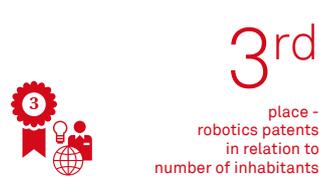
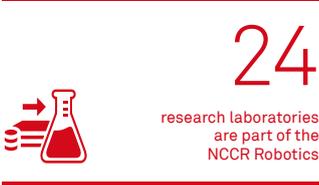




KEY FIGURES



Sources: NCCR Robotics; Drone Industry Association Switzerland; BAK Economics, 2018

**SWITZERLAND – A HUB FOR
ROBOTICS AND DRONES**

AT A GLANCE

The growing use of robots, drones and self-propelled vehicles has the potential to transform many economic sectors, including production, logistics, transport, agriculture, medicine, etc. These developments are shaping the fourth industrial revolution, and Switzerland has the best hand when it comes to profiting from them. In 2017, Switzerland took third place worldwide in terms of robotics patents in relation to the number of inhabitants and has doubled its share of global robotics patents since 2000. The most common area of application is in industry. The Swiss company ABB, headquartered in Zurich, is the world's top performer in this respect (number one in the Robotics Business Review 2017 ranking).

Thanks to pragmatic regulation at Confederation level, innovative researchers and good connections, Switzerland currently leads the way in drone technology. In the area of Unmanned Traffic Management (UTM) in particular, the country is carrying out pioneering work: Air navigation service provider Skyguide has developed a fully digitized airspace management system (U-space), which was successfully tested for the first time in Europe with international partners in Geneva in 2017. Following on from this success, Skyguide and US-based AirMap are currently working on the first nationwide introduction of U-space, a groundbreaking step for the whole of Europe.

RESEARCH AND DEVELOPMENT (R+D)

- Switzerland is at the forefront of research in the field of robotics, thanks to its tradition and strengths in related fields such as mechanical engineering, electronics, microtechnology, optics and watchmaking. Other key areas for robotics and drone innovations are artificial intelligence (AI) and photonics, in which Swiss industry and research are prominently represented.
- Founded in 2010, the **National Centre of Competence in Research (NCCR) Robotics** presides over a network for cutting-edge research in Switzerland that also includes drone technology. This consortium is financed by the Swiss National Science Foundation and its home institutions comprising 24 research laboratories at five Swiss institutions, including the Swiss Federal Institutes of Technology in Lausanne (EPFL, leading house) and Zurich (ETH Zurich), as well as the University of Zurich (UZH). Also involved are researchers from the University of Bern and the Dalle Molle Institute for Artificial Intelligence (IDSIA) in Lugano.
- The **Laboratory of Intelligent Systems (LIS)** at EPFL, led by Prof. Dario Floreano, is world-renowned for its research in robotics. The research foundations of the startups and companies Sensefly, Flyability and Dronistics have been developed at LIS. Sensefly has become the commercial drone subsidiary of Parrot Group, while keeping its research and production in Cheseaux, Switzerland. Flyability develops and sells drones for industrial inspections, operates worldwide and has created more than 70 jobs in Switzerland. Dronistics is known for developing a human-friendly drone delivery system for last centimeter delivery.
- The **Autonomous Systems Lab (ASL)** at ETHZ, which is headed by Prof. Roland Siegwart, has already attracted worldwide attention. This is where AtlantikSolar was developed, an aircraft that set the world record for the longest solar-powered unmanned flight in the weight class (under 50 kilograms) in 2015. The ASL has produced around a dozen spin-offs over the last 20 years.
- The Lugano-based **IDSIA** was founded in 1988 and already ranked among the top ten of the world's best AI research institutions in 1997. It has received international attention thanks to the development of the long-short-term memory (LSTM), upon which Google's speech recognition is based.
- Corporations like Google and IBM choose Switzerland as their preferred R&D location because of the proximity to the **EPFL and ETHZ talent centers**. Google operates the largest research campus outside the USA in Switzerland and opened a new AI research center in Zurich in 2016 with over 250 scientists. The IBM Research Laboratory was opened in Switzerland as early as 1956 and is now delving into AI and photonics. Microsoft recently announced the opening of a research laboratory at ETHZ in the field of machine vision. Since 2010, the global Disney group has also been operating its own research laboratory here.
- In "**Photonics Valley**", the Rhine Valley of Eastern Switzerland, many companies are specializing in photonics. The University of Applied Sciences HTW in Chur started the first Photonics course in Switzerland in 2016.

- The **open-source solution PX4**, which was created by the ETH spin-off Auterion, has now become established as an **industry standard** for drone management.
- At the beginning of 2018, the University of Zurich launched the **UZH Space Hub** to bundle research in the field of aerospace. The hub is located in the Zurich Innovation Park at Dübendorf Airport.
- In May 2017, the **Swiss Smart Factory (SSF)** was opened as part of the Switzerland Innovation Park Biel. Mainly privately financed, it sees itself as an open, neutral platform for large companies, SMEs, startups and research institutions that want to develop industry 4.0 solutions; robotics and AI are focus areas.
- **Robotics software** is the largest robotics segment in Switzerland. In 2017, almost 50% of all Swiss robotics patents belonged to this segment. The Swiss share in top impact patents worldwide has doubled since 2000. Endress + Hauser, ABB and Siemens are currently the research companies with the largest patent portfolios in this field in Switzerland.
- Thanks to top local research at Globus Medical, Roche and Dacadoo, Switzerland has **outstanding patents for medical robots**. In addition, the country is innovative in the field of drones and is home to many attractive startups. In 2012, the French company Parrot, the second largest drone manufacturer in the world, invested in two EPFL spin-offs - Pix4D and Sensefly.

Robotics Switzerland: Top research companies

in terms of patent portfolio size

Industrial robots	Service robots
Tecan Group	Globus Medical
ABB	Roche
Bosch	Dacadoo
Mettler Toledo	Value Biotech
Schindler	Niederberger
Autonomous driving	Robotics software
Continental	Endress+Hauser
Hexagon	ABB
Bosch	Siemens
Rapid Holding	Hexagon
Amazon	Dacadoo

Sources: BAK Economics; Swiss Federal Institute of Intellectual Property, 2018

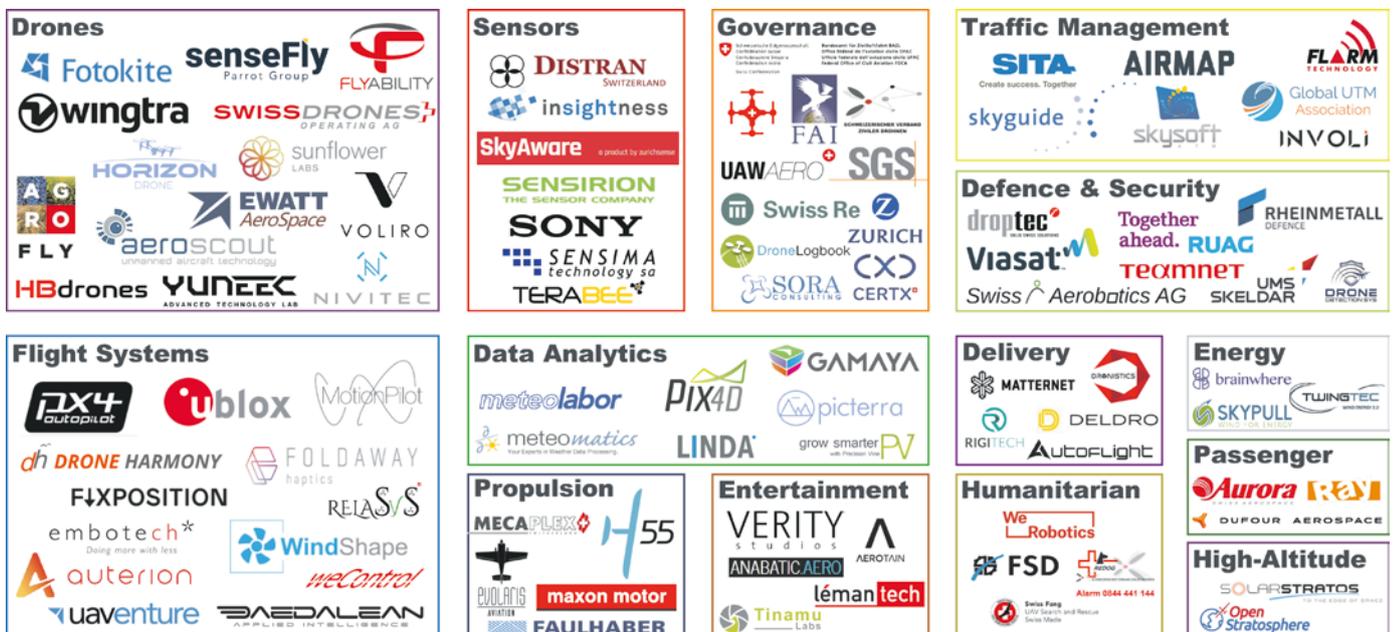
COSTS AND FINANCING

- There is easy access to EU funding and research projects (Horizon 2020). A team from the Zurich University of Applied Sciences (ZHAW) is coordinating the **EU Robo-Mate project** with twelve partners from seven countries. EPFL is a leader in the **European Human Brain Project**, which has a total budget of €1.2 billion over ten years.
- The NCCR Robotics supports research projects and entrepreneurship. The **NCCR Robotics Spin Fund Grant** invests in ideas from which startups could develop. In the four years of its existence, the NCCR Robotics Spin Fund Grant has supported 13 startups, which have created around 125 jobs in Switzerland. Some of the well-known NCCR Robotics spin-offs active in drones are Perspective Robotics (Fotokite), Flyability, and Dronistics.
- In 2017, the venture studio **Rewired** chose the Swiss city of Lausanne as its European headquarters to continue its search for innovative robotics ideas. The company has also launched a USD 100 million robotics-focused Studio and Venture Capital.
- The Swiss Innovation Agency (**Innosuisse**) specifically promotes cooperation between science and the market with innovation projects, networking, training and coaching. It has a funding budget of around 200 million Swiss francs.

FRAMEWORK CONDITIONS AND MARKET ENTRY

- Switzerland is also at the forefront of developing regulations in the area of UTM (U-space), the integration of drones into civil airspace: Skyguide, the Swiss air navigation service provider, has developed a U-space which was successfully tested in Geneva in 2017 as the first live demonstration of U-space capacities in Europe. Together with AirMap, the world's leading airspace management platform for threats, Skyguide will develop and implement the **first nationwide U-space for drones in Europe by 2019**.
- The country is playing an **active role in defining future regulations** that will permit the use of drones within this airspace. The Federal Office of Civil Aviation (FOCA) is developing a new method for reliable assessment of complex risks, which is on track to become a global standard.
- The EPFL Innovation Park in Lausanne is the **headquarters of the Global UTM Association (GUTMA)**. The association represents the drone industry worldwide, including in the debate on flight and regulatory standards. GUTMA has about 70 members.

Swiss Digital Aviation Industry Map



Source: Drone Industry Association Switzerland, 2019

TESTIMONIAL



Switzerland can really be called the “Home of Drones.” With ETHZ and EPFL leading the way in research, Switzerland has developed a great ecosystem of companies and institutions working on robotics and drones. Coupled with the ease of doing business in Switzerland and the specialized knowledge in aerospace systems, this made it a no-brainer for us to establish our European engineering office in Luzern. We are able to pull in top engineering talent not only from the excellent Swiss universities, but also from all over Europe. Engineers also with a hands-on Swiss apprenticeship training are a bonus for us. We are excited to be expanding our operations here, doing work on drone technologies for our corporate parent Boeing, as well as external customers. Hopp Schwiiz!

TIM DAWSON-TOWNSEND
CEO Aurora Swiss Aerospace GmbH
www.aurora-aero.ch

CURRENT DEVELOPMENTS

- Major Swiss companies such as Swiss Post or the telecommunications group Swisscom are active in drone technology. Since 2017, Swiss Post has been offering the world’s first delivery service for commercial customers in Lugano, by means of which lab samples are transported between hospitals. Meanwhile, corresponding pilot projects have also been launched in Bern and Zurich.
- In 2018, the World Economic Forum launched the first international “Drone Innovators Network” meeting (DIN) at ETH Zurich as a forum for discussion of the global development of drones and a joint strategy for the future.
- According to the International Federation of Robotics (IFR), the robot density per 10,000 employees is growing steadily. At 129, the robot density in Swiss industry in 2017 was above the global and European average of 85 and 106 robots respectively.

CONTACTS AND FURTHER INFORMATION

Authorities and regulators

Federal Office of Civil Aviation
FOCA
www.bazl.admin.ch

Good to know:

Drones and aircraft models
www.bazl.admin.ch

Swiss Air Navigation Services
www.skyguide.ch

Associations and networks

www.aeroclub.ch
www.aerodromes.ch
www.aerosuisse.ch
droneindustry.ch
www.gutma.org
www.homeofdrones.org
www.modellflug.ch
www.nccr-robotics.ch
swiss-aerospace-cluster.ch
www.swissmobilerobotics.com
www.swissroboticsindustry.ch
www.swisst.net

Innovation and startup grants/ financing

www.epfl-innovationpark.ch
www.grstiftung.ch
www.ifj.ch
www.innosuisse.ch
www.investiere.ch
www.nccr-robotics.ch
www.rewired.com
www.startups.ch
www.venturekick.ch
www.venturelab.ch

Ecosystems, incubators and accelerators

www.asl.ethz.ch
www.cybathlon.ethz.ch
www.digitalswitzerland.com
dronedays.epfl.ch
www.htwchur.ch/photonics
www.idsia.ch
lis.epfl.ch
www.mindfire.global
www.nccr-robotics.ch
www.polyhack.ch
www.sipbb.ch
www.swissroboticsindustry.ch

Publications

CFAC – Publications about Aviation
www.dike.ch

Siddharta Arora,
Swiss Commercial Drone Industry –
A possibility with potential?
www.dike.ch

Zivile Drohnen, eine zukunfts
weisende Technologie?
Perspektiven und Herausforderun
gen – eine Expertenstudie
(in German)
www.ta-swiss.ch

S-GE resources

Handbook for Investors
www.s-ge.com/
handbookforinvestors

Further fact sheets about
Switzerland as a business location
www.s-ge.com/factsheets

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