





Mobile Command
Centre



Mobile Robot
Operator Centre



Personal
Sensors Sets (PSS)



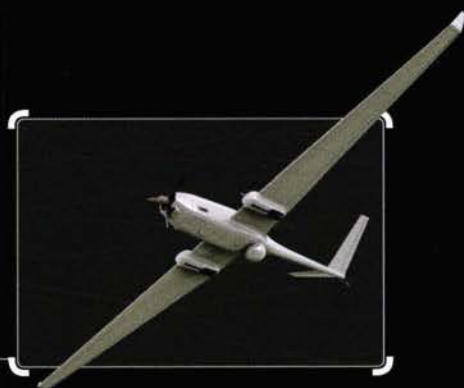
Large
Mobile Robot



Mobile
Robot Simulator



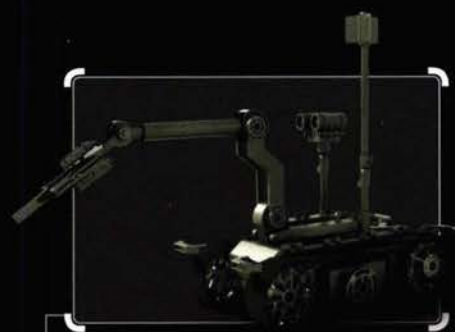
PROTEUS SYSTEM COMPONENTS



Unmanned
Aerial Vehicle (UAV)



Small
Mobile Robot



Medium
Mobile Robot



WWW.PROJEKTPROTEUS.PL

The Proteus Consortium

The Proteus Project is conducted by a consortium of leading scientific research centers under the leadership of Industrial Research Institute for Automatic and Measurements.



Industrial Research Institute for Automation
and Measurements



Space Research
Centre PAS



Scientific and Research
Centre of Fire Protection



Institute of Electronic
Materials Technology



Poznan University
of Technology



Warsaw University
of Technology



Military University
of Technology

- Institute of Radioelectronics
(The Faculty of Electronics and Information Technology)
- The Department of Automation
and Aeronautical Systems
(The Institute of Aeronautics and Applied Mechanics)
- The Division of Theory of Machines
and Robots (The Institute of Aeronautics
and Applied Mechanics)
- Materials Design Division
(Faculty of Materials Science)



PROTEUS SYSTEM

The Proteus Project is an integrated modern system designed for counterterrorism and rescue operations.

Overcoming technological barriers and integrating the innovative solutions from the field of robotics, the Proteus system will set a new standard in crisis and security management.

Technological and operational requirements of the Proteus system were defined with cooperation with potential future users, for example: The Police, The State Fire Service.

The Proteus system will consist of combined and cooperating elements that will guarantee effectiveness in almost every kind of crisis threat. Project is intendend to finish in 2013.



MOBILE COMMAND CENTRE

>> The mobile centre for command of operation

>> Rapid decision process owing to analytical systems for aiding the analytical tasks

>> Complete picture of situation in real time

>> Elaborate autonomous communications systems





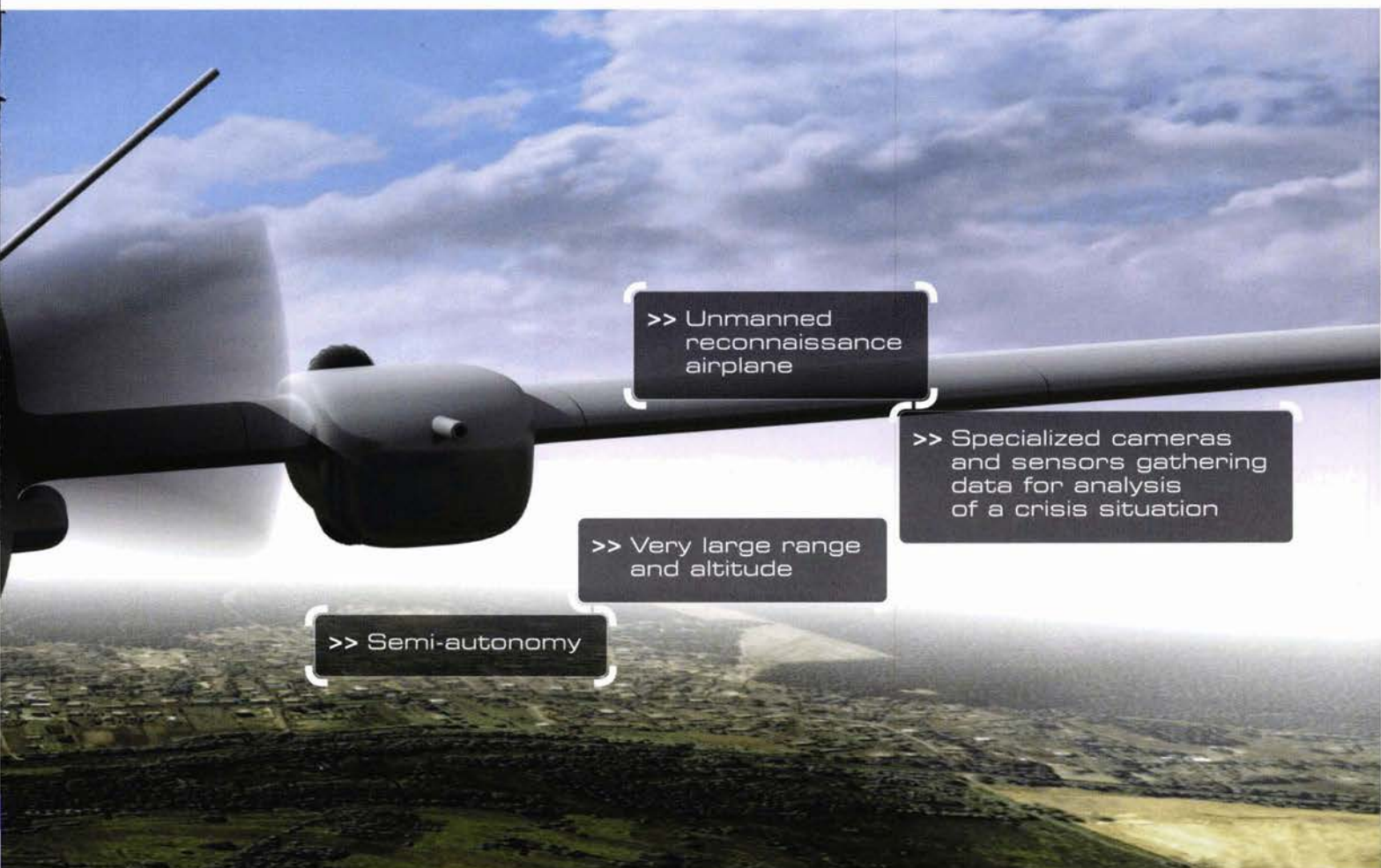
A cutting-edge command centre, mounted on a truck chassis, equipped with a range of solutions from the fields of telecommunications and information technology also taking advantage of satellite techniques. This is where is performed processing and analysis of data provided by the remaining Proteus components such as an unmanned aerial vehicle or mobile robots. As a result, the Mobile Command Centre will function as a hi-tech mobile system for data acquisition, processing and distribution, being an integral element of the complex system of unique functionality.

- A vehicle allowing unfolding a cutting-edge stand-alone command post near the operation site
- Communications systems that guarantee effective cooperation with the remaining system components and other units participating in action, and provide communication with stationary command staffs.
- IT solutions to provide the person in command with the best possible environment for situation assessment, including elements of virtual reality
- Access to external databases and expert systems which facilitate evaluation and forecasting of situation development to aid the process of decision making
- The expert system featured with multi-criteria analysis of a situation



UNMANNED AERIAL VEHICLE (UAV)





>> Unmanned
reconnaissance
airplane

>> Specialized cameras
and sensors gathering
data for analysis
of a crisis situation

>> Very large range
and altitude

>> Semi-autonomy

The task of the unmanned aerial vehicle will be observation and gathering of data from regions under threat, and their transmission to the Mobile Command Centre. It will be equipped with a specialized head incorporating: video camera, thermovision camera, laser distance meter, lighting and an innovative flame sensor. Also mounted on-board will be embedded computers for flight control and recording flight parameters, as well as for picture analysis which will enable recognition of vehicles and their tracking. The unmanned airplane will be a semi-autonomous unit - owing to the capability of moving along a prescribed flight path it will not require continuous supervision from an operator, nor his prior training in pilotage.

- Wing span: 6.2 m
- Length: 2.85 m
- Maximum take-off mass: 40 kg
- Flight duration: 8 h (combustion engine)
- Travel speed: 100 km/h
- Maximum altitude: 4000 m
- Minimum size of a landing zone: 50 x 50 m (catapult take-off, parachute landing)
- Communication range: up to 50 km
- Equipped with optical head with day-light (36 x zoom) and thermovision cameras



SMALL MOBILE ROBOT



>> A small robot for reconnaissance purposes

>> Innovative locomotion system enabling negotiation, e.g. of high stairs

>> Equipped with cameras as well as devices for taking samples in solid, liquid and gaseous state of matter





Collapsed spaces and rubble, areas exposed to threat of chemical or biological contamination are the places at which life and health of rescuers is especially put in danger. Therefore within the Proteus Project will be developed a small-size mobile robot dedicated to inspection of hardly accessible places, enabled by an innovative locomotion system based on four independently driven caterpillars. The robot will be also equipped with a specialized device for collecting samples of soil, liquid or air from the operation site to be subsequently carried to a laboratory for analysis.

- Innovative caterpillar-based locomotion system allowing movement in difficult terrain and negotiation of obstacles of height up to 0.5 m.
- Robot mass: 55 kg.
- Dimensions: 90 x 58 x 30 cm (L x W x H)
- Possibility of on-board installation of sensors, including the device for sampling soil, liquids and air
- Equipped with video cameras and a thermovision camera



MEDIUM MOBILE ROBOT

>> A lightweight medium-size intervention robot

>>> Caterpillar locomotion system enabling movement in difficult terrain

>> A modular design to enable adjustment to action character (carrying loads or reconnaissance tasks)





Actions conducted by rescue and public security services often pose a risk of loss of health or even life to the directly involved persons. Therefore one of the robots included in the Proteus system will be an intervention robot. The robot will be capable of replacing or supporting a human at the most dangerous tasks, e.g., at neutralisation of explosive charges.

- Caterpillar drive system allowing motion in rough terrain and negotiation of kerbs and stairs
- Robot mass: approx. 65 kg
- Dimensions: 100 x 60 x 60 cm (L x W x H)
- Equipped with manipulator of 2 m range and maximum load capacity of nearly 28 kg
- Possibility of on-board installation of various sensors, e.g., the chemical sensor or explosive charges sensor
- Equipped with video cameras and a thermovision camera



LARGE MOBILE ROBOT



>> An intervention robot, the largest of robots in the Proteus Project

>> Large speed and flexible suspension to enhance mobility

>> Possibility of carrying loads of mass up to 40 kg

>> Possibility of reconfiguration and mounting of extra equipment, e.g. negotiation setup





This robot is the largest one of constructed within the Proteus Project. It will be capable of lifting and carrying loads of significant mass and size. High speed and the locomotion system ensuring outstanding mobility enable agile and quick operation in difficult unpaved terrain. Selected robot functions will be realized in the autonomy mode, e.g. moving from one place to another. This feature will make steering and operation of the large robot even more convenient.

- Special type of suspension to guarantee excellent mobility in rough and hilly terrain
- High maximum speed: above 10 km/h
- Robot mass: approx. 300 kg
- Dimensions: 150 x 90 x 100 cm (L x W x H)
- Autonomy module to assist in robot steering and operation or even replace an operator in some situations
- Equipped with foam based fire extinguisher (optional)
- Manipulator of high functionality, range of 2.5 m and maximum load capacity of ca. 40 kg. A replaceable tip of the manipulator for installation of various tools, e.g. metal shears



MOBILE ROBOT OPERATOR CENTRE

>> A high-mobility robots' transporter equipped with independent robot operators' consoles





To the site of action all robots will be carried by the Mobile Robot Operator Centre mounted on a chassis of a truck. The vehicle will be equipped with: devices for rapid loading and unloading robots', portable lightweight robot operator consoles and the system of communications and data exchange with the Mobile Command Centre.

- Innovative lightweight truck vehicle with high mobility
- Rear for medium large robots
- Side ramp for the small robot
- Stationary and portable robot operator consoles
- System of communications and data exchange with the remaining elements of the Proteus system



PERSONAL SENSORS SETS (PSS)

>> Localisation sensors
for people participating
in crisis-management
action

>> Complementary sensors
for monitoring the level
of direct threat of loss
of life



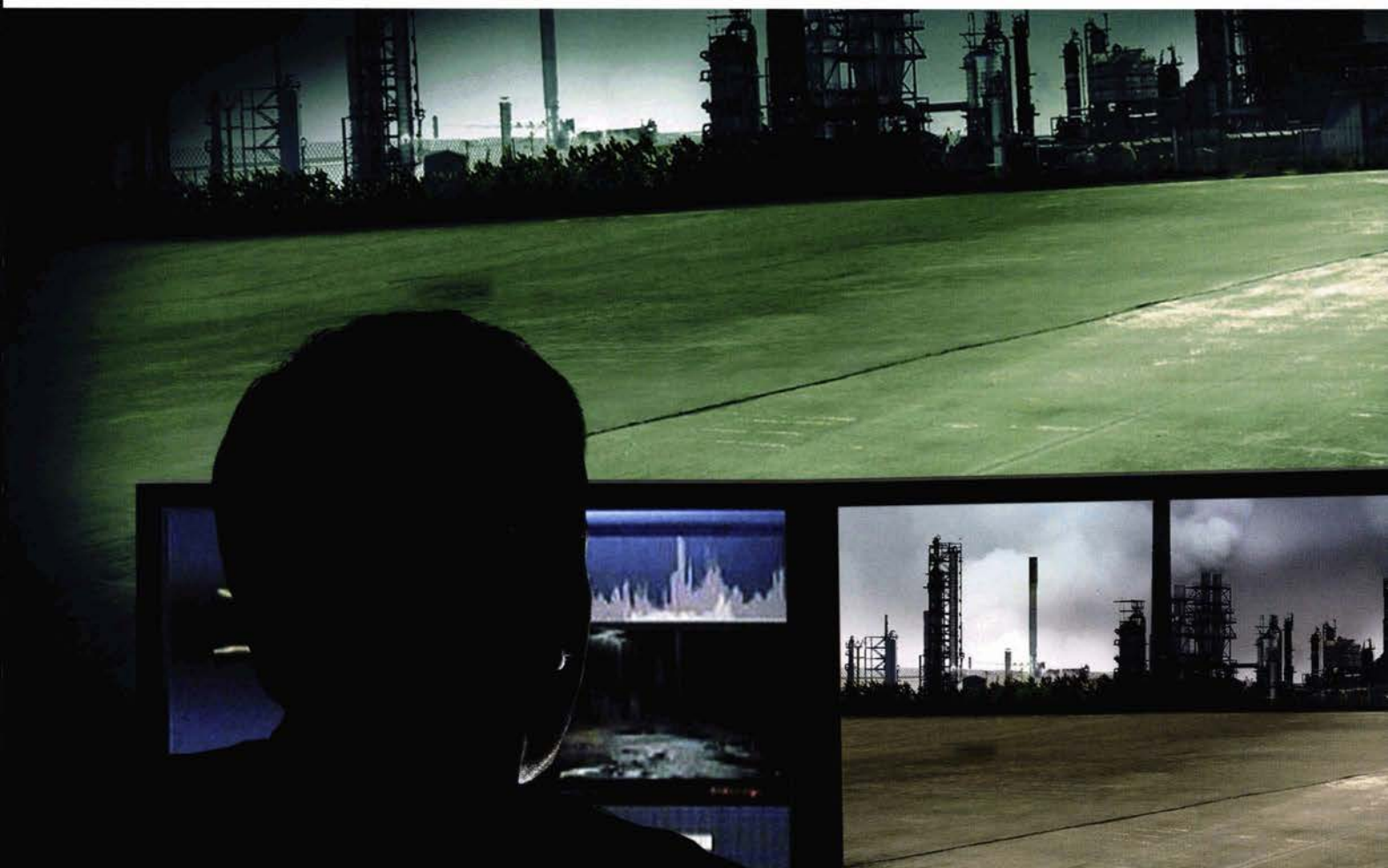


Personal Sensors Sets are radiotelephones equipped with localisation sensors as well as sensors for monitoring safety of people involved in action – heart-rate sensor, motion sensor, temperature and humidity sensor. Owing to them, rescuers' positions and working conditions will be presented graphically on a digital map in the Mobile Command Centre, enabling safe and effective management of available resources.

- Based on original equipment: Motorola DP 3600/3601
- Mass: 800 g
- Power Supply: NiMH Battery 1300 mAh and 4 R6[AA] NiMH Batteries 2650 mAh
- Operating time: min. 5 hours
- Operating temperature: - 30°C/+60°C



MOBILE ROBOT SIMULATOR



Industrial Research Institute for Automation and Measurements
The Institute of Aeronautics and Applied Mechanics of Warsaw University of Technology,
Tests: Scientific and Research Centre of Fire Protection



The Mobile Robot Simulator will play the role of a training and testing centre in the Proteus system. Owing to the visualisation solutions, the simulator will reproduce the operating environment of the robot with high fidelity. One of the most important simulator functions will be training of robot operators and their preparation for future operational actions in any conditions. The important tasks will also include aiding the design and development activities and performing simulation investigations of moving objects. Basic elements of the device will be a semi-spherical display supported with a three-channel visualisation system and the virtual model of the robot. The training station will be directly connected to the control panel of the instructor supervising on-line the process of training or testing.



COMMUNICATIONS



The main goal for the communications system developed within the Proteus Project is to guarantee effective and efficient methods of communication and data exchange. A well-developed system of communication is one of the most important aspects providing integrity of the whole system. The communications will be realized, among others, by means of radio (WiMax), satellite and GSM communications systems. Primary tasks of the developed communications system are:

- Providing communication between robots, robot operator consoles and the Mobile Robot Operator Centre (transmission of control commands, picture and data from robots' on-board sensors)
- Providing communication between the MCC and the unmanned aerial vehicle
- Catering for data transmission between the MCC and the Mobile Robot Operator Centre (exchange of information on robots' localisation, transmission of data from robot on-board sensors)
- Providing voice communication between all participants of an operation and collection of data from Personal Sensors Sets
- Providing broadband link to external networks allowing both use of diverse external knowledge sources and access to external telecommunications and state administration networks



SENSORS



Within the Proteus Project the sensors will be used including both the innovative authored solutions as well as solutions existing on the market. A novel solution is the "flame sensor", which will be mounted on-board the Unmanned Aerial Vehicle (UAV). By sweeping the region with its beam, the sensor will allow detection of the fire source and identification of type of the substance being burned. Another sensor developed within the Project is the chemical sensor enabling detection of dangerous gases. A unique solution of the Proteus system is the Universal Interface (UI).

It makes possible the installation of sensor of any kind on any robot, based on the "plug and play" principle.

This unlocks the possibility of unconstrained reconfiguration of the robot according to user needs.

In the Proteus system the following sensors will be available:

- flame sensor (UAV)
- chemical sensor
- explosive materials sensor
- radiological sensors for alpha, beta and gamma radiation
- laser distance measurement device
- video camera and thermovision camera
- directional microphone



**INNOVATIVE
ECONOMY**
NATIONAL COHESION STRATEGY

EUROPEAN UNION
EUROPEAN REGIONAL
DEVELOPMENT FUND



The Project is co-financed by the European Development Fund within the framework
of the Innovative Economy Operational Programme