

Research group: Security and Defence Systems Division
Head of group: Dr-Eng. Mariusz Andrzejczak

Contact Information

Postal address: Industrial Research Institute for Automation and Measurements PIAP
Intelligent Security Systems Section
Security and Defence Systems Division
02-486 Warszawa
Poland

Street address: Al. Jerozolimskie 202
02-486 Warszawa

Tel.: +48 22874 0143
Fax.: +48 22874 0113

Email: aspronska@piap.pl
URL: <http://www.piap.eu>; www.antyterroryzm.eu

Abstract:

The main objective of the TALOS project is to develop and field test the innovative concept of a mobile, modular, scalable, autonomous and adaptive system for protecting European borders. The complete system applies both aerial and ground unmanned vehicles, equipped with multi-sensor data acquisition systems, with active imaging, such as laser, radar, infra-red and visible cameras, acting as both the watching stations and the first reaction patrols and supervised by the Command and Control Centre.



Detailed research information:

Industrial Research Institute for Automation and Measurements PIAP belongs to the top ten of Polish Research Institutes. Supervised by the Polish Ministry of Economy develops new technologies since 1965. Nowadays, it employs about 200 people, with more than 120 scientists among them. 10 years ago PIAP has set a new strategic course heading towards the development of technical tools for the safety and security domain. As a result, the first mobile robot for removal of hazardous packages from trains and airplane cabins, as well as the novel, innovative Mobile Robotic System for inspection and non-destructive testing of large industrial installations, was designed and constructed in PIAP's laboratories, to be successfully implemented into the everyday work of the bomb squads.

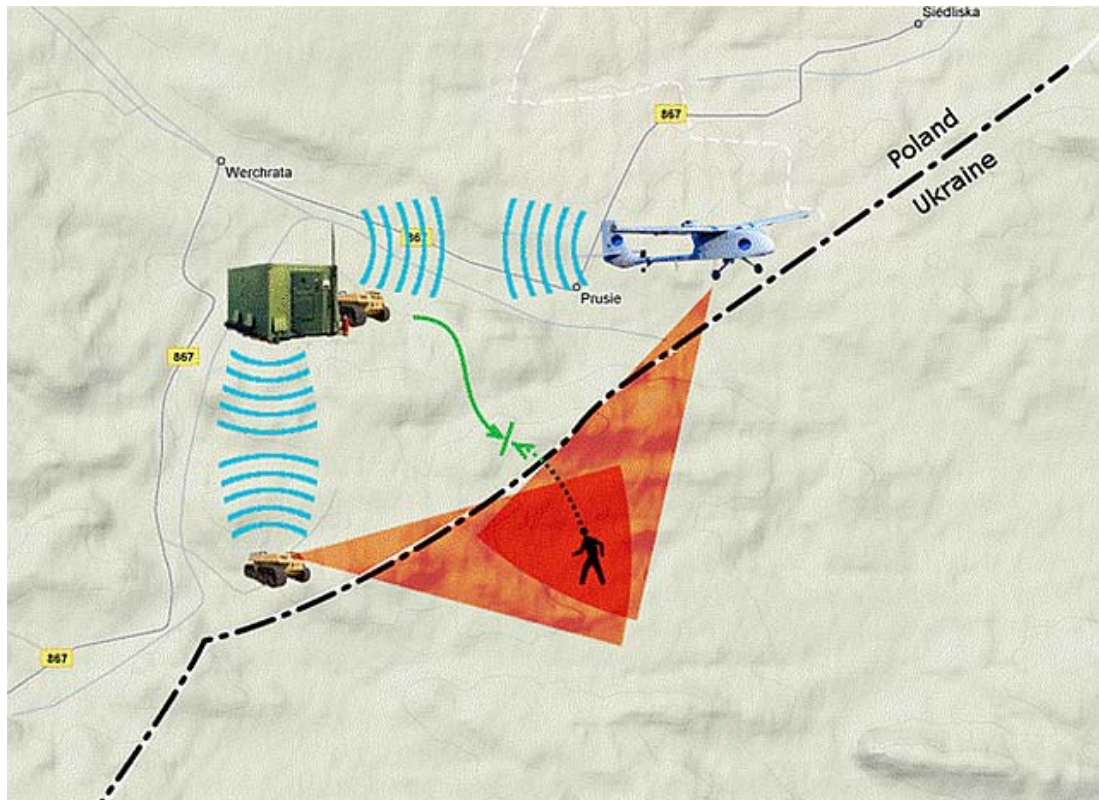
Up until now, the Institute's personnel has accumulated a thorough knowledge and vast experience in the area of safety and security products, also owing to participation in EU funded projects. The largest one, currently coordinated by PIAP is the Transportable Adaptable Patrol for Land Border Surveillance – TALOS.

TALOS is a research project co-founded by the European Commission under the 7th Framework Programme within the Security priority.

Character of the eastern border of the European Union has changed diametrically in consequence of the EU extension in the recent years. Nature of the new external EU border is strongly diversified with regard to topographic characteristics, climatic conditions, as well as probability of occurrence and intensity of illegal activities. The borders of new member states, shared with the former Soviet Union countries, are particularly exposed to illicit activity. This part of the eastern EU frontier is a buffer between the relative prosperity of the West and the poverty of the former Soviet Republics. The border is known for being Union's backdoor used by illegal immigrants, often involved in international terrorism, and as an area of illicit activities, such as trafficking in people. European Union is aware of the challenges created by the new frontier. Border security mission is one of the priority security missions recognized by the European Security Research Advisory Board (ESRAB) and European Commission. The TALOS project is aimed at designing, implementing and field-testing a prototype of an adaptable and transportable border surveillance system. The research emphasis in the project is put on application of unmanned ground vehicle - UGV, communication and ability to command and control.



The main research subjects are the system architecture, scenarios of operation (including cooperation with UAVs), UGV control and navigation, Command and Control Centre and the communication networks.



Like existing surveillance systems, TALOS is going to use sensors allowing detection of people, vehicles and hazardous substances crossing the unregulated land border. The innovative concept behind the project is that the sensors are going to be carried by unmanned vehicles featuring high degree of autonomy. This will give TALOS the advantage of cost effectiveness and surveillance capabilities not available to conventional systems based on static sensors.

The TALOS system will be mobile and transportable, deployed quickly in locations, where the illegal intrusion takes place. It will be able to detect and locate (the movements of) individuals, vehicles, and hazardous substances (CBRNE) crossing unregulated land borders and, when required, track and trace their movement thereafter. TALOS will mark a “soft border line” on the ground, although the concept and elements of the system may be implemented to the air, river and sea borders or at any other areas where fast surveillance is needed (devastated areas, for example).

The autonomous ground platforms – UGVs - will be equipped with multi-sensor data acquisition systems, with active imaging, such as laser, radar, infra-red and visible cameras. These data will be processed and integrated, including their fusion with navigation device information and accurate terrain data-bases. The Command and Control Centre, where large amounts of system information is displayed and managed, will utilize advance Man Machine Interface (MMI) and will facilitate prioritization of alarm events, track responses, record events and enable future analysis, debriefing, support and training.



UGVs will also be capable to communicate with the intruder detected, and to undertake the proper measures towards stopping the illegal action, under the constant supervision of border guard officers. The system will have the capability to be expanded to include other unmanned vehicles such as unmanned surface vehicles (USV).

The most important features of the TALOS system are scalability, autonomous operation, mobility and adaptability. It will be easy to adjust the system to local requirements such as border length. The system elements will operate autonomously using the set of rules defined by the Command and Control centre. The rules, modified from time to time during system operation, will adapt the system to the variable tactics of border crossing and will constantly improve performance in the long term. The system will use adaptive artificial intelligence to implement intruder tactical techniques, in the specific patrol scenario, area of operation, border topography, etc.

Unmanned Air Vehicle (UAV) and transportable Sensor Tower are going to be integrated with the system in the second phase of the project. Unmanned Air Vehicle (UAV) will be responsible for the aerial surveillance and can be used as communication node in particular situations, Sensor Towers are going to be deployed in places requiring ceaseless surveillance twenty four hours a day, seven days a week, or in places not accessible for the vehicles.

