The Polish Space Industry Association
Members Catalog

SPACE PL
Polish Space Industry Association

2024

SPACE.BIZ.PL

Polish Space Industry Association

Office

biuro@space.biz.pl

+48 22 874 04 12

+48 576 792 999

space.biz.pl

in linkedin.com/company/polish-space-industry-association

f facebook.com/PolishSpaceIndustryAssociation

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Dear Sir/Madam,

It is with great pleasure that we present to you the 2024 edition of the Polish Space Industry Association (SpacePL) members catalog. This is yet another edition of the catalog that showcases the most significant achievements, products, and services offered by the entities associated with SpacePL. This publication coincides with SpacePL celebrating its 12th anniversary.

Undoubtedly, these have been important and positive twelve years for the space sector in Poland. During this time, there has been a significant increase in the number of active entities in the industry, their turnover, employment and involvement in programs of the European Space Agency and other agencies, as well as European programs. There has also been an increase in the number of SpacePL member entities, which clearly shows a growing interest in space technologies among many entrepreneurs, companies and institutes.

Among the entities associated with SpacePL there are manufacturers of small satellite platforms and their components, producers of optical instruments, ground-based and onboard software for satellites, electronics, research instruments and providers of services based on satellite data. These entities either function as proven suppliers of products for the space industry or possess their own satellites in Earth orbit. Among the SpacePL members there are also entities that own one of the largest satellite data repositories in Europe and operators of a large network of telescopes dedicated to monitoring space objects for purposes related to building situational awareness in space.

Increased financial resources allocated by Poland to various ESA programs amounting to 295 million EURO bring both new opportunities and challenges. A role of SpacePL is to support the national industry in the most effective utilization of available resources. This should be done not only to the benefit of entrepreneurs or scientific centers but also for the benefit of the state and its administration – in economic, scientific and security fields. We believe in dialogue and desire to continue to best serve as an advocate for the industry and, above all, as a promoter of the space sector. This industry, highly innovative, drives and stimulates the development of the entire economy.

The year 2025 will be crucial for the space sector. Then, many key decisions for the sector in Europe will also be made during the ESA Ministerial Council 2025. Let this catalog and the information contained therein, prepared by the entities associated with SpacePL, serve as the best argument that the dynamic development of the space sector in Poland is in the interest of our country and society.

Yours sincerely,
The Board of the Polish Space Industry Association (SpacePL)

Headquarters of Member Entities in Poland in 2024

Pomorskie: **7**

Kujawsko-pomorskie: **2**

Wielkopolskie: **7**

Mazowieckie: **30**

Lubelskie: **1**

Lubuskie: **2**

Dolnośląskie: **4**

Podkarpackie: **1**

Śląskie: **1**

Małopolskie: **9**
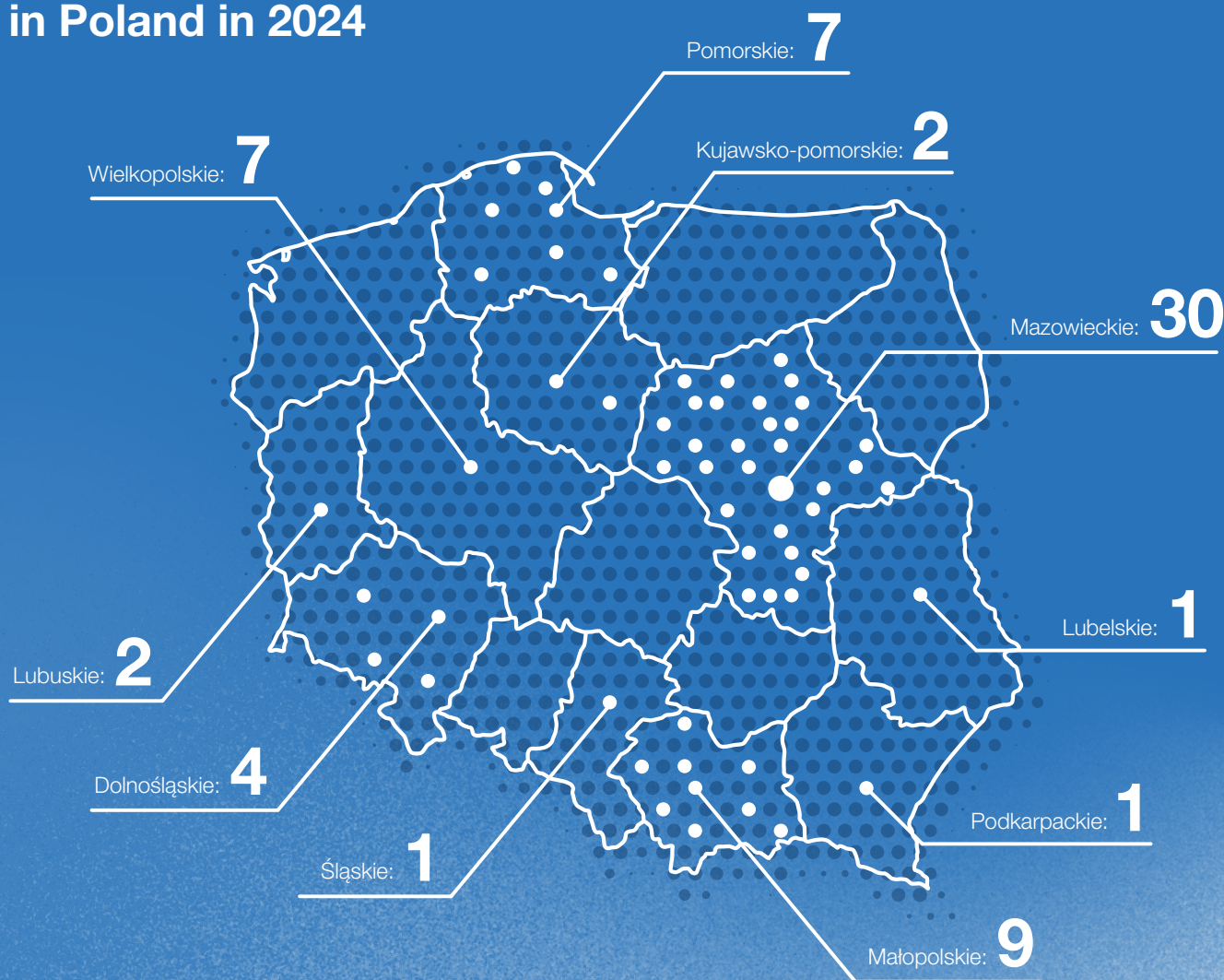
About Polish Space Industry Association

The Polish Space Industry Association (SpacePL) was established on October 31, 2012, through the agreement of 19 entities. SpacePL is an association of employers representing the interests of entities operating in the space sector in Poland and operates under the Act of May 23, 1991, on employers' organizations.

Currently, the association includes over 60 entities:
* 23 micro, 23 small companies,
* 8 medium-sized and 4 large enterprises,
* 6 institutes.

These entities currently employ over 6,000 workers and, according to data for 2023, generate 3.14 billion PLN in annual turnover. SpacePL members operate not only in the space sector but also offer their products and services in other sectors, such as defense, security, IT, ICT, electronics and transport.

SpacePL currently encompasses the most significant entities in the Polish space sector, which are recognized suppliers to the European Space Agency (ESA) and major companies in the European space sector. Among the major successes of the SpacePL members are: participation as solution providers in over 95 different space missions, such as BRITE satellites, STAR VIBE, Intuition-1 and EagleEye satellites, creation and maintenance of the CreoDIAS data cloud, delivery of optical instruments to PIAST satellites, supply of scientific instruments for missions such as JUICE, ATHENA, InSight, Rosetta, and Proba-3, construction of satellite platforms, successful suborbital rocket launches*, and the organization of the European Rover Challenge. An important aspect is also the members' involvement in building a global system of observatories for tracking objects in near-Earth orbits-aiming to build situational awareness in space (SST).

For over ten years, SpacePL has been actively involved in shaping and promoting the Polish space sector, with key activities including presenting recommendations to the government to increase contributions to ESA (ESA Ministerial Councils: 2014, 2016, 2019, 2022), consultations on the Polish Space Strategy and the National Space Program, and consultations on laws-including the Polish Space Agency Act, the Space Activities Act and the National Register of Space Objects. SpacePL also initiates a sectoral program at the National Centre for Research and Development. The Polish Space Industry Association also conducts activities promoting the space sector and its member entities. Since 2016, SpacePL organizes the Space Sector Forum every two years, a conference and exhibition dedicated to the space sector in Poland. SpacePL organizes meetings with partners domestically and abroad, helping entrepreneurs establish relationships with foreign companies and participate in multinational projects.

SpacePL is a member of SME4Space and closely cooperates with the National Chamber of Commerce for Electronics and Telecommunications and other employer associations both in Poland and abroad. By 2024, SpacePL has implemented three projects, also securing grants for its members: Neptune (EU Horizon 2020 program), EO SEED (ESA), ESA TEAM (ESA). Together with the Industrial Development Agency, SpacePL has successfully conducted eight editions of the Polish Space Fellowship Program. To date, 39 companies have participated, with over 700 students and graduates applying for internships in companies and institutes of the space sector.

The primary objectives of SpacePL are the business development of its members and the best representation of their interests – primarily towards the national government administration, but also towards the Polish Space Agency, the European Space Agency, the European Commission and other institutions. SpacePL participates in consultations regarding draft normative acts, arrangements for managing public financial resources and government policy – always when it significantly concerns the space sector. Speaking with one voice on behalf of the industry, SpacePL strives for the best systemic, structural, legal, administrative, regulatory and institutional solutions to foster the greatest development of the domestic space industry.

* including crossing the space frontier

Employment in Member Entities

6095 employees (2023)

**Number of Space Missions
Involving Polish Entities 1970-2024**

AEOLUS	EXOMARS	NEOSAT
ARIEL	GAIA	OPS-SAT
ATHENA	GALILEO	PLATO
BEPICOLOMBO	HERA	PROBA - 3
BIOMASS	HERSCHEL	PW-Sat
BRITE-PL	IMAP	PW-Sat 2
CASSINI-HUYGENS	INSIGHT - NASA INSIGHT	ROSETTA
COMET INTERCEPTOR	INTUITION-1	SOLAR ORBITER
EAGLEEYE	JUICE	STAR VIBE
EnVision	MARS EXPRESS	SWARM
EUCLID	METOP-SG	VENUS EXPRESS

>95

3,14 bln PLN per year

**Annual revenues
that SpacePL members
collectively generate (2023)**

**Markets in which entities
of the Polish space sector
operate**

Europe

USA

Asia and the rest of the world

270 mln €

Since 2015, 199 companies and research and scientific institutions from Poland have received 595 contracts from ESA, with a total value of €270 million (POLSA data*)

Main recipients of products and services of the Polish space sector

ESA
European Commission
National administration
at various levels
MOD
POLSA
ARMA
PANSA
NASA
ESO
EUMETSAT
EUSPA

Number of SpacePL members

64

entities, including:

- 4 Large companies
- 23 Small companies
- 6 Institutes
- 23 Micro - companies
- 8 medium companies
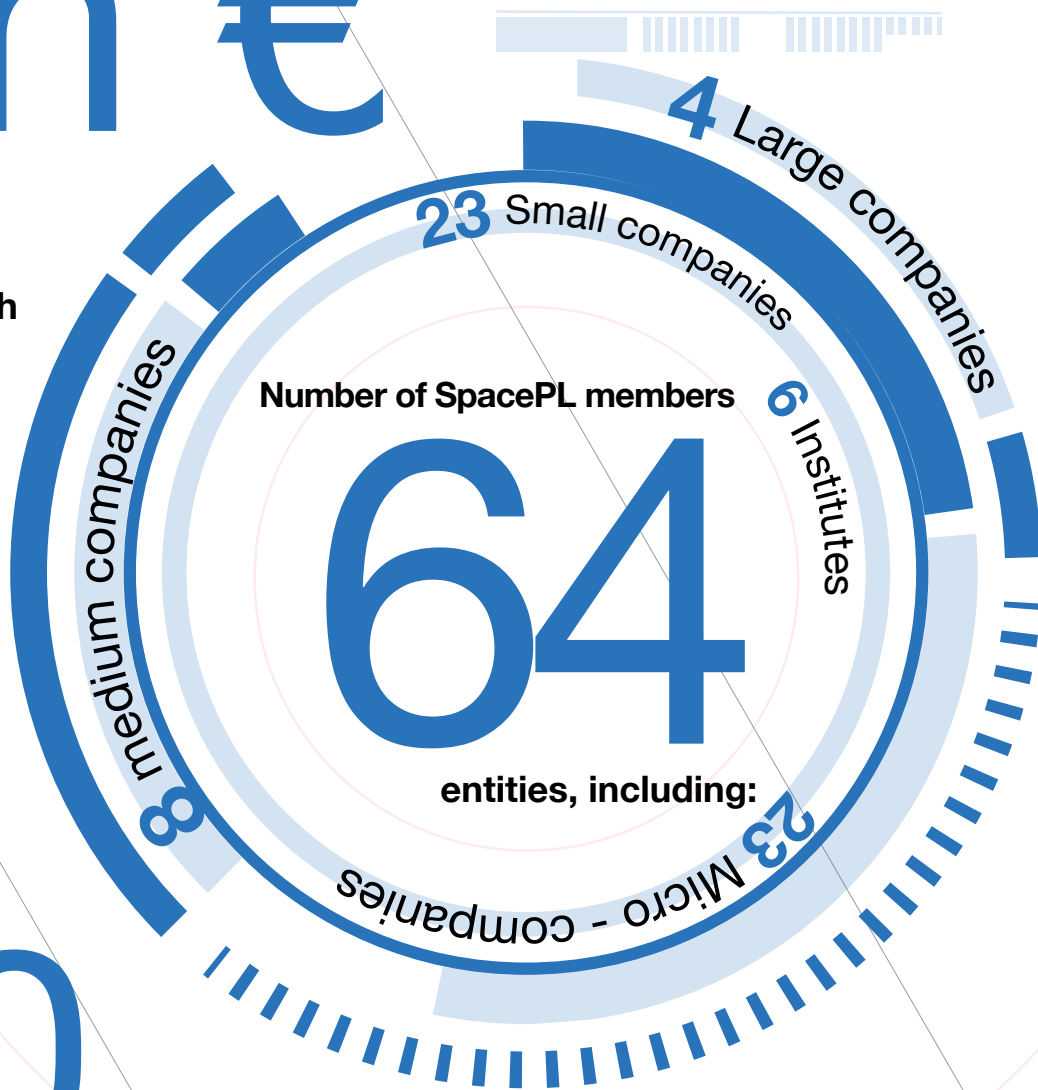
>50

telescopes include a global sensor network created by Polish entities for space observations around the Earth for space situational awareness purposes.

Flagship Earth Observation (EO) projects with a key role of the Polish space sector

Copernicus Data Space Ecosystem - one of the world's largest repositories of EO satellite imagery from the EU Copernicus program**
- close to 100 PB of open, public, instantly available data online
- cloud computing for data processing
- more than 200,000 registered users

Destination Earth - highly accurate, digital model of the Earth for modeling and monitoring phenomena on our planet
- large data repository, based on cloud services, which is the basis of Destination Earth

Satellite Ground Segment of the Copernicus
- programbuilding and operating one of four long-term archives built for ESA

* Report "Assessment of the state of development of space research and use in Poland for 2023"; published by the Polish Space Agency, Gdansk 2024, p. 14
** data as of September 2024

Recommendations for the sector

Working towards the creation and maintaining of favorable conditions for the development of the space sector in Poland is one of the primary tasks of the Polish Space Industry Association (SpacePL). Among the most important factors and mechanisms that will contribute to increasing the competitiveness of the Polish space sector, the following should be listed:

- Maintaining, in subsequent financial perspectives, the financial commitment to the optional programs of the European Space Agency (ESA) at the level of November 2023 or higher, which will help achieve one of the main indicators of the Polish Space Strategy and strengthen the position of the Polish space sector in Europe.

- Launching the National Space Program with a separate budget line, distinct from that designated for ESA programs, which will satisfy national needs in the areas of research, product development and independent access to space technologies.

- Engaging administration to increase the participation of Polish entities in strategic European Union space programs such as IRIS2, GOVSATCOM, Galileo, EU-SST and Copernicus.

- Systematic consultations between administration, end-users, and industry on the use of space technologies for national defense and security.

- Broad and legally sanctioned use of satellite data (observational data, navigation, satellite communications) in the activities of administrations at various levels.

- Establishing legal frameworks that enable space activities and the utilization of satellite data.

- Initiating dialogue with industry and academia on key research areas in the space sector.

- Supporting programs for building workforce for the space sector.

- Creating favorable legal and financial conditions for investors interested in the space sector.

www.6roads.com.pl

Marcin Gędek   +48 606 233 894
Member of the Board   contact@6roads.com.pl

6ROADS sp. z o.o.

6ROADS is a company specializing in the observation and astrometry of man-made objects, including satellites, space debris, and asteroids that threaten the Earth. We have telescopes in nine locations worldwide, allowing us to continuously and long-term observe space objects. The company has several years of experience managing observatories, even in the world's most remote corners. Despite unfavorable weather conditions, our technologically advanced observatories provide valuable observational data virtually every clear night.

6ROADS has theoretical and practical knowledge in maintaining advanced observing systems such as remote observatories. Moreover, numerous astronomical discoveries and advanced observation campaigns carried out by our team confirm our skills in observing and analyzing astronomical phenomena.

Thanks to the proper locations of the observatories and ambitious plans to expand the system, we can ensure continuous, long-term observation of objects. If the orbits of a given satellite allow, tasks from one observatory are transferred to the next, which allows for quick acquisition of observational material necessary for valuable astrometric measurements.

The company's infrastructure, including offices with access control, multiple Internet connections (including satellite), industrial computers, company structures (SPOC, SOP), and close cooperation with leading university centers in Poland and abroad, enable us to take on new challenges. Thanks to this, we maintain continuous access to the latest observation technologies and knowledge in the field of SST (Space Surveillance and Tracking).

Our experience and advantages:
- We have established and successfully operate a network of fourteen telescopes situated in diverse climate zones.
- We have several years of experience in observing and analyzing astronomical data.
- We made numerous astronomical discoveries and advanced observations, confirming our practical skills.
- In addition to the observation network, 6ROADS operates a unique, advanced software enabling data reduction and analysis.

Our network of automated observatories:
- Chile, San Pedro de Atacama, Polonia Observatory,
- Nowy Meksyk, Santa Fe, Beata Observatory,
- Hiszpania, Nerpio, Nerpio Observatory,
- Włochy, Carpineti, Rantiga Observatory,
- Polska, Kraków, Solaris Observatory,
- Polska, Oborniki, 6ROADS Observatory,
- Namibia, Tivoli, Moonbase Observatory,
- Japonia, Nagano, Anjin San Observatory,
- Australia, Youndegin, Marta Observatory.

Experienced team: Astronomers and engineers, each with many years of experience in their respective fields.

Cooperation with research centres: Continuous access to the latest technologies and knowledge.

Our services:

Satellites and space debris observations:
- Monitoring the orbit and movement of space objects,
- Identification and cataloguing of space debris.

Astrometry of Space Objects:
- Determination and analysis of space objects orbits,
- Research on the dynamics of objects in the solar system.

SST (Space Surveillance and Tracking) activities:
- Cooperation with international organizations to monitor space, ensuring the protection and sustainability of the extraterrestrial environment.

Technology:

We use the latest technologies in the field of space observation, including:
- TD 8 System Design & Verification,
- TD 9 Mission Operation and Ground Data Systems,
- TD 11 Space Debris,
- TD 12 Ground Station System and Networks,
- TD 13 Automation, Telepresence & Robotics,
- TD 16 Optics,
- TD 17 Optoelectronics.

Our clients:

We collaborate with esteemed institutions around the globe, including:
- **European Space Agency,**
- **EU SST (Space Surveillance and Tracking),**
- **Polish Space Agency,**
- **ITTI Poznań,**
- **GMV,**
- **Adam Mickiewicz University in Poznań,**
- **Swiss Federal Institute of Technology Zurich (ETH Zurich),**
- **University of Zurich,**
- **Western Sydney University.**

www.abgi-poland.com

Paweł Kwiatkowski
General Manager

+48 698 542 337
pawel.kwiatkowski@abgi-poland.com

ABGi Poland sp. z o.o.

ABGi Poland (formerly Absiskey Polska) is a consulting company founded in 2014. We successfully obtain financing for our clients for their innovative projects from European grants (HE, EIC and others) and national grants (NCBiR, PARP and others). We are a key partner for companies using space technologies and applying for funding from ESA. Since 2022, we have been acting as ESA Technology Broker and ESA Application Ambassador. ABGi Poland also supports its customers in settling research and development tax relief. ABGi Poland is also a business partner within ESA BIC Polska.

Services:

ABGi Poland specializes in obtaining grants under Polish and European financing programs.

For our clients:
- We analyze the call for proposals,
- We support in finding consortium members among a network of over 600 partners across Europe,
- We take responsibility for preparing the entire application, including the financial and administrative part,
- We support consortium partners in properly drafting the substantive part, developing non-technical sections, and indicate where to place emphasis when describing technical aspects,
- We submit the grant application while keeping track of deadlines,
- We negotiate the financing terms of your project.

ABGi Poland supports the coordinator and work package leaders during the project implementation phase for which funding has been granted, in project management, in activities related to Communication and Dissemination, and in contacts with the European Commission.

We prepare reports, analyses, and market research. We look for appropriate directions for financing and development for the technologies, products, and solutions being developed. We operate both for clients from the space and other sectors. ABGi has also specialized in supporting its clients in settling tax reliefs, with an emphasis on research and development relief.

Projects:

ESA Business Application Ambassador – as part of the contract with ESA (as coordinator), we encourage Polish entities to use funds from the European Space Agency and implement projects using space technologies to develop their products and services. We act as an Ambassador of the ESA Business Applications and Space Solutions (BASS) program, under which we support entities from all sectors in preparing applications for financing of their innovative commercial ideas – from early prototype to demonstration version.

ESA Technology Transfer Broker – as part of the contract with ESA (as a coordinator), we support Polish companies from outside the space sector in establishing contacts with representatives of the space sector (Polish and European) in order to introduce space technologies to Earth solutions. We support in creating new solutions and improving existing technological processes. We support obtain grants for technology transfer under ESA and other funding programs.

SpaceHub – ABGi Poland creates an innovative co-creating space called SpaceHub. SpaceHub offers services similar to space technology incubators, where start-ups can have a physical space and receive support in developing their idea and business in the Space area. It is also a series of meetings with representatives of the space sector and enthusiasts of the topic. SpaceHub is dedicated to all types of entities, from startups to large companies, scientific units and research institutes.

Our clients:

ABGi Poland provides support, among others, under the programs of the European Space Agency (ESA), the European Commission (including under the HE program, EIC, and others), and Polish grants. We cooperate with a wide range of clients, from startups, SMEs and large players, but also with administration and science entities. We have a very extensive network of contacts both in Poland and Europe.

www.adaptronica.pl

Przemysław Kołakowski
CEO

+ 48 609 470 500
pkolak@adaptronica.pl
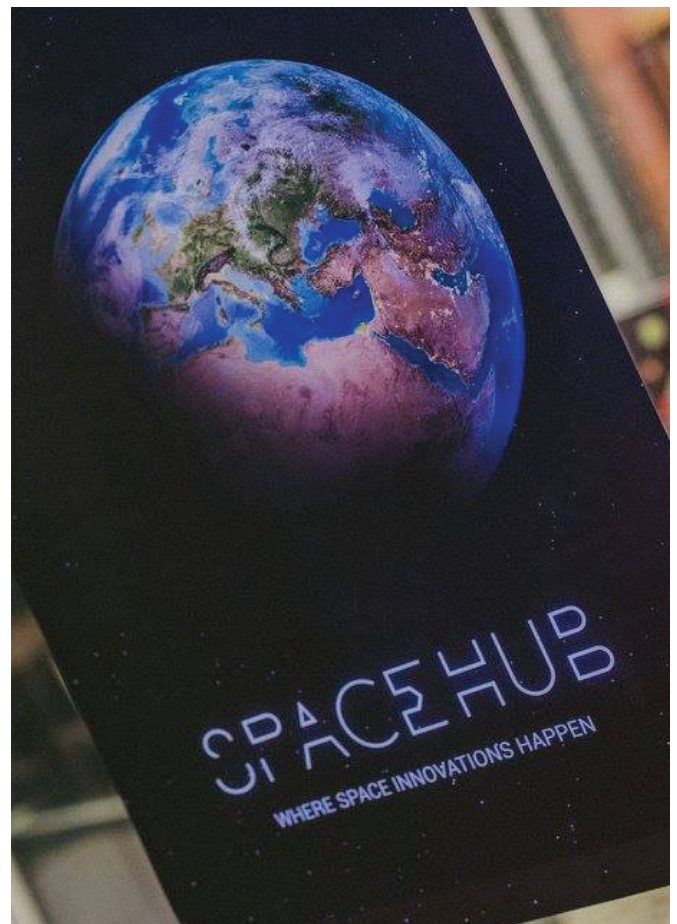
Adaptronica sp. z o.o.

Adaptronica is a small company of research and development profile, with the expertise in structural mechanics, mechatronics and vibro-acoustics. The competences in the space sector comprise the design and testing of passive and active systems for damping structural vibrations, including microvibrations, as well as mitigation of impact loads for various subsystems of a satellite, e.g. cryocoolers, control moment gyroscopes and pyrovalves.

Services:

Design and testing of active and passive vibration damping and impact energy dissipation systems for satellite components; development of dedicated software to implement developed vibration damping and impact energy dissipation strategies; selection and testing of activators and sensors for vibration and impact mitigation systems.

Technology:

Active damping system for micro vibrations generated by the cryo-cooler (TRL6), pyrotechnic valve mount passively neutralizing the effect of the pyrotechnic explosion on the structure (TRL5), passive damping system for micro vibrations generated by the gyroscope with controllable torque (TRL4).

TD 20: Structures
- Structural Design and Verification Methods and Tools

TD 20: Structures
- High Stability and High Precision Spacecraft Structures

TD 20: Structures
- Active/Adaptive Structures

TD 5: Space System Control
- Control Systems Engineering

TD 5: Space System Control
- Control Systems Innovative Technologies

Projects:

Adaptronica has carried out three ESA projects resulting in the AVC system for active cancellation of microvibrations, generated by a cro-cooler. Thanks to the original numerical algorithm, the AVC system reduces the level of microvibrations by almost two orders of magnitude, using proof mass linear actuators as the performing element. The work on structural improvement of the actuators is ongoing. The next step will aim at shifting the whole AVC system to the technology readiness level TRL8. The AVC system has the potential to be applied in other subsystems of satellites, e.g. reaction wheels, control moment gyroscopes, as well as in terrestrial devices.

Adaptronica, as a subcontractor of KP Labs sp. z o.o., has taken part in the project, aiming at identification and mitigation of microvibrations, generated by pulsating heat pipes (PHP). Capturing the nature of the phenomenon implies the assembly of a very sensitive measurement line, with simultaneous elimination of external influences at the lowest level of frequencies.

Adaptronica has worked out an effective support for a pyrovalve, which attenuates the influence of shock on a satellite structure, due to the explosion of the pyrovalve. As a by-product, a numerical model, enabling the simulation of the formation and propagation of elastic waves, has been developed.

Space missions:

6

Our clients:

Thales Alenia Space France, KP Labs sp. z o.o., Astronika sp. z o.o.

www.arobs.pl

Tadeusz Kocman +48 505 580 953
Business Development Manager tadeusz.kocman@arobs.pl

AROBS Polska sp. z o.o.

AROBS Polska specializes in providing solutions in the fields of electronics, FPGA systems and software for space applications. Since 2016, the company located in Gdansk has been implementing projects for ESA and leading companies in the European space industry. Our experience and dedicated team guarantee that we can meet the rigorous requirements of each project.

Products/Services:

Control electronics for instruments and mechanisms:
- Stepper motor controllers, e.g., for antenna pointing mechanisms,
- Control units dedicated to scientific instruments,
- PAT systems (Pointing, Acquisition & Tracking).

Mass memory modules:
- Application of non-volatile Flash memory technology for Earth observation satellites and scientific missions,
- Scalable architecture, fast data reading and writing,
- Use of proven error correction methods as protection against radiation effects.

Quantum and optical communication:
- Development of optical communication protocol technology,
- Detection of single photons with time of arrival determination with accuracy below 5 picoseconds,
- Entanglement source controller.

Data processing units:
- Processing data from e.g., LiDAR cameras and sensors, handling communication with the on-board computer,
- Use of the New Space philosophy to reduce costs,
- Use in Active Debris Removal and In Orbit Servicing missions or landers.

EGSE (Electrical Ground Support Equipment):
- Test racks used during the integration and testing process of satellites.

Services:
- Electronic circuit design,
- Systems design based on FPGA circuits,
- On-board software development,
- System engineering for electronic units.

Products:
- IP Core modules for FPGA circuits:
  - for applications in optical and quantum communication,
  - for controlling stepper motors,
  - interface for the MODBUS protocol,
- Software library for the PUS-C standard,
- Module for detecting single photon coincidences.

Technology:

1 – On-board Data Subsystems / 2 – Space System Software / 3 –Space Systems Electrical Power / 5 – Space System Control / 6 – RF Subsystems, Payloads and Technologies / 11 – Space Debris / 15 – Mechanisms / 17 – Optoelectronics.

Projects:

- **EUCLID ADPME** – design of modules for FPGA device and test software for the antenna deployment and pointing mechanism controller – a flight unit operating in space from 2023.
- **FLORIS ICU** – design of electronic modules: power supply and management, development and verification of FPGA code and software for supporting the Packet Utilisation Standard for the optical Instrument Control Unit on board the FLEX mission.

- **Self-calibrating Electronic Controller Satellite Quantum Entanglement Source** – a unit controlling the source of quantum entanglement developed for the needs of the satellite quantum key distribution market (project co-financed by NCBiR).
- **Flash Memory Module** – development of code for an FPGA controlling Flash-based mass memory.
- **Demonstration of SpaceFibre Technology Usage for Image Processing Applications (SFIC)** – demonstration of parallel operation of IP Core image compression modules on a high-performance FPGA with data transfer using the SpaceFibre protocol at a speed of 3.125 Gbps for immediate processing of Earth observation data.
- **ClearSpace-1** RendezVous Sensor Processing Unit (RVSPU) and Close Proximity Operations Control Unit Development and Qualification (CRIMSON) – electronic units processing data from cameras and LiDAR sensors for Active Debris Removal and In Orbit Servicing missions.
- **COTS FPGA technology for On-Board Switching** – Evaluation of high-performance COTS FPGAs for use as a layer-2 router.
- **High-rate Single Photon Detector Pre-development** – development of single photon detector technology for the SAGA mission.
- **Standardised Stepper Motor Controller with special Emphasis on APME** – qualification of a stepper motor controller for ESA missions, with particular emphasis on usage in antenna directional mechanisms.

Space missions:

- EUCLID, FLEX, ClearSpace-1

Our clients:

European Space Agency, DLR, Airbus Defence and Space, Thales Alenia Space, Beyond Gravity, Leonardo, WORK Microwave, Bradford Engineering, ClearSpace, Nicolaus Copernicus University in Torun, University of Gdansk, University of Warsaw, Military University of Technology, Politecnico di Milano, New Space companies.

www.astronika.pl
+48 22 329 6234
office@astronika.pl
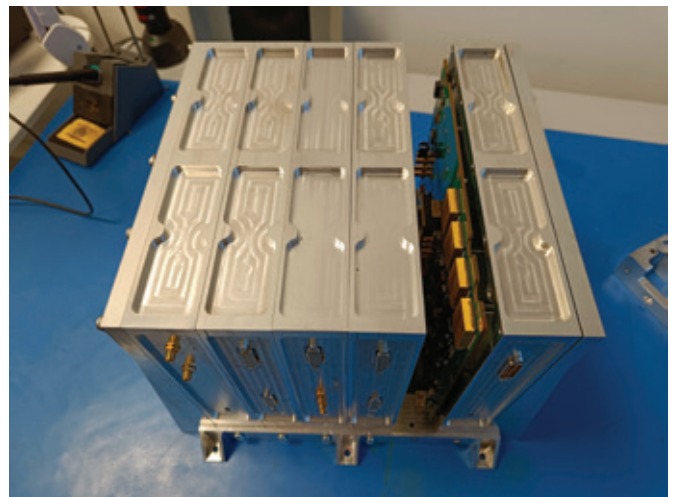
Astronika sp. z o.o.

Astronika creates solutions for the space industry. The company's technologies enable exploration of the Solar System and outer space in missions such as InSight, JUICE, RadCube, Hera, PROSPECT and Athena. At the core of the company's business are lightweight, compact, and reliable mechanisms and instruments, among others antennas, hold-down and release subsystems, propulsion subsystems, linear & rotational actuators, planetary exploration systems. Astronika's activities range from support of the mission definition, through prototyping, to testing, qualification and final integration of flight systems. With a team of experienced engineers and scientists, we utilize our own laboratory facilities (including a cleanroom and a thermal-vacuum chamber), and manufacturing facilities with extensive capabilities for precision and quality production of parts. Astronika is an ISO 9001:2015 and AS9100 certified space mechanism developer.

Products and services offered:

- Lightweight antennas and booms,
- Hold-Down and Release Mechanisms HDRM,
- Satellite propulsion subsystems,
- Planetary Robotics including penetrating and sampling devices,
- Actuators,
- Separation systems for small satellites,
- Mechanical Ground Support Equipment,
- Mission analysis,
- Manufacturing including accurate turning and milling of both plastics (mainly POM, PEEK, Vespel) and metals (mainly aluminum, brass, bronze, titanium, stainless steel),
- Coatings and innovative 3D printing solutions,
- Comprehensive service for testing mechanical devices or rental of testing infrastructure,
- Numerical simulations, including static and dynamic finite element analysis, thermal analysis.

Projects:

Among approximately 30 completed projects, we would like to highlight the following instruments on space missions:
- **InSight HP3 (NASA):** development of the drive mechanism for mole-type penetrator for a Martian mission including redesign and manufacturing of flight versions of the hammering mechanism and integration of the HP3 penetrometer.
- **JUICE RPWI (ESA):** development of RWI and LP-PWI instruments for mission to explore the Jupiter system.
- **HERA Juventas (ESA):** development of the Low Frequency Radar for the Juventas CubeSat in mission to Didymos asteroid.
- **RadCube (ESA):** development of a magnetometer boom for a CubeSat space weather demo mission.

Space missions:

Since 2012, Astronika has participated in the following space missions:
- ATHENA (ESA mission),
- EUCLID (ESA mission),
- HERA (ESA mission),
- INSIGHT (NASA mission),
- JUICE (ESA mission),
- PROSPECT (ESA mission),
- RADCUBE (ESA mission),
- ExoMars – Rosalind Franklin (ESA mission).

Number of ESA missions in which the entity is/was involved (since 2012): **7.**
Number of NCBR projects in which the entity is/was participating (since 2012)*: **5.**

Our clients:

European Space Agency (ESA) – main partner, Airbus Defence and Space GmbH, AGH University of Science and Technology, National Aeronautics and Space Administration (NASA), C3S Electronics Development LLC, California Institute of Technology (Caltech), Space Research Centre PAN, Creotech Instruments S.A., GomSpace A/S, Leonardo S.p.A., German Aerospace Center (DLR), OHB System AG, Warsaw University of Technology, SAT REV S.A., Lukasiewicz Institute of Aviation, Swedish Institute of Space Physics (IRF), Thales Alenia Space France, Zortrax S.A.

www.asynchronics.com

Adam Chikha   +48 691 606 849
Board member   adam.chikha@asynchronics.com

Asynchronics sp. z o.o.

Asynchronics was incorporated in 2023 with a mission to democratize system-level simulation in the small spacecraft industry. It offers top-tier, open-source simulation software for avionics digital-twinning, spacecraft ground validation and spacecraft operation. But Asynchronics commitment goes beyond simulation tools and encompasses the development of the industry's first system digital twin market-place meant to provide avionics manufacturers with the opportunity to sell digital twins that faithfully reproduce the TM/TC protocols and state machines of their hardware, thus providing spacecraft integrators with an ecosystem of readily available simulation models.

Products/Services:

Products:
With the next-generation Rust programming language at its core, our flagship open source software simulator provides performance, reliability and simplicity in one package while bringing radical innovations such as fully automated simulation parallelization. Additionally, in anticipation of the launch of our marketplace, a catalog of ready-to-use digital twins for COTS avionics is to be released under various commercial and open source licenses.

Services:
We are experts in the simulation of avionics and spacecraft platforms with complex state machines and communication protocols. We also develop bespoke software for high-performance, latency sensitive applications such as hardware-in-the-loop benches.

Technology:

- Methods and Tools for On-board Software Engineering Processes,
- Control Design and Verification,
- System Design and Simulation,
- Mission Control System, Automation, Mission Planning, Simulators and Station M&C and Data Centre Architecture and Technologies.

Projects:

- **INVICTUS**, Horizon Europe project led by SAFRAN in cooperation with Airbus D&S, aimed at the qualification of a krypton-propellant version of SAFRAN's PPS-5000, Europe's leading high-power plasma propulsion system. Asynchronics is responsible for the development of a system-level digital twin of the complete propulsion system.

- **ESA BIC**, an ESA-led program within which Asynchronics is currently developing a marketplace for avionics digital twins.
- **The simulator for the ROMEO mission**, developed by the Institute of Space Systems (IRS) of the University of Stuttgart using Asynchronics' simulation framework.

Space missions:

Asynchronics' simulator is currently in use within the ROMEO mission, a 60kg-class spacecraft developed by the Institute of Space Systems (IRS) of the University of Stuttgart. The simulator is also being trialed for Infinite Orbits Endurance mission, a life-extension vehicle for geostationary assets.

Clients and partners:

SAFRAN, Revolv Space, NewSpace Systems, Pulsar Fusion, ESA BIC, Infinite Orbits, Institute of Space Systems (IRS Stuttgart).

www.balticorbitalservices.com
Eugeniusz Rokicki   +48 500 267 310
CEO   ceo@orin.technology
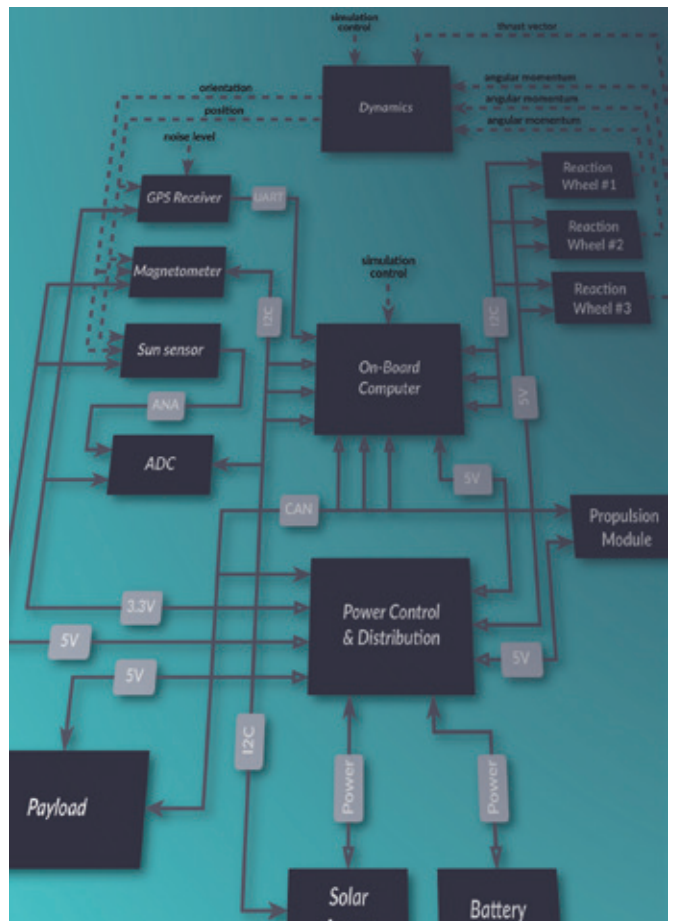
Baltic Orbital Services sp. z o.o.

The company is developing Orbital Mobility and Servicing Systems (OTSV) capable to maneuver through a sequence of alternating active and passive flight phases. OTSV under the development would increase the orbit altitude, angular orientation and stabilization, our product would orient the thrust vector of the propulsion system in the orbital plane close to its velocity vector.

Products/Services:

- The company offers various ion-plasma engines with different levels of thrust for various orbital assets.
- The company provides the service of ballistic calculations of in-orbits assets both passive and maneuvering.

Projects:

- The company has developed the mock-up of the Orbital Transportation and Servicing Vehicle (OTSV) capable to maneuver through a sequence of alternating active and passive flight phases.
- The company is upgrading the line of ion-plasma engines with different levels of thrust to supply operators of various orbital assets.

Space missions:

- EIT-HEI Climate (2023-2024).

Our clients:

PARP, Berlin Space Consortium, Space3ac, Europejski Fundusz Rozwoju Regionalnego.

www.thebitbybti.com

Ph.D. Eng. Dariusz Walczak   +48 503 697 437
                                   dariusz.walczak@thebitbybit.com
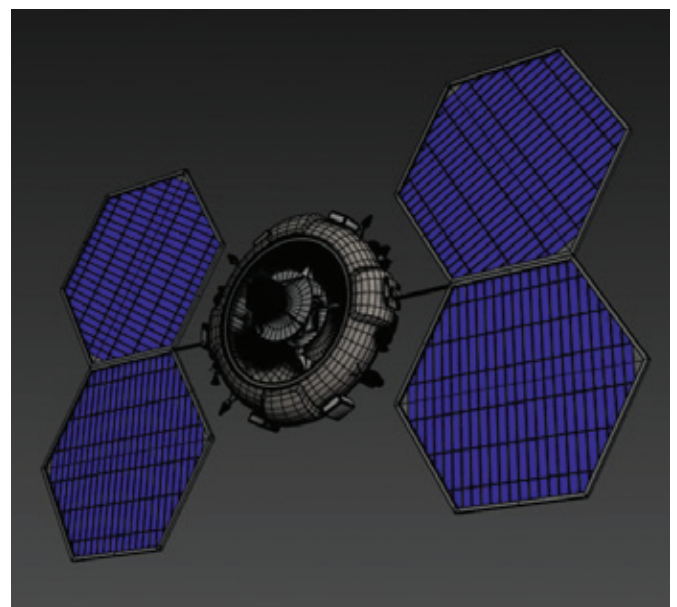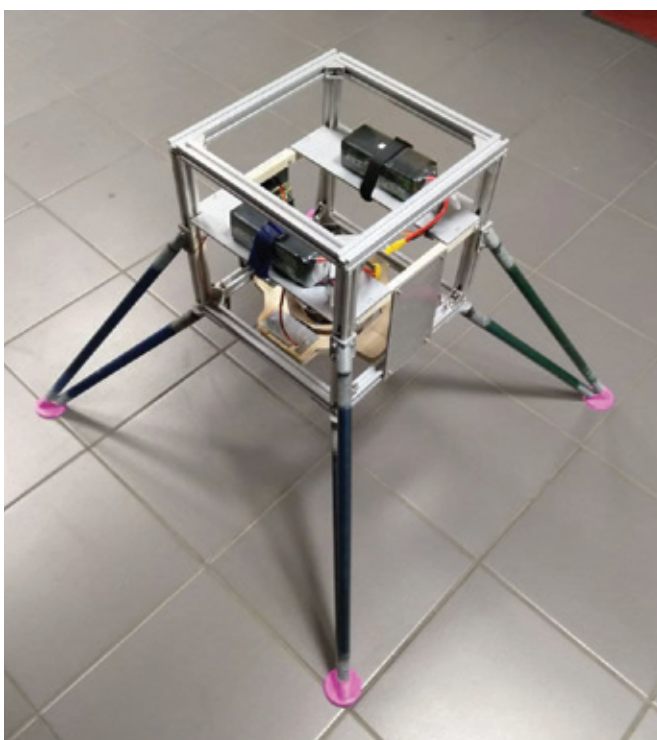
Bit by Bit sp. z o.o.

BitByBit sp.z o.o. is a company dealing with solving complex business and scientific issues with the use of information technology. Our engineers specialize in optimization, algorithmics and machine learning. Using agile methodologies, we create web and mobile applications for our clients using the Python, Java and Javascript programming languages and accompanying tools. We work with large companies, research units, NGOs and startups. Since the beginning of BitByBit, we have been intensively cooperating with companies from the space sector, creating software for the European Space Agency. In the space sector, the company focuses on software supporting the ground segment, including monitoring and management of space missions.

Products/Services:

Software Development in the space sector, the company focuses on software supporting the ground segment, including monitoring and management of space missions.

Technology:

- Ground Station Monitoring & Control,
- Space System Software,
- System Design & Verification,
- Mission Operation and Ground Data Systems,
- Ground Station Systems and Networks.

Projects:

- **Pilot for Next Generation Central Checkout System and Mission Control System** – the aim of the project is to conduct a pilot implementation of EGS-CC in shadow mode as part of the CRISTAL Copernicus Polar Ice and Snow Topography Altimeter mission.

- **Microservice based Mission Control Systems** – the goal of this project is to prepare the way forward to move away from the currently developed integration of EGOS application in EGOS-MG OpsEnv a more optimal solution where the EGOS applications will be deployed as true micro-services.

- **EGS-CC Release Agent** – under the project, the development of EGS-CC has transitioned to a community-based model. This approach lets space industry developers submit source code changes, which are reviewed and incorporated into EGS-CC by experienced consortium members including the BitByBit team.

- **EGS-CC** – Scenario Validation and WEBUI Enhancement the goal of the project it to continue the Scenario Validation development, implement new features for WebUI/JSBridge, and to support the release process of the EGS-CC – as the WebUI (now ri-webui), JSBridge (now ri-services) and Scenario Validation (now sv) became part of the EGS-CC. The project is still in progress.

- **Preparation of enabling space technologies and building blocks** – EGS-CC Consolidation (the goal of the project was to automate the Scenario Validation for EGS-CC with the provided Web client. All required updates of the WebUI and JSBridge had to be provided.

- **EGS-CC Web-Based User Interface** the goal of the project is to provide a prototype of a Web-based client for EGS-CC. The scope was limited but full interaction with the system was tested. The second goal was to start developing a framework for future web-based clients. The project uses the provided Web Widget Library and OSGi-JS Bridge API.

- **EGS-CC WebUI Widget Library** the goal of the project was to prototype series of web based displays and integrate them with OSGi-JS Bridge. The goal of the prototype was to check the flexibility, performance, and speed of the development of complex displays and widgets with HTML/JS/CSS.

- **EGS-CC OSGi-JS Bridge** the goal of the project was to provide a prototype of an API for EGS-CC that enables web based (non-OSGi) clients to connect to the system. We had to support both stateless and stateful communication.

Space missions:

- **Pilot for Next Generation Central Checkout System and Mission Control System** – the aim of the project is to conduct a pilot implementation of EGS-CC in shadow mode as part of the CRISTAL Copernicus Polar Ice and Snow Topography Altimeter mission.

- **Microservice based Mission Control Systems** – under the project, the development of EGS-CC has transitioned to a community-based model. This approach lets space industry developers submit source code changes, which are reviewed and incorporated into EGS-CC by experienced consortium members including the BitByBit team.

Our clients:

ESA (ESOC, ESTEC), Airbus Defence and Space, Terma, SpaceCube, Spacebel.

www.bluedotsolutions.eu

Krzysztof Kanawka
CEO

+48 607 160 640
office@bluedotsolutions.eu

BLUE DOT
S O L U T I O N S

Blue Dot Solutions sp. z o.o.

Blue Dot Solutions is a Gdańsk-based company that specializes in satellite data processing (EO and SAR), as well as satellite navigation GNSS (IoT) for clients from agricultural and maritime sectors as well as for providers of smart city solutions. The company also prepares technological and business studies for governmental agencies and organizes acceleration programs for startups (Space3ac).

Projects:

EO & SAR Solutions: Blue Dot Solutions has developed an innovative technology that combines optical data with radar Earth Observations (SAR) for crop classification, monitoring and growth, regardless of weather conditions. The targeted market for this product is both Europe and non-European markets. The project is supported by the European Space Agency.

GNSS solutions: The company has developed a status monitoring system of mobile equipment infrastructure used by ground-handling companies in airports and seaports. The system ensures optimization of resource utilization and reduction of service time. The technology behind it has been developed in the FLAMINGO project (Horizon 2020), providing location accuracy of up to 1 meter.

IoT and synchronization solutions: The company has introduced a Synchronization Signal Demodulator to the market. This is a product which provides wireless time synchronization with a certified source, serving as an alternative or as a complement to GNSS systems (available in NMEA standard). This technology can be used for, among others, the synchronization of banking operations or for urban lighting.

Studies and acceleration programs: Blue Dot Solutions regularly prepares professional technological-economic studies on the use of satellite data and the development of the Polish space sector. The company organizes its own acceleration program called Space3ac, which has supported over 150 startups with grants totaling over 40 million PLN.

Key products:

- TD 9 Mission Operation and Ground Data systems,
- TD 10 Flight Dynamics and GNSS,
- TD 13 Automation, Telepresence & Robotics,
- TD 20 Structures,
- TD 24 Materials and Manufacturing Processes.

Projects:

Applications: As part of projects co-financed by the European Space Agency (ESA), Blue Dot Solutions has implemented projects such as TILQ-AP (urban heat island detection), Insutrax (definition of products and services for the insurance sector), and Space4Med (water transmission infrastructure safety).

Synchronization Signal Demodulator: In 2023, ordered by the Central Office of Measures, Blue Dot Solutions delivered a product that ensures time synchronization with a certified source, serving as an alternative or supplement to GNSS. The project has significant implementation potential in various areas.

Acceleration within Space3ac framework: Since 2016, Blue Dot Solutions has completed 11 batches of the Space3ac acceleration program, which links and combines the capabilities of small companies with the needs of large technology recipients. Grants of the total combined value of 40 million PLN have been provided to more than 150 startups.

ETCS Housing Module: In a project funded by the National Centre for Research and Development (NCBR), the company developed a 3D-printed housing (with mesh structure) for the power system electronics of a satellite. The housing ensures lower system weight and a thermal control system.

GNSS Interference Detection System: Blue Dot Solutions has conducted a technological study on monitoring GNSS signals in the vicinity of critical infrastructure. A functional prototype of the interference detection system was developed, considering various jamming scenarios.

Our clients:

Polish space industry companies, Large Polish industrial entities Agricultural groups, Governmental clients, Agencies.

www.camk.edu.pl
Prof. dr hab. Agata Różańska

+48 22 32 96 113
agata@camk.edu.pl

Centrum Astronomiczne im. M. Kopernika PAN

CAMK PAN is a leading astronomical institute in Poland. It was established in 1978. The main subjects of research include: stellar astrophysics, binary systems, circumstellar matter, dense matter and neutron stars, black holes, accretion processes, structure and evolution of active galaxies, cosmology, extrasolar planets.

Service:

Evaluation of research projects.

Technology:

Areas of activity in the space sector:
- Space System Control,
- Mission Operation and Ground Data systems,
- Space Debris,
- Ground Station System and Networks,
- Life & Physical Sciences,
- Optics.

Projects:

- H.E.S.S., CTA (observations of high energy photons (TeV) via detection of Cherenkov radiation),
- SALT (Southern African Large Optical Telescope about 10 m in diameter),
- LIGO-VIRGO (detection of gravitational waves),
- Araucaria (calibration of the local extragalactic distance scale),
- SOLARIS (search for extrasollar planetary systems),
- AstroGrid-PL (polish platform for numerical computations),
- Polish Bolid Network (observations of meteors and comets),
- Gaia-ESO (the great spectroscopic review of the Milky Way).

Space missions:

- INTEGRAL, Fermi (satellite observations of gamma rays),
- BRITE (the first Polish scientific satellite). The ground station for the control of the scientific satellites BRITE is located at the CAMK PAN,
- ATHENA (Advanced Telescope for High ENergy Astrophysics) – satellite observations in X-rays,
- THESEUS (Transient High-Energy Sky and Early Universe Surveyor) – detection of cosmic gamma-ray bursts,
- eXTP (enhanced X-ray Time and Polarimetry) – testing the properties of matter in extreme conditions using X-ray polarimetry,

- ARCUS PROBE – exploring Formation and Evolution in the Galaxy, Local Group, and Universe (New announcement of opportunity of NASA mission).

Our clients:

- **ESA (European Space Agency),**
- **ESO (European Southern Observatory),**
- **NASA (USA),**
- **CNES (Toulouse, France),**
- **IRAP (Toulouse, France),**
- **MPE – Max Planck Institute for extraterrestrial Physics (Garching, Germany),**
- **Stanford University (California, USA),**
- **Harvard University (Cambridge, USA),**
- **Durham University (UK),**
- **Institut d'Astrophysique (Paris, France),**
- **Institute of Space and Astronautical Science (Japan),**
- **Ioffe Institute (St. Petersburg).**

www.cbk.waw.pl

dr Tomasz Zawistowski
Deputy Director for Technology
Development

+48 22 49 66 206
zawistowski@cbk.waw.pl

Centrum Badań Kosmicznych PAN

The Space Research Center of the Polish Academy of Sciences (CBK PAN) is the only interdisciplinary institute in Poland whose entire substantive activity is related to conducting research of the Solar System of the space around the Earth and the Earth itself, using space technologies and satellite techniques.

Products:

- **Products and services Space instruments:** X-ray spectrometers, radiospectrometers, thermal sensors, – optical furier and hyperspectral spectrometers.

- **Satellite subsystems:** power system, – on-board computers, – mechanical structures and thermal systems, – satellite orientation and stabilization system, – communication systems, – ground support systems.

- **Satellite navigation:** accurate positioning from GPS, EGNOS, GALILEO reference stations, precision time transfer system.

- **Telecommunications:** ionosondes with software, space weather forecasts, state of the ionosphere HF communications conditions.

- **Earth observation:** semi-automatic change detection system from high-resolution images, terrain classification programs from optical and radar images.

- **Services:** integration of satellite platforms, testing of subsystems and satellite platforms (small), quality control and preparation of documentation.

Projects:

- Major experimental studies in extraterrestrial space: Wave experiments in the circumstellar plasma, optical and microwave studies of planets and other space objects (PFS/MarsExpress ERTIS/BeppiColombo), X-ray studies of the Sun (STIX/SolarOrbiter), direct (in situ) studies of the surface and subsurface layers of planets and small bodies of the Solar System using penetrators and landers (ROSETTA), participation in astrophysical research (INTEGRAL gamma-ray observatory, HERSCHEL far-infrared observatory, the first Polish scientific satellites BRITE), involvement in the use and development of global satellite navigation systems (GPS, Egnoss, Galileo), observations of artificial satellites of the Earth.

- The institute has more than 200 employees, including qualified scientific and engineering staff. Most of the work is carried out in Warsaw; research on the Sun is carried out by a branch of the CBK PAN in Wroclaw (Department of Solar Physics), while work on the Atomic Time Scale and observations of satellites is carried out by the Astrogeodynamic Observatory in Borowiec, and the Laboratory of Dynamics of Satellite Manipulators operates in Zielona Gora. Scientific and research projects solar physics (Wroclaw branch), study of planets and small bodies of the Solar System, interplanetary space physics and astrophysics, plasma physics, planetary geodesy and geodynamics, Earth observations.

Space missions:

Among several other exceptionally high-profile space missions in which the institute is participating are:
- **PROBA 3** – ESA's technological mission, the aim of which is to create an exceptionally long coronagraph in orbit. The Coronograph Control Box, i.e. an on-board computer and a filter wheel, was created at CBK PAN.
- **ARIEL** – ESA's exoplanet atmosphere observatory. The Institute is developing the Fine Guidance System (FGS), whose task is to precisely point the telescope at the observed object. FGS will be such an advanced structure that, regardless of supporting the main telescope, it can be used as an astrometer or photometer – an additional scientific instrument on board ARIEL.
- **IMAP** – scientists and engineers of CBK PAN were the first and so far the only ones in Poland who could prepare their own experiment and instrument for the NASA IMAP heliospheric mission. The GLOWS photometer will examine the impact of the solar wind on hydrogen gas in the heliosphere. The mission launches in 2025.

Our clients:

The Institute has a long history of cooperation with the world's largest space agencies, including the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). CBK PAN is one of Europe's leading space research organizations. Participation in numerous international space missions, construction of space instruments and satellite subsystems for scientific research, or supporting the development of the Polish space industry through education, knowledge and technology transfer, confirms not only the prestige, but also the unique character of CBK PAN.

www.ciliumengineering.com

Stanisław Kozłowski   +48 509 628 491
President of the Board   biuro@cilium.pl
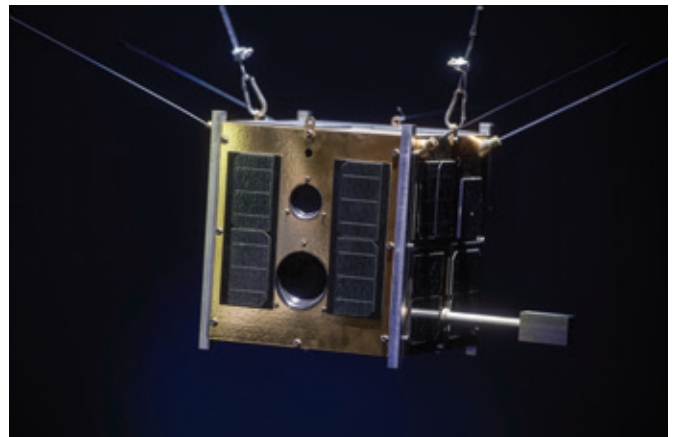
Cilium Engineering

The scope of Cilium Engineering's activities includes the implementation of projects in the space industry for domestic and foreign clients. The company focuses on the design and implementation of ground-based observation systems dedicated to the observation of satellites and space debris, management systems for astronomical observatories and automation systems dedicated to astronomical observatories.

Products:

Cilium Engineering provides custom solutions to meet the rigorous requirements of advanced robotic systems. The company designs independent observatories from scratch, as well as specific hardware and software modules that can be added to an existing system. Cilium Engineering has extensive experience in implementing and commissioning solutions in various parts of the world.

Cilium Engineering's product line includes – OpticalFence: a ground-based optical triangulation sensor network for space traffic management. The observation system consists of a number of observation stations that allow the measurement of the position and velocity of satellites in low earth orbit (LEO) – by using the triangulation technique, it is possible to determine the full state vector of an object, that is, the three-dimensional position. Cilium is the only company in the world producing this type of sensor.

Projects:

- Supply and installation of automated telescope sets with deployment service for use at the South African Astronomical Observatory (SAAO) in South Africa.
- Supply and installation of automated telescope sets with deployment service for use at the Pacific Ocean location – Hawaii.
- Supply of sensors with very wide field of view for optical triangulation, designed for observation of SST objects in HLEO orbits – Europe, Australia, Africa.

Our clients:

Sybilla Technologies (Poland), Polish Space Agency, European Space Agency, Nicolaus Copernicus Astronomical Center, University of Zielona Gora, Poznan University of Technology, Vigo Photonics (Poland), Astros Solutons s.r.o. (Slovakia), South African Astronomical Observatory (South Africa), Natonal Observatory of Athens (Greece), NanoAvionics UAB (Lithuania), Astrolight UAB (Lithuania).

www.cim-mes.com.pl

Armen Jaworski   +48 22 631 22 44
CEO   a.jaworski@cim-mes.com.pl

CIM-mes Projekt sp. z o.o.

We support the design process using simulation. We use existing tools (CFD/FEM) and develop new simulation methods, often in coope-ration with ESA, e.g. for particulate contamination and lunar applications. We specialise in computer modeling of physical phenomena and its application in emerging and unexplored fields.

Products:

1. **Engineering Simulation Services for the Space Industry**
   We offer engineering simulation services to support the design pro-cess for the space industry. Our simulations cover a range of areas:
   a) Cleanroom simulation and optimisation,
   b) Outgassing/venting modelling, molecular simulations of rarefied gases/in vacuum,
   c) Structural FEM simulations,
   d) Rocket engine flow simulations,
   e) Dust/particle simulations in extraterrestrial conditions (Moon, Mars).

2. **DUSTFLOW simulation software**
   In collaboration with ESA, we developed DUSTFLOW software tool. It is designed to simulate:
   a) Particulate contamination in cleanrooms and launchers before and during launch,
   b) Venting/outgassing,
   c) Rocket engine flow,
   d) Gas movement in a vacuum,
   e) Dust particles movement in lunar and extraterrestrial conditions.

3. **TEDMAP simulation software**
   We developed a software to enhance the accuracy of temperature measurements using thermal imaging cameras (in cooperation with ESA and NPL). The software increases temperature measurement accuracy by:
   a) Eliminating the influence of reflections,
   b) Accounting for directional emissivity.

The software is designed to measure objects in TVAC (thermal-vacuum chambers) but can also be used in other temperature measurement applications based on thermal imaging.

ESA Projects:

1. **Software tool for modelling particle contamination during pre--launch and launch phase.**
   The DUSTFLOW software was developed. It can simulate the movement of particles ranging from 1-100 µm in any gas flow environment (e.g., in cleanrooms and Mars).

2. **Software tool for simulating lunar dust contamination.**
   The MoonDUST software was developed. It can simulate various operations (landing, takeoff, movement) on the Moon and assess their impact on contamination risks.

3. **Software tool for correcting temperature measurements using thermographic methods.**
   TEDMAP software was developed. It reduces thermography tempe-rature measurement errors using raytracing simulation techniques. The software's primary application is measurements conducted in thermal vacuum chambers (TVAC).

4. **Development of new guidelines for designers of space mecha-nisms** regarding the evaporation of lubricating oils in high vacuum conditions. Simulations of molecular flow.

5. **Structural calculations for the liquid oxygen turbopump** for the M10 engine of the VEGA-E launcher.

Our clients:

Avio SpA, Aerospace & Advanced Composites GmbH, Jet Propul-sion Laboratory (NASA), National Physics Laboratory (NPL).

www.cloudferro.com

Rafał Kowalczyk   +48 22 354 65 73
Space Policy   rkowalczyk@cloudferro.com
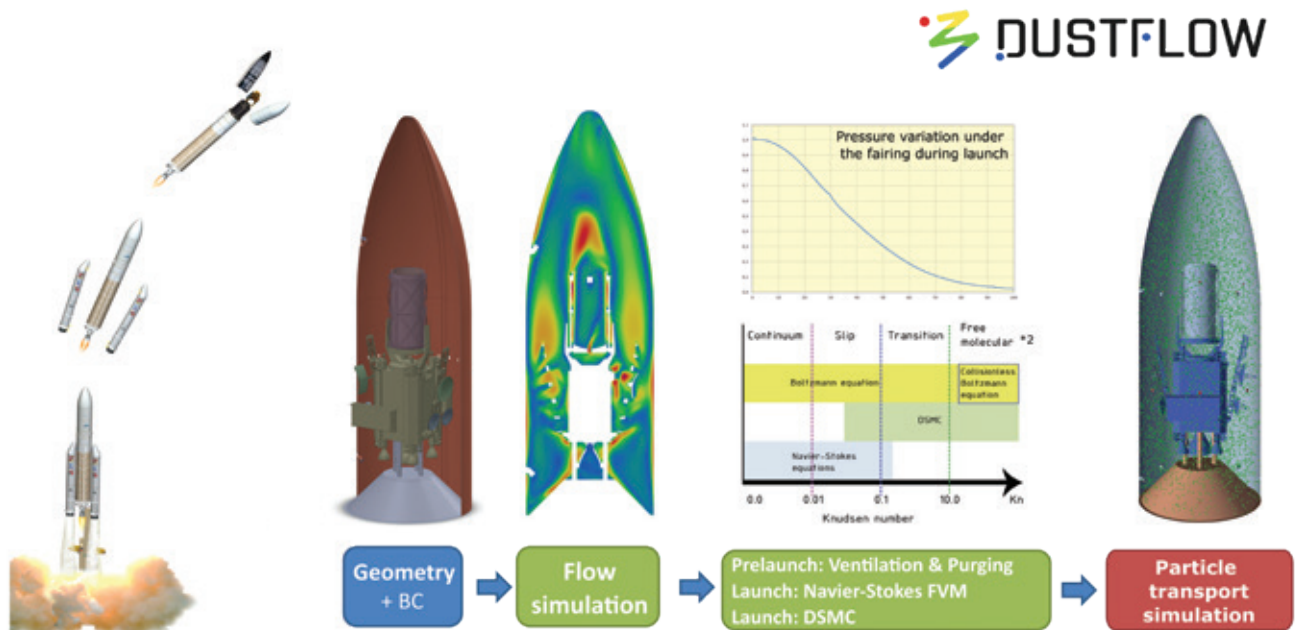
CloudFerro S.A.

CloudFerro provides next generation cloud services dedicated to specific industries. The company's expertise includes storing and processing big data sets, such as multipetabyte repositories of Earth Observation satellite data. CloudFerro has been trusted by leading European firms and scientific institutions from various big data processing market sectors, including ESA, EUMETSAT, ECMWF, DLR, and many others. It is the only Polish company in the space sector that acts as a prime contractor for the above-mentioned institutions. CloudFerro is a European company in every area of its business, from legal aspects and standards, to the location of its data centers and the customer service team. The company cooperates with over 40 scientific institutions across Europe. It is a member of the European Open Science Cloud, and provides cloud computing resources for science financing projects.

Services:

- **IaaS** (Infrastructure as a Service) services in public, private or hybrid cloud model, computing, storage, cloud management, virtual networks, and XaaS virtual appliances,
- **PaaS** (Platform as a Service) services for EO data and PGaaS (Product Generation as a Service) allowing mass product processing,
- **EO Data Repositories** for the Copernicus Sentinel Missions and other satellite data (over 100 PB of online data),
- **Various EO data access interfaces:** HTTP and S3 (STAC, OData and OpenSearch API),
- Commercial access to **EO VHR** data with capabilities of satellite tasking (spatial resolution even below 50 cm).

Technology:

- TD 8 System Design&Verification,
- TD 9 Mission operation & Ground Data systems,
- TD25 Quality, Dependability and Safety,
- 1 Services & applications based on data from EO satellites,
- 2 Services & applications based on data from navigation satellites.

Projects:

- **Copernicus Data Space Ecosystem commissioned by ESA** is one of the biggest repositories of open and free Earth observation data in the world. It includes both new and historical Sentinel, Landsat, SMOS imagery, as well as the Copernicus Contributing Missions data immediately available for downloading, streamlining and on-demand processing. CloudFerro is responsible for providing access to the full archive of Copernicus EO data, data retrieval, and processing services.

- **CREODIAS** is a cloud computing environment with an integrated multi-petabyte repository of Earth observation satellite data, built and operated by CloudFerro. It was initially one of the five DIAS platforms (Data and Information Access Services) commissioned by ESA, that facilitated and standardised access to Copernicus Earth Observation data, as well as to processing tools. CREODIAS 2.0, building on the experiences of the first version, has over 20,000 users from 198 countries now, and provides commercial services for Copernicus Data Space Ecosystem.

- **Destination Earth Data Lake** – a massive repository of data managed by EUMETSAT that provides a foundation for "Destination Earth", a European Union's flagship initiative of digital Earth modeling contributing to the European digital and green transformation. It offers data discovery, data access and near data processing services. CloudFerro, the prime contractor for the project, provides and operates a complex cloud infrastructure distributed in several locations in Europe.

- **CODE-DE** commissioned by German Aerospace Centre DLR, developed and operated by CloudFerro is a national EO platform providing easy and free access to EO data for Germany and an efficient processing environment. Users can benefit from synergy with the CREODIAS platform, ensuring efficient use of resources as well as autonomy for key national processes.

- **EO-Lab** is a platform commissioned by DLR, developed and operated by CloudFerro, providing easy and effective way for German scientists and developers to access Earth observation data. It provides a powerful virtual high-performance working environment for processing these data in the cloud, as well as extended collaborative tools for users.

- **ESA HPC** – CloudFerro provides services and operational maintenance of a private cloud computing infrastructure located in ESA co-location. The platform serves as a pilot and technology demonstrator for the future development of the ESA HPC-infrastructure.

- **ESA LTA** – CloudFerro provides a data archive for ESA, used for downloading, storing, and making available to download by ESA users. The service collects data from the Copernicus programme, and today it has more than 50 PB of data used by scientists, researchers and government administrations around the world.

Space missions:

The most important downstream projects: Copernicus Data Space Ecosystem, CREODIAS, Destination Earth Data Lake, CODE-DE, EO-Lab, ESA LTA, ESA HPC.

CloudFerro participated in Horizon Europe/Horizon 2020 projects: DOME, EO-PERSIST, AerOS, ASCEND, EMERALD, Golden RAM, Candela, EOSC-HUB, Impressive, AI4Copernicus, Centurion, C-Scale.

NCBiR projects: AgroTech, GEP.

Our clients:

ESA, EUMETSAT, ECMWF, DLR, T-Systems, Sinergise, VITO, CS-Group, EODC, Thales Group, Telespazio, Serco, Airbus, Polsa, Soprasteria, University of Salzburg, Uni Demokritos, Uni Louvain.

www.cloudless.tech

Piotr Franczak   +48 695 660 247
CEO   info@cloudless.tech

Cloudless sp. z o.o.

Cloudless develops the technology of innovative flights of unmanned aircraft in the „near space" and stratosphere. Cloudless works comprehensively on stratospheric technologies, from the design, construction of the aircraft and its integration with the payload, to the implementation of the flight service and data delivery. The goal of Cloudless is to build and develop a HAPS-class fixed-wing aircraft.

Services:

Cloudless provides stratospheric flight services (up to an altitude of approximately 25 km) with a payload of up to 2 kg. This enables both testing of the payload itself (e.g. communication component) and obtaining data with its help (remote sensing, aerological research).

The main areas of activity are:

Aerological research – the use of an unmanned powered aircraft allows obtaining data on the physicochemical parameters of the atmosphere at selected altitudes. Horizontal flight in a selected layer allows for more accurate measurements than in the case of traditional measurement using a weather balloon. The acquired data can be used to calibrate/validate models based on satellite data.

Research on HALE/HAPS platforms and research on space technologies in near space conditions. Flight with a test payload allows you to test the operational parameters of the equipment in conditions in which over

95% of the mass of the atmosphere is below the aircraft. This allows for the acquisition of data in the stratosphere-earth surface and stratosphere-space axis. Moreover, such flights enable testing of equipment for large HALE/HAPS class platforms.

Stratospheric remote sensing. Stratospheric flight along a planned trajectory allows for imaging (RGB) from a significant height. This allows to obtain data from large areas, providing GSD resolution<30 cm/px. Full control over the flight allows to take photos at precisely the ordered time. This is an important advantage in relation to satellite imaging, where the imaging time is strictly related to the revisit time.

Projects:

As part of the GreenOffshoreTech program, a solution was created that uses a stratospheric drone to conduct marine observations. An operational concept was developed taking into account the specificity of flight over large bodies of water (e.g. range in given conditions, preferred take-off place, etc.).

www.creotech.pl/pl
+48 22 246 45 75
kontakt@creotech.pl

Creotech Instruments S.A.

Creotech Instruments is a leading Polish integrator and manufacturer of satellites, satellite systems, and advanced electronics dedicated to quantum computer control systems, among other applications. It is the only company in Poland capable of building microsatellites, which weigh between 10 kg and several tens of kilograms. The company has its own electronics production facilities located within the country and a small satellite integration facility. Creotech is one of the largest Polish contractors for the European Space Agency and regularly supplies its solutions to the world's most advanced research institutions and commercial clients. Since 2022, Creotech Instruments has been listed on the Main Market of the Warsaw Stock Exchange (GPW).

Products:

- **Satellite-as-a-Service**: we specialize in creating complete space missions tailored to the individual needs of our clients. Our solutions cover all aspects of a mission, including technology, legal, and operational issues. We support our clients in mission design, registration, payload integration and launch, as well as satellite operations using our Mission Control Center.
- **Offered services:** – Mission analysis and design – Registration, insurance, launch – Operations – Data storage, processing, and advanced analysis.
- **Kestrel MR EO:** An Earth observation optical satellite with a 3-5 m GSD resolution, based on a smaller, non-redundant, and cost-effective variant of the HyperSat platform.
- **Eagle HR EO:** An Earth observation optical satellite with a 1-2 m GSD resolution, created based on a fully redundant HyperSat variant.
- **Seagull HR SAR:** An Earth observation satellite using synthetic aperture radar (SAR) with a resolution of up to 3-5m GSD.
- **HyperSat Satellite Platform:** Consisting of individual subsystem modules, allowing scalable design and production of satellites with different masses (from 20 to 100 kg) and various purposes: satellite imaging reconnaissance, low orbit telecommunication, and low Earth orbit navigation. Each module is scalable and can be tailored to mission requirements.
- **HyperSat Kestrel Platform:** Kestrel, weighing ~25 kg (including payload), offers similar capabilities to recognized CubeSat 16U platforms, but with approximately 2-3 times larger payload volume. Kestrel's versatility allows it to support various mission profiles such as IOD, Earth observation, communication, and more.
- **HyperSat Eagle Platform:** Eagle, weighing up to ~80 kg (including payload), can accommodate advanced and power-intensive instruments for Earth observation, communication, technology, security, science, space logistics, and other mission types. Full redundancy allows Eagle to operate reliably over a long period.
- **Other activities** conducted by Creotech Instruments include: development and implementation of White Rabbit technology for time synchronization systems; development and implementation of the Sinara standard for building quantum computers (in collaboration with institutions such as the University of Oxford, Berkeley, and MIT); implementation of the SAMPLE project for obstacle monitoring systems in aviation.

Space Projects:

Creotech Instruments currently collaborates with major international companies and institutions in the space sector. The company has participated in over 40 projects, including international missions such as JUICE, PROBA3, OPS-SAT, EXOMARS 2016, ASIM, and Comet Interceptor.

Here are the most important ones:
- **EagleEye** – the company has completed work on the EagleEye satellite, which is planned to be launched into low Earth orbit in 2024. It is the largest and most advanced microsatellite in our country's history, built by Creotech Instruments with the involvement of domestic companies. Its weight is about 55 kg, equivalent to the total mass of all Polish satellites developed since our participation in space exploration began. This is a groundbreaking project for the entire Polish space sector and a significant step in developing national capabilities in the design, construction, integration, and launch of small satellites.

- **PIAST** – the main goal of this project is to place three observational satellites into Earth orbit. The PIAST project will develop satellites based on the proprietary HyperSat satellite platform, developed by Creotech. Recently, the CDR review was completed, marking the end of the second phase of the project.
- **Plasma Observatory** – Creotech Instruments will carry out phases A and B1 of the project, which include feasibility assessment and preliminary mission design, along with the design of space probes capable of flying beyond Earth's geostationary orbit (GEO). The engineering team will also be responsible for designing and manufacturing a complete set of radiation-resistant satellite electronics, paving the way for future space missions beyond low Earth orbit.
- **On-Orbit Satellite Refueling Mission** – this project involves preparing a satellite design based on the proprietary HyperSat platform. Creotech is part of an international consortium led by OHB, which will implement a pioneering ESA project to refuel a satellite in Earth orbit. The task of the satellite designed by Creotech will be to dock and then receive fuel transfer from a second, larger satellite.
- **Twardowski** – the goal of this project is to provide precise data enabling the utilization of resources on the surface of Earth's natural satellite. Creotech Instruments will be responsible for designing the entire mission and the satellite, based on the proprietary HyperSat microsatellite platform.
- **Responsive European Architecture for Space** – this initiative aims to prepare a European system capable of launching new satellites into orbit within less than 72 hours in response to a crisis situation. The German Space Agency is the coordinator of the entire project. Creotech is the coordinator of its key part – space segment analysis, including space missions, satellite platforms, and system engineering.
- **Quantum Key Distribution High Rate Detector Predevelopment** – the goal of this initiative is to develop a high quantum efficiency single-photon detector. This device will be used in ground stations for quantum key distribution (QKD) systems and optical communications, particularly for deep space mission communications.

Our clients:

European Space Agency, Space Research Center of the Polish Academy of Sciences (CBK PAN), Center for Theoretical Physics of the Polish Academy of Sciences, University of Warsaw, Warsaw University of Technology, Institute of Plasma Physics and Laser Microfusion, National Center for Nuclear Research, CERN – European Organization for Nuclear Research, GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany, DESY Research Center, National Institute for Subatomic Physics (Nikhef).

eycore

www.eycore.com

Marek Woliński   +48 539 060 372
Business Development Manager   contact@eycore.com

Eycore sp. z o.o.

Eycore is a Polish deep-tech space company. The company creates advanced synthetic aperture radar (SAR) payloads for government and private sector clients who need sovereign Earth observation (EO) capabilities. Eycore's offer ranges from SAR payloads, ready for integration with a range of satellites platforms on the market, or fully integrated SAR satellites.

Products/Services:

Eycore offers two products:

SAR Payload:
- Equipped with advanced military-grade radars,
- Delivered rapidly within 12-months (flight ready),
- Ready for integration – by the customer or chosen satellite bus integrator,
- Post-delivery support.

SAR Satellite:
- SAR satellite fully integrated with SAR payload,
- Delivered rapidly within 24 months (ground delivery),
- Launch services through trusted launch-proven partners,
- Post-launch mission services.

Technology:

TD-6 – RF Subsystems, Payloads and Technologies / TS-D – RF Payloads / TG-III – Remote Sensing Instruments – SAR (Synthetic Aperture Radar).

www.technologypartners.pl

Michał Towpik   +48 22 658 14 76
Vice-President   michal.towpik@technologypartners.pl
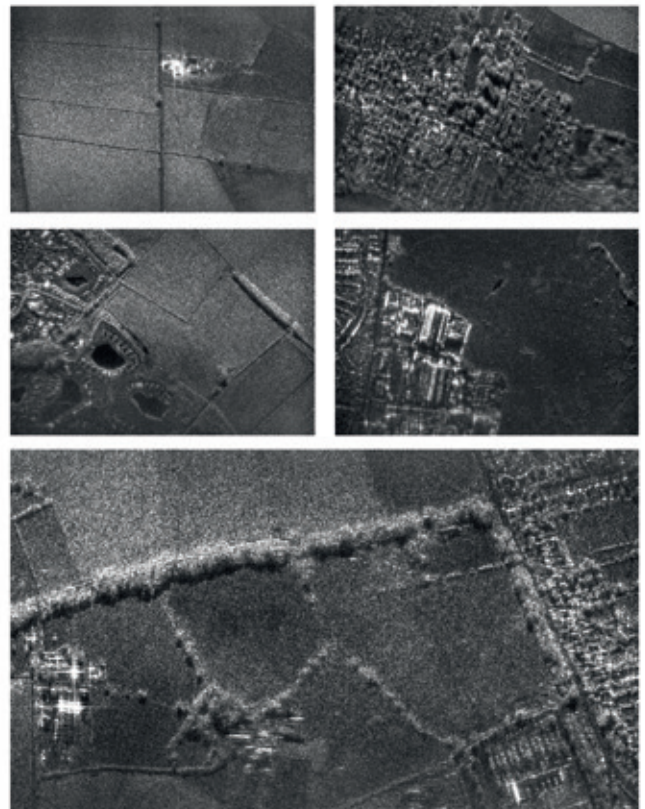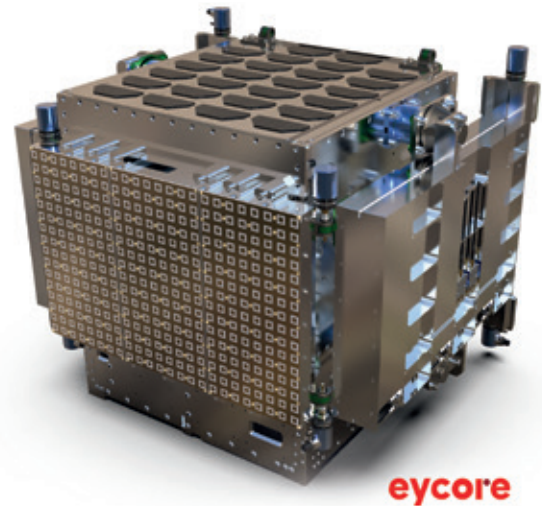
Fundacja Partnerstwa Technologicznego

Technology Partners is a research and technology organization founded in 2003. Our mission is to develop and support cooperation between representatives of the Polish science and technology sector and the international scientific community and industry. We specialize in research and innovation management and in the implementation of large multidisciplinary research projects. We conduct research and act as a General Contractor for multidisciplinary projects, sourcing exceptional teams from among the best scientific and research talents and specialists.

Services:

- **For international research organizations and industry** – access to the Polish science and technology sector combined with professional management of the best scientific and research talents and professionals in teams tailored to the needs of customers / partners.
- **For the best talents and scientific and research specialists –** opportunities to work on innovative projects in an international environment.

Projects:

- 3DFORCOMP – 3D Printing and Nanotechnology for Electromagnetic Shielding of CFRP Structures,
- GO2SPACE-HUBS – Generating New Solutions to and from Space through Effective Local Start-up HUBs,
- ACTTIVATE – Pan-European Clusters for Technology Transfer and New Value Chains,
- OASIS – Open Access Single Entry Point for Scale-up of Innovative Smart Lightweight Composite Materials and Components,
- ICEMAN – Anti-Icing Sustainable Solutions by Development and Application of Icephobic Coatings,
- SOUNDOFICE – Sustainable Smart De-Icing by Surface Engineering of Acoustic Waves,
- COMP-ECO – Strengthening Mazovian multifunctional composite ecosystem through holistic approach and strategic alliance with European leaders,
- FIT-4-NMP – Strategic and Targeted Support to Incentivise Talented Newcomers to NMP Projects under Horizon Europe,
- PROSPECTS 5.0 – Progress towards Industry 5.0: A smart study on analysis and identification of practices, drivers, success factors and obstacles of transitions towards Industry 5.0,
- PLATFORM – Open Access Pilot Plants for Sustainable Industrial Scale Nanocomposites Manufacturing based on Buckypapers, Doped Veils and Prepregs,

- ELECTRICAL – Multifunctional Composite Structures with Bulk Electrical Conductivity and Self-Sensing Capabilities,
- SARISTU – Smart Intelligent Aircraft Structures,
- PHOBIC2ICE – Super-IcePhobic Surfaces to Prevent Ice Formation on Aircraft,
- AERO.UA – Strategic and Targeted Support for Europe-Ukraine Collaboration in Aviation Research,
- CANNAPE – Canadian Networking Aeronautics Project for Europe
- MAAXIMUS – More Affordable Aircraft Structure Lifecycle through Extended, Integrated and Mature Numerical Sizing,
- ELAN – Creation of a European and Latin American Self-Sustainable Innovative Cooperation Network (ELAN) of Research and Innovation (R&I) Actors and Industry Partners to Foster Co-generated, Technology-based Business Opportunities.

Our clients:

- **Aerospace Industries Association of Canada,**
- **Airbus,**
- **Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung e.V.,**
- **Fundacion Para la Investigacion, Desarrollo y Aplicacion de Materiales Compuestos,**
- **Instituto Nacional de Tecnica Aeroespacial Esteban Terradas (INTA),**
- **Iwczenko-Progress,**
- **Joint Institute for Innovation Policy (JIIP),**
- **Nanocyl SA,**
- **National Aerospace University – Kharkiv Aviation Institute,**
- **Pratt & Whitney,**
- **Tecnalia,**
- **TMBK Partners sp. z o.o.,**
- **VTT Technical Research Centre of Finland,**
- **Ukrainian Research Institute of Aviation Technology,**
- **University of Manchester.**

www.giss-satcom.com

Andrzej Gruszka
BD Director
andrzej.gruszka@giss.pl
+48 885 800 480

Bartosz Peas
Int. Sales & BD Director – SATCOM
bartosz.peas@giss.pl
+48 661 684 859

GISS sp. z o.o.

GISS Sp. z o.o. has been operating in the market since 2012. The initial years of its operation were focused on projects related to air traffic maintenance systems, where the company was a supplier of ILS/DME devices and PSR/MSSR radars for the Polish Air Navigation Services Agency. In 2016, the company established an R&D department in the field of satellite communication technology, which to this day is considered strategic in the company's operations. To date, the company has designed and produced a range of products in the SATCOM ground segment, including backpack VSAT terminals and FlyAway terminals. Since 2018, we have been the main supplier of VSAT satellite terminals for the Polish Armed Forces. Since 2022, we have started active operations in foreign markets.

In 2021, the company opened its own Satellite Communication Technology R&D Center in N. Konicz near Warsaw. We continuously develop new products, keeping in mind the dynamic changes in the market, including in terms of new LEO/MEO constellations. We are implementing a number of R&D projects, both our own (development of new products) and co-financed from external funds (National Centre for Research and Development, Ministry of Development and Technology, European Defense Fund).

Products:

SatPack COBALT – A modular backpack VSAT terminal designed for broadband SATCOM communication. Its modular design allows for hardware configuration selection based on specific operational requirements. The user has access to:
- Radio modules – for various bands including X, Ku, and Ka, with different amplifier powers (typically from 12 to 40 W).
- Modem modules – the terminal integrates with modems from leading manufacturers in the market, including NDSatcom, iDirect, Teledyne Datacom, UHP, Comtech.
- Power modules – a standard AC power module or a tactical module is available, allowing for operation with DC sources such as typical NATO BB-2590 batteries or car batteries.
- Antenna part – various aperture sizes are available: 0.6 m, 0.8 m, 1.0 m, 1.3 m.

The terminal features built-in positioning support software that enables the operator to align the terminal with a satellite and establish communication within minutes. It is the main backpack terminal for the Polish Special Forces.

SatPack Automate – A product planned for release in 2024. Designed as a VSAT terminal with automatic alignment, maintaining modularity as in the COBALT terminal. It also implements mechanics and algorithms allowing operation (in pairs of terminals) with LEO/MEO constellations.

SMART – FlyAway class VSAT terminals typically with antenna apertures of 1.8m and 2.4m. The product is integrated by GISS using a proprietary antenna control unit (ACU) with implemented tracking algorithms. It can also be equipped with GISS-produced modules:
- No-IDU – a modem module allowing the omission of typical RACK-mounted modems in transport cases in favor of a fully portable unit mounted on the antenna;
- FO module – an optical converter module enabling the RF L-band conversion and transmission via fiber optic to the command post. The module allows for several kilometers of separation between the antenna part (emitting) and the command post (with operation).

SatPack Phoenix – GISS's first terminal with a flat antenna. Designed for operation with GEO satellites in the Ku band. It enables broadband communication based on its own network resources (own HUB) using a compact terminal.

SatPack L-band – A backpack terminal designed for the OPUNCJA program requirements implemented by the Armament Agency. The terminal enables broadband communication on Ku and X bands with TDMA (NDS 5G mini) and SCPC (Teledyne Datacom Q-Lite) modem technologies. It is the main backpack terminal for the Polish Land Forces.

Services:

- Designing and maintaining satellite networks – based on our engineering team and cooperation with satellite operators, we support clients in designing and maintaining networks.

- Dedicated SATCOM services – we deliver our terminals along with bandwidth, hosting, and management services. Wherever the client does not need to invest in their own network infrastructure or administrative staff.

- Prototyping and low-volume production – we have our own CNC machinery (milling machines, lathes, plotters), a metal 3D printer using SLM (Selective Laser Melting) technology, and RF/EM component design/simulation software. We offer support services and execution in prototype device manufacturing. Using SLM technology, we can produce components with complex shapes in a single compact mass, minimizing material use.

Technology:

- TD6-TSA Telecomunication Subsystems,
- TD7-TSA Antennas,
- TD7-TSB Wave Interaction and Propagation,
- TD12-TSB Ground Communication Networks.

Projects:

- European Commission Grant within the EDF: „European Protected Waveform". The EPW Consortium brings together key players from the satellite industry and academia across Europe to develop a jam-resistant satcom waveform tailored to the needs of military operations and security. This project aims to create satellite communication that is secure, affordable, and interoperable, as well as meeting the increasing demand for European autonomy in defense and space sectors.

- Deliveries to the Polish Ministry of National Defense and the Ministry of Internal Affairs and Administration since 2016 include: a. Backpack VSAT terminals b. FlyAway terminals c. Central stations d. Satellite modems e. Vehicle-mounted terminals

Our clients:

MoD PL, MoI PL, NDSatcom, STE iDirect, Comtech, Teledyne Datacom, SES, GovSat, Avanti, Intelsat, Eutelsat.

www.gmv.com

Paweł Wojtkiewicz +48 693 361 603
Director for space in Poland pwojtkiewicz@gmv.com

GMV Innovating Solutions sp. z o.o.

GMV Innovating Solutions Sp. z o.o. was founded in 2009 as a fully owned subsidiary in Poland of the international technology group GMV. The company develops in Poland the whole GMV portfolio of activities and performs their own projects with particular focus on three industries: Space, Intelligent Transportation Systems (ITS), defense and security. The global aim of GMV Innovating Solutions Sp. z o.o. activities is to provide IT solutions, integrated systems, specialized hi-tech products and services with close cooperation with clients and end-users. Within few years GMV Poland become reliable partner, products and service provider for European Space Agency (ESA), EUMETSAT, EUSPA, Polish Space Agency (POLSA), European prime contractors and satellite operators.

Services:

- Ground segment design and integration,
- Ground Stations Monitoring Control Systems,
- Ground Control Systems,
- Flight Dynamics Systems,
- GNSS receivers for space applications,
- Payload Data Processing,
- Mission planning, Mission Analysis,
- Software tools for SSA/SST applications,
- Engineering Support,
- Guidance, Navigation and Control Systems (GNC),
- Attitude and Orbit Control System (AOCS),
- On-board software,
- Independent Software Validation,
- Autonomy and space robotics,
- Services for different markets based on integrated satellites applications,
- GNSS-based applications development for different markets.

Products:

- **hifly®** – multimission multisatellite system for satellite monitoring and control, providing full integrated, homogenic support for big fleets of various satellites.
- **Sextans®** – high accuracy GNSS software receiver for small satellites and microlaunchers.
- **focuSuite** – an unique software created especially for the need of flight dynamics of most satellite missions with the aim to develop non-standard solutions with high output.
- **flexplan** – GMV´s Commercial Off-The- Shelf solution for Generic Mission Planning and Scheduling.
- **magnet** – a ground station and communication network monitoring and control system offering an advanced graphical interface, fully integrated with Hifly®.
- **MagicGEMINI®** – an operational GNSS performance analysis and monitoring tool.

Projects:

- GNSS receiver – development of GNSS software receiver for small satellites and microlaunchers.
- IOANT-2 – GNC system for in orbit integration of large structures.
- Deorbit KIT – development of GNC system.
- LHDAC – development of HDA camera-based solution for lunar landing.
- BIOMASS – mission analysis, development of L0 data processors.
- EarthCare – Specification, design, deployment, validation and maintenance of L0 level data processor.
- SWARM – quality control of data and data processing algorithms, verification and validation of data processing chain.
- MetoOp-SCA – Scatterometer Ground Processor Prototype and instrument SW simulator.
- EE WIVERN – End-to-End performance simulator.
- ROSE-L, Sentinel-1 NG, Sentinel-2 NG, HYDRON, Copernicus VHR – mission analysis.
- Galileo SG System Test Bed – development of ground infrastructure for Galileo SG tests.

Space missions:

- AEOLUS, BIOMASS, CAIRT, CREAM, Deorbit KIT, EARTHCARE, EUCLID, FLEX, Galileo SG, HydRON, LMT – Laser Momentum Transfer.
- Lunar Mineralogy Mapper LuMM, MetOp-SG, NITROSAT, OPS-SAT, POC-1, PROBA-3, ROSE-L, Sentinel 1 NG, Sentinel 2 NG, Sentinel5, SWARM, WIVERN.
- Number of ESA missions in which the entity is/was (since 2012) involved (signed contract, may be as subcontractor/co-contractor)*: **23.**
- Number of EC/EU/Horizon projects in which the entity is/was (since 2012) involved (signed contract, may be as subcontractor/co-contractor)*: **1.**
- Number of NCRD projects in which the entity participates/participated (since 2012)*: **1.**

Our clients:

**ESA (ESOC/ESRIN/ESTEC), EUMETSAT, POLSA, PANSA, EUSPA
Large systems integrators: Airbus Defence & Space, Thales Alenia Space, OHB.
Universities: Military University of Technology, Warsaw University of Technology, Gdańsk University of Technology.**

www.haiko.pl

Ernest Kryjer   +48 22 724 34 86
COO   haiko@haiko.pl
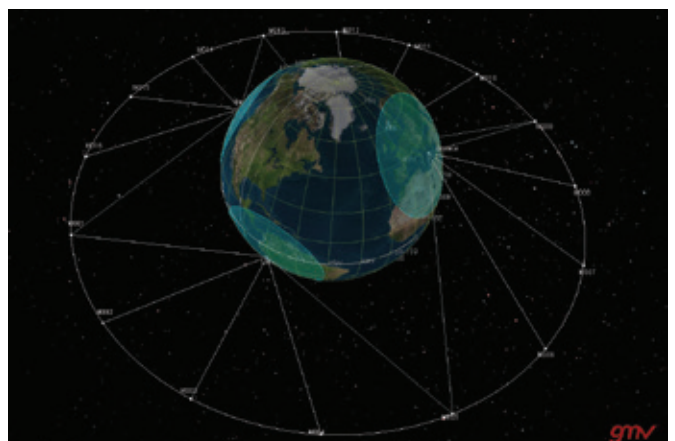
Haiko sp. z o.o.

Haiko has built a strong reputation over many years for providing comprehensive services to industry, resulting in consistently high quality standards. Our comprehensive range of solutions is dedicated to meeting the needs of industry in the broadest sense. We provide comprehensive services, including the installation, maintenance and sale of gates and complete docking systems for industrial applications. Our collaboration with the world's leading manufacturers of industrial automation and electronics ensures that our projects are among the most reliable, with a low rate of failure. Providing the highest level of service is our priority. We carry out all tasks in accordance with ISO 9001 norm.

Products/Services:

Products:
- industrial gates and doors,
- loading systems (docks),
- spare parts for gates, doors and docks,
- industrial automation,
- telemetry modules,
- electronic components,
- chemical accessories.

Services:
- sales, installation, service and maintenance of industrial gates, doors and loading docks,
- sale of spare parts, industry automation, telemetry modules, electronic components and chemical accessories,
- coordination of PCB assembly services, BOM quotations and completions, as well as consulting services in this field.

Technology:

- TD 1 On Board Data Systems,
- TD 13 Automation, Telepresence & Robotics,
- TD 21 Thermal,
- TD 24 Material & Processes.

Projects:

We have considerable experience in coordinating complex projects. Our capabilities allow us to efficiently serve large companies in a variety of industries, including construction, transport and logistics, electronics, and high-tech industry.

Our clients:

HÖRMANN, INVENTIA, British Embassy Warsaw, Creotech Instruments, Warsaw University of Technology, RADMOR, VIGO Photonics, Łukasiewicz Research Network – Institute of Aviation.

www.hertzsystems.com

Urszula Szulewicz   +48 68 328 70 42
CEO   u.szulewicz@hertzsystems.com
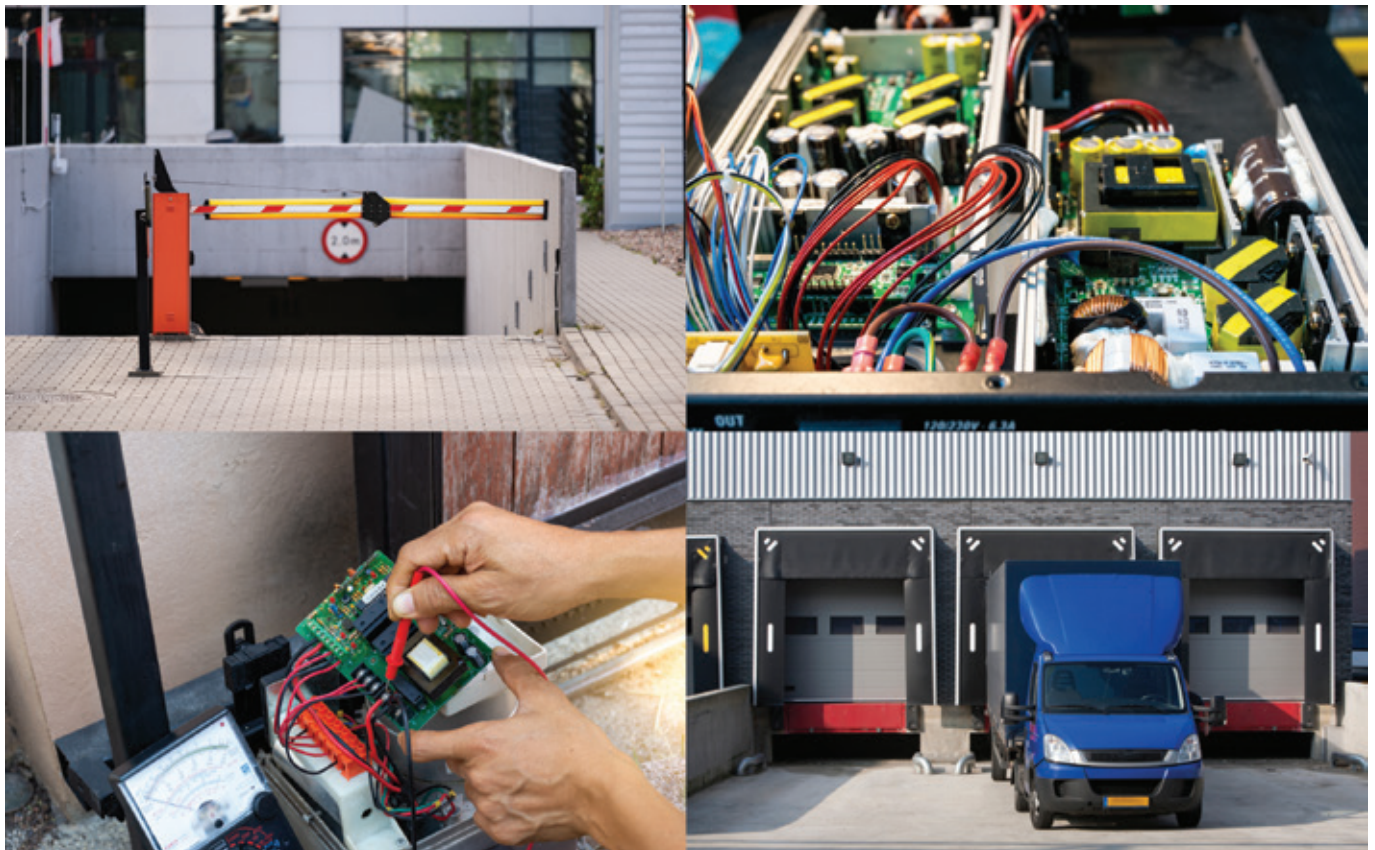
Hertz Systems Ltd sp. z o.o.

For over 34 years, Hertz Systems has been providing hardware and software solutions for the military, government institutions, and the private sector. The company's main areas of operation include military, space, and security systems. Hertz Systems is the only Polish manufacturer of military satellite navigation receivers integrated with cryptographic modules. Simultaneously, the company is involved in space projects related to GNSS and sensors for space applications. The company actively strives to produce Galileo PRS receivers in Poland. Hertz Systems also specializes in technologies ensuring security of critical infrastructure. The company is an industrial partner of the Space Technology Park located in Lubusz Voivodeship (the park began its operations in the fourth quarter of 2023).

Services:

- Development, production, testing and accreditation of GNSS receivers,
- Design and production of sensors, including radars and radar antennas,
- Laboratory testing of single and multiple-antenna GNSS devices for direction finding and spatial orientation,
- Laboratory testing of GNSS devices dedicated to aircraft, rockets and satellites.

Products:

- **Military GNSS receivers** integrated with **SAASM / M-Code** cryptographic modules dedicated for land, air (including UAV) and marine platforms,
- **Military GNSS** receivers integrated with **GALILEO PRS / M-Code** cryptographic modules (product in development),
- Comprehensive system for drone detection and neutralization based on diverse sensors and data fusion **(HAWK system),**
- **TEMPEST class equipment,**
- **Radar systems,**
- **Downstream applications,**

Technology:

- TD2 Space Systems Software,
- TD6 RF Payload and Systems,
- TD8 System Design & Verification,
- TD10 Flight Dynamics and GNSS,
- TD12 Ground Station System and Networks,

Projects:

- Development of standardized GNSS navigation receiver integrated with GALILEO PRS / M-Code cryptographic modules.
- Development of European early warning system against ballistic and hypersonic missiles.

- Development of a precise positioning system focused on delivering the highest possible accuracy and signal availability both outdoors and indoors.
- GNSS interference monitoring system.
- Development of a drone radio communication detection system with intelligent jamming capabilities.
- Network-centric airspace monitoring and defense system against UAV for prevention in states of public danger, protection of critical infrastructure and public facilities.

Space missions:

- Number of ESA missions in which the entity is/was (since 2012) involved (signed contract, may be as a subcontractor/co-contractor)*: **10.**
- Number of EC/EU/Horizon projects in which the entity is/was (since 2012) involved (signed contract, may be as a subcontractor/co-contractor)*: **6.**
- Number of NCRD projects in which the entity participates/participated (since 2012)*: **3.**

Partners and Clients:

Our Clients:
ESA, EUSPA, European Commission, European Defence Agency, Ministry of National Defence, Government Agencies, NATO Agencies.

Our Partners:
Academic and Research institutions (including Space Research Centre, University of Zielona Góra), Military University of Technology, Companies being part of Polska Grupa Zbrojeniowa S.A., BAE Systems, OHB, Leonardo, Thales group companies, Raytheon, Polish companies active in the space sector.

ICEYE

www.iceye.com

Kacper Grzesiak – Sales Director   +48 668 660 077   kacper.grzesiak@iceye.com
Dawid Biesiadecki-Dziuba – Sales Specialist   +48 453 581 253   dawid.biesiadecki-dziuba@iceye.com

ICEYE Polska sp. z o.o.

ICEYE is a world leader in the use of SAR (synthetic aperture radar) technology in microsatellites. With the most numerous satellite fleet globally in orbit, it provides access to reliable and up-to-date data from anywhere on Earth, regardless of atmospheric conditions used by government, administrative and commercial entities.

Services:

- Provision of data from ICEYE's numerous constellation of user areas of interest (AOIs) up to 25cm resolution.
- Ability to deliver ICEYE's latest SAR satellites ready for launch in about 18-24 months.
- ICEYE-managed Low Earth Orbit (LEO) launch service, optimized for area of interest and global access.
- Equipping a ground segment, which consists of hardware and software components for image order processing, satellite tasks, SAR data processing, archiving, operations and maintenance.
- A comprehensive training program to enable sovereign operations in the event of dedicated satellite launches.
- Continuous access to the existing ICEYE constellation to provide additional capacity if required.

Technology:

- ESA TD: 1,2,3,5,6,8,9,12,23;

- Latest generation SAR ICEYE satellite specs:
    - 120 kg total mass;
    - X-band imaging, (frequency 9.65 Ghz);
    - Band frequency max. 1200 MHz;
    - Polarization: VV;
    - Data transfer up to 500 Mbps in X-band;
    - Direct downlink;
    - Ion propulsion, orbit control system;
    - On-board memory: up to 1 TB;
    - System designed to exceed 3-5 years of on-orbit operations.

Space missions:

- 38 successful launches of SAR ICEYE radar microsatellites since 2019 have enabled the largest constellation of radar satellites in the world.
- 10+ more launches planned for 2025.
- Number of NCBR projects in which the entity is/was participating (since 2012)*: **3.**

Our clients:

- ESA, NGA, NRO, EMSA, NOAA,
- Finnish Armed Forces,
- Brazilian Air Force,
- United States Department of Defense,
- American Land Forces,
- Bayanat,
- Ursa Space Systems,
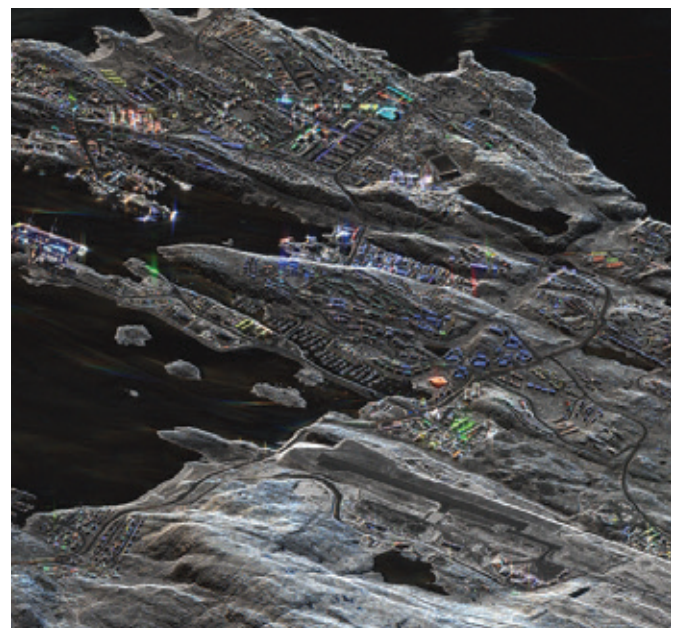- Kongsberg Satellite Services (KSAT).

Keywords – Financing, Incubation, Specialized courses, Internship program

www.arp.pl

Paweł Pacek   +48 (22) 695 3622   pawel.pacek@arp.pl
Director of the Technology   +48 501 216 190
Development Office

Industrial Development Agency JSC

Industrial Development Agency JSC belongs to the Polish Development Fund Group. Together with some of the most important institutions supporting the development of companies in Poland, IDA JSC offers practical solutions in areas such as banking, insurance, investment, development of entrepreneurship and innovativeness, foreign trade&investment. IDA JSC is a company with over 30 years of experience in the Polish market, having played a key role in the free market transformation of the Polish economy. In the coming years it has ambitions to become one of the leaders of the energy transition. IDA JSC's new strategy – „Clean industry" – focuses on investments in offshore wind energy, the hydrogen industry and space technologies.

For over 25 years the IDA JSC has been successfully attracting Polish and foreign investors to the Special Economic Zones it manages, where the Industrial Parks of the Industrial Development Agency operate – EURO-PARK Mielec, EURO-PARK Wisłosan and EURO-PARK Kobierzyce.

IDA JSC's shareholder supervision includes several dozen companies, conducting various business activities. Among them are two companies from the space sector: Creotech Instruments S.A. and PIAP Space Sp. z o.o.

IDA JSC has also prepared a special support programme for the space sector. The nature of the programme is related to IDA JSC's holistic view of investments in the space industry: not only in the context of the space sector or space exploration, but also as a source of innovations applicable in other areas of the economy.

Activities under the Space Technology Sector Support Programme:

• Internship programme "Polish Space Fellowship Programme".
• IDA JSC is responsible for the functioning of ESA BIC Poland – Business Incubator of the European Space Agency in Poland.
• IDA JSC carries out specialised training courses under the common name of "ARP Space Academy".

Projects:

ESA BIC (European Space Agency Business Incubation Centres) is a network of business incubation centres coordinated and co-financed by the European Space Agency, offering assistance in creating a business plan, setting up a company and raising additional funding from both public and private sources. ESA BIC Poland was officially established on 28 October 2022. Its aim is to support the ideas of entrepreneurship and the use of space technology in various sectors of the economy through an incubation programme.

A startup incubated under ESA BIC Poland will obtain:
• EUR 50,000 in non-repayable funding,
• 50 hours of business support,
• 80 hours of technical support,
• 10 hours of legal support,
• access to offices and technical infrastructure,
• access to the international network of ESA BICs community,
• international promotion of the project.

The **ARP Space Academy** is a training programme dedicated to people who want to start working in the space sector, as well as technical employees with experience in other industries who want to retrain for the space industry.

It provides a range of training courses including:
• Satellite design phases 0/a/b,
• Satellite design phases c/d,
• An introduction to space economics,
• Supply chain management and procurement in space projects.

Polish Space Fellowship Program is an internship programme organised by IDA JSC in cooperation with the ZPSK (The Polish Space Industry Association, SPACE PL), and is the first programme of its kind in Poland and one of only three in Europe. It is aimed at young scientists who work with broadly understood space technologies as part of their scientific work. The programme is created on the basis of an internship competition, and the prizes for the winners are paid internships in scientific institutes, research units and enterprises conducting business activities in the space sector, which are members of the ZPSK.

https://arp.pl/en/what-we-do/space-projects/

Our clients:

ESA BIC Poland partners:
• **The Foundation for Technology Entrepreneurship,**
• **Rzeszowska Agencja Rozwoju Regionalnego S.A.,**
• **Podkarpackie Voivodship (Województwo),**
• **Asseco Poland S.A.**

A full list is available on the website: **https://esabic.pl/partners/**

Partners ARP Space Academy:
• **Warsaw University of Technology,**
• **Military Academy of Technology,**
• **Leon Koźmiński Academy,**
• **Space Entrepreneurship Institute.**

www.integratedsolutions.pl

Ilona Wojtkiewicz   +48 509 205 000 / +48 797 799 007
BD Executive space&defence   biuro@i-s.com.pl / iwojtkiewicz@i-s.com.pl

Integrated Solutions sp. z o.o.

Integrated Solutions is a digital solutions partner and one of the largest IT integrators in Poland. On a daily basis, it advises clients on how to grow their business even better through digitization and modern technologies. The company provides advanced solutions and ensures the highest level of security for implementations in all branches of the national economy. In the space sector, it has repeatedly proven itself as a provider of comprehensive IT products and services, including ground infrastructure and data center solutions. The company is part of the Orange Polska capital group.

Products/Services:

Integrated Solutions (IS), as a leading Polish technology integrator, has in its portfolio advanced ICT solutions for business and public institutions. The company's activities are a response to growing customer demand for consistent and professional management of ICT infrastructure. IS cooperates with more than 150 leading IT vendors and offers its products and services in various areas: (1.) AI/Automation, (2.) **Cloud & Data Center**, (3.) Data Analytics, (4.) Microsoft, (5.) Networking & Communication, (6.) **IT Infrastructure (Ground Segment for space industry)**, (7.) Cyber Security, (8.) Services, (9.) Reference Architectures.

Projects:

The company serves and supports entities from all industries, with a particular focus on the financial, e-commerce, trade, logistics and transportation sectors, as well as public institutions and military formations. It carries out projects in security, IT infrastructure, cloud, Microsoft solutions and digital business transformation. Increased interest in digitization in public institutions has resulted in a number of large contracts in 2023 – including with the Social Insurance Institution, the Ministry of Defense, the Ministry of Internal Affairs and Administration and the Government Administration Service Center.

The company remains one of the country's largest providers of IT solutions for key sectors of the economy. Integrated Solutions is also increasing its operations in industries that have not been in the company's strict focus until now – the space sector, healthcare, education, or the manufacturing industry.

In recent years, the company's largest projects include:
- Delivery of Data Center ICT infrastructure with colocation, and construction and maintenance of a wide area network (WAN) for 21 hospitals and medical units.
- As part of a consortium – the supply of computer equipment with the necessary software for the needs of the bodies that run schools and educational institutions, for use by students from 9 regions of Poland (more than 50 thousand laptops).
- Modification of the central backup system at Santander Bank Poland.

For the space industry, the company delivers IT infrastructure – IS's clients are known international and Polish companies such as Airbus Defence and Space, GMV Innovating Solutions, CloudFerro S.A. and others. Integrated Solutions has also been involved in projects for the European Space Agency.

www.itti.com.pl

Joanna Baksalary
Head of the Space Area
joanna.baksalary@itti.com.pl

Bartosz Kaźmierczak
Bid Expert
bartosz.kazmierczak@itti.com.pl

+48 61 622 69 85
sekretariat@itti.com.pl
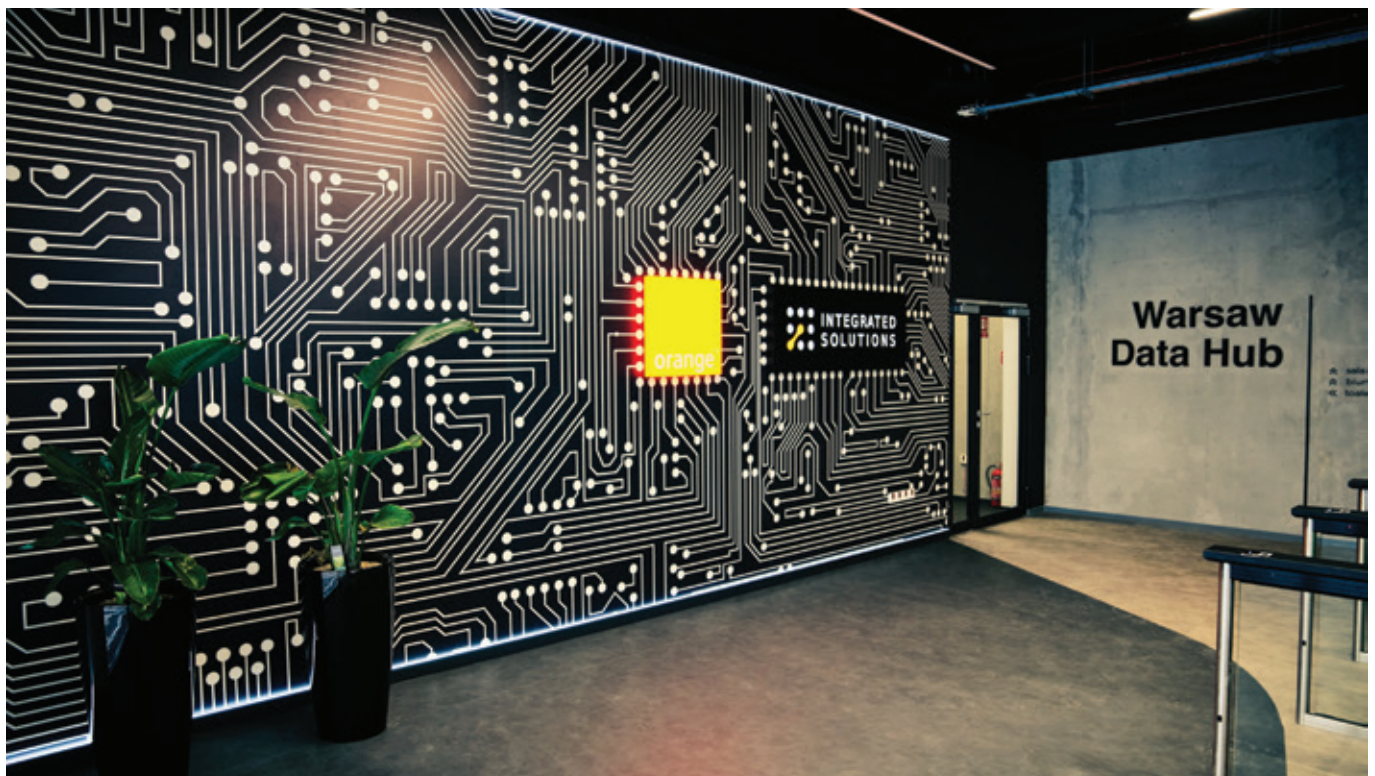
ITTI sp. z o.o.

ITTI is a Polish company in the space sector, founded in 1996 and located in Poznań. We specialize in the development of dedicated software, including ground segment, mission control support, and communication protocols for data handling. We are experts in system integration and supporting ESA projects.

Services:

Delivering high-quality IT services built on close collaboration with clients and users in the following areas:
- Integration of IT systems,
- Developing of ground systems,
- Real-time data management,
- Personalized computational algorithms,
- Utilization of IoT sensors,
- Automation of testing processes using AI,
- Network protocol management and configuration,
- Analysis and visualization,
- Optimal observation planning,
- GNSS applications with spatial visualization,
- Feasibility studies,
- DevOps and Helpdesk support,
- Expansion of development teams.

Products:

- **Atena** – a tool for designing and conducting functional tests of satellite systems.

- **EGMS** – integration software used for testing satellite control and management systems in ESA missions.

- **Multispaceman** – a tool for managing SpaceWire and SpaceFibre networks.

- **Freep** – a mobile application enabling search and navigation to available parking spaces.

- **Hand for U** – a web and mobile application for organizing events, collections, and support for volunteers and those in need.

Technology:

- **Satellite&Probes:**
  E3 Re-usable / customizable SW applications,
  F1 On Board Data Management,
  M4 System Modelling & Simulation.

- **Orbital Transport.&Re-entry Sys:**
  E1 On Board Data Management (HW and SW),
  I2 System Engineering SW.

- **Ground Segment:**
  A2 Mission Control,
  A3 Operations Execution,
  B5 Ground Station Monitoring & Control,
  C Ground Station Monitoring & Control,
  D User Operations,
  E1 Assembly Integration and Test.

Projects:

Rosie – a system for continuous monitoring of solar activity through radio telescope observations. Data is presented in real-time in the form of activity graphs and solar bursts.

SpaceTSN – defining Time Sensitive Networking (TSN) protocol specifications tailored to the needs of onboard spacecraft data handling and demonstrating its feasibility and performance on a demonstrator.

Expert Center i Core Software SST – a system supporting the construction of ground-based management system for observing space objects, collecting and processing data on space objects, and building services related to space objects.

EGS-CC – the project aims to adapt EGS-CC to ground-based mission control systems and scientific missions. The current software version will be implemented in a scientific mission.

Domino-E – development of modules for managing EO satellite constellation. ITTI is implementing a module for planning the use of ground stations to communicate with satellites in both a service and ownership model.

ESO – software for managing the Extremely Large Telescope (ELT) which is being built by the European Southern Observatory ITTI is involved in development of the central control software for the telescope and its subsystems.

Our clients:

European Space Agency, European Southern Observatory, Polish Space Agency, Space Research Center, AIRBUS DEFENCE AND SPACE, THALES ALENIA SPACE, CGI IT UK LIMITED, TELESPAZIO (a Leonardo and Thales company), OKAPI:Orbits GmbH, GMV Innovating Solutions Sp. z o.o., TELETEL, N7 Space Sp. z o.o., AROBS Polska Sp. z o.o., 6Roads Sp. z o.o., and scientific institutions from around the world.

www.jakusz-spacetech.com

Maciej Spigarski
Sales Division

+48 660 783 050
maciej.spigarski@jakusz-spacetech.com
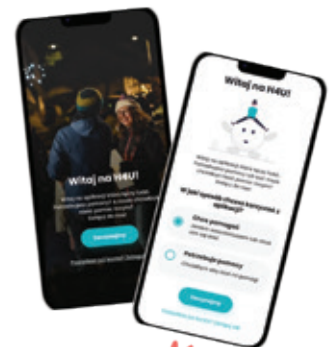
Jakusz SpaceTech sp. z o.o.

The Jakusz SpaceTech Laboratory, established in 2015, specializes in the production of environmentally friendly rocket propellants, such as HTP (hydrogen peroxide with a concentration of up to 98%). The company conducts research in collaboration with the European Space Agency. Additionally, it designs technologies and provides production lines for manufacturing chemical substances for various industrial sectors.

Products/Services:

1. Production:
- HTP green fuel up to 98% concentration,
- DMAZ green fuel,
- Solid rocket fuels based on PA or NA,
- Plasticizers (ADP, DOA) and synthetic polymers (HTPB, GAP).

2. Services:
- Material compatibility tests – tests that verify that the material of which it is made (tank, pipeline, pump, valve) is suitable for contact with liquid space fuel. After completion of the immersion tests, we conduct studies of changes in the mechanical properties of the material and the physicochemical properties of the fuel;
- Design of chemical synthesis plants;
- Supplier of technology for chemical syntheses;
- Services in consulting for optimization and improvement of technological process conditions.

Technology:

- TD 13 Automation, Telepresence & Robotics,
- TD 19 Propulsion,
- TD 20 Structures & Pyrotechnics,
- TD 24 Material & Processes.

Projects:

- Development of a Catalytic Bed for a 1N Thruster – Project in Collaboration with the European Space Agency (ESA): This project, conducted in collaboration with the European Space Agency, Warsaw University of Technology, and the Institute of Aviation – Łukasiewicz Research Network, involves the development of a 1N thrust vector control system powered by high-concentration hydrogen peroxide.
- High Concentration Hydrogen Peroxide Safety Validation Testing: Conducting validation tests to ensure the safe storage and transport of high-concentration hydrogen peroxide.
- Optimization of Passivation Parameters for Selected Aluminum Alloys – Research Project for the European Space Agency (ESA): This research project, commissioned by the European Space Agency, focuses on optimizing passivation parameters for selected aluminum alloys.

Space missions:

- Number of ESA missions in which the entity is/was (since 2012) involved (signed contract, may be as subcontractor/co-contractor)*: **4.**
- Number of EC/EU/Horizon missions in which the entity is/was (since 2012) involved (signed contract, may be as subcontractor/co-contractor)*: **0.**
- Number of NCRD projects in which the entity is/was involved (since 2012)*: **1.**

Our clients:

ESA, German Aerospace Center, Ariane Group, Arkadia Space.

JoinThe.Space

www.jointhe.space

Daniel Płudowski   +48 514 809 668
CEO   office@jointhe-space.com

JoinThe.Space sp. z o.o.

JoinThe.Space (www.JoinThe.Space) is a portal dedicated to the space industry, bringing together more than 50 young and talented individuals from 25 countries in its closest environment. We reach out to 44 countries worldwide, creating a global network of people engaged in projects related to space technologies. Our goal is to become a leading global hub for the space sector, reaching every technical institution worldwide and enabling both young professionals and experienced experts to pursue their dreams and fulfill their ambitions.

Products/Services:

Our main area of activity involves managing the portal (www.jointhe.space), where we aggregate job offers from the space sector, publish articles on space-related topics, and facilitate connections between investors and individuals developing space projects.

We provide support in terms of career counseling, building brand visibility, as well as assistance in the development of startups. With our global reach, we are open to collaboration in areas such as expanding business into new markets, starting from researching local needs and opportunities to recruitment-related areas.

We are also working on a new product related to space technologies that will be beneficial for our global audience.

Projects:

Additional projects completed in 2023:

- Webinars on „How to Start a Career in the Polish Space Sector" – online meetings with 7 top companies, gathering over 500 participants.

- Catalogue of European Student Organizations – compiled in one place, featuring 80 student organizations involved in space technology development. For 2024, we plan to release an updated catalog encompassing 200 entities from 44 countries worldwide.

- Co-organization of the UP! Student Conference, supporting the Student Council under the President of POLSA (Polish Space Industry Association) and the Polish Space Agency.

- Report on „Expectations of Future Workers in the Space Industry" aimed at better understanding the expectations of individuals entering the job market.

Our clients:

We work with companies, institutes and agencies in the space sector that are actively seeking talent for their projects. Our partners also include scientific circles and universities from all over the world, focused on space-related topics. In this way, we create a network that connects a variety of actors in the space industry, enabling the exchange of knowledge and the development of innovative projects.

www.komes.pl

Ph.D. Eng. Piotr Harnatkiewicz   +48 662 123 001
harnatkiewicz@komes.pl

KOMES sp. z o.o.

KOMES offers advanced computer simulations in FEA (Finite Element Analysis) and CFD (Computational Fluid Dynamics), including structural analyses, dynamic vibration simulations, and aerodynamic studies, utilizing solvers such as Nastran, Ansys, and AFT. We also specialize in thermal simulations of electronic systems and space objects. Additionally, we perform 3D scans, geodetic GIS/GNSS measurements, gas pulsation measurements, deformation measurements, and modal analyses.

Services:

- **FEA (Finite Element Analysis) Analyses:** We offer advanced services in the field of Finite Element Analysis (FEA). Thanks to our knowledge and tools, we precisely select materials and verify design assumptions to ensure the effectiveness and durability of structures. We pay attention to compliance with current standards and norms. Each product is analyzed by us in terms of normative requirements, and if necessary, adjusted to them, ensuring its conformity and safety.

- **Fatigue Analyses:** We specialize in advanced fatigue analyses based on the Finite Element Method (FEM). Our knowledge and experience allow us to precisely verify the fatigue durability of various structures, which is crucial for ensuring their longevity and reliability.

  In our work, we rely on guidelines from international norms and standards such as FEM 1.001, EN 12663, EN 17149, DVS 1612, DVS 1608, FKM, as well as Eurocode 3, Eurocode 9, and USN.

- **Strain Gauge Measurements:** We offer specialized services in the field of point strain gauging – a precise method for measuring material deformations in the structures under study. Thanks to advanced technology and specialized equipment, we are able to accurately measure and monitor deformations in critical structural elements.

- **Vibration Measurements:** We specialize in advanced vibration measurements, focusing on unique tasks involving ground vibrations, engineering structures, and building objects. We analyze the impact of vibrations resulting from industrial activity on various structures, from buildings to machinery. Additionally, we conduct strength calculations and monitor both local and global vibrations.

- **Distribution of Engineering Software:** We are the official distributor of advanced software, providing engineers with tools such as Midas NFX – a specialized tool for FEA analyses, Midas MeshFree – a revolutionary approach to mesh-free modeling, and Limit CAE, tailored for precise strength calculations. Our offer includes not only software but also professional advice and support.

Technology:

- **VISHAY RS 200** – a dedicated device used for precise positioning and drilling through strain gauge rosettes. It is applied to determine the values of residual stresses in structures using the hole-drilling method.

- **HBM QuantumX Data Acquisition System** – 40 measurement channels, with the ability to also measure in a ¼ bridge strain gauge configuration, taking into account full synchronization of the measurement signal. The sampling frequency is up to 20kHz.

- **Siemens LMS Scadas** – compact and mobile recorder that allows vibration measurement on 12 channels simultaneously. Sampling frequency up to 50kHz. Ideal tool for field measurements.

- Measurements of vibrations of server rooms, microscope sites and other special equipment with devices for assessing the impact of vibrations transmitted by the ground on buildings. Measurement devices with sensitivity up to 10V/1G.

- **Software:** Ansys, Nastran, Siemens LMS Durabillity, CAE Limit. Ability to perform virtual tests with correlation of vibration or strain gauge measurements. Ability to analyze thermomechanical issues and random vibration. Strength analyses including random vibration analysis.

Our clients:

Partners: Midas IT, LIMIT – CAE Simulation und Solutions, AFT, DEP MeshWorks, Syscom, HBM strain gauges system, EC Tests, Siemens, Kesacon / KYOWA strain gauges, SAFIBRA – Fiber Optic Technology and Sensors, TDG sensors.

Our clients: Orlen SA, KGHM, Lotos, GE, ALSTOM, Siemens, Stadler, PESA, NEWAG, Bumar, PGZ, Makrum, Hydac, Danieli Corus, Arcellor Mital.

KOMES has an accredited laboratory, which enables it to provide services at the Client's premises:

ACCREDITED TESTING LABORATORY No. AB 1873 for acceleration measurements and strain measurements using resistive strain gauges.

KOMES holds a license from the Ministry of the Interior and Administration No. B-025/2023 for conducting business activities related to the production and trade of explosives, firearms, ammunition, as well as military or police equipment and technology.

www.kplabs.space

Iuliia Marushchak
Head Of Business Development

+48 32 356 49 50
info@kplabs.pl

KP LABS sp. z o.o.

Founded in 2016, KP Labs is a New Space company with a mission to accelerate space exploration by advancing autonomous spacecraft operation and robotic technology. They operate as a comprehensive provider, offering an integrated package of hardware, software, and algorithms developed in-house for on-board data processing. Currently, KP Labs is carrying out more than 25 projects for ESA, NASA, and private entities, actively participating in space missions within international consortia. The company has the status of Research and Development Centre granted by the Ministry of Science and Higher Education in Poland.

Products/services:

1. **Imaging:**
- Hyperspectral imaging: developing technologies to analyze images in detail, which is crucial for Earth observation.
- Advanced vision systems: developing systems capable of processing images in harsh space environments.

2. **Software:**
- Space software and mission automation: developing software for space mission management, including process automation.
- Product:
  - Oryx – a modular flight software tool developed for mission control of small satellites. If components are not directly supported by Oryx, customers can extend the simulation by creating personalized controllers.

3. **Testing and simulation**
- Developing systems for testing and simulating space hardware.
- Product:
  - Oasis – a single-board, PC-104 EGSE (Electrical Ground Support Equipment) compliant device that allows full versions of volatile software to run on actual hardware before the physical presence of subsystems.

4. **Data processing:**
- Onboard computers and data processing units: development of onboard computers (OBCs) and data processing units (DPUs) to provide on-orbit data processing.
- Products:
  - Antelope – a combination of On-Board Computer and Data Processing Unit. It is the powerful heart of the satellite, responsible for controlling the satellite and performing basic tasks.
  - Leopard – a CubeSat-compliant Data Processing unit based on Xilinx Zynq UltraScale+, enabling mission designers to apply artificial intelligence solutions in space. It is designed to capture, manage and process data in orbit.
  - Lion – a Data Processing Unit for advanced artificial intelligence and on-board data processing operations. Lion is designed for micro and small satellites weighing between 50 and 500 kg.

5. **Artificial intelligence:**
- Computer vision: developing artificial intelligence algorithms for analysis, interpretation and advanced processing of satellite images.
- Machine learning: creating machine learning models, including deep learning, for telemetry data processing and anomaly detection.
- Product:
  - The Herd – a set of artificial intelligence-based algorithms designed to help analyze Earth observation data.

Intuition-1 mission: the satellite was launched on 11.11.2023 using SpaceX's Falcon 9 rocket. Intuition-1 is designed to observe the Earth using a hyperspectral camera and a Leopard Data Processing Unit, enabling in-orbit data processing using deep neural networks.

Technology:

- E2 Libraries,
- E3 Re-usable / customisable SW applications,
- F1 On Board Data Management,
- F1.1 On Board Data Management – BB,
- O2 Heat storage and rejection,
- O3 Heat Transport,
- O5 Thermal Engineering SW.

Projects:

- **Genesis:** Estimating macronutrients and pH in soil using onboard deep learning and hyperspectral imagery.
- **Bolero:** Implementing classical and deep machine learning techniques in satellite data with online training to improve model reliability under changing space conditions.
- **ESA Anomalies Data Set:** New techniques based on deep learning for detecting anomalous events from telemetry data.
- **Cognition:** Performance comparison of the Leopard DPU with a new architecture based on Xilinx Versal AI ACAP in lunar rover applications.
- **Mitigate:** Investigating the mechanics of Pulsating Heat Pipes (PHPs) and their thermofluidics to cool electronics and improve the thermal performance of hardware components.

Missions:

- **Intuition-1:** Earth observation mission using a hyperspectral instrument and a computing unit capable of processing data using neural networks in orbit.
- **OPS-SAT VOLT:** Implementation of advanced hardware and software technologies in orbit, including the Leopard data processing unit for real-time data classification, calibration, and compression.
- **VIREO:** Demonstrating the operation of an AI-supported algorithm package for cloud detection and cloud mask generation on the C3S system.
- **IMAP:** Development of software for efficient data collection and telemetry handling, supporting the mission to study the global structure of solar wind and interstellar neutral hydrogen.
- **Phi-Sat 2:** Development of a next-generation satellite mission using artificial intelligence to demonstrate innovative Earth observation techniques, including a cloud detection application based on convolutional neural networks.

Our clients:

ESA, AAC Clyde Space, D-Orbit, IBM Research Zurich, Airbus Defence and Space Gmb, Thales Alenia Space, AAC Microtec, Politechnika Poznańska, Politechnika Wrocławska, Telespazio, ClearSpace SA.

www.liftero.com

Przemysław Drożdż
COO

+48 602 710 197
przemek@liftero.com
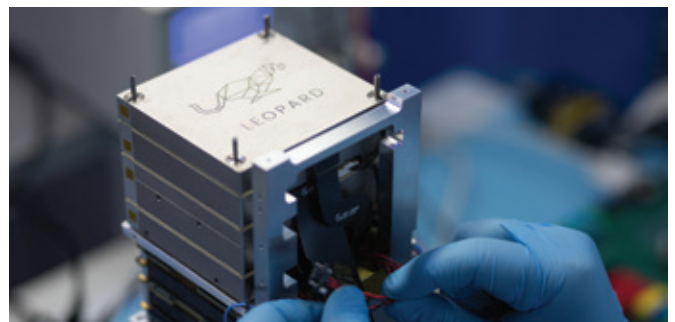
Liftero

Liftero sp. z o.o.

Liftero is an orbital transportation company. Our vision is to open up space access to bring connectivity, mobility and security to all. We develop High-Energy Orbital Transfer Vehicle allowing satellite deployment that is fast, efficient and cost-effective.

Products/Services:

1. Thruster One

We provide a turn-key propulsion system, including propellant tanks tailored to your mission specifications. Main features are a steady-state capability, system simplicity, green propellants, software-defined controller and COPV tanks.

Our propulsion system is entirely ITAR-free, operates without the need for preheating, and uses non-toxic propellants that are widely accessible globally. Additionally, we offer an engineering model for seamless integration and testing.

2. High-Energy OTV

Liftero offers last-mile satellite delivery via rideshare-launched OTVs, enabling rapid LTAN changes or GTO-to-GEO transfers.

Our High-Energy OTV has an unprecedented Δv capability coupled with high thrust, enabling orbit changes that were not feasible before. With over 2000 m/s Δv and green chemical propulsion, we can get your satellites to target orbits faster and more efficiently.

Technology:

- TD 19 Propulsion,
- TD 2 Space System Software,
- TD 10 Flight Dynamics & GNSS,
- TD 20 Structures & Pyrotechnics,
- TD 21 Thermal.

Space missions:

RED5 – RED5 is our own In-Orbit Demonstration mission featuring the Thruster One chemical propulsion system on a 6U platform. This demonstration will occur aboard SpaceX's Transporter 13 mission in Q1 2025. We'll be testing the propulsion system and orbital maneuvers in preparation for the first space mission of the OTV vehicle slated for 2026/2027.

Our clients:

Orbital Astronautics, GapSat, IFPILM, PW, Łukasiewciz, ANSYS, OnShape, AGH.

www.piap.lukasiewicz.gov.pl

Patryk Koć   +48 501 522 301
Head of Project Management Office   patryk.koc@piap.lukasiewicz.gov.pl

Łukasiewicz
Industrial Research Institute for Automation and Measurements PIAP

Łukasiewicz Research Network – Industrial Research Institute for Automation and Measurements PIAP

Łukasiewicz – Industrial Research Institute for Automation and Measurements (PIAP) one of Poland's leading research institutions, specializing in automation, robotics, and space technologies. As part of the Łukasiewicz Research Network, PIAP offers advanced solutions for industry, including robotic production stations, quality control systems, and mobile robots. The institute conducts research and development projects across various sectors, including the space industry, providing innovative technologies and supporting knowledge transfer. Additionally, PIAP actively participates in international research programs and collaborates with the European Space Agency in the development of space technologies, including 3D printing and additive manufacturing technologies.

Products/Services:

- **Products:**
  - Robots and mobile platforms for defense and security applications (1.5-3,500.00 kg), designed to support remote operations in hard--to-reach and hazardous environments, especially for reconnaissance and C-EOD activities (e.g., PIAP IBIS®, PIAP GRYF®, PIAP TRM®, PIAP FENIX®, PIAP PATROL®, PIAP HUNTeR®).
  - Communication systems (mesh networks) with enhanced resistance to interference.

- **Research and Development Projects:**
  - Suspension systems for mobile robots,
  - Manipulators, Cartesian control,
  - Autonomy and teleoperation,
  - Control and management of unmanned missions,
  - Specialized equipment for mobile robots,
  - System integration,
  - Telemetry devices for measuring vehicle movement parameters.

- **Services:**
  - Functional testing of components, subsystems, and systems,
  - Environmental and EMC testing,
  - Training.

Technology:

- TD 8 System Design & verification,
- TD 10 Flight Dynamics and GNSS,
- TD 13 Automation, Telepresence & Robotics,
- TD 15 Mechanisms & Tribology,
- TD 20 Structures & Pyrotechnics.

Projects:

1. **LEO Projects:**
   Galileo/GPS interference detection and navigation systems. We focus on monitoring and detecting interference in Galileo and GPS signals, which are essential for space operations and ground applications, such as transportation and communication. With the increasing number of low Earth orbit (LEO) satellites and widespread use of GNSS, we are developing technologies capable of quickly detecting interference.

2. **Solar System Exploration Projects:**
   Teleoperated or autonomous mobile platforms. We are developing mobile exploration platforms that operate autonomously or are remotely controlled from Earth. These technologies can be adapted for the exploration of, for example, Mars or the Moon's surface. Equipped with advanced navigation systems, sensors, and cameras, they enable in--situ sample collection and analysis. Our projects focus on driving mechanisms that function in challenging conditions and on enhancing platform autonomy with AI algorithms for real-time decision-making, such as obstacle avoidance and data analysis.

3. **Projects related to space object colonization:**
   Construction Automation and Modular Structures: We focus on creating modular building systems and automating the production and assembly of construction structures. We use 3D printing technologies adaptable for building habitats from local materials (e.g., lunar regolith, Martian soil). Our projects concentrate on construction automation, minimizing human involvement in hazardous environments. We design lightweight, durable structures that are modular, scalable, easy to assemble, and adaptable to variable conditions, such as those in space.

Our clients:

Police, armed forces, border guard, national and international services responsible for security, crisis management, and civil protection, European Defence Agency, TNO Defence, Security and Safety, SCISYS UK, British Geological Survey, EADS Defence & Security, SAGEM Sécurité, DINAMIC Biotechnology Innovation Centre, Patria Vehicles Oy, Fraunhofer Network, VTT Technical Research Centre of Finland, Alenia Aeronautica.
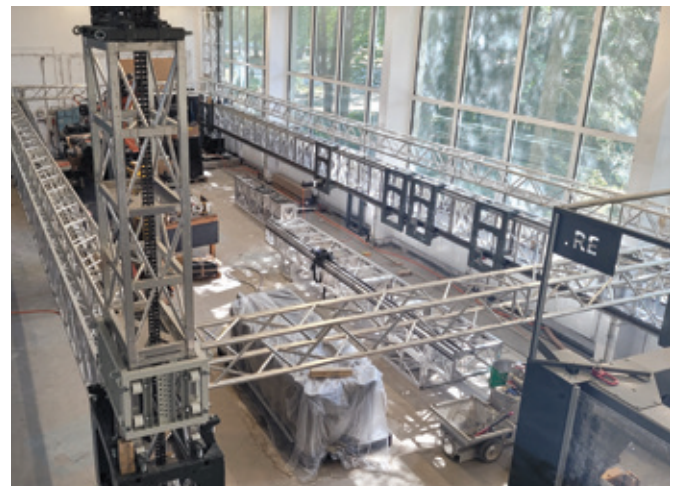
www.ilot.lukasiewicz.gov.pl

Ph.D. Eng. Adam Okniński   +48 789 061 149
Director of Space Technology Center   adam.okninski@ilot.lukasiewicz.gov.pl

Iwona Przygoda   +48 503 819 637
Head of Commercialization and Sales   iwona.przygoda@ilot.lukasiewicz.gov.pl

Łukasiewicz Research Network – Institute of Aviation

The institute conducts R&D activities in the field of space propulsion systems, including innovative solid, liquid, and hybrid rocket motors and engines, as well as the development of eco-friendly propellants. R&D efforts are focused on the institute's patented hydrogen peroxide technology with a concentration exceeding 98%. Specialized and accredited laboratories conduct tests for the aerospace industry.

Products:

Areas of activity in the space sector:
- Rocket Systems,
- Space propulsion,
- Deorbitation,
- Structures and pyrotechnics,
- Aerothermodynamics,
- Electronics and control,
- Remote sensing,
- 3D printing.

Products:
- POLON – green satellite propulsion module,
- ILR-33 AMBER 2K – suborbital hybrid rocket using 98% hydrogen peroxide as oxidizer,
- Mobile autonomous launcher for rockets of mass of up to 3 t,
- Eco-friendly propellants,
- Satellite and rocket engines from 1N to 50 kN,
- Valve series (pyrotechnic, electromagnetic, etc.),
- Space avionics (ECUs, flight computers, etc.),
- Composite technologies for space applications.

Services:

Qualification and acceptance tests

Space propulsion research:
- Hot – firing test for rocket and satellite propulsion in atmospheric (up to 5 kN) and vacuum (up to 500 N) conditions,
- Test bench for Rotating Detonation Engines (RDE).

Chemical testing of:
Catalysts; Solid propellants; Synthesis; Liquid fuels; Thermal and analytical testing.

Testing of materials and structures:
- Environmental laboratory (TVC, shakers, climate chambers including Clean Room),
- Non-destructive testing laboratories,
- 4 wind tunnels,
- Complete IT infrastructure for acquiring, processing, storing and sharing Earth observation data,
- Hardware-in-the-loop simulation research.

Projects:

The institute has more than 30 space projects under its own funds and those of ESA, POLSA, NCBR, EC, EDA and EDF. Most of the projects involve green space propulsion.

Selected projects:
- ILR-33 AMBER 2K – An experimental two-stage suborbital rocket using an innovative hybrid propulsion system,
- POLON, Polish Propulsion Module-Design and testing of a propulsion module for satellites,
- PIAST – Polish ImAging SaTelites,
- SUBCOM – Satellite Remote Sensing and Communication System for Suborbital Research Rockets,
- HYDEF – European Hypersonic Defence Interceptor,

- REACTS – Responsive European Architecture for Space,
- DSVD – 1N Monopropellant & 10N Bipropellant Dual Seat Thruster Valve Development,
- TLPD – Throttleable Liquid Propulsion Demonstrator,
- GRACE 2 – Green bi-propellant apogee Thruster for future spacecraft,
- SPRODEM – Solid Propellant De-orbit Motor Engineering Model Development,
- Development of Green Storable Hypergolic Propellants for in-space Propulsion.

Space missions:

- Orbital space flight hardware heritage since 1973.
- The launch campaign of the ILR-33 AMBER 2K suborbital rocket was conducted on July 3, 2024, at the Andøya Space Sub-Orbital center in Norway. This marked the first-ever Polish space mission involving a rocket that surpassed the Kármán Line, reaching an altitude of over 101 km.
- The mission served as a demonstrator of HTP technologies in concentration over 98% and also the mobile WR-2 launcher, avionics systems, supporting infrastructure and energetic materials. All design and development work for the rocket was carried out at the Institute, in collaboration with over 500 suppliers and partners within the country.

www.microamp-solutions.com

Marianna Frasunek   +48 500 242 127
Office Manager   hello@microamp-solutions.com

Microamp Solutions sp. z o.o.

Microamp Solutions sp. z o.o. (www.microamp-solutions.com) The company merges deep-tech know-how and a broad portfolio of techno-logy partners, empowering industries, system integrators, MNOs, DSPs, governments, and research institutions with new dimensions of wireless connectivity. Microamp's cutting-edge networks enable the implementation of the most bandwidth-hungry use cases, such as live 8K/IR video streaming and analytics, industrial VR/AR, remote controlling, fixed wireless access, or metaverse applications.

Products:

Microamp Solutions is arming enterprises and network providers worldwide with flexible, scalable and mighty networks based on gro-und-breaking 5G mmWave technology. Easy to set up, scale and inte-grate. Microamp 5G mmWave consists of 5G Core, CellBox mmWave Radio Units providing wireless ultra-low latency gigabit connectivity, a selection of plug & play-end devices like 10K/IR cameras or VR/AR headsets and use-case optimized applications. Microamp 5G mm-Wave supports cloud-based applications and can be full autonomous (isolated from external networks) and is ready to be deployed in sen-sitive areas.

Technology:

* TD6 RF Subsystems,
* Payloads and Technologies.

Projects:

Sub-measure of the Operational Program Smart Growth 2014-2020 co--financed by the European Regional Development Fund. Project title: „Innovative on a global scale Transceivers operating in the mmWave band for modern 5G network systems," aimed at developing innovative on a global scale Transceivers (transmitter-receiver circuits) for modern 5G network systems operating in the millimeter wave band.

Our clients:

* **Druid Software,**
* **Radisys,**
* **Capgemini,**
* **Qualcomm,**
* **AMD,**
* **Intel.**

www.gov.pl/instytut-lacznosci

Michał Marszalec
Head of Time and Frequency
Metrology Team

+48 22 5128 720
m.marszalec@il-pib.pl

PAŃSTWOWY INSTYTUT BADAWCZY
Instytut Łączności
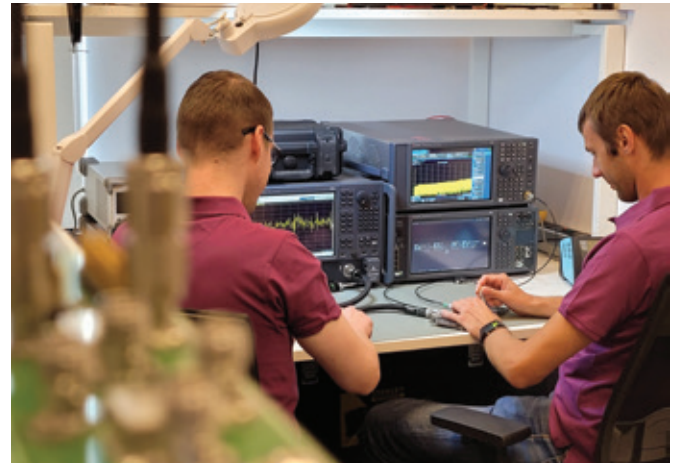
National Institute of Telecommunications

National Institute of Telecommunications is an independent national research and development institution in the field of telecommunications and information technologies. The Institute is classified as a scientific unit of category B+ in the discipline of Technical Informatics and Telecommunications.

Products:

- Integrated telecommunication systems, ambient intelligence networks, Future Internet;
- Optoelectronics and photonics for ultra-fast telecommunications;
- Electromagnetic compatibility, electromagnetic field (EMF) research;
- Frequency management and radio planning;
- Broadband networks and systems;
- Maritime radiocommunication networks and systems, e-navigation;
- Cellular (5G) and wireless networks and systems;
- Satellite communication and navigation systems;
- Digital radio and television;
- Telecommunication power systems, smart grid networks, renewable energy applications;
- Teleinformatics security and information security in organizations;
- Intelligent transport systems (ITS);
- Software engineering, knowledge and decision support;
- Information systems and process monitoring, databases;
- Telecommunication infrastructure: organizational, functional, and developmental aspects;
- Service quality in telecommunication networks;
- Electronic communication: technologies, services, regulatory, economic, and user development aspects of the electronic communication market and postal market;
- National and international standardization.

Technology:

- G1 Optical Communication,
- L1 Antennas,
- L3 Receivers,
- P Other,
- B1 Antennas,
- B5 Ground Station Monitoring & Control,
- C Ground Segment Network (or Ground Comm. sub-net).

Projects:

- Implementation concept of a universal GALILEO system receiver for maritime navigation, realized in software-defined radio technology.
- Cooperation in creation of the Polish Atomic Time Scale TA(PL) (Works on timescale algorithms' development).
- Operation of a time transfer system, in cooperation with GUM, utilizing fiber optic link and Two-Way Satellite Time and Frequency Transfer (TWSTFT) (also with SDR receiver), for the purpose of comparison the Polish National Coordinated Universal Time UTC(PL) with international time scales.
- Project 3PfD and project GIMME PRS – measurement research on the quality of the Public Regulated Service (PRS) in the Galileo system.
- Project RIDETA – research on new algorithms for detecting various types of disturbances in GNSS signals, utilizing inertial techniques (INS) in particular.
- Project VDE Future/Jericho VDE – identification and specification of two new services in the maritime sector using elements of the VDES satellite and terrestrial system.
- Project SAT-AIS-PL Phase A – feasibility study for the construction and operation of AIS microsatellites.
- Project EfficienSea 2.0 – development of the VDES standard including its satellite segment.

Our clients:

Gdańsk University of Technology, Warsaw University of Technology, Ministry of Digital Affairs, Main Office of Measures, Space Research Centre of the Polish Academy of Sciences (AOS-CBK), Competent PRS Authority (CPA) Poland, Wrocław University of Science and Technology, AGH University of Science and Technology, Institute of Bioorganic Chemistry Polish Academy of Sciences Poznań Supercomputing and Networking Center, ISN Sp. z o.o., German Aerospace Center (Deutsches Zentrum für Luft und Raumfahrt – DLR) e.V., NASK – National Research Institute, Institute of Innovative Techniques EMAG, National Revenue Administration, Ministry of Health, Medical University of Lublin, Turku University of Applied Sciences (Finland).

www.n7space.com

Michał Mosdorf   +48 22 299 20 50
CEO   sales@n7space.com

N7 Space sp. z o.o.

N7 Space is a Warsaw-based software house specialising in embeddded software for the space sector and in solutions based on automatic code generation and validation (Model-Based Software/System Engineering). Our mission is to support the space industry in creating even more reliable systems based on a formal approach to software development.

Services:

- Custom on board software development,
- MBSE tools implementation support,
- Independent Software Verification and Validation (ISVV).

Products:

- ECCS criticality B pre-qualified SAVOIR-compliant bootloaders (BSW) and board support packages (BSP) for ARM and LEON MCUs **(https://bootloader.space)**,
- ECCS criticality B pre-qualified ECSS-E-ST-50-15C compliant CANopen library for use in space environment **(https://canopen.space)**,
- ICE Cube On-board Control Unit – the complete, ready-to-use module for in-orbit experiments on board the International Space Station **(https://obc.n7space.com/).**

Technology:

- H1 Flight SW,
- A4 AOCS & GNC On Board SW,
- E1 Operating Systems,
- E2 Libraries,
- E3 Re-usable / customizable SW applications,
- E4 Other,
- F1 On Board Data Management,
- E1 On Board Data Management (HW and SW),
- A2 Mission Control.

Projects:

- PROBA3 ASPIICS flight software development,
- HERA mission central software validation,
- EagleEye PSC on board software development support,
- Extremely Large Telescope (ELT) Control System Software development,
- ASN.1/ACN modelling tools IDE,
- Deployment of the PUS-C Standard in Projects supported by an Automatic Generation Toolset (©ESA),
- ECSS-E-ST-50-15C Protocol On-board Software Implementation,
- On-Board Control Unit for Ice Cubes Experiments,
- AURORA – Tool suite AUtomatic code generation and validation of model-based critical inteROpeRAble components,
- Model Checking for Formal Verification,
- Toolchain to connect EDS and TASTE,
- Validating SEDS as a bridge between hardware and software models,
- ARM Board Support Package Criticality B Qualification,
- C++20 for the Flight Software,
- Evaluation of Rust usage in space applications by developing BSP and RTOS targeting SAMV71,
- SAVOIR File Management System,
- CANopen Library Toolset.

Space missions:

- PROBA3,
- Comet Interceptor,
- HERA,
- ARIEL,
- EnVision,
- Eagle Eye,

Our clients:

- **European Space Agency (ESA),**
- **European Southern Observatory (ESO),**
- **Microchip (FR),**
- **SENER Aerospacial (ES),**
- **Thales Alenia Space,**
- **Spacebel (BE),**
- **Centrum Badań Kosmicznych PAN (PL).**

www.opegieka.pl

Jakub Krawczyk
Director R&D and remote sensing

+48 (55) 237 60 00
poczta@opegieka.pl
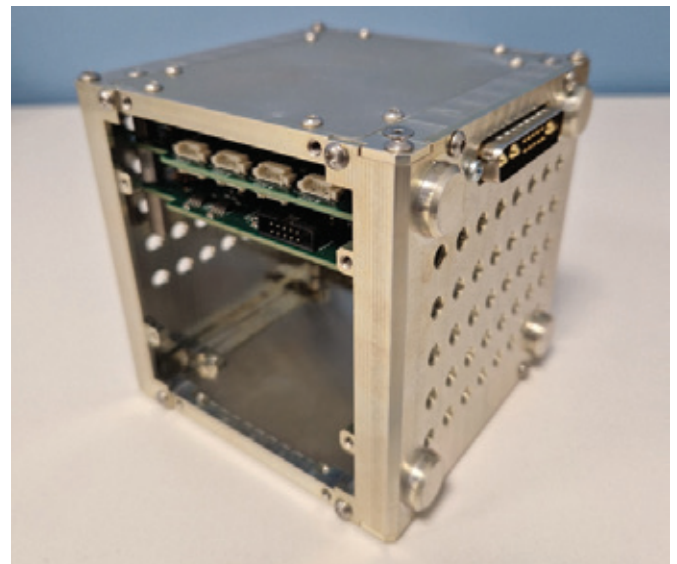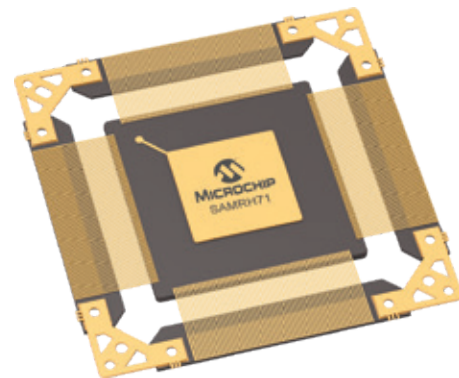
opegieka

OPEGIEKA sp. z o.o.

OPEGIEKA is a company with more than 30 years of experience in developing advanced IT solutions tailored for a diverse range of industries and sectors. Our specialization encompasses geoinformatics, spatial information systems, data analysis, artificial intelligence, and bespoke software development. Further solidifying our commitment to innovation, OPEGIEKA proudly holds the designation of a Research and Development Centre, a testament to our scientific and technological prowess.

Services:

SKY/OPEGIEKA – Aerial and Mobile Imaging:
- We acquire high-quality nadir and oblique aerial imagery, topographic and bathymetric LiDAR, thermal imagery using our own fleet of aircraft and high end sensors.
- We process aerial and remote sensing data to create maps, 3D models and analysis.
- We map areas from street level, using mobile scanning and photographic systems.
- Data acquisition for satellite data calibration.

LAB/OPEGIEKA – research and development
- We offer R&D services in data analysis, remote sensing, geoinformatics, and machine learning tailored for businesses.
- InsLAB – provides a holistic solution for agricultural insurers, leveraging satellite data and AI for accurate crop damage assessments.
- CertifIAI enhances aerial image quality control through AI integration.
- QuantCity employs photogrammetry and remote sensing to design resilient blue-green urban infrastructures against climate change.
- InsFlo focuses on chlorophyll fluorescence measurement in plants using terrestrial sensors.

IT/OPEGIEKA – IT solutions and own Data Centre
- Our extensive experience in software development spans various systems and applications.
- We deliver specialized solutions on CAD/GIS platforms like ArcGIS, QGIS, AutoCAD, and MicroStation.
- GeoARA offers an integrated GIS data warehousing solution for the aggregation, processing, analysis, and visualization of spatial data from diverse sources.
- SimplyGeo is an intuitive web-based viewer for spatial data.
- Our cloud solutions are built on an optimized, converged ecosystem, ensuring scalability, security, and performance.
- As an outsourcing partner, we provide specialist support for a wide range of projects and tasks.
- We offer hosting and colocation services, including server colocation and dedicated servers, as central offerings of our Data Centre.
- Our consulting services assist clients in selecting, building, and implementing the optimal software solutions

GEO/OPEGIEKA
- We provide surveying services essential for the planning, execution, and oversight of construction and infrastructure projects.
- We specialize in the creation and updating of BDOT500 and GESUT databases, containing detailed information on topographical features and utility networks.
- Our digitization services convert traditional surveying and mapping documents into digital formats, adhering to the latest standards.
- We focus on updating and enhancing the quality of real estate and building data, in compliance with contemporary norms.
- We handle property division and demarcation, including documentation preparation, dispute resolution, and boundary marking.
- We produce maps and survey data tailored to the needs of designers, architects, and engineers.

Technology:

- 2 Space System Software A Software Technologies/ E.Remote Sensing Payload Data Exploitation/ II Remote Sensing Applications and Services;
- 2 Space System Software A Software Technologies/ E.Remote Sensing Payload Data Exploitation/ III Remote Sensing Information Subsystems and User Interfaces;
- 2 Space System Software A Software Technologies/ E.Remote Sensing Payload Data Exploitation/ IV Remote Sensing Core Infrastructure and Architectures.

Projects:

The InsSAT project involved the design and delivery of comprehensive services for the agricultural insurance sector, available through a dedicated web application. The proposed services are based on the use of Earth Observation data, the most important source of which are Copernicus satellite imagery (Sentinel-1 and Sentinel-2) and meteorological data. These data are used to calculate vegetation indices (e.g., NDVI) and parameters that form the basis for crop condition analysis. Complementary data are field measurements, land cover maps, cadastral data and meteorological data.

The project results in 3 services:
- a service confirming the occurrence of spring frost and analyzing its impact on specific crop species,
- a service resulting in the definition of crop harvesting dates,
- a service to determine the condition of the rapeseed crop after the winter period.

Space missions:

InsSAT, Agrisat (617766-EPP-1-2020-1-BE-EPPKA2-CBHE-JP, Erasmus + CBHE), Fabspace 2.0 (European Union's Horizon 2020 Research and Innovation programme, umowa Numer °693210.).

Our clients:

Główny Urząd Geodezji i Kartografii, HEXAGON, Branża ubezpieczeń rolniczych, Leica, Geosystems Technology A/S, Transprojekt Gdański Spółka z o.o., MW Forest Sense AB, Krajowy Ośrodek Wsparcia Rolnictwa, Województwo Mazowieckie, Urząd Morski w Gdyni, Miasta: Elbląg, Kraków, Warszawa, Gdańsk, Stalowa Wola, Politechnika Warszawska.

ORBITAL MATTER

www.orbital-matter.com

Jakub Stojek   +48 668 770 170
CEO   jakub.stojek@orbital-matter.com

Orbital Matter Poland sp. z o.o.

Orbital Matter is developing a new way of manufacturing for satellite manufacturers and prime contractors thanks to its 3D printing technology that works directly in exposed space conditions. By moving the production process from earth to space, it can 3D print larger and lighter elements of space infrastructure, cheaper and faster than currently possible.

Products:

3D printing module for satellites – a 3D printing module of 1U size mounted on satellites. Its task is to produce a 3-meter beam upon reaching the target orbit by the satellite, to deploy and maintain in a fixed position satellite subsystems such as optics or photovoltaic panels.

3D printing utilized for space infrastructure element production – an autonomous spacecraft equipped with a 3D printer capable of producing space infrastructure elements directly in Earth orbit without constraints on the design and dimensions of the structure. It can be used for projects such as truss structures, antennas, walls, space station elements, and other large constructions.

3D printing with conducting properties – used for the production of structures requiring a material with conducting properties, such as antennas.

3D printing with the ability to cover surfaces with a special coating – used for the production of structures requiring a material with reflective properties, such as reflectors redirecting sunlight towards photovoltaic cells.

Materials for industrial 3D printing – a portfolio of polymers for use in industrial 3D printing.

Technology:

- D1.1 Mechanisms – BB, D1.1.1,
- Mechanisms – C&P, L1.1,
- Antennas – BB, N4 Folded structures,
- N5 Space structures with changing geometries,
- Nall.1 Structures – BB.

Projects:

ESA OSIP – Once Upon a RIDE!: Once Upon a RIDE!: in progress, a demonstration of 3D printing technology in space will take place during the first flight of the Ariane 6 rocket, scheduled for July 2024. Orbital Matter is on track to become the world's first company to demonstrate 3D printing technology beyond the International Space Station.

Utilizing 3D printing for the production of antennas and space infrastructure directly in orbit: a project carried out jointly with Thales Alenia Space as part of the Space Business Catalyst Accelerator.

Space missions:

- Replicator 1: 3U satellite with 3D printer prototype launched into orbit on 09.07.2024 by Ariane 6.

Our clients:

Thales Alenia Space, OHB, SpaceFounders, ESA BIC, TU Berlin.

www.pcosa.com.pl

Tomasz Dąbrowski   tomasz.dabrowski@pcosa.com.pl
Project Management Specialist

PCO S.A.

PCO S.A. was established in 1976 under the name „Przemysłowe Centrum Optyki w budowie". In 1994 it was transformed into a state–owned joint–stock company under the name Przemysłowe Centrum Optyki Spółka Akcyjna. Since 21st of October 2014 company is a member of Polish Armaments Group (PGZ).

Products/Services:

The primary activities of PCO S.A. consist of the production and sale of optoelectronic observation and aiming devices, employing laser, night vision and thermal vision technologies supplied to the army. Furthermore, the company is engaged in research and development as well as implementation activities. PCO S.A. manufactures and hazards tests optoelectronic devices for night observation and sighting in light magnification and thermal vision technologies. Our production is fully developed, designed and manufactured on site in own production facilities. PCO manufactures mainly small hand held and medium sized vehicle mounted devices, for example electrooptic surveillance heads.

Optical production includes:
• Flat optical plates,
• Optical wedges,
• Prisms,
• Mirrors flat and spherical,
• Spherical and aspherical lenses of Glass, Germanium and Crystals,
• Glass technological production jigs and holders.

Technological processing include:
• Grinding,
• Polishing spherical and flat,
• Centering,
• Cementing and lacquering,
• High Vacuum Coating,
• Testing per various mechanical, vacuum and thermal requirements.

Technology:

LABORATORIES AND TECHNICAL FACILITIES
• Production technology of optical elements using CNC machines and hard substrate,
• Production technology for aspheric optical elements,
• SPDT – Single Point Diamond Turning,
• Optical elements vacuum coating technology,
• Mechanical part production technology using CNC machines,
• Final assembly technology for optoelectronic devices,
• Technology for testing and acceptance of finished products.

Projects:

PCO S.A.is engaged in several projects related to the Space activity i.e. PROBA-3, PW-Sat2 and PIAST.

Our clients:

Armaments Agency, Huta Stalowa Wola, Creotech Instruments S.A., The Space Research Centre of the Polish Academy of Sciences, Military University of Technology, Łukasiewicz Research Network – Institute of Aviation, Scanway S.A., Warsaw University of Technology, WB Electronics S.A.

www.phonemic.pl

Adam Gieras +48 573 835 272
Sales Manager adam.gieras@phonemic.pl

Phonemic sp. z o.o.

Phonemic offers FPGA design services, especially hardware implementation of complex algorithms. Our expertise covers areas such as digital signal processing (DSP for telecommunications), image processing, and cryptography.

Products/Services:

Our services cover a wide range of FPGA design:
from algorithm optimization at the mathematical level, RTL design and verification, and embedded software development, to FPGA system integration and bring-up. Phonemic is MicroChip's authorized design partner for FPGA design services.

Examples of service areas:
• design and integration of a complex SoC system: from specification to FPGA system bring-up,
• specialized IP-Cores: optimization for specific design requirements, from the algorithm and computation level to the hardware architecture,
• hardware acceleration of the target application:
  - analysis of hardware acceleration capabilities,
  - identification of algorithm "bottlenecks",
  - performance studies of possible hardware architectures,
• implementation and verification of the IP-Core.

Projects:

Telecommunications systems:
• Digital Front-End for LTE base station,
• NB-IoT baseband coprocessor,
• BCH error correction decoder for satellite communication (CCSDS standard),
• system on an FPGA for evaluating machine learning models (part of ESA missions),
• AES-GCM encryption IP-Core for aerospace applications,
• IP-Core components for digital signal processing (DSP) and cryptography.

Our clients:

Companies from the space sector (KP Labs) and aerospace, telecommunications (IT Partners Telco), fabless (ChipCraft) / In total: 7 customers (as of 06.2024) domestic and foreign. Partners: Microchip – Authorized Design Partner.

www.piap.space/pl/

Anna Nikodym-Bilska +48 885 404 409
Business Development Manager commercial@piap-space.com

PIAP Space sp. z o.o.

PIAP Space is the first 100% state-owned company actively involved in the space sector. The company specialises in space robotics and develops robotic subsystems for in-orbit applications (ISAM – In-Orbit Servicing, Assembly, Manufacturing) as well as planetary missions. The company is a European leader in satellite docking technology. PIAP Space is also one of the main Polish manufacturers and suppliers of MGSE (Mechanical Ground Support Equipment) for European space missions.

Products:

- **TITAN robotic arm:** The TITAN multi-articulated robotic arm has been designed to service satellites in orbit in accordance with the stringent requirements of the ESA and meets the standards of orbital operational conditions. TITAN can be used for a variety of missions, both servicing, on-orbit assembly and fabrication, and even refuelling. In addition, the arm has been designed to be used for planetary missions, such as sampling or resource acquisition on the Moon.

- **LARIS gripper:** LARIS is designed to grasp a customer's satellite during a capture manoeuvre to enable satellite maintenance, repair, trajectory control or deorbit. PIAP Space first demonstrated the LARIS gripper in January 2023, during the demonstration of the entire EROSS service satellite system. Work is currently underway and preparing the gripper for ground testing and a flight mission.

- **MULTIS gripper:** MULTIS was designed for servicing satellites and planetary missions. The result of the development represents a product innovation on a European scale. The gripper is in line with the European paradigm that sets the stage for the development of space robotics as modular solutions that can be used interchangeably and for different missions, including servicing, assembly and on-orbit production, refuelling and even planetary exploration. MULTIS has specially designed jaws that are capable of unlimited rotation and can use interchangeable tools, also specifically designed for a certain type of space mission.

- **Force and torque sensor (FORTIS):** FORTIS with 6 degrees of freedom can have applications in orbital (LEO, GEO), space and planetary missions. FORTIS can be used in space robotics, mechanisms and navigation systems. The aim of the project is to develop a universal architecture, hardware and software at TRL 6, which could be used directly as QM for applications not exceeding reference mission requirements (LEO, robotics) or could be easily adapted to QM for more demanding missions.

Technology:

TD 1 On-board Data Subsystems; TD 2 Space System Software; TD 5 Space System Control; TD 8 System Design & Verification; TD 10 Flight Dynamics and GNSS; TD 11 Space Debris; TD 13 Automation, Telepresence & Robotics; TD 15 Mechanisms; TD 21 Thermal; TD 23 Electrical, Electronic and Electro-mechanical (EEE) Components and Quality.

Key projects:

- **CHABLIS (ESA),**
- **ORBITA (NCBiR),**
- **EROSS SC (HEU), EROSS+ (H2020), EROSS (H2020),**
- **TITAN (ESA).**

Space missions:

EROSS SC (EROSS+, EROSS) (European Commission), ENDURANCE, ATHENA (ESA), BIOMASS (ESA), ORBITA (NCBIR).

Our clients:

European Space Agency (ESA), Polish Space Agency (POLSA), European Commission, German Aerospace Center (DLR), MDA, GMV, Space Research Center of the Polish Academy of Sciences (CBK PAN), SAB Aerospace, National Technical University of Athens, OHB, Thales Alenia Space, KP Labs, Sintef, Space Applications Services, Airbus Defence & Space, Infinite Orbits, Łukasiewicz – Institute of Aviation, Leonardo, Redwire, ClearSpace, Sener, The Exploration Company, Sintef, Tipik, Exotrail, Kongsberg Defence & Aerospace, Network Research Belgium, Almatech, CSEM, Astronika, Absiskey Polska, ESA BIC Polska, ESA Broker Polska, Centralny Klaster Wodorowy im. Laszczynski Brothers, Orbital Outpost, Space Robotic Workers, Manufacturing Technology Centre, E.O. Paton Electric Welding Institute, Institute of Fundamental Technological Problems of the Polish Academy of Sciences.

PIK|TIME SYSTEMS®

www.piktime.com

Paweł Nogaś   +48 61 624 36 37
Robert Urbaniak   piktime@piktime.com

Piktime Systems sp. z o.o.

Piktime Systems sp. z o.o. – satellite techniques and precise time sector company, established in 2007. Research, development and manufacturing equipment for measurement and distribution of time and frequency is our core business. Unique know-how in time and frequency domain is our asset.

Products/Services:

- Time Transfer Systems TTS-5,
- Fiber optic Time and Frequency Distribution Systems OSTT-4,
- Optical amplifiers OBA-3,
- Precise time & frequency counters and generators,
- Advisory on precise time and time scales,
- Time & frequency software and algorithms,
- Designing and execution of time and frequency laboratories on a turn-key basis.

Technology:

- TD9 Mission Operation and Ground Data Systems,
- TD10 Flight Dynamics and GNSS,
- TD11 Space Debris,
- TD12 Ground Station Systems,
- TD14 Life & Physical Sciences.

Projects:

Participation in:
- „Prototype of GALILEO Time Service Provider" – realization of the system time scale for GALILEO GNSS,
- Realization of the main control station for GALILEO GNSS (Precise Time Facility, Orbital Facility) in Fucino, Italy,
- CLONETS I CLONETS DS Clock Network Services – Design Study (HORIZON 2020) – establishment a pan-European time and frequency reference system as a European Research Infrastructure to serve the European science community.

Space missions:

- Number of ESA missions in which the entity is/was (since 2012) involved (signed contract, may be as subcontractor/co-contractor)*: **1.**
- Number of EC/EU/Horizon missions in which the entity is/was (since 2012) involved (signed contract, can be as subcontractor/co-contractor)*: **2.**
- Number of NCRD projects in which the entity is/was involved (since 2012)*: **2.**

Our clients:

- GUM (Central Office of Measures, Poland),
- National Institute of Standards and Technology (NIST) Boulder, USA,
- The United States Naval Observatory (USNO) – Washington, USA,
- Physikalisch-Technische Bundesanstalt (PTB) – Germany,
- The National Physical Laboratory (NPL) – United Kingdom,
- Deutsche Telekom – Germany,
- KRISS – Korea Research Institute of Standards and Science – Korea.

PLANET **PARTNERS**

www.planetpartners.pl

Łukasz Wilczyński   +48 516 036 036
Strategic Partner   l.wilczynski@planetpartners.pl

Planet Partners sp. z o.o.

Planet Partners is Poland's most experienced marketing and communication agency. For 15 years, we have supported entities in the Space, Defence, IT, and Security industries. We carry out activities in Poland and worldwide (thanks to the Space Communications Alliance network we have established) in the B2B and B2G areas. We plan and implement communication strategies and campaigns, introduce them to foreign markets, design marketing materials, conduct social media activities, and manage crises.

Products/Services:

- **Communication campaigns**
  Comprehensive preparation and implementation of communication campaigns: development of creative ideas, recommendation of communication channels, mapping, cooperation with bloggers, influencers, ambassadors, and opinion leaders, media planning, and purchasing.

- **Content marketing**
  Company blogs, social media, industry and market reports, trend books, advertising campaigns, media purchasing.

- **Public Relations**
  Strategic and creative support as part of current PR activities, Investor Relations – support for communication with investors, development of a matrix of recommended communication tools and channels, communication support for the company's marketing campaigns, journalist mapping, comprehensive media relations activities, and social media campaigns.

- **Social media**
  Facebook, Twitter, LinkedIn, and others. Unique and engaging content supported by our graphics department. Communication strategies, including brand story, managing brand profiles, moderating interactions with recipients, analyzing and monitoring activities, and tracking online trends.

- **Creations and multimedia**
  Visual identification systems, brand books, key visuals, logos, outdoor and indoor advertising media.
  Graphic materials, 2D animations, explainer videos, animated GIFs.
  Video materials, photo sessions.
  Websites, landing pages.

- **Digital campaigns**
  Facebook Ads, LinkedIn Ads, and Google Ads Defining target groups, creating personas, slogans, content supporting sales, and monitoring effects.

- **Influencer marketing**
  Short- and long-term cooperation with micro and macro-influencers, as well as multi-channel strategies to implement brand goals.

- **Events**
  Planning, comprehensive implementation and promotion of stationary and hybrid events. Organization of online meetings and press conferences. Event reports and online broadcasts on YouTube and Facebook.

- **Market reports**
  Preparation of marketing industry reports, substantive and graphic development of trend books, preparation of expert opinions in strategic areas of communication of companies and institutions.

- **Communication strategy**
  Strategy planning for new brands and brand rebranding.

- **International communication**
  Coordinating projects implemented simultaneously on many markets by various agencies and communication support for Polish clients planning foreign expansion.

- **Crisis management**
  Crisis procedures, crisis management training, crisis intervention, post-crisis image management.

Projects:

- **Sener Polska**
  Increasing the company's recognition in Poland. Reaching selected groups of recipients: decision-makers and public administration, the business environment, and space industry representatives.
- **RAPORT branżowy:** Analysis of the IT Area in the Polish Space Sector. Creation of the first report on IT in the Polish space sector, presenting the current situation and further development prospects for this market area.
- **Sybilla Technology:** Development of a new visual identity for the company and job advertisements for its use; designing and implementing a website project based on an editable CMS system.
- **GMV:** Building the image of an expert company in the high-technology industry, communicating with selected groups of stakeholders from the business and public administration environment, and consolidating the position of the Polish company.
- **EUROPEAN ROVER CHALLENGE:** Reaching diverse target groups: from students from all over the world, through recruiters from engineering and technology companies, local and government authorities, to scientific as well as regional communities and science enthusiasts.

Our clients:

NATO, ESA BIC, Polska Agencja Kosmiczna, Cloud Ferro, Sener Polska, GMV, AROBS Polska (dawniej Syderal), SAAB, PIAP Space, Agencja Rozwoju Przemysłu, European Rover Challenge, Sybilla Technologies.

www.qwed.eu

Ph.D. Eng. Marzena Olszewska-Placha   +48 (22) 625 73 19
                                        m.olszewska@qwed.eu
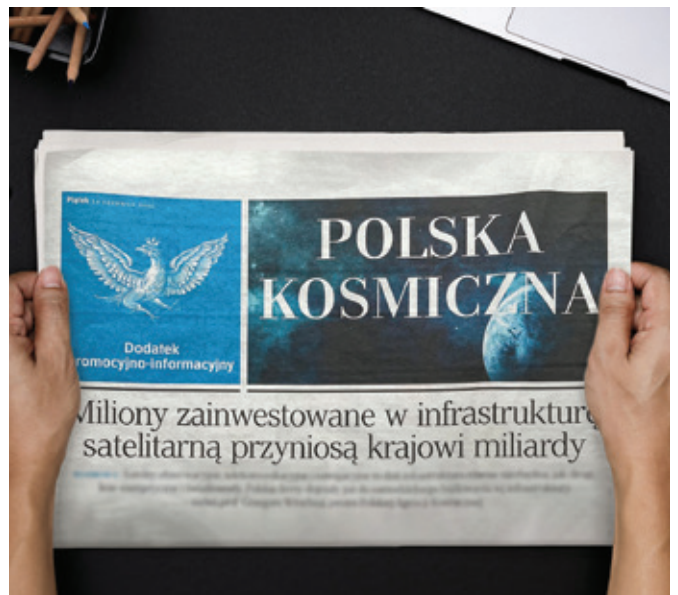
QWED sp. z o.o.

QWED was founded in 1997 to develop and commercialise QuickWave EM simulation software, co-authored by the company co-founders. Since 2000, QWED further specialises in high-precision microwave material measurements. QWED mission is to promote the use of computer modelling and modelling-based material measurements in science and industry, with a focus on space applications. The team (currently 14, 50% female) is led by Dr. M. Celuch and includes 2 IEEE Fellows (Profs. W. Gwarek and J. Krupka) and 4 Ph.Ds.

Services:

QuickWave simulation software:
- QW-3D, a general-purpose 3D electromagnetic simulator, used for the design of antennas, resonators, filters, polarisers in planar and waveguide technology (e.g. couplers, junctions, power dividers in ALMA project);
- QW-V2D – a unique ultra-fast full-wave solver for Bodies-of-Revolution such as circular horn antennas and feeds, used by most of the manufacturers of antennas for Earth stations, especially for multi-mode antennas with tracking functions;
- QW-BHM – multiphysics solvers for microwave heating effects, used in material science, industrial material processing, and by world's leading domestic microwave oven manufacturers;
- QWED GUI – several options from the industrial standard Autodesk® Inventor®, to FreeCAD licence-free QW Modeller.

QWED test-fixtures for material measurements:
- Resonators (SPDR, SiPDR, FPOR) with proprietary software for precise measurements of EM properties of materials (dielectrics, semiconductors, thin films, metallic foils, rough surfaces due to additive manufacturing) in GHz range;
- Customised test-fixtures for e.g. surface imaging of materials;
- Microwave Frequency Q-Meters combined with QWED resonator and PC App, form a complete portable measurement setup (with no need for fully-fledged microwave laboratory equipment).

Consulting, design and prototyping services:
- Antennas and microwave power applicators;
- Measurements for novel materials and emerging technologies;
- Microwave Front-End parts of radio systems Including low noise power amplifiers, filters, OMTs, frequency synthesisers and converters.

QuickWave software was acclaimed gem in IEEE Spectrum Magazine (1998), awarded with e.g. the European IT Prize (1998) and Prime Minister of Poland Award (1999), today it outperforms competitor software in accuracy to computer effort. QuickWave is used in space research since 1997.

QWED test-fixtures are recognised by industry, science (Eureka Medaille d'Or, the Prime Minister of Poland Award 2007, European Horizon Innovation Radar), and standard creators (SPDR in IEC 61189-2-721:2015).

Our clients:

QuickWave software: over 200 licences are implemented on 6 continents by clients in industry, academia, and research. Non-confidential users in the space-sector include:
- National Radio Astronomy Observatory (Charlottesville, US),
- Jet Propulsion Laboratory (Pasadena, US),
- Lyrebird Antenna Research (Aus),
- Global Skyware (US),

- CALTECH University (US),
- Chalmers University (S).

QWED test-fixtures: over 100 units per year (decade average) are sold. Distribution and endorsement are led by Keysight Technologies, Rohde & Schwarz, VEGA Technology (Japan), and QWED directly.

R&D projects: QWED completed several collaborative (H2020, FP6, FP7, Eureka, ERA NET, PBS, iNEMI) and participates in 3 European projects: EUREKA-Eurostars 5G_Foil, M ERA.NET ULTCC6G_Epac and I4Bags.

www.radiotechnika.com.pl

Marcin Powązka
Dyrektor of Research
and Development

+48 603 868 592

mpowazka@radiotechnika.com.pl
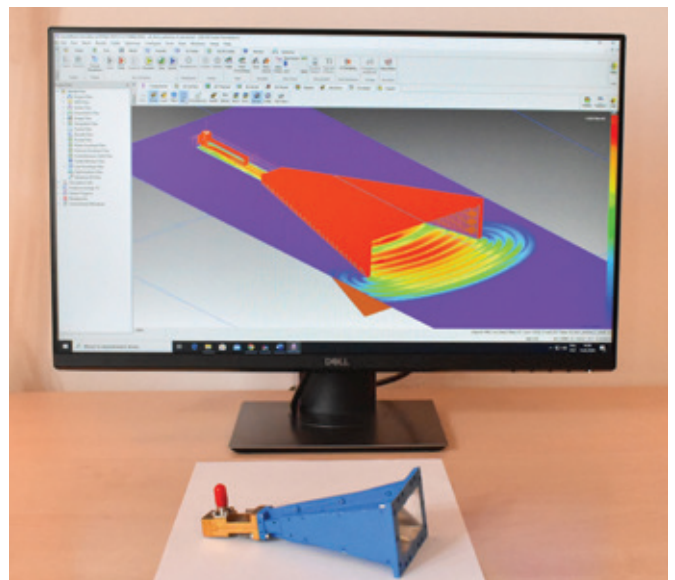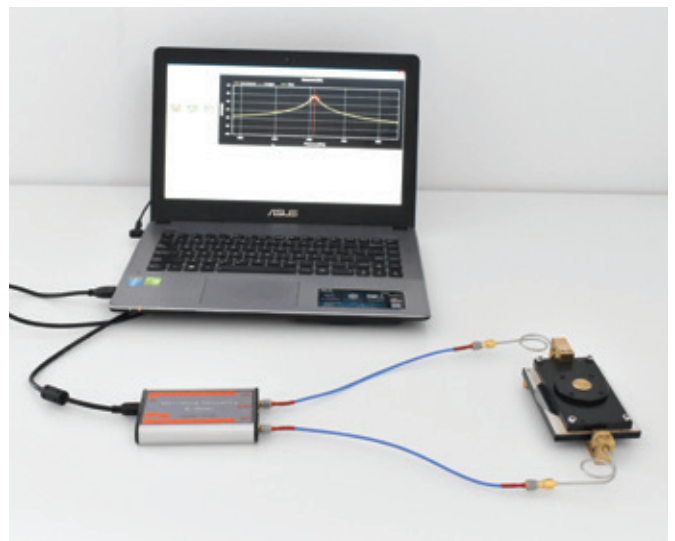
Radiotechnika Marketing sp. z o.o.

Radiotechnika Marketing is a manufacturer of individual solutions in the field of connectors and cable harnesses, optical fibers, power and control systems and electromagnetic compatibility. Radiotechnika Marketing is a modern manufacturer of electronic components for specialized applications. It creates individual solutions in the design and production of connectors and cable harnesses, optical fibre, power and control systems and electromagnetic compatibility. Its portfolio also includes products from the distribution offer and research and development services. For 30 years, Radiotechnika has been a reliable partner for contractors from the military and industrial sectors.

Products:

- Fiber optic connectors and cables,
- Connectors and cable harnesses for special applications,
- Power and control systems for military vehicles,
- Interference filters and dedicated solutions to EMC problems.

Technology:

- TD3 Space Systems Electrical Power,
- TD7 Electromagnetic Technologies and Techniques,
- TD23 Electrical, Electronic and Electro-mechanical (EEE) Components and Quality.

Our clients:

Radiotechnika has been a reliable partner for contractors from the military and industrial sectors.

www.satim.co

Lena Woźniak   +48 601 870 646
Chief Operating Officer   hello@satim.co
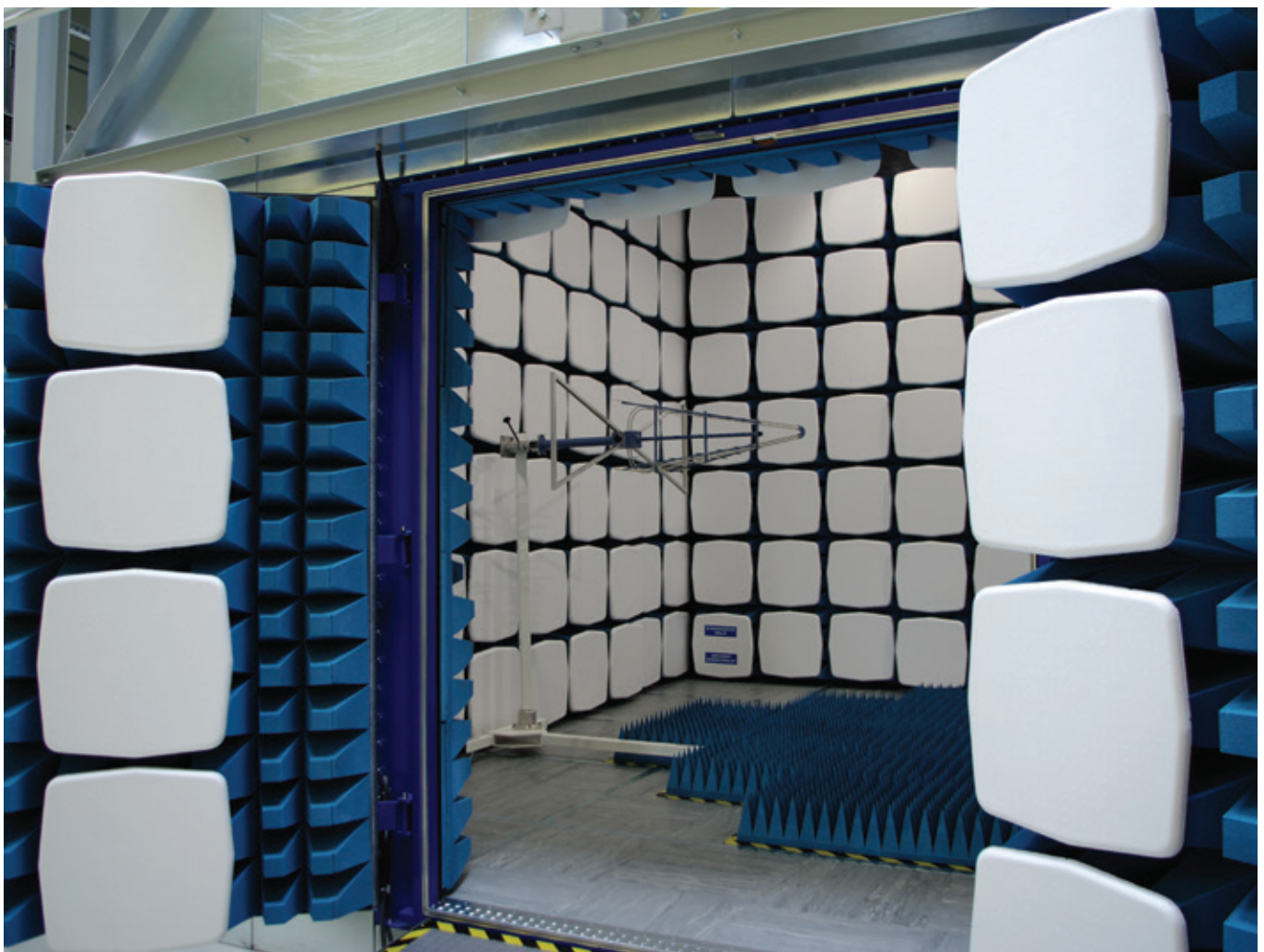
SATIM Monitoring Satelitarny sp. z o.o.

Development and delivery of state-of-the-art software solutions for detection, classification and identification of objects (ships, vessels, aircraft, etc.) in SAR (Synthetic Aperture Radar) images acquired from various platforms (satellite, aerial), for different types of areas (marine, land). Solutions are provided in various forms, such as stand-alone software, SaaS, or as firmware installed on satellite or aerial platforms.

Products:

- **SSIG image simulator SAR** – a world-unique SAR image simulator enables highly accurate mapping of signatures of any objects for any SAR radar.

- **OREC – Artificial intelligence-based model trained on sar simulations Object Detector and Identifier –** software for object detection and classification in SAR images provides results in a very short time (less than 1 minute for a single SAR image).

Technology:

- SW – M4 System Modelling & Simulation,
- SW – P Other.

Projects:

For several years, SATIM Satellite Monitoring has been involved in a number of research and development activities initiated by the European Space Agency, namely:
- „Development of innovative software, the so-called SATREC 1.0 for identifying objects in SAR satellite images through modeling and recognizing radar signatures" (May 2017 – September 2019).
- „SATREC 2.0 – commercial software for modeling and recognition of SAR signatures based on ray tracing and graphics cards" (July 2020 – July 2022).

Space missions:

- ESA "Development of innovative software SATREC 1.0 detecting objects on SAR satellite imagery through modeling and recognizing radar signatures" (May 2017 – September 2019) Sentinel - \1.
- ESA "SATREC 2.0 – commercial software for modeling and recognition of SAR signatures based on ray tracing method and GPU cards" (July 2020 – July 2022), Sentinel -1.
- ESA "PolSARPro" software development 2022-2024, ALOS-2.

- ESA – "SAT DEFO" – warning system for inhabitants of areas threatened by ground deformations (demonstration project). Sentinel-1.
- NCBiR – "RAMON" Innovative service to landslide monitoring using SAR data, Sentinel -1.
- NCBiR – "INGA" monitoring system of ground deformation Sentinel – 1.

Our clients:

- SkyFi – SAR satellite data provider;
- Synspective – SAR satellite data provider ;
- ESA European Space Agency;
- UMBRA Space – SAR satellite data provider;
- ICEYE – SAR satellite data and optical data provider;
- CAPELLA Space – SAR satellite data provider;
- SATCEN- The European Union Satellite Centre
- Jastrzębie Zdrój Municipality;
- Imielin – Municipality;
- MDA Space – Canadian satellite data provider;
- AirBus Defence and Space GmbH.

www.scanway.space

Mikołaj Podgórski   +48 504 217 324
COO   m.podgorski@scanway.pl
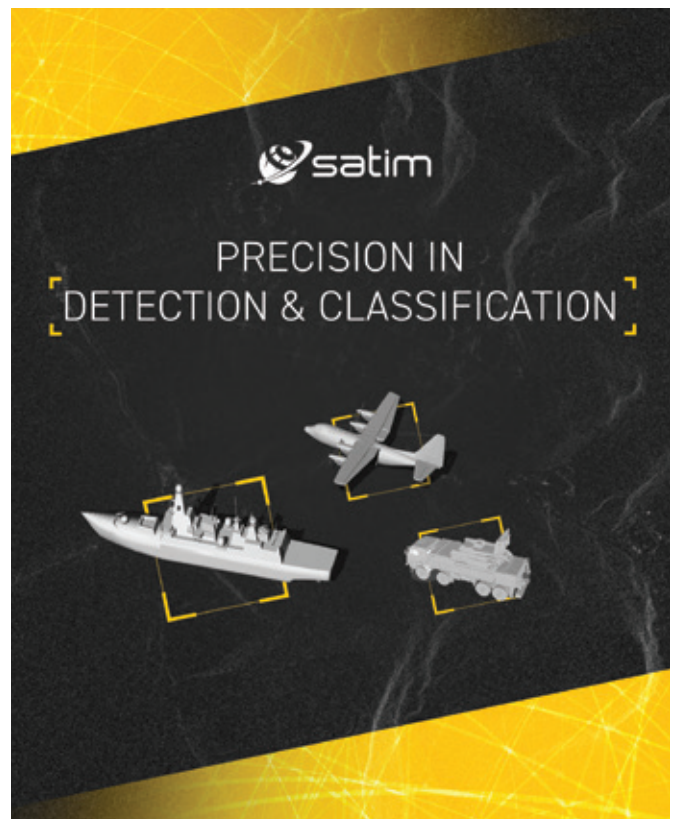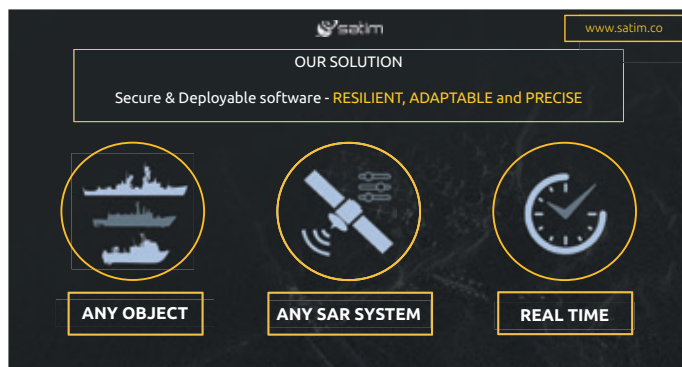
Scanway S.A.

Scanway Space is a Polish-US company developing advanced optical payloads for space. The company has more than 7 years of experience in the space industry and TRL 9 for its solutions. Scanway offers two types of products: optical telescopes for Earth Observation and camera systems for space applications, and it also conducts R&D activities in the field of optoelectronics. Since 2023, Scanway is a public company with 50+ employees on board.

Products:

- **Scanway Optical Payload** – series of Earth observation telescopes for small satellites. The company offers telescopes able to image the Earth's surface in different spectral bands (RGB/PAN/NIR/SWIR) with a GSD from <1 to 25 m/pixel. SOP telescopes have an athermal design that maintains high imaging quality parameters. Imagery obtained with SOP has many applications, such as monitoring natural disasters, studying climate change, supporting agriculture and urban development, object classification.
- **Scanway Camera System** – series of vision systems for space that consist of cameras and other sensors for their operation and have the ability to analyze changes or processes using machine learning and AI-based vision algorithms. Applications of vision systems in space: self-diagnosis of space vehicle modules and objects approaching the vehicles, observation of space vehicle processes while operating in space, control of production and service processes in space, and possible applications to SSA.

Technology:

- **Technology:** TD 16 Optics, TD 17 Optoelectronics,
- **Services:** Services & applications based on data from EO satellites.

Space missions:

- **DREAM (DRilling Experiment for Asteroid Mining)** – was our first project as a part of the REXUS/BEXUS (Rocket/Ballon Experiment for University Students). Project goal was to explore the drilling process in microgravity and vacuum conditions prevailing in Space. As Scanway we were responsible for the design of the measurement chamber which included a vision system to observe the experiment.
- **TRACZ (Testing Robotic Application For Catching in Zero-G)** our second project as a part of REXUS/BEXUS (Rocket/Ballon Experiment for University Students). Project goal was to test the feasibility of using a jamming gripper in microgravity and vacuum conditions and conduct a series of tests in space and analyze the result. As Scanway we were responsible for the design of the vision system to observe the gripping process.
- **ScanSAT** – a project to develop a satellite and aerial observation platform for real-time geo-information acquisition with high precision and over a very wide electromagnetic band. The role of Scanway was to develop a telescope for imaging the Earth with a resolution of 4 m per pixel. The project was co-financed by the NCBiR.
- **STAR VIBE** – a demonstration mission by Scanway and German Orbital Systems to rapidly acquire so-called flight heritage optical instruments. The project consists of two experiments, i.e. SOP (telescope for Earth observation at 25m per pixel resolution, in a 6U-class nanosatellite) and SHS (vision system for satellite status observation). From January 2023 in orbit.
- **LUWEX** – our contribution to the colonization of the Moon. Development of technology for extracting water from the lunar regolith. Scanway working in a consortium with, among others, the German Space Agency and ThalesAlenia, we are developing a spectrometer to analyze the purity of water extracted from lunar soil in the future.
- **PIAST** – a consortium project to launch a constellation of Earth observation nanosatellites for a military client. Scanway's role in the project is to provide 2 telescopes. The project is co-financed by NCBiR (the National Center for Research and Development) under the Sapphire program.

- **EagleEye** – a consortium project to launch a microsatellite capable of observing the Earth with a resolution of 1 m from an orbit of 300-350 km (VLEO). Scanway's role in the project is to provide the entire imaging device. The project is co-financed by NCBiR.
- **OTTER** – Optical Traffic Tracking Experiment for Responsive Space – a nanosatellite being developed by DLR (Deutsches Zentrum für Luft- und Raumfahrt) in cooperation with GOS (German Orbital Systems), which will aim to detect signals from ships. Scanway is responsible for supplying the SOP 1U telescope with a resolution of 14 m /pixel.

Number of ESA missions in which the entity is/was (since 2012) involved (signed contract, can be as a subcontractor/co-contractor)*: **2.** (Ariane 6, SEMOViS).
Number of EC/EU/Horizon missions in which the entity is/was (since 2012) engaged (signed contract, may be as subcontractor/co-contractor)*.
Involved (signed contract, can be as subcontractor/con-sor-sorant)*: **2** (LUWEX, Cassini).
Number of NCRD projects in which the entity is/was involved (since 2012)*: **3** (ScanSAT, EE, PIAST).

Our clients:

DLR, German Orbital Systems, Cteotech Instruments, PCO, AICRAFT, KP Labs, WAT, Łukasiewicz Instytut Lotnictwa, CBK PAN, Wroclaw University of Science and Technology, Blue Dot Solutions.

www.semicon.com.pl

Dariusz Sokół   +48 669 655 525
Business Development Director   dsokol@semicon.com.pl
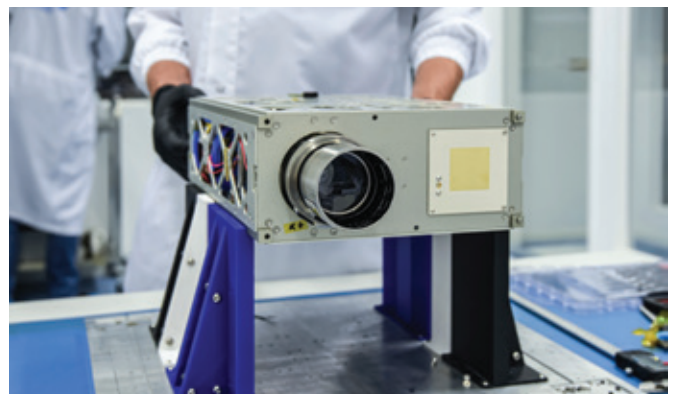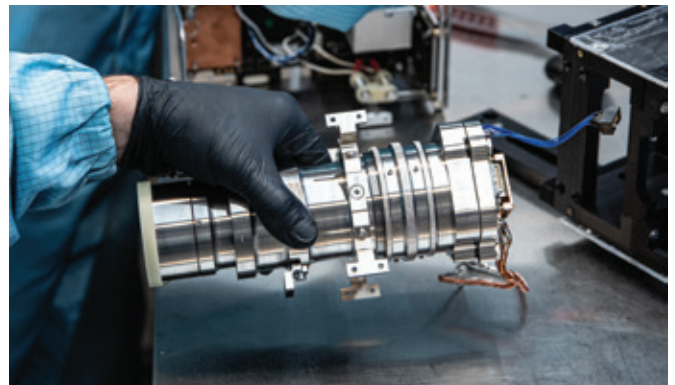
Semicon sp. z o.o.

Semicon has been conducting distribution and production activities for 37 years. As a representative of many well-known global brands, it supplies chemical products (3M, Henkel/Loctite, Electrolube, CRC), electronic products (3M, Schurter, VPT), tapes (3M, Tesa, Nitto, SaintGobain), connectors (3M, Lemo, Staubli, WECO) and cables (3M, New England Wire, Staubli) to customers from various sectors of the electronics industry: medical, defense, automotive, aviation, space.

For over a dozen years, we have been participating in research and development projects related to advanced technologies for scientific, military and space purposes.

The company also operates in the EMS production area, focusing on the production of low- and medium-series electronics with a high degree of project complexity. EMS's activity is based on a comprehensive service, starting from the purchase of components and bare PCBs, through SMT and THT assembly, AOI, X-Ray and Flying-Probe testing, programming, to cleaning, ionic contamination control, conformal coating/potting, final testing and final assembly. 3D-AOI, X-Ray and Flying Probe inspection devices increase quality capabilities and provide certainty that manufactured products are 100% verified. Semicon specializes in the assembly of components from 01005, PoP, µBGA, on RIGID, RIGID-FLEX, FLEX and SEMI--FLEX PCBs. We also offer assembly in Hot-Bar and Chip-on-Board technology. We have the capabilities of packaging SMT components (Tape&Reel), cutting SMT stencils and processing adhesive tapes (cutting, die-cutting).

EMS production has a modern machine park of world manufacturers of assembly equipment JUKI, ERSA, EKRA, ASYS, MEK, GE, SEICA. In order to maintain the highest level of service, we are constantly expanding our portfolio of devices. We also invest in employees, providing them with training and necessary courses, allowing them to constantly improve their qualifications. Our production team is trained in accordance with international PCBA production standards, including: IPC-A-610, IPC/WHMA--A-620, IPC-A-600, IPC-7711/7721. Semicon has an equally highly qualified team of R&D engineers and designers who provide technical support and develop production processes and distribution products.

Semicon constantly maintains and works in accordance with the standards ISO 9001:2015, ISO 14001:2015, AQAP 2110:2016, EN 9120:2018, ISO 13485:2016.

Projects:

- **2004 – 2007 GreenRose (FP6),**
- **2007 – 2008 Tele-Ekg (FP6),**
- **2009 – 2012 Diamond, Radi-Cal (FP7),**
- **2010 – 2012 ChipCheck (FP7),**
- **2010 – 2013 µBGA (FP7),**
- **2013 – 2014 PoP, flex-PCB, flex-LCD, Long-PCB (POIG),**
- **2015 – 2019 SustainablySMART (H2020),**
- **2018 – ADC Converters (FAIR),**
- **2018 – 2021 FLEX-PLUS (POIR),**
- **2020 – 2021 URIBOX (POIR),**
- **2022 – 2024 QuD Units (FAIR).**

Products/Services:

- PCB design and assembly,
- Laser cut SMT stencils: graded, with nano-coatings, nickel, "fine grain", frameless, VectorGuardTM, on aluminium frame,
- X-Ray with analysis – electronic components, connectors, PCBs,
- Flying Probe electrical testing,
- Design and production of ICT, FCT testers,
- Selective application of protective coatings, potting,
- Hot-Bar soldering (Flex PCB, LCD),
- Wire Bonding – Chip on Board,

- Board cleaning with ionic purity control,
- PCB ionic contamination control,
- Tape & Reel – repacking SMD/THD components in tape,
- THT – lead forming, cutting leads to size,
- SMD component drying according to IPC/JEDEC J-STD-033 standards,
- PCBA laser depanelization (RIGID, RIGID-FLEX, FLEX and SEMI--FLEX),
- Selective removal of protective layers on PCBA and copper,
- PCB repairs, including reballing of BGA and µBGA systems,
- Wave masks – design and implementation,
- PCB dedicated supports,
- ESD dedicated packaging,
- Cutting and pouring of gaskets, including EMC,
- Cutting of thermally conductive pads,
- Cutting of Kapton circles and wave masking formats,
- Repacking of materials – resins, adhesives, pastes, into smaller containers, also UV: syringes, tubes.

Delivery of:
- Insulating, conductive tapes,
- Cables,
- Lemo, AirBorn, MIL-38999 connectors,
- VPT, EPT components, ELMA,
- materials for painting and pouring.

Space missions:

- **Delivery of VPT and EPC** components for missions designed and implemented by the Space Research Center.
- **Project: 2024 – 2025 NAVTIME-Rx** – production of precise positioning and timing GNSS receiver for rockets and satellites intended for LEO orbit.

Our clients:

PB Technik – joint venture.

www.group.sener/polska

Jakub Pierzchała   +48 607 555 296
Business Development Manager   Info.polonia@aeroespacial.sener
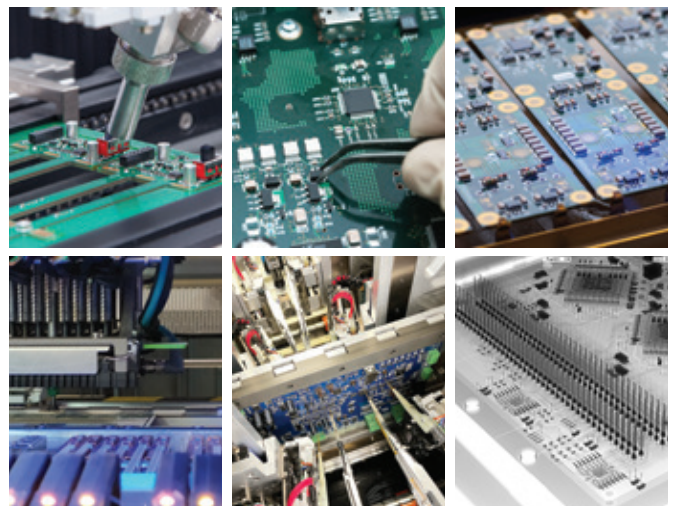
Sener sp. z o.o.

Sener Poland commenced its activities in 2006, and since 2012 it is focusing on creating specialized, innovative solutions for the space sector. The company participates in the most important projects of ESA, NASA and ESO. It specializes in mechanical engineering, creating:
- **Mechanisms for space applications** – including deployment and hold-down mechanisms, essential for transportation of space vehicles in the launch vehicles' loading spaces, and for subsequent deployment of solar panels, antennas and measuring instruments.
- **Mechanical ground support equipment (MGSE)** – used e.g. for precise repositioning of satellites in order to facilitate access for technicians, and for transportation to test chambers and loading spaces.

Products:

Mechatronics and mechanical systems:
- mechanisms for deploying antenna booms and structures,
- linear and rotary actuators,
- antenna pointing mechanisms,
- hold-down and release mechanisms,
- structures,
- separation mechanisms,
- stabilization mechanisms.

Mechanical Ground Support Equipment (MGSE):
- horizontal lifting devices,
- vertical lifting devices,
- devices for tilting and rotating satellites during the assembly process,
- clamp bands,
- containers.

Technology:

- Antennas,
- Mechanism Core Technologies,
- Mechanism Engineering,
- Inflatable and Deployable Structures,
- Launchers, Reentry Veicles, Planetary Vehicles,
- Robotic Applications and Concepts,
- Non-exlosive release technologies,
- Verification & AIT,
- Exploration tool technologies.

Projects:

- **International Berthing and Docking Mechanism (IBDM)** – six types of mechanisms for an innovative docking and mooring system for space vehicles.
- **ATHENA** – Instrument Selection Mechanism (ISM) and two types of support and release mechanisms (HDRM and MAMD).
- **ELT** – mechanisms to help mount, transport and protect the mirrors of the world's largest telescope.
- **PROBA-3** – a mechanism for unfolding the solar panel and collaborating on the design of optical instrument mounts.
- **Euclid** – a set of 13 ground-based devices to support the satellite assembly process.
- **ExoMars** – the "umbilical" mechanism that connects the rover to the transport vehicle and provides power when launching the robot on the Martian surface.
- **LISA** – Antenna Direction Mechanism and Optical Tracking Mechanism for one of the largest space experiments in history.
- **ARIEL** – development, manufacturing, test and delivery of the ARIEL Medium Gain Antenna Mechanical Assembly (MGAMA). The MGAMA is composed of: the Medium Gain Antenna (MGA), its associated Antenna Pointing Mechanism (APM) and its electronic (APME).

Space missions:

Euclid, ExoMars, Proba-3, SAOCOM, Athena, JUICE, e.Deorbit, Biomass, Electra, Plato, FLEX Floris, ELT, Galileo, OneSat, Comet Interceptor, LISA, ARIEL Forum.

Our clients:

European Space Agency, European Commission, European Defence Agency, European Southern Observatory, Ministry of Entrepreneurship and Technology, Ministry of Science and Higher Education, Ministry of National Defence, National Centre for Research and Development, Polish and European space companies, Polish and European universities, research and development institutes and centres, Airbus, Thales, OHB.
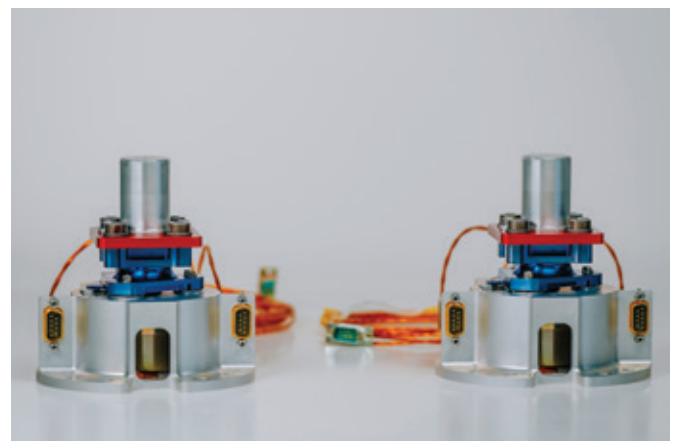
www.smallgis.pl
Beata Szafrańska   +48 506 640 337
Market Development Director   beata.szafranska@smallgis.pl

SmallGIS sp. z o.o.

SmallGIS, which is part of the Altergeo holding company, specialises specifically in the geoinformatics and aeronautics industry, with a focus on building proprietary aerial observation platforms, software and terrain mapping services. As a cohesive whole, these solutions are intended to streamline and automate processes in many areas of the economy, such as agricultural monitoring, forestry, security, environmental protection, insurance, among others. As of 2023, we have a production and aerospace base at the Krosno airport where the DataCentre, mechanical (material processing with CNC assistance) and electronic workshops, aircraft and office infrastructure are located.

Services:

- **Geoinformatic systems – Design and development of spatial information systems (GIS)**
  From desktop solutions to server-based enterprise class solutions, including remote sensing data repositories, advanced web applications performing automated spatial analysis. The implementations use proprietary algorithms resulting from R&D work, with an emphasis on the use of AI and machine learning.

- **Construction and integration of aerial observation platforms**
  Modification and equipping of ultralight aircraft for observation flights (patrol, photogrammetry, other). Implementation of BRLOS communication solutions, remote control of observation apparatus.

- **Satellite and aerial remote sensing** – provision of services for the analysis of data from observation satellites and data acquired using own manned aircraft.

  We have experience in the application of remote sensing to assess vegetation conditions, wildlife monitoring, changes of anthropogenic origin and more, using photogrammetry, airborne laser and hyperspectral scanning techniques and space-based optical/radar sensors.
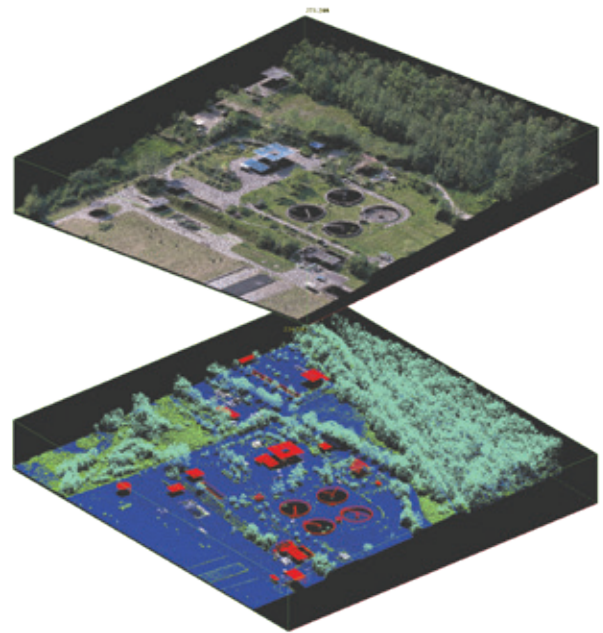
Projects:

We have been cooperating with the European Space Agency for years, implementing a number of projects involving the construction of IT solutions using the space segment, including EO and GNSS. These include projects implemented for the needs of, among others, State Forests, National Parks and Environmental Protection Institutions.

We have been trusted by institutions such as POLSA (NSIS), KOWR, the Ministry of Maritime Affairs and Inland Shipping, National Parks, insurance companies and many others for consultancy services, research work, IT system development and training.

In the field of aerospace systems, we have carried out sensor deliveries and integrations for, among others, the Military University of Technology, as well as for our own needs.

Space missions:

IWBSF, TIKKA, RSFPS, SBWS, CANDELA.

Our clients:

POLSA, ESA, National Parks, public administration, universities.

www.spaceagency.biz

Maciek Mysliwiec
Owner

+48 884 778 177
hello@spaceagency.biz
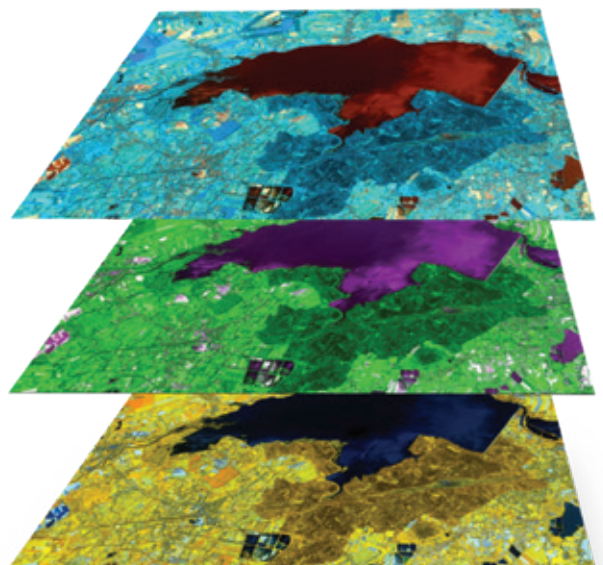
Space Agency Maciej Myśliwiec

SPACE AGENCY is built with people from the world of business and science. Their experience spans from public and media relations to copywriting, social media, graphic design and web design. Its portfolio of services includes both communication activities and building relationships between scientific institutions and business.

Services:

Space Agency is experienced in public relations, media relations and science-business relationship building. Its services include activities in:

- Public Relations and Media Relations,
- Developing marketing and brand strategies,
- Running press offices,
- Building social media strategies,
- Managing social media channels and creating content,
- Graphic and video design,
- Apps development,
- Consulting on accessibility,
- Event marketing,
- Establishing partnerships between companies, universities and research centres,
- Support in the organization of internship programs,
- Creation of postgraduate study programs and courses,
- Training at various levels in Social Media, Public and Media Relations, Communication and Public Speaking, Space Sector and Space Exploration History.

Projects:

The agency supports the SPACE and technology sector entity in terms of communications and social media. Among the supported projects were are the following:

- **Polish mission to ISS – POLSA,**
- **PIAP SPACE robotics projects:** MANUS, TITAN, ORBITA, LARIS,
- **Industrial Development Agency:** ARP Space Academy,
- **KP Labs:** Intuition-1.

Our clients:

POLSA Polish Space Agency, Industrial Development Agency, PIAP Space, New Space Foundation, The National Centre for Research and Development, Jagiellonian University, UNIVERSEH, AGH University of Krakow.

www.spaceforest.pl

Marcin Sarnowski   +48 58 770 56 46
Director of Sales and Marketing   spaceforest@spaceforest.pl

SpaceForest sp. z o.o.

We provide a wide range of services in the field of design, prototyping, and manufacturing of microwave devices, precision mechanics, electronics and rocket technologies. Combining expertise from a number of fields, we develop satellite telecommunications systems, radio communications systems, and rockets designed to launch scientific experiments into space.

Main areas of activity:

- Design, prototyping and integration of advanced electronics systems, including high frequency and satellite components,
- Radar technologies and ground communication systems,
- Microwave filter tuning systems,
- Rocket technologies.

Key products:

- Portable Synthetic Aperture Radar (photo HUSSAR),
- Micro-gravity services on board a suborbital rocket (photo PERUN),
- Satellite components (photo),
- Design, manufacture and tuning systems for microwave filters,
- Autonomous tracking and communication system for flying vehicles.

Projects:

- **DEWI** – (Dependable Embedded Wireless Infrastructure). 2014-17 development of a wireless sensor network demonstrator for launcher. Partners: Thales Alenia Space and Gdansk University of Technology.

- **"Development and Qualification of Frequency Generators" (PLDRO)** – two-phase ESA project, frequency generator for satellite applications. RUAG Space partner. Completed in May 2018 at TRL6. TRL8 in 2019.

- **MLO** – "Development and Qualification of Dual Redundant Medium Power Master Signal Source". – ESA project, signal distribution device from PLDRO, for frequency conversion applications on satellites. Completed in December 2020, TRL7.

- **SSPA** – "Solid State Power Amplifier for X-band" ESA project. TRL7 by end 2023; Partner: Tesat.

- **"Fully digital, generic RF-Switch Control Electronic"** – Design of a CAN (Controller Area Network) bus-controlled generic RF switch control unit (GSCU). TRL 3. Partner Tesat.

- **SIR** – "Controllable and reusable suborbital rocket with SF1000 hybrid engine based on environmentally friendly propellants", funded by NCRD. Construction of a commercial suborbital rocket capable of lifting a 50 kg payload to an altitude of min. 100 km. End 2023.

- **SSPA** 7.2 GHz amplifier, 5-10 kW continuous power for satellite communications applications. Partner Trump Huttinger and the Fraunhofer Institute. Planned 2024.

- Universal inertial counting navigation unit (IMU) for missile guidance and control systems. NCRD.

- **SALTO** (Reusable Strategic Space Launcher Technologies & Operations), coordinated by ArianeGroup under the Horizon Europe programme. The SALTO project aims to validate the landing phase of the rocket. SpaceForest is responsible for the design of the Green Flip Control System for the Themis launcher.

Space missions:

Test environment for ESA's JUICE on-board mission data collection system.

Our clients:

ESA, IAF, Beyond Gravity, Tesat Spacecom, TRUMPF Huettinger, Fraunhofer Institute IAF, Warsaw University of Technology, Gdansk University of Technology.

www.lunares.space   www.spaceismore.com
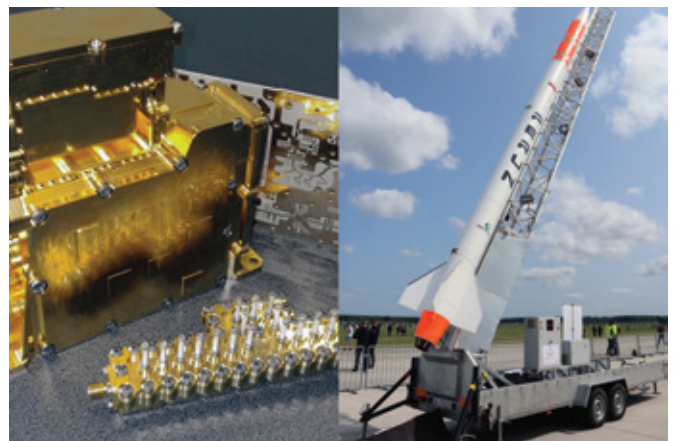
Marcin Traple   +48 660 700 807
Board Member Space Garden   info@lunares.space

Agata Mintus – COP
Chief Operational Officer Space is More

SPACE 🔷 GARDEN

— PLANT IDEAS, GROW TECHNOLOGIES —

Space Garden sp. z o.o.

Space Garden, founded in 2017, manages two main projects: the LunAres Research Station, where simulated space missions are organized for research purposes, and Space is More, a leading design team focused on extreme architecture. Space is More, established in 2013, became a subsidiary of Space Garden following its transformation into a company in 2017. Both entities collaborate to advance research in space medicine, architecture, and analog mission simulations.

Services:

Space Garden, through its subsidiary Space is More, is involved in architectural design, space medicine research, and the execution of analog mission simulations at the LunAres Research Station. Together, they offer laboratory and testing facilities for human spaceflight research.

Technology:

Ground Segment:
- Mission Operations,
- Mission Control,
- Analog habitat and research – Organization of simulated space missions considering space mission architecture,
- Testing of communication, operational, and security procedures in the preparation of operational protocols and experiments for manned space missions,
- Operations Execution,
- Testing experiments, technologies under simulated conditions.

Other:
- Data collection in ground-based segment operations for human spaceflight research.

Projects:

- Expert representation in the ESA Topical Team for Space Analogs, contributing to international research and standards in analog habitats,
- Recipient of a Norwegian grant for parastronautics analog research and the construction of a science center in Plia (EUR 1 million),
- Implementation of scientific research at the LunAres Research Facility with partners and clients.

Space missions:

- Test campaign during DLR's analog simulation of the RETINA project mission,
- Astronaut preparation campaign for manned suborbital flight of New Shepard rocket,
- Two scientific projects pre-selected by ESA and the Ministry of Development for Polish experiments on the ISS.

Our clients:

AGH, KP LABS, AGH Space Systems, TU DELFT, University of Silesia in Katowice, University of central Florida, Pomorski Uniwersytet Medyczny, Politechnika Wrocławska, University of Zurich + ATR-Applied Team Research, Politechnika Śląska, Universidad De Ingeneria Y Tecnologia, Uniwersytet Zielonogórski, DLR, AstroAccess, University of South Arizona, Austrian Space Forum (OeWF).

www.spacive.pl

Piotr Osica   +48 888 881 862
CEO   office@spacive.pl

⊘ SPACIVE

Spacive sp. z o.o.

Spacive Sp. z o. o. is a company operating since 2014, which provides research and development services for partners. The company has its own research facilities and offers comprehensive thermal services. Apart from thermal field, Spacive specializes in structural analyses and mechanism design. The company conducts internal research such as: MLI, deployable structures, graphite thermal straps, radiators and 3D printed heat pipes.

Services:

Thermal system design & analysis
We offer comprehensive thermal analyses for space satellite instruments, components and systems. We execute projects end-to-end from conceptual stage up to assembly and integration and testing. We have experience in software for general as well as specialized applications (matlab, esatan, comsol).

Thermal tests
We have an infrastructure necessary to conduct thermal tests in a cleanroom ISO8 class. Pressure achieved in our thermal-vacuum chamber is at the level of 10-6 mbar and ambient temperature of -190°C, which allows us to perform the most rigorous tests, both initial and qualification.

Mechanical design &development
Spacive has competences in the field of mechanical design of mechanisms and structures of satellite components. We execute projects from conceptual stage up to assembly and integration. We prepare technical documentation, select materials and make sure that every component can be manufactured and assembled. We design test rigs for vacuum, air-bearing table, off-load tests and others:
• State of the art assessment,
• Design of mechanisms,
• Design of test benches,
• Cad modelling,
• 3d prototyping.

Structural analysis services
We perform both static and dynamic analyses of mechanisms and structures. Our team is experienced in frequency and random response studies of space components:
• Development of fe models,
• Static analyses,
• Dynamic analyses: modal, frequency response, random response,
• Fem software: femap, nastran/patran.

Outgassing tests
Testing setup works in our tvc to carry out outgassing tests in accordance with the following standards:
• Ecss-q-st-70-02c,
• Astm e595.
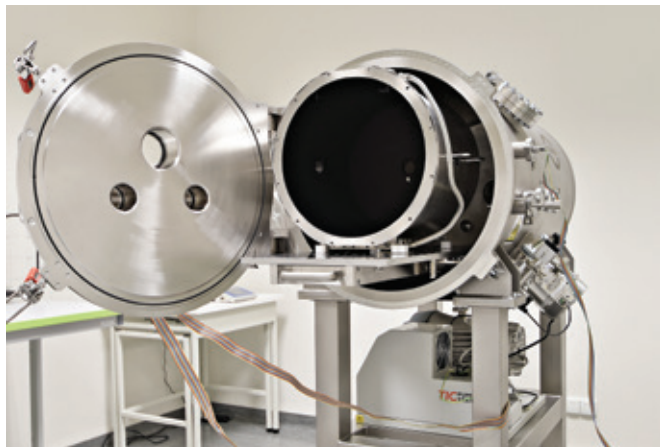
Products:

• Multi-layer Insulation (MLI) – production by a standard method (sewing or taping all layers together) and 'layer-by-layer' method with enhanced insulative properties, even by 100%.
• Graphite thermal straps.

Projects:

ARIEL CTP: Design and execution of a test bed for a thermal-vacuum chamber for operation at 30K cryogenic temperatures for the ARIEL mission. Spacive is responsible for designing the system, performing the necessary thermal and structural analyses, executing the designed system and conducting the test campaign.

TITAN: Design and implementation of a temperature control system for a robotic service arm for operation in Earth orbit. Spacive is responsible for the design of the temperature control system, performing the necessary thermal analysis, design and construction of the thermal insulation(MLI) and conducting the thermal test campaign.

DIGGER: Design and implementation of a temperature control system for a lunar regolith retrieval device. Spacive is responsible for the design of the temperature control system, performing the necessary thermal analyses, and conducting the thermal test campaign in the thermal-vacuum chamber (clean and dirty).

GLOWS: Design of the temperature control system for the GLOWS instrument of the IMAP mission. Spacive is responsible for the design of the temperature control system, performing the necessary thermal analyses, and conducting the thermal test campaign in the thermal-vacuum chamber.

Space missions:

• ARIEL (2019 – now),
• Solar Orbiter (2014 – 2018),
• JUICE (2015- 2019),
• GLOWS IMAP (2021-2024).

Our clients:

Space Research Center of the Polish Academy of Sciences, European Space Agency, Piap Space sp. z o.o., Creotech Instruments S.A., Kp Labs sp. z o.o., RedWire.

www.spectator.earth
Waldemar Franczak   hello@spectator.earth
CEO

SPECTATOR ◉ EARTH

Spectator sp. z o.o.

Spectator sp. z o.o. specialises in building sophisticated, multi-platform geospatial applications based on satellite-data. It's flagship product, app.spectator.earth, is an online platform used by thousands of users, in 100+ countries around the world. Tailored for both specialists and amateurs, to discover, analyse and share satellite-image-based products.

Products/Services:

spectator.earth is an online platform with a suite of earth observation tools for exploring satellite imagery. Future satellite acquisition planning, real-time satellite tracking, access to and processing of the archive data. User interface seamlessly integrated with available API, allowing easy transition between code and manual imagery exploration.

Technology:

TD2 Space System Software, TD6 RF Subsystems, Payloads and Technologies, TD12 Ground Station Systems and Network.

Our clients:

Krakowski Park Technologiczny, Copernicus, CloudFerro, Geoscience Australia, Universytet Rolniczy w Krakowie, Cracow University of Technology, University of Agriculture in Cracow, Envisage Space, Astrosat Ltd.

www.sybillatechnologies.com

Radosław Sknadaj
Head of Business Development

+48 792 356 675
radoslaw.sknadaj@sybillatechnologies.com
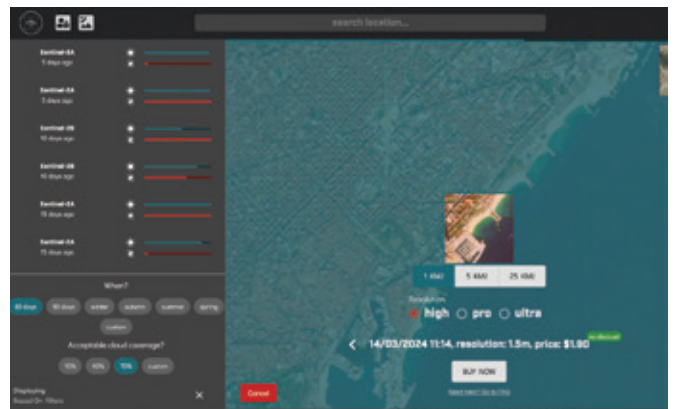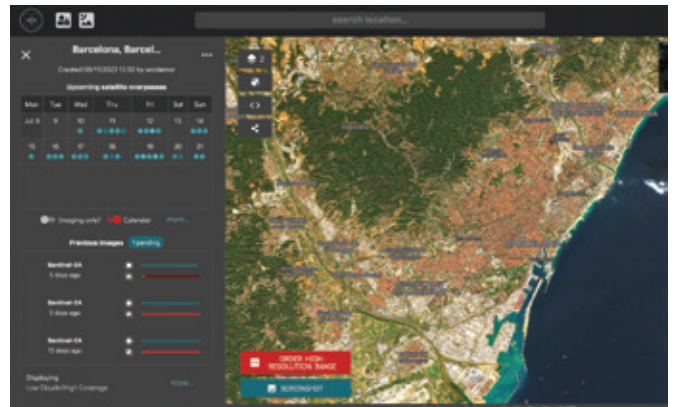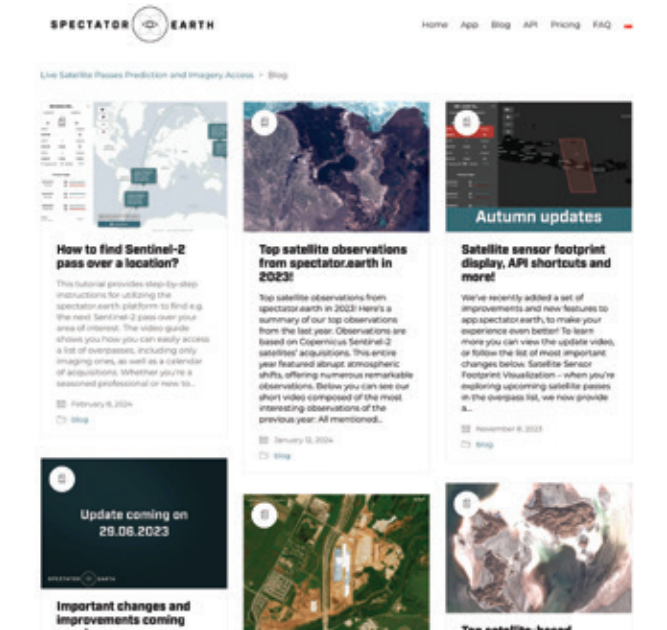
Sybilla Technologies sp. z o.o.

Sybilla Technologies is a company dedicated to providing software and hardware solutions based on industry standards for the domains of space observation and tracking, space traffic control, observational astrophysics, and public operations. The company leverages 20 years of astronomical experience, active research and development in several ESA projects and commercial activities to operate ground-based optical sensors on six continents. The network provides high-quality data to government and international partners and institutions, supporting daily decision-making for traffic control in the challenging environment of Earth orbit.

Sybilla Technologies Ltd. (ST) specializes in ground-based astronomical observatories, helping to operate more than 60 telescopes on six continents. The observatories conduct Space Surveillance and Tracking (SST) and Near-Earth Objects (NEO) research, commercial and educational observations. The company provides advanced IT projects, focusing on implementing scientific approaches for commercial applications.

Products:

- **Abot Suite** – SCADA system for supervising the operation of observatories (device drivers, services, services aggregating functionality, control panel, reporting).
- **Astrometry24.NET** – astrometry and photometry data processing chain supporting point sources and objects moving in non-stellar motion.
- **AstroDrive.IO** – a cloud-based platform for storage, visualization and analysis of optical observational data, sensor management, telemetry, reporting and tasking.
- **Perseus – A Ground-Based Observation System** – a turn-key, Space Safety focused, hardware and software solution for ground-based optical observations, integrated with the AstroDrive.IO platform.
- **Adiutis** – hardware and software for mobile measurement of psychophysiological parameters to monitor emotions and stress levels.

Technology:

- A1 Control Centre general equipment,
- A3 Operations Execution,
- B1 Antennas,
- B5 Ground Station Monitoring & Control,
- C Ground Segment Network (or Ground Comm. sub-net),
- D User Operations,
- E2 General Support.

Projects:

Polish Optical Network (POLON)
The Polish Space Agency (POLSA) embarked on an ambitious project with Sybilla Technologies to establish the Polish Optical Network as part of the EU's Space Surveillance and Tracking (EUSST) initiative. The goal was to create a global network for tracking space debris and satellites, ensuring 24/7 operation with high-tech telescopes across Chile, South Africa, Australia, and the USA. Sybilla Technologies implemented a customized Perseus system, integrating advanced technologies and high-quality components for optimal observation and data analysis.
This network achieves remarkable results, including the collection of over 3 million raw measurements per month and the observation of more than 50 unique objects per hour, with a 96% utilization of available observation time. The project's success has significantly enhanced global space safety, positioning POLSA as a leader in optical measurements within the EUSST framework and protecting key European space assets. This case study demonstrates Sybilla Technologies' ability to deliver innovative and effective solutions under tight deadlines, advancing space surveillance capabilities and safety.

Space missions:

- Astrometry24.NET – ESA project on astrometry and photometry data processing chain for passive optical sensors.
- AstroDrive.IO – SST-focused cloud platform and services (internal funding).
- MISST – improving collaboration and decision-making in SST operations using Mixed Reality (MR) platforms and Intelligent Agent Framework.
- Lightstream – An NCBR project for improving astrometry and photometry of point and streak sources for high frame-rate sCMOS cameras.
- EUSST – high-quality SST data delivery to the European Union SST consortium.

Our clients:

Polish Space Agency (POLSA), ESA (European Space Agency), EUSST consortium, The Open University (UK), University of Zielona Gora (UZG), MeerLICHT (South Africa, Netherlands), BlackGEM (Netherlands), Cilium Engineering (Poland), M. Kopernik Astronomical Center PAN (Poland), Airbus Defense & Space (Germany).

www.systemics.com.pl
Piotr Grabczyński

+48 22 424 70 01
p.grabczynski@syspab.eu

Systemics-PAB sp. z o.o.

Systemics-PAB sp. z o.o., a subsidiary of the Apave Group, is a leader in the comprehensive testing of the quality of services, security, and efficiency of telecommunications networks for operators, infrastructure suppliers, private network providers, and market regulators in Poland and worldwide. We analyze and provide information about the real quality of 2G-5G networks and the embedded services in terms of all technologies and latest devices. We also offer optimization services and monitoring solutions that are particularly appropriate for customers with multiple RAN equipment vendors. Moreover, we offer devices for testing Ethernet / Virtual / Cloud networks as well as professional testing of IT networks, applications, and cybersecurity. The company has quality certifications, including ISO 9001-2015 for "Measurements in Telecommunications Networks." and ISO 27001:2022 in measurement, analysis and consulting on the quality of tele-communication networks and distribution of ICT solutions. In our work, we are guided by business and environmental responsibility. Our continuing achievements being recognized with the award of Gold Medal in the EcoVadis Sustainability Rating 2023.

Systemics-PAB sp. z o.o. was established in 1990 and is a member of the Agreement for the Strategy "5G for Poland" and actively participates in the work of the ETSI standardization organization and International Telecommunication Union (ITU-D) in group SG-2. In July 2023, Systemics-PAB joined the Apave Group, an international group with more than 150 years of experience specializing in technical, human, environmental and digital risk management. Apave provides a full range of technical and professional services in the fields of inspection, professional training, certification and labelling, tests and measurements, and consulting and technical support.

Products:

- 5G and LTE mobile platform for Private Networks,
- GNSS simulators,
- Solutions for timing&synchronizations,
- Networks and services monitoring,
- Active testing of communications services,
- Drive testing,
- Drive tests reports&analysis&visualization,
- Network benchmarking& optimization,
- Network auditing&trubleshooting,
- Network&service deployment assurance,
- Indoor coverage measurements,
- VoIP quality management,
- VoLTE service investigation,
- RAN real – time monitoring,
- Core monitoring,
- Network&subscribers intelligence.

Technology:

- **Launchers** – GNC – Guidance, Navigation and Control – A4 GNC Units,
- **Satellite&Probes** – AOCS & GNC – A3 Guidance Navigation Control (GNC),
- **Orbital Transport.&Re-entry Sys** – GNC – Guidance, Navigation and Control- B1 Sensors – B2 GNSS receivers,
- **Orbital Transport&Re-entry Sys** – GNSS – GNSS – Global Navigation Satellite System – B1 Sensors – B2 GNSS receivers,
- **Ground Segment** – F&T – Frequency & Time – B2 RF equipment – B4 F&T equipment – B5 Ground Station Monitoring & Control – C Ground Segment Network (or Ground Comm. sub-net).

Projects:

The company participates in projects of the **CELTIC-NEXT** cluster within the framework of the EUREKA project, an agreement between 47 countries and the European Commission to promote competitiveness, market integration and cooperation in research and development.
- **5G PERFECTA International** project, 16 partners, including 3 Polish (with NCBR co-funding). The main objective of this project was to develop a 5G performance compliance testing assurance solution that calculates KPI (Key Performance Indicators) to show the real behavior of 5G network and services.

- **IMMINENCE** International project, 18 partners, including 3 Polish (with NCBR co-funding). The main goal is to develop new intelligent network management techniques: control functions for future mobile networks (Application Aware Networks, Self-configuration Networks), management functions (Adaptive Management, Autonomous Management), intelligent business analytics (Business Analytics, Data Analytics open platform).

Our clients:

Vodafone, Orange, T-Mobile, Nokia, Huawei, Urząd Komunikacji Elektronicznej, technical universities, Instytut Łączności, Athonet, Cisco, Safran.

www.techocean.pl

Błażej Roch Żyliński   +48 792 314 159   b.zylinski@techocean.pl
Member of the Management Board   biuro@techocean.pl

TechOcean sp. z o.o.

TechOcean specializes in research and development in the fields of the Internet of Things, PCB design, embedded software, robotics, mechatronics, and artificial intelligence. We carry out projects at every stage of development: from concept to small-scale production.

Services:

- Design and prototype development,
- Design and construction of electronic and mechatronic devices,
- Consulting and design services in:
  - Mechatronic structures,
  - Robotics,
  - Automation,
  - Internet of Things,
  - Embedded software,
  - Industrial design,
- 3D printing,
- Artificial intelligence,
- Vision quality control systems,
- Human-cobot collaboration systems.

Projects:

- Vision Qb Mass Manufacturing Quality Control Systems,
- 3D printing filament for space applications – 3D Zodiak,
- VisionQb Assistant – Intelligent operator support system.

Technology:

- Space System Software,
- Materials and Manufacturing Processes,
- Quality, Dependability, and Safety.

Our clients:

- **Polish Development Fund,**
- **Warsaw University of Technology,**
- **Airbus,**
- **Opegieka,**
- **Spacive.**

www.thorium.space

Ewa Poławska
Chief Communication
& Public Affairs Officer

+48 789 254 610
ewa.polawska@thoriumspace.com
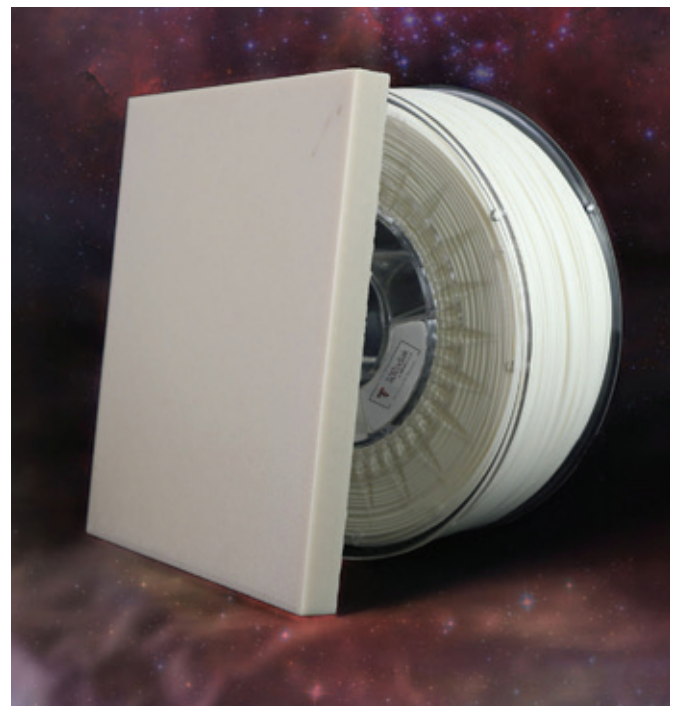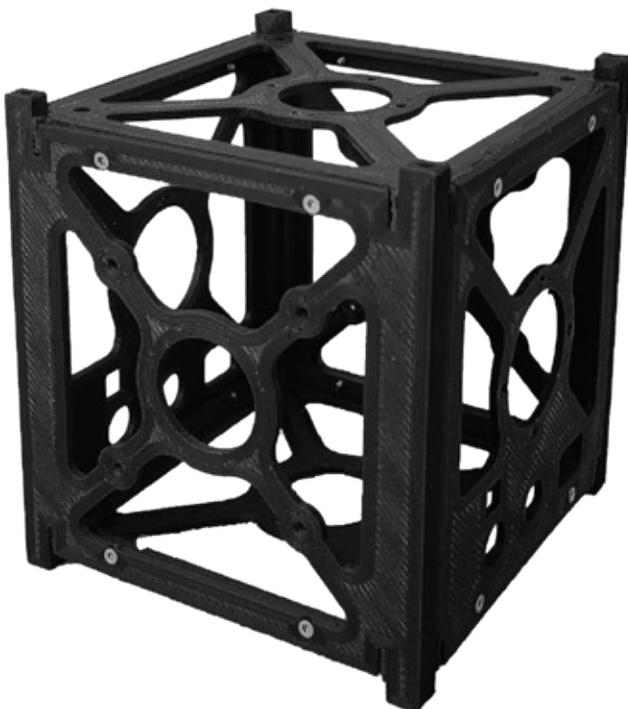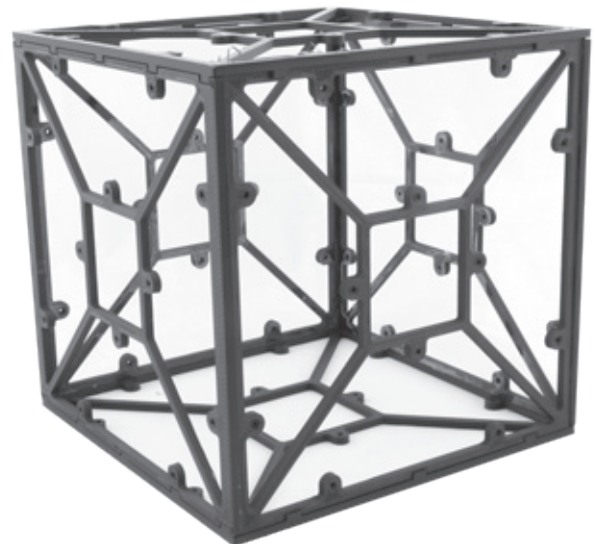
Thorium Space S.A.

Thorium Space S.A., Advanced Space Communication Company from Poland, founded in 2017 by Paweł Rymaszewski, an expert with over 25 years of experience in the Space and Defense industries. The company currently employs 60+ engineers and experts from Space and Defense industry, working together to create a new generation satellite telecommunications solutions.

Thorium Space specializes in cutting edge, advanced satellite communication systems, including terminals, system modules, and electronically steered phased array antennas (AESA), as well as the most advanced Space RF payloads (transponders) and fully flexible telecommunications satellites (Software Defined Satellites) in the Ku, Ka, and E radio frequency bands. The company is developing high-throughput small telecommunications satellites (HTS), designed to operate in geostationary orbit (GEO), as well smaller payloads for LEO and MEO missions.

The company with cooperation with Sivers Semiconductors, successfully develop innovative microwave chipsets for SATCOM ground terminals and for Satellite payloads to offer complete solution on the market. Thorium Space is one of the world leaders in electronic beam steering technology in the Ka and E bands, which gives it a competitive advantage on the market.

Thorium Space is actively involved in international projects, including the construction of Poland's first telecommunications satellite for geostationary orbit, also participating in strategic European programs such as IRIS² EU and GovSatCom. The company is currently collaborating with the European Space Agency (ESA) and Hellas Sat operator to develop a flexible, digitally defined telecommunications payload, which will be used in a new Hellas Sat satellite mission. This project, funded by ESA, is one of Thorium Space's most ambitious undertakings and represents a key step in strengthening its position in the global market.

Technology:

- "AURORA" Ka-band Ground Terminal,
- "AURORA – PRO" Ka-band Ground Terminal,
- Phased Array Antennas with Active Beamforming for Ka-band and 5G Networks (FR2 range),
- Satellite Payloads – E-band and Ka-band.

Projects:

- 5G Base Station in the Millimeter Wave Band,
- Multibeam E-Band AESA Transponder,
- Flat Active Antenna for Ka-band,
- SUBCOM – Satellite Remote Sensing and Communication System for Suborbital Research Rockets,
- T-XPDR Tactical Adaptive Satellite Transponder.

Our clients:

Thorium Space's key partners include OHB, Hellas Sat, Teledyne e2V, ANSYS, SYMKOM, Wrocław University of Science and Technology, and Warsaw University of Technology. The company's offerings have attracted interest from clients in EU and also the Middle East.
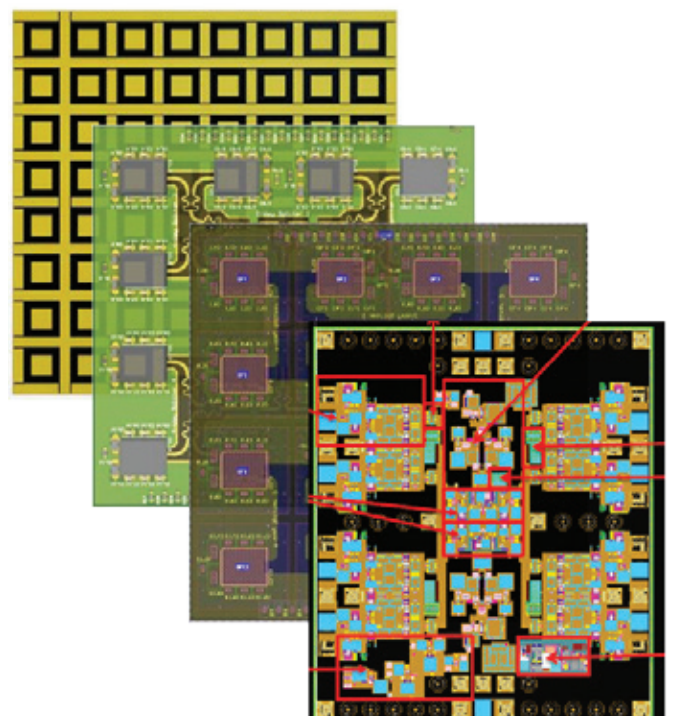
www.tuatara.pl/space

Artur Nowakowski
Earth Observations Lead

+48 783 472 242
artur.nowakowski@tuatara.pl

TUATARA sp. z o.o.

TUATARA is a company specializing in solving business challenges through a unique blend of business, consulting, and technology expertise. Our interdisciplinary team includes AI, machine learning, and cognitive technology experts, alongside marketers, data scientists, and Earth Observation specialists. Together, we deliver innovative solutions for our clients.

Products:

In the area of space mission planning and management, TUATARA, thanks to its experience and wide network of technology partners, offers a one-stop shop for the entire process involved in building satellites, including mission planning, satellite execution, launch, organisation of data reception and sharing, as well as data analytics and business consulting at each of these stages.

Working narrowly in the area of data storage, sharing and analytics, TUATARA, with its broad IT and EO competences, offers comprehensive solutions based on the latest technologies, including AI methods based on deep networks. A special aspect of our business is the automation of EO data analysis processes and their innovative applications.

Technology:

- Mission Planning and Management,
- Ground Data Archiving Subsystems,
- Ground Data Analytical Processing,
- Technologies for Data Security, Openness and Privacy,
- Remote Sensing Data and Information Processing and Exploitation,
- Remote Sensing Applications and Services,
- Remote Sensing Information Subsystems and User Interfaces,
- Remote Sensing Core Infrastructure and Architectures.

Projects:

From 2021 **TUATARA**, together with the subcontractors, has been implementing the Oman Space Programme involving the provision of a constellation of observation satellites, a ground-based data receiving station and an image storage, sharing and analysis platform. So far, the launch of two satellites from the constellation has taken place, and an online satellite data sharing and analytics platform is being developed to present the images obtained from this mission together with ESA data.

In addition, **TUATARA** carries out analytics related to the detection of oil spills from ships and the estimation of algae in inland and marine/oceanic waters. The company also conducts research in methods for determining the extent of floods and in broadly understood topic areas around fire, including the determination of forest parameters. The solutions provided use both optical and radar image analysis.

TUATARA is also conducting analyses of night-time images for applications including energy conservation, light pollution estimation, night-time fire detection and street lighting conditions.

Space missions:

Aman

Our clients:

Alioth, Creotech Instruments S.A., Irix, OrbitalEOS, Politechnika Warszawska, SatRev, Scanway, Space Exploration Technologies Corporation, SpaceX.

Our clients include organisations in the sectors of:
- **Telecommunications,**
- **Financial (Banking, Insurance, Finance Companies),**
- **Public.**

SPACE FOR GOOD

AFTER (19.08.2022)

SATELLITE IMAGES WITH NDCI FLOWERING COEFFICIENT
ACTIVATION OF THE COEFFICIENT FROM JULY TO AUGUST

NDCI COEFFICIENT VALUE:
Lowest (0)
Highest (0.1)

uniflowdynamics.com

Zbigniew Rarata   +48 519 648 060
Managing Director   contact@uniflowdynamics.com
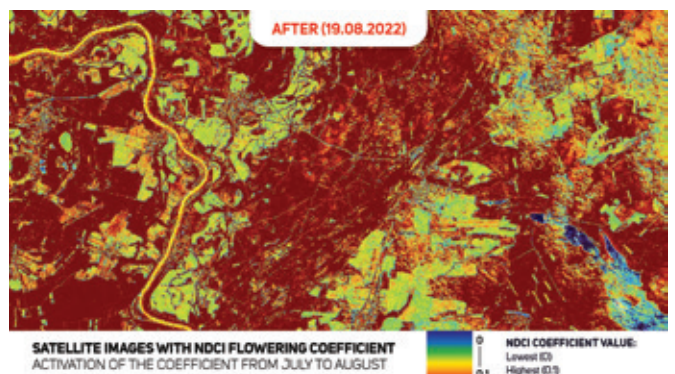
UniFlow Dynamics

UniFlow Dynamics is a Small and Medium-sized Enterprise (SME) which was founded in 2014. UniFlow Dynamics provides highly specialized knowledge and experience in fields such as computer aided design, computational fluid dynamics, computational acoustics, vibro- and aero-acoustics, and multidisciplinary design search and optimisation. UniFlow Dynamics serves customers in aerospace, space, railway, automotive and machine industries.

Technologies:

- TD 4 Spacecraft Environment & Effects,
- TD 8 System Design & verification,
- TD 15 Mechanisms & Tribology,
- TD 16 Optics,
- TD 17 Optoelectronics,
- TD 18 Aerothermodynamics,
- TD 19 Propulsion,
- TD 20 Structures & Pyrotechnics.

Projects:

- Vibration, vibro-acoustic and purge flow numerical simulations in the frame of the WFI filter wheel development for the ATHENA (Advanced Telescope for High Energy Astrophysics) X-ray observatory. The work is carried out under subcontract to Centrum Badań Kosmicznych PAN – CBK PAN. Numerical simulations are performed to investigate the vibro-acoustic response of the Wide Field Imager (WFI) instrument subjected to an intense diffuse sound field generated during a rocket launch. The main focus is put on the Large Detector Array (LDA) optical blocking filter, which consists of relatively large size thin polyimide film (~150 nm thick) coated with aluminium layer. Therefore it is particularly sensitive to high-level vibro-acoustic loads.

- Acoustic simulations in the frame of the Clean Sky 2 Joint Undertaking (JU), Optimization of APU Exhaust Muffler Thermal Barrier and Air Intakes construction Technologies (CHRZASZCZ) project. The work was carried out under subcontract to Sieć Badawcza Łukasiewicz – Instytut Lotnictwa. The project goal was to design, test and manufacture a whole APU (Auxiliary Power Unit) compartment (air intake, exhaust system, etc.) of a typical large passenger aircraft using newly developed materials. The newly designed and manufactured elements aimed at fulfilling functional requirements related to mass reduction, noise suppression, thermal protection and fire resistant. CFD study to determine three-dimensional aerodynamic characteristics of the next-generation train (no description given – NDA agreement).

Space missions:

- Misja ATHENA (Advanced Telescope for High Energy Astrophysics) mission.
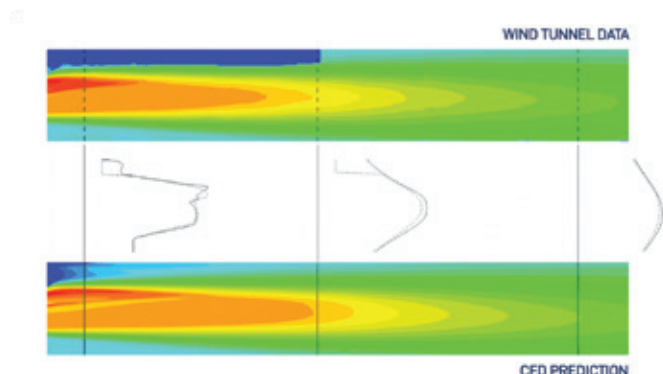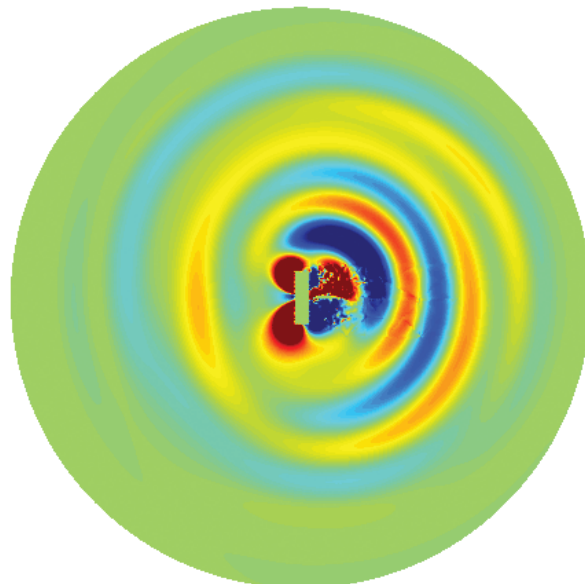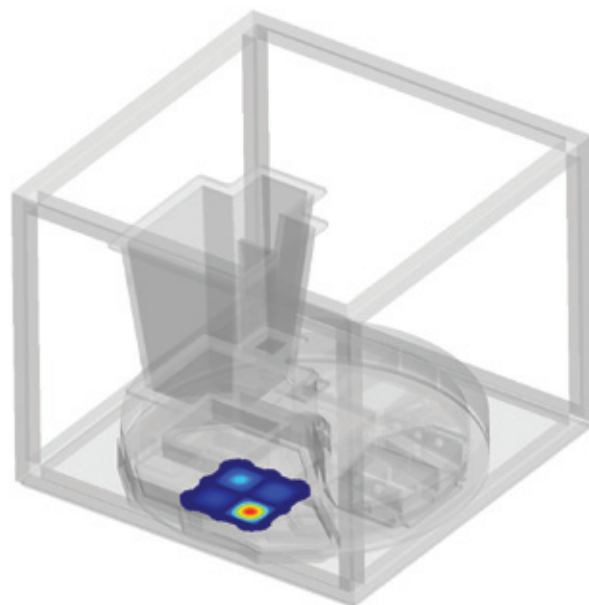
www.wasat.pl

Bartosz Buszke   +48 600 253 700
Managing Director   office@wasat.pl

Wasat sp. z o.o.

Wasat Sp. z o.o. is a company specializing in services based on satellite remote sensing, GIS and GNSS. The commercial offer is addressed primarily to farms and other entities in agriculture, as well as to clients from the environmental protection and renewable energy sectors. In frame of ESA projects, the company develops innovative solutions in the processing and analysis of satellite data and the use of satellite navigation.

Products:

Fertisat.com is an online service for farmers that generates high-quality application maps enabling precise fertilization, sowing and plant protection. Thanks to advanced analyzes of satellite data, it also provides information on the current condition of crops, which supports making optimal decisions regarding other agrotechnical treatments. The radar module in the service minimizes the dependence on weather conditions in the process of creating application maps of mineral fertilizers.

Irriget.com service provides precise information about current moisture conditions in fields and the condition of crops. Legible maps and charts present the amount of evaporation, field water balance and plant stress, which helps farmers make optimal irrigation decisions and evaluate the results of their actions. A unique feature of the service are actual evapotranspiration (evaporation & transpiration) maps offered daily based on satellite and weather data, with a resolution of 20 m per pixel.

Technology:

- Remote Sensing Data and Information Processing and Exploitation,
- Remote Sensing Applications and Services,
- GNSS and Geodetic Data Processing.

Projects:

The MaizEO project, co-financed by ESA, aims to increase the efficiency of maize production in Central Europe by using satellite data. The result will be a set of precise advice functions on corn growing from sowing to harvest.

Our clients:

- **Farmers and agricultural companies,**
- **Institutions and companies from the environmental protection and renewable energy industries,**
- **Archaeologists and cultural heritage institutions,**
- **Universities and scientific institutes,**
- **European Space Agency.**

WB CENTRUM KOMPOZYTÓW
WB GROUP

www.wbgroup.pl

Agata Bardega   +48 32 779 60 00
Management and Development Office   wbck-biuro@wbgroup.com

WB Centrum Kompozytów sp. z o.o.

WB Centrum Kompozytów sp. z o. o. established in 2012 offers composite structures manufacturing in autoclaves technology along with mechanical laboratory. Its core competencies are in the development and manufacturing of lightweight flight structures such as CFRP and aluminum sandwich panels for spacecrafts building. The company is ready to accompany its customers on each step of the manufacturing processes – from design to manufacture of finished parts.

The company's idea is also to introduce the autoclave technology used so far in aerospace into the other areas, such as marine, automotive, railway and wind power industry. These new technologies can be used wherever it is necessary to use light and durable materials that guarantee high security to the end user.

Products:
Primary and secondary structures for satellite platforms:
- aluminum skin / aluminum honeycomb flat panels,
- epoxy CFRP skin / aluminum honeycomb flat panels equipped with:
  - aluminum or titanium structural and equipment inserts,
  - non-structural components (rivets, connectors, wiring supports, rivkles, velcros etc.).

Technology:

Satellites & Probes:
- N2 Primary Structures,
- N3 Secondary Structures.

Projects:

ESA contracts as a Prime:
- 4000127984/19/NL/CBi: Carbon Fiber Reinforced Cone Structure Complex Shape Manufacturing,

- 4000123840/18/NL/CBi: Next Generation Solar Arrays Lightweight Panel Substrates Technology,

- 4000121146/17/NL/CBi: Implementation of aluminum sandwich panels manufacturing processes for spacecraft structures in the Silesian Science and Technology Centre of Aviation Industry Ltd.,

- 4000113449/15/NL/CBi: Cyanate-ester composite technology demonstration for space telescopes,

- 4000110672/14/NL/CBi: Validation of CFRP substrates manufacturing process for SPACECRAFT Structures.

ESA contracts as a Subcontractor:
- 4000128047/19/NL/CBi: Design, manufacturing of the Structural Model of the Polish Multi-Mission Platform (MMPF),

- 4000126111/18/NL/RA: Thin Ply Laminate Composite Structures.

Space missions:

CHIME (Copernicus Hyperspectral Imaging Mission) mission, part of the Copernicus program – primary structures manufacturing (flat sandwich panels equipped with structural and non-structural components) for recurring flight models.

ESPRIT HALO Lunar Communication System (HLCS) Bay Box sandwich panels manufacturing.

ATHENA Science Instrument Bench (SIB) Focal Plane Module Development Model – primary structures manufacturing (aluminum and CFRP flat sandwich panels + CFRP cone structure equipped with structural and equipment inserts).

Our clients:

- **European Space Agency,**
- **Thales Alenia Space,**
- **WB Group.**

www.wiran.pl

Maciej Król   +48 58 663 10 10
Chairman of the Board   info@wiran.pl
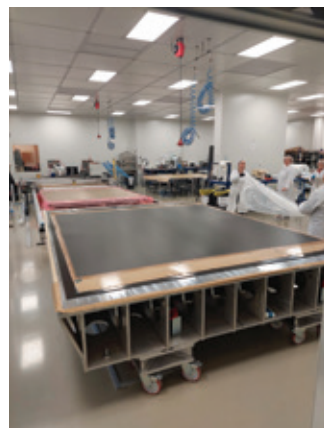
WiRan sp. z o.o.

WiRan is a design office for electronic devices and systems of high reliability. Our specialty are solutions using wireless communication / radio frequencies (in particular LoRaWAN, NB-IoT, LTE-M, but not only). We provide a.o. solutions for the following industries: SPACE, INDUSTRY 4.0, SMART CITY, DEFENSE, railway, maritime.

Products/Services:

Products:
- Components of communication paths for satellites and the earth segment, i.e. antennas, diplexers, couplers, power splitters.

Services:
- Feasibility studies and fast prototyping (electronic design, measurements, RF/Microwave specialization),
- IoT solutions (engineering, prototyping, firmware development, LoRa / NB-IoT / LTE-M),
- Electromagnetic compatibility (EMC) testing laboratory, including a climatic chamber and a Faraday cage,
- Electromagnetic simulations,
- Cleanroom.

Projects:

- **"Design, production and tests of an Engineering Model of S-band diplexer for CubeSat nanosatellites"** – the project implemented in 2016-2018 concerns the design and implementation of a laboratory prototype of a communication module – a diplexer for the S band in the TRL range 2 to 4.
- **"Design, production and tests of an Engineering Model of cheap X-band diplexer for CubeSat nanosatellites"** – the project implemented in 2017-2019 concerns the design and implementation of a laboratory prototype of a communication module – an X-band diplexer in the TRL range 2 to 4.
- **"Design, production and tests of an Engineering Model of cheap RX&TX S-band antenna for CubeSat nanosatellites"** – the project implemented in 2019-2020 concerns the design and implementation of a laboratory prototype of a communication module – an S-band antenna in the TRL range 2 to 4.

- **"Development and test of the EQM model of compact X-Band Diplexer for Cube-Sat"** – the project carried out in 2020-2021 concerns the design, production and testing of a qualified prototype of a communication module – an X Band Diplexer in the TRL 4 – TRL 7 range.
- **"Extending Qualification Range of S Band Diplexer Regarding RF Power"** – Preparation of Enabling Space Technologies and Building Blocks, GSTP – realized in 2021-2023.
- **"Ku And Ka-Band Filters For Transmit And Receive Active Antennas"** – Artes 4.0 Core Competitiveness Generic Programme Line – Component A: Advanced Technology, Activity Reference 5c.431 – realized in 2022-24.
- **"Compact S-band diplexer for small satellites TT&C Applications"** – Artes 4.0 Core Competitiveness Generic Programme Line – Component A: Advanced Technology, Activity Reference 5e.023 – realized in 2023-25.
- **"Raising the technological readiness of products/components of WiRan S and X band communication systems to the TRL9 level"** – NCBiR project as part of the "Fast Track – Space Technologies" competition, contract won in 2019.

Space missions:

- Number of commercial missions in which the entity is/was (since 2012) involved as a supplier of components: **>10.**
- Number of NCBR projects in which the entity participates (since 2012)*: **1.**

Our clients:

- **Public sector (defense and heavy industry) and private sector (space, defense, industry, railway and maritime industries.**

Technology Domain legend

- TD1 — On-board Data Subsystems
- TD2 — Space System Software
- TD3 — Space Systems Electrical Power
- TD4 — Space Systems Environments and Effects
- TD5 — Space System Control
- TD6 — RF Subsystems, Payloads and Technologies
- TD7 — Electromagnetic Technologies and Techniques
- TD8 — System Design &Verification
- TD9 — Mission Operation and Ground Data Systems
- TD10 — Flight Dynamics and GNSS
- TD11 — Space Debris
- TD12 — Ground Station Systems and Network
- TD13 — Automation, Telepresence & Robotics
- TD14 — Life & Physical Sciences
- TD15 — Mechanisms
- TD16 — Optics
- TD17 — Optoelectronics
- TD18 — Fluid Mechanics
- TD19 — Propulsion
- TD20 — Structures
- TD21 — Thermal
- TD22 — Environmental Control & Life Support (ECLS) and In Situ Resource Utilisation (ISRU)
- TD23 — Electrical, Electronic and Electro-mechanical (EEE) Components and Quality
- TD24 — Materials and Manufacturing Processes
- TD25 — Quality, Dependability and Safety
- TD26 — Others

No	Company	TD1	TD2	TD3	TD4	TD5	TD6	TD7	TD8	TD9	TD10	TD11	TD12	TD13	TD14	TD15	TD16	TD17	TD18	TD19	TD20	TD21	TD22	TD23	TD24	TD25	TD26
1	6ROADS sp. z o.o.																										
2	ABGi Poland sp. z o.o.																										
3	Adaptronica sp. z o.o.					■															■						
4	AROBS Polska sp. z o.o.	■	■	■	■			■								■		■									
5	Astronika sp. z o.o.								■				■	■		■	■			■	■	■			■	■	
6	Asynchronics sp. z o.o.													■													
7	Baltic Orbital Services sp. z o.o.		■			■	■		■			■	■													■	
8	Bit by Bit sp. z o.o.		■							■																	
9	Blue Dot Solutions sp. z o.o.									■																	
10	Centrum Astronomiczne im. M. Kopernika PAN					■			■		■						■										
11	Centrum Badań Kosmicznych PAN	■				■	■	■	■	■	■	■	■	■		■	■	■		■	■	■			■	■	
12	CIM-mes Projekt sp. z o.o.								■							■					■				■		
13	Cilium Engineering																										
14	CloudFerro S.A.								■	■																■	
15	Cloudless sp. z o.o.														■												
16	Creotech Instruments S.A.	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■			■			■	■	■	
17	Eycore sp. z o.o.						■																				
18	Fundacja Partnerstwa Technologicznego Technology Partners																				■						
19	GISS sp. z o.o.	■	■				■	■																			
20	GMV Innovating Solutions sp. z o.o.	■	■			■	■		■	■	■	■	■														
21	Haiko sp. z o.o.																					■					
22	Hertz Systems Ltd Sp. z o.o		■	■			■				■																
23	ICEYE Polska sp. z o.o.	■	■	■	■	■	■		■																		
24	Industrial Development Agency JSC																										
25	Integrated Solutions sp. z o.o.																										
26	ITTI sp. z o.o.	■		■		■			■	■		■															
27	Jakusz SpaceTech sp. z o.o.													■							■						
28	JoinThe.Space sp. z o.o.																										■
29	Komes sp. z o.o.															■					■				■	■	■
30	KP LABS sp. z o.o.	■	■	■					■													■					
31	Liftero sp. z o.o.		■																	■							
32	Łukasiewicz Research Network – Industrial Research Institute for Automation and Measurements PIAP								■		■			■		■					■						
33	Łukasiewicz Research Network – Institute of Aviation																		■	■					■		
34	Microamp Solutions sp. z o.o.						■																				
35	National Institute of Telecommunications						■	■	■				■				■								■		
36	N7 Space sp. z o.o.					■			■																		
37	OPEGIEKA sp. z o.o.																										
38	Orbital Matter sp. z o.o.															■	■				■						
39	PCO S.A.																■	■							■		
40	Phonemic sp. z o.o.	■				■	■				■																
41	PIAP Space sp. z o.o.	■	■	■					■		■			■		■						■					
42	Piktime Systems sp. z o.o.								■	■	■																
43	Planet Partners sp. z o.o.																										
44	QWED sp. z o.o.							■	■																		
45	Radiotechnika Marketing sp. z o.o.			■																							
46	SATIM Monitoring Satelitarny sp. z o.o.																										■
47	Scanway S.A.															■	■										
48	Semicon sp. z o.o.																								■	■	
49	Sener sp. z o.o.								■			■		■							■				■	■	
50	SmallGIS sp. z o.o.		■																								
51	Space Agency Maciej Myśliwiec																										
52	SpaceForest sp. z o.o.						■	■	■		■									■					■		
53	Space Garden sp. z o.o.						■									■				■					■	■	■
54	Spacive sp. z o.o.																										
55	Spectator sp. z o.o.																										
56	Sybilla Technologies sp. z o.o.		■						■		■	■															
57	Systemics-PAB sp. z o.o.		■						■	■	■	■															
58	TechOcean sp. z o.o.																								■	■	
59	Thorium Space S.A.	■				■	■	■					■														
60	TUATARA sp. z o.o.		■							■																	
61	Uniflow Dynamics				■			■						■		■	■	■	■	■							
62	Wasat sp. z o.o.		■								■																
63	WB Centrum Kompozytów sp. z o.o.																					■					
64	WiRan sp. z o.o.						■	■																			

Contact list

No	Company	Contact person	Phone	email
1	6ROADS sp. z o.o.	Marcin Gędek	+48 606 233 894	contact@6roads.com.pl
2	ABGi Poland sp. z o.o.	Paweł Kwiatkowski	+48 698 542 337	pawel.kwiatkowski@abgi-poland.com
3	Adaptronica sp. z o.o.	Przemysław Kołakowski	+48 609 470 500	pkolak@adaptronica.pl
4	AROBS Polska sp. z o.o.	Tadeusz Kocman	+48 505 580 953	tadeusz.kocman@arobs.pl
5	Astronika sp. z o.o.	Marta Tokarz	+48 573 171 292	mtokarz@astronika.pl
6	Asynchronics sp. z o.o.	Adam Chikha	+48 691 606 849	adam.chikha@asynchronics.com
7	Baltic Orbital Services sp. z o.o.	Eugeniusz Rokicki	+48 500 267 310	ceo@orin.technology
8	Bit by Bit sp. z o.o.	Ph.D. Eng. Dariusz Walczak	+48 503 697 437	dariusz.walczak@thebitbybit.com
9	Blue Dot Solutions sp. z o.o.	Ph.D. Eng. Krzysztof Kanawka	+48 607 160 640	office@bluedotsolutions.eu
10	Centrum Astronomiczne im. M. Kopernika PAN	Monika Zuchniak	+48 604 343 932	mzuchniak@camk.edu.pl
11	Centrum Badań Kosmicznych PAN	Piotr Orleański	+48 22 49 66 206	piotr.orleanski@cbk.waw.pl
12	Cilium Engineering sp. z o.o.	Stanisław Kozłowski	+48 509 628 491	biuro@cilium.pl
13	CIM-mes Projekt sp. z o.o.	Armen Jaworski	+48 22 631 22 44	a.jaworski@cim-mes.com.pl
14	CloudFerro S.A.	Rafał Kowalczyk	+48 22 354 65 73	rkowalczyk@cloudferro.com
15	Cloudless sp. z o.o.	Piotr Franczak	+48 695 660 247	info@cloudless.tech
16	Creotech Instruments S.A.		+48 22 246 45 75	kontakt@creotech.pl
17	Eycore sp. z o.o.	Marek Woliński	+48 539 060 372	contact@eycore.com
18	Fundacja Partnerstwa Technologicznego Technology Partners	Michał Towpik	+48 22 658 14 76	michal.towpik@technologypartners.pl
19	GISS sp. z o.o.	Andrzej Gruszka / Bartosz Peas	+48 885 800 480 / +48 661 684 859	andrzej.gruszka@giss.pl / bartosz.peas@giss.pl
20	GMV Innovating Solutions sp. z o.o.	Paweł Wojtkiewicz	+48 693 361 603	pwojtkiewicz@gmv.com
21	Haiko sp. z o.o.	Ernest Kryjer	+48 22 724 34 86	haiko@haiko.pl
22	Hertz Systems Ltd Sp. z o.o	Urszula Szulewicz	+48 68 328 70 42	u.szulewicz@hertzsystems.com
23	ICEYE Polska sp. z o.o.	Kacper Grzesiak / Dawid Biesiadecki-Dziuba	+48 668 660 077 / +48 453 581 253	kacper.grzesiak@iceye.com / dawid.biesiadecki-dziuba@iceye.com
24	Industrial Development Agency JSC	Paweł Pacek	+48 (22) 695 3622, +48 501 216 190	Pawel.Pacek@arp.pl
25	Integrated Solutions sp. z o.o.	Ilona Wojtkiewicz	+48 509 205 000 / +48 797 799 007	biuro@i-s.com.pl / iwojtkiewicz@i-s.com.pl
26	ITTI sp. z o.o.	Joanna Baksalary / Bartosz Kaźmierczak	+48 61 622 69 85	joanna.baksalary@itti.com.pl / bartosz.kazmierczak@itti.com.pl
27	Jakusz SpaceTech sp. z o.o.	Maciej Spigarski	+48 660 783 050	maciej.spigarski@jakusz-spacetech.com
28	JoinThe.Space sp. z o.o.	Daniel Płudowski	+48 514 809 668	office@jointhe-space.com
29	Komes sp. z o.o.	Ph.D. Eng. Piotr Harnatkiewicz	+48 662 123 001	harnatkiewicz@komes.pl
30	KP LABS sp. z o.o.	Iuliia Marushchak	+48 32 356 49 50	info@kplabs.pl
31	Liftero sp. z o.o.	Przemysław Drożdż	+48 602 710 197	przemek@liftero.com
32	Łukasiewicz Research Network – Industrial Research Institute for Automation and Measurements PIAP	Patryk Koć	+48 501 522 301	patryk.koc@piap.lukasiewicz.gov.pl

No	Company	Contact person	Phone	email
33	Łukasiewicz Research Network – Institute of Aviation		+48 22 846 00 111	ilot@ilot.lukasiewicz.gov.pl
		Ph.D. Eng. Adam Okniński	+48 789 061 149	adam.okninski@ilot.lukasiewicz.gov.pl
		Iwona Przygoda	+48 503 819 637	iwona.przygoda@ilot.lukasiewicz.gov.pl
34	Microamp Solutions sp. z o.o.	Marianna Frasunek	+48 500 242 127	hello@microamp-solutions.com
35	National Institute of Telecommunications	Michał Marszalec	+48 22 5128 720	m.marszalec@il-pib.pl
36	N7 Space sp. z o.o.	Michał Mosdorf	+48 22 299 20 50	sales@n7space.com
37	OPEGIEKA sp. z o.o.	Adam Wasilewski	+48 55 237 60 00	office@opegieka.pl
38	Orbital Matter sp. z o.o.	Jakub Stojek	+48 668 770 170	jakub.stojek@orbital-matter.com
39	PCO S.A.	Tomasz Dąbrowski	+48 604 18 67 47	tomasz.dabrowski@pcosa.com.pl
40	Phonemic sp. z o.o.	Adam Gieras	+48 573 835 272	adam.gieras@phonemic.pl
41	PIAP Space	Anna Nikodym-Bilska	+48 885 404 409	commercial@piap-space.com
42	Piktime Systems sp. z o.o.	Paweł Nogaś	+48 61 624 36 37	piktime@piktime.com
43	Planet Partners sp. z o.o.	Łukasz Wilczyński	+48 516 036 036	l.wilczynski@planetpartners.pl
44	QWED sp. z o.o.	Ph.D. Eng. Marzena Olszewska-Placha	+48 (22) 6257319	m.olszewska@qwed.eu
45	Radiotechnika Marketing sp. z o.o.	Marcin Powązka	+48 603 868 592	mpowazka@radiotechnika.com.pl
46	SATIM Monitoring Satelitarny sp. z o.o.	Lena Woźniak	+48 601 870 646	hello@satim.co
47	Scanway S.A.	Mikołaj Podgórski	+48 504 217 324	m.podgorski@scanway.pl
48	Semicon sp. z o.o.	Dariusz Sokół	+48 669 655 525	dsokol@semicon.com.pl
49	Sener sp. z o.o.	Jakub Pierzchała	+48 607 555 296	info.polonia@aeroespacial.sener
50	SmallGIS sp. z o.o.	Beata Szafrańska	+48 506 640 337	beata.szafranska@smallgis.pl
51	Space Agency Maciej Myśliwiec	Maciek Mysliwiec	+48 884 778 177	hello@spaceagency.biz
52	SpaceForest sp. z o.o.	Marcin Sarnowski	+48 58 770 56 46	spaceforest@spaceforest.pl
53	Space Garden sp. z o.o.	Marcin Traple / Agata Mintus	+48 660 700 807	info@lunares.space
54	Spacive sp. z o.o.	Piotr Osica	+48 888 881 862	office@spacive.pl
55	Spectator sp. z o.o.	Waldemar Franczak	+48 577 503 683	hello@spectator.earth
56	Sybilla Technologies sp. z o.o.	Radosław Sknadaj	+48 792 356 675	radoslaw.sknadaj@sybillatechnologies.com
57	Systemics-PAB sp. z o.o.	Piotr Grabczyński	+48 22 424 70 01	p.grabczynski@syspab.eu
58	TechOcean sp. z o.o.	Błażej Roch Zieliński	+48 792 314 159	biuro@techocean.pl; b.zylinski@techocean.pl
59	Thorium Space S.A.	Ewa Poławska	+48 789 254 610	ewa.polawska@thoriumspace.com
60	TUATARA sp. z o.o.	Artur Nowakowski	+48 783472242	artur.nowakowski@tuatara.pl
61	UniFlow Dynamics	Zbigniew Rarata	+48 519 648 060	contact@uniflowdynamics.com
62	Wasat sp. z o.o.	Bartosz Buszke	+48 600 253 700	office@wasat.pl
63	WB Centrum Kompozytów sp. z o.o.	Agata Bardega	+48 32 779 60 00	wbck-biuro@wbgroup.com
64	WiRan sp. z o.o.	Maciej Król	+48 58 663 10 10	info@wiran.pl

Office

Al. Jerozolimskie 202
02–486 Warszawa

biuro@space.biz.pl
+48 22 874 04 12

KRS: 0000447107
NIP: 522–300–36–82

space.biz.pl

linkedin.com/company/polish-space-industry-association

facebook.com/PolishSpaceIndustryAssociation