Orłowski, Bolesław

Polish Inventions : a Forgotten Contribution to the Allied Victory in World War II

Organon 41, 121-128

2009

Bolesław Orłowski (Warsaw, Poland)

POLISH INVENTIONS: A FORGOTTEN CONTRIBUTION TO THE ALLIED VICTORY IN WORLD WAR II

Few things that attract public interest are less publicised, in Poland or elsewhere, than Poland's contribution to the Allied victory in the Second World War through its new technologies. The Polish contribution through various inventions no doubt matched our military effort on the battlefield, which Poles are widely and rightly proud of today. Given our potential and real possibilities it is hard to dismiss the fact that the Polish armed forces fielded what was effectively the fourth army in terms of size and combat force in the anti–Nazi coalition. Nor can one overlook their spectacular successes which were based on Polish soldier's valour and morale, to mention but the gallant service of Polish airmen in the Battle of England, the capture of Monte Cassino, their part in operation of Narvik or in the defence of Tobruk.

In paying all due respect to the Polish blood sacrifice, however, it is to be said clearly that our intellectual contribution to the victory seems to have been no less significant, yet all the more surprising. Its impact on the ultimate prevalence of the coalition, on minimising its losses and shortening the war was probably even stronger. Chance had it that a substantial part of the Polish potential that was recreated during the war in the West were, next to servicemen, engineers and scientists working for victory. A count of those people made to the date of 1 January 1944 showed there were 5592 of them there, mainly in Britain, of whom 4049 were in the armed forces. The contribution they made was impressive, with many notable achievements.

Why then is it largely unknown even today? Mainly because the work of those people was kept in strict secrecy and in the postwar years no one took the job of describing the accomplishments or acknowledging their merits. The British, who tend to keep reticent with other people in acknowledging their accomplishments, were unlikely to do that. Were they to bring forward the exploits of an ally they had dropped out of political calculation they would put themselves even in a more embarrassing moral position. In socialist Poland as well, it was unthinkable that praise should be shed on talented fellow countrymen virtually none of whom came home back to post–Yalta Poland, as incompatible with the fundamental propaganda tenets then. Their achievements, not only in wartime but also later while in foreign lands, were clouded in silence in a deliberate effort by the domestic media then. That was

easier for them to do than to ignore Polish military exploits which just had to be recalled from time to time.

Apart from such political exigencies, another important barrier made it difficult to publicise the Polish contribution for a long time, namely the still incomplete accessibility of wartime archives. Such and similar factors combined to make any presentation of the Polish intellectual contribution to the wartime effort incomplete and so further research is called for. Yet should such further research be undertaken it is likely to stumble, if only because recently some of the wartime documents that were *less important from the British point of view* were deliberately destroyed.

Yet despite the scarce knowledge and paucity of accessible sources, even a patchy picture of the Polish wartime achievements in that respect is impressive. It is hard to resist the feeling that the driving force behind the hard work of our fellow countrymen to make their lifetime successes in inventive work at the time of the great ordeal, was, quite simply, patriotism.

Not without reason

Most Poles today would be surprised to hear that Polish technicians played so prominent a role then. The Poland of between the world wars is widely believed to have been a backward country in terms of technology. That was the message people were given in publications and in school throughout the half–century of socialist Poland. The various deficiencies which came on Poland in consequence of the lack of national independence in the 19th century, the key period of nascent modernity, and of the downturn connected with the world crisis of the 1930s, were deliberately flaunted and highlighted. Things that were good reasons to be proud of in what came to be called the Twenty–Year Independence were passed over in silence or barely mentioned. A deliberate disinformation policy was launched in a political propaganda effort, which was designed to twist the image of The Second Republic in that respect as well.

We were made to believe that misguided perception. But Poland's technical talent in the inter–war years was in fact in much better shape than might be expected from a country the size of Poland with its economic potential situated where they were. Indeed, there were a large group of experts representing top world class. Never before was Poland better off in that respect nor had it ever been modernizing as fast in what was a deliberate plan thought out in advance to make up for time it had lost following a series of political misfortunes.

In technical science we had a top star then in Maksymilian Tytus Huber (1872–1950), the main author of plasticity theory, Mieczysław Wolfke (1883–1947), the author among other things of the theoretical concept of holography, Karol Adamiecki (1866–1933), one of the pioneers of scientific work organisation or Aleksander Wasiutyński (1859–1944), a forerunner of experimental research into railway track dynamics. Poland has a brilliant group of inventors of world renown. One of them was Ignacy Mościcki (1867–1946), the author of an industrial method of nitric acid production from atmospheric air, who held a number of important patents, also for crude oil processing. Equally

prominent was Jan Czochralski (1885–1953), the inventor of tin–free bearing alloy (metal B) and an artificial monocrystal growing method. In 1933, in Kostuchna near Katowice, Tadeusz Sendzimir (1894–1989) launched a cold strip rolling technology which permitted production of extremely thin strip and an improved steel galvanizing method, a revolution in world steel manufacturing. Multitalent inventor Jan Szczepanik (1872–1926), a holder of several patents in electrotechnology Jan Pollak (1859–1928), and Kazimierz Prószyński (1875–1945) who built hand–held film camera should also be mentioned in this connection. Janusz Groszkowski (1898–1984) and Stanisław Ryżko (1910–1974) were involved in developing radar technology, as Stefan Bryła (1886–1943) introduced welding in construction technology.

A large group of top class engineers practitioners were active with prominent experts with proud career records abroad to mention but Gabriel Narutowicz (1865–1922), a leading European pioneer of modern water–power plant technology, Ludwik Eberman (1885–1945), who served long as production manager with submarine engine supplier Maschinenfabrik Augsburg–Nürnberg or Andrzej Pszenicki (1869–1941) who built big bridges in Russia. Tadeusz Wenda (1863–1948), a graduate from a Saint Petersburg Institute of Transport Engineers, who chose a location for a harbour of Gdynia, designed and built it, was among them.

Interwar Poland developed high class modern industries in some areas from scrap. Shortly after independence Poland started making renowned locomotives, which soon started to be exported, and later diesel and electric locomotives as well. Nitric production turned out one of Poland's major leading industries, supported for obvious reasons by the then president of the country, Ignacy Mościcki. It was in that industry that Eugeniusz Kwiatkowski (1888–1974), the most prominent business leader in The Second Republic, began his career, which took him to the posts of industry and trade minister in 1926–1930 and deputy prime minister and treasury minister in 1935–1939.

An exceptional development was the Polish air industry, which was created even though Poland had no automobile industry to rely upon and which was among the world's top countries in that respect. What was called the Polish aerofoil, a construction introduced by Zygmunt Puławski (1901–1931), the chief builder of Polish fighter aircraft, was received with interest and found applications abroad. RWD sports planes were successful internationally. A medium bomber, called PZL–37 Łoś, designed by Jerzy Dąbrowski (1899–1967) which went into production in 1937, had excellent specifications. It was fitted with an original landing gear with double wheels, on an idea of Piotr Kubicki (1903–1990), which became a model for various multi–cycle undercarriages used in building heavy multi–engine aircraft.

In 1937, a Central Industrial District (COP) program was launched with the idea of reinforcing the country's potentials in many areas – not only in defence industries, which became increasingly necessary with the threat from Poland's preponderant neighbours growing, but also in a longer economic and social dimension perspective. Determined as it was to join actively the civilisation race and keen to catch up eventually with Czechoslovakia, Poland had to

take effective measures to remove some obvious obstacles to growth that existed in the state.

Given these facts and the geographic pattern of needs, potential resources (raw materials, energy resources, and labour) and military conditions, Poland chose an area extending over some 15% of its territory and concentrating 18% of the population as a first target for its activation project. It was localised around what was called a triangle of security in the arms of the rivers Vistula, San and Dunajec at safe distance from the dangerous borders to serve as a supplier base to the armed forces in case of war.

That idea created good prospects for new local jobs, located production relatively close to domestic raw materials and energy sources in addition to securing efficient provisioning. The territory was divided into three regions each with its own characteristics: a raw materials region around Kielce – Radom (building stone, clays, iron ores, phosphate rock), a provisioning region around Lublin (food, timber, skins), and an industrial manufacturing region around Sandomierz – Rzeszów (oil, natural gas, water energy, metal ores). The last–named one was key.

Work was conducted at staggering speed, at what then was called *American* speed. The town of Stalowa Wola is perhaps the most persuasive case in point. In March 1937, development works started on what were called South Works [*Zakłady Południowe*], a combine of a steel mill, a rolling mill, a forge, a stamping plant and mechanic workshops making artillery supplies and as early as in December that year a first machine–tool and a first artillery gun rolled off the line. Those were ultra modern works operating to best world standards. They were the first in Europe to use natural gas as fuel in open–hearth furnaces and heating stoves.

Construction works were completed in the spring of 1939. From 1938, those works started making toughened steel as well with target capacity at 80 thousand tons a year and they started preparing production of turbines, steam and air hammers and heavy steel mill machinery. Construction work for a thermal power station began in 1938. Along with that, a large town for employees was being developed.

By the time war broke out more than a hundred modern factories were put in place in the Central Industrial Region. The most important ones were localised in Dębica (tyres and Polish artificial rubber, codenamed KER), Mielec (aircraft), Rzeszów (aircraft engines), Sanok (machine guns), Niedomice near Tarnów (cellulose), Lublin (truck assembly line), Poniatowa (communications equipment), Tarnów (copper refinery). Furthermore, a hydroelectric plant in Myczkowice on the river San and an oil pipe from the Borysław – Drohobycz oil field were under construction. Three hundred more working establishments were in preparation, but never really got off the ground. It was mainly through those investment undertakings that prewar Poland's industries owed their well–deserved renown. Quantitatively modest, they still rivalled the best ones in terms of quality.

What specifically were the best achievements

As the brief outline above show, interwar Poland's technical personnel

did have good grounds to rely upon in fulfilling the role under discussion here to meet the exigencies of wartime.

Much of what our inventors, scientists and engineers did in World War II to strengthen the power of the Allies had in fact its beginning in Poland. That was the case of what is probably their best and certainly the best–known contribution: the breaking of code of the German Enigma machine ciphers. That was done in 1932 by a team of three mathematician–cryptologists under Marian Rejewski (1905–1980), which worked with Jerzy Różycki (1909–1942) and Henryk Zygalski (1907–1978). As the result of their work some 30 replicas of the machines were built, two of which were turned over as gifts in July 1939 to military intelligence service in France and Britain. One of them was then used as a base for further work conducted at Bletchley Park centre to enable the British *to peek into the cards* of German arm staffs throughout World War II.

The other main Polish achievements in that respect can be classed in three groups of equipment improvements: in weaponry, aircraft and communications.

Weaponry improvements

Even before the war, captain (from 1937, major) Rudolf Gundlach (1892–1957) who from 1934 led the Armoured Weapons Development Office (*Biuro Badań Technicznych Broni Pancernych*) invented a tank rotary periscope, a first such device which made possible full–range (360°) vision, through prism mirrors fitted in a mobile strap. The invention was patented, also in Britain and France, and from 1936 it went into production in Lwów. The periscope was made available to Vickers–Armstrong, a British company co–operating with Polish weapons industries, which then built the periscope into all tanks they produced. Through it the periscope was adopted by American tank suppliers and soon all tank producers during the Second World War. With the tank deliveries under the lend–lease program, the periscope appeared in the USSR, where it was copied and implemented in all tanks (including the T–34 and IS–1). It came back to Poland from the East to be fitted on the weaponry of socialist Poland's armed forces as Observation Periscope MK–4.

Its inventor is known to have escaped via Romania to France, where he stayed for the remainder of the war after he failed to evacuate to Britain. In 1947, after a long court battle he received a 84 million franc damages payment for his periscope patent. Of that sum, after paying court fees and taxes, he was left with 17 million francs. It allowed him to buy a villa farm in Le Vesinet near Paris, where he had a champignon business in 1955–1956.

Also before the war, in the spring of 1939, in the Warsaw military Special Signals Unit, a mine detector concept was developed which worked as an electromagnetic device. The device was eventually designed and built in Britain late in 1941 by lieutenant engineer Józef Kosacki (1909–1990). He made sure that the Polish provenience of that invention was recorded in its patent name: Mine Detector Polish Mark 1. The mine detector turned out to be several times more efficient than previous devices and it made the important difference that it could be used in the night hours as well. It was to be used for

the first time in action to clear mine fields during the battle of El–Alamein in November 1942. Produced in massive numbers, the mine detector became a standard equipment of British armed forces in 1944.

Poles conducted in Britain also other useful and important weapon improvement work. In November 1940, a Military Technical Institute (*Wojskowy Instytut Techniczny*) was established in London, to resume, in mid–1941, production of a 40 mm anti–aircraft gun which used to be made by Cegielski works in Poznań. The Institute also developed a method of protecting coastal strips of land against air raids. From 1941 it organised and assigned Polish specialists to work with British institutions. A Polish Section with the Armaments Design Department in Cheshunt designed a small 20 mm anti–aircraft gun codenamed Polsten, built under the leadership of Jerzy Podsędkowski, of which more than 50 thousand units were produced to for use among others by the navy and a semiautomatic rifle EM2 on a concept of Kazimierz Januszewski. In 1942, Januszewski and Aleksander Czekalski contributed importantly to the development, under Sir Dennis Bruley, of a British non–recoil cannon, which soon came to be used in the campaign in North Africa and was the only weapon at the time capable of destroying German tanks of the Tiger class. Poles also made important contributions to work on developing a flame thrower and improving the resilience of armoured plates.

Aircraft improvements

One of prewar Poland's specialties was its aviation industry. It is hardly surprising, then, that our contribution in that special area was significant and remarkable. Many Polish scientists and constructors were engaged in work on various aerodynamics and flight mechanics problems (Stefan Neumark, 1897–1967), improving jet engines (Wiktor Narkiewicz, 1905–1985, K. Wójcicki), heat resistance of aluminium alloys (N. Dudziński) or specific construction solutions. For instance, Zbigniew Oleński introduced major improvements to the fighter Spitfire, specifically he helped expand the pilot's field of view and provided for easier evacuation from the flying machine in case the pilot had to parachute. T. Czaykowski in turn helped eliminate certain dangerous vibrations occurring in fighter Tempest, which were used, because of their high speed, for dealing with the German flying bombs V–1.

Polish specialists in that area were employed mainly at the Royal Aircraft Establishment in Farnborough (around 50), as well as in the Aircraft and Armaments Experimental Establishment and in Airborne Forces Experimental Establishment (a total of more than 80). They also worked for British manufacturing plants. Most of the prewar top constructors found jobs with the Westland Aeroplane Co., among them well–known co–designers of the RWD sport plane Jerzy Drzewiecki (1902–1990) and Stanisław Rogalski (1904–1976), Piotr Kubicki, a pioneer of landing gear with double wheels used in the medium bomber PZL–37 Łoś, and Stanisław Prauss (1903–1997), who designed the PZL–23 Karaś and PZL–46 Sum planes. Aleksander Seńkowski (1897–1964) was deputy chief constructor with Bristol Aero Engines and Wilhelm Challier the chief aerodynamics engineer with Rolls Royce Engines.

A method invented by Wacław Czerwiński (1902–1988) for plywood hot forming made possible its substitution for aluminium in making certain construction elements of planes (the NA–66 Harvard II, the Anson, or the DH.98 Mosquito). The inventor produced them in a plant of a Canadian Wooden Aircraft Ltd. established in Toronto in 1942. That was quite significant a development in the bad material shortages in wartime.

But the most spectacular contribution in that area was another Polish invention, which was to do with bomb release gear. In 1940 Władysław Świątecki (1895–1944) presented to the British aviation production ministry his idea of a slip bomb device which worked on the multiple lever principle and which he designed technically in 1941. More than 165 thousand such slip bomb devices were manufactured and fitted in British bombers. In 1943, Jerzy Rudlicki (1893–1977) further developed the idea as he designed a special release gear for high altitude surface bombing, which was used in American B–17 Flying Fortress bombers.

Poles also made major contributions to the development of a fog dispersal system on airfields.

Contribution to improving communications equipment

No less important were Poles' achievements in improving radio equipment. Poles worked in numbers as early as from the autumn of 1940 especially with the Admiralty Signal and Radar Establishment (some 30 people) as well as with the Signal Research and Development Establishment and the Royal Aircraft Establishment. Wacław Struszyński (1905–1980) developed a high frequency radio direction finding system which could locate German submarines using on the sea surface high frequency radio communications. Some 3 thousand such aerials were fitted on ships escorting convoys. That helped the Allies win the battle of the Atlantic. Juliusz Hupert invented a frequency stabiliser for ship transmitters. Engineer Heftman led a team making miniature radio stations of his own design – from 1944 some one thousand such devices were produced in a year – for resistance movements in German occupied countries. Henryk Magnuski (1909–1978) who from 1940 worked for the American company Motorola designed the SCR–300, a light and relatively wide–reaching first military radio station based on frequency modulation for the lowest command levels. Zygmunt Jelonek (1909–1994) developed the WS Nr 10, a pioneering radio station on world scale operating 8 communication channel which made enabled commanders to talk to combat forces engaged on Normandy beaches during the early June 1944 invasion. For that he got a citation, as the only person, in the day's command message released by the chief headquarters of the Allies on D–Day (6 June 1944). It should perhaps be mentioned that in 1935–1936 Jelonek designed the frequency oscillator for the Wilno Broadcasting station which ensured it the best frequency stability in Europe.

What had never came to, but was close to, fruition

In 1938 in Dębica, Wacław Szukiewicz (1896–1992) started manufacturing Polish artificial erythrene rubber, named KER, an invention to which

he himself contributed decisively at Warsaw's Chemical Research Institute in 1935. It was one of the most advanced materials of that kind in history (with potato the starting raw material), and therefore Poland proudly showed it at the New York world exhibition of 1939. It should perhaps be pointed out that particular Polish technology stood a good chance of making an impressive career during World War II. Early in 1942, an American Senate committee recommended that a synthetic rubber production expansion program – a high priority then amidst the wartime limitations and exigencies – be based on a method of butadiene synthesis from alcohol, including precisely the Polish process. In August that year President Roosevelt vetoed the recommendation under pressure from the powerful oil lobby which forced through a synthesis method based on oil derivatives which at the time was still in the design stage only. Eventually one factory was put in place in the United States towards the close of war which worked on the Polish technology (previously the Polish process was used in Italy).

The contribution from the underground in occupied Poland

The domestic technical personnel supporting the Polish Underground State at home had incomparable smaller possibilities, not least because they had to work in conspiracy. Ingenuity, enterprise and courage, however, enabled them to score achievements in weaponry production and useful technical equipment, especially in radio communications, which were quite impressive given the conditions in which they had to work. They also had a role in organising subversive actions. And of course they engaged in activities of clandestine technical university education. Given that all that was happening in an occupied country, some of those accomplishments bordered on the boundaries of the possible. Still, all that had very limited effect on the outcome of the war.

One domestic development of the time appears to have been comparable in significance with the above–discussed accomplishments of Polish engineers and scientists then working in the West. It is the story of the German flying bomb V–2, which was intercepted in May 1944 after it swerved off course in a test flight in eastern Poland by the Home Army [*Armia Krajowa*]. Its propagation and steering systems were then studied, in clandestine conditions, by professor Janusz Groszkowski and chemistry professor Marceli Struszyński (1880–1959), the father of the afore–mentioned Wacław. The knowledge they so gained was then radioed to London to help fight that Wunderwaffe of Hitler's which terrorised people in south–east England.

The above–presented accomplishments are no doubt incomplete as a depiction of Polish achievements in that area during World War II. But even this abridged and incomplete survey is impressive and can give Poles good reason to be proud.

transl. by Z. Nierada