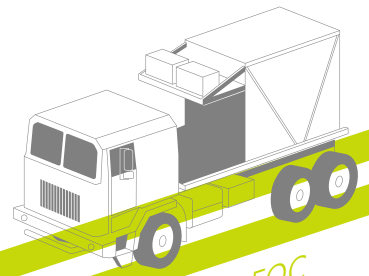
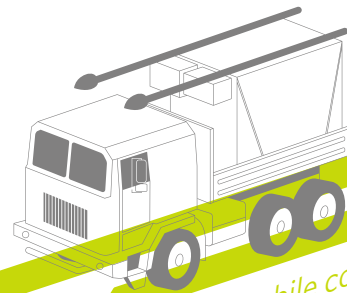


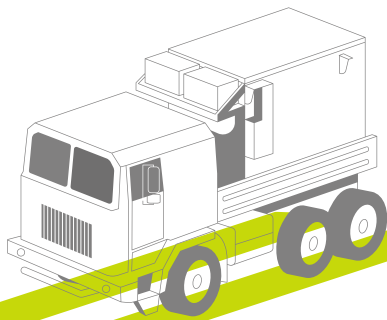
*AN/MPQ-65 radar*



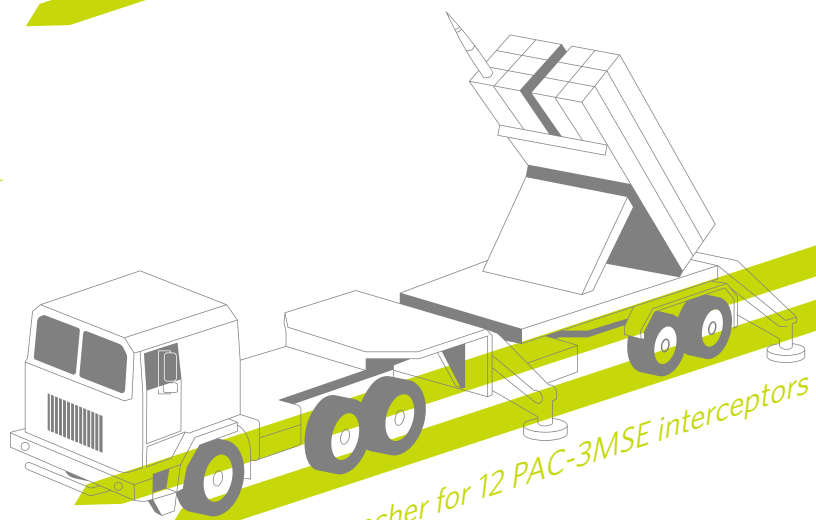
*IBCS EOC*



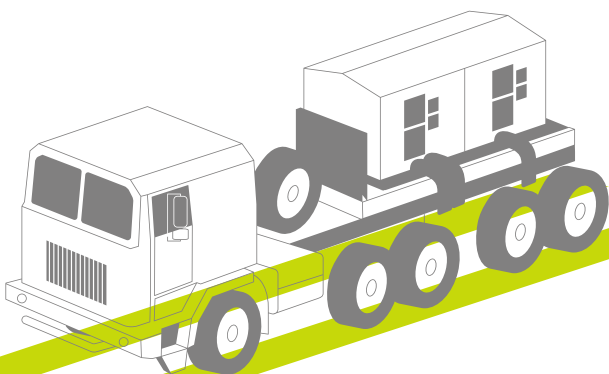
*mobile communication node*



*ECS fire control station*



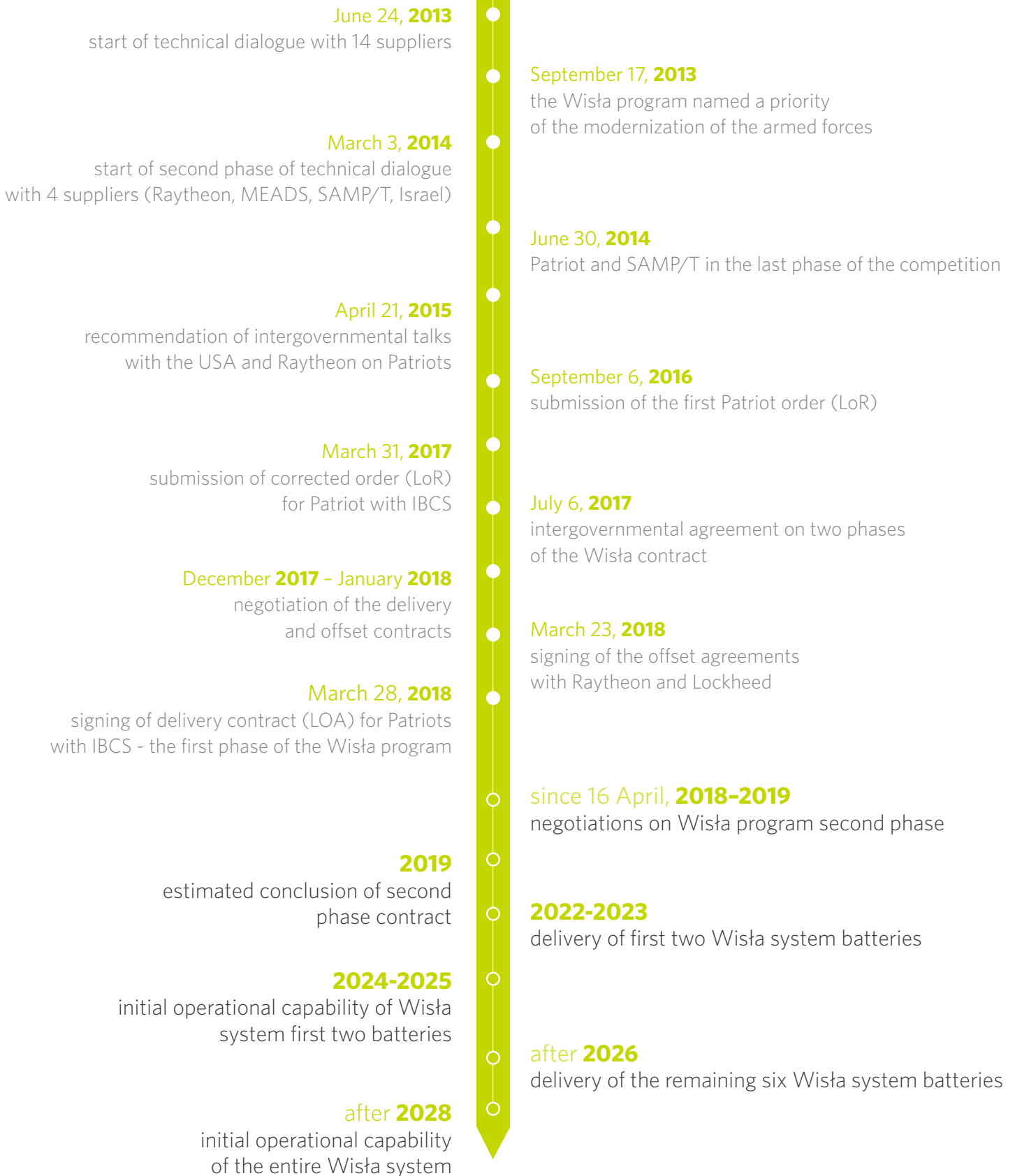
*M903 launcher for 12 PAC-3MSE interceptors*



*EPP power station*

# Patriot system in Poland

# Timeline of the deal



# What's next with the Patriots

The first phase of the Wisła programme will start for good in 2019. The future of the second phase will be decided when the US Army chooses its 360-degree radar.

**On March 28, MinDef Mariusz Błaszczak signed the Letter of Offer and Acceptance (LOA), which is an intergovernmental agreement between Poland and the US for the delivery of the IBCS-enabled Patriot system.** The price tag for the first phase of the Wisła missile and air defence system amounts to USD 4.75 billion (about PLN 16 billion net). Poland will receive four fire units deployed with Raytheon's sector radars and Lockheed's PAC3-MSE missiles. All of the units will be managed by Northrop's Integrated Battle Command System (IBCS). In 2019, the implementation of the first phase will overlap with negotiations on the second phase, which would accumulate a number of political, industrial and financial challenges.

**The main contract is signed, nine additional ones still ahead.** The LOA signed by Błaszczak is a framework contract with the US government under the FMS procedure. The implementation of the first phase of Wisła requires the signing of additional agreements in Poland and the US. By the end of the year, the Armament Inspectorate (AI) will sign contracts with four Pentagon agencies: two for training sessions, one for cryptographic equipment and one to connect the Polish Patriots with NATO's Link16 data exchange system. In Poland, AI needs to negotiate and sign five contracts with PGZ plants to deliver equipment. MinDef claims it included the cost of those agreements in the official price estimate for the first phase of Wisła.

**The Polish government as a subcontractor.** By the end of the year, MinDef will place orders with some of Poland's defence plants for components of the Wisła system. Later on, the components will be handed over to the US government to be integrated with the Patriots and IBCS systems. This aims to reduce the costs by circumventing US suppliers in the supply chain, as some components will already be produced by PGZ. Such components will include chassis and trucks from Jelcz, transport and loading vehicles from WZU Grudziądz, mobile communication centres from WZŁ Zegrze and three types of container cabins from Autosan, which will be used to assemble elements of the IBCS system of various command levels. Polish defence contractors will also manufacture components as a result of Raytheon's direct order – the list will include launchers and communication masts.

**Fewer orders for the Polish industry than announced by MinDef.** The ministry has repeatedly declared that in the order for Wisła it wants to guarantee that Polish defence companies will manufacture components worth at least half of the contract's total amount. In the official presentation, however, MinDef only mentioned PLN 700 million, or slightly above 4 per cent of the total value of the order. Raytheon's representatives declare that they would meet the 50 per cent requirement of Poland's share in the production, but only after both phases of the contract are concluded. Such expectations will certainly not be met by Lockheed, which delivers US-made missiles, or Northrop since most of its costs stem from US-made proprietary software, which remains classified.

**The payments will consume a significant part of the defence fund.** The US government will immediately receive the so-called initiating payment in the amount of PLN 500 million. That amount is necessary to start implementing the order under the FMS procedure. The remaining amount in the first phase should be paid in instalments in 2018-2022. If we split PLN 16 billion into five instalments, we would end up with an annual expenditure of over PLN 3 billion, which is a third of MinDef's current modernisation budget. If MinDef signs the contract for the second phase of Wisła later this year, payments will overlap and might exceed half of the annual modernisation fund. MinDef should pay VAT at the time of payment, which means that the price might increase to PLN 20 billion unless MinFin decides to exempt this transaction from the VAT.

**The negotiations on radars will determine the second phase.** On April 16, a delegation of AI representatives requested information from the US Army when the 360-degree radar for the air defence system will be chosen (LTAMDS programme in the US). Poland will use that information to decide whether to choose Raytheon's proposal or wait until the current competition in the US is decided (it includes three other prototypes – Lockheed's, Northrop's and one designed by Technovative Applications). AI has emphasised that in the second phase of Wisła, it wants to get the same radar that the US plans to use in the future, and will not order any other model. This situation might lead to a delay in the second phase of Wisła, since the US radar tender will be concluded in 2024.

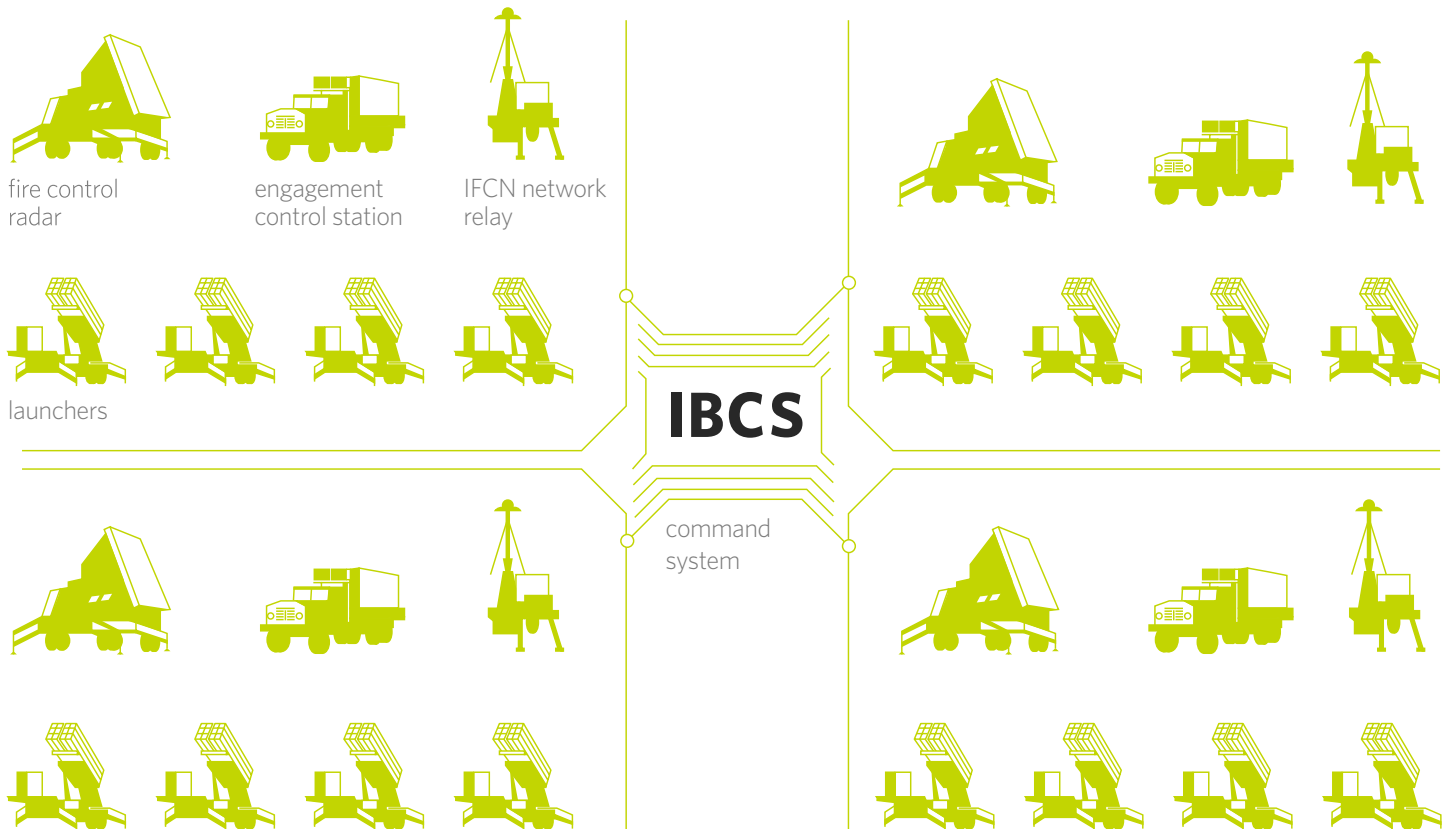


## CONCLUSIONS

The Polish government's decision on the scale and date of the second phase of the Wisła system will be taken later this year. The pace of negotiations will be largely determined by whether it would be realistic for Poland to obtain a radar identical to the one selected by the US Army. The decisions will also focus on whether Poland might obtain a guarantee of the transfer missile and radar technology. Combined with the financial challenges ahead of MinDef, the most likely scenario involves launching the negotiations but taking the decision to buy the second phase of Wisła after the elections.

# What's unique about Patriots for Poland

Poland has ordered four self-contained fire units, capable of independent operation and armed with anti-ballistic missiles.



## Polish systems with missiles superior to that of US ones.

A single battery-sized element of the Wisła system ordered in the first phase of the contract will consist of two fire units, each made of four launchers. One launcher contains 12 PAC-3 MSE interceptor missiles. In the US Patriot configuration, two fire units are made up of three launchers, two of which contain four previous generation PEM-2 GEM-T missiles while one 16 PAC-3 CRI or 12 PAC-3 MSE missiles. In the Polish configuration, one battery will have up to 96 ready-to-fire missiles, compared to the 40-48 missiles in the US variant.

## Each fire unit to be independent.

In the configuration designed for Poland, each group of four Patriot launchers will be linked to their own radar and a separate fire control unit. IBCS will allow individual fire units to exchange information about targets and use data from all radars that remain active in the network. The Polish configuration will enable each fire unit (consisting of four launchers) to operate independently even if the connection with the IBCS network is lost. In the US Patriot configuration, one radar and one control station are used by two fire units, which limits their flexibility and level of independence.

### **Fire control network will make it hard to disable the system.**

The Integrated Fire Control Network (IFCN), part of the Integrated Battle Command System (IBCS), is the heart and brains of the Wisła system, much as in case of the forthcoming Integrated Air and Missile Defense (IAMD) system built for the US Army. It allows data to be sent from radars and other detection devices (AWACS aircraft, reconnaissance drones and satellites) and it also allows each fire control station to access such data. The current Patriot configuration requires data to be concentrated in the battery and division-level command units. IBCS, on the other hand, allows information to be decentralised. As a result, taking out the command unit in an ongoing battle will not render the entire system obsolete.

**Trucks provide high mobility.** In contrast to the US version with fold-out tents, Polish command posts (part of IBCS) will be housed in containers on lorries. This will ensure improved working conditions and crew protection but will primarily make it possible to change the system's firing position, increase the speed of movement and allow camouflage of the site. All three components of the command system (server room, operations centre and planning centre) will be mobile, mounted on an off-road lorry or trailer. Switching to firing mode after moving the system to a new position will not require the crew to put up tents, but only to stop, connect fibre-optic cables and deploy communication masts that connect command units to launchers and radars.

### **Poland concentrates on kinetic ballistic defence missiles.**

Patriots in the first phase of Wisła will only be fitted with PAC-3 MSE interceptor missiles, considered the world's most advanced defence missiles. Poland has bought 208 such missiles and additional 11 for testing purposes. The PAC-3 MSE missile has been designed to destroy any type of air threats. Its speed, manoeuvrability and the ability to destroy the target without an explosive charge (using kinetic energy) all mean that it is a reliable weapon against tactical ballistic missiles. In the second phase of the contract, MinDef plans to purchase SkyCeptor missiles, which are also capable of destroying targets in a direct hit. As a result, Patriots made for Poland will be fitted with world's most advanced ammunition.

### **WHAT THIS MEANS**

The configuration of IBCS-enabled Patriot ordered by Poland under the Wisła programme has shown that we might treat each fire unit made up of four launchers as a self-contained independent weapon. Each system will consist of four separate fire subunits, capable of independent operation with superior armament compared to their US counterparts. The limitations of sectoral radars mean that missile defence of a given area will require units to form a single group. In the second phase of Wisła, after 360-degree radars are introduced, Poland will own a dispersed ballistic defence system, one that would be easy to relocate and camouflage.

# What is included in the Patriots offset

Poland will not get the desired radar and missile technology for now, which could jeopardise the completion of the Wisła order.



**Postponing a breakthrough in radar technology.** In the first phase of the contract, Poland will not be able to access the radar construction technology included in the list of key offset requirements. The know-how transferred to Poland will only contain the technology that would allow PAC-3 MSE missiles to work with the current Patriot radar. The technology to produce active radar antennas – of key importance to MinDef – is to be negotiated in the second phase of Wisła. Poland's requirements include the current Patriot fire control radar, Raytheon's new 360-degree array radar and a rotating antenna. Poland wants to be able to have open options if the US army decided to choose a rotating radar instead of Raytheon's proposal.

**Missile technologies split between Lockheed and Raytheon.** According to MinDef, the technology of warheads' guidance systems, control mechanisms, missile engines as well as the technology of assembling interceptor missiles are to be based on the PAC-3 MSE and SkyCeptor missiles. However, Lockheed's technology is protected by the US government and cannot be exported. The producer can only export the missile's service and upgrade options, not its design data. That is why Poland hopes that Raytheon's SkyCeptor missile, based on Israel's Stunner, will enable a wider spectrum of cooperation. It is believed it will fulfil Poland's offset requirements in the second phase of Wisła, allowing Poland to independently build short-range missiles.



**Lockheed with the biggest offset, Raytheon with the smallest one.** Most of the costs of the first phase and three-quarters of the offset price stem from the cost of all of the PAC-3 MSE missiles intended for Wisła (208 combat and 11 training missiles). Out of the 15 elements of Lockheed's PLN 725 million offset, the key one will include a missile test laboratory that would offer hardware-in-the-loop testing. In the first phase, Northrop Grumman is set to meet all of its commitments with regard to IBCS, which suggests that Poland will not gain large-scale access to the system. In the first phase, Raytheon has a larger portfolio than Lockheed – it consists of 31 offset projects. Their overall price, which includes Northrop's proposals, was estimated at PLN 244 million, which points to relatively inexpensive technologies.

**The simplest solutions to be implemented first.** In the upcoming months, Poland will begin the production of missile launchers and additional transport and loading vehicles. In addition, the launchers will also be mounted on the vehicles. The negotiated offset does not specify that the chassis for Polish Patriots will be supplied by Jelcz; the decisions will be made after the US government verifies suppliers' bids since the US is Poland's contractor in the agreement. The first phase will include the production of antenna masts and mobile communication centres, the technology for which will also be provided by Raytheon. Northrop will provide the IBCS software necessary to connect radars, launchers and missiles in a single network. However, the offset does not specify whether IBCS components could be produced in Poland.

**The first phase extended to include additional projects.**

In the list of required offsets, MinDef included the licence to produce 30mm Bushmaster guns and gun barrel technology, programmable mortar ammunition, launchers, components for the production of short-range missiles and the transfer of maintenance and servicing technology for F-16 and C-130 aircraft. With regard to the F-16, Poland would like to be able to provide the full range of maintenance and service domestically, mirroring the capabilities of the aircrafts' manufacturers. Those elements are not directly linked to the delivery of the Wisła system, but MinDef argues that they all are a part of a broadly understood air defence system and as such can be the subject of offset in the order for the Patriots.

 **WHAT'S NEXT**

In April Poland launched the second phase of negotiations for Wisła. Since the offset included in the first phase of Wisła will not give the Polish defence sector a breakthrough in know-how, negotiations on the second phase will put increased pressure on the transfer of technology. Poland will negotiate with the US and Israel to ensure the transfer of their latest defence technology, which is closely protected by their defence sectors and governments. If Poland fails to get the desired radar and missile technology, the second phase of the Wisła programme might be at risk.



# Poland joins the elite group of Patriot operators

US aside, Poland will be the world's fifteenth Patriot operator. After joining the programme, Warsaw will be able to influence its further development.

country	number of launchers	country	number of launchers
US	480 (PAC-2 and PAC-3, PAC-3MSE being implemented)	Kuwait	40 (PAC-2)
Japan	120 (PAC-2 and PAC-3)	Jordan	40 (PAC-2)
Germany	112 (PAC-2 and PAC-3)	Greece	36 (PAC-3, updated to PAC-2)
Saudi Arabia	96 (PAC-2, updated to PAC-3, additional ordered in 2014)	Taiwan	24 (PAC-3, updated to PAC-2)
South Korea	48 (PAC-2, updated to PAC-3)	United Arab Emirates	20 (PAC-3)
Israel	48 (PAC-2) real data may vary	The Netherlands	20 (PAC-3)
Qatar	44 (PAC-3 ordered in 2012, contract in 2014, not delivered)	Spain	24 (8 PAC-2, 16 PAC-3 - not introduced)
Romania	28 (PAC-2 and PAC-3 MSE, contract 2017, delivery 2019)	Poland	16 (PAC-3 MSE, contract 2017, delivery 2022)

**NATO's European four.** After 1989, Germany operated the largest number of Patriot systems in Europe. The Luftwaffe had over 300 early versions of the air defence system, which formed a single network together with US launchers deployed in the German Federal Republic. After the cold war ended, Germany reduced their number to 14 systems fitted with PAC-2 and PAC-3, which are set to be upgraded. The Netherlands, which became Europe's first PAC-3 user (in 1984) operates 20 Patriot PAC-3 launchers, which also will be modernised. Spain has three Patriot batteries, which were purchased from Germany in 2004 (PAC-2) and 2014 (PAC-3) and it is not yet planning to modernise them. Greece, on the other hand, has 36 PAC-3 systems.

**Patriots against North Korea and China.** Japan, America's closest ally in the region, became the first operator of the Patriots in Asia (1989). Currently, it operates 120 systems in PAC-3 configuration. Japan is also the only country (apart from the US), which produces dedicated missiles and participates in the latest US missile defence programmes. South Korea bought 48 PAC-2 systems from German surplus and upgraded them to PAC-3. In 2014 and 2015, it also placed orders for the latest systems. Taiwan operates 24 systems in the older version (PAC-2), but several years ago, it began to upgrade them to the latest version (PAC-3) and has since bought a large number of the latest anti-ballistic missiles (PAC-3 MSE). They are set to defend the island against Chinese missiles.

**Arab investors from the Gulf.** The United States' Arab allies are key to the development of the Patriot system. As a result of a huge order placed by the United Arab Emirates in 2008 (USD 3.3 billion), Raytheon was able to quickly complete the latest anti-ballistic missiles (PAC-3), and UAE acquired 20 fully digital Patriot systems. The region's largest operator, Saudi Arabia, has 96 PAC-2 systems, which it plans to upgrade to PAC-3. Kuwait and Jordan have 40 PAC-2 systems each. In 1991, Patriots were deployed in both countries during Operation Desert Storm. Recently, the group of Gulf countries that use the system grew to include Qatar. In 2014, the country placed an order for 44 launchers in the latest configuration (PAC-3 MSE).

**On the front line in Israel.** Israel does not release information about its military potential, but experts estimate the number of the country's Patriot systems is at 48, although the country operates an older configuration of the Patriots (PAC-2). This does not mean, however, that Israel has failed to keep up with the development of missile defence technology. For two decades now, it has worked closely with Raytheon aiming to create its own three-tier missile defence network consisting of the Arrow, David's Sling and Iron Dome systems. Israel has also developed its own Stunner missile, which can be fired from a PAC-3 system (according to Raytheon's proposal for Poland, this missile, called SkyCeptor, is to be part of the Wisła system). Israel has also accumulated the largest number of combat uses of the Patriot (apart from the US). The system has been used against targets in Iraq, Syria, Lebanon and Palestinian territories.

**Part of US Army missions.** US Army has 480 Patriot launchers in the PAC-2 and PAC-3 configuration deployed in five brigades and 15 air defence battalions. A majority of them protect US and allied troops in overseas operations. The early configuration of the Patriot was first used during Operation Desert Storm in 1991. PAC-2 systems were tested in Operation Iraqi Freedom in 2003, alongside the Patriots in PAC-3 configurations shipped directly from the assembly line. For several years now US commanders have warned that they have an insufficient number of Patriot batteries. As a result, it is hard to modernise them, train crews and conduct operations all at the same time. Each year, the US Army asks Congress to approve funds to modernise the Patriot system. The next generation of the Patriots, with components from different manufacturers, is set to be completed around 2025.

#### WHAT THIS MEANS

Poland will likely join the group of Patriot operators as the 15th country (excluding the US). Warsaw might also be overtaken by Bucharest, which signed its order earlier and chose a less demanding configuration. Sweden, which announced the purchase in 2017 but has yet failed to sign the contract, will become Raytheon's next European operator. Countries that enter the Patriot programme, will later be able to exercise some leverage in decisions regarding the system's modernisation and receive data on its combat effectiveness from countries that have agreed to share such information.

# Wes Kremer about the chances and challenges of the second phase of Wisła programme



**Wesley D. Kremer,**

Vice President of Raytheon, and President of Integrated Defense Systems

## QUALIFICATIONS

bachelor's degree in electrical engineering, Montana State University (1988)  
MBA, City University of Seattle (1998)

## CAREER

- US Air Force pilot who was flying the F-111 and F-15E fighter aircraft, combat sorties in Iraq and Bosnia.
- Joined Raytheon in 2003:
- the director of the SM-3 interceptor program (2010-2011)
- vice president of the Air and Missile Defense Systems (2011-2015)
- president of the Integrated Arms Systems Department (since 2015)

**Technology transfer as the main challenge of the second phase.** According to Kremer, the scope of Poland's access to modern technologies will become a key element of negotiations with the US. Raytheon's vice president also pointed out that the second phase will be influenced by Washington's export policy and the price of components that have not yet gone into mass production. "You have a certain budget which you will use to buy some new hardware as well as finance technology transfer. How this budget will be divided is the choice Poland is facing," said Kremer. He emphasised that the decisions have to be made at an intergovernmental level, based on the data provided by Raytheon.

**Collecting the necessary information might take longer than Poland expected.** This applies to the scope of radar and missile technologies that can be obtained. "In order to get a full picture, we need to evaluate all the hardware, but the second phase is not only about hardware, but about joint development. We are entering the stage of joint development and technology transfer," explained Kremer. He believes that the time necessary to assess the possibilities of industrial cooperation and the process of converting that into a cost estimate may turn out to be longer than Poland initially planned. MinDef announced that the contract for the second phase of Wisła is going to be concluded by the end of 2018.

**Radar for Poland is still in development stage.** Kremer has been open about the fact that the 360-degree radar for the second phase of Wisła is not yet ready. "We have a prototype that has been completed and has accumulated 3,000 work hours. It is about verifying GaN AESA technology – the radar's core element. Moving the system into production stage still requires a lot of engineering work. On the software side, we need to introduce the 360-degree capability and characteristics of the SkyCeptor missile." Poland can choose Raytheon's design, but no one can guarantee that the US Army will choose the same weapon for its new air defence system.

**Key decision on the type of radar.** According to Kremer, Poland might face a long wait before the US Army decides on the new radar. The final choice in that competition is expected in 2024, and the new radar will go into service in 2028. "Depending on which design wins, the new radar may have a completely different configuration, while our 360-degree AESA radar is a modernised Patriot radar", said Kremer, who also stressed that Warsaw is free to take any decision. Kremer admitted that the timeline of the Wisła programme and the decision of a new radar in the US (LTAMDS) hardly overlap. "I believe that everyone is aware of that fact at a basic level. This matter should be negotiated between the Polish MinDef and the US government."

**SkyCeptor as the biggest chance for the industry.** According to Kremer, launching the production of interceptor missiles in Poland, included in the second phase of Wisła, fulfils the condition that the Polish defence industry will receive orders corresponding to a half of the total value of the contract. However, Kremer believes that mastering the missile technology will offer Poland much more. "It might be 50 per cent of the Wisła programme, but if you become a global supplier and you sell the missile globally as a Raytheon's contractor to global markets, we are talking about 200-300 per cent." According to Kremer, the transfer of SkyCeptor technology will be less complicated than the transfer of radar technology.

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