



## Developing Practical Cooperation through Science

**Ukraine has been actively engaged within the framework of the NATO Science for Peace and Security (SPS) Programme since 1994.**

The NATO SPS Programme enables close collaboration on issues of common interest to enhance the security of NATO and partner nations by facilitating international efforts to meet emerging security challenges, supporting NATO-led operations and missions, and advancing early warning and forecasting for the prevention of disasters and crises.

The current SPS Key Priorities include:

- *Counter-Terrorism;*
- *Energy Security;*
- *Cyber Defence;*
- *Defence against CBRN Agents;*
- *Environmental Security;*
- *Security-related Advanced Technology;*
- *Border and Port Security;*
- *Human and Social Aspects of Security.*

Additionally, the SPS Programme helps to promote *regional security* through scientific cooperation among partners. The Programme also helps to *prepare* interested eligible nations for NATO membership. SPS activities often have a high *public diplomacy* value.

## UKRAINE

Following the Russian illegal annexation of Crimea in 2014, cooperation between NATO and Ukraine has been strengthened in many areas, including through the framework of the SPS Programme. Since then, Ukraine has become the largest beneficiary of the SPS Programme. 20 SPS activities are currently being led by Ukrainian scientists and experts. Below are some examples of completed and ongoing activities led by Ukraine and NATO Allies in the framework of the SPS Programme.

### Cooperative Activities

#### MICROWAVE IMAGING CURTAIN

This ongoing Multi-Year Project (MYP) is included in the DEXTER (Detection of EXplosives and firearms to counter TERRORism) programme, which aims to develop a solution for the detection explosives and firearms in a mass-transit environment without disrupting the flow of pedestrians. The project will design, develop and test a radar-based imaging device capable of generating 2D and 3D images in real time for the non-checkpoint detection of explosives and firearms. Taking into account current regulations on the impact of radiation exposure to human health, the project will integrate high-performance microwave modules, and will develop specific signal processing algorithms to construct 3D images of dangerous objects carried by moving persons. *This project is led by Ukraine and France, and also involves experts from the Republic of Korea.* [ref. G5395].

#### PORTABLE CHARGERS

This MYP aims to develop a lightweight, efficient and wearable self-charging system. The proposed system will be composed of two independent units: an energy harvesting unit and an energy storage unit. The first one will work by converting mechanical energy into electrical energy, and will use advanced piezoelectric multi-level ceramic-polymeric nanocomposites to achieve light-weight and flexible units with improved piezoelectric properties. The second one, the energy storage unit, will be constituted by new, lightweight and flexible devices that can

store a large amount of energy (also known as Supercapacitors). The advantage of this system is the substitution of the heavy and environmental-dependent photovoltaic cells with lighter and more efficient solutions. *This project is led by scientists from Ukraine, Italy and North Macedonia.* [ref. G5772].

#### **SUPPORT TO HUMANITARIAN DEMINING IN UKRAINE**

This MYP provided Ukraine with assistance in the area of humanitarian demining by enhancing the capacity of the State Emergency Service of Ukraine (SESU) in undertaking demining operations in the Donetsk and Luhansk regions. It significantly contributed to safeguarding the civilian population in eastern Ukraine where explosive remnants of war pose a significant threat. SESU Explosive Ordnance Disposal (EOD) teams were introduced to and provided with modern technologies of detection and clearance and associated specialist training so that the SESU can cope with the additional challenges brought about in a high threat environment. In addition, following a fire at the ammunition depot in Balaklia, Kharkiv region, which destroyed valuable equipment, the SPS Programme rapidly delivered the needed equipment to enable Ukrainian demining teams to successfully clear the territory of Balaklia and nine settlements in the vicinity. *This project was co-led by the SESU and the NATO Support and Procurement Agency.* [ref. G5024].



#### **NOISE IMAGING RADAR NETWORK FOR COVERT AIR AND MARITIME BORDERS SECURITY (NORMA)**

Launched in 2018, this MYP developed a radar network that will ensure an all-weather 24-hour resilient surveillance system with high detection capabilities. It will be used for continuous monitoring of national sea and land borders (with both civilian and military applications). The project enhanced air border surveillance, which is of paramount importance in the

management of new threats related to the cross-border use of drones, as well as to security in conflict areas around the world. *This project was completed in 2022 and was led by experts from Ukraine and Italy.* [ref. G5465].

#### **DEMINING 4.0: MULTI-SENSOR COOPERATIVE ROBOTS FOR SHALLOW BURIED EXPLOSIVE THREAT DETECTION**

This MYP aims to demonstrate the feasibility of a safe landmine and improvised explosive devices (IED) detection system by using a team of cooperative robotic vehicles, each carrying specialized sensors (ground penetrating radar, optical, metal detector). Potential threats will be digitally mapped in a geo-referenced coordinate system for the appropriate local team or authority for elimination. All robots securely share the data in real time with remote terminals and portable devices. With this system, a mission path is assigned by an operator with a remote interface and the robots operate in sequence. Shared data is then used to generate a data fusion display to classify explosive threats. This project will improve detection of explosive threats in post-war zones, avoiding direct contact until the threat removal stage, introducing a safer demining procedure. *This project is led by scientist from Ukraine, Italy, the United States and Jordan.* [ref. G5731].

#### **A GENDERED LENS APPROACH TO MILITARY TO CIVILIAN TRANSITION AND REINTEGRATION FOR UKRAINE JOINT FORCES OPERATIONS (JFO) WOMEN COMBATANTS**

In response to a priority agreed by the Joint Working Group on Scientific and Environmental Cooperation (JWGSEC), this Advanced Research Workshop reflected an interest in Ukraine for cooperation regarding the plight of woman combatants returning from combat zones (either due to post-traumatic stress disorder – PTSD - or reintegration issues). The ARW took place on 4 November 2021 with 54 participants. The workshop assessed what research may lead to more successful reintegration of Ukrainian women military into civilian life. *This ARW was led by scientist from Ukraine and Canada.* [ref. G5903].