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DEFENCE INNOVATION: NEW MODELS AND PROCUREMENT IMPLICATIONS

The Polish Case

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ABSTRACT

Poland's strategic situation in Europe, as a centre of gravity for NATO in the Baltic region, and the growing threat posed by its Eastern Russian neighbour strongly influences its defence policy priorities and approach to defence innovation. Furthermore, Polish national defence technological and industrial base (DTIB) specific condition makes investments into advanced R&T/D programmes difficult as many high-end technologies remains out of reach for indigenous defence businesses. Indeed, to acquire new capacities, Poland is more used to search for offsets and off-the-shelf acquisitions than R&T/D. Yet, Poland's recent expenditure on defence R&T/D and the establishment of Armaments Agency (AA) in 2022 alongside the Polish ministry of national defence's 2020 new innovation policy has enabled new results for Polish DTIB, including new weapon systems or innovative programmes. But the likelihood they will lead to significant European armament project is still to be proven, and innovation may remain to certain technology areas and market segments considering the Polish security environment's accelerated deterioration.

Keywords: *Poland, innovation, procurement, European cooperation, transatlantic cooperation, European Defence Fund.*

Poland's approach to innovation in the defence sector has to be seen in the broader context of Polish defence policy priorities and the specifics of the national defence technological and industrial base (DTIB). Both factors determine Poland's armaments policy, which features some specifically designed tools, dedicated to fostering defence innovation. Yet, the budget for national R&T/D projects has remained at a modest level of approximately EUR 1 billion over 2011-2020[1]. With more money in the pipeline and streamlined mechanisms for funding innovative programmes – including a novel Armaments Agency, launched in January 2022, and New Innovation Policy, announced in 2020 –, Polish defence innovation is expected to finally take off. At the same time, key capability gaps – resultant from the operational realities of NATO's Eastern Flank – continue to be addressed through off-the-shelf acquisitions or offset-based cooperation. The biggest Polish programmes follow this model, which may limit the room either for the development of large, indigenous R&T/D projects or for joining future flagship European armaments programmes, in which Poland's footprint has been very weak so far. This trend is likely to be reinforced given the dramatic deterioration of Poland's security environment following Russian invasion on Ukraine, started on 24 February 2022.

UNDERLYING FACTORS (1): DEFENCE POLICY PRIORITIES

Ever since its accession to NATO in 1999, Poland has regarded the Alliance and the transatlantic security guarantees for Europe – manifested in the first place through a visible US military presence on European territory – as pillars of its security. At the time when NATO was adapting to out-of-area operations, and Russia seemed to be a prospective partner of the West, Poland – having the Russian threat in mind – staunchly called for sustaining the Alliance's capacity to perform its core task of common defence. Russian aggression on Ukraine, started in 2014 and now entered a phase of an open invasion, only validated Polish concerns.

[1] For a comprehensive and first ever analysis of Poland's R&T/D programs, see. T. Dmitruk, *Prace badawczo-rozwojowe w obszarze polskiej obronności* [R&T/D work in the field of Poland's defences], „Nowa Technika Wojskowa" no 5/2021. It is 4,342 bn in current prices, hence the figure in EUR is an approximation only, based on the of average EUR/PLN exchange rate in 2011-2020 (own calculations).

The current assumption, widely shared by majority of political elites in Poland, is that Russian invasion on Ukraine marks a start of a dangerous period of a sustained standoff between the West and Russia. First, Poland – as a hub for international support efforts for Ukraine -may become a target of a Russia-provoked incident or signalling strike, meant to dissuade the West from supporting more weapons to aid the Ukrainian defenders. Second, regardless of the situation on the battlefield in Ukraine, politically and economically isolated Russian leadership may be prone to brinkmanship and seek a direct – though most likely space- and time-limited – confrontation with the Alliance in an ill-devised attempt to gain new ground in its relations with the West This scenario is seen now by Poland as the threat to the security of the state. Everyday hostile Russian actions in cyberspace and the information domain complement the picture of a sustained and structural threat from the East.

This threat perception has deep consequences for Polish defence policy. Since 2014, Poland has doubled down on its commitment for a whole-sale rearmament of its armed forces, with state-of-the art systems replacing legacy platforms and entirely new capabilities planned to be acquired under an ambitious Technical Modernization Plan (in its current revision, the plan is worth approximately EUR 118 billion for 2021-2035 period)[2]. Furthermore, an increase of the size of the military was decided and involves developing Territorial Defence Forces as a separate service branch, establishing a fourth armoured division, and building a dedicated cyberspace force[3]. To finance these endeavours, Poland's defence expenditure is set to increase gradually from 2.3% GDP in 2021 (or approximately EUR 13 billion) to 2.5% GDP by 2030[4]. The effect of the February 2022 invasion is that the government suggested rewriting these plans to reach 3% GDP already in 2023[5]. To what extent this idea will be implemented, remains, however, to be seen.

[2] K. Płatek (mjr), *Wybrane aspekty modernizacji technicznej Sił Zbrojnych RP* [Chosen aspects of the technical modernization of the Armed Forces of the Republic of Poland], Polska Zbrojna, 17 August 2021, www.polska-zbrojna.pl .
[3] Polish Armed Forces involve five separate branches: land forces, navy, air force, special forces and Territorial Defence Forces, the latter being almost all-voluntary force composed of individuals, who share their civilian careers with military service.
[4] *2,2 proc. PKB na armię w 2021 roku. Prezydent podpisał ustawę budżetową* [2,2% GDP for military in 2021. President signs the budget bill], Defence24, 28 January 2021, www.defence24.pl . In September 2021 a decision was made to augment defence budget with additional EUR 1,5 bn, though it will be spend in next years, thanks to a special financing mechanism.
[5] Wicepremier Kaczyński: Polski zwiększy wydatki na obronność do 3 proc. PKB [Deputy prime minister Kaczyński: Poland will increase defence expenditure to 3% GDP], Polish Press Agency, 3 March 2022, www.pap.pl

At the same time, Poland has sought to improve NATO's capacity to respond to the growing Russian threat. Indeed, Poland views recent NATO steps to deliver on Article 5 guarantees as vitally important. Such measures include the deployment of multinational battle groups to the three Baltic states and Poland in 2017, an updated of both NATO's command and force structures – including Allied command elements on Polish territory – and operational planning for the Eastern Flank. American military presence in Poland, established independently from NATO's framework, is also clearly aimed at increasing Allied defence and deterrence in Europe. Since 2017, it is based on a rotating armoured brigade combat team (ABCT), but has grown significantly with the Russian escalation around Ukraine in early days of 2022, and then even more, following the actual Russian invasion on that country The plans to develop military infrastructure to receive, integrate and move forward reinforcements that would arrive in the Baltic theatre in most contingencies involving a crisis with Russia, became also even more acute, than before the invasion.

With all these developments, Poland has become a centre of gravity of any Allied defence against Russia in the Baltic region. Hence, the Polish drive to close key capability gaps relatively quickly and to build a maximal level of interoperability with American forces, rightly seen as a backbone of NATO defence posture in the Eastern Flank. Credibility of NATO security guarantees for Poland hinges upon – among many other factors – Poland's capacity to provide a dependable force and being able to play some key roles in NATO defence operations. Needless to say, without these Polish contributions the Alliance's defences across the entire Eastern Flank would be greatly compromised.

This way, Poland's strategic situation has deep implications for its armaments policy and its approach to defence innovation[6]. Further, there is an urgency to modernize Poland's armed forces due to the fact, that many post-Soviet legacy platforms and weapons systems (such as air and missile defence systems or helicopters) are reaching, or have reached, their end-of-life. Replacing these legacy systems is crucial for both: sustaining combat worthiness of Polish armed forces and increasing their interoperability with Allies. This

[6] Although there is no official document, which would comprehensively present either main principles, governing Polish investment in armaments (including approach to defence R&T/R&D) or goals and instruments of Poland's defence-industrial policy, some main features of Polish defence innovation policy can be clearly identified on the basis of official statements of senior decision makers, and through an analysis of practical decisions, taken with regards to key programs.

sense of urgency, driven by external and internal factor, makes off-the-shelf procurement and off-sets the primary way of acquiring new weapon systems, while R&T/D, let alone international cooperation, is much less favoured

UNDERLYING FACTORS (2): POLAND'S DTIB

An additional factor, which heavily informs Poland's approach to armaments, and consequently to defence R&D/R&T, is also a specific condition of the national DTIB.

There is a widespread understanding in Poland that many technology areas remain out of reach for indigenous defence businesses. Consequently, ambitious national R&T/R&D programs – if not regarded *by definition* as bound to fail – are largely seen as potentially long-term endeavours, burdened with likely delays, cost overruns and potential problems regarding the interoperability of new systems with existing ones. This is a consequence of a particular structure of Poland's DTIB as regards big, past programmes and its mixed records – to say the least. As a result, investing into advanced R&T/D programmes, and particularly involving Emerging and Disruptive Technologies[7], is considered too costly and skills-demanding for the Polish DTIB and largely neglected as a way to acquire new capabilities.

Interestingly enough, Poland boasts a rich tradition of defence innovation, dating back to pre-World War II times, when new models of airplanes or armoured vehicles were designed, tested and manufactured indigenously. During the Cold War, Poland was entirely dependent on Soviet policies regarding the export of defence technologies. Most innovative weapon systems were usually exported by the USSR to its satellite countries with delay and agreements, allowing licensed production or indigenous modernization of these armaments - but this would typically come even later. The main USSR concern was that its satellite states, like Poland, did not get access to the most modern technology, but deployed only the previous generation of key weapon systems.

[7] These follow as defined by NATO: artificial intelligence (AI), autonomous weapons systems, big data, biotechnologies and quantum technologies, but also state-of-the-art materials, stealth technology.

Regardless of these constraints, Polish companies were able to develop some original technologies: for example, the TS-11 "Iskra" jet trainer which was introduced in 1960s and withdrew from service only in 2020, or the W-3 "Sokół" medium helicopter, which has remained in service in Poland and a number of other countries until today. Poland was also designing and producing its own naval vessels, though mostly smaller ones, like counter-submarine or counter-mine ships. Consequently, the national DTIB grew significantly – up to 250,000 people were employed in the defence sector in the late 1980s – and numerous military research centres were established. Poland was also a prominent exporter of armaments, though only to the Soviet bloc and some non-aligned countries. Yet, following the end of the Cold War the Polish DTIB largely collapsed.

The fast pace of the disintegration of Poland's DTIB in 1990s was as a result of a combination of unmarketable legacy Soviet technologies, the scaling down of the military (previously tailored according to Soviet plans, in the event of a full-fledged war with NATO), deep cuts in Poland's defence expenditure (which translated into no investments into new armaments) and overall economic difficulties in transitioning from a centrally planned to a free-market economy. The result was the closure of large parts of Poland's DTIB (including numerous research centres), layoffs and the deterioration of both facilities and technological skills and competences.

Conversion, consolidation and privatisation brought final results only in 2013, when over 50 state-owned entities were coalesced within the Polish Armaments Group (PGZ). They operate almost exclusively in land systems and military electronics markets, but there is also a military shipyard, and some aerospace maintenance/servicing works among them. Altogether, they directly employ approximately 16,000 people, representing a vast majority of Poland's DTIB. Privately-owned companies (active also on the military electronics and drone market, like the leading WB Group) and subsidiaries of world's top aerospace prime contractors (Airbus Group, Lockheed Martin, Leonardo and Pratt & Whitney) complement the landscape of Poland's defence sector[8].

[8] More: M. Terlikowski, *Defence and Industrial Policy in Poland*, ARES Policy Paper, no 18, July 2017, https://www.iris-france.org/ares .

In 2020, PGZ was placed 68th in SIPRI's yearly ranking of the world's biggest defence companies, with arms sales estimated at around EUR 1.3 billion (USD 1.5 billion)[9]. Yet, the company is heavily reliant on the national market, with big indigenous programmes (mostly in land systems and small arms technologies) and modernization/maintenance of existing platforms driving its sales. A weak exposure of the Polish DTIB on the global market is confirmed by the scale and structure of the actual arms exports from Poland. Between 2016 and 2020, it has stayed at a level of EUR 390-490 million and was dominated by components, parts and ready systems produced by the Polish subsidiaries of the world's top aerospace prime contractors. Only in some cases were complete systems exported, but most often the exports were relatively small[10].

THE STRUGGLE FOR DEFENCE INNOVATION

As a consequence of the lengthy process of consolidation, the Polish DTIB has a mixed track record regarding R&T/D programmes. Generally, there has been a clear and positive trend in recent years: more and more indigenously developed systems have reached the demonstrator phase and some have even already entered service[11]. A number of businesses – mostly private – are starting to use their own funding for R&T/D, which has resulted in marketable technologies, offered both to Polish armed forces and export markets. There is also a growing – though still weak – interest in European cooperation, including in the European Defence Fund.

Yet, what is regarded as the main shortcoming of Poland's defence innovation policy is the low level of financing of R&T/D. It is estimated, that the overall budget of different programmes, launched between 2011 and 2020, stood at around EUR 1 billion, which equalled to approximately 1.4% of Poland's total defence expenditure over this period[12]. Although this figure might be higher with some R&T/D "hidden" activities within

[9] *The SIPRI Top 100 Arms-producing and Military Services Companies, 2020*, Stockholm International Peace Research Institute, December 2021, www.sipri.org .

[10] E**ksport uzbrojenia i sprzętu wojskowego z Polski. Raport za rok 2020 [***Exports Of Arms And Military Equipment From Poland, 2020 Report***]**, Official Report of Ministry of Foreign Affairs of the Republic of Poland, Warsaw, 30 September 2021, https://www.gov.pl/web/dyplomacja/eksport-uzbrojenia-i-sprzetu-wojskowego-z-polski-raport-za-rok-2020

[11] T. Dmitruk, *Prace badawczo-rozwojowe*...op. cit.

[12] More: ibidem.

programmes regarding the modernization, upgrades and adaptation of existing systems, it does not change the overall picture[13]. And this picture is clear: Poland more often seeks offsets and off-the-shelf acquisitions than R&T/D as ways of acquiring new capacities. This is especially true for flagship, multibillion programmes: the F-35 stealth combat aircraft (32 airframes with an approximate value of EUR 4 billion), the MIM-104 Patriot air and missile defence system (2 batteries in I phase with an approximate value of EUR 4 billion), or most recent M1A2 Abrams main battle tank (250 vehicles worth EUR 5.1 billion)[14]. Consuming the bulk of the modernization budget, their effect on Poland's DTIB is mainly through the development of competencies with regard to through-life support of acquired systems. This translates to acquiring some new skills and technologies but cannot be compared to outcomes of a proper R&T/D effort. It is then, an open question, if F35 or M1A1 programs lead to any R&T/D effort in Polish DTIB.

If any R&T/D appears in such projects, it is linked to "polonisation", understood as adapting acquired systems to Polish requirements, and with the use of Polish components/subsystems. An example illustrating this trend is the "Rosomak" APC – a licensed version of Finnish Patria's AMV, which has been produced in Poland since 2005. While the basic version of this vehicle was largely Patria's original configuration, with time a number of specialised indigenously developed platforms were produced (e.g. like MEDEVAC, recovery/service vehicle, wheeled mortar, etc.). The value of the entire programme was approximately EUR 1.5 billion, but R&T/D was a fraction of this sum[15]. Another case is the modernization of the Leopard 2A4 main battle tanks, acquired second-hand from Germany, to a new "PL" standard. This programme, even if relatively small (approximately EUR 770 million), implies some R&T/D, as new subsystems will need to be integrated with existing vehicles[16]. The air and missile defence programme involves acquiring the US-developed MIM-104 Patriot system, but in a special version, tailored to Polish needs (using a 360-degree radar and a low-cost interceptor to name only a few of the main updates). Furthermore, offset agreements provide for production of some components in Poland. Again, these examples imply some R&T/D, though of unspecified

[13] Ibid.
[14] For a detailed review of all Poland's armaments programs, see: T. Dmitruk, *Stan realizacji Planu Modernizacji Technicznej* [The state of implementation of the Technical Modernization Plan], Dziennik Zbrojny 10 November 2016 (updated 7 June 2021), www.dziennikzbrojny.pl .
[15] Own calculations based on T. Dmitruk, *Stan realizacji…* [op. cit.]
[16] More: M. Terlikowski, *Case study: Poland*, in: A. Marrone, E. Sabatino [eds]. "Main Battle Tanks, Europe and the Implications for Italy", IAI, March 2020

value (more financial resources for that goal may come in the second phase, but that is currently under negotiation).

There are, obviously, cases of "R&T/D-heavy" programmes in which the works are run from scratch by Polish companies and result in new technologies. Such endeavours regard, however, less costly weapon systems. These involve mostly soldiers' personal equipment, firearms, military electronics/software or smaller UAVs. One of the most notable systems developed this way is the "Grot" service rife. Developed without any reliance of technologies from abroad, it is meant to be widely used (over 60,000 items may be procured) by Polish forces as a replacement for older rifles (mostly "Beryl", which was a Polish design, based on the Soviet AK/AKM). A special case of successful R&T/D, financed from own resources, is a private company called WB Electronics. It developed from scratch small UAVs ("FlyEye") and a loitering munition ("Warmate"), which were sold to the Polish armed forces. Interestingly, there were also cases of indigenous R&T/D, which resulted in concepts and technology demonstrators in the light tank niche, as proven by the 2013 PL-01 Concept, and 2010 "Anders" platforms (both, however, never found their way forward into implementation).

The most common model of defence R&T/D in Poland, however, involves designing an original, indigenous platform to be integrated with various key components/subsystems, acquired either off-the-shelf or through licenses from abroad. In this case, the R&T/D effort is focused on integrating crucial components, like propulsion systems, sensors, effectors (guns, missiles) and/or electronics within a novel platform, developed specifically with an aim of meeting the distinct requirements of the Polish armed forces. This is a tested model and it is to be followed with regard to Poland's next armoured platforms and naval vessels. Successful ongoing programmes, which follow this approach, involve most notably a self-propelled 155 mm howitzer (Krab), which integrates a license-made hull (Korean Samsung's K9, adapted to Polish needs) with a license-made turret (British AS-90) and a German engine (MTU). Some 125 howitzers will be produced and the programme is worth over EUR 1 billion.

A similar approach is applied in the most prospective, upcoming or newly launched programmes. In the land domain, it is perhaps a new armoured infantry carrier – "Borsuk". The platform is indigenously designed to meet the specific Polish requirement of mixing

a high-level of ballistic protection with floatability. It is the result of a national R&T/D programme, which involves a number of components (though the gun is a license-made, US-developed Bushmaster II gun). This may be a multibillion euro programme as Poland plans to replace more than 1,000 post-Soviet BMP-2s with these vehicles (as of today, the demonstrator is undergoing tests). In the naval domain, the new frigate class – "Miecznik"– will be based on UK's Babcock AH140 platform, which will be integrated with weapon and other systems (sensors) acquired from other foreign companies along with Polish specific requirements. The programme (3 vessels will be built) will, hence, involve some R&D, though to an unknown extent. It's foreseen to be worth approximately EUR 2 billion[17]. Finally, in the air domain, the short-range air and missile defence programme - "Narew" – foresees acquiring missile technology from MBDA (the CAMM missile) and integrating it to a largely indigenously-developed sensor and C2 network. It is speculated, that this programme may be worth as much as EUR 13 billion; a significant part of this sum will fund the required R&T/ D[18].

Against this backdrop, Polish participation in European armaments cooperation, including R&T/D programmes, has been limited, to say the least. The main vehicle, used to that aim by Poland, has been the European Defence Agency. Since the inauguration of the EDA in 2004, Polish research centres and defence businesses have participated in joint investment programmes (JIP Force Protection 2007-2010, JIP Innovative Concepts and Emerging Technologies 1&2, JIP CBRN 2013-2016) and many category B projects. One of the most prominent cases of the latter is the ESSOR programme (involving a new generation of secure digital radio with an initial budget of EUR 100 million). Launched within the EDA framework in 2009, with Poland as one of founding member states along with Finland, France, Italy, Spain and Sweden, it has found its way to PESCO and successfully completed subsequent milestones. Arguably, Poland's footprint in EDA projects was larger than one could expect, given the condition of Poland's DTIB[19].

These experiences became a base for Poland's approach to EDF and PESCO. As of January 2022, Polish entities have been taking part in 12 different EDIDP projects and 2 PADR

[17] M. Szopa, *Poland Signs Agreement for Miecznik Frigates,* Defence 24, 27 July 2021, www.defence24.com .
[18] M. Szopa, *Inspektorat Uzbrojenia wskazał rakietę do Narwi* [Defence Inspectorate chooses the missile for Narew], Defence 24, 18 November 2021, www.defence24.com.
[19] Current Polish engagement in the EDA projects remains significant: as of 2021 Polish entities were implementing 14 different projects and the Polish contribution stood at app. EUR 12 mln.

projects. The biggest of them (financed under PADR), is OCEAN 2020, which includes the participation of a maritime technology research centre from the Polish city of Gdynia (OBR CTM) and a budget of EUR 35 million. Additionally, within 13 PESCO projects with Polish participation there are 8 that can be said to involve significant R&T/D – they mostly regard maritime technologies (see: Table 1). Other than that, Poland has never participated in any European joint armament programme, of a A400M or EURODRONE type. Only recently has Poland has officially signalled an interest in joining the Franco-German project on the future main battle tank (MGCS), yet to no avail as this initiative has remained bilateral for now[20].

Table 1. R&T/D PESCO projects with Polish participation

Project name and acronym	Topic of the project
Maritime (Semi-) Autonomous Systems For Mine Countermeasures (MAS MCM)	Developing underwater, surface and aerial unmanned technologies (vehicles) for mine countermeasures.
Harbour & Maritime Surveillance And Protection (HARMSPRO)	Developing an integrated system of maritime sensors, software and platforms (surface, underwater and aerial vehicles) to monitor threat in harbours and littoral waters.
Integrated Unmanned Ground System (MUGS)	Developing a modular, multi-mission-capable UGV together with a dedicated C3 solution.
European Secure Software Defined Radio (ESSOR)	Developing a secure military communications system, improving voice and data communication – a standard for European military radio technology.
Integrated European Joint Training And Simulation Centre (EUROSIM)	Developing a real-time, networked, connected system, for joint tactical training and simulation.

[20] M. Terlikowski, Case study: Poland, op. cit.

EU Radio Navigation Solution (EURAS)	Developing Position, Navigation and Timing (PNT) technologies for military applications, based on Galileo signal (PRS).
EU Collaborative Warfare Capabilities (ECoWAR)	Developing technologies for interoperability, interactions and interconnections between different platforms form different states.

Source: https://pesco.europa.eu/

On a national level, Poland set up a special framework to support military innovation only about 10 years ago. In an attempt to centralize national R&T/D efforts – and to stimulate innovation in the academia – a National Centre for Research and Development (NCBR) was established in 2010. Tasked to fund R&T/D both in civilian and military domains, it allotted around EUR 450 million for some 90 R&T/D projects run by consortia of Polish entities and regarding defence technologies[21]. The biggest grants involved mostly radar technologies for potential use in air and missile defence systems (the record grant was worth EUR 37.7 million). A number of big grants were also awarded to projects regarding armoured land platforms, including a light tank (EUR 20.1 million) and the next-generation infantry carrier "Borsuk" (EUR 17.6 million) and the new self-propelled howitzer "Krab". Other projects ranged from military electronics through to munitions, directed energy weapons and missile technologies (See: Table 2). This suggests that the priority areas for Poland's national defence R&T/D effort are military electronics, land systems and naval technologies. In each of these areas, the Polish DTIB has enough competencies and skills to launch new projects.

Table 2. Top 10 Polish R&T/D projects financed from public sources between 2011-2021

Subject of the project/Name	**Value (million EUR)**
Novel, multi-purpose frigate ("Miecznik") – prototype + 2 vessels	2000
Novel mine-counter measures ship (Kormoran II) – 1 vessel (prototype)	165

[21] Own calculations based on T. Dmitruk, *Stan realizacji…* [op. cit.]

Medium-range multifunctional radar with 2D phase scanned beam for air and missile defence (Wisła)	37,7
Mobile long range radar for missile defence (Warta)	31,5
Multi-functional AESA GaN radar for air and missile defence (Sajna)	24,2
Laser-Based Directed Energy Weapon Systems	22,2
Future soldier system (TYTAN)	21,5
Unmanned turret system for infantry fighting vehicles (ZSSW-30)	21
Light tank (Gepard)	20,1
HPM impulse protection	20

Source: T. Dmitruk, Prace badawczo-rozwojowe w obszarze polskiej obronności [R&T/D work in the field of Poland's defences], „Nowa Technika Wojskowa" no 5/2021. M. Szopa, Poland Signs Agreement for Miecznik Frigates, Defence 24, 27 July 2021, www.defence24.com .
Own calculations, based on average EUR/PLN exchange rate from a year of contract.

Coincidentally, in 2010, the military procurement system was reformed with the establishment of the Armaments Inspectorate (AI). The AI was designed to consolidate responsibility for armaments programmes, but it fell short of coalescing all tasks regarding investment into new capabilities. For instance, in the R&T/D domain a novel Inspectorate for Implementation of Innovative Defence Technologies (I3TO) was established with wide-ranging tasks (though its core function was linked to managing grants for defence R&T/D programs)[22]. Nevertheless, in 2011-2020 the AI granted some EUR 430 million for R&T/D projects. The biggest was the investment in a new mine-counter measure vessel "Kormoran II" (EUR 163 million), developed as an indigenously designed programme, involving off-the-shelf components (like engines) from abroad.

This system was reorganized again, this time along the entire armaments acquisition structure. The launch of the Armaments Agency (AA) on 3 January 2022 centralized all aspects of investing into new capabilities for armed forces, something long called for by experts and practitioners. Until today, and despite many reforms from the past, the responsibility for agreeing requirements for new systems, identifying market options, negotiating with prime contractors, overseeing the implementation of contracts (including off-sets), managing through-life support of weapon systems, including

[22] J. Ciślak, *MON wdraża reformę zakupów. Powstaje Agencja Uzbrojenia* [The MOD implements the form of acquisition. Armaments Agency is established], Defence24, 6 September 2021, www.defence24.com .

potential upgrades, and, finally, withdrawing such systems from service, has been diffused between AI and a few other military and civilian entities (with I3TO responsible for aspects of R&T/D). Loosely based on the French model of the '*Direction Générale de l'Armement*' (DGA), the AA is meant to allow the handling of virtually all aspects of armament programmes of Poland within one entity. Coordination of defence R&T/D is also part of the AA's mandate[23].

What accompanies these changes is a new innovation policy, announced in 2020[24], from the Polish ministry of national defence (MOD) ("B+R+Armia"). At its core, there will be a long-term planning document (for the 2021-2035 period), which will declare future technology areas being a priority for the armed forces (the document is in the drafting phase and will be presented in 2022 and operate within the 2035 timeframe). The goal is to help streamline the R&T/D effort of defence businesses, research centres and academia, so that efforts are more focused on technologies that stand a chance to actually allow for the design of new weapon systems and, eventually, to be procured. This way, Poland's innovation potential is meant to be better used in building the competitiveness of the national DTIB. Within the MOD, the dedicated Innovation Department was established in November 2020. Its broad range of tasks is concentrated on coordinating both Poland's national defence R&T/D effort and participation in international programmes, with the European Union's instruments in the first place (EDF, EDA programmes, NATO Innovation Find, DIANA accelerator). The main task of the Department is to streamline the use of innovation potential of not only Polish defence companies but also both military and civilian research entities, including academia, for supporting the development of military capabilities for the armed forces.

Furthermore, the new policy assumes closer cooperation with the civilian research community – a first agreement to that end was signed with "Łukasiewcz" network[25]. Notably, a new space policy (linked to Polish ambitions to have a sovereign, though limited, Earth observation capability) is also seen as part of the evolving Polish approach

[23] Yet, draft legislation, establishing the Armaments Agency has not been publicly available at the time of completing this paper. This makes it impossible to say, what will be the exact scope of AA competences with regards to R&T/D.
[24] Innowacje na rzecz Wojska Polskiego [Innovations for Polish Armed Forces], press release of the Polish Ministry of National Defence, 31 July 2020, https://www.gov.pl/web/obrona-narodowa/innowacje-na-rzecz-wojska-polskiego .
[25] The network consist of 32 public research/technical institutions, which are meant to work together as projects teams both in cooperation with Polish businesses, offering applied research results, oriented on different industries, and with foreign research communities, like German Franuhofer Gesellshaft.

to defence innovation. So too is international cooperation with a special focus on European instruments and the EDF. Participation of Polish defence businesses in EDF projects has two central goals. First, to generate direct results in the form of ready systems, subsystems or complete components, which may be later used in national programmes, tailored to the specific needs of the Polish armed forces. Second, to allow for the strengthening of technological competencies and skills of the Polish DTIB, which –again – may be helpful in the design and development of next-generation, indigenous platforms and weapon systems [26]. These assumptions confirm Poland's somewhat utilitarian approach to EU instruments. Arguably, it does not resonate with EU-level motivations, which laid the ground for the EDF with the overall quest to build European strategic autonomy. This, however, is not a surprise given Poland's overall approach to European defence, which is largely seen as a potentially valuable tool to reinforce European capacity in NATO (through stimulation of the development of military capabilities), but denied a bigger political role (as this might weaken the transatlantic bond and undermine the Alliance's defence and deterrence)[27].

Poland's approach to defence innovation may be also affected by a regulatory reform of the entire defence system of the state, planned with a new defence bill, that was revealed in November 2021. Its main role in this regard is to provide a stable financing framework for the technical modernization of the armed forces. The draft bill confirms that Poland will increase its defence expenditure each year to reach 2.5% of GDP in 2026. More importantly, however, it provides for a new mechanism for an extra-budgetary fund, which will be used to finance the most expensive programmes. The Armed Forces Support Fund will use financial market instruments and novel methods of financing acquisition of assets (such as leasing). What these measures will mean for the level of the Polish R&T/D effort remains an open question. However, the larger defence expenditure supported by this special Fund may provide a path towards some more ambitious national programmes.

[26] *Europejski Fundusz Obronny (EDF). B+R w dziedzinie obronności* [European Defence Fund (EDF). Defence R&D.] Department of Innovation, Ministry of National Defence, June 2021, https://www.gov.pl/web/obrona-narodowa/europejski-fundusz-obronny-2021

[27] See for instance: M. Terlikowski, *Stronger Together - Poland: Realigning the Compass*, Institute Montaigne Blog, 4 March 2021, https://www.institutmontaigne.org/en/blog/stronger-together-poland-realigning-compass .

CONCLUSIONS

Despite its relatively low scale, Poland's expenditure on defence R&T/D over the past decade is bringing some results today, new weapon systems have already entered service (e.g. the "Krab" howitzer) or are likely to do so in near future (e.g. the "Borsuk" armoured infantry vehicle). Many other programmes, even if not bound to result in marketable systems, may generate technologies and competencies, which may then be used in other R&T/D programmes. Yet, the key question regarding what the future holds for the Polish DTIB and its capacity to innovate remains unanswered. The biggest programmes (F35 fighter, M1A1 tank, air and missile defence with MIM-104 Patriot) are based on government-to-government agreements and do not really involve R&T/D, even if in some cases off-set agreements will provide for building some national capacity for through-life support. They will consume a significant part of the modernization budget. Given the rapid deterioration of Poland's direct security environment following Russian invasion on Ukraine and the perspective of sustained standoff between Russia and NATO a similar approach can be expected for upcoming big programmes such as the attack helicopter. In such circumstances, innovation may remain to be limited to certain technology areas and market segments (e.g., land systems), even if the Polish defence expenditure actually is increased to the proposed 3% GDP

Consequently, it is also not clear what role European instruments (both the EDF and intergovernmental programmes) will play in stimulating Polish defence R&T/D. For now, it seems that the likelihood of Poland joining any flagship European armament project of the scale resembling A400M or Typhoon, will remain low. The MGCS might, perhaps, be an exception to this regard, but an unclear one. The reasons are structural, as indicated above. The biggest Polish programmes that are already running involve US prime contractors and will consume a significant part of funds, allotted for the modernization of armed forces. At the same time, they will not drive much R&T/D, if any. As noted above, the need to beef-up national force posture due to the severity and imminentness of Russian threat to Poland and Eastern Flank, make many other perspective programmes likely to follow the off-the-shelf acquisition path. This translates into a limited scope (and budget) for both national R&T/D effort and participation in European projects. In other words, it is unlikely that a rejuvenated Polish approach to defence innovation,

strengthened with new structures, instruments and money, will quickly bring a quantum leap or land Poland among the EU's top military innovators, or leader in harnessing Emerging and Disruptive Technologies. It is also an open question, if Poland can heavily engage in the recent NATO initiatives: the Innovation Fund and the DIANA accelerator. Though Poland acceded these vehicles at the very moment of their launch in October 2021, these instruments are focused on EDTs and seek to promote start-ups, which as of now are a marginal part of the Polish DTIB landscape. Hence, only an incremental growth of Poland's defence R&T/D capacity is possible. European instruments – with the EDF in the first place – may be a part of it, if only for the bottom-up drive of Polish research centres to take part in project consortia (demonstrated in the EDF) is met with a top-down push for increasing Poland's footprint in European armaments cooperation. ■

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Policy Paper

DEFENCE INNOVATION: NEW MODELS AND PROCUREMENT IMPLICATIONS
The Polish Case

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ARES GROUP

The Armament Industry European Research Group (Ares Group) was created in 2016 by The French Institute for International and Strategic Affairs (Iris), who coordinates the Group. The aim of the Ares Group, a high-level network of security and defence specialists across Europe, is to provide a forum to the European armament community, bringing together top defence industrial policy specialists, to encourage fresh strategic thinking in the field, develop innovative policy proposals and conduct studies for public and private actors.

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