PIAP

Industrial Research Institute
for Automation and Measurements PIAP

DEFENCE AND SECURITY SYSTEMS

PRODUCTS 2014 / 2015

Polish National Police Calendar 2013 (photo: Michał Drabikowski)

www.antiterrorism.eu www.piap.pl/en

Dear Sirs and Madams,

I am very glad to hand you over the brand new issue of "PIAP DEFENCE AND SECURITY SYSTEMS products 2014/2015". In this publication we present highly specialized robots, which are manufactured at the Industrial Research Institute for Automation and Measurements PIAP. We are the first and the biggest producer of high quality mobile robots for counter-terrorism applications in Central Eastern Europe.

PIAP was founded 50 years ago and for all the decades it has gained experience in such fields as: automation, industrial robotics, rehabilitation robotics and mobile robotics. PIAP has outstanding experience in coordination of international and national R&D projects.

Nowadays army, police, fire brigades and other forces responsible for public security, crisis management and civil protection face new challenges such as threat of crime terrorism (related to the activities of criminal groups) and local political terrorism (such as the IRA in Ireland, Kurdish terrorists in Turkey, Basque terrorists in Spain). State-of-the-art solutions such as EOD equipment must integrate the newest technologies available on the market. In response to these needs PIAP has specialized in mobile robotics for last 15 years.

Our mission is to protect life and health of those who are responsible for security and defense. Therefore, we make every possible effort to ensure that tailored to their needs solutions developed in PIAP demonstrate the highest quality.

Please feel invited to have a look at the examples of our solutions. I do believe they will inspire you to find out more about opportunities of cooperation with PIAP.

Jan Jabłkowski, PhD, eng.

Director of Industrial Research Institute
for Automation and Measurements PIAP

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About us

Industrial Research Institute
for Automation and Measurements PIAP

- ✓ Among Top ten Polish Research Institutes
- ✓ Supervised by the Ministry of Economy
- ✓ The biggest producer of high quality mobile robots for counter-terrorism applications in Poland

Producer & R&D hub:

- ✓ Mobile robots for security & defense,
- ✓ Mobile robots for industry,
- ✓ Automatization of production and assembly lines,
- ✓ Industrial robots for specific purposes,
- ✓ Special equipment for police, army and civil protection services,
- ✓ Equipment for rehabilitation and first aid,
- ✓ Special solutions for automation of processes,
- ✓ Research for SMEs.

Support activities for automation industry:

- ✓ ***AUTOMATICON***® annual tradeshow & technical conference,
- ✓ Editor of two journals – PAR and JAMRIS,
- ✓ Industry training Awarded in Poland, Europe and worldwide for the technical expertise within the robotics field.

Technologies

Autonomy & tele-operation

Comprehensively tested autonomy systems for mobile robots.

Ability to avoid obstacles and plan global paths and local trajectories.

Advanced obstacles navigation system tests in progress, as well as behavioral model of the robot.

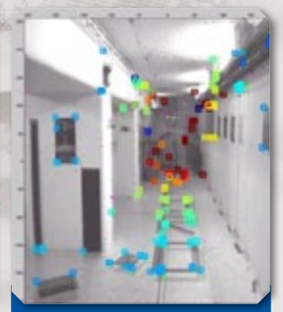


Image Processing

Machine vision for industrial robotics – commercial implementation.

Image processing for autonomous robots in indoor use cases.

Ensures smooth motion recognition and analysis.

High mobility robot systems

Mobile platforms for operations in difficult and diverse terrain (including sand, rocks).

Ensures smooth motion on stairs and good grip in difficult terrain.

Manipulation & gripping

Manipulators with six degrees of freedom.

Range more than three meters, able to lift up to 60 kilograms.

Allows for precise gripping and manipulation of hazardous devices.

HMI & MMI

Modular software for remote control of mobile robots.

Allows to control more than one mobile system.

Independent from platform, possibility to implement on dedicated personal computer, laptop or tablet.

ATX technologies

Certificated systems able to work in methane atmosphere.

Implemented in mobile robots dedicated for operating in mines under risk of explosion and fire.

Samplers

Environmental samplers, that can be used as additional robot equipment.

Samplers allow picking small quantities of liquid or soil, as well as filtering air in order to acquire airborne particles.

Shock-Proof electronics

Electronic subsystems resistant to mechanical shock.

Able to withstand impact of a fall from 9 meters.

Implemented in commercial mobile devices for reconnaissance.

PIAP GRYF®

EOD/IEDD mobile robot

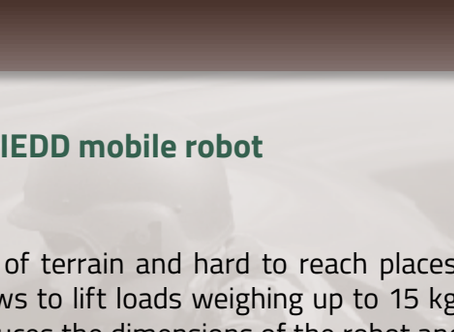
PIAP GRYF® is a robot used for reconnaissance of terrain and hard to reach places. The manipulator with 5 degrees of freedom allows to lift loads weighing up to 15 kg. Robot's wheels can easily be removed, which reduces the dimensions of the robot and thus facilitates missions in tight spaces.

Owing to the applied drives, the robot smoothly overcomes uneven terrain and obstacles up to an angle of 45°.

The robot is characterised by excellent manoeuvrability. Low weight makes it easy to transport and carry the robot, and its modular design allows for quick and easy change of additional equipment.

Main features of PIAP GRYF®:

- ✓ Open area or objects inspection and reconnaissance,
- ✓ Lifting and carrying objects of up to 15 kg,
- ✓ Neutralization of explosives, e.g. by using a disruptor or other technical devices,
- ✓ Possibility to perform CBRN reconnaissance with additional accessories (e.g. chemical sensors).



Technical data

No	Parameter	Value
1	Weight of the robot	38 kg
2	Weight of control panel	12 kg
3	Width	59 cm
4	Width without wheels	46 cm
5	Length	69 cm
6	Length with front caterpillars	90 cm
7	Height	45 cm
8	Maximum speed	3.6 km/h
9	Manipulator's maximum lift	15 kg
10	Number of degrees of freedom (manipulator)	5 + clamp of gripper, in addition to a manually adjustable telescopic arm
11	Control system	radio / fibre optic
12	Maximum range (open area)	up to 800 m

PIAP GRYF®

Snow and Sand EOD/IEDD mobile robot

PIAP GRYF® Snow and Sand is a Remotely Operated Vehicle designed for operations in harsh environment such as loose snow or sand.

Modified traction system is characterized by reduced unit pressure on the ground, which results in better driving capabilities on loose ground. At the same time, a sensitive caterpillar tensioner and a cleaning system ensure that snow and sand do not clog up the chassis.

Main features PIAP GRYF® Snow and Sand:

- ✓ Able to move in soft snow, sand and wetland,
- ✓ Navigates gravel roads without fear of damage to the caterpillars as a result of a stone getting in the traction system,
- ✓ Overcomes obstacles such as stairs with more stability.

Technical data

No	Parameter	Value
1	Weight of the robot	38 + 1 kg
2	Height	540 mm
3	Length	660 mm
4	Width	440 mm

PIAP GRYF®

2-Speed Gearbox

PIAP GRYF® 2-Speed Gearbox is dedicated to activities which require fast travel time to remote places of events in conjunction with high torque traction.

A model with increased mobility. Owing to the use of a gearbox, the operator has at his disposal two characteristics of a robot's operation corresponding to two completely different robots. It is a unique combination of strength and speed.

Main features of PIAP GRYF® 2-Speed Gearbox:

- ✓ Overcoming ascents with an angle of 45˚ with full and excess load,
- ✓ Quick access to the place of the event in second gear (approaching speed),
- ✓ Improved precision of control in first gear (operating speed),
- ✓ Ability to drag objects with a mass of 60 kg or more (depending on the ground),
- ✓ Ability to tow a carAbility to carry heavy loads of approx 100 kg.

Technical data

No	Parameter	Value
1	Weight	38 kg + 4 kg
2	Maximum speed on second gear	8 km/h
3	Maximum pulling force on first gear	> 600 N

PIAP SCOUT®

small robot for reconnaissance

PIAP SCOUT® is a robot designed for quick reconnaissance of field and places difficult to access, i.e. vehicles' chassis, places under seats in means of transportation, narrow rooms or ventilation ducts.

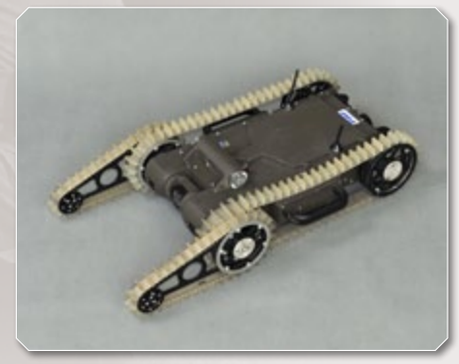
The robot PIAP SCOUT® basic moving assembly consists of hybrid system (tracks-wheels), but if necessary, moving wheels can be dismantled.

Solid construction with small dimensions, small weight and dynamic driving system provides high maneuverability and high speed of the robot (7 km/h).

Additional handle for devices (recoilless disrupter, video recorder, chemical sensors, RTG, fibre optic cable with roller) mounted to the robot's mobile base, could significantly broadened its scope of applications.

Main features of PIAP SCOUT® robot:

- ✓ Small robot dimensions enable swift inspection of hard to reach areas and rooms.
- ✓ The robot wheels are easy to dismantle. This allows for a limitation of the robot's overall dimensions and operation in spaces that are hard to reach.
- ✓ The very low robot weight enables its transport in a typical military knapsack.
- ✓ Thanks to the drives used, the robot efficiently travels across area unevenness and obstacles of inclination angle up to 45°.
- ✓ Modular structure of the robot enables easy and swift replacement of any additional equipment.
- ✓ The robot is able to carry with its manipulator loads of up to 5 kg.
- ✓ Optional use of optic fibre transmission enables the robot's operation at significant distances, even in an environment with a high electromagnetic noise level.



Technical data

No	Parameter	Value
1	Weight (with battery, manipulator and main camera)	27.5 kg
2	Weight of control panel	12 kg
3	Width with wheels	54 cm
4	Width without wheels	40 cm
5	Length	60 cm
6	Length+front caterpillars	75 cm
7	Height	20 cm
8	Maximum speed	7 km/h
9	Manipulator's maximum lift	up to 5 kg
10	Control system	radio / fibre optic
11	Maximum range (open area)	up to 800 m

EXPERT

neutralizing and assisting robot

EXPERT mobile robot is a device designed to carry out operations in means of transport. The robot is equipped with a gripper, able to reach nearly 3 meters.

Main features of EXPERT robot:

- ✓ The design of the robot reconciles two conflicting features: small mobile base allows manoeuvring in tight spaces, and three meter long manipulator allows lifting objects from hard to reach places.
- ✓ Front tracks (remote control of tilt angle) ensure stability of the structure during surmounting high obstacles and stairs.
- ✓ Foldable lateral stabilizers enable solid lock of the mobile platform, what allows safe lifting of considerable loads and precise operation of the robot manipulator even during maximum lateral reach of its arm. Stabilizers can be dismounted what makes the mobile platform 8 cm thinner.
- ✓ Range of the manipulator with the gripping device amounts to 2.9 meters. Exceptionally long reach of the upper arm allows inspection of space both at the level of overhead lockers for passenger luggage and under passenger seats.
- ✓ EXPERT is equipped with 6 color cameras placed on the gripper, at the back and front of the robot and on the manipulator (the main camera which may be turned completely around by 360° and 90° up and down) and two on the sides of the front tracks, what enables the inspection of, e.g. place under seats.
- ✓ Control system of robot enables to control all of its drives at the same time.
- ✓ Auto diagnosis system constantly checks if there are any faults and shows special warnings on an supplementary LCD screen.
- ✓ Most of the robot's and manipulator's cables are routed inside the structure, thus reducing the risk of damage.

Technical data

No	Parameter	Value
1	Dimensions	88/47/78 cm (length/width/height)
2	Weight	197 kg
3	Maximum time of operation on battery power supply	up to 8 hours
4	Climbs stairs of maximum tilt	30^0
5	Remote control	radio/cable
6	Radio transmission (control data)	digital
7	Method of data protection	spread spectrum and/or encoded
8	Radio transmission (vision)	analogue
9	Maximum range (open area)	up to 800 m
10	Cable (control, vision, battery charge)	- cable length: 100 m - cable roll-up device - cable runner mounted on the robot

IBIS®

robot for pyrotechnic operations and reconnaissance

IBIS® is a robot designed for pyrotechnic operations and reconnaissance. Upon installation of additional devices, it can be used, among others, for disposal of dangerous objects, chemical detection and rescue operations.

High speed of the robot enables dynamic actions. Robot's manipulator provides a range of activities and applications. Precision drive system ensures fluidity of the movement of every part of the robot, at any speed.

Main features of IBIS® robot:

- ✓ High speed of the robot (10 km/h),
- ✓ Mobile platform with six-wheel drive,
- ✓ Each wheel is powered with independent drive,
- ✓ Wheel arms used in robot's suspension, provide very good grip even in difficult terrain,
- ✓ High lifting capacity of the robot's arm (30 kg unfolded arm, 50 kg - folded arm),
- ✓ The range of manipulator with gripper: over 3 m,
- ✓ Possibility of remote control by fiber optic cable,
- ✓ Robot's control system enables independent and simultaneous steering of it's every drive,
- ✓ Auto diagnostic system detects all faults,
- ✓ The robot is compatible with different additional equipment: pyrotechnical disrupters, automatic shotguns, chemical and radioactive contamination sensors, bus bar for remote detonation of explosives, barbed wire cutters, drills, recording devices and weaponry of every caliber.

Technical data

No	Parameter	Value
1	Weight	300 kg
2	Width	88 cm
3	Length	135 cm
4	Height	125 cm (with folded arms and antennas)
5	Maximum speed	10 km/h
6	Activation time	max. 2 s
7	Number of degrees of freedom	6 + clamp of gripper
8	Manipulator base rotation range	400^0
9	Lower arm rotation range	200^0
10	Upper arm rotation range	220^0
11	Telescopic arm linear motion	0.5 m
12	Wrist rotation range	220^0 (±110)
13	Gripper jaws rotation range	unlimited
14	Gripper jaws opening range	0 – 36 cm
15	Manipulator's maximum lift	50 kg
16	Manipulator maximum reach	vertically: 3.3 m, horizontally 2.2 m
17	Operator's control panel weight	12 kg
18	Control system	radio / fibre optic
19	Battery operation time	approx. 4 hours
20	Maximum range (open area)	up to 1000 meters

INSPECTOR

robot for inspection and intervention

INSPECTOR is used for operations in urban terrain. It is a device designed primarily for work related to explosive ordinance disposal. Due to its construction, the robot can also be used for inspection, various types of work in dangerous or risky areas or for demining with countercharges as well as for antiterrorist activities, scouting and reconnaissance.

Main features of INSPECTOR robot:

- ✓ Considerable pulling force of the robot allows it to tow or push vehicles weighing up to 1,500 kg,
- ✓ Front tracks (remote control of tilt angle) increase traction abilities, longitudinal stability and enable smooth motion on stairs, as well as highly uneven terrain,
- ✓ The manipulator of INSPECTOR robot is designed to lift objects weighing up to 60 kg,
- ✓ The turn of the manipulator's base amounts amounts to 400°,
- ✓ Constant spatial orientation of the object placed in the gripper, irrespective of the movement of other manipulator arms, enables precise handling of hazardous devices,
- ✓ Control system of the robot enables to control all of its drives at the same time,
- ✓ A program for automatic folding of the manipulator down to a transport position speeds up and makes it easier to prepare the robot for transport.

Technical data

No	Parameter	Value
	Mobile platform	
1	Dimensions (with folded arm)	171 / 67 / 114 cm (length / width / height)
2	Weight	550 kg
3	Time of robot's operation when powered by batteries	up to 4 hours
4	Climbs stairs of maximum steepness	35^0
5	Remote control	radio / cable
6	Radio transmission (control data)	digital
7	Radio transmission (vision)	analogue
8	Maximum range (open area)	up to 1000 m
9	Cable (control, vision, battery charge)	- cable length: 100 m - cable roll-up device - cable runner mounted on the robot

RMF ROBOT

This upgraded version of IBIS® robot was developed in Proteus project. This is robot for complicated pyrotechnic and fire fighting missions. It has full digital communication with fast on-site reconfiguration capabilities. It was designed in PIAP open architecture approach which give him possibility to fast, mission oriented tools and sensors reconfiguration (plug and play). It has two main tool families: pyrotechnic devices and fire fighting devices. Proven on three continents IBIS® mechanical suspension give him high terrain and manoeuvre ability. For fire fighting actions in high temperature robot has water shielding ability. New, digital control panel give more configuration elasticity and is significantly lighter than old one. RMF is on prototype level in final test campaign. It will be commercially available in 2015.

Main features of RMF robot:

- Digital communication (up to 1.5 km range),
- Improved IBIS mobile platform (speed up to 12 km/h),
- Improved lifting and manipulation capacity,
- Improved control panel – controller preferences and mission oriented GUI,
- Improved situational awareness - map, manipulator safe configuration watch-dog,
- Improved sensors usage,
- New tools for fire fighters: C and RN sensors , thermo camera, fire nozzle, rescue tools,
- Water shielding ability.

RMI ROBOT

RMI is 70-kg fast, intervention unmanned ground vehicle. It is fist PIAP construction with wide usage of carbon fibber composites. Those new, airborne materials leads to significant improvements of robot performances and usability/mass coefficient. Robot has digital and easy reconfigurable communication. With mission oriented architecture it could be equipped on-site with dedicated tools and sensors. Its flexible suspension give him ability to work in-door and out-door environment. RMI use the same control panel as RMF. It could be for recon, explosives neutralisation, rescue or CBRN missions. RMI is on prototype level in final test campaign. It will be commercially available in 2015.

Main features of RMI robot:

- Digital communication (up to 1.5 km range),
- Flexible mobile platform (stairs climbing, good terrain movement ability, high manoeuvre in-door),
- Lifting capacity up to 30 kg, 2 m range manipulator,
- Improved control panel – controller preferences and mission oriented GUI,
- Improved situational awareness - map, manipulator safe configuration watch-dog,
- Improved sensors usage,
- Negotiation set.

TRM®

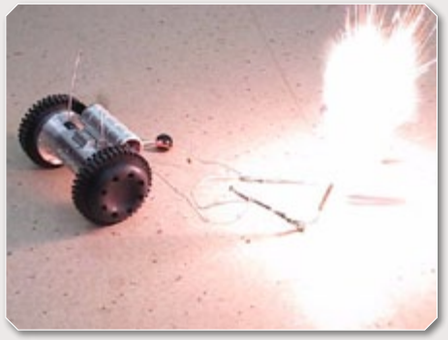
Tactical Throwable Robot

TRM® is a small robotic device designed to deliver support for operations in difficult to access and dangerous places. It has been designed in response to the threats faced by forces responsible for public safety during area and objects reconnaissance.

TRM® can be thrown into a building or to an open area and steered by remote control in order to perform an inspection from a safe distance.
The construction of TRM® is designed to withstand the impact produced by a fall from up to 9 meters.

Main features of TRM® robot:

- ✓ Open area and objects inspection and reconnaissance,
- ✓ Possibility to transmit sounds produced in the robot's immediate area,
- ✓ Possibility to work in different light conditions,
- ✓ Possibility to cast light on targets and dangerous objects,
- ✓ Additional devices and accessories can be adapted to the robot (e.g. flash bangs, smog, teasing grenades),
- ✓ Up to 3 devices can be steered from one control panel.



Technical data

No	Parameter	Value
1	Weight (basic version)	1.4 kg
2	Additional load weight	0.16 kg
3	Weight of control panel	7.8 kg
4	Maximum speed	3.1 km/h
5	Maximum climbing angle	25 degrees
6	Drop height	< 9 m
7	Range within buildings	≤ 30 –100 m
8	Range in open areas	≤ 120 – 150 m
9	Basic equipment	camera, microphone, LED
10	Materials used in the robot's structure	duralumin alloys, rubber, steel
11	Operation time on battery	≈ 1 h
12	Control panel working time on battery	≈ 4 h
13	Number of devices operated from one control panel	≤ 3
14	Robot dimensions (W x L x H)	205 x 167 x 190 mm
15	Control panel dimensions (W x L x H)	360 x 304 x 194 mm
16	Transport case dimensions (3 robots)	546 x 347 x 196 mm

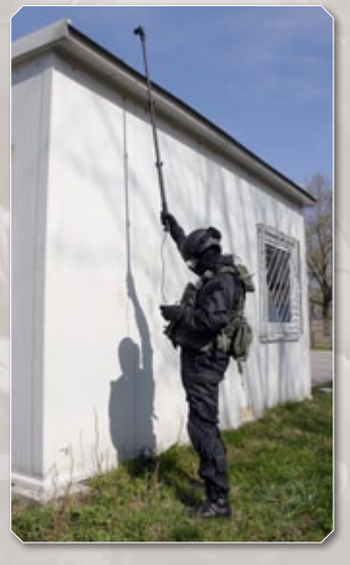
EXPLORER

inspection device camera with telescopic boom

EXPLORER inspection device is a camera with telescopic boom dedicated to a wide range of use: inspection of difficult to reach and high risk tight spaces, vehicles and suspicious packages, protection and object inspection and support of counter-terrorist operations.

EXPLORER device in standard version consists of the following elements:

1. Telescopic boom, with continuous adjustment range from 0.45 to 1.57 m.
2. Tele-operated inspection camera, with 180° angle of sight, equipped with strong LED illuminators and integrated output socket for fast connection of the camera to the telescopic boom.
3. Visualisation module, consisting of:
   - ✓ LCD,
   - ✓ Camera illuminator switch,
   - ✓ Camera motion control,
   - ✓ LED scale of the battery charge level,
   - ✓ Video In/Out sockets (RCA connector, enables image recording with an external recorder – available in additional equipment set),
   - ✓ Power source – Li-Ion battery Canon BP-941/BP-945 (integrated with the display's casing, the connection enables fast battery change),
   - ✓ Canon BP-941 / BP-945 battery charger.
4. Carrying case or bag, for the device and accessories.



ADDITIONAL EQUIPMENT:

- ✓ Additional telescopic booms of diferent length and aplications, e.g.: long boom or adjustable angle boom,
- ✓ Spare battery,
- ✓ Digital recorder (can be used to record the video from EXPLORER device camera),
- ✓ Sun-protection casing,
- ✓ Additional lens.

Technical data

No	Parameter	Value
1	Battery life (continuous operation)	approx. 2.5 h
2	Length of the standard telescopic boom	continuous adjustment 0.45 m - 1.57 m
3	Length of the additional long boom (optional)	operational length – 4.10 m folded – 1.15 m
4	Mass of the elements: – Standard telescopic boom – Additional long boom – Visualisation module	 0.45 kg with camera 1.35 kg with camera 1.15 kg with battery
5	Sensitivity of the colour inspection camera	0.35 lux
6	Focal length of the standard lens	3.6 mm
7	Available/additional lens (optional)	2.5; 2.9; 3.6; 4.0; 4.3; 6.0 mm
8	Display resolution	320 x 234
9	Display size (diagonal)	5”
10	Power	7.2 V
11	Output signal	PAL (no audio)
12	Operating temperature	-10°C to +50°C
13	Operating humidity	below 60%
14	Transport and storage temperature	-30°C to +50°C
15	Transport and storage humidity	≤ 60%
16	IP Code of the elements: - Camera with servomechanism - Camera without servomechanism - Visualisation module	 IP54 IP54 IP54

SPECIAL PURPOUSE VEHICLES

Our mission is to provide our customers with the best-fit solutions. This is also true with regard to special vehicles. We are able to deliver state of the art technologies from various fields integrated with vehicles from SUVs to heavy trucks. Our innovative and experienced team is able to carry out a full development process: starting from sketch, through research, development and manufacturing, to a ready to operate system. The more challenging the project the more satisfaction for us.

We specialise in creating sophisticated systems which others can't do. Example scopes of our products:

- ✓ EOD vehicles,
- ✓ CBRN reconnaissance vehicles,
- ✓ Surveillance and covert vehicles,
- ✓ Mobile operation centre,
- ✓ Mobile robot operator centre,
- ✓ Mobile X-Rays and security checkpoints,
- ✓ Fast response vehicles,
- ✓ ... and many others.

VEHICLE's TECHNOLOGIES

Multisource flexible continuous electric power supply

In every vehicle we are using patent pending technology of effective, continuous electric power supply for on-vehicle equipment. Thanks to this innovation we are able to provide low-noise, high-power, unbreakable system even for very demanding equipment.

Onboard video recording

We have experience in providing specialized vision systems for monitoring vehicle surroundings, long-distance surveillance and supporting driver in critical environmental conditions.

Specialized equipment loading and fastening

In our vehicles, we introduce proprietary solutions for loading and fixing carried devices and equipment, paying special attention to safety concerns.

Digital communication

The vehicles can be additionally equipped with various kinds of communication systems (also in the licensed band). In addition we are able to integrate radio control systems for devices from other companies.

PIAP V_{EOD}

EOD vehicle type VMA1

Basic tool for bomb squad technician. Versatile transporter, comfortable base, always in the centre of action.

The vehicle allows to carry a mobile robot with all the equipment necessary to counteract risks associated with explosives. The interior is designed to transport EOD tools of different sizes and configurations. The vehicle provides space for rest and preparation of documentation. Innovative multi-source electric power supply system gives energy independence in the place of action. The vehicle may be equipped with warning lights and a siren. Configuration of the vehicle can be arranged according to client requirements.

Dimensions and weight:

- ✓ Max gross weight 5 t
- ✓ Max load capacity 1.6 t
- ✓ Length 7 m
- ✓ Height (unladen) 2.8 m

Workshop:

- ✓ Shelves, cabinets and drawers with quick and easy fastening system to carry the EOD equipment,
- ✓ Robot fixing system for fast and easy securing of the robot to avoid moving during transport,
- ✓ Single man operated ramp for easy loading of the robot,
- ✓ Automatic electric step for easy entry,
- ✓ Workbench with multi input monitor.

Electric power supply and distribution

- ✓ Innovative multisource power system supplied from:
- ✓ vehicle engine,
- ✓ external 230 V AC power source (possible auxiliary generator),
- ✓ on-board batteries,

is able to switch current consumption continuously between available sources.

Lights

- ✓ The vehicle is equipped with operational LED lights designed for efficient support of operators duties (roof panel lights, interior light bars, floodlights, side work lights).

PIAP V_{MOC}

Mobile Robot Operator Centre type VLC1

Vehicle designed to carry three mobile robots with the all necessary equipment and to provide comfortable workplace for their operators.

This medium chassis truck called Mobile Robot Operator Centre is equipped with devices for rapid loading and unloading of robots, portable lightweight robot operator consoles and the system of communication and data exchange with possible other participants of rescue operation. Innovative multi-source electric power supply system based on an on-board generator gives energy independence and allows work in silent mode on batteries. Configuration of the vehicle can be arranged according to client requirements.

Dimensions and weight:

- ✓ Max gross weight 12 t
- ✓ Max load capacity 2.2 t
- ✓ Length 8.3 m
- ✓ Height (unladen) 3.2 m

Features:

- ✓ Rear hydraulic ramp for the medium and large robots and side ramp leading to isolated chamber for small-size robot,
- ✓ Robot fixing system for fast and easy securing of the robot to avoid moving during transport,
- ✓ The mobile console can be docked into operator station increasing functionality and comfort of work,
- ✓ Additional station for the commander/radio operator,
- ✓ Communication system allows connection with other units and the Internet in many different ways: wire, fibre wire and wireless – including GSM and satellite service,
- ✓ Observation system placed on top of the pneumatic mast is equipped with daylight and thermal camera to look at the place of action from a different angle.

Innovative, multisource electric power supply and distribution system supplied from:

- ✓ on-board generator,
- ✓ external 230 V AC / 400V AC power source,
- ✓ on-board batteries,
- ✓ vehicle engine.

is able to switch current consumption continuously between available sources.

PTZ units

Surveillance units produced in PIAP can be used wherever there is a need for a reliable, often mobile solution, which ensures that the task will be accomplished despite adverse conditions. Each of them can be equipped with the most popular types of cameras, in particular daylight and thermal cameras. The units presented below are based on state of the art technologies providing parameters unique to the market while maintaining reasonable price.

Light-weight PTZ unit

The miniature surveillance system depending on version can be fitted with a single daylight camera or dual daylight and thermal vision system, that allows operations even in poor visibility condition.

Main features of the system:

- Low weight and small dimensions allow to use this system in a mobile application: AGV, UAV, mobile robots,
- High speed pan-tilt unit,
- Possibility of unlimited pan and tilt rotation,
- Precise control of the pan-tilt unit owing to backlash-free direct drive,
- LED Illuminators with focusing and diffusing lens provide adequate illumination depending on the distance from the observed objects.

Miniature Surveillance System

	Daylight camera only	Daylight and thermal camera
Dimensions (L × W × H)	120 × 105 × 190 mm	160 × 105 × 190 mm
Weight	1.8 kg	2.1 kg
Maximum speed of pan-tilt unit Pan Tilt	 85°/s 85°/s	
Daylight camera		
Resolution	HD 720p (1280 × 720)	
Optical zoom	28×	
Angle of view (horizontal)	55.9° @ f = 3.5 mm to 2.1°@ f = 98 mm	
Image stabilization	YES	
Thermal camera		
Sensor resolution	384 × 288	
Sensor pitch	25 µm	
Sensitivity (@ f/1.0)	NEDT < 85 mK	
Angle of view	Horizontal 65.2°, Vertical 51.3°	

Mobile surveillance unit

Nearly 2.5 km range of human heat signature makes this mid-sized surveillance unit a champion in its class. The unit has been designed with care for improved mobility and ad hoc use. It can also be mounted on vehicles or used with fixed infrastructure. Owing to the modular design it can be produced in many variants differing in video and control interfaces as well as power supply.

Main features of the system:

- Mobile (handheld) rugged system,
- 2 axis gyro-stabilization,
- Multiple options for video and control interface,
- Option for multisource redundant power supply.

Thermal performance

Sensor type	640 x 480 Focal Plane Array uncooled detector
FOV	6.3° x 4.7°
Sensitivity	NEDT < 100 mK
Daylight imaging performance	
Resolution	800 x 600; 540 TVL
FOVs	horizontal from 33.4° to 2.1° continuous
Sensitivity	up to 0.0014 lux@F1.2/20IRE
Pan - Tilt unit	
Azimuth range	+/- 190°
Elevation range	+40° / -20°
Presets resolution	+/- 30'
Image stabilization	YES
Overall features	
Weight	17 kg
Dimensions (L x W x H)	360 x 350 x 270 mm

Long range surveillance unit

In cases where it is necessary to observe at very large distances, the most important is the precision. Extremely high accuracy and stability of the camera positioning, achieved in the mechanism of this unit, leads to effective supervision of targets even at several kilometers. It is excellent base for surveillance system which can be equipped and tuned in according to customer's requirements. The unit can be installed on fixed or mobile mast and used for large area monitoring or supervision of inaccessible objects.

Main features of the system:

- Multiple options available (internal recorder, stabilization, rangefinder etc.),
- Ultra precise, backlash free mechanism,
- Wide range of focal length,
- Ultra low-light EMCCD, thermal, IR cameras are available.

Example specification (not maximum values)

Pan - Tilt unit	
Azimuth range	+/- 230°
Elevation range	+/- 15°
Pan resolution	0.002°
Tilt resolution	0.0008°
Rotation speed	up to 20°/s
Daylight imaging performance	
Resolution	658 x 496; 450 TVL
FOVs	horizontal from 14.5° to 0.125° continuous
Sensitivity	up to 0.00025 lux@F1/50IRE
Signal to noise ratio	55 dB
Overall features	
Weight	aprox. 45 kg

PROTEUS

“Integrated Mobile System for Counterterrorism and Rescue Operations” has been national research project founded under Operational Program Innovative Economy, 2007-2013 with kind support of European Development Found. The main technical aim of this project is design and validate technology demonstrator (TRL6) of crisis management system for police and fireguards. Consortium which has been developing this project consist from seven scientific and technology partners. PIAP has been project coordinator.

Proteus implements two main functional concepts. First was to develop innovative command and control subsystem for rescue intervention – software which performs those function is integrated on Mobile Control Canter. Second was to prepare set of new rescue tools like three dedicated UGV, system integrated sensors which feed control subsystem and UAV for fast recon and situation awareness. Main technical challenge of this project was to integrate data from several sources into command subsystem.

Project co-financed by the European Union from the European Regional Development Fund under the Innovative Economy Operational Programme, 2007-2013

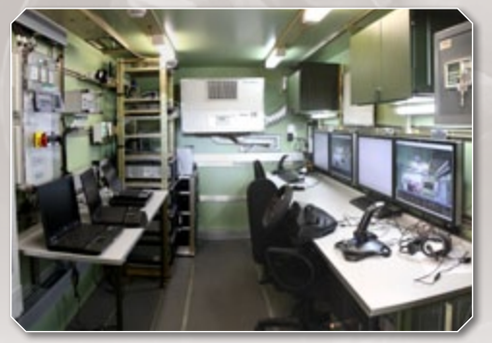
All Proteus components were integrated into system in 2012. Verification on test range took place in 2013. Element and system level test were done. For final testing scenario Proteus performed command and intervention role in simulated C-threat invent. Test range verification allow to make several integration system upgrades and modifications. Final demonstration of Proteus system technical capabilities took place in September 2013. In 2015 commercialisation phase of Proteus project products will begin.

PROJECT ELEMENTS:

- **Mobile Command Center** – car equipped with field communication and C&C module
- **Mobile Robot Operator Center** – please find detailed description on page **29**
- **MRM robot** – this is small robot for recon mission in CBR scenarios. MRM has chemical shielding and liquid/soil sampling ability.
- **RMI robot** – please find detailed description on page **21**
- **RMF robot** – please find detailed description on page **20**
- **UAV** – 50 kg class autonomous airplane with IO and fire sensors
- **Robot support set** – universal sensors and tolls collection of more than ten pieces which could be easily assemble on UGVs in field environment

Project co-financed by the European Union from the European Regional Development Fund under the Innovative Economy Operational Programme, 2007-2013

Autonomous Patrol for Land Border Surveillance system – TALOS was an international research project co-funded by the European Commission (EC) under the 7th Framework Programme in Security priority. The project was aimed at designing, implementing and field-testing a technology demonstrator of an adaptable and transportable border surveillance system.



Innovative concept behind the project was that the different sensors, allowing to detect people, vehicles and hazardous substances crossing the unregulated land border, are carried by unmanned vehicles (both ground and aerial) having a high degree of autonomy.

TALOS project was executed under the leadership of PIAP by the experienced research teams from industry, R&D and academia from 10 different countries: Belgium, Estonia, Finland, France, Greece, Israel, Poland, Romania, Spain and Turkey.

The Project ended up in May 2012 having a successful demonstration of its results during the live-in-field presentation in April 2012, in Poland.

Research in TALOS

TALOS system was based on a concept of unmanned units able to autonomously perform both the navigation and surveillance tasks, under the supervision of the Border Guard officers. Therefore, its three core components are: the UGV (Unmanned Ground Vehicle) subsystem, UUCC (Unmanned Units Command Centre) subsystem and the Communication subsystem. Unmanned Air Vehicle (UAV) and transportable Sensor Tower, as originally a part of the system architecture, were simulated in this phase of the project, but shall be integrated with the system in future. The main research that has been done over the four years of project works was upon the following areas:

UGV

- ✓ Autonomous technologies, i.e.: vehicle mapping and localisation
- ✓ Navigation with and without GPS
- ✓ Artificial Intelligence / expert systems in vehicle decision making
- ✓ Dynamic vehicle path planning
- ✓ Low Level Vehicle Control
- ✓ Sensor fusion (Video, Radar, Laser)
- ✓ Payload management

Command&Control

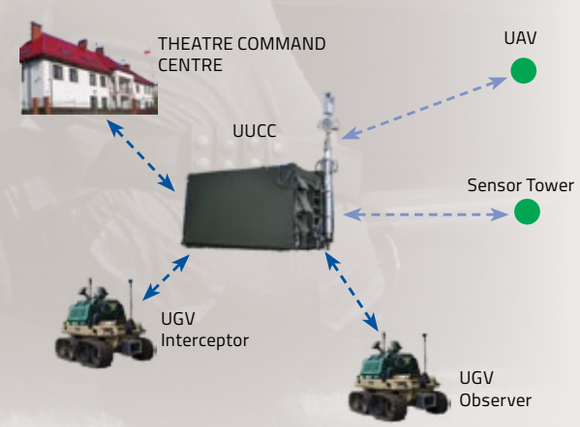
- ✓ Common operational picture, using data from various unmanned systems
- ✓ Mission Planning activities for various unmanned systems
- ✓ 3D Map / Terrain Model generation from different sources

Communication

- ✓ Communication systems and technologies (including MESH, WiMAX)
- ✓ Combination of new networking protocols

TALOS system demonstrator

The TALOS system demonstrator contains of two UGVs and one UUCC. The vehicles are able to operate simultaneously, based on the same mobile platform, and differentiated with regard to the vehicle's function. First UGV (Observer), as designed for the performance of the surveillance and detection missions (preset patrolling route and observation tasks), is equipped with the specialised surveillance sensors (including the Doppler radar and the observation camera, with a FLIR capability and the automatic video tracker (AVT)). The second vehicle (Interceptor) is intended for interception of the suspicious objects (individual, vehicle etc.) and to follow it until the manned Border Guard patrol will arrive to intervene. In case of a need the communication with the tracked intruder is possible via the interrogation system.



Both UGVs are equipped with high and low level computers, enabling the platform steering and sensors data transfer; as well as the specialised navigation devices (including precise GPS, INS and 3D laser scanners) for autonomous driving.

Unmanned Units Command Centre has been designed to allow an easy transport and deployment of the unit at the desired border section. Therefore, it has been placed within the standard 12 ft container.

TALOS Partners

No	Partner	Country	No	Partner	Country
1 (Coordinator)	Przemysłowy Instytut Automatyki i Pomiarów – (PIAP)	Poland	8	Defendec – (DF)	Estonia
2	ASELSAN Elektronik Sanayi ve Ticaret A.S. – (ASELSAN)	Turkey	9	Société Nationale de Construction Aérospatiale – (SONACA)	Belgium
3	European Business Innovation & Research Center S.A. – (EBIC)	Romania	10	STM Savunma Teknolojileri Mühendislik ve Ticaret A.Ş. – (STM)	Turkey
4	Hellenic Aerospace Industry S.A. – (HAI)	Greece	11	Telekomunikacja Polska SA – (TP)	Poland
5	Israel Aerospace Industries – (IAI)	Israel	12	TTI Norte S.L. – (TTI)	Spain
6	ITTI Sp. z o.o. – (ITTI)	Poland	13	Technical Research Centre of Finland – (VTT)	Finland
7	Office National d'Etudes et de Recherches Aérospatiales – (ONERA)	France	14	Warsaw University of Technology – (WUT)	Poland

PIAP's business offer

Industrial Institute For Automation and Measurements PIAP is the first and largest producer of cutting edge mobile robots for counter-terrorism applications in Poland and Central-Eastern Europe. Our EOD gear is designed for army, police, fire brigades and other forces responsible for public security, crisis management and civil protection.

We are a cutting-edge company active on the international market of robotics.
We believe that only collaboration with other entities will ensure outstanding performance of our products and services.

PIAP's products and services are always tailored to the end-user requirements.
We gear up our products with additional accessories, which are often constructed according to the end-user's needs. For the most demanding customers, we design new products in line with the future user.

Regardless of whether you want to acquire a single product or a number of products – PIAP will meet your needs.

PIAP is ready to partner with all companies and public bodies in R&D projects in the following fields:

- ✓ C-IED and EOD operations,
- ✓ Border and infrastructure protection,
- ✓ Reconnaissance and remote observation
- ✓ Convoys and patrols escort,
- ✓ Surveillance and patrolling,
- ✓ Crisis management,
- ✓ SAR (Search and Rescue) operations.

Contact details

Industrial Research Institute for Automation and Measurements PIAP
Defence and Security Systems Marketing and Sales Department

Aleje Jerozolimskie 202
02-486 Warsaw, POLAND
Tel. (+48 22) 874 03 26, (+48 22) 874 03 43
e-mail: mds@piap.pl

We are pleased to invite you to visit our website (www.antiterrorism.eu) where you can find more information about our company and its offer as well as familiarize yourself with already executed projects. We do hope to do business with you.