Annex H: Poland

Annex to report: Vision on defence related skills for Europe today and tomorrow

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Defence-related skills:
Building evidence on skills shortages, gaps and mismatches and defining the sector’s strategy on skills
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Annex H. Poland

Figure H.1 Executive summary – Poland

| DITB size | ~127 companies and over 60,000 employees; PGZ (17,500 employees), annual turn-over of €1B |
| Domain focus | Land, with some industries in aerospace, shipping and complex weapons |
| Defence capabilities | Armoured and artillery vehicles; helicopters, light fixed wing aircraft; small surface vessels; small arms; electronics, air defence systems, multipurpose helicopters, UAVs, naval vessels, mine destroyers, submarines |
| Exports | In 2017 €2.5 million, with significant year-to-year fluctuation; 61% of export are armoured vehicles |
| Selected companies | PGZ, Sikorsky/PZL Mielec, PZL-Swidnik, Shipbuilding Repair Shipyard Gdansk, TELDAT, Ultratech |
| Identified skills gaps and challenges | - Skills that require more attention include information architecture, as well as a range of design and engineering skills such as systems engineering, mechanical and thermal engineering, systems test engineering, electrical and control engineering. |
|  | - In addition, project managers with skills in marketing, safety, strategy building and knowledge of foreign markets, as well as competences in autonomous systems and a greater managerial focus on innovation and engaging openly with academia or non-traditional partners. |

<table>
<thead>
<tr>
<th>Skills supply landscape</th>
<th>Identified top-down initiatives</th>
<th>Identified bottom-up initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>National strategy</td>
<td>Includes</td>
<td>Education programmes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills focus</td>
<td>Design and engineering (civil, mechanical, mechatronics, aeronautics, optoelectronics, automation); cybernetics, new technologies, international security, defence planning, information security, management</td>
<td>Mechanical motoring, chemistry, battery development</td>
</tr>
<tr>
<td>Examples</td>
<td>1st degree studies in Faculty of Mechanical Engineering in Military Technical University, Mechanical Engineering 1st degree in Polish Naval Academy and Information Security 1st degree in War Studies University</td>
<td>System for supporting aerospace industry by Polish Aviation Valley Association</td>
</tr>
</tbody>
</table>

Source: RAND Europe
H.1. Background

Poland is the seventh largest defence spender in the EU and has exhibited steady growth in defence spending since 2014, with a 10 per cent real terms increase in the defence budget in 2018. In 2018 this stood at 2 per cent of GDP, and the government has legislated to increase spending to 2.5 per cent of GDP by 2030,\(^1\) reflecting Poland’s commitment to collective defence and crisis response within the EU, NATO and UN frameworks.\(^2\) As a participant of the EU’s PESCO initiative, Poland has also pledged to allocate 20 per cent of the total defence expenditure to defence investment and is subject to the NATO Defence Investment Pledge included in the NATO Wales Summit declaration that asks for the allocation of at least 20 per cent of the defence budget to the procurement of major new equipment.

While Poland’s defence industry experienced significant disruption and eventual consolidation after the Cold War, over the last several years it has again undergone a series of mergers. This restructuring reflects an effort to promote greater efficiency and competitiveness, but also an evolution in government policy due to the emergence of threats on the country’s eastern border, re-emphasising the role of the national defence industry in Poland’s defence policy, capability planning and the search for reindustrialisation of the wider economy.\(^3\) Furthermore, the importance of economic actors, or the ‘industrial defence potential’ that includes the state’s ability to produce defence equipment, is highlighted in the *Strategy of Development of the National Security System 2022* as one of the key ‘determinants of the state’s sovereignty.’

H.1.1. Key industry players

The Polish defence industry produces a wide array of products in land, sea and air domains and has strong traditions in manufacturing land platforms, major systems electronics and helicopters as well as naval vessels and torpedo systems.\(^4\) A notable industry player is PGZ, a holding which comprises over 60 companies, but a number of Polish SMEs also operate in manufacturing, telecommunications, and logistics support. The Polish DTIB also includes local subsidiaries of or partnerships with foreign defence prime-contractors (mostly from the US). Examples include Lockheed Martin, which has invested in a Polish supply base for the manufacture and assembly of the Black Hawk helicopter at Sikorsky/PZL Mielec, or Finmeccanica/Leonardo/AgustaWestland via the local design, manufacture, development and

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support of the Głuszec helicopter by PZL-Swidnik. Selected national defence companies and foreign defence investors are listed in Table H.1.

### Table H.1 Selected Polish defence companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Focus area</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGZ5</td>
<td>Aerospace, land and naval defence</td>
<td>17,500</td>
</tr>
<tr>
<td>Shipbuilding Repair Shipyard Gdansk6</td>
<td>Shipbuilding</td>
<td>850</td>
</tr>
<tr>
<td>TELDAT</td>
<td>Telecommunications and ICT</td>
<td>Unknown</td>
</tr>
<tr>
<td>Ultratech7</td>
<td>Aerospace and power generation</td>
<td>95</td>
</tr>
<tr>
<td>Sikorsky/PZL Mielec8 (Lockheed Martin)</td>
<td>Aerospace and defence (helicopters, aircraft, aerostructures)</td>
<td>17,000</td>
</tr>
<tr>
<td>PZL-Swidnik9 (Finmeccanica/Leonardo/AgustaWestland)</td>
<td>Aerospace and defence (helicopters)</td>
<td>3,000</td>
</tr>
<tr>
<td>WG Group (incl. WB Electronics)10</td>
<td>Military electronics and informatics</td>
<td>8,000</td>
</tr>
</tbody>
</table>

Source: RAND Europe analysis

The defence industry is recognised by the government as one of the key areas of national economy. Most of Poland’s defence companies are united under one single state-owned holding group, PGZ (Polish Armsaments Group)11. PGZ’s activities in recent years indicate an objective to increase its competitiveness and take new steps towards bringing the group’s companies more closely together through the PGZ’s Code of Conduct. This initiative aims to promote the uptake of new technologies and facilitate internal exchange of experience and expertise.12 Cooperation may also be observed among different defence companies in order to design and produce specific capabilities. For example, the creation of the Borsuk armoured vehicle stemmed from collaboration among a consortium of armoured vehicle design and

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manufacturing companies (such as Rosomak JSC and Military Engineering Works), military and civilian research institutes, and universities.\(^\text{13}\)

The Polish Chamber of Producers for National Defence includes 127 members, reflecting the presence of a range of other firms active in defence, including many of the local and international companies comprising the Aviation Valley cluster in southeast Poland.\(^\text{14}\) PGZ has increased its involvement with projects commissioned by the European Space Agency (ESA), the EDA, and the new EU funding opportunities available through the European Defence Fund in recent years.\(^\text{15}\)

### H.2. Overview of skills gaps and shortages

Poland has a comparatively high level of STEM graduates (see Section A.1.3), however, this may be challenged by demographic changes such as the high emigration rate or increased demand for specific skills due to technological developments, as well as the low overall unemployment rate (four per cent of the labour force in Q1 2018), which may constrain the availability of qualified talent.

The skills that were concurrently viewed to be of highest importance as well as those that were most difficult to access currently are information architecture, electronic warfare systems and systems engineering skills.\(^\text{16}\) Simultaneously, there is both a skills gap and a skills shortage in design engineering, autonomy engineering, information architecture, draughtsmanship and CAD design, mechanical/fluids design, mechanical and thermal engineering, systems test engineering, software design and engineering and unmanned system engineering skills.\(^\text{17}\) In addition, the skills that industry stakeholders ranked the most difficult to access quickly enough were electrical and control design, design engineering, systems engineering and safety and governance management skills.\(^\text{18}\) A temporal aspect to the evolution of skills gaps in the future is also discernible. Important skills to the defence industry that will become even more difficult to access in the next five years include design engineering, project management, autonomy engineering, and information architecture, design validation, electronic warfare systems, mission systems design, mechanical and thermal engineering, systems engineering, software design and engineering and unmanned system engineering.\(^\text{19}\) In ten years, one skill area that stood out as the most likely to generate the most demand was make-safe engineering.\(^\text{20}\)

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\(^\text{16}\) RAND Europe survey analysis

\(^\text{17}\) Ibid.

\(^\text{18}\) Ibid.

\(^\text{19}\) Ibid.

\(^\text{20}\) Ibid.
Available research suggests that it is be important to **improve access to generic vocational skills** and make the vocational training system more adaptive to the changing needs of the defence market.21 Skills that are in short supply include **managerial skills in marketing, strategy building and knowledge of foreign markets**, as well as **competences in emerging technologies such as autonomous systems and engaging with academia or non-traditional partners.**22 Poland is likely to experience a continued requirement for skills across all equipment life-cycle stages that Poland already produces, such as armoured vehicles, helicopters, missile defence systems, electronics and information technology. Furthermore, skills programmes in Poland tend to be focused on the skills required in the production of the relatively limited range of equipment. While the availability of skills is impacted by the historic and current defence product portfolio, skills gaps may also arise or become more urgent as Poland seeks to expand the breadth and depth of its outputs and assimilate new and emerging technologies in the manufacturing process as well as the manufactured equipment.

### H.3. National and regional policies and programmes

#### H.3.1. Overview of national and regional policies

The large majority of national and regional skills programmes are not defence-specific. Poland has a National Training Fund that supports the development of skills for small and medium enterprises in various areas.23 Support from the EU’s funding mechanisms such as the European Social Fund (ESF) has also been beneficial to strengthening and expanding the scope of vocational training.24 Although national high-level defence and security strategies and policies do not speak in detail about the skills required in the defence industry, they do recognise the importance of developing national defence industrial capabilities. The **Responsible Development Strategy (2017)** is focused on improving Poland’s overall economy through reindustrialisation and developing and producing new technologies.25 It also sets forth the ambition for the defence industry to become a source of high-quality innovation.26 The ‘whole-of-government’ approach to national defence that encompasses national economy, industry and society is exemplified by

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the development of the Economy Mobilisation Programme (in progress since 2018), which considers tasks that would be carried out by entrepreneurs in the case of a threat to the country. It is planned that the programme will make available an annual funding of €30-40 million to companies of special economic and defence significance to ensure that they are able to prepare for emergency tasks, and include them into the supply chain of the National Armed Forces.

Furthermore, Poland was expected to publish a new 'Integrated Skills Strategy' in late 2018, presenting an opportunity to consider the skills necessary to ensure a strong and competitive defence industry. Poland’s industry predominantly produces land systems, electronics, aeronautics as well as some naval assets and therefore it could be expected that a national skills strategy would focus on maintaining and developing skills in these areas, as well as address potential skills requirements related to promoting exports and innovation. With a view to preparing for changes in the future operational environment and the required battlefield technologies, the Defence Concept of the Republic of Poland (2017) stipulates amending the education and training system to better support not only military but also industry, needs.

H.3.2. Overview of national and regional programmes

The Polish government provides funding for public higher level education programmes as well as various technical and vocational training programmes that develop defence industry-relevant skills. While most STEM and management programmes are not specifically aimed at defence industry, Poland’s military higher-education institutions do offer a wide selection of courses for civilian students without the obligation to serve in the National Armed Forces after graduation (see Table H.2).

In 2016, 19 graduates per 1,000 inhabitants aged 20-29 graduated from university programmes with a science and technology focus, and every year over 40,000 engineers graduate from Polish universities.

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Likewise, the number of students involved in public vocational training and education programmes was above the EU average, with 49.2 per cent of upper secondary level students compared to the 47 per cent EU average – though participation of adults in life-long learning programmes is much lower in Poland, with only 3.5 per cent in 2015, compared to an EU average of 10.7 per cent and vocational schools may not always have access to machinery or other practical teaching equipment needed to train defence industry specific skills.

Table H.2 Overview of selected public skills programmes in Poland

<table>
<thead>
<tr>
<th>Programme</th>
<th>Career stage</th>
<th>Domain</th>
<th>Skills focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT AERONET consortium(^{33})</td>
<td>Post-Doc researchers, university students</td>
<td>Air, space</td>
<td>Research, modelling and assembly, advanced aerospace materials</td>
</tr>
<tr>
<td>Military University of Technology first and second degree civilian studies(^{34})</td>
<td>University students</td>
<td>Cross-domain</td>
<td>Advanced materials and technology engineering, cybernetics, electronics, civil engineering, geodesy, mechanical engineering, construction, logistics, bioeconomy, mechatronics, aviation and astronautics, safety engineering, chemistry, space/satellite engineering</td>
</tr>
<tr>
<td>Polish Air Force Academy first and second degree civilian studies(^{35})</td>
<td>University students</td>
<td>Air</td>
<td>Aircraft engineering, navigation, air traffic management, avionics, unmanned aerial vehicle engineering, aviation, aeronautics, aviation logistics</td>
</tr>
<tr>
<td>Polish Naval Academy of the Heroes of Westerplatte first and second degree civil studies(^{36})</td>
<td>University students</td>
<td>Naval, space</td>
<td>Mechanical engineering, mechatronics, automatics and robotics, information systems, navigation, naval weapons, space and satellite technologies</td>
</tr>
<tr>
<td>Silesian University of Technology(^{37})</td>
<td>University students</td>
<td>Air</td>
<td>Mechanical engineering – lightweight structures</td>
</tr>
<tr>
<td>War Studies University civilian education programmes(^{38})</td>
<td>University students</td>
<td>Cross-domain</td>
<td>Management, strategy, economics of defence, logistics, information security.</td>
</tr>
</tbody>
</table>


\(^{37}\) Silesian University of Technology. 2018. Faculty of mechanical engineering. As of 3 January 2019: https://www.polsl.pl/EN/Pages/RMT.aspx

H.4. Industry-led policies and programmes

Poland has a number of relevant company-led skills programmes and notably a significant number of mid-career development programmes for existing employees. Programmes aimed at vocational and university students tend to be carried out either by large individual companies (e.g. PGZ) or, in the case of small and medium companies, via industrial clusters (e.g. Silesian Aviation Cluster). Technology, knowledge and skills transfer from a number of European defence industry and US companies’ production and maintenance programmes provide opportunities to contribute to the maintenance and development of skills. Examples of such programmes include the procurement and maintenance of F-16 fighter planes, Black Hawk helicopters, and the Głuszec helicopter. PGZ has also signed a number of cooperation agreements with major Polish universities. These universities include: Westerplatte Heroes Polish Naval Academy, War Studies University, Gdańsk University of Technology, Lublin University of Technology, Poznań University of Technology, Cardinal Stefan Wyszyński University, Kazimierz Wielki University in Bydgoszcz, and University of Warmia and Mazury in Olsztyn, Military University of Technology and with the Military Institute of Armament Technology. In addition to R&D cooperation, these agreements included terms on the promotion of training opportunities, internships and apprenticeships at PGZ’s companies, and may in turn encourage the development of new training programmes and specialisations in universities. 39 In 2018, PGZ also established cooperation with the Kościuszko Foundation, a non-profit Polish-American cultural and educational institution, to create joint educational programmes, scholarships, internships and apprenticeships. 40 Other initiatives are more established, with representative examples shown in Table H.3.

Table H.3 Overview of selected industry-led skills programmes in Poland

<table>
<thead>
<tr>
<th>Programme</th>
<th>Career stage</th>
<th>Domain</th>
<th>Skills focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGZ scholarship program for university students</td>
<td>University students</td>
<td>Cross-domain</td>
<td>All defence industrial skills within PGZ</td>
</tr>
<tr>
<td>PZLŚ Świdnik practice programme</td>
<td>High-school students and university students</td>
<td>Air</td>
<td>Technological, construction and quality control</td>
</tr>
<tr>
<td>PZLŚ Świdnik internship programme</td>
<td>Recent graduates</td>
<td>Air</td>
<td>Aviation-specific skills, technical skills and economics</td>
</tr>
<tr>
<td>Sikorsky/PZL Mielec graduate internships</td>
<td>Recent graduates</td>
<td>Air</td>
<td>Technical and engineering skills</td>
</tr>
</tbody>
</table>

H.5. SWOT analysis of national and industry programmes

Most publically funded defence-specific STEM and management programmes, either at vocational or higher education level, tend to be aimed at military service members, while most civilian-based programmes do not target the defence industrial sector, with the exception of civilian defence-specific programmes offered by military universities. However, considering that most defence industrial skills may not require defence-specific courses, this may not impede the pool of skills available for the defence industry, as many defence-specific skills may be developed within the companies. While there are existing links between the industry and educational institutions, this collaboration may increase in intensity and become more streamlined in future given the recent cooperation agreements between PGZ and Polish universities.

Figure H.2 Poland: SWOT analysis of programmes

<table>
<thead>
<tr>
<th>Internal factors</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td>Education programmes provided to civilian students by military universities provide industry-relevant education and training, defence-specific knowledge and professional networks to potential employees of the defence industry. The importance of the Polish defence industry for the national economy and defence may motivate further governmental support policies and programmes for skills needed for a strong and competitive industry. Internships, traineeships and direct consultation with the educational institutions help companies be proactive in</td>
<td>Most publically funded defence-specific STEM and management programmes, either at vocational or higher education level, tend to be aimed at military service members, while most civilian-based programmes provide general or dual-use skills and do not target niche skills needed by the defence industrial sector specifically. While Poland has a strong regional aerospace industry cluster, the level of skills exchange and cooperation within other domains is unknown.</td>
</tr>
</tbody>
</table>

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ensuring the necessary defence-related knowledge in the pool of applicants.

### External factors

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>The national ambition for the defence industry to spearhead industrial development and be a key stakeholder in national defence, complemented by increases in the defence budget, may lead to further investments in the industrial skills necessary to support these ambitions.</td>
<td>Poland’s DTIB may be increasingly competing for skilled graduates of vocational and higher education institutions.</td>
</tr>
<tr>
<td>The close geographic proximity between industry sites and educational institutions helps establish and maintain direct links between skills supply and demand.</td>
<td>Development of effective programmes aimed at defence sector skills requires coordination between the Ministry of National Defence and the Ministry of Education, between which there is a clear division of labour.</td>
</tr>
<tr>
<td>Industry clusters provide opportunities for small and medium-sized companies to participate in skills development programmes with vocational schools, universities and private training companies, while reducing costs</td>
<td>National security clearance requirements and the related nationality requirements may restrict the possibilities of cross-border on-the-job training, internship and other educational programmes.</td>
</tr>
<tr>
<td>More streamlined cooperation between the industry and military/civilian educational institutions and programmes, actively promoted by PGZ, may lead to (1) an increased interest in entering the defence industry, and (2) skills programmes that are better attuned to industry needs.</td>
<td>The resurgence of the Russian threat on Poland’s borders may also lead to more support for skills that are necessary to ensure that the defence industry is able to support the country’s deterrence and defence efforts.</td>
</tr>
</tbody>
</table>

Source: RAND Europe