

NATIONAL UNMANNED SYSTEMS PROGRAMME

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Abstract

In the first half of 2014, the National Security Bureau has been obliged to develop assumptions of the National Unmanned Systems Programme. Taking into account that UAVs are becoming more and more commonly used not only in armed forces, but also in other structures and national security services as well as branches of the national economy and due to this fact they are among the most prospective systems ensuring safety, it seems that their development and use should become priorities in the field of modernisation of the national security of the Republic of Poland, including also defence.

In order to meet this challenge, we need in Poland not only political awareness, but also social acceptance and cooperation of i.e. all users, research and development centres, universities, entrepreneurs and non-government organisations. We are looking for solutions that will enable to concentrate on the rapid development of these innovative and technologically advanced fields of science and economy. There is a pressing need to develop a cooperation model, and as an end result, to create an efficiently working system that will enable not only the purchase of the most modern systems in the aspect of number and operation, but also the creation of prospective solutions on the basis of, to the largest possible extent, Polish research and engineering solutions, which shall be an answer to users' expectations.

Keywords: *unmanned systems, innovation, robotics, information exchange, technological leap*

1. Introduction

Since the beginning of humankind and the foundations of industry emerged, humans have been striving for easier life in order to, while doing the same works, dedicate more time to other activities. They built machines and more and more technologically complicated devices. The first ones, until now, were controlled by humans. A qualified and appropriately trained operator or a team of operators managed the work of individual devices and complicated systems.

Convenience, will of discovering the new and finally economy and pragmatics laid at the heart of such solutions.

In the second half of the 20th century a very dynamic development of electronics, informatics and automatics occurred. Designed devices were becoming more and more autonomic. Technological developments were at first implemented in armed forces, subsequently in the economy and finally became widely available. Humans figured out very fast that a popular robot is not only convenient, time- and effort-saving. It is also a possibility of conducting activities and tasks, for execution of which large teams of people and complicated, for those times, computing machines had to be engaged [1], [2].

This technological development and drive for "making the life easier" caused that humans got interested in so-called unmanned systems. Often small machines (flying, ground and swimming) are able to perform complicated tasks in places where no human can get and in a way that is invisible for those who are not authorised to see it. Additionally, they can do it quite cheaply. At the same time, they collect and analyse unlimited amount of data and show ready analyses in form of proposed solutions to an operator [3].

All those factors caused a situation in which popular unmanned systems have become one of the most dynamically developing field of technology. Countries allocate larger and larger financial outlays on works on unmanned systems of various applications and use. When we observe their development and use, it is hard to predict today in which direction further research on those systems will go [4].

2. History of works on the National Unmanned Systems Programme

As a result of analyses, working meetings and consultations with appropriate environments, the National Security Bureau has proposed four main theses that became the beginning of creating a common way of thinking and acting in this field, which have been subsequently defined as the National Unmanned Systems Programme (NUSP).

1. Unmanned systems are among the most prospective safety systems, including defence and protection systems, and will be more and more commonly used in various other public and private spheres. Therefore, this should be one of the main modernisation priorities in the area of the safety of Poland.

Unmanned systems offer effectiveness. They are efficient and economical. They find wider and wider range of applications. As is the case with modern technologies, they appear in armed forces at first, and they are now present in all fields of the safety, public, commercial and private sphere.

When it comes to armed forces, without a shadow of a doubt unmanned systems belong to the most prospective computerised combat and support systems. The Polish Armed Forces already take this fact into account in their modernisation programmes. In addition, in the future they will take it into consideration on an even larger scale. However, all public and private services and guards will also use them on a larger scale. We also anticipate bigger commercial demand for unmanned systems.

There is no future without unmanned systems now. Disposing of unmanned systems is an essential need today. Poland also needs them.

2. Due to the fact that unmanned systems are highly computerised devices, it is crucial to have own national "cryptographic control" over this equipment, especially when it comes to the use for defence purposes. This is the second need. The condition for that is our own domestic production.

We know very well what computer control over modern devices means. Without our own source codes we cannot have full confidence in armament, we dispose of.

Unmanned systems constitute in fact mainly information technology. In order to control them in the operational, service and maintenance aspects, they have to be manufactured in Poland. Otherwise, we will be unable to fully manage this kind of equipment. This in fact determines the need for developing the national production of those systems. Foreign purchase of this type of systems bear a lot of risk and therefore equipping of Polish national security structures, including the Armed Forces, with this type of systems should not be based upon it.

3. Poland already today disposes of promising staff and technical potential that creates research, development and production opportunities in order to design and manufacture a full range of unmanned systems of various classes and types in the perspective of the coming decade. It is a good area for innovation in the Polish economy and safety. We have an opportunity to meet the two above-mentioned needs and to have our own unmanned systems.

Poland can afford to design and manufacture its own systems, of course in cooperation with foreign producers, e.g. within a European unmanned systems programme.

It is also an excellent chance for innovation. By using those chances, Poland may become one of the top European countries producing unmanned systems.

4. On the basis of the above reasons, the President of Poland ordered preparation of the National Unmanned Systems Programme. For launching this initiative common interest and coordinated

activities of three types of subjects: users determining needs, scientific potential for designing domestic solutions and industry potential producing needed projects are necessary.

We have to unite efforts of those environments together. Only together, we will be able to address this important and complicated issue and synergy may be achieved. These coordinated efforts may not only lead to strengthening of the Polish security system – on the basis of our own domestic production – with very prospective unmanned systems.

Moreover, other aspects determining the preparation of the NUSP were also taken into account – at every level on which unmanned systems operate. Unmanned systems are, after all, part of the information processing system. Development programmes planned by Poland may not be limited to the aerial part of this complicated system, which acquires information from various types of sensors and uses data from external sources. The strategic planning has to involve the improvement of analytical and interpretative capacities, processing of big data including graphic ones, appropriate training, specialisation and upskilling systems.

It is necessary to formulate principles of collecting and processing data belonging to various services. Autonomic systems require implementation of rules of information exchange between different sources, principles of analysis, processing, transferring, storing and archiving information as well as deleting information, which are no longer needed. Principles concerning sharing results of analyses between different services, public administration, law institutions and citizens are needed. A platform for sharing information and results processed in intelligent systems is also needed.

All the above-mentioned issues may be addressed by systems using the cutting edge technologies, including unmanned systems themselves.

3. Goals and basic assumptions of the NUSP

For the purpose of formulating basic assumptions for the National Unmanned Systems Programme, the Armed Forces Supervision Department of the National Security Bureau held a number of consultations, expert discussions and working meetings with representatives of interested environments, which is with scientists, industry and potential users. Among others, the following entities participated in them: 24 Godziny Sp. z o.o., Gdansk University of Technology, Poznan University of Technology, Rzeszow University of Technology, SAP Polska sp. z o.o., AGH University of Science and Technology, Warsaw University of Technology, Opole University of Technology, Wroclaw University of Technology, Tischner European University in Cracow, Robokopter Technologies, Mikromakro Institute, Gas Transmission Operator GAZ-SYSTEM S.A., Ministry of National Defence (Armament Inspectorate, Armaments Policy Department, Department for Science and Military Education, General Command of Branches of Armed Forces), Gdynia Maritime University, Polish Agency for Enterprise Development, Polish Defence Holding, Air Force Institute of Technology. Subsequently, as a result of further discussions, certain representatives were appointed from those environments, appointing the so-called Initiative Group. Its task was to prepare the basic assumptions of the NUSP. The Initiative Group consisted of Ministry of National Defence, Polish Chamber of National Defence Manufacturers, Polish Armaments Group, WB Electronics, Industrial Research Institute for Automation and Measurements, Air Force Institute of Technology, Military University of Technology, Warsaw University of Technology, Polish Technology Platform for Unmanned Systems, Civil Aviation Authority, Marine Technology Centre, Mikromakro Institute.

As a result of works lasting for several months, the basic assumptions and goals of the National Unmanned Systems Programme have been established. Those goals have been divided into two groups – main (strategic) goals and intermediate goals.

1. The following main goals of *the Programme* have been established:

Development of a system for support of domestic production of unmanned systems in the areas which are key to our safety;

Creating of a Polish economic speciality in the area of construction and commercialisation of unmanned systems.

2. The intermediate goals are as follows:

- Development of a long-term strategy for supporting the development of unmanned and robotic systems that is key to the national security and socio-economic development of Poland.
 - Definition of organisational, financial and legal frameworks for the development of Polish unmanned and robotic systems.
 - Building of the awareness of a need to develop Polish unmanned and robotic systems.
 - Stimulation of demand for Polish solutions in the area of robotics, including unmanned systems within the national security.
 - Development and implementation of a long-term strategy in the context of the human-machine-society relation.

Creating of a platform for dialogue and broad exchange of information between environments responsible for the security and those representing science and industry with the support of i.e.: the National Security Bureau and the National Centre for Research and Development, that is:

- Preparation of a book of demand and supply for unmanned systems for the needs of management and protection of infrastructure of a strategic importance for the national security (for the next 20 years),
- Consolidation of environments and facilitation of a rational cooperation between their representatives,
- Stimulation of demand for Polish solutions in the area of robotics, including unmanned systems within the national security,
- Consultations with government agencies and state-owned enterprises aiming at the assessment by them of the benefits resulting from the implementation of unmanned systems – robots.

Stimulation of a dialogue and broad exchange of information between environments responsible for technological development, that is: science, industry, users, National Centre for Research and Development, Civil Aviation Authority, Ministry of Economy, Ministry of Science and Higher Education, Ministry of Administration and Digitisation and so on and so forth, that is:

- Consolidation of environments and facilitation of a rational cooperation between their representatives through the support for actions taken by the Polish Technology Platform for Unmanned Systems and the Polish Technology Platform of Security Systems,
- Determination of the present abilities and research and development capabilities of science and industry environments,
- Establishment of the following programmes of:
 - ✓ sector financing by the National Centre for Research and Development, which shall integrate companies, research institutes and end users for the development of a full range of civil unmanned aircraft, ground and maritime systems,
 - ✓ financing by the National Centre for Research and Development in the area of the national defence and security which shall integrate companies, research institutes and end users for the development of unmanned systems for military use that will be complementary to the above mentioned programme,
- Intensification of the cooperation with industrial and scientific partners in the area of unmanned and robotic systems' development at the international level,
- Preparation of syllabi for high-class specialists in the field of unmanned systems and their components at universities (telecommunications, IT, cryptology, navigation, mechatronics, advanced materials).

Gaining of the social acceptance for development of robotics as a branch of science, development of the national economy and social phenomenon in Poland.

Support of the new innovative branch of science and economy through appropriate changes in the applicable law.

Such a big and ambitious initiative requires appropriate management and, first of all, political and financial support. Experts preparing the above assumptions came to the conclusion that the most appropriate body will be the Polish Government as it is responsible for and creating the policy, including also the economic one.

It has been agreed that for the purpose of the NUSP's implementation the so called Programme Board by the Prime Minister should be established which shall be managed by its Chairman, that is the Prime Minister (or the Head of the Chancellery of the Prime Minister) with the participation of deputy ministers from ministries which are most interested in the future use of unmanned systems (Ministry of National Defence, Ministry of Economy, Ministry of the Interior, Ministry of Infrastructure and Development, Ministry of Administration and Digitisation, Ministry of Science and Higher Education, Ministry of Foreign Affairs) and the Head of the National Security Bureau.

The executive body of the Programme Board would be the Steering Committee (SC) - 21 persons in total, consisting of:

- Chairman (1 person);
- Deputy Chairmen (7):

Warsaw University of Technology,
Polish Armaments Group,
Air Force Institute of Technology,
Marine Technology Centre,
Industrial Research Institute for Automation and Measurements,
WB Electronics,
representative of the Ministry of National Defence,

- Members of the SC (13):

representative of the National Security Bureau (1),
representatives of Ministry of Economy, Ministry of the Interior, Ministry of Infrastructure and Development, Ministry of Administration and Digitisation, Ministry of Science and Higher Education, Ministry of Foreign Affairs [6];
representatives of Internal Security Agency and Military Counterintelligence Service (2);
representatives of science and industry representing the areas of ground, aircraft and maritime unmanned systems (4), including:

- ✓ Military University of Technology,
- ✓ Lodz University of Technology,
- ✓ Polish Chamber of National Defence Manufacturers,,
- ✓ Polish Technology Platform for Unmanned Systems.

The Steering Committee at the same time would be an advisory body to the Programme Board, which would have deciding voice by defining the activity. The Steering Committee could indicate and supervise those subjects/teams, which, after the SC's recommendation and approval of the Board, would be appointed to execute undertakings indicated in their tasks.

The National Centre for Research and Development would be the subject implementing programmes/projects in accordance with mechanisms contained in the act on the National Centre for Research and Development.

The Programme Board, at least once a year and after acceptance of the report by the Prime Minister, would report to the President through the Board Chairman.

The most important tasks standing in front of the Steering Committee are as follows:

1. Development of the concept and assumptions of the National Unmanned Systems Programme. The Steering Committee should develop the programme's goals, convince the state authorities of their implementation and subsequently organise appropriate thematic teams and supervise the implementation of the accepted schedule.

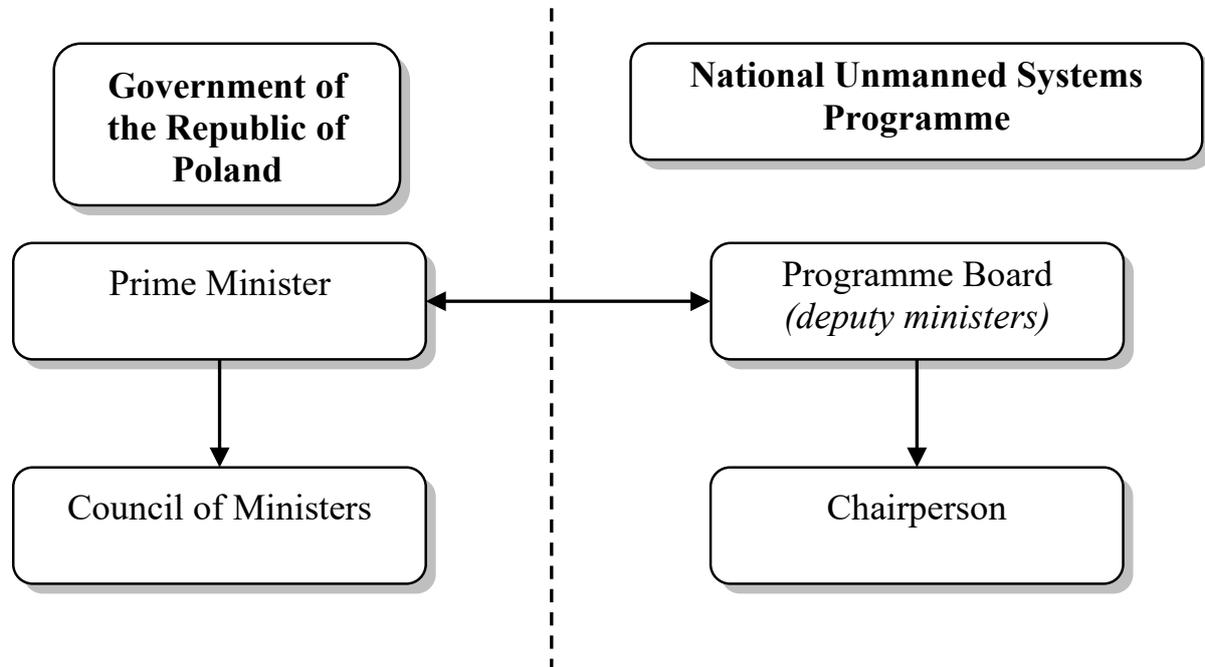


Fig. 1. Diagram illustrating the placement of the NUSP and model of managing it within the State's structure

2. Analysis of the needs of individual government agencies and industry branches in the scope of the use of unmanned systems.
3. Review of the technologies necessary for the development of unmanned systems in Poland. Indication of the priority technologies, because of which future unmanned systems projects will be implemented. A defined technology level will be achieved as a result of an intensified process of financing of research and development works and as a result of acquiring these technologies within international cooperation.
4. Cataloguing of the already owned products, technologies, services, and capabilities connected with unmanned systems. Assessment of the current progress of domestic works on necessary technologies, both available in industry and developed by scientific units. Assessment of the availability of the necessary technologies from foreign sources.
5. Definition of legal constraints that make it impossible to operate unmanned systems for various purposes and initiation of legislative works aiming at legitimisation of the legal aspects.
6. Dialogue and broad information exchange (in the case of the Polish Armed Forces given an appropriate security classification) between users of unmanned systems.
7. Management over means, including financial ones, provided for the implementation and development of projects, which are results of consultations with users and defined expectations.
8. Indication and monitoring of the education process and development of the staff, e.g. engineers or managers, which will be able to implement and manage the prepared projects.
9. Appointing, if necessary, of expert panels on a consultation and advise basis (investment, IT, professional, financial, legal etc. consultancy). The scope of responsibility and composition of the expert panels will reflect in a natural way the scope of prospective actions. Different ways of the recruitment of the panel's members will take two principles into account – principle of diversity (of knowledge/views) and balance (of different attitudes/views).

4. Conclusion

One may ask what the real motivation behind the idea was and what was the basis of the preparation of the basic assumptions of the National Unmanned Systems Programme?

Analysis of the current situation, in which Poland is now, including especially scientific and technical potential, economic position and capabilities of Poland, unambiguously indicates that there is a great chance that highly computerised and automated technologies may become a driving force for our economy and a flagship of the national defence potential.

Directions of the development, which are currently defined under the common term – robotics -, are those in which Polish scientists, engineers and manufacturers are achieving greater and greater successes – both nationally and abroad [5, 6].

What lacks is an injection of a real innovation, because, as it looks now, we are no match for the biggest producers of the most technologically advanced systems yet.

Hence, binding of national entities having the biggest potential and achievements in the field with definite foreign strategic partners which guarantee the injection of the most modern but at the same time necessary for us technological solutions, creates opportunities of development, implementation and export of services, products and technologies that are innovative and key to the Polish economy.

Initiatives similar to the discussed project, but skilfully supported, and even favoured by the government authorities, will undoubtedly influence not only the already repeatedly mentioned economic growth. They will also contribute to the creation of new, competitive with the Western markets, jobs for graduates of definite universities, mainly technical ones, and will create a fertile ground for the higher education in Poland for education of modern and dynamic managers, which will be ready for managing similar programmes. All of these will finally undoubtedly contribute to the creation of an appropriate climate curbing the emigration of our graduates.

As a final result, the establishment and implementation of regulations of the National Unmanned Systems Programme prepared under the direction of the National Security Bureau, including its appropriate funding, will contribute to the strengthening of the Poland's position on the international arena.

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