



Import Substitution for Rogozin

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¹ For the Russian armed forces and defence industry, ruptured ties with Ukraine and Western sanctions are proving disastrous.

Calls for a full transition to using only Russian materials and components in the manufacture of military hardware have been heard coming out of the Kremlin since the Yeltsin era, but the problem has become acute since the operation involving Russian troops in Crimea. It came as no surprise that the agenda for Vladimir Putin's 10 April 2014 meeting with the directors of the leading enterprises of the Russian military-industrial complex was unambiguously titled "To Consider Import Substitution Due to the Threat of Termination of Supplies from Ukraine of Products for a Number of Russian Industries". The head of state expressed optimism, even before receiving a reply to his question of which Russian enterprises could increase production and how much it would all cost. Putin said he had "no doubt we will do it", and that this "will be to the benefit of Russian industry and the economy: we will invest in developing our own manufacturing."²

This confidence was evidently based on assurances from Denis Manturov, the Minister of Industry and Trade, who the previous day, had reported at a meeting between Putin and members of the government that his department had "already carried out a fairly in-depth analysis" and "concluded that our country is not seriously dependent on the supply of goods from Ukraine".

As awareness of the extent and severity of the problem grew, however, the tone of speeches by the first person of the state changed markedly, and by April 2015 Vladimir Putin was admitting at a meeting of the Military-Industrial Commission that "substitution of imports in the defence industry is a serious challenge."³

Gradually, factual data began to emerge on the size of the problem. For example, Deputy Prime Minister Dmitry Rogozin reported in a speech that parts and components from NATO and the EU were used in 640 items of Russian military equipment, mainly in respect of electronics and optics.⁴ Of these, "we will have to replace 571 items by 2018." Deputy Defence Minister Yury Borisov, responsible for military technology supplies to the armed forces, on 16 July 2015 reported rather different figures to Vladimir Putin, stating that, by 2025, "we are planning to implement import substitution in 826 items of armaments and military equipment."⁵ Other sources go further, by indicating that substituting components only from NATO and the EU will affect no fewer than 800 items of armaments and specialized equipment. In total the figure of at least "some 10,000 specific products".⁶ One year after the policy was announced, however, full import substitution of components from NATO and EU countries has been achieved in only 7 out of 127 items selected.⁷

Russia without Ukraine: a Titan without titanium

The most acute, even critical, dependence of the Russian military-industrial complex on Ukrainian firms is in missile and space technology, aviation and shipbuilding. I have analysed this in detail

¹ This paper was written for the Russian Service of Radio Free Europe / Radio Liberty. It can be accessed at, Voronov, V. 'Importozameshenye dlya Rogozina', *svoboda.org*, 10 January 2016, available at: <http://www.svoboda.org/content/article/27477140.html>

² <http://kremlin.ru/events/president/news/20756>

³ <http://kremlin.ru/events/president/news/49270>

⁴ <http://m.ritimeurasia.org/news--2015-07-18--rossijskij-vpk-i-zapad-problemy-importozameshenija-18851>

⁵ <http://www.kremlin.ru/events/president/news/50005>

⁶ http://www.gazeta.ru/business/news/2015/08/11/n_7453253.shtml

⁷ <http://www.kremlin.ru/events/president/news/50005>

elsewhere (“Russia’s addiction to Ukrainian rockets”⁸, “Russian helicopters need Ukraine”⁹, “Sevastopol is Russian, ‘Varyag’ is Chinese”¹⁰ and “Divorce military-style”¹¹).

Let us recall the Ukrainian origins of the RS-20 or R-36M missile system, with the NATO reporting name of SS-18 Satan, developed at the Southern (Yuzhnoye) Design Centre in Dnepropetrovsk, also manufactured in Dnepropetrovsk at the Southern Mechanical Engineering Plant (Yuzhmash). Its control systems were designed at the Kharkov Electronic Device Research and Development Centre (Elektropribor, now Hartron PJSC). Hartron is also the developer and supplier of control systems for the UR-100N intercontinental ballistic missile and related silo installations, and for the control systems of the space rockets Energia, Dnepr, Strela, Rokot, Tsiklon, Tsiklon-4, the Briz-KM booster unit, and a whole lot of other spacecraft and satellites. The Zenit launch vehicles for the Russian space industry were produced solely by Yuzhmash. To this missile list we can add the sighting system for the Topol-M strategic missile system, developed at the Arsenal Factory in Kiev.

Russian naval shipbuilders are critically dependent on the Zorya-Mashproekt Research and Production Gas Turbine Engineering Complex in Nikolaev. This is one of three sources of gas turbine engines for ships, primarily warships, which between them have a global monopoly. In Soviet times, several series of warships were designed to take the Nikolaev gas turbine engines, for example the large anti-submarine craft of Projects 61, 1135 and 1135M, 1134-B, 1155 and 1155.1, the missile cruisers of Project 1164, the destroyers of Project 956, and patrol boats of Projects 11540 and 11661, many of which are still in service in the fleet. More recently, some series of ships for the navy of the Russian Federation were designed to be fitted with Zorya-Mashproekt gas turbine engines: patrol boats of Project 11356, frigates of Project 22350. The forthcoming multi-purpose destroyers of Project 21956 were also designed to take them.

In aviation, the main headache for the Russian military-industrial complex is again Ukrainian engines: combat, military transport, transport and civilian helicopters Mi-8/ Mi-14/ Mi-17/ Mi-171, Mi-24/ Mi-35, Mi-26, Mi-28, Ka-50/Ka-52, Ka-27, Ka-29, Ka-31 and Ka-32 are equipped with various versions of the TV3-117, VK-2500 and D-136 helicopter engines, whose basic manufacturer is the Motor Sich plant in Zaporozhye. To make matters worse, Motor Sich also manufactures engines for a whole cohort of aircraft in service with the Russian Air Force: the IL-18/ IL-20 electronic intelligence and electronic warfare aircraft, the anti-submarine IL-38, the AN-8, AN-12, AN-24, AN-26, AN-32, AN-72, AN-124 military transport aircraft, the Be-200 and Be-12 amphibious aircraft, and the An-30 aerial reconnaissance aircraft. Motor Sich engines also equip the “flying school desks” of the Russian Air Force: the old L-39 Albatross training aircraft produced long ago in Czechoslovakia, and the Yak-130 which is due to replace the Albatross. If we take account also of civilian aircraft, we can add to the list the An-74, An-140, An-148, Yak-40 and Yak-42.

That is not counting such “minor details” as the fact that Motor Sich is the main manufacturer of various aircraft auxiliary engines and motors: for air supply, the electricity supply for on-board circuits, heating the cabins and starting the main engines. Neither is everything straightforward in

⁸ <http://www.svoboda.org/content/article/25308098.html>

⁹ <http://www.svoboda.org/content/article/25320203.html>

¹⁰ <http://www.svoboda.org/content/article/25368574.html>

¹¹ <http://www.svoboda.org/content/article/25426347.html>

terms of aircraft ordnance: it is the Kiev Arsenal Factory which manufactures the infrared (heat-seeking) warheads for such Russian close-range air-to-air missiles as the P-73, which are standard armaments on the basic Russian warplanes, the MiG-29, Su-27, MiG-31, Su-30, Su-34, Su-25 and others.¹²

In the report mentioned above, Yuri Borisov stated that in the first half of 2015, 57 components of Ukrainian origin had been replaced out of a planned 102.¹³ In total, according to Deputy Prime Minister and Chairman of the Board of the Russian Federal Military-Industrial Commission Dmitry Rogozin, 186 models of armaments and specialized equipment from Ukraine will be replaced in about 1,000 different locations.¹⁴ The most difficult things to replace, he said, are “gas generators, propulsion units for a number of ships, and aircraft engines for helicopters and planes”.

Cessation of deliveries of Ukrainian components caused problems almost immediately. Some of these are well known. For instance, in March 2014 the Arsenal Factory in Kiev stopped deliveries to Russia of R-73 homing missiles, and by early 2015 the manufacturer’s stock, according to media reports, had virtually run out.¹⁵ In March 2015 the planned launch from the Plesetsk Cosmodrome of a Rokot launch vehicle carrying three satellites for the Gonets-M (Messenger) communication system was abandoned. The reason given was “technical problems”, but information leaked to the press indicated that these had resulted from a ban by the Ukrainian authorities on supplying components for the Briz-KM upper stage rocket.¹⁶ The control systems for this stage are manufactured by Hartron in Kharkov. Indeed, as there is nothing obviously available with which to replace the Ukrainian components, Russia may have to abandon the Rokot launch vehicle altogether, despite the fact that they are relatively cheap to build and considered reliable.

Unavailability of components manufactured in Ukraine has also caused problems for the manufacture of torpedoes for submarines. The Dagdizel Factory, one of the leading manufacturers, was on the verge of bankruptcy because of the breakdown of links with Ukraine. In February 2015, Deputy Prime Minister Dmitry Rogozin demanded that the factory’s directors should, by the end of the year, clear their backlog.¹⁷ Giving orders is easy, but the problem was that the component in short supply, the system control unit, was produced by Petrovsky Automation Research and Production Complex in Kiev. Incidentally, back in the early 2000s, the longest-established Russian developer of naval armaments, the Gidropribor Scientific Research Institute (today it is JSC Gidropribor Marine Underwater Armaments Corporation) was tasked with producing a Russian alternative to the Ukrainian unit. Now it was suddenly remembered that the problem had not been solved. A visit to Petrovsky Automation’s website reveals that the Ukrainian firm manufactured all sorts of important bits and pieces for the Russian Navy’s armaments, for example, the control system equipment for the “K-10 Shkval”, evidently the high-speed cavitating torpedo.¹⁸ They also make control system equipment and navigation devices for a range of torpedoes - anti-submarine, anti-ship and universal; autopilots for airborne anti-submarine missiles; and servomechanisms for torpedoes.

¹² http://www.gazeta.ru/politics/2015/02/20_a_6420965.shtml

¹³ <http://www.kremlin.ru/events/president/news/50005>

¹⁴ http://www.gazeta.ru/business/news/2015/08/11/n_7453253.shtml

¹⁵ http://www.gazeta.ru/politics/2015/02/20_a_6420965.shtml

¹⁶ <http://www.mk.ru/science/2015/03/03/zapusk-rakety-rokot-otlozhen-posle-togo-kak-ukraina-otkazala-v-postavke-komplektuyushihkh.html>

¹⁷ <http://ria.ru/economy/20150211/1047117735.html>

¹⁸ http://www.kza.com.ua/index.php?option=com_content&view=article&id=48&Itemid=65

Perhaps the unkindest cut is that Russia is totally dependent on Ukraine for ... titanium. Russia gets 100% of its titanium ore from Ukraine. This is quite odd, because there are vast titanium deposits on Russian territory, but they are not being exploited. Specialist sources and publications report that, “At the present time, Russia completely lacks its own effective supply of titanium ore. All active titanium mines of the former USSR are now in Ukraine.”¹⁹

A propeller screw loose

The situation is equally critical with helicopter engines. In December 2014, Deputy Defence Minister Yury Borisov in an interview with *Izvestia* acknowledged that delivery of engines from Ukraine was one of his main problems and that “to become independent, we had to speed up, to double or treble the output of engines”.²⁰ However, to judge from a talk given by Vladimir Artyakov, chairman of the board of directors of United Engine-Building Corporation, chairman of the board of directors of JSC Helicopters of Russia, and first deputy general director of Rostech State Corporation, they are not even close to doubling or trebling output. A year ago, when Artyakov was asked how the problem of replacing the products of Motor Sich would be resolved, he said that JSC Klimov in Russia had begun production of VK-2500 engines for the Mil and Kamov helicopters but that production was as yet still only at the “experimental design” stage. This, translated into plain language, meant there was no mass production but only ad hoc assembly. This was confirmed when Artyakov continued, “The challenge now is to increase batch production of engines from 50 in 2014 to 350 engines by 2017.”²¹ In February 2014 Sergey Chemezov, the head of Rostech Corporation, put the need for helicopter engines from Ukraine at 250-270 units per year.²² By 2020, it seems likely that Russian helicopters will be in need of at least 5,000 such engines.²³

A consolidated day of failure

As revealed by a videoconference on 16 July 2015, the consolidation day for military acceptance of industrial production, deadlines for delivery of products are constantly being missed. On that occasion, Deputy Defence Minister Yury Borisov, reported that in 2014 the Yantar’ Shipyard in Kaliningrad had failed to deliver the first patrol ship in the Project 11356 Admiral Grigorovich series on time. The delivery date for the ship was set back six months, but was again missed. Other news of the day: the Beriev Aviation Research and Technology Complex in Taganrog failed to deliver the Be-200ChS amphibious aircraft on time, then failed to meet the revised deadline of a remedial schedule. “The second aircraft of the 2015 programme is also in danger of failing to be delivered on time.”

The deputy minister of defence had also to report to the supreme commander-in-chief that the “Russian National Research Institute of Radio Equipment has failed to deliver 8 Igla homing missile and control transmission stations. It is anticipated that a further six similar stations will fail to be delivered on time in 2015.” The same enterprise had “missed by over a year the deadline for developing a secondary location system for the Premier airborne unit of radar surveillance and monitoring.” The list of failures continues. JSC Tekhnodinamika has failed to deliver three

¹⁹ <http://www.sittec-titan.com/proizvodstvo/yaregskoe-mestorozhdenie-titana.php>

²⁰ <http://izvestia.ru/news/581385>

²¹ <http://www.kommersant.ru/doc/2640351>

²² <http://rostec.ru/news/4241>

²³ <http://www.svoboda.org/content/article/25320203.html>

multiposition launch vehicles for the Tu-160 strategic bomber, and delivery of the other “six programmes in 2015 is in jeopardy.” The Mayak Plant in Kirov has failed to deliver 326 Vikhr’-1 (Whirlwind-1) guided missiles (in development since 1990, designed for the Vikhr’ anti-tank missile system, with which Ka-50 helicopters and Su-25TM ground attack aircraft were to be equipped. It is now instead to be fitted to Ka-52 helicopters.) “The material manufactured,” Yury Borisov stated, “failed its tests and the specification was not met. The enterprise’s remedial timetable is behind schedule.” The situation is similar for the supplying of the same Vikhr’-1 missiles by Kalashnikov Group. “1,972 guided missiles have not been delivered.”²⁴ Kalashnikov managed to deliver the first batch of Vikhr’ missiles to the Ministry of Defence only in October 2015.²⁵

There have also been one- or two-year delays in completing experimental design work “towards creating and developing automated control and communication systems for the armed forces”. Timely delivery of two of four planned An-148-100E aircraft is in doubt at the Voronezh Aircraft Factory. “The reason is refusal by a Ukrainian firm to supply the main landing gear.” The Amur Shipyard is behind schedule on construction of the Project 20380 corvette “Sovershennyi” (“Perfect”). “There is concern about failure by the Severnaya Verf’ (North Wharf) Shipyard to complete systems testing of the Project 22350 lead frigate ‘Admiral of the Soviet Union Gorshkov’ by the deadline”.

“They’ve taken the money but there is absolutely nothing to show for it!”

Even more impressive were the details revealed at a meeting of the Marine Board of the Government of the Russian Federation, chaired by Deputy Prime Minister Dmitry Rogozin in July 2015. To cut a long story short, the Marine Board noted that the proportion of foreign components in maritime equipment and devices is 95%, and that all the billions of rubles invested in import substitution for shipbuilding had been wasted. It was noted that only six consortia are now involved in the manufacture of “apparatus” (which covers a wide range of products, including components of naval armaments) for Russia’s shipbuilding industry. These are the Morinformsystema-Agat, Granit-Elektron and Okeanpribor Corporations, the Elektropribor National Research Institute, the firm Transas, and Aurora Research and Manufacturing Group. All the hardware in this apparatus, all the assemblies and components in them, are foreign.²⁶ When Admiral Viktor Chirkov, commander-in-chief of the Russian Navy, spoke, he blew the meeting out of the water by stating that, as far as marine engineering and instruments were concerned, the policy of import substitution had been a complete failure. According to the admiral, military clients (as well as civilian shipowners) had innumerable complaints about absolutely all the propulsion units manufactured in Russia, whether diesel or gas turbine. Moreover, all three of the Russian factories which do produce ship engines, are still heavily dependent on imports. This speech by the head of the Russian Navy deserves to be quoted at length:

“Just look what happens! The Navy orders a propulsion unit, conducts scientific research, then design and development work, then combined scientific research and design and development work, spending the state’s money. The coastguards spend money, the fishermen spend money, the civilian land and marine transportation companies spend money, the river boatmen spend money.

²⁴ <http://kremlin.ru/events/president/news/50005>

²⁵ <http://lenta.ru/news/2015/10/23/vikhr/>

²⁶ <http://www.fontanka.ru/2015/07/02/135/>

The list is endless. From Gazprom to private businesses, everybody is spending money on the same thing. And here we are: in Russia today, only three companies manufacture these units. There is the Kolomna Factory; there is the Urals Diesel Engine Factory, which makes engine covers which within two months have been completely corroded by seawater; and then there is Zvezda (Star), our favourite. Their new engine really was designed by them, but where is it made? Again, imports! I got in touch with them yesterday: “That metal,” I said, “which you’ve made the engine from, are we capable of producing that in Russia? And the housing and component parts?” “No!” We’ve lost all those technologies! “The electrics?” “No!” I ask them, “Who makes the turbocharger for the engine?” Austria, Switzerland, Sweden and so on! We have to recognize that all the people sitting here today are spending public money, and at the end of it all, we see no results!” the commander-in-chief of the Russian Navy declared.²⁷

Much the same spirit informed the speech of the deputy prime minister of the Russian Federation: “If we start to analyse where billions of rubles have been spent, we will clearly see that, in principle, everything should already have been invented and long available as demonstration models. Except that, in reality, there is nothing. On paper, everything has been done, but when you ask about results, you are told, ‘Oh, that was only called scientific research, but in fact it was a kind of aid for our research Institute.’ In other words, they’ve taken the money but there is absolutely nothing to show for it!” Rogozin expostulated.²⁸

GLONASS is “beyond our means”

Import substitution for items in the space programme is a separate issue. The main negative impact on the Russian space programme has come from the ban on the sale of hardware components for space applications.²⁹ This immediately slowed development of the Russian GLONASS navigational system right down. Here it is not Ukrainian manufacturers who are the problem. The fact is that in standard Russian satellites the proportion of foreign electronic components varies between 25-75%, but in the most advanced space projects, such as GLONASS-K, the proportion of imported parts is way up beyond 90%. Moreover, in most Russian satellites the electronic hardware is manufactured, or at least designed, in the US. The export of US parts and components for military or dual use is regulated by the International Traffic in Arms Regulations (ITAR), a system of rules and regulations established by the US authorities, covering exports of goods and services with a military application. Under these regulations, export to Russia of electronic components for use in military or space systems is possible, but only with the permission of the US State Department. Today, provision of all components for the Russian space programme is prohibited. As Andrey Tyulin, the CEO of JSC Russian Space Systems has announced, development of a future satellite for the GLONASS system, built with exclusively Russian-manufactured components, has only just begun.³⁰ Tyulin suggests that Russian industry is capable of creating the necessary industrial base for such a craft in the next four or five years. In turn, the CEO of Roselektronika Group, Andrey Zverev, assures us that by 2019 80% of electronic components in the payloads of Russian satellites will be made in Russia.³¹ However, Ivan Moiseyev, one of the senior figures at the Space Policy Institute, remarked wryly that, “If, during the next four years, we take it upon ourselves to replace

²⁷ <http://www.fontanka.ru/2015/07/02/135/>

²⁸ <http://www.fontanka.ru/2015/07/02/135/>

²⁹ <http://m.ritmecurasia.org/news--2015-07-18--rossijskij-vpk-i-zapad-problemy-importozameschenija-18851>

³⁰ http://vpk.name/news/132399_iz_sputnikov_glonass_uberut_importnyie_komplektuyushie.html

³¹ http://vpk.name/news/132399_iz_sputnikov_glonass_uberut_importnyie_komplektuyushie.html

90% of the foreign components in the Glonass-K satellite with Russian products, I fear we will end up with a satellite not of the next but of the previous generation.”³²

The major issue, without which import substitution is simply impossible, is machine tools, and Russia does not manufacture the ultramodern types, with computer numerical control, which are essential. As Boris Dubrovsky, the governor of Chelyabinsk Province explained, 90% of all machine tools in Russia are imported.³³ According to the experts, the situation is most critical precisely in the production of ordnance. As one expert, Yury Shabalin, bitterly complains, “At the present time we simply do not have our own capacity in Russia for manufacturing the machine tools needed by the arms industry.”³⁴ According to Shabalin, half the CNC systems currently in use in the defence industry are imported.³⁵ In his view, “At a given signal the CNC could be switched off or instructed to operate the wrong program.” Whether or not that is so, the fact remains that Russia no longer has a machine-tool or tool-making industry of its own. Neither, come to that, does it have operatives capable of working the machines. As Oleg Sienko, CEO of Uralvagonzavod admits, “We had, and still have, a real shortage of highly skilled workers, and primarily of operators of CNC machine tools, without which it is impossible to see through an overall modernization of our technology.” He listed some of the areas where Russia’s leading tank-building enterprise, for which he is responsible, has suffered losses as a result of sanctions and the non-delivery of imported components:

“We are operating under sanctions, which means that foreign banks and suppliers are not permitted to be in contact with us. We had been working very seriously on creating a power unit with Caterpillar, but sanctions were introduced two days before items made at our partners’ site in Latin America were due for shipment. We had made a good vehicle for export with Renault Truck Defence, which our military also liked, but have had to halt the programme. We have an analogous situation with Bombardier ... We had programmes with other foreign partners which we have had to wind down.” “Import substitution is extremely important, but it cannot be done in a day or a year, or even five years,” Sienko admitted. “We have lost competence. We need to replace the technology of the twentieth century with the technology of the twenty-first, but this will take years. We will need a very long time to catch up with what has already been done elsewhere in the world.”³⁶ This top manager has no doubt that is because, in order to create an optimal product, “we cannot use inferior materials and poor equipment. Every link in the chain needs to be top quality.” Almost a dead end?

We have been here before

It is considered axiomatic that Soviet military equipment had not and could not contain imported parts and components, and that the Soviet military-industrial complex manufactured everything itself. That is not entirely true, because even in “better times”, the Soviet military-industrial complex could not avoid imports entirely, although that was always its ultimate aim. Already in 1935, policy documents from the People’s Commissariat of Heavy Industry talk of the need to try to move away from “import dependence” towards “organizing manufacture in the USSR of all the machinery

³² http://vpk.name/news/132399_iz_sputnikov_glonass_uberut_importnyie_komplektuyushie.html

³³ <http://www.mashportal.ru/interview-36924.aspx>

³⁴ <http://vpk-news.ru/articles/27612>

³⁵ <http://vpk-news.ru/articles/28057>

³⁶ <http://www.rbc.ru/interview/business/19/01/2015/54bb92799a79478224c760e2>

currently ordered for import.”³⁷ That speaks volumes! And indeed, there were many orders for imports, for example, in the field of naval weaponry. Here, from the 1920s right up until the German invasion on 22 June 1941, the Soviet Union actively collaborated with fascist Italy, not breaking its links even during the Spanish Civil War of 1936-9. Absolutely everything for the Soviet Navy was ordered from Italy: warships and designs for warships, propulsion units, boilers, ancillary machinery, torpedoes. These Russia was quite unable to produce before 1932, when an agreement was concluded with the Italians to assist with production of 533-mm torpedoes.³⁸ A complete set of documentation was obtained from the Italians for constructing light cruisers (which went into production in the Soviet Union in a series under the titles of “Project 26” and “Project 26b”). These were the cruisers “Kirov”, “Voroshilov”, “Molotov”, “Maxim Gorky”, “Kalinin” and “Kaganovich”, and Maestrals-class destroyers (which in the USSR were built under “Project 7”).

Immediately before the war the Soviet navy’s vanguard torpedo-boat destroyer, the “Tashkent”, was built for the Soviet Union in Livorno. The Italians provided invaluable technical assistance in organizing the stockpiling of equipment, the manufacture of boilers, turbines and auxiliary machinery. The Soviet G-5 torpedo boats had Italian engines. Neither should we forget the Germans who, after Hitler came to power, supplied the main turbogear assemblies for Soviet warships. German assistance in the building of submarines for the Soviet navy is another topic: until 1932, all major machinery for submarines was imported, mainly from Germany.³⁹ Even after Hitler came to power, German companies continued equipping the Soviet submarine fleet. Series D submarines were fitted with German diesel engines, ordered under the guise of engines for locomotives. Friction clutches, the main bilge pumps, air blowers and other equipment for submarines were also imported. The same was true of the building of Type C submarines which were, moreover, in reality licensed copies of German Project E-1 and E-2 submarines from the firm Deschimag. The Germans provided the USSR with technical assistance in the building of the submarines at least until the end of 1935. After the 1939 Molotov-Ribbentrop Pact, Germany supplied the Soviet Union with a heavy cruiser, the “Lutzow”, and a host of other weaponry, including an 88-mm cannon for submarines, 211-mm field howitzers, 105-mm anti-aircraft guns, anti-submarine depth charge throwers, and naval mines. We should not overlook purchases of artillery systems from Škoda in Czechoslovakia, or pre-war cooperation with the US, including the purchase from Consolidated Aircraft in 1937 of the Catalina flying boat, subsequently manufactured under licence in the Soviet Union, and the purchase of the DC-3 aircraft from the US, which was the basis on which licensed production of the PS-84, also known as Li-2, proceeded.

After the war, of course, a lot changed, and in the years 1960-91 Soviet armaments did not contain parts made in West Germany, Italy, France or Switzerland, let alone the United States or China. Against that, there was a huge quantity of parts and components, and in some cases even entire models, of weapons made in the “fraternal socialist countries”. Cooperation in the field of military technology was established immediately after the setting up of the Warsaw Pact, because it would have been a sin not to exploit, for instance, “the brooding genius of Germany”, or the unique industrial facilities of Czechoslovakia. Accordingly, the countries of Eastern Europe actually produced a very great deal in the way of parts and components for arming the Soviet Union. For instance, the proportion of East German and Czechoslovak “content” in Soviet missiles and anti-

³⁷ Irina Bystrova, *The Soviet military-industrial complex: issues of its formation and development (1930-1980s)*, Moscow, 2006, p. 131. In Russian.

³⁸ Bystrova, p. 112.

³⁹ Bystrova, p. 111.

missile defence was over 30%, and in the technology of Soviet tank units and the navy reached 20%.⁴⁰ A number of weapons systems would have been inconceivable without electronics from the Polish and Hungarian People's Republics, the Czechoslovakian Soviet Socialist Republic, and the German Democratic Republic. Components manufactured in these countries were to be found in the systems and hardware of telecommunications and space reconnaissance, of warning and protection against missile attack, in submarines and long-range aircraft, in guidance systems and so on. But it was not only parts and components which were imported to the USSR. Czechoslovakia, for example, was the sole manufacturer of L-29 Dolphin and L-39 Albatross trainer aircraft for the Soviet Air Force and those of other socialist countries. From the early 1960s, the Dolphin, and then from the early 1970s, the Albatross were the aircraft on which absolutely all Soviet military pilots were trained. Incidentally, although the Albatross is fairly obsolete, it continues to be the "flying school desk" of Russia's military pilots.

⁴⁰ <http://vpk-news.ru/articles/28165>



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