The NATO Science for Peace and Security Programme

CountryFlyer 2022

August

Developing Practical Cooperation through Science

Israel has been actively engaged within the framework of the NATO Science for Peace and Security (SPS) Programme since 1996.

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.

ISRAEL

Israel is an active partner in the SPS Programme with a number of ongoing activities. At present, the leading areas for cooperation include **Advanced Technology, Counter-Terrorism and CBRN Defence**. Below are some examples of ongoing and completed activities led by scientists and experts from Israel and NATO countries in the framework of the NATO SPS Programme.

Cooperative Activities

ANALYSIS, DESIGN AND IMPLEMENTATION OF AN END-TO-END 400KM QKD LINK

The main goal of this Multi-Year Project (MYP) was to develop new methods of secure long-distance communication to allow military personnel to connect and communicate safely in protected cyber-space. The project focused on carefully analysing every aspect of the practical implementation of a long range Quantum Key Distribution (QKD) link with trusted nodes to achieve the highest possible secret-key rate generation within the security and system level constraints. To this purpose, a long range QKD link with trusted nodes was used as a test benchmarker. The project aimed to assess and improve the resilience of military systems to communications hacking. *This project was led by experts from Israel and the United States, with support from Italy and Pakistan.* [ref. G5263].

THE ANTHRAX TRANSPORTER: FROM MOLECULAR MECHANISM TO MEDICATION

Anthrax is a fatal disease caused by the spore-forming bacterium *Bacillus anthracis* that can be readily cultured, easily collected, stored, and dispensed in populated environments. It represents a serious bioterrorism threat. The goal of this ongoing MYP is to improve anti-Anthrax protective measures, identify small molecules that block the Anthrax virulence, and provide a basis for the development of novel Anthrax counter measures. This project builds on the successful cooperation developed in the framework of the SPS MYP "The Anthrax MntABC Transporter: Structure, Functional Dynamics and Drug

Discovery", which was awarded the SPS Partnership Prize for excellence in 2018.

The manganese transport (MntABC) system is an essential virulence determinant of *Bacillus anthracis*. The objective is to identify and develop molecules that block the activity of the MntABC transport system. The resulting molecules will provide a basis for the development of novel Anthrax counter measures. *This project, launched in August 2020, is led by scientists from Israel and Türkiye.* [ref. G5685].

CLOUD-BASED ARCHITECTURE FOR BORDER SURVEILLANCE SYSTEMS

The project 'Dynamic Architecture based on UAVs mOnitoring for border Security and Safety" (DAVOSS) was launched in April 2018 and completed in July 2021. It developed a cloud-based architecture to enhance capabilities for border surveillance. The system is based on an innovative sensors-network model, which better fits the need to protect large areas and is capable of integrating a large number of different sensors (cameras, thermal and noise sensors, unmanned systems, etc.). *This project was led by experts from Israel and Italy.* [ref. G5428].

DEVELOPMENT OF NEW CHEMICAL SENSORS AND OPTICAL TECHNOLOGIES FOR FAST AND SENSITIVE DETECTION OF IMPROVISED EXPLOSIVE DEVICES

The objective of this project, launched in September 2018, was to develop a compact, portable system for the detection of explosives to be used by police and security officers. It combined two independent sensor technologies: a chemical sensor and Multiphoton Electron Extraction Spectroscopy (MEES). The system is able to take measurements from the same sample simultaneously, and provide a robust detection sensitivity while limiting false positive events. *This project is led by Israel and Spain and was completed in February 2022.* [ref. G5536].

NEW GENERATION OF DRUGS PROTECTING AGAINST NEUROTOXIC INDUSTRIAL CHEMICALS

Toxic chemicals represent a significant threat, because both troops and civilian population can be exposed to high doses of these compounds that can be used in improvised explosive devices or contaminate food or water. Effective medical countermeasures to fight against these neurotoxic syndromes are needed. This project explores the therapeutic potential of N-acetylcysteine-amide (NAC-amide or AD4) and the thioredoxin-mimetic (TXM) peptide, blood-brain barrier (BBB) permeable drugs specifically developed for reducing inflammation, oxidative stress and apoptosis in the central nervous system (CNS), in the treatment of these acute neurotoxic syndromes. *This project was launched in June 2021 and is led by experts from Israel, Spain and USA.* [ref. G5852].

ADDITIVELY PRINTED ENGINE (APE)

This project aims to develop and demonstrate a micro gas turbine for UAS entirely produced using additive manufacturing and 3D printing. The engine will be printed in its final assembly state in a single uninterrupted print sequence. Such technology will make it possible to obtain an extremely cheap engine with minimal post production procedures while simultaneously significantly decreasing the engine production and delivery time. While the technology will be demonstrated at the level of a prototype for mini/micro UAS, the principle and design could be extended in the future also to bigger platforms. *This project was launched in October 2021 and is led by experts from Israel, Belgium and Türkiye.* [ref. G5939].