HISTORY
In Year 2008 the Institute of Metal Science, Equipment and Technologies with Hydroaerodinamics Centre (IMSETHC) together with Academy of Ministry of Interior established the Center of Excellence “Anti-Terrorist Advanced Systems” (CoE ATAS).

MAIN GOALS
1. Research and development of technical and operational concepts for advanced projects and technologies against terrorism. Conducts research, development and experiments of new technologies;

2. Provide adequate participation in:
   - National programs and projects against terrorism;
   - NATO Defence Against Terrorism Programme (DAT);
   - Implementation of EU Strategy against terrorism; and
   - The activities of the international network of Centres of Excellence in the anti-terrorist area;

3. Provide synergy of expertise and results on the base of participation in some NATO DAT projects:
   - Reducing the vulnerability of helicopters to rocket-propelled grenades (RPGs);
   - Harbour protection;
   - Protection of critical infrastructure;
   - Developing non-lethal capabilities.

4. Training national operational and technical personnel and NATO missions-oriented personnel:
   - Support education, training and exercise activities of national and NATO mission-oriented personnel in the identified areas:
     a) Personnel:
        - Training operators, technical personnel and management level personnel (from Armed Forces field commanders and government agencies’ staff) to use the devices and the systems and to make independent, innovative solutions;
        - Training and certifying instructors and trainers.
     b) Courses provided by IMSETHC:
        - Critical infrastructure protection;
        - Training and education of individuals to NATO standards.
   - Prepare national and international scientific conferences and workshops related to advanced methods, tools and systems against terrorist threats;
   - Establish international, bilateral and inter-institutional contacts for training and joint investigations of the Centre;
   - Creation of a “pool” of highly professional specialists -technicians, operators and management-level personnel (in the identified areas) for developing, using, maintenance and upgrading advanced systems against terrorism.
ADVANCED SYSTEMS FOR PROTECTION
OF CRITICAL INFRASTRUCTURE
DEVELOPED BY NCATAS

ADVANTAGES OF THE SYSTEMS:

- **Reliability** – high-tech, flawless, effective and complete means for detection, identification and reaction. Multi-level protection;
- **High degree of readiness** – continuous mode ensured and swift operation of the entire scale of functions of the system;
- **Flexibility** – re-adjustment the characteristics of the system in real time, in accordance with the changeable characteristics of the threats and the various configurations of the infrastructure. Autonomous operation of the constituent modules;
- **Cost effectiveness** – entirely developed by the participants in the project using available materials and own technologies.

SYSTEM FOR SECURITY AND PROTECTION OF LAND INFRASTRUCTURE

MAIN FUNCTIONS:
1. Detection, identification and exact identification of the threat;
2. Transition and analysis of the signal for presence of a trespasser;
3. Active and autonomous protection.

MAIN COMPONENTS:
1. Fiber-optics sensor with localization of unauthorized access;
2. Autonomous Intelligent System for Video Surveillance;
3. Obstacle complex against intrusion of trespassers.
4. Complex for prevention against pedestrian violators.
1. FIBER-OPTICS SENSOR WITH LOCALIZATION OF UNAUTHORIZED ACCESS

MAIN PURPOSE

Detection and localization of long-distance threats (the distance from the threat depends on the concept of the protection and the needed level of protection and reliability). The system is successfully applied to ensure security and protection of power objects (nuclear-, hydro- and thermal power stations), oil processing installations, oil pipelines, munitions depots, etc. critical infrastructure.

OPERATION

The main concept is based on analysis of the Ralay scattering of light propagating in buried optic fiber which serves as a sensor. The light impulses from semi-conductive laser of big coherency and generating Relay signal are entered in the fiber, which generate a Relay signal. In case in the surrounding area mechanical vibrations are generated through pressure or seismic waves, they effect in phase alterations of that signal which may be detected after electro optical processing.

ADVANTAGES OF THE SYSTEM

- Capability for operation in different meteorological conditions;
- Resistance to electromagnetic impact;
- Capability to cover large distances at resolution of the signal transmitted up to a few meters;
- Cost effectiveness;
- Easy maintenance;
- Possibility for identification and determination between human or animals in all meteorological conditions and various relief of the terrain;
- High reliability for recognition of false signals – more than 1:1,000.
2. AUTONOMOUS INTELLIGENT SYSTEM FOR VIDEO SURVEILLANCE

AISViS

The Autonomous Intelligent System for Video Surveillance (AISViS) is developed within the Center of Excellence “Anti-Terrorist Advanced Systems”. The device can be used for intelligent security monitoring. It is designed to be a part of an early warning system. In many cases, the system might help, or entirely reduce, the need for human active monitoring.

Its advantageous characteristics are:

**Characteristics**
- Autonomous Energy Supply
- Long battery run-time
- Possibility for solar power usage
- Advanced computer vision algorithms
- Operation at night illumination
- Communication in a wireless sensor network

**Applications**
AISViS can be utilized in a wide range of activities including security and vigilance, science/education, quality control of production, etc.

**Surveillance for Public Security**
- Identification of intruders in zones with restricted access
- Banks, schools, airports, hospitals
- Public events (football matches, concerts, strikes)
- Identification of suspicious objects in airports, government buildings, etc.
- Traffic and accidents

**Nature Surveillance**
- Surveillance against natural disasters (fire, floods, hurricane, volcanoes)
- Wildlife (endangered and close to extinction species, night fauna, etc)
Specific Features:

Software highlights

✔ Self-calibration in accordance with the light conditions and position of sight
✔ Intelligent – advanced computer vision algorithms, object identification, classification, location, tracking
✔ Rich data of identified objects: categorization (human, vehicle, animal, etc), speed, direction of movement, color, size, behavior

Security zone prioritizing

✔ User-defined security zones of surveillance
✔ Green zone - no danger for the security of the perimeter
✔ Yellow zone – there are objects identified as potential threats for the security
✔ Red zone – alert for security zone penetration

Command center

✔ Collects data from several AISViS cameras
✔ Artificial intelligence module for decision making
✔ Wireless sensor network management software
✔ A convenient map representation allows for centralized surveillance of large areas.

Technical Specifications

✔ High camera sensor resolution: 1 to 2 Mpixels
✔ Sensitive in low illumination
✔ Viewing angle: optional - 90 degrees, 45 degrees
✔ Possibility for autonomous or centralized usage
✔ Operation temperatures: - 40, +80 degrees Celsius
✔ Size: 350 x 300 x 100 mm
✔ Weight c.a. 3 kg.
✔ Autonomous life on battery: approximately 30 days
✔ Possibility for solar energy usage to extend autonomous operation time

Contents of the package:

✔ AISViS autonomous camera,
  Mounting kit,
  ✔ Spare battery,
  ✔ Battery charger,
  ✔ Software CD,
  ✔ Printed user’s manual.
Seismic Radar

General Information
Seismic Radar is developed, designed and produced by IMSETHC in the frame of Centre of Excellence “Anti-Terrorist Advanced Systems” for the purpose of perimeter security and/or protection of critical infrastructures. The main idea is to recognize between human penetration/intruders, vehicles and/or occasional events in given territory. Moreover, the product can be used as a part of surveillance system. However, the design of the seismic radar allows functioning as a single autonomous application or as a integrated part of multidevicesystem and can be successfully applied for different kind of terrains and soils. The ultra low power consumption of the product offer very long operational life using power supply with Lithium-Thionyl Chloride (Li-SOCl2) batteries from 3.6 V to 12 V.

Application Variants
The seismic radar can be applied for a variety of missions from force protection, to perimeter surveillance or as a part of warning system around: Oil-or gas pipelines against unauthorized cutting. Army or civil camps in a harsh environment and hostile territory. Etc...

Technical Data:
- The seismic radar can be delivered with 3.6 V (5500 mAh), up to 12V (7000 mAh) (Lithium-Thionyl Chloride (Li-SOCl2) battery) battery depending on the customer requirements;
- Initial establishment time is from 1 to 10 min;
- Sensitivity to human steps (up to 50 m) and vehicle (up to 100 m);
- Several adaptive software algorithms for different terrains and soils;
- Human steps from artificial activity (e.g. vehicle) recognition;
- Single event detection;
- Determination of relative distance to the sensor (about 5m, 20 m, 50 m, and 70 m);
- Reliability of the recognition methods more than 85 %;
- Ambient/Operating temperature: -30 °C to + 70 °C;
- Waterproof -IP65 (Water resistance);
- Electromagnetic shielded;
- Chemical resistance;
- Self-health-checks with sending data about the charge of the battery and environmental temperature.
3. OBSTACLE COMPLEX AGAINST INTRUSION OF TRESPASSERS

MAIN PURPOSE
The complex is intended for protection of key infrastructure objects, e.g. roads, oil pipelines, borders, electric installations, military camps, elements of the logistic support, against unauthorized infantry intrusion.

The complex is deployed for security and protection in areas and facilities that are prepared in advance and is intended for operation during a comparatively long time in regions of different climate. The deployment is carried out manually, thus enabling to arrange to means precisely and to provide optimal operation conditions. The means for non-lethal impact are rubber damage elements.

OPERATION
Within the deployment area, sensors to warn for possible intrusion of trespassers are arranged, which simultaneously provide the necessary information for autonomous operation of the non-lethal impact means.

The impact means are activated by the operator of the system after the object/intruder refused to retreat or to stop advancing within the secured area.

The complex is controlled remotely. All impact means can be reloaded for multiple uses.

ADVANTAGES OF THE SYSTEM
The main advantages of the complex are: capability for 24-hour mode; automatic warning; frustration of violation intrusions through autonomously operating impact means; multi-strip building of the security area; clearly outlined boundaries of the complex.

THE COMPLEX CONSISTS OF:
- **EXECUTIVE DEVICES**
- **Five-barrel module** for non-lethal impact with jumping charges. The module is activated remotely and ejects ammunition containing rubber fragments, which is initiated at 0.8 m height and covers damage area of 15 m diameter. The module is reloadable for multiple uses.

- **Fragment charges for non-lethal impact**. Stationary ammunition Claymore type containing rubber fragments. The ammunition is remotely controlled and inflicts damages within area of radius
up to 25 m. The grenade is activated at 1 m height and ejects the fragments, which scattered in circular sector area at height from 0.3 m to 4 m from the ground.

- **SYSTEM FOR IDENTIFICATION OF TRESPASSERS AND CONTROL OF THE IMPACT MEANS**

  - **Induction sensor.** It is arranged in road sections and warns for possible presence of magnetic items, e.g. weapons, and motor vehicles at distances: in radius from 2 to 2.5 m – for human with equipment; in radius from 8 m to 10 m – for low speed motion of light automobiles; in radius from 14 m to 15 m – for motion of trucks.

  - **Vibration-acoustic sensor.** It is arranged along the perimeter of the secured object. Detects, analyzes and recognizes the signals and warns for presence of possible intruders at distances: in radius up to 50 m – for motion of single intruder; in radius up to 100 m – for motion of light automobile. The sensor reliably operates on the background of different jamming, e.g. wind, rain, etc.

  - **Electric and mechanical sensor.** Consists in thin two-wire cable arranged along the perimeter of the secured area for warning upon breaking by pedestrian of mechanized intruders.

  - **RS-L wireless radio-wave intrusion sensor.** Detection of pedestrian intruders and land vehicles by variations of the electromagnetic field. Installed on three types of mounting devices depending on the task: a quickly deployable tripod, clamp for mounting on trees and clamp for mounting on a fence. Consists of two units: receiver and transmitter, between which magnetic field is formed. The receiver and transmitter are adjusted via radio channel. The length of the RS-L detection zone of pedestrian intruder and a vehicle is from 3 m to 200 m, depending on the proximity of the transmitter and receiver installation. Height of the detection zone - from 1.6 m to 1.8 m. Width of the detection zone - from 1.5 m to 3.5 m, depending on the proximity of the transmitter and receiver installation.

- **SYSTEM FOR CONTROL.**

The system employs standard communication protocol and module architecture. The possibility to join new modules imparts flexibility for resolving optional tasks depending on the customer's demand and self-adjusting routing during transmitting data on the network depending on the visibility and proximity of the particular modules.

The module architecture also enables easy initial adjustment, testing and operation (observation and control) of the specific network or network of systems. The applied software has an easy and user-friendly interface. It keeps record for the actions of the operator, displays the information on the linked geographic map, or layout, or satellite photo of the area.
Security of oil-or gas pipelines against unauthorized cutting

APPLICATION VARIANTS

Development of detection barriers along existing enclosures and fences
4. COMPLEX FOR PREVENTION AGAINST PEDESTRIAN VIOLATORS

MAIN PURPOSE

The complex is intended for protection of critical infrastructure such as roads, oil pipelines, boundaries, electric installations, camps, etc. elements of logistic support against unauthorized infantry invasion.

The complex is deployed for security and protection of areas or objects prepared in advance and are intended for relatively long term operation in various climatic conditions. The deployment is carried out manually, thus enabling precise deployment of the means and achieving optimal conditions for their operation. The means for non-lethal impact kinetic shots with rubber damaging elements are used. The lethal means consist mainly in using kinetic shots with metal damaging elements, e.g. fragments. All means for impact may be reloaded for multiple uses.

COMPONENTS OF THE COMPLEX FOR PREVENTION AGAINST PEDESTRIAN VIOLATORS
DEPLOYMENT OF THE COMPLEX IN THE AREA

ANALYSIS AND VISUALIZATION OF THE DATA
II. ADDITIONAL ANTI-TERRORIST MEANS

1. COMPOSITE ARMORS

1.1 Solid plates for personal armor protection

The solid plates for protective vests, level IV according to NIJ 0101.04, consist of ceramic components, polymer backing plate and packing (Fig. 1). Different in material and shape ceramic components are used (Fig. 2 and Fig. 3).

1.2 Composite armors for light armored vehicles

The developed armors for light armored vehicles are in two lines – for protection against kinetic small-gage projectiles and for protection against shaped charges.

Fig. 1 Solid plates for protective vests, level IV according to NIJ 0101.04

Fig. 2 Ceramic components used by protective vests

Fig. 3 Ceramic components used by protective vests
2. HAND GRENADES

2.1 TEAR GAS GRENADE TYPE “LA-G”

2.2 UNDERWATER GRENADE

2.3 FLASH & SOUND HAND GRENADES TYPE “LS – G”

4. MEANS FOR EXPLOSIVE NEUTRALISATION

BLAST INHIBITION DEVICE TYPE “LV”

SYSTEM FOR SAFE NEUTRALISATION OF IED’s
III. SYSTEM FOR SECURITY AND PROTECTION OF HARBORS

MAIN PURPOSE

1. Reconnaissance, surveillance, detection, identification and early warning through static and spreading nets and complexes of sensors.

2. Prevention and destroying by means of:
   - Barriers against small vessels and divers;
   - Means for lethal and non-lethal impact.

3. Techniques to reduce the vulnerability of the vessels in the harbors.

GENERAL VIEW OF THE SYSTEM FOR RECONNAISSANCE, SURVEILLANCE, DETECTION, IDENTIFICATION AND EARLY WARNING
GENERAL VIEW OF THE PROTECTION SYSTEM

1. MODULE “SURVEILLANCE, DETECTION, IDENTIFICATION, EARLY WARNING”

Sector sonar SON-7

Sonar for circular observation SON-30
2. MODULE “PREVENTION AND DESTROYING”

COUNTERMEASURE MEANS OF LETHAL IMPACT

Remote controlled explosive device “BWE”

Remote controlled protection charge MEP-2RC

Mobile rocket grenade launcher
COUNTERMEASURE MEANS OF NON-LETHAL IMPACT

AUTONOMOUS MOBILE PNEUMATIC SYSTEM

PROTECTION NET (FROGMAN) - “ANT-25/2”
IV. HYDRO ACOUSTIC SYSTEM “MIDA”

PURPOSE
In answer to the pressing global need for reliable harbor protection and underwater port security, the CoE ATAS has developed a comprehensive Harbor Surveillance System (MIDA) that reliably provides the long distance underwater passive acoustic watch functionality against surface ships and submarines. The MIDA is a Hydro-acoustic System which is used for building sensor barriers enabling observation of the surrounding water area for presence of surface or underwater vessels and their tracking through the hydro acoustic sounds transmitted on the background of the sounds generated by the sea motion. The system is very effective in identification of the possible presence of a submarine in the "shadow" of an incoming friendly ship.

The modular design of the system allows easy configuration changes and, if necessary, the installation of a number of arrays to adapt to variations in water depth, Sound Velocity Profile characteristics and other geographical constraints.

The technology is used is on the base of IMS experience of more than 40 years.

STRUCTURE
The system consists of coastal station and stationary hydro acoustic devices. One coastal station is capable to receive and analyze the information transmitted from 32 stationary hydro acoustic devices.

OPERATION
The specialized hydro acoustic receiver receives and analyzed hydroacoustic signals from vessels in the range from 200 Hz to 10 kHz on the natural sea noise background. It is deployed at 30 m depth depending on the relief of the surrounding area.

KEY ADVANTAGES
MIDA is designed to be adaptable to the constraints of each specific harbour protection requirement with stress above:

Adaptability. The system proposed is designed in such a way that compatible variants can be proposed to secure further harbour configurations as required by the customer in the future, with common supply, training and support benefits.

Proven products and technology. CoE ATAS security systems are designed for the very high reliability needed to permit continuous 24 hour surveillance over long periods with low maintenance.

Low manning cost as the level of automation reduces operator numbers to the minimum.

Simple use. The system is very easy to operate; it includes a user-friendly Man Machine Interface that helps the operator quickly to evaluate any threat and to initiate effective and timely action. The probability of false alerts is consequently very low.

KEY FIGURES:
- the functionality of the System is preserved up to 5 wind forces (in bad and foggy weather);
- long range detection;
- localisation capabilities, using multiple array information and precise target motion analysis;
- one man operation;
- automatic recognition and tracking functions;
quick pre-classification functions for identification the possible threat in an intense naval activity area, classification capabilities, discriminating between surface ships and submarines.

**OPERATION OF THE SYSTEM**

**COMPONENTS OF THE SYSTEM**
V. SYSTEM FOR SECURITY AND PROTECTION OF AIRCRAFTS

REDUCING HELICOPTER VULNERABILITY AGAINST ROCKED PROPELLED GRENADES

VISUALISATION OF SUCCESSFUL TEST RESULTS