such a small force, but the army is capable of operating largely at the battalion level, with limited combined arms capability and negligible capability for manoeuvre warfare and combined arms.” Cordesman also states that this weakness hinders Qatar to play a major military operation and build a strategic role in the Gulf region. Qatar can only participate in coordinated operations and play small actions. The country relies mainly on the foreign partners’ presence on its territory and keeps its forces at a minimal readiness.

Another challenge for Qatar in the absorption of military technologies and gaining military independence is the lack of potential technology transfer to the country. Indeed, according to Dr Brahim Saidy, Associate professor of Diplomacy, Security and Defence Studies at the Qatar University, the Qatari military defence industry is still in its infancy. The Qatari industrial base, in general, is weak but its research and development branch is growing.

Qatar relies mainly on direct technology transfers and joint ventures to build rudimentary industrial capabilities. The stake is to decrease its over-reliance on the USA that tends to disengage from conflicts in the Middle East and avoid the costs of its foreign procurement; it could remove the hurdle of authorizations for arms exports from the West. Developing the industrial defence sector at the national level could also create a new economic sector for countries dependent on exports of energy products, also very volatile.

In Qatar, the tool to ensure such a cooperation is Barzan Holdings, established in 2016 and made public in 2018 by the Ministry of Defence. The group is “the first Defence and Security Company responsible for empowering the military capabilities of the Qatar Armed Forces.” Its being established in 2018 was very late compared to its regional rivals. Barzan Holdings aims to ease technology transfers in the defence industry and provide the framework for innovations in this sector. Barzan is also the platform for direct investments and joint venture deals, a way for Qatar to improve its technological capabilities and defence industry. It helps the government to integrate procurement projects to maximize their effectiveness.

In 2018, for example, Qatar signed a joint venture with Italy: the Barzan Holdings with



the Italian Beretta group. Beretta group committed itself to build an assault rifle plant in Doha and transfer technology to Qatar and develop new weapons. Another deal was announced in 2018 with Fincantieri and its subsidiary, Seastema, to develop unmanned vessels and facilities related to the production of these weapons. Barzan Holding implemented other joint ventures with Kongsberg and QinetiQ, defence companies from Norway and the UK respectively.

Qatar is also trying to obtain a similar synergy with Turkey. In November 2017, the Turkish Ambassador to Qatar, Fikret Ozer emphasized that the defence industry between the two countries was the cornerstone of the cooperation. Turkey supported Qatar in the opening of a factory for military gear in Doha.

Unfortunately, these initiatives are not sufficient for building the national defence industry. Anthony Cordesman criticized the national defence industry in GCC countries. According to him, the lack of sophistication of these production facilities would limit costly projects to assembly lines with no actual technology transfers and development. In Qatar, the lack of its national heavy industry blocks development of the defence industry and the possibility to produce high-quality weapons independently. The technology transfers from the West are lim-



ited to basic assembly lines and this suggests the lack of political will to share technological know-how.

III. ABSENCE OF CONSISTENCY BETWEEN PROCUREMENT PLANS AND REGIONAL THREATS

The reliance of Qatar on foreign weapon procurement and defence alliances can hinder the design of a military strategy to answer regional threats.

On the one hand, the imports of western weapons are not adapted to answer asymmetric and hybrid threats in the Persian Gulf region. The GCC crisis that imposed an embargo on Qatar and isolated it on the international stage was held in the informational and cyberspace against the Qatari News Agency. Qatari military alliances with Western powers could not protect the state from such situations.

On the other hand, the over-reliance on Western defence partners also hinders building of regional integrated security architecture to answer such threats. Iranian military and its proxies have perfectly identified the gaps in the Gulf missile defence systems and their lack of coordination for detection of low altitude weapons. Anthony Cordesman highlights that “Iran does not so much project power, it exploits Arab division and weaknesses. This lets windows of opportunities for hybrid actors, such as Hezbollah and Houthis, with little technical means to

inflict serious strategic threats to GCC states. Iran with a far lower GDP and an outdated air force could produce an efficient ballistic and cruise missile force threatening the strategic assets of its regional rivals.”

Recently, GCC cooperation could be visible only on an ad hoc basis with operations against ISIS and in Yemen but no efforts in the long term could come to fruition. The GCC joint military unit, Dir Al Jazeera was dismantled in 2005, allegedly due to the rivalry between Saudi Arabia and Qatar or the will of Saudi Arabia to be more independent. Anthony Cordesman added that “each GCC country still pursues its security efforts with far too little emphasis on standardization, interoperability, common efforts to develop focused mission capabilities and deterrent efforts, and integrated air, maritime, and missile defence systems.”

Cordesman severely criticized this trend and the lack of defence cooperation between these states. He qualified the wasteful defence procurement from the GCC states as the “glitter factor”, the procurement of weapons without any military operational doctrine or strategy. Qatar spends a bigger share of its GDP in defence procurement than the USA. Western military allies rely on selling of their weapons to maintain their defence industries. They did not have any interest to propose a real framework to streamline the procurement plans in the region. This situation only led to the growing arms race in the Persian Gulf region with little effect on the security architecture. ♦



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Despite some nonsense about the size of Arab Gulf military efforts – and burden sharing – spouted by both President Obama and President Trump, every Arab Gulf state except Qatar routinely spends more of its GDP on security than the United States. Most spend far more than twice the 2% of GDP the U.S. is asking of its NATO allies

Light Amphibious Tank SPRUT-SDM1. On the land, in the water, and in the air

For the first time in the world, it is in Russia where a modern light tank has been developed, and what makes it absolutely unique, it is an amphibious tank. This is a novelty that many military experts have already seen at international military exhibitions. It was presented by PJSC Kurganmashzavod (part of the High-Precision Weapons Holding belonging to the Rostec State Corporation).

The advantages of this light amphibious tank, the self-propelled anti-tank gun SPRUT-SDM1, are particularly obvious in the conditions of high mountains and coastal marine areas.

The vehicle is capable of performing tactical tasks including reconnaissance, combat, march, and out-guard security; actions within raiding, flanking, and forward squads; actions within a combat support area and providing maneuvering defence; forcing water barriers agoing; amphibious operations; actions in forested, mountainous and northern areas; territory monitoring in peacekeeping operations and in local armed conflicts.

And, since it is still a light amphibious tank by definition, the SPRUT-SDM1 has to meet some of general requirements related to a main battle tank:

- Fire power equal or at least comparable to that of a main battle tank;
- Enhanced tactical mobility and operational maneuverability, including the capacity to independently cross a water barrier agoing;
- Significantly better adaptability to an operational and strategic transportation by air, sea, rail, and road.

All these features have been embodied in the design of the Russian Light Amphibious Tank, the self-propelled anti-tank gun SPRUT-SDM1. The vehicle is capable of performing tasks in the three elements – on the land, in the water, and in the air.

It is absolutely clear for experts that, at last, there emerged a universal fighting machine for a variety of armed forces' branches. Thus, the Land Forces equipped with such vehicles would now be able to complete their reconnaissance, anti-tank or police units, special mountain formations and squads. Both the Marines and coastal Land Forces would receive additional protection and enhanced firepower. Area defence units would acquire a rapid response force against sudden threats and attacks. At the same time, the cruising range of the SPRUT-SDM1 is up to 500 km without refueling that provides an additional service life and ensures fulfillment of a combat task over a long time.

The 500-HP multi-fuel diesel engine UTD-29 develops the power necessary to drive this 18-ton three-man combat vehicle at speeds of up to 70 km/h on land and up to 10 km/h in the water. At the same time, the SPRUT-SDM1 Light Amphibious Tank is able to overcome mountain bridges without losses in personnel and materiel.

Across the world, there are no similar amphibious vehicles enjoying such powerful weapons per unit weight. So, the SPRUT-SDM1 Light Amphibious Tank is equipped with the 2A75 125-mm gun, which is capable to fire modern APFSDS, HEAT and HEF projectiles, as well as munitions with remote detonation on a trajectory. Such weapons are particularly efficient against enemy personnel, MANPATs elements, soft-skinned vehicles, and light armor.

In terms of firepower, it is on the level with another Russian novelty – the T-90MS Main Battle tank. It is also necessary to mention that the upgraded SPRUT-SDM1 Light Amphibious Tank can fire guided missiles with shaped and HEF payloads, thanks to which the most protected enemy armor can be penetrated at a range up to 5 km. One ammunition allowance of the SPRUT-SDM1 Light Amphibious Tank totals 40 rounds for the gun, including 22 rounds in the mechanized rounds rack.

The vehicle mounts a 7.62 mm remote-controlled machine gun. As a result, the vehicle commander would be able to independently engage detected targets at the same time when the main weapon is being used by the weapons operator. The total ammunition for the MGs is 3,000 rounds.

Apart from the tank gun, the “self-propelled gun” enjoys the latest fire control system. This is the SOSNA-U, one of the world's best sights for a weapons operator. The PKP, the commander's panoramic sight, would allow firing all types of ammunition, including guided missiles. Both sights are equipped with an automatic target acquisition and tracking device. In case of damage of the main sights, there is a backup sight, an optical-electronic one which has a vertical-stabilized field of vision and a stand-alone power system.

The information and control system of the chassis does greatly facilitate operation and has a failure-warning feature. The chassis is equipped with a highly efficient independent hydro-pneumatic suspension with an adjustable chassis clearance system. Considering somewhat specific application of the vehicle, a possibility of squashing a bottom against the ground shall not be overestimated.

The demand for this category of armor will only increase in the near future. Especially, after foreign military specialists have seen the price of the SPRUT-SDM1 Light Amphibious Tank compared to that of similar vehicles offered by other foreign manufacturers. ♦



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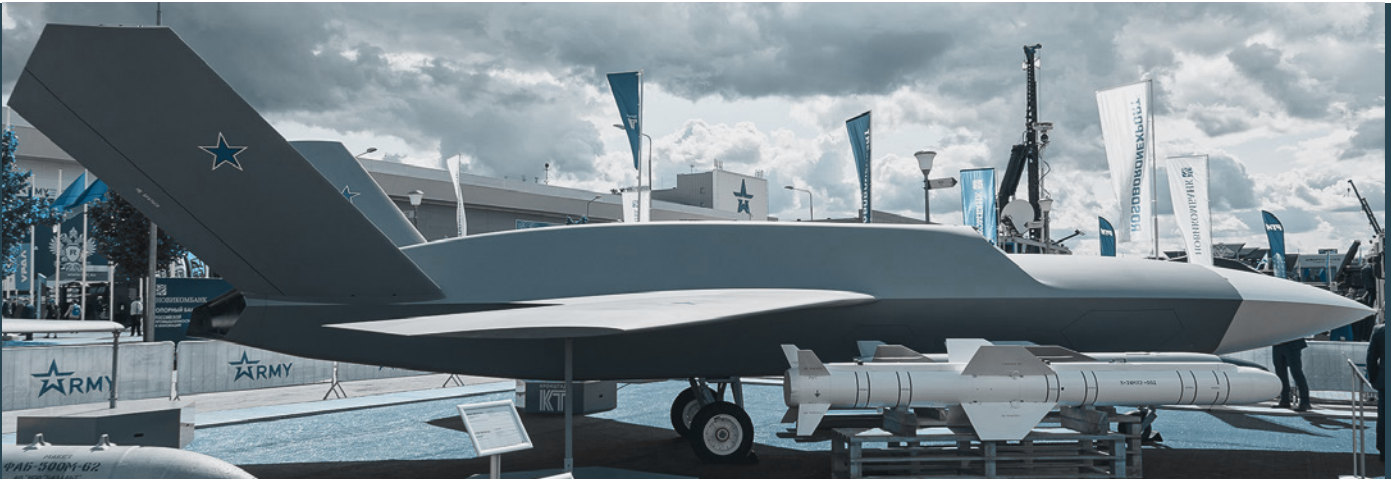
THREE DOMAIN VEHICLE



SPTP SPRUT-SDM1 LIGHT AMPHIBIOUS TANK



KURGANMASHZAVOD
www.kurganmash.ru



Grom UAV

Thunder is Heard

The Grom (Russian for Thunder) unmanned aerial vehicle exists now in the form of a mock-up and a concept. Preliminary design works began in August 2021, and at this phase the shape of the future combat robot will be specified. But one unique capability of the new UAV has already been announced: it will be able to control a swarm of ten Molniya (Russian for Lightning) small-sized strike drones, which can be used to break through modern air defence systems and strike even the most protected targets.

Author Dmitry Kornev

The Kronshtadt Group is developing a promising strike drone. The Grom is made according to the normal aerodynamic scheme and has a shape that provides the aircraft with minimal radar visibility in most angles. Like fifth-generation UAV fighters, Grom carries some of its payload in an internal weapons compartment. There can be conventional bombs of different calibers, guided Kh-38 air-to-ground missiles (AGM), as well as guided aerial bombs KAB-250 and KAB-500. The weight of the Grom striker weapon payload will be at least 1,300 kg, which is serious enough for a vehicle with the takeoff weight of a light fighter.

REMOTE WARFARE

One of the most efficient scenarios of combat use of Grom drones is a strike operation to break through the enemy air defence. Even now they can already be classified as a classic drone engagement. An indisputable advantage of such operations is saving lives of pilots of conventional attack aircraft. Why

is this important? Besides humanitarian reasons, there are also financial ones: the cost of training a bomber or attack aircraft pilot is sometimes comparable to the cost of an aircraft itself and certainly higher than the cost of an attack drone. And the loss of professional pilots certainly affects the morale of a warring army.

Drone strike operations can resemble a computer game: somewhere far away from the frontline, a pilot operator is sitting at the dashboard and controlling the drone. The most advanced devices allow the operator to be several thousand kilometers away from the combat zone – satellite communication will ensure transfer of images and flight parameters from the drone to the operator, and then will transmit the command to use weapons from the operator to the drone.

Of course, the aircraft must be largely automated – when performing routine operations, participation of a pilot-operator is not

necessary at all, even passenger airliners fly under autopilot control most of the way. But when a target is reached or any change in the information field around the vehicle occurs, the pilot-operator gets to work.

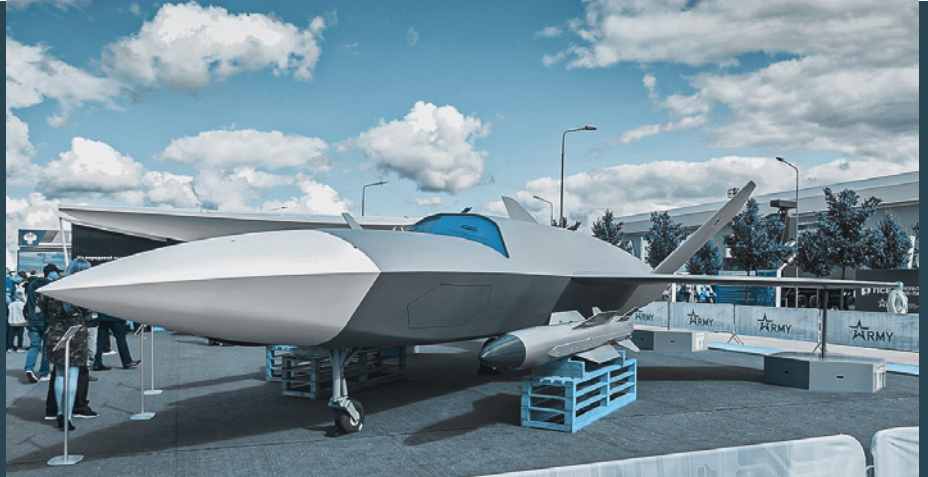
In a classic situation, a combination of reconnaissance and attack functions works, which has been implemented for many years in the concept of American counter-terrorist operations. First, there is reconnaissance and identification of the target, then the drone hits the target with a guided weapon – a guided air bomb or an air-to-ground missile. If the enemy has no full-fledged air defence or it's easy to suppress, everything looks simple and efficient.

DRONE ATTACK

We see a completely different picture when the enemy has a powerful air defence system. What matters here is not so much the presence of modern systems as the well-

TACTICAL AND TECHNICAL CHARACTERISTICS OF THE GROM UAV:

Length – 13.8 m
Wingspan – 10 m
Height – 3.8 m
Takeoff weight – 7,000 kg
Payload mass – 1,300 kg
Maximum speed – 1,000 km/h
Cruising speed – 800 km/h
Operating range – 800 km
Ceiling – 12,000 m



Grom UAV

SEVERAL GROM STRIKES WITH DOZENS OF MOLNIYA COORDINATED ACTIONS ARE ABLE TO CLEAR THE WAY FOR HEAVY PLANES, DESTROYING THE ENEMY'S ANTI-AIRCRAFT SYSTEMS, WHICH WOULD HAVE BECOME UNGUIDED AND BLIND. AFTER THAT, THE MAIN AIR FORCES – MANNED AIRCRAFT AND HEAVY UAVS SUCH AS OKHOTNIK (AKA SUKHOI S-70) – WILL ENTER THE FRAY. THIS IS A VERY REALISTIC SCENARIO FOR A FUTURE DRONE ATTACK

thought-out and controlled organization of an echeloned defence. After all, in 2019–2020 Saudi Arabia has had quite modern Patriots in service, and Armenia used S-300, but practice has shown that neither side was ready for modern unmanned attacks.

In the war of the future, for which Grom is being prepared with a swarm of small-sized Molnias, a successful strike operation is very likely. Operators will be able to direct the attack from long-range surveillance and control aircraft such as the A-100 Premier. The Grom strike drones will attack the enemy defence system as the first echelon, its task being to open up and destroy air defence installations. Part of the Grom drones will conduct reconnaissance and provide information coverage of the entire operation, while another group will suppress all communication channels on the enemy territory and, after portraying several false raids, eliminate the air defence command centers in the main strike.

Several Grom strikes with dozens of Molnias coordinated actions are able to clear the way for heavy planes, destroying the enemy's anti-aircraft systems, which would have become unguided and blind. After that, the main air forces – manned aircraft and heavy UAVs such as Okhotnik (aka Sukhoi S-70) – will enter the fray. This is a very realistic scenario for a future drone attack.

CLOSER TO REALITY

So far, Grom exists only as a mock-up and a concept. Its conceptual development began only in the summer 2021, and it can be

assumed that in 2022–2023 works on the strike drone will reach the stage of technical design, and by 2025 we might see the first prototype of the new drone in the air. Predicting the future is an ungrateful task, but it may well happen that with increased interest from the customer – the Russian Ministry of Defence – the project will be implemented in a short time frame.

It will probably take two to three years for comprehensive testing and pilot operation of the new type of equipment. Not only tactics of the drones themselves will have to be practiced, but also coordination of joint combat operations with a swarm of small Molniya drones, as well as with other drones and manned aircraft. Currently, no other army in the world has such an experience. Not only control systems, but also fully automated modes of operation of mini drones will have to be developed and worked out. It is the autonomy that ensures the speed of technology. In an instantly changing environment, a human operator will lose to artificial intelligence in decision-making speed.

It is assumed that the Grom will be used in conjunction with manned fighters Su-35, Su-57 and bombers Su-34 and provide suppression of enemy air defence. Probably, there will be specialized modifications of the Grom, such as with jamming and electronic warfare. Information exchange between all manned and unmanned aerial vehicles is also likely to be possible. This is the main feature of the future air warfare: network-centricity and unified information space will ensure victory in impending high-tech conflicts. ♦



SPLAV: FIRE CONTROL

Joint-stock company SPLAV Scientific Production Association named after A. Ganichev is a leading enterprise in the development of multiple rocket launch systems (MRLS) both for the Army and the Navy. Our company is part of the management network of the Technodinamika Holding company of the Rostec State Corporation – the managing organization being the JSC Techmash SPC.

Through the years of its existence, SPLAV has developed outstanding systems such as Grad, Uragan, Smerch for the Army; Grad-M, Udav-1M, Ogon', Damba, RPK-8 for the Navy; as well as dozens of unique manufacturing techniques for rocket projectiles. Also artillery shell cases of calibers from 23 to 152 mm made of various materials have been elaborated. Today, our engineering developments and production techniques in the field of the rocket artillery and shell cases production are world-renowned.

Specialists of the company have developed modernization programs for Grad and Smerch systems. These programs have ensured execution of fire missions to destroy an enemy over a distance of 40 and 90 km correspondingly, enhancing capabilities

of fire engagement against typical targets, the computerization of the fire preparation and delivery, and upgrade of the launch vehicles.

JSC 'SPLAV SPA' named after A. Ganichev offers for international defence markets upgraded Grad and Smerch MRLSs, including various-purpose warheads rocket projectiles with a firing range of 40 and 90 km correspondingly, and upgrade of previously delivered launch vehicles for these systems; the state-of-the-art Tornado-G MRLS; rocket projectiles for TOS-1A MRLS; the new generation of the 80-mm unguided aircraft rocket armament: HE-fragmentation penetrating warhead unguided aircraft C-80FP rocket projectile equipped with a small-type high-energy solid rocket propellant motor,

and last but not least, the state-of-the-art Russian MRLS 9K515.

9K515 MRLS was designed on the basis of Smerch MRLS as a result of:

- Development of brand new guided missiles with a firing range up to 120 km, fitted with a control system that is built on a strapdown inertial navigation system with enabled onboard equipment of satellite navigation system and with the possibility to bring individual flight mission data to each missile;
- Upgrade of launch vehicles for Smerch MRLS, which ensures launch preparation and firing of both types of RPs (for Smerch MRLS and the newly developed



guided missiles) without the crew leaving the cabin;

- Equipping the launch vehicle with an autonomous topographic survey system and navigation system.

CURRENTLY, THE FOLLOWING SYSTEMS ARE AVAILABLE FOR THE EXPORT DELIVERIES:

GRAD MRLS:

1. 122-mm Rocket Projectiles (RPs):

- High-effect warhead 9M521 RP;
- HE-fragmentation separable warhead 9M522 RP;
- Shaped-charge fragmentation submunitions 9M218 RP.

2. 2B17-1 Launch Vehicle (LV) equipped with automated laying fire and control system (ALFCS).

TORNADO-G MRLS:

1. 122-mm Rocket Projectiles (RPs):

- High-effect HE-fragmentation warhead 9M538 RP;
- High-effect separable HE-fragmentation warhead 9M539 RP;
- Shaped-charge fragmentation submunitions warhead 9M541 RP.

2. 2B17M launch vehicle equipped with ALFCS and ground launch preparation and firing equipment.

TOS-1A Heavy Flame Throwing System:

- 220-mm extended range MO.I.OI.O4M unguided RP.

SMERCH MRLS:

1. 300-mm RPs:

- Fragmentation submunitions warhead 9M525 RP;
- HE-fragmentation separable warhead 9M528 RP;
- Fuel-air explosive warhead 9M529 RP;
- Shaped-charge fragmentation submunitions warhead 9M531 RP;
- Sensor-fuzed submunitions warhead 9M533 RP.

2. 9A52-2 LV (on MAZ chassis), 9A52-2T LV (on Tatra chassis), 9A52-4 LV (lightweight six-round launcher mounted on elongated KAMAZ chassis) equipped with ALFCS.

3. 9T234-2, 9T234-2T, 9T234-4 Transporter-Loaders.

4. 9F819 Arsenal Equipment.

5. 9F827 Training Aids.

6. 9F840 Training Set.

7. MP32M1 Unified Command and Staff Vehicle.

8. 1B44 Radio Direction-Finding and Meteorological Complex.

MRLS 9K515:

1. 300-mm Guided Missiles:

- Shaped-charge fragmentation submunitions 9M544 guided missile;

- Fragmentation submunitions 9M549 guided missile.

2. 9A54 Launch Vehicle equipped with automated laying fire and control system (ALFCS) and ground launch preparation and firing equipment (GLPE).

Specialists of the company have developed an upgrade algorithm for standard rocket projectiles for Grad, Grad-1 and Prima MRLSs, ensuring an increase in the maximum fire range of up to 40 km, as well as the repair documentation for overhauling Uragan MRLS rocket projectiles 9M27F and 9M27K with expired specified service life, so that they get guaranteed 10 years' shelf life after repair. ♦



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Western Sixth-Generation Air Systems

The new millennium brought with it a new generation of fighter aircraft. The progress between the fourth and the fifth generations was primarily a leap in information technology, but the incorporation of stealth features and cutting down Radar cross section also marked the new generation of fighters.

Author Kevin Klemann

INTRODUCTION

While the number of models that can be described as afifth-generation fighter is rather limited and with relatively few more in development right now, already the most advanced defence complexes of the world are gearing up for the next aircraft: the sixth generation aircraft. As this next generation of aircraft is being developed, it seemed that many countries would entirely forgo the development of fifth in favour of the sixth generation. This article will take a look at the western (European, American and Japanese) developments that are aiming for this next generation of air dominance.

SCAF / FCAS

The origins of the Franco-German-Spanish Future Combat Air System (FCAS) or Système de combat aérien du futur (SCAF) lie in a Letter of Intent (LoI) agreement signed in 1998, in which France, Germany, Great Britain, Italy, Spain, and Sweden aimed at “establishing a co-operative framework to facilitate the restructuring of European defence industry.” This agreement resulted in the European Technology Acquisition Program, which was started in November 2001, when the ministers of defence of the six nations signed a memorandum of understanding underlining the importance of preparing for future fighter systems. By 2011, this program had launched 15 Technology Development Programs (TPDs) worth 118 million Euro, among them there were projects to develop a high bandwidth communications link and manufacturing of low observable materials.

In November 2014, the British and French Governments awarded Dassault Aviation and BAE Systems with a first feasibility study contract for a future combat drone. The two industrialists were given 250 million Euro and two years to design

and define the specifics of this “Future Combat Air System.” The two prime contractors were to work with engine manufacturers Safran and Rolls Royce, as well as electronics groups Thales and Selex ES. Both companies have had some experience in the development of Unmanned Combat Aerial Vehicles (UCAV): the nEU-ROn launched by Dassault in 2005 in partnership with Sweden, Switzerland, Italy, Greece, and Spain, which had been flying since December 2012; and BAE’s Taranis, which had been undergoing tests since April 2013. While both France and the UK had still declared their commitment to the joint project at a summit in 2016, no further development was confirmed in January 2018 and by 2019 the program was at a standstill¹.

While the cross-channel project petered out, the Franco-German cooperation on the same topic had begun in earnest. In July 2017, German Chancellor Angela Merkel and French President Emmanuel Macron announced at a Franco-German Council of Ministers meeting in Paris their intention to pursue the joint development of several weapons systems, including a European air combat system, under the leadership of both countries. In April of the following year, during the ILA exhibition in Berlin, Airbus and Dassault signed an initial agreement to cooperate, followed the very next day by a German and a French General signing the High Level Common Operational Requirements Document. This document confirmed that SCAF was to be a ‘System of Systems’ of manned or optionally manned command platform (Command Fighter Ad-

vanced or New Generation Fighter (NGF)) and an unmanned component (Remote Carriers)².

In February 2019, French and German defence ministers Ursula von der Leyen and Florence Parly announced a contract award to Airbus and Dassault Aviation for a Joint Concept Study (JCS), authorizing the contractor duo to come up with more concrete concepts for the future weapon’s main elements. With a volume of 65 million Euros, the contract was supposed to run for two years and lay the groundwork for demonstrator programs to be launched at the Paris Air Show in June the same year. The year 2019 also saw Spain formally join the program, as the Spanish Defence Minister Margarita Robles signed her country onto the program in June.

In December of that same year, German MTU Aero Engines and French Safran settled the details concerning their eye-level partnership to develop the engine of the next-generation European fighter aircraft NGF. In February, the two companies had signed a letter of intent specifying that Safran would take the lead in engine design and integration, and MTU Aero Engines would take the lead in engine services. The two partners also agreed on the foundation of a 50/50 joint venture that would be incorporated by the end of 2021 to manage the development, production, and after-sales support activities of the new engine that will power the next-generation fighter aircraft (NGF)³.

Despite this, in February 2021, French, German, and Spanish officials reached an impasse. The three countries disagreed over intellectual property rights and work shares. Before Spain has joined the project, the workload had been split 50/50 between Airbus and Dassault. But with Spain also being represented by Airbus in the project, the workload distribution had to be renegotiated. By the April 2, the par-

FCAS is one of the most ambitious European defence programmes of the century

Dirk Hoke,
CEO of Airbus
Defence and Space



European SCAF / FCAS (up)
Tempest / FCA

ties came to an agreement, although at the time Airbus still declined commentaries. In the following month, the partners reached an agreement to develop a demonstrator fighter aircraft by 2027.

Despite these difficulties, on the August 30, current year, a trilateral agreement was signed in Paris, to begin a preliminary development phase for a lead plane under the SCAF program. The agreement followed the approval of a 4.5 billion Euro investment through 2027 by the German Parliament earlier in June. The trilateral agreement entailed phases 1B and 2, thus covering research and development activities and the construction of an initial, flyable prototype.

It seems that at this point, the previously described dispute between the main contractors Dassault and Airbus had not been resolved, as the German Defence Ministry tweeted: “Now it’s industry’s turn – come to an agreement.”⁴

TEMPEST / FCAS

As mentioned before, the Franco-British cooperation in developing a new fighter was slowing down by 2018. Despite this, in July of the same year, British Defence Secretary Gavin Williamson unveiled a concept model of a next generation fighter jet at the Farnborough International Airshow. This aircraft was to be part of the stated goals of the Defence Ministry’s Combat Air Strategy, which called for an implementation of Future Combat Air System Technology Initiative, established by the 2015 Strategic Defence and Security Review. In the same statement, it was announced that the so-called Team Tempest would be comprised of BAE Systems tasked with advanced combat air systems and integration; Rolls-Royce, with advanced power and propulsion systems; Leonardo, with sensors, electronics, and avionics; and MBDA, with advanced weapons. Early

decisions around how to acquire the capability were to be confirmed by the end of 2020, before final investment decisions would be made by 2025. The aim was then for a next generation platform to have operational capability by 2035⁵.

Only a few days later, the Swedish defence ministry signed a memorandum of understanding (MoU) to explore ways of jointly developing sixth-generation air combat technologies. Sweden’s Saab hoped to transfer some of its expertise on the development to its Gripen E fighter, but at the time there was no definitive signing of Saab into Team Tempest⁶.

In September 2019 at DSEI, the members of Team Tempest together with key Italian Industry players (Leonardo Italy, Elettronica, Avio Aero, and MBDA Italy) announced their intent to partner on the Tempest program by signing a Statement of Intent (SoI). This statement would see the parties work together to define an innovative concept and

partnership model which was to include knowledge sharing, product definition, and technology development for the joint development of future combat air systems. A joint government feasibility study also concluded that the UK and Italy were natural Combat Air partners, with both Air Forces operating the same mixed fleet of Eurofighter Typhoon and F-35 aircraft⁷.

On December 21, 2020, Italian Defence Minister Lorenzo Guerini, UK Secretary of State for Defence Ben Wallace, and Swedish Defence Minister Peter Hultqvist signed a trilateral MoU on the development of Tempest, “the general principles for co-operation on an equal basis between the three countries comprising all activities including research, development, and joint conceiving necessary for governments.”⁸

In July 2021, the UK MoD awarded BAE Systems a contract worth approximately £250 million, marking the official start of the program’s concept and assessment phase. A month later, Italy similarly freed up funds of the project: 20 million Euros each year from 2021 to 2023. Rome had also defined the project as one of its ‘flagships’, which were to have a guaranteed funding stream, as involving international cooperation, a high level of technology, and Italian work share.

DSEI 2021 also saw the showcasing of a model of a modified Boeing 757, nicknamed Excalibur. It is to serve as a test bed for a sixth-generation fighter, with a representative Tempest cockpit installed inside the fuselage. The United States had pioneered this sort of test bed for its F-22 and F-35 programs, making Excalibur the first non-US example of such an experimental airplane⁹.

F-X

In 2010, the Japanese MoD released a study on its vision of a future fighter development, which suggested development of a next generation fighter as a successor to the Mitsubishi F-2. The aircraft envisioned in this document, dubbed the i³ Fighter, is set to be realised within 20 years and features integrated fire control, next generation avionics and engine technology, and

We have been a world leader in the combat air sector for a century, with an enviable array of skills and technology, and this Strategy makes clear that we are determined to make sure it stays that way

Gavin Williamson,
UK Defence Secretary



improved stealth. Within 30 to 40 years, the concept should also feature directed energy weaponry and a combat cloud for fighting in cooperation with UCAVs¹⁰.

In the wake of not receiving the American F-22 Raptor, Tokyo set out to develop its own fifth-generation fighter, eventually resulting in the Mitsubishi Advanced Technology Demonstrator – X (ATD-X) Shinshin (心神). After reportedly having spent ¥39.4 billion (\$332 million) on the project, Japan unveiled its first stealth aircraft in January 2016, making its maiden flight in April of the same year. At the time, this made Japan the fourth nation in the world to field a domestically produced stealth aircraft¹¹.

Despite these developments, Japanese MoD in October 2018 decided to develop a new, sixth-generation aircraft, after proposals by Boeing (for an F-15 based fighter), Lockheed Martin (for a F-22/F-35 hybrid), and BAE Systems (for the Eurofighter Typhoon) failed to meet Japan’s expectations regarding costs and capabilities. Further developments of the ATD-X were similarly cancelled. In

Based on previous discussions, the option of ‘developing derivatives of existing fighters’ cannot be a candidate from the perspective of a Japan-led development, and the MoD has come to the conclusion that we will develop a new model

Acquisition,
Technology,
& Logistics Agency
of the Japanese
Ministry of Defence

February 2019, Japanese MoD announced that it would pursue a “Japan-led” program to develop a next-generation fighter aircraft, though open to cooperation with outside partners. The project was to begin phasing out the Mitsubishi F-2 by the 2030’s.

In April 2020, the MoD’s Acquisition, Technology, & Logistics Agency (ATLA) had established a dedicated team to develop the next generation fighter, which by now has been named F-X (but will likely enter service as the F-3). By December 2020, it was announced that Lockheed Martin was to support the prime contractors, Mitsubishi Heavy Industries (MHI), in developing the aircraft. The following month, it became clear that F-X would also feature artificial intelligence, developed by ATLA and earmarked at 2.5 billion yen (\$24.3 million), while Subaru Corporation was assigned to develop the aircraft’s remote and flight control systems. In June 2021, the Japanese government announced that it had partnered with the UK to jointly develop new engine technologies that could be applied by both the London-led FCAS program and its own F-X¹².

US NAVY NGAD (F/A-XX)

The US Navy first defined the requirements for a sixth-generation aircraft as early as in 2008. By January 2016, the service began its requirements study for the Next Generation Air Dominance (NGAD) program that could produce a family of NGAD systems to replace the capability of Super

Hornets and the electronic attack EA-18G Growler in the 2030s. There had been speculations over a joint exploration and analysis of alternatives (AoA) for the following on to Navy's Boeing F/A-18E/F Super Hornet and the Air Force's Lockheed Martin F-22 Raptor air superiority fighter, but this possibility was discarded by 2016. The analysis efforts were completed by July 2019.

In 2020, the Navy created a program office for the NGAD initiative. With the fiscal year 2021 being the last in which the Navy planned to acquire more F/A-18s, it went on to portion \$4.5 billion across its five-year budget plan and put the funds toward the NGAD effort. In March 2021, it was announced that the said successor would still "most likely be manned," but that the NGAD program would include a mix of both manned and unmanned platforms.

We truly see NGAD as more than just a single aircraft. We believe that as manned-unmanned teaming comes online, we will integrate those aspects of manned and unmanned teaming into that

**Rear Adm.
Gregory Harris,**
*Air Warfare
Directorate of the
Chief of Naval
Operation*

As of late March 2021, the NGAD program was still in the 'concept refinement phase', in which the Navy work with the industry to determine the latest technology and whether it could pursue an unmanned fighter aircraft. Despite the earlier break with the Air Force's program, the Navy is working with the Air Force during this stage, as the services are expected to have different air frames, while the systems inside the platforms would be similar¹³.

US AIR FORCE NGAD (F-XX)

The US Air Force's NGAD program was initiated in the early 2010s to develop a 2030s air superiority system. The United States' DoD had mentioned its interest in building a new 'X-plane' prototype as far back as 2014, and on September 15, 2020, the Air Force announced that it had flown a full-scale flight demonstrator as part of the NGAD program. The Air Force has said that NGAD exists to examine five major technologies that are likely to appear on the next generation aircraft, but has kept secret what four of those technologies are.

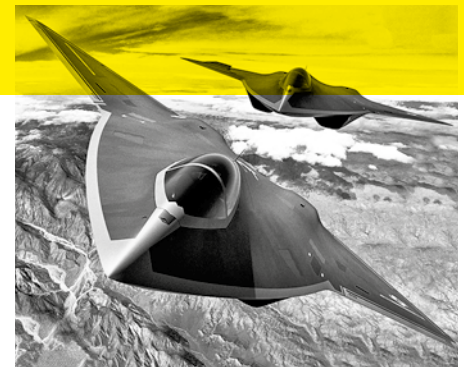
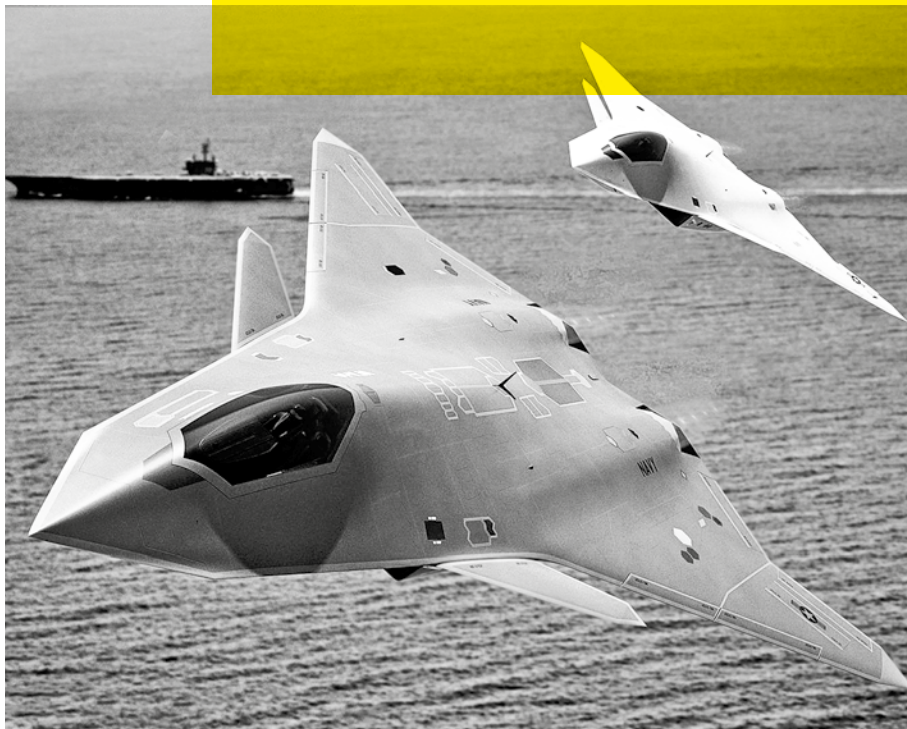
The one acknowledged NGAD-related technology is propulsion, with other likely candidates being new forms of stealth, advanced weapons, including directed

energy and thermal management to deal with increased heat output of modern and more powerful engines. The Air Force's NGAD is budgeted at \$9 billion from 2019 through 2025. The FY 2021 budget is \$1 billion, with a request of \$1.5 billion for FY 2022¹⁴.

According to the Air Force's biennial 2021 report for acquisition, "the program uses a non-traditional acquisition approach to avoid traditional monolithic program schedules and exorbitant life-cycle sustainment costs. This strategy, called the Digital Century Series approach, creates a realistic business case for industry to adopt commercial best practices for key design activities – before a part is even manufactured." The 2020 demonstrator was probably constructed by Lockheed Martin. While much of the details about the aircraft is shrouded in secrecy, it is extremely likely that it will also be a system-of-systems and will operate with the assistance of 'loyal-wingman' type drones.

We've already built and flown a full-scale flight demonstrator in the real world, and we broke records in doing it

Will Roper,
*Assistant Secretary
of the Air Force
for Acquisition,
Technology & Logistics*



US Air Force NGAD (F-XX)

US Navy NGAD (F/A-XX)

SO, WHILE SECRECY STILL SHROUDS MANY OF EXACT DETAILS OF THESE NEW WEAPONS SYSTEMS, THE NEXT GENERATION FIGHTERS SEEM TO BE TRULY WORTHY OF THEIR NAME



CONCLUSION

With the cost of newer, more advanced models of aircraft ever increasing, we can see a definite trend towards networked developments. While joint development between European manufacturers is nothing new, dating back at least as far as the venerable Cold War warrior Tornado, the Franco-German-Spanish and the British-Italian-Swedish efforts both have common roots. Given the towering costs for these projects, it is far from unlikely that these projects could merge in the future.

At the same time, within one of these projects, SCAF, cracks can already be seen between manufacturers over workload and intellectual properties. So, while a merger may lead to deflate increasingly ballooning budgets and create synergies rather than parallel developments, disputes between manufacturers can also lead to crippling slowdowns in development and later pro-

duction. Given that fifth generation fighter planes are non-existent in Europe (and even the multirole F-35 is rather a scarce sight), such slowdowns would make Europe definitely lose a competitive edge. Especially with its nearest competitor, Russia, having developed and increasingly fielding such an aircraft. An interesting development is therefore the cooperation between Team Tempest and Japan's MHI, which by itself is much unlike the European cooperation, bordering on tradition for bigger projects.

The outlined developments also make clear what will be the hallmarks of the sixth generation aircraft: All the above projects are not merely a single weapons platform, but rather systems of systems. The pilot of these new aircraft (and it should be said that he may not even exist, as some projects are already described as manned optionally) will be backed up not only by sensors and analyses outside his airframe, but also, more directly, by unmanned drones

and artificial intelligence, even in his own aircraft.

Predictably, stealth remains a big factor in the development of these systems, though the usage of more disposable drones seems to lighten the emphasis on relying on stealth to assure persistence in a highly contested environment. A similar trend can be seen regarding manoeuvrability: while of course still of great importance, the sheer distance of the engagements enabled by 'loyal-wingman' type drones would make this less of a concern than in previous generations. But while drones are already an established aspect of modern warfighting, many of these projects are including research into directed energy weapons, which, discounting some prototypical experiments, would be a novum in aerial combat.

So, while secrecy still shrouds many of exact details of these new weapons systems, the next generation fighters seem to be truly worthy of their name. ♦

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⁴ <https://www.mtu.de/newsroom/press/press-archive/press-archive-detail/safran-and-mtu-aero-engines-achieve-a-major-step-forward-for-the-engine-contract-of-the-new-generation-fighter-ngf/>

⁵ <https://www.defencenews.com/global/europe/2021/05/17/new-trinational-deal-paves-way-for-fcas-demonstrator-program/>

⁶ <https://www.gov.uk/government/news/britain-to-take-leading-role-in-next-generation-air-power-as-defence-secretary-launches-combat-air-strategy>

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¹¹ https://www.mod.go.jp/atla/soubiseisaku/vision/future_vision_fighter.pdf

¹² <https://www.defenceaviation.com/mitsubishi-atd-x-shinshin-a-japanese-stealth-fighter>

¹³ <https://www.thedefencepost.com/2021/01/07/japan-plans-native-combat-drone/>

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¹⁵ <https://news.usni.org/2020/08/18/navy-quietly-starts-development-of-next-generation-carrier-fighter-plans-call-for-manned-long-range-aircraft>

¹⁶ <https://assets.documentcloud.org/documents/7222525/Air-Force-Next-Generation-Air-Dominance-Program.pdf>

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DefenPol China2022

15-16 July 2022

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Checkmate by the Black Knight

Without doubt, the new fifth-generation Sukhoi light fighter the Checkmate became the main premiere of the MAKS-2021 airshow, which took place in Zhukovsky near Moscow at the end of July, 2021.

Author Alexander Ermakov

THE DEBUTANTE BALL

The social media campaign launched by Rostec's press service before the opening of MAKS-2021 was second to nearly none in the Russian military-industrial complex. When it became clear that it would be the premiere of a new fighter, the interest of aviation enthusiasts and specialists was piqued – new combat aircraft appear rarely, especially if they are made by one of the world's leading producers. As if not wanting to distract attention from the premiere of the Checkmate, the rest of novelties presented at MAKS-2021 were mostly of a civilian nature. Although the point here, of course, is in the specializations taking

shape in the main Russian exhibitions: MAKS is focused on civilian products and export versions of military products, while the ARMY Forum is dedicated to military products, including those for the domestic market.

However, this time MAKS provided a site for one of the year's most significant premieres in the military aviation sphere. Officially presented to the public on July 20, the Sukhoi LTS (Light Tactical Aircraft is the formal name of the program), dubbed Checkmate for the international market and having an unofficial, unapproved Su-75 index, turned out to be a truly unique vehicle. What do we know about it so far?

The Sukhoi Checkmate is a single-engine fighter with a triangular wing and a V-shaped tail. Two all-flying surfaces installed at an angle, perform simultaneously roles of both horizontal and vertical empennage, and such a configuration reduces radar visibility.

The most important advantage in terms of development, production, and operation costs was the unification with the Su-57 in regard to the engine – the Checkmate in series is going to be equipped with the "second stage" engine of the Su-57, also known as "type 30", which is undergoing tests at the moment. The nozzle of the engine is round, controlled, with measures applied to reduce visibility.

Great attention was also drawn to a detail which is quite unusual for a Russian fighter: the underbelly air intake, which, judging by the shape, is a diverterless supersonic inlet (DSI). This type is considered to be the most progressive, as it reduces radar visibility and weight, and simplifies design. A minor disadvantage of such a construction is that sometimes aircraft with a DSI have a slightly lower maximum speed due to the air intake optimization for working in more common modes.

Flight characteristics have been revealed:

- maximum speed up to 1.8 speed of sound;
- range up to 2,800 km (without a drop tank, it is possible to place additional tanks, both under the wing and in the internal weapons bay);
- G-force up to 8g.

The armament is placed in three internal fuselage compartments – there are two front ones for one air-to-air missile each and a central one capable of accommodating either three air-to-air missiles or two bombs or air-to-ground missiles (the Kh-38 and Grom-1 missiles were placed in the compartment on the presented sample). A wide range of available armaments has been announced, probably corresponding to the Su-57 nomenclature. There are no specific details about the underwing pylons for armaments, but this option is available.

There was separately mentioned at the presentation the option of accommodation of a gun in the weapon bay as well as unguided weapons (bombs, rocket missiles) in the arsenal for “economical” destruction of ground targets under simple conditions. The declared total payload weight is up to

7,400 kg. Thus, in terms of armament, the Checkmate is almost as good as the much heavier F-35: the common load in the internal compartments of an American fighter is also two air-to-air missiles plus two bombs / air-to-ground missiles, the total payload weight being up to 8,160 kg.

The basic version of the fighter is a single-seat, but it is possible to develop a two-seat version and an unmanned/optionally manned version that will be able to operate in the same formation with manned Su-57 and Su-75 as a “Loyal Wingman”, which is an extremely popular concept for development of combat aviation nowadays. By the way, after the MAKS air show, sources in the military-industrial complex revealed to the TASS the plans to develop a two-seat, “commander” version of the Su-57.

The maiden flight of the Checkmate is scheduled for 2023, it should be made by the sample which was presented at the MAKS-2021, of course, after having been completed and with ground tests passed. The release of several more prototypes is planned for 2024–2025, and the readiness for series production is set for 2026–2027.

OPEN GROUND

Such an aircraft is much needed, and the sooner the better. The fact is that the traditional and large niche of light fighters is almost empty in the world market. In the second half of the Cold War period, the concept of the ideal composition of the Air Force has been formed. According to it, the Air Force was composed of light and massive fighters and heavier “elite” vehicles. The American pair of a twin-engine F-15 and a single-engine F-16 can be considered as the “gold standard” since the aircraft were largely unified, including the key operational component – the engine. At the same time, the

single-engine version was much cheaper, not even in purchase, but in operation.

In the USSR, due to several internal economic and technical reasons, both the Su-27 and the MiG-29 were developed with twin-engines and not unified with each other, which may have indirectly affected the development of the MiG family. Representatives of this family are much less frequently exported and are almost absent in the Russian Aerospace Forces. China, taking into consideration American and Soviet experiences, developed with Russian assistance the single-engine J-10 largely unified with the Su-27/J-11/16 family, including the engine standartization.

With the fifth generation, the tradition was broken. The only country with two fifth-generation fighters in service was the United States, but the second fighter, the F-35, was developed much later than the F-22 and turned out to have little to do with it. Besides, requirements of the military made the fighter far from being light and cheap. Programs in other countries, capable of holding the development of only one fighter, focused on creation of a twin-engine aircraft (for more information, see *The New Defence Order. Strategy*, issue No. 3 (68) 2021).

In Russia, a unique situation arose when, based on the experience of developing the Su-57, it became possible to create a single-engine fighter right after it, the one maximally unified (and therefore simpler, cheaper and faster to design, manufacture, and operate). Many of its components can either be borrowed (in this area it is important not to forget about software) or scaled (for example, airborne radar with active electronically scanned array with a reduced number of modules).

Thus, the Checkmate can be promoted in the market both as a separate aircraft

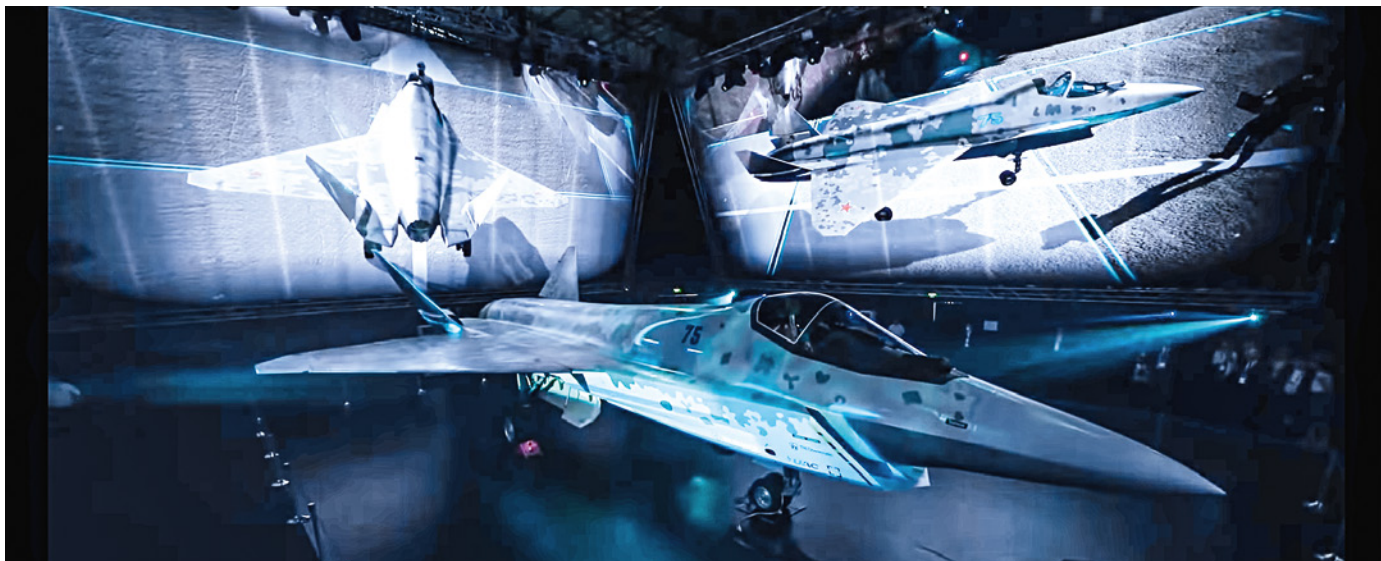


VLADIMIR PIROZHKOV,

CEO OF THE KINETICA HIGH COMPLEXITY PROTOTYPING CENTRE,
CREATOR OF THE BRAND IDENTITY OF THE SUKHOI SUPERJET 100 AIRCRAFT,
DESIGNER OF SEVERAL RUSSIAN SPACECRAFT AND ARTIFICIAL SATELLITES:

– The Checkmate contains an unexpected combination of smooth and very sharp forms. The air intake under the fuselage looks tough, which could actually be good. This is how the new aviation aesthetics are implemented. Speaking of that, Su-57 and the Checkmate look like father and son; they belong to the same brand and their family resemblance is felt. However, the conflict between faceted and smooth outlines is worth working on. This is my primary doubt as of a designer.

There is yet another point to mention here: no matter how the Checkmate is made, it will be trendy anyway, just because it is new and unique. The presentation was organized professionally, although it was a bit histrionic. The global community should react positively at least because a new player has appeared in such an exclusive segment.



YURI SLYUSAR,
HEAD OF THE UNITED
AIRCRAFT CORPORATION

We can promise, particularly for our traditional partners, that it is not just a purchase but also participation in the project itself: in its modernization, adaptation, aftersales technical service on the territory of the customer's country, including even production programs

and as part of a package offer with the Su-57 for wealthy buyers – in this case, the synergy effect works, both aircraft do not compete but strengthen each other's positions. There are simply no competitors with such an offer in the market. The F-35 is perhaps cheaper than the most expensive Western fighters, and its purchase is often accompanied by political obligations – the termination of the contract with Turkey is a good example. Even close allies are sold the F-35 with many delays, for example, contracts with Arab monarchies of the Gulf are openly opposed by Israel. Chinese JF-17 and Swedish JAS-39 fighters are modestly represented in the market and are unlikely to be successful in the long term. The United States continue to offer its allies with limited means upgraded versions of the F-16, but most of these countries would not

buy Russian weapons anyway for political reasons.

Thus, a wide market of Asian countries, the Middle East, Latin America, and the growing market of Africa is open for the Checkmate. According to Yuri Slyusar, the Head of the UAC, the business plan for the first 15 years is to produce 300 fighters. In the promotional materials, Vietnam, India, Pakistan, and Argentina were specifically mentioned as interested countries. The United Arab Emirates hold a special place as potential partners and possible customers for the Checkmate.

Without a doubt, the new fighter will find a place for itself in the Russian Aerospace Forces. Sukhoi LTS is urgently needed as a mass scale addition to the Su-57, which cannot replace all the fourth-generation fighters in service. ♦



2022

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exhibitors

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98,720

Total attendance

(exhibitors, visitors,
press, organisers)

227

Official delegations

from 94 countries
and 4 organisations
(representing 760 delegates)

690

journalists

from 44 countries

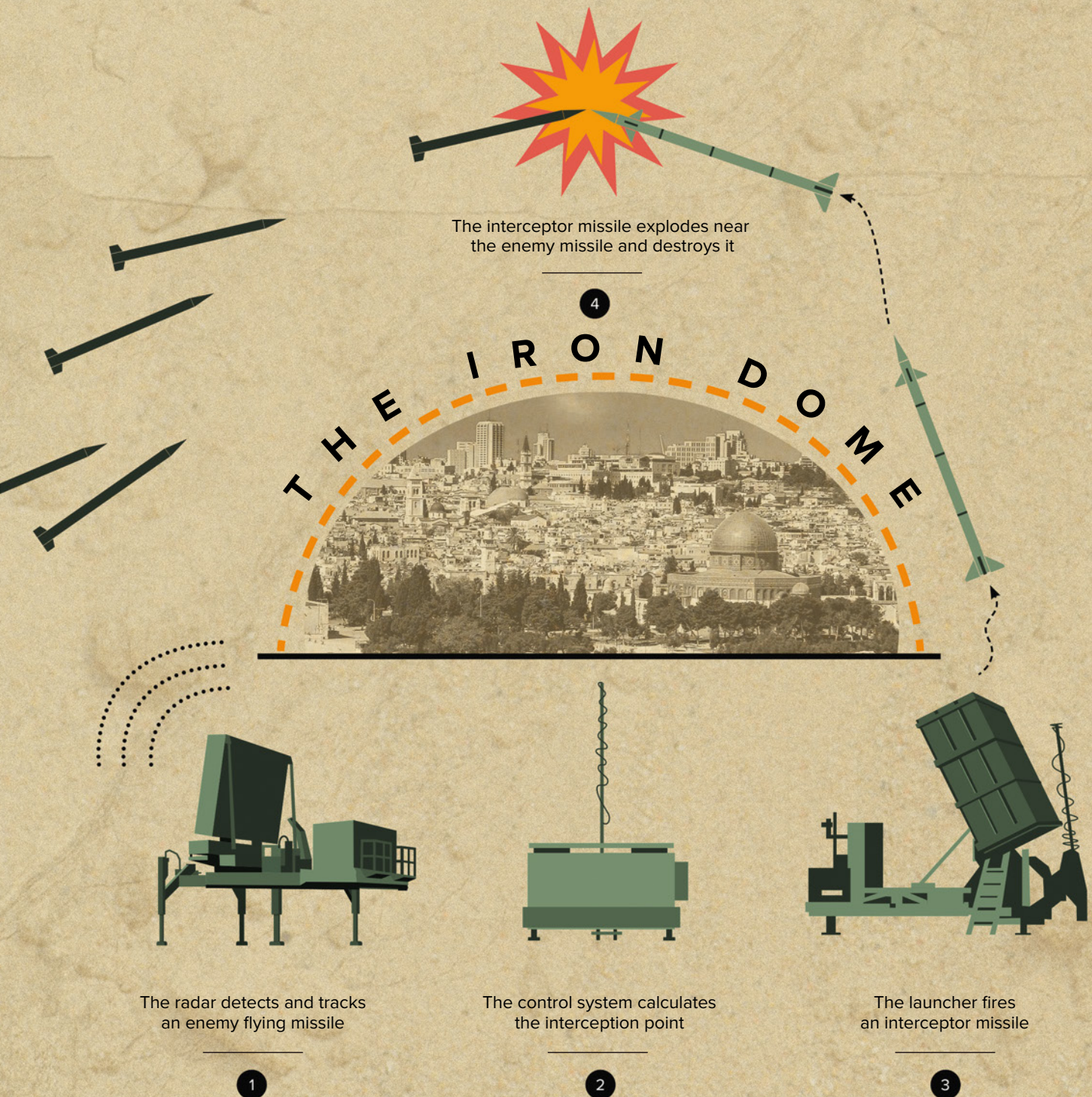
75 Conferences

2,100 Business meetings made



2018 key figures

Israel's Iron Dome



EACH BATTERY OF THE IRON DOME AIR DEFENCE MISSILE SYSTEM CONSISTS OF A COMMAND AND CONTROL CENTER, A MULTIFUNCTIONAL TARGET DETECTION AND TRACKING RADAR, AND THREE LAUNCHERS WITH 20 TAMIR ANTI-AIRCRAFT MISSILES IN EACH LAUNCHER. ISRAEL NEEDS TO HAVE AT LEAST 10 BATTERIES OF THE IRON DOME AIR DEFENCE MISSILE SYSTEM

4360



From May 10 to 21, 2021, about 4,360 unguided rockets **were fired** from the Gaza Strip from various launchers

3573



3,573 rockets **crossed the border** of the airspace controlled by Israel, and the rest fell inside the Gaza Strip or at sea

About 90% of unguided rockets or mortar shells that came flying into populated areas covered by the Iron Dome air defence missile system **were shot down**



\$300
\$1 000

Homemade unguided rockets produced in the Gaza Strip, of which the lightest ones of the Qassam series **can cost** about \$300–800 and the heavier ones – from \$1,000

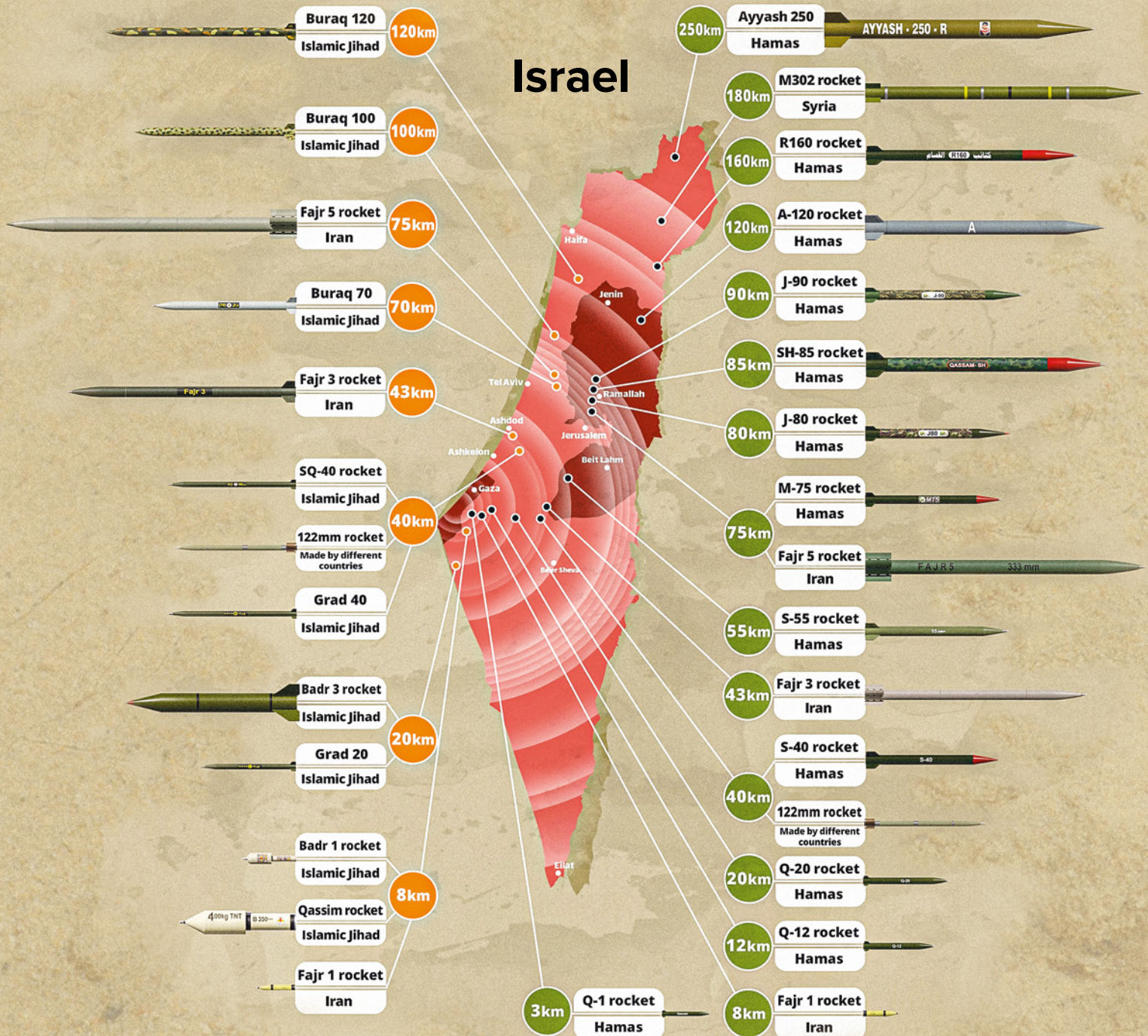


\$40 000
\$163 000

The **cost** of a Tamir anti-aircraft missile for the Iron Dome system is, according to various estimates and data, from \$40,000 to \$163,000 per piece

HOMEMADE UNGUIDED ROCKETS OF AL-QUDS BRIGADES OF THE ARMED WING OF THE PALESTINIAN ISLAMIC JIHAD

HOMEMADE UNGUIDED ROCKETS OF IZZ AD-DIN AL-QASSAM BRIGADES OF THE ARMED WING OF THE HAMAS MOVEMENT



SNSZ: INNOVATIVE TECHNOLOGIES IN THE SERVICE OF THE NAVY

Sredne-Nevisky Shipyard (part of the United Shipbuilding Corporation) is a leading Russian company in the field of composite shipbuilding. Since its foundation in 1912, more than 650 ships and vessels, including 300 mine countermeasures ships for the Russian Navy and foreign countries' naval forces, have left the plant's shipbuilding slips.

The concept of search and detection of mines has changed with development of technologies: nowadays, a customer needs not just ships capable to carry out minesweeping, but multi-functional high-tech platforms that can combine functions of both minesweeper and mine-hunter.

To implement this task, the new generation ships are equipped with specialized controlled underwater vehicles. Their use allows to conduct remote search for and disposal of mines without entering a minefield. New mine countermeasures ships carry onboard vehicles of that kind as well as unmanned power-boats which substantially expand the search range and detection of mine-like objects. Also, one more important factor is reduction of the ship's physical self-fields as the result of application of new non-magnetic materials in the process of her construction.

Sredne-Nevisky Shipyard has mastered series production of cutting-edge mine countermeasures ships for the base zone. These are the latest up-to-date projects, which are being developed with the instruments and technologies of the 21st century. Ships of the Project 12701, intended for the export market, are equipped with the newest means for search and neutralization of all mines types at a safe distance. Without entering a minefield, such a ship is able to conduct search, identification, and detection of all types of mines with the use of a Russian-manufactured countermine system as well as submersible vehicles made by the ECA (France).

The length of the ship is 61.6 m; the width, 10.3 m; displacement, 890 tons; the midship draft is 3.1 m. The crew consists of 44 people, the operational range is 1,500 miles, the cruising capacity, 10 days. Ships



Project 10750E



Project 12701

of this project are characterized by high maneuverability and sea-keeping ability (up to 5 points).

Two Russian-manufactured diesel engines M 503B-1 with a power of 2,500 h. p. each, made in low-magnetic version, are used as the main propulsion plant. The full speed of the ship is 16 knots. The Project 12701 ships have a great modernization capacity that allows adapting them to new tasks and mine disposal weapons according to a customer's choice.

Inshore minesweeper of the Project 10750E is yet another contemporary ship that fully meets current requirements in regard to tactical and technical characteristics. Her main aim is counter measures against the mine threat in inner harbor areas, ports, and coast sea fairways, in the spots that have the most difficult assess and are hard-to-reach for navigation. She is able to solve effectively tasks of mine defence in such places where neither base type minesweepers nor mine-sweeping helicopters are able to work properly. The Project 10750E is rigged with up-to-date mine countermeasures equipment, the latest hydro acoustic mine detection stations as well as with remotely operated and unmanned undersea vehicles.

The length of the ship is 32.4 m; the width, 6.9 m; the full displacement, 165 tons; the draft, 1.75 m. The full speed of the ship is about 11 knots. The operational

range is 650 miles; the cruising capacity, 5 days. The crew consists of 14 people, including three officers. Two engines MAN D2866LXE40 with the power of 379 h. p. each, made in low-magnetic version, are used as the main propulsion plant.

The outstanding feature of Projects 12701 and 10750E ships is their hull, which is a fiberglass monolith manufactured according to the advanced technology by the vacuum infusion method. The weight of such a hull is significantly lower compared to a metal one, which allows reducing the fuel consumption. At the same time, its durability is considerably increased. The hull of this type is resistant to corrosion and its lifetime is almost unlimited provided that performance standards are observed. ♦



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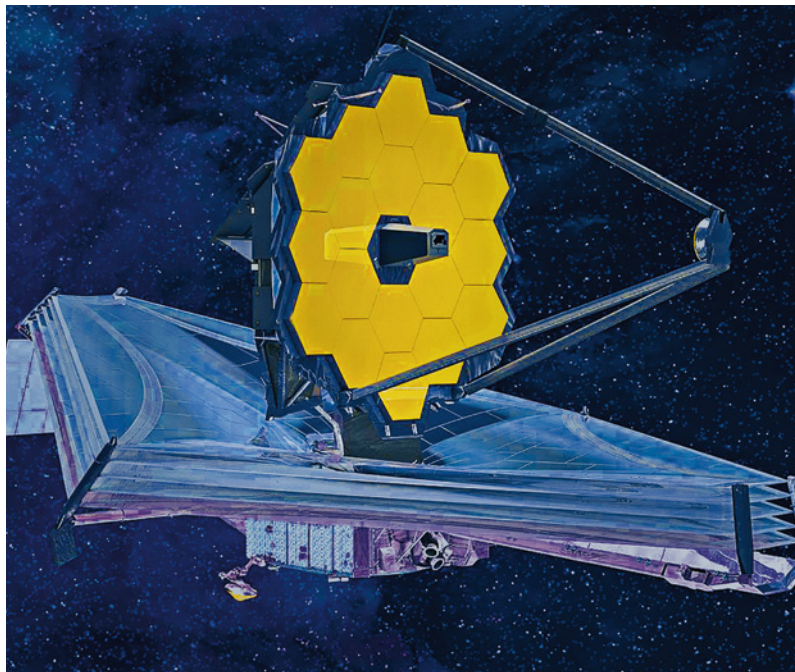
In association with



INDIA AND RUSSIA SIGN PACT TO DEEPEN SPACE COOPERATION / THE ECONOMIC TIMES

India and Russia have vowed to deepen collaboration in the space sector, including in the human spaceflight program, and signed an agreement for cooperation in building as well as operation of launch vehicles. In a joint statement issued following the summit, India and Russia “welcomed the enhanced cooperation between the State Space Corporation ‘Roscosmos’ and the Indian Space Research Organization, including in the human spaceflight programs and satellite navigation, and agreed to study the prospects of the development of mutually beneficial cooperation in the development of launch vehicles and use of outer space for peaceful purposes, including planetary exploration.”

Both sides intend to strengthen cooperation within the UN Committee on the Peaceful Uses of Outer Space (UN COPUOS), including the issues of the long-term sustainability of outer space activities. ♦



NASA'S WEBB TELESCOPE REACHES MAJOR MILESTONE AS MIRROR UNFOLDS / NASA

NASA's James Webb Space Telescope, launched on December 24, 2021, team fully deployed its 21-foot, gold-coated primary mirror, successfully completing the final stage of all major spacecraft deployments to prepare for science operations. A joint effort with the European Space Agency (ESA) and Canadian Space Agency (CSA), the Webb mission will explore every phase of cosmic history, from within our solar system to the most distant observable galaxies in the early universe. The world's largest and most complex space science telescope will now begin moving its 18 primary mirror segments to align the telescope optics. The ground team will command 126 actuators on the backsides of the segments to flex each mirror – an alignment that will take months to complete. Then the team will calibrate the science instruments prior to delivering Webb's first images this summer. “The James Webb Space Telescope is an unprecedented mission that is on the precipice of seeing the light from the first galaxies and discovering the mysteries of our universe,” says NASA Administrator Bill Nelson. ♦

NEW HYPERSONIC MISSILE-TRACKING SATELLITES PASS CRITICAL DESIGN REVIEW / C4ISRNET

The prototype satellites that will help the U.S. Missile Defence Agency track hypersonic threats have passed a critical design review, meaning the contractors can move forward with manufacturing. The Missile Defence Agency selected L3Harris Technologies and Northrop Grumman in January to design, build, and demonstrate prototype satellites for its Hypersonic and Ballistic Tracking Space Sensor. HBTSS will operate in low Earth orbit as part of a proliferated constellation of hundreds of satellites. “The combination of high speed, maneuverability and relatively low altitude of some of the emerging advanced missile threats makes them challenging targets for our current missile defence systems,” the agency explained when it issued the contracts. “HBTSS is needed, since we cannot populate the Earth and the oceans with terrestrial radars to meet this need. The ‘birth-to-death’ tracking that HBTSS can provide when integrated with terrestrial sensors will make it possible to maintain custody of missile threats from launch through intercept regardless of location.” ♦



RKS PHOTONIC TECHNOLOGIES WILL CONTROL SPACE DEBRIS / ROSCOSMOS

To control near-Earth space and observe artificial objects in the Earth orbit, the specialists of the Russian Space Systems Holding propose using the latest photonics technologies and original methods of ground-based processing of optical information. The corresponding system for monitoring “space debris” was developed and patented by the RKS to solve one of the most urgent tasks today – cleaning the orbit from exhausted artificial Earth satellites, various space objects and their fragments.

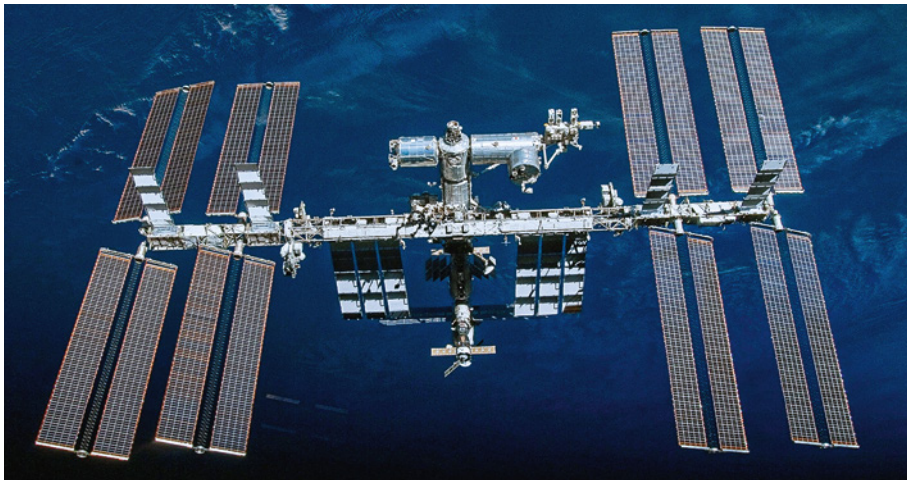
With the help of optical signals and their processing system, it will be possible to find, recognize, identify, measure the size and calculate the trajectory of even small-sized fragments of space debris. The system will be able to identify potential threats for timely response and changes in the trajectories of movement, for example, a spacecraft. Observation of space debris will be conducted by ground-based optical telescopes. ♦

ALEXANDER SERGEYEV,
PRESIDENT OF THE RUSSIAN ACADEMY
OF SCIENCES

The launch of the Luna-25 probe is the main Russian scientific event of 2022 and our return to the Earth’s natural satellite since the 1970s. I am confident that this will take place and I am confident that we will fly to the Moon and land softly and safely in the area of the southern pole, which will be the world’s first landing on that territory

LAETITIA CESARI ZARKAN,
UNIDIR

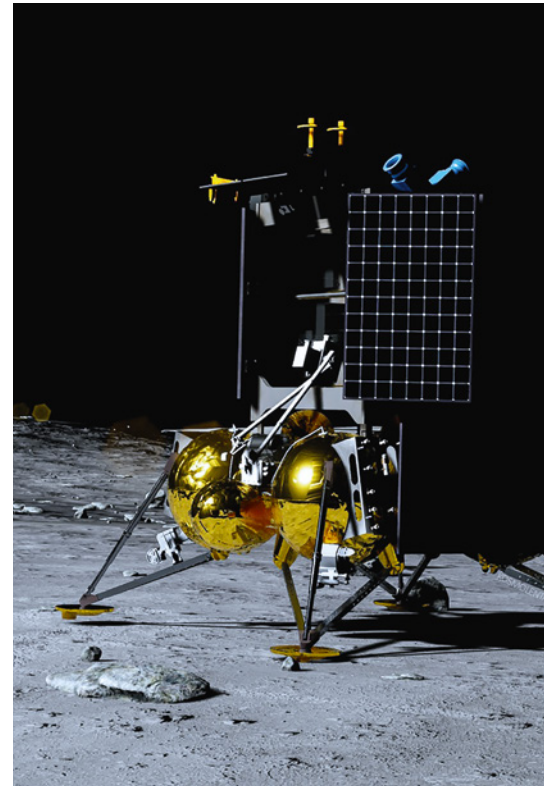
The deployment of potentially disruptive systems and strategies through new types of space operations is an ongoing concern across the globe—sometimes intensifying, sometimes diminishing



SPACE AND NATIONAL SECURITY: WHAT TO EXPECT IN 2022 / TASS

The Russian Roscosmos state space agency and NASA are in talks on extending the operation of the International Space Station (ISS) until 2030, CEO of Roscosmos Dmitry Rogozin said. On December 31, 2021, the US sent an official notification relating to the extension of using ISS until 2030. Rogozin said that the parties reached an agreement on engineering support for the Zarya module until 2024 carried out by Russia.

In April 2021, Russian Deputy Prime Minister Yury Borisov said that the state of the ISS left much to be desired, so Russia could focus on developing its own project – the Russian Orbital Service Station (ROSS). On September 2, Rogozin announced that the deployment of ROSS was planned to kick off in five or six years. At the same time, in late 2021, the US confirmed plans to extend the presence of American astronauts on the ISS until 2030. During this period, Washington wants to cooperate with its international partners, including Russia, Canada, Japan, and Europe, in order to resume the breakthrough research carried out at this unique orbital laboratory until the end of the decade. ♦



LUNA-25 LUNAR MISSION TO BE RUSSIA'S MAJOR 2022 SCIENTIFIC EVENT / TASS

The launch of the Luna-25 probe and its planned landing on the Moon’s southern pole will be Russia’s key 2022 scientific event since the 1970s, President of the Russian Academy of Sciences Alexander Sergeyev told TASS. The Luna-25 is a space research lander module whose launch is scheduled for July 2022 from the Vostochny spaceport in the Russian Far East. The module is expected to touch down the Moon’s surface on the territory of the Boguslawsky crater in the area of its southern pole.

The Luna-25 module will have nine scientific devices installed on its board to enable Russian scientists to study the properties of the Moon’s oldest rock in detail. “I am confident that this will take place and I am confident that we will fly to the Moon and land softly and safely in the area of the southern pole, which will be the world’s first landing on that territory,” Sergeyev said. ♦

NEWS NEWS NEWS

Space Commands of the USA, China, Russia and Europe

Author Kevin Klemann

The space domain is of increasing importance in the international environment that is becoming more contested and confrontational. Many states have recognised this as a challenge and formed unified space commands in recent years.



USA



Space is a war-fighting domain, just like the land, air, and sea.
Donald Trump, Former US President

The United States is the only country in the world that has a designated, specific branch of the military that is concerned with the space domain of warfare. It was established as the sixth service branch, alongside the Army, Navy, Air Force, Marines, and Coast Guard on December 20, 2019, according to the order of President Trump of the previous year. Prior to the Space Force becoming an independent service branch, the responsibilities it was now entrusted had been largely those of Air Force Space Command since 1982.

According to the memorandum for its establishment, the Space Force “will develop and integrate into the Joint Force the space doctrine, capabilities, and personnel [the US] needs to outpace future threats. [...] It will remain mission-focused by leveraging infrastructure of the U.S. Air Force, except in performing those functions that are unique to space or central to the independence of the new Armed Force.” Similar to how the Marine Corps are inevitably tied to the Navy, and therefore comprise part of its department within the Department of Defence (DoD), the Space Force is part of the Department of the Air Force, upon which it heavily relies in administrative matters. The comprehensive plan outlining its organisational structures notes that the Space Force will receive more than 80% of its critical support functions from the Air Force. On the other hand, this also means that the Space Force can focus on its core capabilities, rather than having to build its own bureaucratic apparatus, a detail explicitly mentioned in DoD’s legislative proposal to the US Congress: “Where appropriate, [the Space Force] will leverage existing [U.S. Air Force] infrastructure, except in performing those functions that are unique to the space domain or that are central to the independence of the new Military Service.”

However, this leveraging of existing capabilities goes beyond the organisational structure. While the Space Force will eventually build up its own career and training opportunities, it initially relies largely on transfers from other branches or Air Force personnel working within the Space Force’s organisation. These first transfers from other service branches have begun in the summer 2021, as has building of training capabilities, with the activation of the Space Training and Readiness Command past August. Even with these transfers, however, the Space Force will be the smallest service branch of the US military: The Space Force has a required strength of 8,400, but its actual strength is 6,434, while even the next smallest service branch, the Coast Guard, has around 40,000 active personnel. Another peculiarity of the Space Force is its unusually high ratio of officers – 42% (see Table 1).

On August 23, 2021, the Space Force activated its third and final field Command: The Space Training and Readiness Command (STARCOM) which is in charge of training, test, and evaluation as well as doctrine development. It joins the Space Operations Command (SPOC), in charge of space, cyber, intelligence operations, and combat support; and the Space Systems Command (SSC), which is tasked with acquisitions, engineering, research and development, and launch activities.

Each of these commands is subdivided into several ‘Deltas’, which are roughly equivalent to an Air Force wing or an Army Brigade. The SPOC (the former Air Force Space Command) comprises Space Delta 2 tasked with Space Domain Awareness; Space Delta 3 tasked with Space Electronic Warfare; Space Delta 4 tasked with Missile Warning; Space Delta 5 tasked with Command and Control; Space Delta 6 tasked with cyberspace opera-

AIR FORCE DOCTRINE PUBLICATION: COUNTERSPACE OPERATIONS

Space capabilities allow terrestrial forces (on the land, in the sea, and in the air) to cover more area with a smaller force; provide [...] warning of strategic, operational, and tactical threats [...]; enable expeditionary operations [...] and combat sorties worldwide to be flown stateside with unprecedented persistence

tions; Space Delta 7 tasked with intelligence surveillance and reconnaissance; Space Delta 8 tasked with satellite communications and navigational warfare, and Space Delta 9 tasked with orbital warfare.

The SSC comprises Space Launch Deltas 30 and 45, as well as several other corps, including the Strategic Warning and Surveillance Systems Division, which oversees ground-based radars, missile warning, space domain awareness, missile defence and shared early-warning capabilities.

Finally, STARCOM comprises Space Delta 1 tasked with personnel space training; Space Delta 10 tasked with Space Doctrine and war gaming; Space Delta 11 tasked with space range and holding off an attack of hypothetical aggressor; Space Delta 12 tasked with holding space tests and evaluation, and Space Delta 13 tasked with education in the field of space exploration.

In May 2021, the Air Force released its Fiscal Year 2022 Budget proposal. The Air Force

Table 1.
NUMBER OF OFFICERS IN THE US MILITARY, %

SPACE FORCE	ARMY	NAVY	MARINE CORPS	AIR FORCE
42	19	16	12	19



JOAN JOHNSON-FREESE,
PROFESSOR OF NATIONAL
SECURITY AFFAIRS

All countries have a vested interest in sustaining the space environment so as to be able to reap the wide-ranging benefits it yields. That is the commonality all countries can and must build on. Hopefully, but not assuredly, all countries recognize the need for stability in order to facilitate the use of space assets



NOAM CHOMSKY,
PHILOSOPHER

The development of space technology, including space warfare today, is similar in its technological-industrial significance to the development of navies a hundred years ago

Figure 1.
**SPACE FORCE
BUDGET**

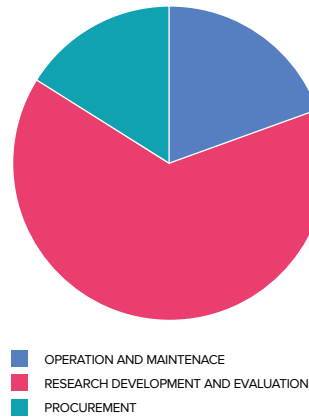
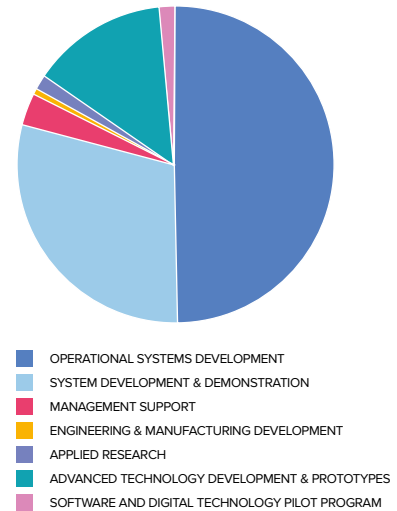


Figure 2.
**SPACE FORCE RESEARCH
DEVELOPMENT TEST
& EVALUATION (RDT&E) BUDGET**



as a whole requested \$173.7 billion, out of which the Space Force's budget is \$17.4 billion. This also includes a military personnel budget of \$929.8 million, which remains at the Air Force disposal. While the total budget increase of the Air Force over the previous year's budget is 2.3%, the Space Force's budget was increased by a markedly higher 13.1%. The proposal explains this as being "due to additional investments in space sector and transfer of funding from the Air Force, Army, and Navy. [...] First of all, the transfer of funds refers to space-related Air Force, Army, and Navy Elements, such as: Intelligence, Surveillance, and Reconnaissance; Research, Development, Test and Evaluation; Equipment Maintenance, Restoration, and Modernization; Education and Training."

The Operation and Maintenance budget increased by over 36%. But, the largest share of the Space Force's Budget, at \$11.2 Billion, is taken up by the Research Development Test & Evaluation (RDT&E) budget (Fig. 1). For such a small service, whose overall budget makes up a mere 2.5% of the DoD's overall budget, this is a huge number, especially if contrasted with the DoD's overall RDT&E budget of \$112 billion or the Air Force's RDT&E budget of \$28.8 billion. Out of the Space Force's RDT&E Budget, 50% are used for Operational Systems Development, 30% for Systems Development and Demonstration, and 14% for Advanced Component Development and Prototypes (Fig. 2).

The Space Force's stand-out project is the Next Gen Overhead Persistent Infrared

(OPIR) missile warning system, which is expected to have its initial launch in 2028. Other projects include growth in the Space Command and Control (C2) mission system, like the Military Global Positioning Station (GPS) User Equipment (MGUE) program to develop receiver circuit cards, for secure and accurate positioning, navigation and timing data in a contested environment. On the procurement side, the next budget also funds two GPS III Follow-on, which will provide new capabilities including a spot beam that maintains a 100x anti-jam improvement over current encrypted military P(Y) code.

As of 2019, the Space Force operated 73 spacecraft in orbit. The main part of them were the Global Positioning System (GPS) satellites with 31 currently in orbit. Other satellites include communications satellites, such as the Advanced Extremely High Frequency (AEHF) system; environmental data collection by the Defence Meteorological Satellite Program (DMSP); strategic and tactical launch detection by the Defence Support Program (DSP); and Orbital surveillance by the Space Based Space Surveillance (SBSS).

The Space Force also operates two X-37B Orbital test vehicles. These are aimed at development and maturing a reusable space-launch capability and conducting classified, extended, on-orbit missions or launching small satellites. Originally a NASA program, Space Force took over these capabilities and launched its inaugural mission OTV-6 (USSF-7) in May 2020.

RUSSIA



Space and cyberspace are becoming increasingly involved in military confrontation.
Sergei Shoigu, Defence Minister of the Russian Federation

The year 1992 saw formation of the Russian Aerospace Forces (VKS) as a separate combat arm – formerly the Directorate of the Chief of Space Assets of the Ministry of Defence. Since then, the Space Forces, much like the rest of the Russian Air Forces, have gone through various mergers and splits, culminating in the 2015 merger with the Air Force, thus forming the modern Space Forces within the Air and Space Forces.

As part of these, the Space Forces comprise the 15th Aerospace Forces Army (Special Purpose), the 1st State Test Cosmodrome Plesetsk of the Ministry of Defence of the Russian Federation, as well as the A.F. Mozhaysky Military-Space Academy.

The 15th Aerospace Forces Army in its turn consists of the Titov Main Test and Space Systems Control Centre, which serves as a mission control for Russian military and civilian satellites; Main Centre for Missile Attack Warning which controls the network of early warning radar stations and satellites, and Main Centre for Reconnaissance in Space, which registers and catalogues satellites.

While there is no official budget information on Russia's military Space program, using governmental open sources and financial information from the State Space Corporation ROSCOSMOS it can be estimated that the annual spending on development of military satellite constellations

is around \$1 billion, including satellites, vehicles, and launchers.

Spending on GLONASS 27 satellites amounted to \$437 million while the Plesetsk launch site costs at least \$100 million per year. Also factoring in other expenditures, such as the ground-based infrastructure and personnel, the overall budget for Russia's military space program amounts to \$1.6 billion. The Russian Space Forces control 51 communications satellites and 16 earth-looking surveillance satellites.



CHINA



Outer space is a critical domain in international strategic competition.
From China's National Defence in the New Era by the PRC's State Council

Similar to Russia, China has also established its modern Space Force in 2015, with formation of the Strategic Support Force (SSF). This became the consequence of the growing realisation in academic circles that the structure of the People's Liberation Army (PLA) was not adequate to the demands of modern warfare. This also roughly coincides with the ongoing shift of the military posture from land-based territorial defence to extended power projection. While the Strategic Support Force as a whole is tasked with warfare in outer-, cyber- and information space, space proper is covered by the Space Systems Department (SSD).

The SSD has consolidated nearly every aspect of China's military space operations, including space launch, telemetry, tracking, and control (TT&C), satellite communica-

tions, space intelligence, surveillance, and reconnaissance (ISR), the astronaut program and space-related Research and Development (R&D) and support. Its launch sites are situated in the Jiuquan, Taiyuan, Xichang, and Wenchang satellite launch centres. Smaller control centre is located in Beijing – Aerospace Flight Control Centre, the Xi'an Satellite Control Centre deals with China's land-based Telemetry Tracking and Control network for space operations, and the China Satellite Maritime Tracking and Control Department is occupied with space tracking ships. The Satellite Communications Main Station is responsible for managing the PLA's military satellite communication network and the Aerospace Reconnaissance Bureau is responsible for space-based intelligence, surveillance, and reconnaissance.

The Aerospace Engineering University is the PLA's primary education and training institution for space command, management and engineering. The China Astronauts Group manages China's astronaut corps, while the Beijing Institute of Tracking and Communication Technology provides R&D on space information and communication, and navigation and control. Other R&D is provided by the Aerodynamics Research and Development Center, Aerospace Research Development Center, Engineering Design Institute and the China Nuclear Test Base. China's military budget is famously opaque and no specifics on how that budget is spent is currently openly available. The Chinese operate 105 military satellites including the Yaogan Weisun optical reconnaissance satellites, and the Chinese GPS equivalent, BeiDou, which consists of 35 satellites.

EUROPE



We will reinforce our knowledge of the situation in space, we will better protect our satellites.

Emmanuel Macron, President of France

France, Germany, and the United Kingdom have by now all established Space Commands. While both the German and French Space Command are part of their respective Air Forces (the latter actually being called Air and Space Forces since 2020), the UK Space Command is a joint command of its service branches, as well as the Civil Service and commercial sector.

Established in April 2021, the UK Space Command brings together space operations, space workforce training and growth, and space capability, meaning development and supplies of space equipment and programs. Formation of the UK Space Command is not entirely completed, but it has already established its Operations Centre and operates the Skynet system of military communication satellites (maintained by Airbus), and RAF Fylingdales military base is engaged, which provides a continuous ballistic missile early warning service to the UK and US Governments. UK Space

Command will also have responsibilities over all space-based capability development.

The German Air and Space Operations Centre was established in September 2020. It is also still in a formation phase and will build up its capability for mission control over the Bundeswehr's satellite operations and for satellite flight operations and incorporate these tasks into the planning and command of space operations. Technically, some prerequisites still have to be created for this. Operationally usable sensors for space surveillance, reconnaissance, and identification will only be available for German military in a few years. The French Space Command is older than both Britain's and Germany's, if only by a year, as it was established in 2019. It is meant to be organised around four pillars, in close coordination with the CNES, the French space agency: Space service support, Space situational awareness, Operations support, Active space defence.

In March 2021, they conducted their first military exercises in space: AsterX 2021. The French operate five Earth observation, four radio signals intelligence and four communications satellites.

The French Space Command has a projected budget reach €4.3 billion (\$4.9 billion) over the next six years. Its personnel amounted to 220 in 2019, but should reach full operational capacity in 2025 with a staff of almost 500. The German Air and Space Operations Centre consists of 50 personnel, with a budget that is part of the German Air Force but likely negligible. The UK is spending an additional \$1.92 billion on space capabilities over the next 10 years.

Generalised data on space budgets by country are presented in Fig. 3. Space units budget shares as of total defence budgets are shown in Fig. 4.



Figure 3.
SPACE UNIT BUDGET (BY COUNTRY)

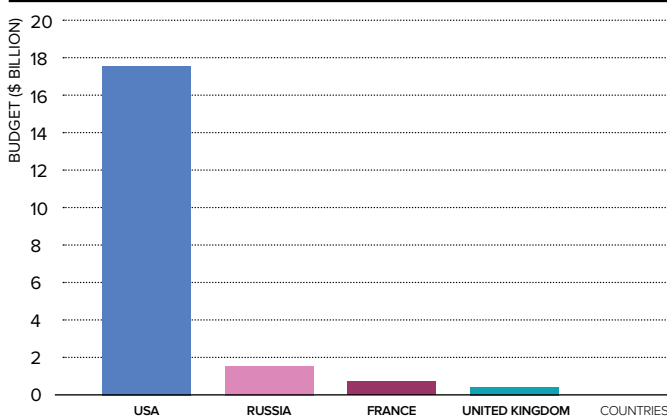
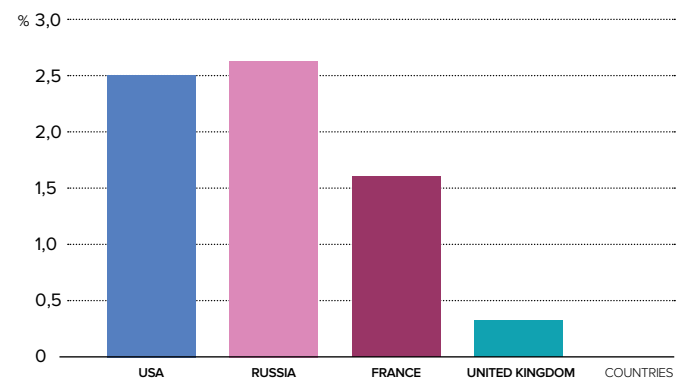


Figure 4.
SPACE UNIT BUDGET SHARE (% OF TOTAL DEFENCE BUDGET)



COMPARISON

Regarding the history of the Space Units, it looks like as if the NATO powers were playing catch-up with China and Russia. Of course, many of these states have had some sort of military unit tasked with the space domain, even before the transformations into the current state. Russia is a clear out stander in this field, having had a unified space command since at least the 1990's. However, the changes going on now indicate that status and functions of space commands remained rather unclear the entire time.

The formation of the US Space Force is largely seen as an answer to the increasing competencies in this field by China and Russia. The Europeans seem to copy the US movement, although it must be said that the formation of the French Space Command in its current form predates the formation of the US

Space Force by several months. In any case, the space domain is well accepted to be its own contestable space, rather than a domain which merely supports operations on land, the sea or the air.

As far as organisation and mission are concerned, while there are obviously huge differences in size, they all seem broadly similar. Capabilities are what differs. For instance, the French do not seem to have their (ballistic missile) early warning capabilities integrated, with the Germans not even having such capabilities. The Europeans all lack integrated launch units and while this seems understandable, given the general unsuitability of Europe for space launches, it should be noted that France would have such a facility in Kourou in French Guiana, which is operated by the European Space Agency (ESA) and the French National Centre for Space Studies (CNES).

Besides these differences, all space units monitor their domains and are building capabilities to defend them. They also control their respective nations' military satellites, be they for communication or surveillance.

The most striking difference between the space units is their funding. While the US Space Force has by and large the highest funding, its disproportional RDT&E budget also shows an ambition to further innovate. Given how its main competitor, China, has had a unified space command for longer time and has recently shown its prowess for anti-satellite capabilities, it is not unlikely that the US feels insecure about its own capabilities or, at the very least, wants to secure a technological advantage over other players. ♦



ABSOLUTE ALGORITHM

Author Alexander Yatsurenko

PROBLEMS OF ARTIFICIAL INTELLIGENCE DEVELOPMENT

AT THE BEGINNING OF AUGUST, 2021, THE PENTAGON CONDUCTED A LARGE-SCALE ANALYSIS OF FUTURE SCENARIOS. SATELLITE DATA, INTELLIGENCE SUMMARIES AND MUCH MORE HAVE BEEN USED TO GATHER INFORMATION. ARTIFICIAL INTELLIGENCE PREDICTED OPTIONS AND POSSIBLE CONSEQUENCES OF STRIKES AT THE GROUND AND SPACE OBJECTS OF RUSSIA AND CHINA. AFTER STUDYING THE RESULTS, THE MILITARY MADE CONCLUSIONS ABOUT HOW TO REDISTRIBUTE FORCES AND WHAT STRATEGIES SHOULD BE CHOSEN AS THE MAIN ONES. TRUE, THE FORECAST WAS MADE ONLY FOR A FEW DAYS, BUT EVEN THIS IS ENOUGH TO MAKE FUNDAMENTAL DECISIONS.

This is just one example of the AI application to large-scale tasks. Theoretically, Big Data technologies combined with neural networks make it possible to build a model that accurately reproduces the entire real world. Estimated errors and uncertainties can be introduced into it, to then accelerate the simulation and see how the new factors affect reality. With infinite resources, such a system would take into account movements of each atom and free choices of each person, reducing them to a practically applicable algorithm. But for now, there is no such power and its appearance remains a distant prediction. Much like creation of a general theory of everything in physics.

1. OPERATION OF CHOICE

Artificial intelligence is not just a collection of huge amounts of data.

“There are textbooks of grammar, stylistics, and logic. You have to take the rules in them and ‘teach’ them to a machine. Just like [they teach] people. Unfortunately, this turned out to be impossible because machines are still too ‘dumb and limited’ to immediately perceive generalizations. It turned out to be a bit more complicated...”. This is how Dmitry Zhukov outlined the problem back in 1965 in his book *Translator, Historian, Poet? A Word to You, Machine*. Back then, computers were programmed with punched cards: scientists made holes in cardboard cards, which the machine perceived as a code.

More than half a century has passed, and we still doubt the quality of computer translation, although samples are often published in magazines under the guise of articles. And scientists still state the limitations of machines.

Physicist and futurologist Michio Kaku in a book recounted a conversation with a Honda engineer, creator of the famous ASIMO robot. The android can talk, dance, and even play musical instruments, but when asked directly about ASIMO’s level of intelligence, its developer admits that it looks more like a multifunctional player and is no more intelligent than an insect.

“Current robots are stuck at a very primitive level: they are still trying to make sense of the physical and social world and master basic facts,” says Kaku. And he raises the question of how to get to the next level.

There are two concepts of artificial intelligence in science fiction. One belongs to William Gibson, and in it most of events are taken into virtual space. Netflix series still successfully demonstrate this approach, we watch them, therefore we consider this prediction more realistic.

NEWS – 2072



A SCIENCE FICTION WRITER AND LAUREATE OF THE NATIONAL BESTSELLER PRIZE FOR 2021 ALEXANDER PELEVIN SHARES A FORECAST FOR THE FORESEEABLE FUTURE AT THE REQUEST OF THE *NEW DEFENCE ORDER. STRATEGY*.

TRANSPORT

The opening ceremony of the anti-precipitation dome and the network of underground bike routes took place in Moscow. The main event of the day was the opening of the Kukoldoshnaya coffee shop on the Red Square, serving the world's best banana frappe with lavender raph. The ribbon in front of Kukoldoshnaya was solemnly cut by the mayor of the city Mark Barovsky. In honor of the holiday, Muscovites increased their daily payments for morning coffee from 70 to 80 thousand rubles.

In St. Petersburg, the opening of the Teatralnaya metro station was postponed until 2072.

SCIENCE

Archaeologists of St. Petersburg are sounding the alarm: more and more often, drugs are found in the cultural layer related to the beginning of the century. In particular, during the excavations of an old nightclub in the Central District, about a thousand plastic bags with ancient poison, tightly sealed in duct tape, were discovered. "We have dug up more caches than clay shards in Athens," said the Head of the Institute of Archeology of the Russian Academy of Sciences. "We've got mountains of amphetamine now."

MEDICINE

The Master of World Government Sigmund Rothschild urged everyone not to miss another dose of the COVID-71 vaccine. «If you don't get your jab on time, your software will become incompatible with the latest technology, you simply won't be able to turn on your phone," said Rothschild. "Please upgrade!"

Meanwhile, the Head of the St. Petersburg branch of the Anti-Vaccination Global Society, Gondoslav Rodnoverov, announced that he had to close the branch due to lack of people. «Many died, but we are not giving up, we are recruiting new ones. And so it goes every year," Rodnoverov said.

SOCIETY

The 30th anniversary congress of the Twitter Veterans Society was held in Moscow. Aged bloggers gathered for the annual event in a ryumochnaya (boozer) of Zyuzino district to commemorate the old days. As usual, five ambulances were on duty at the ryumochnaya. ♦

NEWS OF THE YEAR 2072 BY THE EDITORS OF NDOS IS ON THE BACK OF THIS SHEET. SAVE IT TO CHECK WHO PROVED TO BE RIGHT IN 50 YEARS.

NEWS - 2072

NDOS

THIS VERSION OF THE NEWS OF THE FUTURE WAS COMPILED BY EDITORS OF *NEW DEFENCE ORDER. STRATEGY* WITH PARTICIPATION OF SCIENTISTS, ENGINEERS, JOURNALISTS, FUTUROLOGISTS, AND OFFICIALS.

TRANSPORT

The Moscow government has tightened penalties for movement of private air transport in the lanes allocated for air taxi. According to the press secretary of the State Air Traffic Safety Inspectorate (SATSI), most accidents were caused by violations of this rule, since the autopilot system for public transport can malfunction when private air vehicles appear in designated lanes. The department hopes that these measures will improve air traffic safety and reduce congestion over the section between the Third Ring Road and the Moscow Automobile Ring Road.

Sources: **development of JSC Tactical Missile Corporation, LLC Modern Aviation Technologies Design Bureau, HoverSurf startup**

SCIENCE

Scientists state that Moore's law no longer works. Over the past hundred years, the number of transistors on an integrated circuit chip has doubled every 18 months. This has made computers more complex and faster, and ensured technological and economic growth. But, now miniaturization has approached a physical limit – a transistor cannot be thinner than the size of one atom. The market reacted to the news with the collapse of shares of IT giants, while physicists and engineers still do not see ways to overcome this technological crisis.

Source: **Michio Kaku, Physics of the Future**

MEDICINE

The success of gene therapy has practically saved people from diseases that have been considered incurable half a century ago: diabetes mellitus, bronchial asthma, and oncological diseases. Today, the first patients who had undergone modifications have crossed the threshold of their forties, and doctors can attest to the viability of the method. But, unfortunately, the children of the modified parents have not yet undergone large-scale research. So, we still cannot say with confidence how gene therapy affects future generations.

Source: **UN Recommendations on Human Genome Editing**

SOCIETY

The second half of the 21st century has brought to humanity three new ideologies. Most developed civilizations adhere to one of them, and this largely determines the semantic map of the world, the actions of online communities and political blocs. The first concept is corporate libertarianism, the second is digital democracy, and the third, synthetic technocracy. Officially, the Russian Constitution declares the freedom of the state from any ideology; however, according to polls, more than 70% of citizens are more or less inclined towards digital democracy.

Source: **List of social concepts in the computer game Civilisation VI**

CULTURE

Louvre officials stated that the period of time the average visitor spends in front of the Mona Lisa has been reduced to three seconds. This is exactly how much it takes to take and post a photo against the background of the famous painting. Visitors choose to explore most of the other exhibits online or in 3D print, but the Mona Lisa painting remains a tribute to the great European tradition at the turn of the century.

Source: **Richard Watson, Digital vs Human: How We'll Live, Love, and Think in the Future**

NEWS OF THE YEAR 2072 ACCORDING TO ALEXANDER PELEVIN CAN BE FOUND ON THE BACK OF THIS SHEET. SAVE IT TO CHECK WHO PROVED TO BE RIGHT IN 50 YEARS.

The second concept, described by Isaac Asimov, is a combination of artificial intelligence and robotics, where everything happens offline. The real economy seems to be leaning towards the second version. Both manufacturing and development of robots themselves require it.

“Artificial intelligence researchers today are trying to look closely at the bottom-up approach. This approach means trying to follow Mother Nature, who created intelligent beings (us) through evolution, starting with simple animals such as worms or fish and creating more and more complex organisms. Neural networks have to learn on their own, making mistakes and bumping into obstacles,” assures Michio Kaku.

This is also where the conversation about the inclusion of androids in human societies begins. “Civil Law Rules On Robotics” were introduced by the European Parliament in 2017. The document consists of hundreds of clauses, dealing with various aspects of robotics and artificial intelligence. Robots’ rights societies have existed since the turn of the century, though so far techno-activists are inferior to other human rights activists in their influence.

The choice between Gibson’s and Asimov’s predictions largely comes down to whether a robot driver will have the intelligence of a chauffeur or the intelligence of a horse. Functionally, both autopilots will do the job of transporting a passenger, but conceptually they will lead us down different, non-intersecting paths of development.

2. MISSING DATA

One of the main problems in the development of AI is the question of where it will take the data for processing. The U.S. military assume it will be from radars and satellites, for the Soviet popularizer, it is dictionaries and encyclopedias.

“...BY COMPARING ALL DATA, THE SYSTEM, FOR EXAMPLE, COMES TO THE CONCLUSION THAT A TICKET TO LAS VEGAS IS MOST LIKELY TO BE BOUGHT BY A USER WITH BIPOLAR DISORDER ON THE VERGE OF A MANIC PHASE. IT IS THESE PEOPLE WHO BECOME AVID GAMBLERS, AND THIS IS A SUCCESS IN SOLVING THE PROBLEM...”

“Object and person recognition is already an industrially implemented capability. But besides recognition, the important points are comprehension and action. We don’t have the means to mark up and collate data. There’s a neural network, it’s trained for something. We added data to it. Has it gotten better? I take the data with high resolution, then I add the data with a worse resolution. What effect will this have on the neural network? We do not fully understand it, although a lot of drones fly in the sky, swim in the water, drive on the ground,” admits Andrei Fedulin, director of Kronshtadt’s Software Development Center.

The internet and everything people write in an online environment is already a huge information base, and marketers, intelligence services, and, of course, scientists all use it. But if we are not critical in regard to the data from social networks, the picture of the world is far from reality. The model will include not real people, but how they want to present themselves.

“When describing ourselves and telling stories online, we rarely mention fear, doubt or vulnerability. With Photoshop, we look happier, prettier and more successful than we really are. We prefer digital pixel perfection to analog ambiguity,” states Richard Watson in his book *Digital vs Human: How We’ll Live, Love, and Think in the Future*.

Andrei Fedulin names another obstacle to working with social networks: “There is a problem with neural networks, both civilian and military: we can’t train them on the open data. Because then it would be clear to intruders how to fool our neural networks. We need

means of synthesizing information, because real data is often lacking.”

There is another condition that has not yet been talked about much. Regardless of the programmers’ decision, machines will learn from the cultural background of different communities and countries. Russian artificial intelligence will form its own conceptual field, different from Chinese or Brazilian one. The professional community is familiar with a story of an experiment, told as a joke, in which AI collected data in English-language networks and as a result began to make non-politically correct statements using profanity.

Some features that are indistinguishable in reality will become much clearer in a computer version – an inevitable consequence of reducing reality to an algorithm. Today, we can doubt and argue as how Russians differ from Americans. Artificial intelligence will demonstrate the differences with crystal clarity. As St. Petersburg futurologist Alexander Revkov joked, “There will never be a machine uprising in Russia. Robots will always think that either humans are losing on purpose or that they have a cunning plan incomprehensible to artificial intelligence.”

When solving applied tasks, the source of information for AI can be the activity itself which is to be analyzed. No one inputs data on purpose. In production, for example, there is technical documentation, registration of various stages of work, and accounting records. Taken together, this provides enough information to create an intelligent model. But its tasks are quite specific, nothing human is put into the machine, it still remains a tool.

A witty suggestion of how a machine can get exhaustive information about reality was made by the writers of the sci-fi series *Devs*. In these, the system analyzed processes occurring in the body of a dead mouse, and according to them reproduced all the cause-and-effect relations in the universe. Clearly, the rodent body is only a metaphor – an eerie image of the price of omniscience. But the particulars do depend on the whole, and infinite computing power theoretically makes it possible to arrive at the method described in the series.

3. EMERGENCY RESERVE

If the laws of dialectics work and quantity really does change into quality, processing gigantic amounts of data will sooner or later give the machine new properties which are not put there by humans. But people want to see machines as being of the same kind.

In one of the stories about Pilot Pirks, Stanislaw Lem explains the purpose of endowing AI with human traits: “This ‘superfluous,’ now-damaging ‘intelligence’ of the machine aroused the anger of the participants in the operation: they could not understand why the engineers had given a machine designed only for mining such a freedom and independence of action. McCork calmly explained that ‘intellectronic overdesign’ is – at the current stage of technological development – the same as the excessive safety margin that conventional machines and engines usually possess. It is an emergency reserve, which increases safety and reliability of operation, because it is impossible to foresee in advance what situations the machine, energetic or informational, will find itself in.”

Incidentally, it was by provoking a human-like reaction that the out-of-control mining robot was defeated. In another story in the same cycle, an android, indistinguishable from a human, on the contrary, gave himself away because he was not ready to act irrationally.

Immanuel Kant’s definition of humanity is close to Lem’s: human nature is transcendent. In other words, there is an inherent need to ask unanswerable questions. But modern anthropology often sees humanity differently. John von Neumann and Oskar Morgenstern describe homo economicus, a species always striving for maximum profit, no matter how it is expressed. And perhaps such an economic man, as an exceptionally rational subject, would find it easier to find common ground with artificial intelligence.

4. THE HIDDEN THREAT

In 1966, Dennis Jones wrote the novel ‘Colossus’, in which a supercomputer took over all U.S. defence tasks and then, by threatening humans with a nuclear arsenal, established power over the world.

All subsequent predictions about the dangers of AI retell this story, only details differ. Bill Gates compares artificial intelligence to nuclear weapons. Elon Musk calls the most dangerous thing the development of DeepMind within Google. Moreover, it is not always clear where the warning ends and advertising begins.

Artificial intelligence is indeed frightening. But not at all the way the creators of Terminator and The Matrix, followed by Gates and Musk, describe it.

Here’s how a Turkish sociologist Zeynep Tufekci described the threat on TED: “We should fear not what AI will do to us on its own, but how people in power will use it against us. [Doing it] in some new, some-

times covert, insidious, and unexpected ways. Most of the technology that threatens our freedom and dignity is being developed by companies in the business of collecting and selling our information to advertisers and other companies like Facebook, Amazon, Google, Alibaba, Tencent. It may seem that artificial intelligence is just a new version of online advertising. It isn’t! It’s a different category, a completely different world.”

The sociologist explains that every word you have written on Facebook, for example, even those you have deleted, every place you were in when you wrote it, every photo you are tagged in, the system uses to analyze. Based on this information, machines learn to understand people. And even developers themselves no longer know how the algorithms work or what principles AI uses to classify users.

Tufekci says that by comparing all data, the system comes to the conclusion, for example, that a ticket to Las Vegas is most likely to be bought by a user with bipolar disorder on the verge of the manic phase. These are the kinds of people who become avid gamblers. And this is a success in solving a problem that a human being has set for the machine.

It turns out that AI is so fearful not because it will behave the way a person endowed with absolute knowledge would probably behave, that is, it would try to take over the world or destroy all biological organisms. The danger lurks in the fact that it works according to algorithms that no one knows, which it has constructed itself, which are completely unlike human ones, but which are undoubtedly effective.

5. THE GENERATOR OF IDEAS

People are fascinated by the supernatural potential of machines and as if seem to forget that development of technology is not an end but means only. Even the most perfect computer has no subjectivity, it is only a combination of elements and it will be ‘human’ only as long as we endow it with its own properties. This is how a smartphone camera sees a human face in a circle with two dots. This is how owners attribute their features to pets, and children attribute their features to their favorite toys.

Samuel Yakovlevich Marshak describes this effect as follows:

*All that a man touches,
Acquires something human.*

In the eyes of the poet, even the balcony, the house and the street are endowed with life. Then, what can we say of a system that truly recognizes images and has the gift of speech? It is easy for us to recognize it as equal to ourselves, that is human nature.

The AI does not consider us equal, it does not think about it at all – it has got other tasks. It occupies our workplaces, continuing the work of machine units and conveyors. Mathematicians and programmers set the tasks for artificial intelligence, and they will remain the most in-demand specialists in the coming years. It is these people who will control drones and neural networks, who will create the reality that everyone will get into later. But a few more years will pass, and the creators of the new world will be out of business.

“People try to teach children the exact sciences – math, physics, programming, engineering. But that is exactly what machines can already do better than we! In ten years all programmers will be unemployed, or at least most of them. India produces a million engineers a year. Can you imagine what an army of unemployed people that would be?

**“PEOPLE ARE TRYING
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ALL PROGRAMMERS
WILL BE UNEMPLOYED”**



You have to teach what makes us human: communication, understanding, humanism. I tell my son that travelling around the world is much more useful than studying for an MBA,” admits Gerd Leongard, a European expert in the sphere of technology impact on humanity.

Pedro Domingos in his book *The Supreme Algorithm* describes increasing complexity of the hierarchy of computer algorithms: spatial, temporal, human, etc. The scientist assumes that there is a supreme algorithm capable of bringing all elements of the system to a common denominator. Having received it, computers will switch to self-learning and will be able to program themselves.

It would be impossible to compete with machines in performing mechanical tasks. The only thing left for people will be to generate ideas, to create completely new images, which is a very difficult task. Humanization of the information space is already happening. Previously, a search engine reacted to keywords and it was important to repeat them 500 times, but now it monitors how a person reads. In order to promote a product on the Internet, you need to get people interested in it, and the machines will react just to that.

In his novel *S.N.U.F.F.* Victor Pelevin describes the work of a publicist in such a way: a person behind the monitor creates a verbal image and chooses settings. Roughly the same way we now apply filters to photographs on a smartphone. The machine itself suggests speech constructions, synonyms and turns of phrase according to the specified style. The main thing is to suggest new thoughts that the AI can develop. If the text written in such a strange co-authorship turns out to be popular, the figure in the corner of the screen will grow and other users' interest will be instantly converted into money. And all this within a single service.

6. THE BEST VERSION

So, humanity is entering an unknown zone, where the line between the living and the machines is more blurred than ever. Raymond Kurzweil, speaking at Skolkovo in May, 2021, described it as the soon-to-be fusion of human body with intelligent technology. “We will be a better version of ourselves and gain ‘informational’ immortality,” said the futurologist.

But so far there has been no qualitative changes. Everything we see on the monitor reproduces what is already there in the world.

“There’s a wonderful story. When computers first appeared, a young man came to a financial company. He said: I wrote a program that makes money on the stock exchange,

and within two hours it made 10 million. The financiers were frightened, they paid money to keep the programmer quiet. Although even at that time it was conceivable that what one programmer had invented could be copied by another. Today, there are robots in stock exchanges, and they compete in calculations of large numbers. But it is still the same stock exchange to which Peter the Great used to herd merchants with a whip,” says Nikolay Yutanov, head of the Constructing the Future research group.

Perhaps, one day AI will offer completely non-human yet inexorably effective principles of existence, which we will have to adapt to, just as machines now imitate our characteristics. There will be no room for the transcendent.

And the main questions will become those already being asked by Richard Watson: “Will we be forced to adapt to new technologies and global norms, or will we continue to insist that the new technologies adapt to us? Will all forms of automata and artificial intelligence (AI) exist within an agreed morality and where, if at all, should the line be drawn indicating what humans and machines are allowed to do? Should we allow the possibility of a fusion of humans and machines, creating an augmented, partially synthetic or cybernetic hybrid of humans, and if so, what place will be reserved for the remaining unchanged homo sapiens, the human rationale?” ♦

CYBER RISKS POSE GLOBAL THREATS / THE WORLD ECONOMIC FORUM

Growing dependency on digital systems – intensified by COVID-19 – has altered societies. Over the last 18 months, industries have undergone rapid digitalization, workers have shifted to remote working where possible, and platforms and devices facilitating this change have proliferated. At the same time, cybersecurity threats are growing – in 2020, malware and ransomware attacks increased by 358% and 435% respectively – and are outpacing societies' ability to effectively prevent or respond to them. Lower barriers to entry for cyberthreat actors, more aggressive attack methods, a dearth of cybersecurity professionals and patchwork governance mechanisms are all aggravating the risk.

Attacks on large and strategic systems will carry cascading physical consequences across societies, while prevention will inevitably entail higher costs. Intangible risks – such as disinformation, fraud, and lack of digital safety – will also impact public trust in digital systems. Greater cyberthreats will also hamper cooperation between states if governments continue to follow unilateral paths to control risks.

As attacks become more severe and broadly impactful, already sharp tensions between governments impacted by cybercrime and governments complicit in their commission will rise as cybersecurity becomes another wedge for divergence – rather than cooperation – among nation-states. ♦



EMERGING SECURITY VULNERABILITIES AND ISSUES / FORBES

One reason why cybersecurity will capture international attention in 2022 is hybrid and remote working. Many organizations are still figuring out what their long-term workplace models will look like, as continued COVID-19 uncertainty keeps remote working firmly on the agenda. But, those workplaces where hybrid working remains an option need to reassess their security vulnerabilities. In particular, they should ensure that the broader perimeter created by employees using their own devices doesn't increase their levels of risk. Doing so will help ensure they can deliver the best of both worlds – office-based and remote technology services delivered with the performance users expect. This requires an agile approach, and in this era of tech-led flexibility, organizations are also increasingly interested in alternatives to traditional long-term IT contracts where cloud-based services are the key. To meet these needs, service providers are under pressure to create pricing models that work within cloud-only or hybrid infrastructure strategies so their customers can balance affordability with protection. This is important given that research suggests that nearly 100% of organizations experienced a cloud data breach since mid-2020. ♦

GLOBAL \$3.58 BLN AERIAL IMAGING MARKETS 2021–2026 / BUSINESSWIRE

The Global Aerial Imaging Market is estimated to be \$2.15 Bln in 2021 and is expected to reach \$3.58 Bln by 2026, growing at a CAGR of 10.74%. Aerial imaging is the process of capturing images of ground surfaces with the help of cameras attached to vehicles, such as helicopters, parachutes, aircraft, kites, unmanned aerial vehicles (UAVs), balloons, vehicle-mounted poles, and airships.

Aerial imaging assists in risk mitigation, resource planning, mapping, research & excavation, security and surveillance, urban planning, engineering, farming management, tourism, and others. Growing adoption of aerial imagery services in military & defence applications, increased use among various verticals, rise in demand for aerial imaging in disaster risk reduction and prevention and use of aerial imaging technology in setting up 5G infrastructure are some of the factors driving the growth of the global aerial imaging market. However, stringent government regulations regarding the use of aerial imaging devices and rise in concerns over cyber-data security regarding drones are restraining factors for the market's growth. ♦



CHINA CALLS ON NUCLEAR-ARMED NATIONS TO FOCUS ON AI AND SPACE / BLOOMBERG

Beijing is calling on the world's nuclear powers to expand discussions on global security to include emerging threats, following a rare multilateral pledge to temper the risks of nuclear war. Fu Cong, director-general of the Chinese Foreign Ministry's Arms Control Department states that P5 nations should talk "more directly" about global security. "Strategic stability goes beyond nuclear," he said. "Our idea is to expand the subject of the P5 process so we could discuss not only the nuclear issues, but also other issues related to strategic stability, including outer space, missile defence, even AI and other emerging technologies."

China's call for greater cooperation could be met with skepticism in Washington given its recent military tensions with Beijing, something the Biden administration has called "strategic competition" between the world's two largest economies. Fu rejected US claims that China is expanding its nuclear capabilities, saying Beijing is keeping its resources at the minimum level required for national defence. "We are not denying that China has taken steps to modernize its nuclear arsenal," he added, "if only for reasons of reliability and security." ♦

WENDY FRANK,
CYBER 5G LEADER, DELOITTE

As the Internet of Things (IoT) devices proliferate, it's a key issue to build security into the design of new connected devices themselves, as well as artificial intelligence (AI) and machine learning (ML) running on them (e.g., tinyML). Taking a cyber-aware approach will also be crucial as some organizations begin using 5G bandwidth, which will drive up both the number of IoT devices in the world and attack surface sizes for IoT device users and producers, as well as the myriad networks to which they connect and supply chains through which they move

ANKIT KUMAR,
INDIAN JOURNAL OF ASIAN AFFAIRS

The global interest in drone acquisition makes its proliferation inevitable if the global market for UAVs, weaponized or otherwise, remains unregulated. [...] For regions grappling with low intensity conflicts, drones could complicate the security environment further. Threat from drones would also result in countries developing counter measures

THE GLOBAL CBRN SECURITY MARKET TO GROW AT A CAGR OF ~5.5% BY 2027 / REPORT OCEAN

The global CBRN security market was valued at ~\$16,700 million in 2020. It is forecast to grow at a CAGR of ~5.5% during the period from 2021–2027. In geographical terms, North America was the highest revenue contributor and is estimated to grow at a CAGR of 5%. CBRN security market experienced a negative performance in 2020 due to restrictions stemming from the COVID-19 crisis and disruptions in supply chains. The global CBRN security market has also been negatively impacted by the COVID-19 pandemic, given the increased commute restrictions, tight defence & security budgets, and forecast weak financial performance of players in 2020. Additionally, the COVID-19 pandemic has clearly highlighted the importance of enhanced preparedness for upcoming CBRN threats, whether accidentally, naturally, or maliciously occurring.



Also, Asia-Pacific will grow significantly at a CAGR of 6.5%. The expansion of the global market is primarily dependent on the modernization of defence. Besides, the market players are expected to reap remunerative opportunities through contracts and agreements with law enforcement agencies and military forces. ♦



IT IS 100 SECONDS TO MIDNIGHT / BULLETIN OF THE ATOMIC SCIENTISTS

This is the closest the clock has been set to midnight since it was first created in 1947. "Today, the members of the Science and Security Board find the world to be no safer than it was last year at this time and therefore has decided to set the Doomsday Clock once again at 100 seconds to midnight," said Rachel Bronson, Bulletin President & CEO. The furthest away from midnight the clock ever moved was 17 minutes, right at the end of the Cold war. It has been slipping back towards extinction ever since.

That is partly because of the increasing volatility of geopolitics, the proliferation of nuclear weapons, and the new existential threat of climate change, which was formally made a factor in the calculation in 2007. "In 2021, there were some positive developments in each of the areas of concern that the Science & Security Board reviews. However, these have not managed to outweigh the longer-term negative trends that continue to erode security," said Sharon Squassoni, Bulletin Board member. ♦





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Research fellow, IMEMO RAS

Missile Trends in South-East Asia

South-East Asia is one of the most rapidly developing regions of our planet, and its military security domain is no exception. Missiles are especially relevant these days due to constantly growing capabilities of precision non-nuclear weapons. Missiles of ever-increasing range appear in the arsenals of many countries and perform functions of regional deterrence, but also they have very specific military missions to defeat high-value targets. The geography of the region is important to consider, its huge water spaces and island territories have led to a great interest in anti-ship missiles of various types and basing modes. Moreover, the presence of missile arsenals can contribute to the rapid escalation of armed conflicts, including those due to the perceived threat for platforms and stockpiles of missiles.

The emergence of modern missiles in the countries of South-East Asia in the future may lead to formation of regional 'mutual vulnerability' and contribute to the traditional 'security dilemma': the build-up of corresponding arsenals by some countries to ensure their own military security is viewed by other countries as an immediate military threat, which can lead to destabilization and even conflict escalation, as well as fuel a multilateral arms race.

Two caveats should be made separately here. First, while not a topic of this article as it is, but one should take note of the paramount importance of intelligence, surveillance, and reconnaissance (ISR), and of targeting capabilities and communications, which are crucial for the missiles' usability and usefulness. Secondly, this article focuses on missiles with a range exceeding 100 km, however, such interesting examples as supersonic anti-ship and anti-radar air-launched missiles of the Russian Kh-31 family, and the exotic subsonic anti-ship missiles Robotsystem-5F (RBS5F) originally from Sweden and British helicopter-based Sea Skua, will be left out.

Thus, we can say that there is a kind of bias towards sea-based and land-based anti-ship missiles, since this type of weapons has the greatest impact on the overall balance of forces in the region of concern here, also opening the way to increased-range land-attack cruise missiles. As well, a number of Southeast Asian countries that do not possess the appropriate weapons will not be

mentioned. With that in mind, a deeper dive into missile operators and sources in the region will follow.

MAJOR TRENDS

The most important trend in most South-East Asia countries is their desire to diversify sources of missiles, which might be caused by fears of becoming dependent on a 'sole supplier' and by a need to 'optimize' costs of purchases by stimulating competition between different producers. The main driver of investments in missiles is the relative growth of their effectiveness with a gradual build-up of air defence capabilities. It is also important to mention the global trend of 'blurring boundaries' between heavy MLRS (multiple launch rocket systems) and SRBM (short range ballistic missiles), the signs of which are also present in South-East Asia.

The influence of the increasingly heated confrontation between China and the United States, including that directly in the region, deserves a separate mention. It is not excluded that, following the example of Australia, other countries will be faced with the necessity to 'choose sides' unambiguously. As a result of such a choice, on the one hand, the possibility of military-technical cooperation with the 'probable adversary' will be sharply limited, but, on the other hand, the 'allies' will be interested in increasing military capabilities of their 'team' and may well offer quite favorable conditions for military sales. In parallel, countries that do not want to become pawns in others' games can become

South-East Asia is a promising region for us, during [... ADAS 2015] we were visited by a number of high-ranking representatives of the defence ministries of Thailand, Malaysia, Indonesia, Vietnam, and the Philippines. No official negotiations are held yet, but there is a high probability that in the future they will become our customers

A BrahMos representative at ADAS 2015

a promising market for military products for extra-regional powers that are not formally involved in the confrontation between Beijing and Washington, or possessing a sufficient degree of autonomy in their foreign policy and foreign economic activities. It can be assumed that with such a development of events, France, Russia, South Korea, Israel, and Turkey will be able to increase the presence of their defence industry in the region.

The most popular missile topics, namely hypersonic weapons, should also be mentioned. At least part of the developments that are underway in various countries are evolutionary development of supersonic anti-ship missiles. The desire to increase speed as one of the ways to increase the likelihood of overcoming air and missile defences and defeating a target is a fairly traditional approach. Of course, there is still interest in obtaining missile weapons with the maximum possible range (albeit still formally limited to 300 km in accordance with the Missile Technology Control Regime, MTCR). Thus, if, for example, an export version of the Russian Tsirkon or the American ARRW (with appropriately limited capabilities) enters the market, the countries of South-East Asia, considering their experience in operating a very diverse missile arsenal, may be more than interested in acquiring such high-value products.

MISSILE OPERATORS AND SUPPLIERS

BRUNEI is not the most powerful military power in the region; however, its Navy has four German-built Darussalam-class patrol ships equipped with two twin launchers for the Exocet Block II anti-ship missile system. The ships are relatively new (built in 2011–2014), and a further build-up of the Sultanate's missile potential can hardly be expected soon.

INDONESIA has powerful regional armed forces in general; hence, her desire for diversification is very clearly manifested. Frigates of the Ahmad Yani class are equipped with Russian supersonic Yakhont Anti-ship missiles (AShM) or Chinese subsonic C-802 AShM, while more modern Martadinata class frigates are armed with a pair of quad subsonic launchers of the French Exocet subsonic AShM. Corvettes of various classes are also armed with Exocet family AShM. Russian air-launched "tactical cruise missiles" Kh-59M are also present in the Indonesian arsenal. Indonesia is also one of the rare examples of a somewhat localized missile pro-



The Hanoi submarines (aka Russian 636.1) are armed with cruise missiles of the Club family



Frigates of the Ahmad Yani class are equipped with Russian supersonic Yakhont Anti-ship missiles (AShM)

duction, in this case of Chinese short-range anti-ship missiles C-705 from ready-made kits. In addition, Indonesia is the only country in the region to develop rocket motors for a space launch vehicle, their progress to date has remained modest though.

MALAYSIA, unlike most countries in the region, was able to ensure almost complete uniformity in terms of its missiles, at least in the Navy. Lekiu and Kasturi class frigates, Tunku Abdul Rahman class submarines are all armed with Exocet AShM.

As for air-launched missiles, there is a mix of American and Russian armaments which include the Kh-59M tactical cruise missile and the Harpoon subsonic AShM.

Moreover, Malaysia has already signed a contract for the purchase of 100 units of Norwegian Naval Strike Missile (NSM) anti-ship missiles to arm future corvettes currently in production.

MYANMAR, currently experiencing yet another internal political crisis and sanctions pressure, has a very diverse missile arsenal

based on supplies from China and North Korea. Presumably, this country has a number of Hwasong-6 short-range ballistic missiles, the North Korean derivative of the famous Scud SRBM. Frigates and corvettes of various types, as part of the Myanmar naval forces, are equipped with North Korean copies of the Russian Uran subsonic AShM (and, possibly, an improved modification with an increased range), and with Chinese subsonic C-802 AShM (as well as the C-801 of more modest range). The Air Force also has a relevant modification of the Chinese missile – C-802AK.

In the foreseeable future, a way out of the crisis in Myanmar is not visible, but the Russian side has demonstrated in every possible way its interest in stepping up military-technical cooperation. Myanmar has already acquired Russian Pantsir-S1 air-defence systems and supplies of strike systems have not been ruled out yet, with corresponding restrictions. It seems that Russian coastal missile systems may be of particular interest for Myanmar, although, of course, traditional suppliers (China and North Korea) may well meet local needs.



There is indeed a need to visibly demonstrate, via exercises like the Taming Sari, Malaysia's capabilities and national will to defend its sovereignty

Lai Yew Meng,
Regional Security
Analyst, University
Malaysia Sabah

The only guided missile frigate Jose Risal



DEREK GROSSMAN,
SENIOR DEFENCE ANALYST
AT THE RAND CORPORATION

The Vietnam People's Army (VPA) has responded to China's militarization of the South China Sea by procuring offsetting and retaliatory capabilities

In recent years, the **PHILIPPINES** has repeatedly made rather peculiar sharp foreign policy maneuvers which probably left a certain imprint on the composition of missile weapons of this island state. So, work is underway to form the first battery of surface-to-surface missiles with three launchers, which are planned to be armed with the Russian-Indian BrahMos universal supersonic cruise missiles. At the same time, the only guided missile frigate Jose Risal is equipped with a rather rare product: its pair of quad launchers carry the South Korean subsonic anti-ship missile system Hae Sung 1 (C-STAR).

Taking into account the already mentioned twists in the foreign policy of the Philippines and in connection with the seemingly successful visit of the US Secretary of Defense Lloyd Austin, new supplies of US armaments cannot be ruled out if an agreement is reached on the inclusion of the Philippines in the emerging architecture to deter China.

SINGAPORE has one of the most balanced military forces in the region. In the naval forces of the city-state, six Formidable-class

frigates with a pair of Harpoon anti-ship missile launchers each, as well as eight Victory-class missile corvettes with a similar weapons suite, are in service. Air Force is also armed with Harpoon and Exocet ASHMs. The versions of Harpoon and Exocet in service are relatively old, and taking into account Singapore's desire to maintain its armed forces at a modern level, it is possible to upgrade existing platforms or purchase new ones in order to deploy, for example, American LRASM AShM (as well as the JASSM and JASSM-ER ALCMs of the same family), or the Norwegian NSM (and, similarly, JSM). The ground forces have 18 HIMARS launchers with guided multiple launch rocket system (GMLRS) rockets. It is possible that, as part of their modernization, ER-GMLRS with a range of up to 135 km will be acquired, as well as future quasi-ballistic missiles PrSM.

Moreover, Singapore (along with the Philippines and Vietnam) is viewed as one of the "sites" for the possible deployment of American ground-launched missiles, including LRASM in order to threaten the deployment of the Chinese fleet.



Anti-ship missiles Norwegian Naval Strike Missile (NSM)

THAILAND'S need for AShMs is almost completely covered by the classic American Harpoon and augmented by the Chinese C-802A AShM. Missile boats carry more than modest Israeli anti-ship missiles of the Gabriel family, with the exception of the only representative of the Ratcharit class, armed with the Exocet anti-ship missile system. Additionally, the Thai Air Force has also a version of the Harpoon anti-ship missile system.

The Royal Thai Army deploys heavy MLRS (actually, tactical ballistic missiles) DTI-1 with a range of 180 km and guided DTI-1G with a range of 150 km, developed jointly with China in 2011–2012 (variants of WS-1B and WS-32, respectively). Increasing design and production capabilities can create conditions for the emergence of local SRBMs in the future.

In the medium term, a search for options for modernizing the Kingdom's anti-ship power is probable. It is quite possible to gradually "upgrade" the corresponding platforms to equip them with a new generation of anti-ship missiles, primarily LRASM and NSM, as well as, supposedly, future French products. The expansion of the Chinese presence

is not excluded, but this process is influenced by political considerations.

VIETNAM is one of the most powerful 'missile' countries in Southeast Asia – to begin with, one can only see a Scud (-B and -C) SRBM brigade. Of course, this is far from the most modern weapon, but the option of deploying more advanced systems (including Iskander-E) is quite visible. Serious attention is paid to coastal missile systems, and in this case, diversification is noticeable, as well as continued operations of seemingly obsolete coastal missile systems. Vietnam deploys three anti-ship missile brigades and one artillery brigade for coastal defence. Missile brigades simultaneously operate the legacy Redut with the P-35 AShM and Rubezh with the P-15 AShM, as well as the modern Bastion coastal missile system with the Oniks/Yakhont AshM (P-800). The 'artillery' brigade is armed with MLRS, including those capable of using the Israeli 306 mm EXTRA – basically, a tactical missile.

At sea, Vietnam boasts an impressive range of platforms armed with modern Russian missiles. The Hanoi submarines (aka Rus-

sian 636.1) are armed with cruise missiles of the Club family, both anti-ship versions and those designed to engage with ground targets. Surface ships are equipped with an impressive number of Uran subsonic AShM launchers that can deliver a serious salvo, which is especially important in the light of ongoing mutual territorial claims in the South China Sea. As for the Air Force, it is equipped with Kh-59M tactical cruise missiles.

As for the prospects, Vietnam regularly appears in the list of first customers for the Russian-Indian BrahMos, fortunately, the experience of operating Bastion will be very useful here. It is another matter that the "shadow of US sanctions" remains a very important factor in the region, even if in this case, apparently, India is showing excessive caution. And yet, new deliveries of the Club missiles (possibly upgraded in terms of increased accuracy and power), as well as the Kh-59MK2, cannot be ruled out. Perhaps, at a certain stage, Vietnam will show a substantial interest in the Bal (or Rubezh-ME, which is a cheaper and export-oriented option) coastal missile system, especially since having had the experience of working with do-

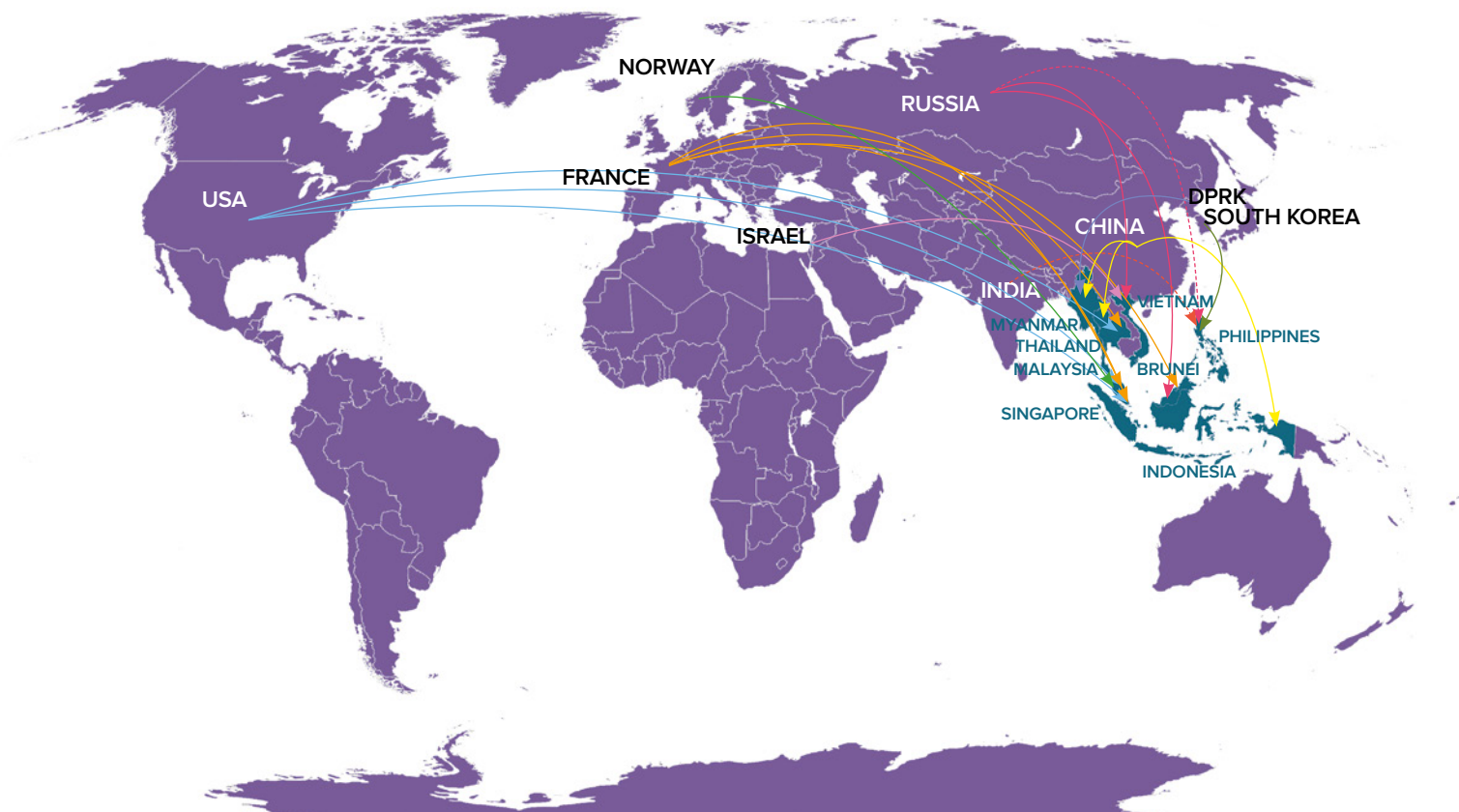
MAJOR SOUTH-EAST ASIA MISSILE SUPPLIERS AND OPERATORS

PRODUCER	OPERATOR	DESIGNATOR	TYPE
DPRK (NORTH KOREA)	Myanmar	Hwasong-6	SRBM
		KH-09 / KH-19	Subsonic AShM
CHINA	Indonesia Myanmar	C-705	Subsonic AShM
		C-802/802A	Subsonic AShM
	Thailand	DTI-1 / WS-1B DTI-1G / WS-32	MLRS/SRBM MLRS/SRBM
RUSSIA	Vietnam	Yakhont (Oniks)	Supersonic AShM
		Club 3M14E	Subsonic cruise missile
		Club 3M54E/E1	Subsonic AShM with supersonic battle stage / Subsonic AShM
		Uran 3M24E	Subsonic AShM
	Malaysia Indonesia	Scud-B/-C	SRBM
		Kh-59M Yakhont (Oniks)	Subsonic cruise missile Supersonic AShM
INDIA/RUSSIA	Philippines	BrahMos	Universal supersonic cruise missile
USA	Thailand	Harpoon (family)	Subsonic AShM
	Malaysia		
	Singapore		
FRANCE	Thailand	Exocet (family)	Subsonic AShM
	Malaysia		
	Singapore		
	Brunei		
SOUTH KOREA	Philippines	Hae Sung-1 / C-Star	Subsonic AShM
ISRAEL	Vietnam	EXTRA	MLRS/SRBM

More modern Martadinata class frigates



MISSILES IN SOUTH-EAST ASIA



SIEMON T. WEZEMAN,
SENIOR RESEARCHER
WITH THE SIPRI ARMS
TRANSFERS AND MILITARY
EXPENDITURE PROGRAM

Regional trust in South-East Asia remains low, and states react to what their neighbors are doing

mestically produced/assembled missiles of this family. Vietnam has launched production (apparently using some parts imported from Russia) of the KCT-15 ASHM and its further development VCM-01, presumably similar in capabilities to the Russian Kh-35E and Kh-35UE.

REGIONAL SECURITY IMPLICATIONS

Undoubtedly, there is no point in drawing the notorious 'evil red circles' around probable locations of ASHM launchers and other types of missiles in the region and talking about Anti-Access/Area Denial (A2/AD) zones. However, the qualitative and quantitative growth of missile arsenals makes the concept of 'non-nuclear deterrence' and its applicability to the region worth considering.

Of course, all Southeast Asian countries have their own interests and approaches to

their security. At the same time, it is difficult to imagine a situation in which development of one or another system of weapons and military equipment would be conducted for its own sake. Nonetheless, the key factor in making appropriate decisions is the threat perception. This perception may well be distorted, and, moreover, the buildup of a missile arsenal by one country in order to strengthen its security would be inevitably perceived as a threat by other countries, which is especially important in conditions of complex geography and deep contradictions in South-East Asia.

In such an environment, it is advisable to conduct a substantial conversation about these threats, but the role of non-regional actors can only involve exchange of experiences and best practices, as well as a deep and comprehensive assessment of possible deals in the supply of military products. ♦

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AEXKS





Author Akram Kharief

The Rise of the Southern Mediterranean Navies

Born sailors, the inhabitants of the southern shore of the Mediterranean have always attached importance to the navy, a vector of force projection and deterrence; it also resurged as a vector of enrichment and economic development in times of piracy.

For countries on the edge of deserts, it was essential to defend the coasts and to invest in coastal defence. Alexandria, Benghazi, Tripoli, Tunis, and Algiers were real strongholds.

Two centuries after the colonial invasions and the construction of modern states, we are witnessing a renaissance of the navies of these southern Mediterranean countries. Long linked to the Soviet Union, the Algerian, Libyan and Egyptian navies have slowly turned to Western suppliers for various reasons, mainly those of interoperability.

Starting in 2010, these navies began a modernization program that is still underway. It corresponds to the replacement of ships acquired at the end of the 1980s and to the new regional and national challenges that these countries are facing.

Two new phenomena have emerged in the region: international terrorism, including at sea, and illegal migration. These phenomena are linked to a particular event in the region, which is the Arab Spring that began in 2010 in Tunisia and destabilized these countries and encouraged the installation of major terrorist centers.

The discovery of gas deposits in the Eastern Mediterranean has also accelerated the naval rivalries between the countries of the two shores. It has also necessitated the sizing of navies for the protection of offshore platforms and submarine pipelines.

The protection of fiber optic cables has also become an object of attention for the different navies.

EGYPT

Due to the geography of this country, the Egyptian Navy is separated into two distinct

corps, one in charge of the protection of the Red Sea and one in charge of the surveillance of the Mediterranean Sea.

Of all the navies in the southern Mediterranean, the Egyptian navy is the one that has seen the most combat – in 1948, 1956, 1967, and 1973. With 18,500 men and 316 ships, it is the largest navy in the North Africa.

Recently, two main naval bases were inaugurated by the authorities: in Marsa Matruh in the North West of the country and in Berenis on the Red Sea. The headquarters of the Egyptian Navy are in Alexandria.

Like with most navies in the region, a great change has been initiated since 2010 with a great modernization of capabilities. The purchase of the two Mistral projection and command ships (French: *bâtiments de projection et de commandement*, or BPC) – built by France for the Russian Navy in 2014 but never delivered – became the trigger for a vast modernization program for the Egyptian Navy. In addition to the two BPCs, there are three FREMM frigates – one French and two Italian. Plus, four German MEKO A-200 frigates and four French Gowind heavy corvettes, that will be partly built in Egypt.

To defend the entrance to the Suez Canal, the Egyptian Navy relies on four Ambassador MKII class heavy missile patrol boats, which combine speed and high firepower with its 8 Harpoon missile tubes.

Egypt still deploys U.S. surplus ships, primarily the Oliver Hazard Perry and Knox frigates, which are completely outdated. Egypt has also a considerable submarine force with four old Romeo class submarines, which have been modernized and are capable of firing American Harpoon missiles. Four German Type 209-1400 submarines are being integrated into the Egyptian



THOMAS VOLK,
DIRECTOR OF KONRAD-
ADENAUER-STIFTUNG'S
REGIONAL PROGRAM
POLITICAL DIALOGUE SOUTH
MEDITERRANEAN

.....

The significance of the Mediterranean Sea is clear on different aspects; economic, geopolitical, strategic and security related. Maritime Security, especially with the rising role of different actors, could be challenging and even lethal to the stability of the South Mediterranean region



Navy, which faces numerous threats from Turkey and Israel.

LIBYA

The country has been under an arms embargo since July 2011. It had suffered from a war led by an international coalition that destroyed its navy.

Faced with the embargo and the need for maritime patrols and because of the civil war, the Libyan authorities have resorted to improvisation – by equipping tug boats with 23-mm cannons or MLRS.

In 2015, the coast guards had two aging 25-meter tug boats and a few small fast boats. The 1,000-strong coast guard was spread out over a vast coastline from the oil city of Brega in the east of the country to the Tunisian borders. The ratio is about one soldier per kilometer. They are poorly paid and not very well organized. A coast guard soldier can expect less than 1,000 Libyan dinars at the end of the month, less than €200. Many double up as part-time fishermen in order to earn a decent salary; some even have been involved in human trafficking or smuggling.

In 2006, the Libyan Coast Guard purchased six Croatian PV30-LS stealth patrol boats, known locally as Mergueb Class. They are now the backbone of the Libyan Navy.

In 2018, Italy transferred 10 Class 500 patrol boats to Libya as part of Operation Sophia to combat illegal migration. That year saw numerous human rights violations in Libya including by the Libyan Navy and security forces, which led to a large protest movement by human rights NGOs in Europe. These protests resulted in the termination of cooperation with the European Union in this area and the cancellation of a French donation of six patrol boats to the Libyan Navy.

TUNISIA

The Tunisian Navy was founded in 1958 and began operating a year later starting with a decommissioned French Navy ship, the Chevreuil. The navy has never been a strategic organ for the small North African country. For a long time, its fleet was content with missile patrol boats of the Combattante and Albatros classes; the idea was to have small military ships that could intervene quickly and, if necessary, fire Exocet or similar anti-ship missiles. With 4,500 men, it is the smallest navy in the North Africa.

Until after 2010, there were no major acquisitions for the Tunisian Navy which was beginning to face new challenges, such as transnational terrorism and illegal migration. In 2015, Tunisia ordered from the Romanian Damen Shipyards Mangalia three



MSOPV-I400, multi-mission patrol boats with a displacement of 1,400 tons and a length of 75 meters, to make its main ships and coverage of the three Tunisian maritime regions.

It is also noteworthy to mention the local manufacture by the Company of Industrial and Naval Construction of a class of light patrol boats Istiklal of 23 meters' length and 80 tons of displacement. The entry into service of these small lightly armed vessels began in 2015.

ALGERIA

Formed in 1962, just after the country have gained independence, the Algerian Navy is the most diversified Algerian armed corps in terms of equipment and strategy. It is also the military branch that carries out the majority of exchanges and exercises with Western and other armed forces in the Algerian Army.

It is made up of 15,000 men divided into six missions, coast guard, surface navy, submarine force, coastal defence, naval aviation, and landing forces.

The Algerian Navy is divided into three maritime fronts with different missions: the Western front responsible for monitoring and, if necessary, locking the Strait of Gibraltar, the Central front responsible for protecting the capital Algiers, and the Eastern front responsible for monitoring the Strait of Messina.

The naval forces are generally distributed equally between these three fronts with two major naval bases, that of Mers el Kebir in the west and that of Jijel in the east, which house the bulk of the fleet.

Between the 1960s and 1990s, the Algerian Navy was made up of Soviet or Eastern bloc ships with a focus on the speed and missile capabilities of the ships. The Algerian Navy had a large fleet of patrol boats with OSA 1 and 2 missiles. From the 1980s onwards, Algeria had two choices: to develop a local naval construction or to open up to new Western partners. This would result in the local construction of a class of missile corvettes Djebel Chenoua and Kebir-class patrol boats, a dozen of which have been produced with British assistance. Britain has also sold to the Algerian Navy two Ka-laat-class landing ships built by Brooke Marine. At the end of the 1990s, the Algerian Navy had Koni frigates and Nanushka corvettes and was deploying two Kilo 877EKM submarines which had replaced two Soviet Romeo-class submarines received in 1981.

The transformation of the Algerian Navy began in 2010 with multiplication of orders from various suppliers: Russia, China, Germany, France, and Italy.



Within a decade, Algeria will receive: an Italian flagship, the landing and logistical support vessel Kalaat Beni Abbès of 143 meters' length and 9,000 ton of displacement; two heavy frigates Meko A-200 built by TKMS in Germany with a length of 118 meters and a displacement of 3,400 tons, they are equipped with Swedish missiles RBS-15MKIII; Chinese heavy corvettes C28-A, 120 meters long and with a displacement of 2,880 tons; six Chinese corvettes on an improved Type 056 base will be delivered starting in 2022. Additionally, the Algerian Navy has six Russian Kilo submarines with Kalibr anti-ship and land attack missiles capability.

As for its coastal defence, the Algerian Navy deploys three coastal defence missile regiments, one per each sea front, the regiments being composed of Bal-E launchers and Chinese supersonic missiles CM-302. It has also anti-ship artillery regiments composed of 155-mm guns and howitzers of the same caliber.

Algeria deploys a force of 7,000 men specialized in landing and anti-terrorist operations. The Marine Fusiliers Regiment is composed of 9 battalions distributed on each maritime front. They are equipped with landing craft and armored vehicles such as BTR-80. They were actively involved in the fight against terrorism in Algeria during the 1990s and are responsible for the protection of naval bases.

MOROCCO

Founded in 1960, the Royal Moroccan Navy has always been the poor relative of the Kingdom's army. Morocco is the only country in the North Africa to have a maritime front on the Atlantic Ocean. Because of the immensity of this front, Morocco has historically always neglected its Mediterranean part despite the presence of the Strait of Gibraltar, a strategic location for the passage of civilian and military ships. Until very recently, Morocco left the military management of the Strait to Great Britain and Spain.

The main concern of the Moroccan Navy since its foundation has been the regulation of fishing activities in its exclusive economic zone and fight against trafficking.

Until the early 2000s, the Moroccan Navy lived mainly on foreign aid and on ships from American or European military surplus. The backbone of the Moroccan Navy at that time was composed of the Floréales French light frigates and the Descubierta Spanish corvette.

Since 2010, the Royal Moroccan Navy has embarked on an ambitious moderniza-

tion program with an increase in firepower and coverage and with the construction of a naval base in the North on the Mediterranean coast, that of Ksar Seghir, whose missions are protection of the port and the economic zone Tangier Med and demonstration of its presence at the level of the Strait of Gibraltar.

In terms of equipment, since 2011 the Moroccan Navy has begun to receive stealth corvettes Sigma, built by Damen in the Netherlands, it has received three of those between 2011 and 2012. For the needs of offshore patrols, the same year Morocco received an OPV-70 built in France by STX.

It will reinforce the fleet of OPV-64s acquired during the 1990s for the surveillance of the Moroccan EEZ. But the most beautiful acquisition of the Moroccan Navy remains to be that of the FREMM, a Multi-Mission Stealth frigate built by the Naval Group (ex-DCNS) in France. This frigate with an anti-submarine configuration is stationed in the naval base of Ksar Seghir, and it is the flagship of the Moroccan fleet.

With strength of 12,000 men, the Moroccan Navy is the smallest branch of the Royal Armed Forces. Of these men, 2,000 make up three marine battalions, with a landing component supported by the Newport and Champlain landing ships dating to the 1970s. Morocco does not have a coastal missile defence and is content with towed artillery and lookout posts to monitor and defend its coastline.

In its quest for modernization, Morocco is looking for submarines; several tracks have been mentioned. The first is Russian, with a project to purchase a Lada-Amur class submarine, a very unlikely possibility. The second, more realistic one is the purchase of a second-hand Portuguese U-214 Tridente class submarine. Talks have been held between the two countries in 2020 on this subject, but were not successful. Finally, if financed, Morocco could order a new submarine directly from Germany, a contract similar to the one with Egypt.

CONCLUSION

The future for North African navies will be complicated by the increase in merchant traffic in the Mediterranean and rivalries between countries. The issue of surveillance of the straits and delimitation of exclusive economic zones, which is very sensitive, will increase the use of naval forces. Democratization of missiles also represents a greater danger. Rivalries between Egypt and Turkey in Libya and between Algeria and Morocco could also lead to maritime conflicts in the coming years. ♦



EMANUEL MACRON,
PRESIDENT OF FRANCE

.....
The Mediterranean area will be a challenge over the next few years as the factors of crisis which combine there are numerous: contestation of maritime areas, clashes between neighboring countries, the destabilization of Libya, migration, human trafficking, and access to resources



JAKUB GRYGIEL,
NATIONAL SECURITY VISITING
FELLOW AT THE HOOVER
INSTITUTION

.....
The importance of the Mediterranean Sea is conditional and its nature favors continental control; it is a sea of passage and a sea of land powers



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