Most of the radar systems utilized by the Polish Armed Forces come from the Polish industry. Currently, works are in progress to develop the next generation radars that would constitute the cornerstone of modernization of the Polish military in this domain. Furthermore, the Polish entities are also involved in fairly advanced works on IFF class systems, including the ones designed for the Patriot air/missile defence solution. All of the aforesaid issues were being stressed by the participants of the Dni Radiolokacji [Radar Technology Days] event.

Speeches by the representatives of the military, the industry, as well as of the research bodies, were made with regards to a variety of aspects pertaining to usage of radar technologies in Poland. Plans for development of new solutions within that scope were being presented by the industrial entities, including the PIT-RADWAR company which is a part of the PGZ Group. Vast majority of the showcased radar systems is expected to become a part of a variety of Polish Armed Forces’ modernization programmes.

The summary of the development initiatives in the area of radar detection was outlined by the directors of the radar detection and SIGINT bureaus of the PIT-RADWAR company: Piotr Dyderski and Mirosław Sankowski. Within the introductory note, it was said that radars capable of being operated in variable environments are an indispensable asset on the contemporary battlefield.

Proper specification is possible to be obtained through usage of active electronically scanned arrays – the AESA technology. This development ensures a high degree of flexibility when it comes to using the individual radar elements. The technology in question is also highly reliable. Furthermore, it should also be noted that it is indispensable to make the radar resistant to jamming. It also remains infinitely important to protect the detection system from the anti-radiation missiles.

The representatives of the PIT-RADWAR company additionally noted the capabilities offered by the Electromagnetic Values Measurements Laboratory established in Kobyłka. The said facility allows the company to verify and measure the specifications ascribable to passive and active antenna arrays. This remains especially important when carrying out a variety of works on radar systems.

P-18PL metre-length wave radar was the first of the specific designs presented during the meeting. The system in question has been designed for preliminary detection and target indication. P-18PL shall be capable of detecting tactical ballistic missiles and objects with low RCS, including the ones designed in line with stealth principles. In order to ensure the above variable polarization of the antenna would be applied.

P-18PL radar may thus be used both by the air-defence units, as well as by the radar (radiotechnical - according to the Polish nomenclature) elements. The system is to have an ability of working as a
passive solution, by receiving signals from another system of the same type. It is planned to be applied as the preliminary detection radar within the Wisła air defence system. According to the schedule set, the completion of works on this project and subsequent readiness would be achieved in March 2020.

PCL/PET passive aerial targets detection system is also being developed. This solution has a purpose of being used as a “silent” means for detecting and tracking the airborne targets. It could also be employed to monitor the airspace without compromising the air defence system. Thanks to the fact that no emission takes place in case of the PCL/PET solution, it remains infinitely difficult to for it to be detected by the potential adversary.

PCL/PET fuses the data, through detection and blending of signals emitted by the aircraft. The passive solution in question treats the aircraft radars, communication systems and IFF transmitters as the signal source (“PET” subsystem). Meanwhile, the “PCL” portion of the aforesaid design detects the signals coming from other sources (radio, digital TV or cellphone signals) reflected by the aircraft. The whole package is operated within the bandwidth ranging from 20 MHz and 18 GHz. It is also expected to be capable of detecting and tracking the stealth objects too.

Furthermore, PIT-RADWAR is also working on the Warta mobile long range radar. The system was premiered during this year’s edition of the MSPO defence industry exhibition held in Kielce. Representatives of the PIT-RADWAR company were placing emphasis on the fact that the aforesaid radar station offers capabilities usually ascribed to the stationary systems. The radar utilizes AESA technology for the purpose of detecting airborne targets (aircraft and cruise missiles), ballistic missiles and hovering helicopters.

The maximum range of the aforesaid solution has been defined as 470 kilometres. Within the Warta programme, a particular emphasis has also been stressed on anti-radiation missile countermeasures. In case of the aforesaid system these come in a form of electromagnetic decoys.
San multi-role fire control radar is yet another project pursued by the Polish industry. The above system is expected to become a part of the Wisła air defence solution. San is designed as a high-accuracy radar utilizing advanced technologies. It was planned to apply AESA antennas in its case, featuring more than 12 thousand transmitter-receiver modules in each of the antenna arrays. Solution as such would provide the radar in question with an ability to track and detect the threat. It would also be capable to act as a fire control system for multi-channel air defence at long distances, even in conditions with interferences present, and with regards to “difficult” targets.

Following the analysis that took place during the first stage of the project, it turned out that the costs would grow beyond the level foreseen within the agreement. This led the National Centre for Research and Development to suspension of the initiative, with selection of the Patriot system within the Wisła programme being an additional factor contributing to the above. PIT-RADWAR submitted a proposal to create a demonstrator that would allow to showcase the design options for advanced radar systems.

During the Radar Technology Days, Piotr Dyderski and Mirosław Sankowski also talked about the status of the Kwisa programme. The Kwisa programme covers development of the IFF Mark XIIA systems that are capable of being operated within all modes. The qualification test programme concerning the medium and long range interrogators (ISZ-50 and IDZ-50) had positive results. The short range interrogator that is not a subject to the works undertaken within the Kwisa initiative is also being developed already.

The ability possessed by the Kwisa systems, to be operated in EW environment, in line with the NATO requirements, has been confirmed. Thus the said solution is said to be ready for series production. The only step left to be made is related to approval of the documentation. The representatives of the PIT-RADWAR company also noted that there is a need to have the requirement to tailor the military equipment to the IFF Mark XIIA standard embedded within the modernization plans.

Usually, not only does the scope of changes entailed by introduction of each and every new IFF
system include the set-up, but it is often followed by software and hardware changes made to the carrier platform itself. The keys for mode 4, utilized as the primary combat mode of the IFF Mark XII system, would be generated until 30th June 2020. It is expected that a new IFF system is introduced before that. In any other case, relevant capabilities may be lost by the Armed Forces.

Sajna radar is also one of the priority programmes pursued by PIT-RADWAR. This system is going to be embedded within the structure of the Narew air defence solution. Sajna radar would be placed on a 20 m tall mast which would facilitate camouflaging the whole package. Furthermore, such solution would be beneficial for detection of low-flying aerial targets. The system is to be used to detect artillery shells, along the standard list of threats including aircraft, drones, cruise missiles, anti-radiation missiles or helicopters. Sajna would also be resistant to jamming. The said radar is to be characterized by a higher survivability in the light of the threat posed by the anti-radiation missiles.

Read more: MSPO 2017: Polish Radar Capabilities

Sajna is going to be capable of detecting and tracking the targets with a high degree of accuracy. The system is going to be designed for use with multi-channel SAM solutions. Lastly, the radar would be operated in 360 degrees, or within selected sector. The antenna consists of transmitter-receiver modules, with 1600 independent transmitter-receiver tracks integrated with the emitters. The transmitter amplifiers are based on microwave integrated circuitry using the GaN technology.

The whole system is to be transported on a single Jelcz chassis. Self-unloading decoy platforms system is also to be embedded within the whole suite. Currently works and tests are in progress, related to usage of a C-band antenna demonstrator. The radar is scheduled to reach the production-ready status in 2021.

Bystra deployable radar was also presented within the context of the Narew programme. The PIT-RADWAR company representatives suggested that Bystra’s performance figures remain in compliance with the short range radar system requirements defined for the Narew SHORAD solution. The above would mean that Bystra could provide the Narew system with its basic capability. The radar would be a bridge-solution, utilized until the Sajna system reaches its readiness.

This remains relevant as the Polish MoD assumes that majority of the Narew system would be based on the Polish components. Missile technologies remain the only element that is to be acquired from an external partner. Hence, applying the Bystra radar could accelerate the implementation of the Narew programme.

At the same time, as recalled by the PIT-RADWAR’s representatives, AESA technologies allow the Bystra radar to be utilized across a number of fields of application. The system also remains capable of detecting mortar rounds, including definition of the point of impact and the points where the round was fired. Bystra is the first Polish radar based on the AESA technology.

The radar is scalable (with regards to the antenna array and the software), thus it may be used by different branches of the military, for a number of purposes. In 2016 the qualification test programme was finalized, with a positive result.

Concluding the presentation, the representatives of the PIT-RADWAR company stressed the fact that development of new radar solutions is a long-term process. Frequently, the said process is costly, this also applies to maintenance of the infrastructure elements such as the anechoic chambers. R&D cycle lasts from 3 to 10 years.

Here, Bystra radar was listed as the example. The first of the development initiatives, the goal of which was to create a proper transmitter-receiver module, was initiated back in 2005, at the former
PIT company. Currently, after several years have passed, the company remains ready to introduce the module above into production. In the meantime, the Polish Ministry of Defence also underwent a major structural transformation. After the research initiative is finalized 2 to 3 years need to go by, before the equipment is ultimately delivered to the Armed Forces. The radar lifecycle is defined by duration of around 3 decades. Throughout the said period proper maintenance and modernization initiatives need to be implemented by the industry. The undertaken work though, allows for heightening the level of technological sovereignty of the Polish Armed Forces.

On the other hand, Marek Borejko, director of the air/missile defence bureau of the PGZ S.A. Group outlined and presented the work undertaken by the industry in relation to the radar systems. For instance, in case of the Wisła programme, 360 degree-coverage multi-channel sensor suite would be required. This sensor is to offer the capability to detect highly differentiated threats with varied RCS characteristics. Requirement as such suggests that Wisła’s radars shall remain capable of detecting conventional fighter aircraft, cruise missiles or even stealth objects.

The sensors utilized within the Wisła system are to have a range between 200 up to 600 kilometres, also remaining capable of being operated in an environment in case of which terrain reflections of the radar waves would be quite strong. The 360 degrees coverage also bears a high degree of relevance, which has been highlighted in case of procurement of the Patriot system.

P-18PL preliminary detection radar, PCL-PET passive detection system, expected multifunctional Wisła fire control radar and a multifunctional radar that could potentially be delivered by a foreign partner, were all listed among the radars that are expected to be embedded within the Wisła medium range air defence solution. The individual radar systems that would offer support for Wisła, similarly as other solutions, will have to be fused and interconnected. Marek Borejko also pointed out that there is a need to continue the Polish radar programme for Wisła.

On the other hand, Sejna multi-purpose radar station is being designed for the Narew programme. The short range systems require a radar that would offer tracking capability at distances of up to 100 kilometres. This also concerns an operational environment in which terrain is a source of reflection of
the radar waves. The radar shall retain a high degree of mobility. It should also have fire-control abilities, with regards to the missiles. These requirements are similar to the ones defined for the Wisła programme. Here it also remains highly important to detect targets of low RCS, as low as 0.01 square metre. Borejko additionally noted that there is a need for the short range radar to be capable of detecting and tracking helicopters, UAVs, cruise missiles or even aviation ordnance.

Noteć project is yet another initiative planned to be implemented by the Polish Armaments Group. Noteć system is classified as a VSHORAD solution, applicable against helicopters, UAVs, artillery rounds and rockets. The said system is to utilize 35 mm cannons. Optronic system is to be applied alongside the radar. When it comes to the radar systems, it is planned that Noteć would utilize the readily available Bystra radar, coupled with a separate target tracking radar. The latter solution could also be potentially applied in other artillery programmes. Marek Borejko assured that the key performance figures related to the Bystra system correspond with the requirements defined for the radars that would be embedded in case of the Narew SHORAD solution. This means that the said radar may be used within the SHORAD system, before Sajna becomes fully operational. A relevant concept has been recently outlined to the Secretary of State at the Polish Ministry of Defence, Bartosz Kownacki. When it comes to the Pilica system, a directional decision was made to select a radar for the said solution. “At the moment there is a decision with regards to the direction (…) thanks to Pilica a new class of radar instrument has emerged, that is soon to be introduced in the Polish Armed Forces as portable radars” - as it was noted by Marek Borejko.

The Director of the air/missile defence division of the PGZ Group also suggested that development work is undertaken towards this direction, as a response to the army’s requirements and needs. The Pilica radar is to have a range between 20 up to 60 kilometres. Not only would it be used to support the fire control processes, as it would also act as a key situational awareness asset for the elements involved in the operational activities.

PGZ Group is also working on a project, at the National Centre for Research and Development, related to the execution and control systems for the missiles. The said initiative is to make the Polish industry ready to adopt the missile technology (short range guided missiles), expected to be transferred via the Narew programme. Seeker is the radar element within the aforesaid technology.

Furthermore, PGZ pursues the 35 mm naval cannon programme too. Not only does the aforesaid programme require an optronic sensor package to be delivered, as a track radar coupled with the optronic system, as well as a preliminary target indication radar, would also be needed for the aforesaid AAA solution. Borejko also highlighted the export potential that may be ascribed to the said system. He stressed the importance ascribed to air defence programmes in the general planning practices usually utilized by the PGZ Group.

The Radar Technology Days were organized by the Polish Ministry’s of Defence Armament Policy Department, Military Institute of Armament Technology, Military University of Technology and by the PIT-RADWAR company.