

THE LUDWIG BÖLKOW CAMPUS
Innovations for aerospace and security

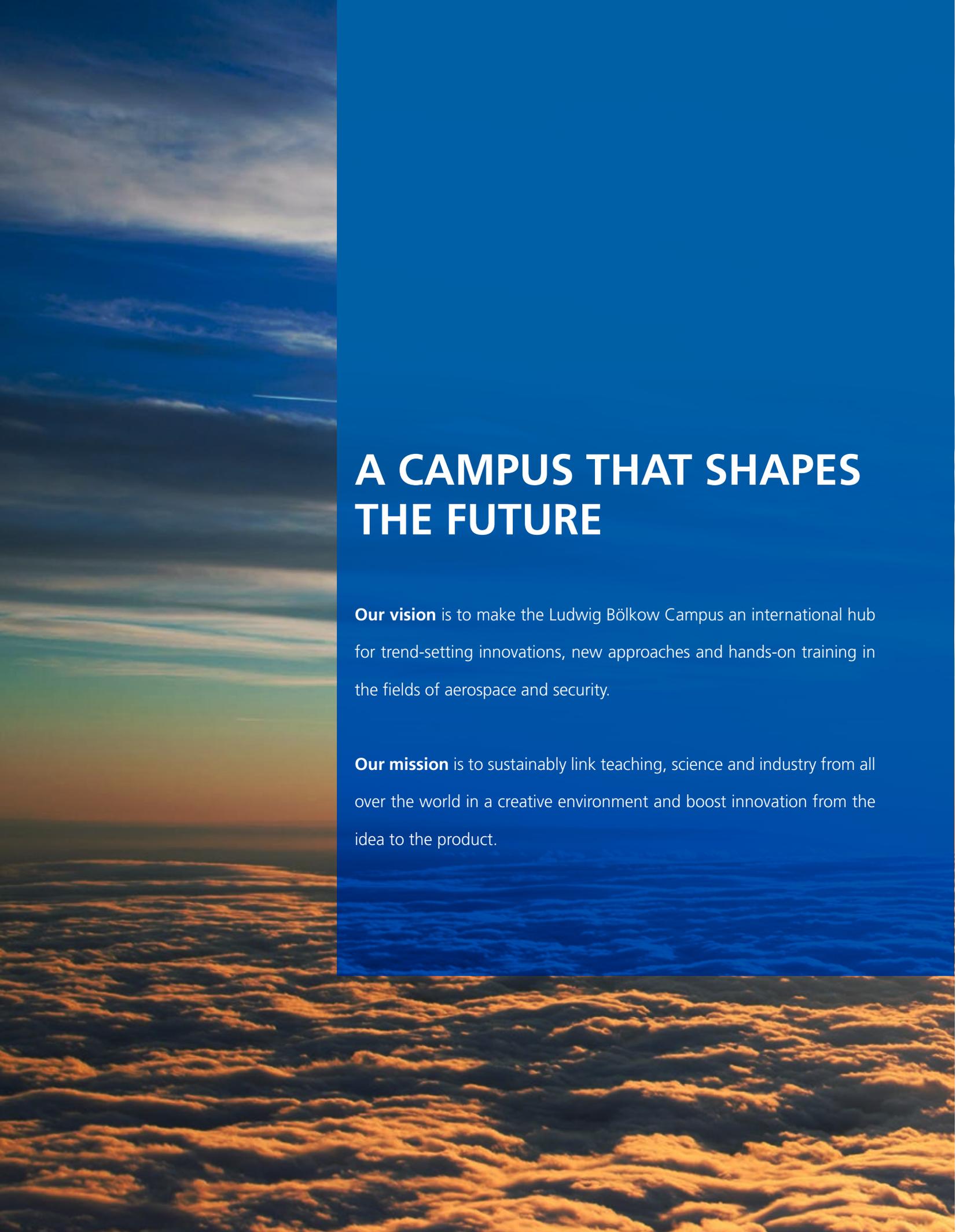
**OUR GOAL:
FUTURE**

AUTONOMOUS SYSTEMS

GREEN AEROSPACE

INTEGRATED SYSTEMS

PUBLIC SECURITY



A CAMPUS THAT SHAPES THE FUTURE

Our vision is to make the Ludwig Bölkow Campus an international hub for trend-setting innovations, new approaches and hands-on training in the fields of aerospace and security.

Our mission is to sustainably link teaching, science and industry from all over the world in a creative environment and boost innovation from the idea to the product.





FROM THE IDEA TO THE PRODUCT

Visions take flight at the Ludwig Bölkow Campus located just south of Munich. Whether it's kerosene made from algae, hybrid and electric aircraft engines, high-tech components from the 3D printer or ultra-lightweight designs, for example made of carbon: A unique campus is emerging in Ottobrunn/Taufkirchen within the shadow of the Alps – right next door to Airbus, IABG and Siemens, a wide range of smaller aerospace companies, as well as first-class universities.

Since 2012, renowned academic institutions, start-ups, industrial companies and spin-offs in the aerospace industry, as well as security technology have come together on the LBC under the banner *campus@industry*. Institutions of participating industrial partners, the Technical University of Munich and the University of the German Federal Armed Forces, the hosting of the visionary think tank, Bauhaus Luftfahrt, and the involvement of the German Aerospace Centre and Munich University

on-site ensure that the results of research are properly implemented to make commercially viable products. The LBC enhances Munich's position as a centre for business and science and acts as a magnet for international specialists and experts from the worlds of science, business and politics. Research is conducted in four areas on the campus with the support of the Free State of Bavaria: Green Aerospace, Public Security, Autonomous Systems and Integrated Systems. Numerous research projects have already been successfully completed or have made significant progress.

Come with us into the future and learn more about our ground-breaking activities in aerospace and security.

**Munich Aerospace e.V. and
Ludwig Bölkow Campus GmbH**

ORGANISATION OF THE LBC

Munich Aerospace e.V. and Ludwig Bölkow Campus GmbH work closely together at the Ludwig Bölkow Campus. Munich Aerospace e.V. represents science and Ludwig Bölkow Campus GmbH represents industry on the campus.



The partners

Ludwig Bölkow Campus GmbH

AIRBUS **iABG** **SIEMENS**

Munich Aerospace e.V.



Deutsches Zentrum
für Luft- und Raumfahrt



der Bundeswehr
Universität  München



With the support of the Free State of Bavaria



FIELDS OF RESEARCH ON THE LBC

AUTONOMOUS SYSTEMS

Autonomous Systems performs pioneering work in the field of unmanned air systems.

GREEN AEROSPACE

Green Aerospace focuses on the reduction of fossil fuels.

INTEGRATED SYSTEMS

Integrated Systems researches complex approaches in the area of System of Systems.

PUBLIC SECURITY

Public Security researches innovative security solutions for emergency and crisis prevention, and crisis management.



FIELD OF RESEARCH

AUTONOMOUS SYSTEMS

Service from the air

When the postman doesn't ring anymore! Autonomous systems such as unmanned aircraft will soon be part of everyday life. One example of this is quick and reliable postal delivery from the air. Far more complex drones can also be flown over pipelines and power lines in areas where access is difficult, for monitoring purposes and to report dam-

age. In order to attain the highest possible degree of automation, realistic parameters are defined on the LBC for applications and missions of all kinds. Unmanned aircraft will therefore be in a position to record and interpret relevant information, and ultimately to take decisions based on that information.

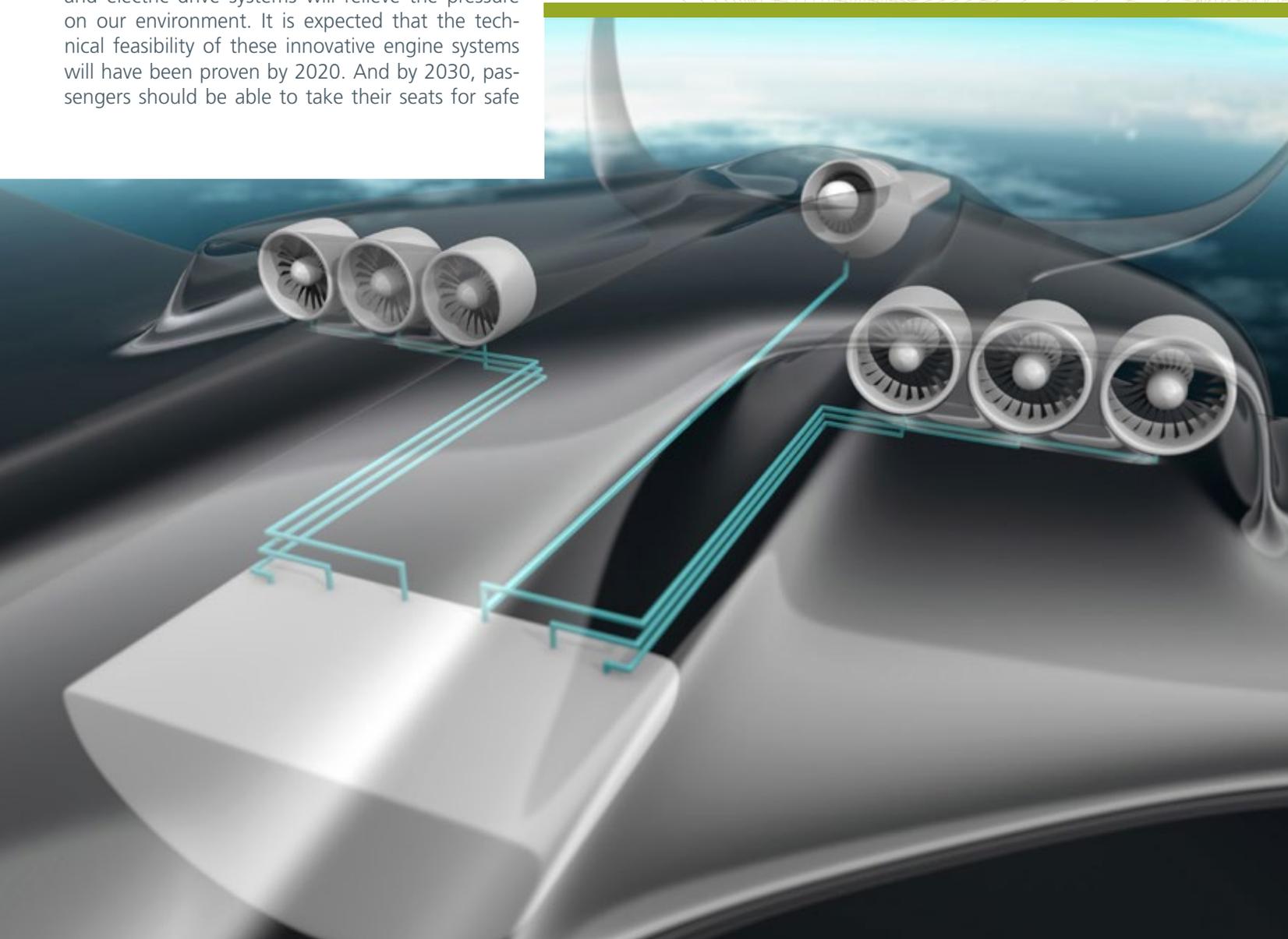
FIELD OF RESEARCH

GREEN AEROSPACE

Biokerosene, electric drives and lightweight construction

Well equipped for the future: The research conducted on the LBC today will help to drastically reduce harmful emissions in just a few years time. What is now considered futuristic will soon become reality. Starting and landing aircraft with climate-neutral biokerosene produced from algae. Hybrid-electric and electric drive systems will relieve the pressure on our environment. It is expected that the technical feasibility of these innovative engine systems will have been proven by 2020. And by 2030, passengers should be able to take their seats for safe

take-off in commercial aircraft with a capacity of up to 100. New production methods such as "3D printing" and the intelligent use of new lightweight materials, such as carbon fibre composites, will similarly make a key contribution to "low-emission flight".



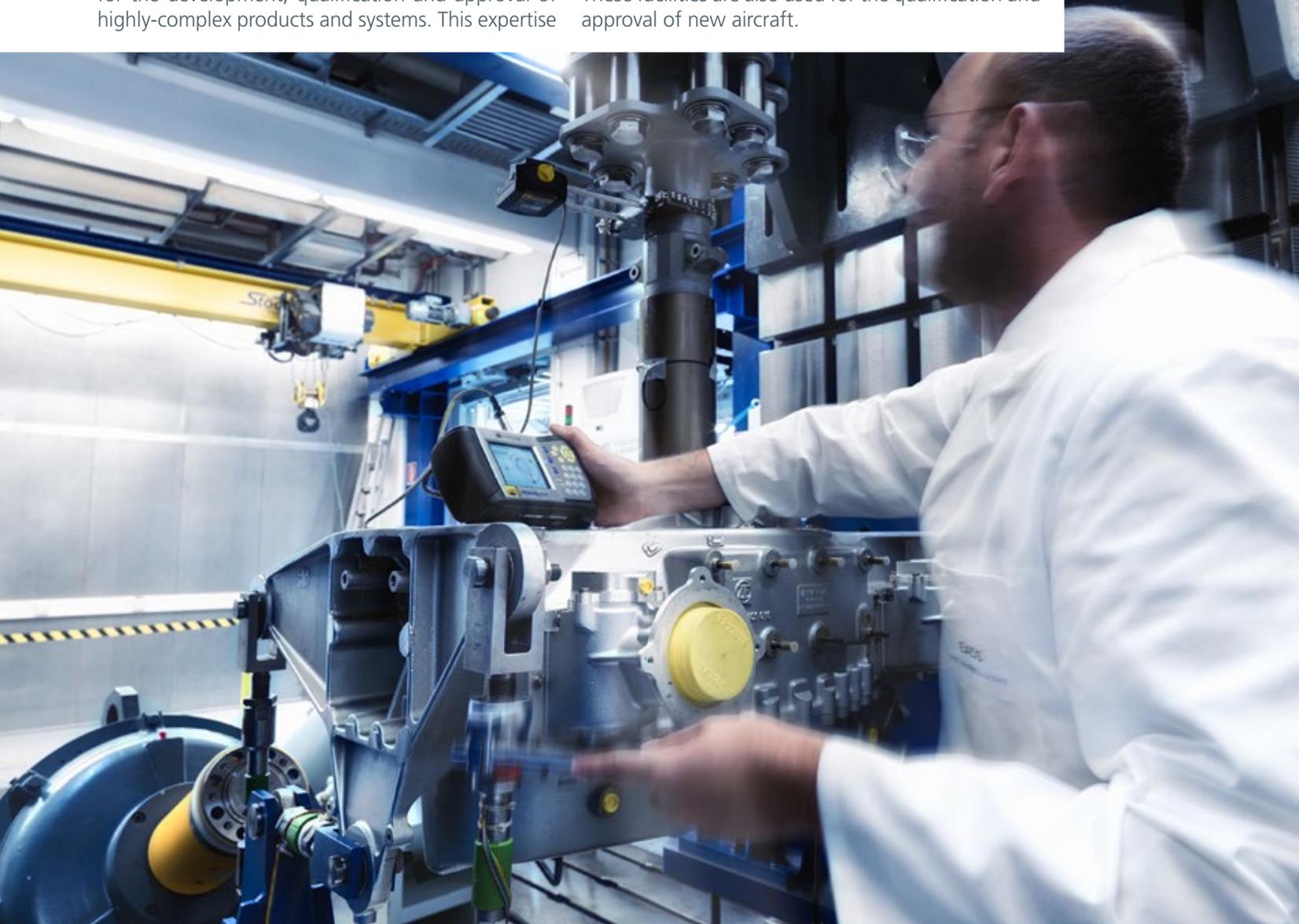
FIELD OF RESEARCH

INTEGRATED SYSTEMS

Simulations and demonstrations

Cumulative expertise in the area of “System of Systems”: The overall system capability is a major factor in innovative capacity, and represents an increasing technological and commercial challenge. However, at the same time it is also a prerequisite for the development, qualification and approval of highly-complex products and systems. This expertise

is provided on the LBC using system engineering approaches and methods, as well as suitable laboratory facilities. Integration laboratories and simulation capacities for prototypes and demonstrators are being developed and constructed on the campus. These facilities are also used for the qualification and approval of new aircraft.





FIELD OF RESEARCH

PUBLIC SECURITY

Security in the air- and cyberspace

Airborne systems are already a key element today of civil security. Yet, current technological developments pose new challenges to the aerospace industry – for example through cyber attacks on our infrastructure or through misuse of unmanned aircraft.

To guarantee security in spite of these changes, some highly promising approaches are being developed on the LBC.

Typical examples of this include the deployment and defence of autonomous aircraft for civil security purposes, and the development of systems which reliably protect the aerospace sector against cyber attacks in the long term.

RESEARCH FACILITIES ON THE LBC

With the support of the Free State of Bavaria, the chairs of various universities, together with industrial partners, are setting up large research facilities and laboratories which can be used across a range of disciplines. These facilities are available for research, teaching and training.



Advanced ALM Lab

Highly-complex structures from the 3D printer: Innovative products are researched and developed in the Advanced ALM Lab, ranging from extremely heat-resistant components for rocket propulsion, to new types of component for commercial aircraft, right through to... motorbikes! The picture shows the "Light Rider" from Airbus APWorks, a lightweight 35 kg prototype for the electric motorcycle, made from bionically-optimised metal components, all of which were developed and produced on the LBC.



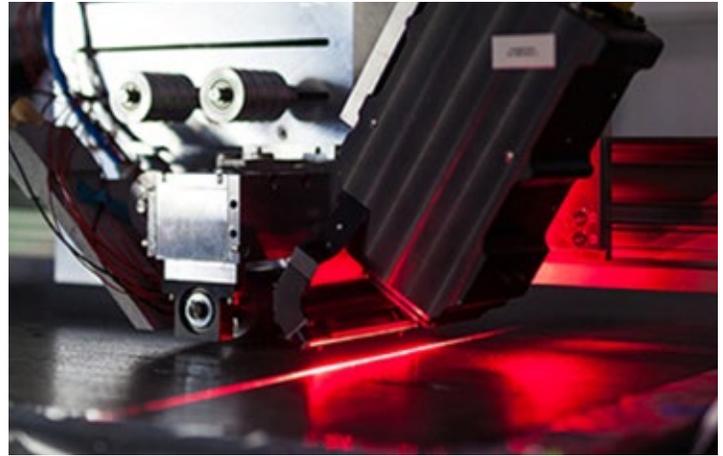
System Lab

A ground-breaker for integrated infrastructure: The System Lab accelerates research with regard to system design, simulation and integration, and the system testing of new technologies in the field of manned and unmanned fixed wing and rotary wing aircraft. Here shown the System Lab for "DeckFinder", developed by Airbus Defence and Space, in which autonomous landing approaches onto a moving ship's deck are optimised and further developed.



Algae technology facility

A greenhouse of innovation: The TUM, together with its project partner Airbus, has built a 1,500 m² algae technology centre for research within the context of the “Algae Powered Flight” project. For the first time, feasibility studies for algal processes linked to various climate zones, algae strains and cultivation technologies can be held in this special building. Alongside renewable fuel, the focus is also on bio-based production of lightweight construction materials.



Processing Lab 4.0

Where the future takes shape: The Processing Lab 4.0 project will further extend the processing lab for the Carbon Composites chair at TUM that already exists on the LBC. Among other features, a key contribution to this will be made by cutting-edge 3D printers for new materials and composites, and a continuous fabrication unit.



Power Lab

Less aircraft noise and less pollution in the air: On the Power Lab test bench, researchers and engineers test lightweight and reliable engines, networks, energy storage systems and control systems for energy management in aeroplanes and helicopters. The Power Lab is the nucleus of the centre of expertise for hybrid and all-electric aircraft engines on the LBC.

The excellence and expertise of the partners operating there form the basis of a consistent innovation process on the LBC – and for genuine pioneering work in the field of aerospace and security.

ONE OF THE SUCCESS STORIES ON THE LBC

The Airbus research organisation has developed an intelligent sensor system for the manufacture of carbon composites, which determines the quality of each individual component in real time during the fabrication process. The industrialisation of this technology for aerospace was supported by an incubator program on the LBC.

A spin-off company, responsible for the commercialisation of this new type of sensor system up to commercial viability, was then established on the LBC.

A real time transfer of measurements to the next process steps and the networking and digitisation of these processes (Industry 4.0) will be developed further from January 2017, in a jointly-funded project between partners from industry and science as well as several start-ups on the LBC.



TEACHING

MÜNICH AEROSPACE



Munich Aerospace e.V. represents the interests of scientific partners and coordinates all scientific research activities on the campus. This includes coordinating research projects, establishing university courses, developing international research collaboration, and providing an attractive post-graduate program. 150 academics from 27 countries conduct research under the auspices of Munich Aerospace.

TEACHING ON THE LBC

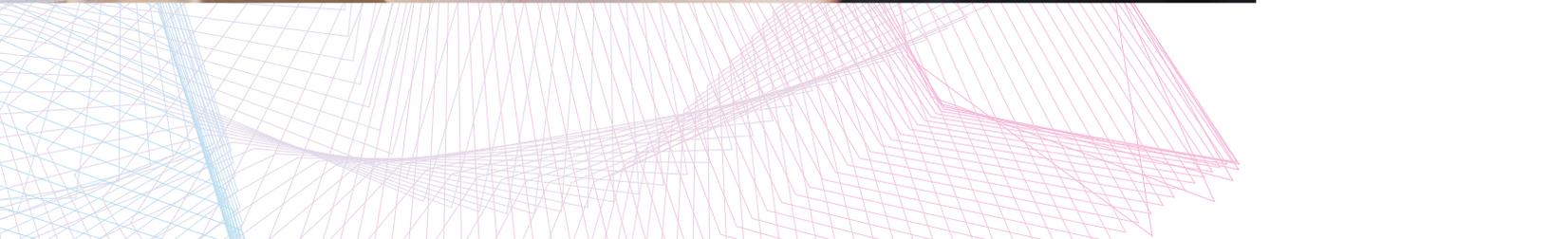
Teaching, research and industry side by side: On the LBC, students have access to the latest research and industrial topics. Teaching and networking events on the campus provide opportunities for the direct exchange of ideas.

International reach

Students, researchers and managers come together on the LBC, enabling them to adapt teaching content and company strategies more quickly to meet the challenges of the future. To realise the vision of an interdisciplinary, cross-target audience and international campus, global collaboration with universities is planned and some elements of this are already in the implementation stage.

Pilot training on the campus

The dual bachelor's degree course in Aeronautical Engineering offered by the University of the German Federal Armed Forces is the first university course on the LBC. Since 2015, prospective pilots of German Armed Forces have been trained in practical and academic aspects. The course, which is unique in Germany, combines content from engineering sciences, business studies and management, and the premises are equipped with high-tech laboratories for composites, flight simulators and test turbines.



ENTREPRENEURSHIP ON THE LBC

Enthusiasm meets experience: Strong businesses use the results of research to make commercially viable products and to market them successfully. For this reason, a central activity on the LBC is hosting start-up companies and R&D departments, as well as establishing spin-off companies. The general conditions provided on the LBC are exceptional:

- Pooling of knowledge in the field of aerospace and security,
- Transfer of research results to other sectors and applications,
- Ground-breaking research infrastructure (offices, shop-floors and laboratories side by side),
- Strong network consisting of representatives from industry and academia,
- Participation in funded research projects,
- Networking with students from the resident top universities,
- Accelerator and incubator programs (e.g. ESA-BIC),
- Expertise in property rights and licences,
- Access to investors (venture capital).

If you are interested, please contact us directly at:
info@lb-campus.com

Further information is available at: www.lb-campus.com



RESEARCH PROJECTS ON THE LBC

Several research projects have been launched on the LBC since 2013. They are co-funded by the Bavarian Ministry of Economic Affairs and Media, Energy and Technology.

AUTONOMOUS SYSTEMS

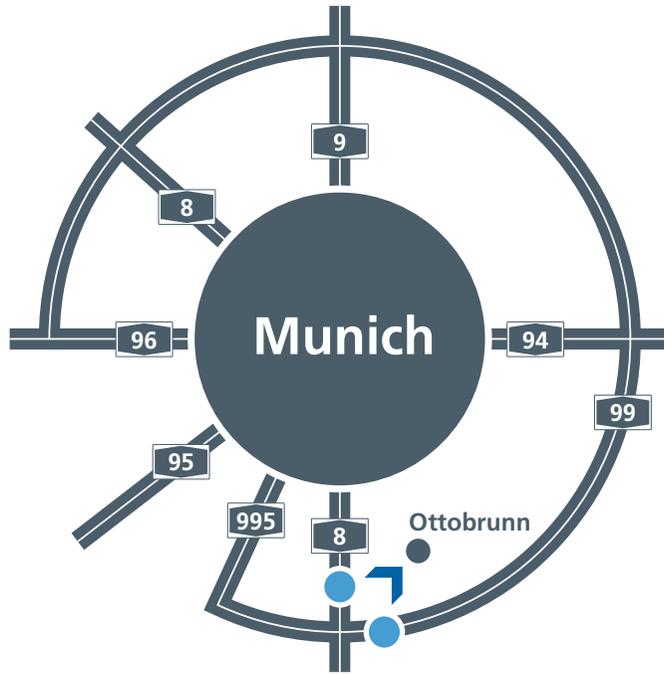
GREEN AEROSPACE

INTEGRATED SYSTEMS

PUBLIC SECURITY

ADDRESS DETAILS

Willy-Messerschmitt-Straße 1
82024 Taufkirchen





Willy-Messerschmitt-Straße 1
82024 Taufkirchen
Deutschland

CONTACT

Ludwig Bölkow Campus GmbH

Alexander Mager
Telefon: +49 89 607 34594
info@lb-campus.com

Munich Aerospace – Fakultät für Luft- und Raumfahrt e.V.

Professor Klaus Drechsler
Telefon: +49 89 307 484949
info@munich-aerospace.de