



**CLUSTER**

Technological Support  
of Innovative Aeronautical Projects





Institute of Aviation - Coordinator (Instytut Lotnictwa)	6
Aero-Service - Jacek Skopiński	6
AIR-POL Ltd. (AIR-POL Sp. z o.o.)	7
AT-P Aviation Ltd. (AT-P Aviation Sp. z o.o.)	7
Becker Elektronic Polska Ltd. (Becker Elektronic Polska Sp. z o.o.)	8
Center of Maritime Technology (OBR Centrum Techniki Morskiej S.A.)	8
Eurotech Ltd. (Eurotech Sp. z o.o.)	9
Fusioncopter Ltd. (Fusioncopter Sp. z o.o.)	9
HORNET - Ireneusz Kramarski	10
Air Force Institute of Technology (Instytut Techniczny Wojsk Lotniczych)	10
Margański & Mysłowski Aircraft Factory (Margański & Mysłowski Zakłady Lotnicze)	11
Metal Master/Flaris Ltd.	11
P.W. METROL Dąbkowski Dariusz	12
MORATEX - Institute of Security Technologies (Instytut Technologii Bezpieczeństwa MORATEX)	12
MSP Innovative Technology	13
Warsaw University of Technology (Politechnika Warszawska)	13
Polish Society of Aeronautics and Astronautics (Polskie Stowarzyszenie Aeronautyki i Astronautyki)	14
Silesian Science and Technology Centre of Aviation Industry (Śląskie Centrum Naukowo-Technologiczne Przemysłu Lotniczego)	14
Military University of Technology (Wojskowa Akademia Techniczna im. Jarosława Dąbrowskiego)	15
Military Aviation Works No. 1 J.S.C. (Wojskowe Zakłady Lotnicze Nr 1 S.A.)	15
Military Aviation Works No. 2 J.S.C. (Wojskowe Zakłady Lotnicze Nr 2 S.A.)	16
Composite Structures Workshop - Andrzej Papiorek (Wytwórnia Konstrukcji Kompozytowych - Andrzej Papiorek)	16
Glider Factory „Jeżów” - Henryk Mynarski (Zakład Szybowcowy „Jeżów” - Henryk Mynarski)	17





The Cluster for Technological Support of Innovative Aeronautical Projects was created to stimulate pro-innovation activities in aviation and to facilitate Access to the modern research base for small and medium enterprises and science centres. The Cluster aims to develop and make available a research base for the needs of jointly realised projects, mainly in the area of robotisation of the manufactured aircraft structures, applied aerodynamics, space technologies (data processing, Earth observation from unmanned, manned aircraft and satellites, design and application of space structures, rocket engines supply systems, optimization of space structures for thermo-mechanical loads, rockets flight numerical simulations), research on piston and rocket engines, space technologies, and for the needs of General Aviation and unmanned aerial vehicles (UAVs).

The Cluster, with Institute of Aviation in its role of the Cluster Coordinator, will be overseeing the following activities:

- establishing cooperation between the cluster members to create opportunities for engaging in jointly realised projects,
- diffusing new technologies in the area of aircraft aerodynamic and structural design, robotisation, manufacturing and testing to meet the needs of General Aviation and Unmanned Aerial Vehicles (UAVs),
- activity expansion of space and satellite technologies
- developing jointly realised products and services,
- promoting innovation and new technologies to enhance competition,
- supporting initiatives connected with the development of the airport infrastructure and the research base for testing manned and unmanned aerial vehicles,
- defining technical and quality standards of products and services in the area of aeronautics,
- organizing and conducting training to enable managers and staff of the Cluster members to gain new competencies.

Currently, the Cluster comprises twenty three members including two higher education institutions (the Warsaw University of Technology and the Military University of Technology), three research centres (the Institute of Aviation, the Air Force Institute of Technology, Institute of Security Technologies MORATEX), an institution from the business environment (Polish Society of Aeronautics and Astronautics) and seventeen enterprises (the Military Aviation Works No. 1 J.S.C., the Military Aviation Works No. 2 J.S.C., the Silesian Science and Technology Centre of Aviation Industry, Margański&Mysłowski Aircraft Factory, Metal-Master/Flaris Ltd., Eurotech Ltd., MSP Innovative Technology, Composite Structures Workshop - Andrzej Papiorek, Aero-Service - Jacek Skopiński, Fusioncopter Ltd., Air-Pol Ltd., Becker Elektronik Polska Ltd., Hornet - Ireneusz Kramarski, Metrol Mielec, Glider Factory in Jeżów Sudecki, AT-PAviation Ltd. and Center of Maritime Technology).

### **Director of Center of Space Technologies**

Leszek Loroach, Ph.D. Eng.

Institute of Aviation

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**Center of New Technologies** - aerodynamics, avionics and systems integration, design and strength analysis of metallic and composite structures, systems, landing gears and shock absorption systems, composite technologies, vibration investigations and flutter analysis.

**Materials and Structures Research Center** - static testing, quasi-static fatigue testing, dynamic testing: high-cycle fatigue tests of structural components, vibration frequency analysis.

**Centre of Space Technologies** - aircraft propulsion, space technology, design and applications of space structures, rockets flight numerical simulations, optimization of space structures for thermo-mechanical loads, data processing,

adaptronics.

**Engineering Design Center** (GE Aviation, GE Energy, GE Oil&Gas) - design and improvement of components of aircraft engine systems, high power gas turbines, steam turbines. Design, analysis and maintenance of equipment utilised in the oil and chemical industries.

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**Aero-service - Jacek Skopiński**



Design and manufacture of ultralight metallic aircraft, CNC processing, welding aircraft components.

**Panda** - a 2-seater cantilever high-wing aircraft with a T tail. Technical data: Wingspan 8.91 m, Length 6.62 m, Height 2.32 m, Max. Take-Off Weight 472.5 kg, Payload 202.5 kg, Cruising Speed 190 km/h, Rate of Climb 6 m/s, Ceiling 3650 m, Range (with 45 min. reserve) 1200 km.

**Puma** - a 2-seater low-wing aircraft with a retractable landing gear.

Technical data: Wingspan 9.15 m, Length 6.27 m, Height 2.30 m, Max. Take-Of Weight 472.5 kg, Payload 182.5 kg, Maximum Horizontal Flight Speed 270 km/h, Cruising Speed 250 km/s, Ceiling 3650 m, Range (with 45 min. reserve) 500 km.

**CNC technology** - processing materials with a high-tech 3-axis CNC Router with the working area 3x2x0.2 m. Cutting, milling, engraving in plexiglas, PCV, wood, plywood, MDF plates, dibond and coloured metals.

**Aero-Service - Jacek Skopiński**

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[www.aero-service.com](http://www.aero-service.com)



## AIR-POL Ltd.



AIR-POL manufactures parachuting equipment and other aviation equipment.

Parachutes offered on a regular basis: rescue parachutes, air assault parachutes, trainer parachutes, braking parachutes, cargo parachutes, special purpose parachutes. AIR-POL also provides compensation and high altitude g-suits, wind sockets, weather vanes, harnesses and containers.

Made to order: paragliders (Albatros, Blackbird), field parachute rigging tables, bags, tow parachutes (AS-2, AS-3, AS-4, AST), fixed advertising balloons, personal rescue parachutes, personal reserve parachutes, personal air assault parachutes, personal trainer parachutes, special parachutes (unmanned, remote-controlled), deployment drogues, harnesses and containers, rescue systems.

### AIR-POL Ltd.

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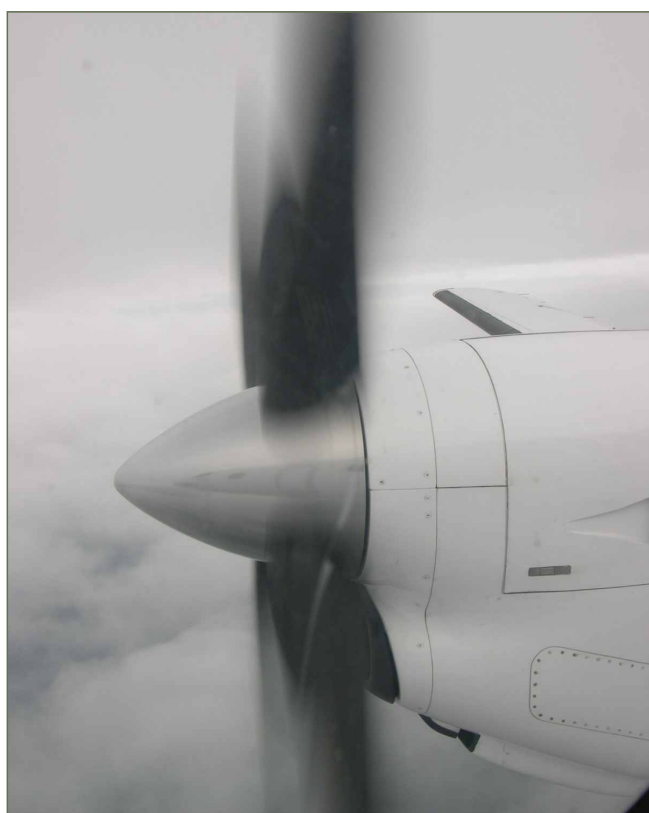
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## AT-P Aviation Ltd.



AT-P Aviation was created in 2010 by Tomasz Antoniewski. The company designs, manufactures and sells General Aviation aircraft.

Oriented to meet the needs of a higher and more innovative segment of the General Aviation market, AT-P is currently starting two projects co-financed by PARP and NCBiR:

- AT-6: a 4-seater twin-engined hybrid airplane with 3 lifting surfaces,
- AT-5: a 3-seater single engine complex airplane for advanced training with elements of spin.

Research and design works will lead to the registration of industrial design and patent rights.

Both planes are scheduled to be tested in flight by the end of 2015.

Currently, the company is focusing on design works at its site in Warsaw while prototype works are due to start mid year in Mielec.

### AT-P Aviation Ltd.

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Becker Elektronik Polska Ltd. is an Avionics Company, polish private SME established 1996. Our Business area is research, design, development, validation, testing and qualification for certification and production of electronics modules and equipments mainly for avionic CNS (Communication, Navigation, Surveillance) especially for:

- Software and hardware design, development and integration,
- Preparation of documentation for certification by an aviation authority and for production by customers,
- Software, Hardware and Tools Verification, Equipment and design results qualification according to recent avionic standards prior to certification by an aviation authority.

Our Domains are Airborne Communication Transceivers, Airborne Transmitters, Receivers, Surveillance Transponders for Mode-S and ADS-B, Radio Management Units, Airborne Computers, Control Panels, as well as Test Stations built around Communication Transceiver Core Modules, Transmitters and Receivers, Advanced Automatic Test Tools, Special Adapters and Interfaces.

**Becker Elektronik Polska Ltd.**

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www.becker-avionics.pl



**OBR Centrum Techniki Morskiej (Center of Maritime Technology)**



**Underwater Weapon Systems** - Hydro-acoustic and non-acoustic systems for detection and identification of mine like objects, systems used to neutralize sea mines and underwater weapons systems (mines, depth charges, etc.) as well as passive defense systems against sea mines and torpedoes. Sea mines and fuses; mine countermeasure systems.

**Maritime Infrastructure Protection Systems** to monitor under and above water situation in areas of critical maritime infrastructure. KRYL Mk3 - integrated, multi sensor system dedicated for monitoring marine, river and lake borders, critical sea structures and infrastructure.

**Testing and product certification - Research Laboratories** Electromagnetic Compatibility Laboratory, Vibroacoustics, Shock Resistance and Magnetic Fields Laboratory.

Command, Control and Communication Systems for tactical and operational levels of command for land establishments as well as for afloat and air platforms. Data exchange and fusion systems, simulators for operations at tactical and operational level as well as systems and equipment for radio communications - HF radio communication system. Main advantages of communication systems: NATO compliant, automatic link establishment, operation mode - frequency hopping.

**Center of Maritime Technology**

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Eurotech specializes in the design and manufacture of CUSTOM-MADE high-tech products and systems.

In the area of avionic technique Eurotech offers avionics and unmanned aircraft platforms:

**The MJ-7 Shogun Unmanned Platform**, an aerial target, is the main component of the Vermin System which provides a complete training environment for a fully developed command system of the Air Defense Forces. The Vermin makes it possible to simulate tactical situations using many targets at the same time.

**The E-310 Unmanned Platform** was designed to carry top-ranking surveillance sensors (both electro-optical and radar). The system is easy to operate and independent of the ground infrastructure (airports). The high configuration potential enables a wide range of applications by military users and other uniformed services. Basic parameters: mission duration – 8-12 h, payload – up to 20 kg, service ceiling – up to 5000 m, speed – 120-160 km/h, range of operation – up to 150 km, start – launcher, landing – with a parachute, landing gear.

#### EUROTECH Ltd.

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Fusioncopter was specially established for the purpose of conducting R&D works on a new type of a twin-engined autogiro with the payload increased to four people and MTOW over 1000 kg.

The objective is to develop an autogiro with a unique system of shortening its runway by means of simultaneous acceleration of the main rotor and the autogiro along the runway using the asymmetry of thrust of the two engines to compensate the torque of the main rotor.

The design will be based on a standard semi-monocoque metallic structure for the ease of calculations and construction and to simplify the certification procedure.

The skin will be made of composites. Certified aircraft engines and a number of subassemblies widely used in the aviation industry are planned to be used.

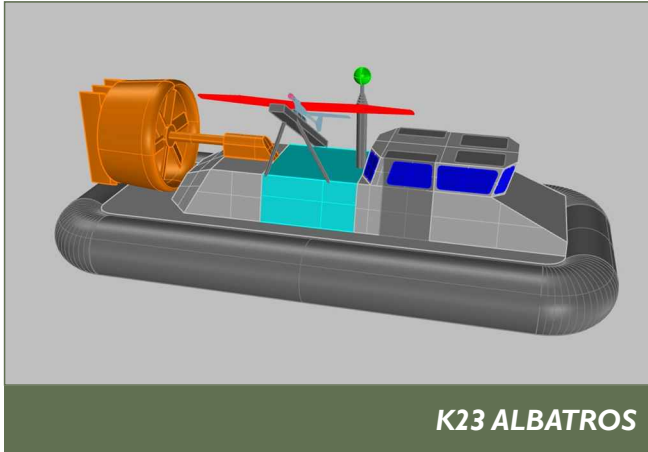
The project is co-financed by NCBiR under the Hi-Tech Programme. A number of Polish scientific and research centres will participate in the project.

#### Fusioncopter Ltd.

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02-748 Warsaw  
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## HORNET - Ireneusz Kramarski



**K23 ALBATROS**

Hornet specializes in designing, testing, manufacturing, conducting training devoted to as well as maintenance and repair of equipment utilising high-tech materials including textiles, composites and technical foils.

Established in 1994, Hornet keeps expanding into new areas of business, which include:

- parachute systems for unmanned aerial vehicles (e.g. the SUO parachute recovery systems for UAVs like the mini UAV Rybitwa),
- tethered aerostats equipped with observation heads,
- hovercrafts (e.g. Patrol-Reconnaissance Hovercraft K23 Albatros with the mini UAV Rybitwa).

Hornet is also a dealer of propellers made by Hoffmann Propellers.

### **HORNET - Ireneusz Kramarski**

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## Air Force Institute of Technology



The Institute is a research centre with a longstanding experience in providing scientific and research support for the exploitation of aviation technologies.

The Institute supports innovation in the following areas: design and integration of aeronautical and logistic systems, reliability and safety of aviation technologies, unmanned aerial vehicles/systems, integration of data transmission systems LINK-16, training methodologies including e-learning, air armament, airport and road infrastructure, fuels, working liquids and lubricants.

Hundreds of publications documenting its scientific and research achievements as well as experimental and design activity have brought the Institute international recognition for work conducted in the field of avionics systems integration for helicopters, recording and decryption of aircraft flight parameters, TURAWA - a comprehensive system for analysis and evaluation of flight safety used by Polish Air Force, SAMANTA - a computer system for the assessment of the aircraft exploitation process, diagnostic simulators using virtual techniques, aerial targets imitators - SZERSZEN, KOMAR, JET, and unmanned aerial vehicles - KOLIBER, NIETOPERZ, PSZCZOŁA.

To maintain high quality of products and services, the quality management system was implemented in compliance with NATO AQAP 21 10 and PN-EN ISO 9001. The Institute also has the NATO commercial and governmental entity code 048 I H, the licence issued by the Polish Ministry of Internal Affairs and Administration and the Internal Control System.

### **Air Force Institute of Technology**

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**KOLIBER**



**Avionics Systems Integration**

## Margański & Mysłowski Aircraft Factory



**ORKA** - a 4-seater twin-engined high-wing airplane with a retractable landing gear and pusher propellers. ORKA is adapted to VFR flights during the day and at night while planned to be adapted to IFR flights in the future. Technical data: Length 8.705 m, Height 2.585 m, Wingspan 13.50 m, Max. Take-Off Weight 1820 kg, Max. Range (with 45 min. navigation reserve) 1700 km, Max. Horizontal Flight Speed 261 km/h, Never Exceed Speed 359 km/h, Landing Speed 142 km/h, Fuel Consumption AVGAS 100 I l at 75% power 52 l/h.

**MDM-I FOX** - a 2-seater aerobatic glider. Technical data: Wingspan 14.00 m, Length 7.38 m, Height 2.25 m, Never Exceed Speed 282 km/h, Max. Empty Weight 530 kg, Max. G-Force +9/-6 g.

**MDM-I FOX P** - a 2-seater glider with detachable wing tips, in the aerobatic version - without wing tips, wingspan is 14 m, in the utility version - with wing tips the wingspan is extended to 16.15 m.



### Margański & Mysłowski Aircraft Factory

ul. Strażacka 60  
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#### Design Office:

ul. Górnicza 107  
43-502 Czechowice Dziedzice  
phone/fax: +48 32 784 15 00

e-mail: office@marganski.pl, www.marganski.pl

## FLARIS

## Metal Master/Flaris Ltd.

### Business Jet FLARIS LAR I

Designed by Andrzej Frydrychewicz and Rafał Ładzinski. Basic parameters: propulsion system - 1xPWC PW610F, static thrust 4 kN, avionics - System G600. Dimensions: Wingspan 8.68 m, Length 8.32 m, Height 2.43 m, Wing Area 10.0 m<sup>2</sup>, Max. Empty Weight 650 kg, Max. Take-Off Weight 1500 kg. Performance: Cruising Speed 700 km/h, Stall Speed 115 km/h, Ceiling 9000 m, Range 2500 km, Take-Off Run 250 m (including a grass runway), L/D ratio=18. Properties: detachable wings, rescue system, parachutes in the nose area, structure: carbon prepreps.

Main areas of business: manufacturing machines and devices (technological and transport production lines, transporters,

automated work stations, etc.), design and construction of technological equipment for aviation, design and manufacture of carbon prepreg structures, CNC cutting, metal sheet CNC processing, and steel constructions welding.

### Metal-Master/ Flaris Ltd.

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www.metal-master.pl  
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**Machining processes and machine tools:** CNC fabrication of elements for the aeronautical industry, either in single units or in series, of constructional steel and tool steel for heat and cold treatment, coloured metals alloys, titanium alloys, stainless steel, and plastic materials; manufacture of drums and special rollers.

**Tooling:** injection molds for plastic materials, permanent molds, progressive dies, core boxes, progressive stamping dies, tools for machining processes.

**Machine Park:** 5-axis CNC Milling Machines (e.g. CNC Milling Machine Matsuura, CHARMILLES ROBOFIL 300 wire EDM, CNC Mill Machine HECKERT, boring machine SIP ORLIKON, tooling mill machine BRIDGEPORT, standard miller NU420, band saw BOMAR 370).

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**MORATEX - The Institute of Security Technologies**



The Institute of Security Technologies MORATEX is a scientific organisation supervised by the Minister of the Interior.

The activity area: scientific research and developmental works in the field of developing the equipment and individual means of human life and health protection as well as implementing them to the practice. Developing the personal protection equipment: bullet-, fragment- and knife-proof vests, composite panels for them, bullet- and fragment-proof helmets, ballistic armour shields, armour for transportation means and for solid objects – i.a. selection of materials for armouring the helicopters, vehicles, elements of buildings etc.

The offer: recently developed textile ballistic composites of relatively low areal density, applicable ballistic resistance and low combustibility. Other advantages: no maintenance necessary, resistance to corrosion, abrasion, blows, chemical agents and water, UV radiation and variable environment conditions. The composites also are effective cover against radar and thermal vision.

MORATEX has the Laboratory of Ballistic Research accredited by Polish Centre for Accreditations and by Minister of National Defence within the scope of testing the ballistic properties of personal protection equipment, which secure the wearers from bullets, fragments and hitting by various types of objects. The Laboratory is equipped with the mostly modern research apparatus which allows for execution of ballistic and shock tests.

**Institute of Security Technologies MORATEX**

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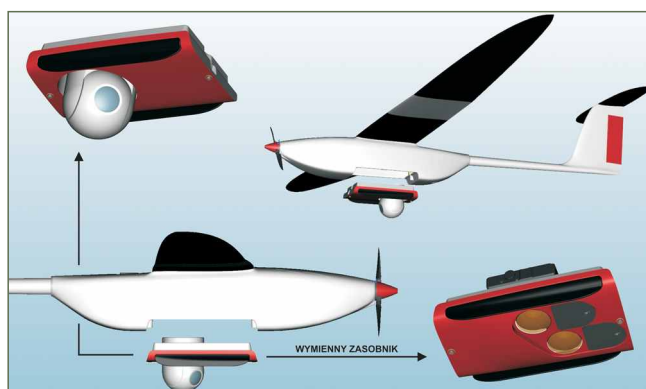


Project management, design of advanced composite structures, developing technical and production procedures, construction and testing of prototypes, design and manufacture of production tooling (CNC 2.5x1.2x0.4 m).

**The Multi-role Unmanned System NEO** - a composite airplane with electric propulsion equipped with changeable functional modules for use in different types of missions. The NEO is produced in the following versions: the observation variant, equipped with a stabilized head (day or night), the photogrammetric variant, and as a carrier of micro UAVs. Basic technical data: Wingspan 3600 mm, Length 1650 mm, Max. Take-Off Weight 10 kg, Cruising Speed 60-80 km/h, Never Exceed Speed 105 km/h, Stall Speed 40 km/h, Max. Flight Duration 90 min, Standard Flight Duration 60 min., Practical Ceiling 100 - 1000 m, Take-Off from hand or a starting platform, Landing: standard or by parachute.

### MSP Innovative Technology

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 www.uav.com.pl



## Warsaw University of Technology

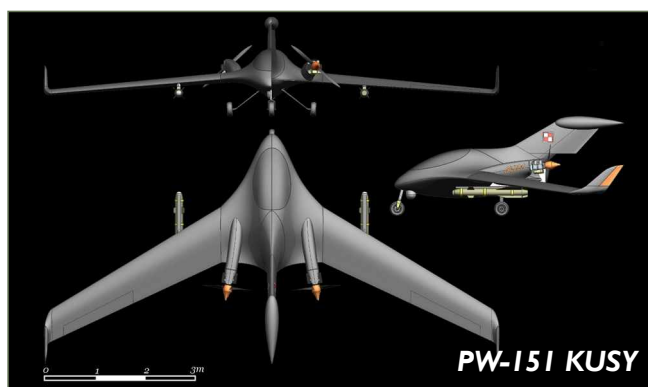
**PW-151 KUSY** - Unmanned Aircraft for tactical surveillance and destruction of ground targets. Propulsion: two engines of the total power 100 KM, Empty Weight 252 kg. Mission equipment: surveillance system 80 kg, armament 120 kg, MTOW 700 kg, Never Exceed Speed 260 km/h, Rate of Climb 7 m/s, Patrol Speed 130 km/h, Practical Ceiling 6000 m, Take-Off Run (minimum) 150 m, Patrol Duration 24 h.

**PW-141 SAMONIT** - Unmanned Observation Aircraft. Equipment: the mini scanning radar system by Sandia: work frequency 16.8 GHz, resolution 4 inches. Propulsion: two engines of total power 15 KM, Empty Weight 38 kg, mission equipment 16 kg: the scanning radar MiniSAR, the observation head FLIR, Max. Take-Off Speed 95 kg, Never Exceed Speed

183 km/h, Rate of Climb 4 m/s, Patrol Speed 90 - 125 km/h, Take-Off run (minimum) 120 min., Patrol Duration 12 - 24 h.

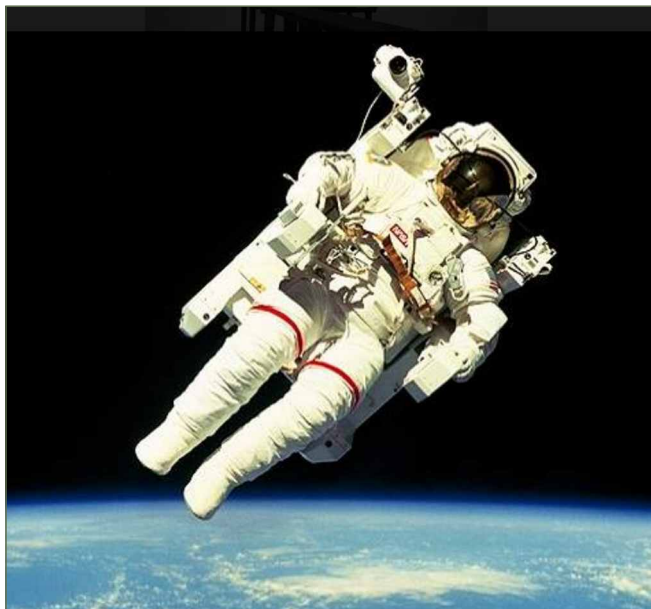
### Warsaw University of Technology Airplane and Helicopter Centre

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## Polish Society of Aeronautics and Astronautics



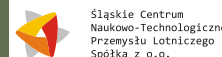
The mission of the Polish Society of Aeronautics and Astronautics is to support aviation and space sciences as well as to publicize successes and scientific research results achieved in particular by Polish researchers and science centres across all areas of aeronautics and astronautics.

This goal is fulfilled by organizing and co-organizing different types of science congresses both in Poland and abroad, initiating discussion on aviation and space science related subjects, presenting opinions on issues important for aviation and space science with a special emphasis placed on the problems of the scientific milieu, inspiring and organizing scientific competitions, maintaining cooperation with aeronautical associations in Poland and abroad as well as encouraging scientific cooperation between Polish and international science centres, and running own website.

### Polish Society of Aeronautics and Astronautics

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## Silesian Science and Technology Centre of Aviation Industry



This high-tech centre produces composite structures using autoclaves and conducts structural and material tests for the aerospace and other industries.

The technological facilities include:

- Composite Structures Laboratory, which designs and manufactures complete composite structures or their elements,
- Research Laboratory, which conducts static and fatigue tests of complete structures or their elements according to the client's requirements.

### Silesian Science and Technology Centre of Aviation Industry

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## Military University of Technology



BSc and MSc programmes of studies: National Security, Construction, Chemistry, Electronics and Telecommunications, Energetics, Geodesy and Cartography, Computer Science, Security Engineering, Materials Science, Logistics, Aeronautics and Astronautics, Mechanics and Machine Construction, Mechatronics, and Management.

PhD programmes of studies: Machine Construction and Operation, Construction, Electronics, Geodesy and Cartography, Computer Science, Materials Science, Mechanics and Telecommunications.

Organizational structure: Faculty of Cybernetics, Faculty of Electronics, Faculty of Civil Engineering and Geodesy, Faculty of Mechanics, Faculty of Mechatronics and Aeronautics, Faculty of New Technologies and Chemistry, and the Institute of Optoelectronics.

### Military University of Technology

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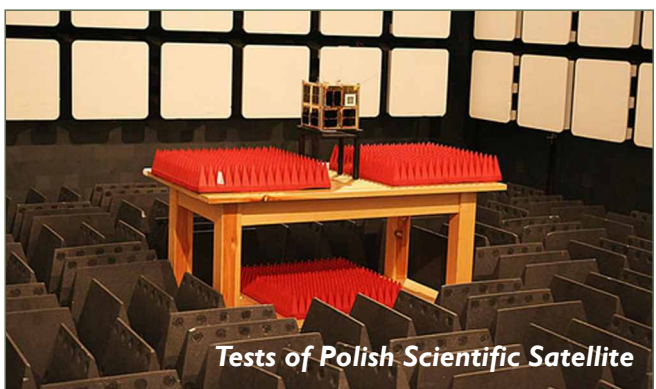
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Ultralight Patrol Airplane OSA



Tests of Polish Scientific Satellite



## Military Aviation Works No. 1 J.S.C.

General overhauls, emergency repairs, maintenance and modernization of helicopters: Mi-2, Mi-8, Mi-14, Mi-24, Kaman SH-2G, airplanes TS-11 Iskra, and engines: TW3-117, SO-3, SO-3W. Servicing and periodical inspections to ensure proper exploitation and good preparation of aircraft for missions in Poland and abroad.

Modernization of helicopters includes installation of aircraft transceivers and navigation systems, lightning adaptation, modification to a medical version (Mi-17AE) including providing medical equipment, modification of the Mi-8T to the passenger version the Mi-8 P, the VIP Mi-8 S as well as to the search and rescue variant the Mi-8 SAR, installation of specialized systems according to the client's requirements,

repair of aviation assemblies and aggregates, and production of spare parts. Other services include extending service life of aircraft equipment, design and construction of inspection and measurement stands, galvanic coating, metrology and machining.

### Military Aviation Works No. 1 J.S.C.

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## Military Aviation Works No. 2 J.S.C.

Overhauls including verification, repair and paint work, periodical inspections, damage repair, repair of aircraft system components, extending service life, production and supply of single-use parts, development and implementation of control and measurement instrumentation and ground equipment, and staff training.

**Military aircraft maintenance:** support and ensuring secure exploitation of aircraft operated by the Polish Air Force: Su-22, MiG-29, C-130 Hercules. Overhauls, repairs, assembly, paint coating, test flights, servicing, verification and repair of aircraft system components excluding engines, extending service life, production and supply of spare parts, development and implementation of control and

measurement instrumentation and ground service equipment, staff training.

Civil Aviation aircraft maintenance: hangar and line servicing of Cirrus SR20, SR22, Cessna 150, 152, 172, 182, Piper PA-34-200 Seneca, PA-34-220T, PZL-104 Wilga 35, 80, PZL-110 Koliber, Koliber 150 and AN-2.

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## Composite Structures Workshop - Andrzej Papiorek



Wytwórnia Konstrukcji Kompozytowych  
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Composite Structures Workshop offers airplane and glider parts.

**SZD 54-2 PERKOZ** - a 2-seater composite glider. High performance, simple handling, comfortable cockpit and perfect visibility. Designed for use by clubs, soaring schools and private pilots.

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## Glider Factory „Jeżów” – Henryk Mynarski



**Services:** routine and damage repairs, general overhauls, routine glider inspections, glider inspections after 1000, 3000 and 6000 hours of flight, paint coating of composite gliders, recovering and lacquering of wooden gliders, painting of registration, contest and special signs, regeneration of pilot safety belts and the SZD-III-A56 glider release hooks.

**Products:** the PW-6U Glider - a cantilever mid-wing double seat sailplane in a classic configuration with a standard tailplane arrangement. The structure is made of glass-epoxide composites. The PW-5 Smyk Glider - a cantilever mid-wing single seat sailplane in a classic configuration with a standard tailplane arrangement. The structure is made of glass-epoxide composites. The wings are of trapezoid contour with bow-shaped tips. Wings are monospar construction with sandwich shells. The air brakes are of panel type, extendable from the upper wing surface. The fuselage - laminar structure stiffened with frames. The cockpit is equipped with pedals adjustable in flight and the backrest adjustable on the ground. The canopy opens forward. Fixed landing gear. 2 take-off hooks. The US. 122.000 propeller blades for the aircraft Wilga and the Jak-12.

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