DRONES
An innovation domain of the canton of Vaud
WORLD LEADERS IN DRONE TECHNOLOGIES

Drones will soon become a part of our everyday lives. The canton of Vaud is helping smooth the way.

The idea of mainstream drone use implies both the development of practical rules to manage their operation as they move through airspace, and the development of safe and capable technologies and systems. Historically, Swiss aviation authorities have been open to new users and aircraft types accessing national airspace. This has encouraged innovation and helped with public acceptance.

As the rest of Europe enters a test phase, Switzerland positions itself as a world leader in drones traffic management with the Swiss U-space project, an ecosystem of public-private partnerships. Switzerland is once again at the forefront in terms of innovation and know-how in relation to emerging technologies.

TECHNOLOGICAL AND REGULATORY INNOVATION

The canton of Vaud fosters excellence in drone technologies thanks to its rich network of research and development actors.

Vaud’s drone developer network is sustained by public policy that supports the development of innovative uses of the airspace. Companies and academic institutions are working together to develop smaller and lighter unmanned aircraft systems, enabling technologies such as flight control systems, as well as low power applications, like search-and-rescue.

The Federal Office of Civil Aviation is working closely with Joint Authorities for Rulemaking on Unmanned Systems (JARUS) on an emerging international regulatory framework. It also maintains close links to academic and business actors to ensure the regulatory framework takes account of innovation. In further evidence of Vaud’s reputation in drone avionics, the Global Unmanned Aircraft Systems Traffic Management (UTM) Association is headquartered in Lausanne.

“We now cover practically the entire spectrum of technology for small drones: sensors and control, mechatronics, mechanical design, communication, and human interaction.”

PROFESSOR DARIO FLOREANO
Director, Swiss National Center of Competence and Research Robotics
BOOSTING YOUR COMPANY IN THE DRONE VALLEY

To support excellence in innovation, the canton of Vaud and the federal government have established forward-thinking fiscal and financial measures, a purpose-built and connected infrastructure, and first-class academic and information capabilities. Established as a cutting-edge region, the canton of Vaud is called the drone valley.

Setting up a European presence in the canton of Vaud gives companies direct access to an exceptional drone ecosystem and a pool of multitalented experts. The region’s dense avionics network creates synergies that help accelerate research, development and sales of new products and services worldwide.

Team of teams
Academia, government agencies, established companies, startups and industry associations have a proven track record of collaborating in the field of flying robotics and unmanned systems. Since 2009, the Federal Office of Civil Aviation (FOCA) has hosted the Swiss Drone Day, a sharing and networking event for active members of the research, regulatory and industry communities. FOCA is chairing two of the six working groups at the Joint Authorities for Rulemaking on Unmanned Systems (JARUS).

Cooperation for innovation
The mapping solution proposed by senseFly and Pix4D – EPFL spin-offs from the Intelligent Systems Lab and Computer Vision Labs respectively – illustrates how proximity to universities and a close relationship with FOCA can be combined to achieve efficient market entry and significant competitive advantage. Within three years, the two companies created 200 jobs in the Vaud region and now sell their products and services worldwide. Another EPFL spin-off, Décision has leveraged the regional knowhow of strong, robust and lightweight structure specialists, while Flyability and North TPT produced a collision tolerant drone that won the million-dollar UAE Drones for Good Award in 2015.

Excellence
Swiss drone stakeholders have expertise and experience that can be leveraged by those looking to invest in a high growth industry, develop their own business or hire talent adapted to this new era for aviation. Foreign companies, like Parrot and GoPro, have already started to invest in Switzerland.
BEING IN THE CANTON OF VAUD GIVES YOU ACCESS TO...

Ambitious technological projects are well supported in the region.

Direct financial incentives are available to support specific business projects for companies operating in industry, production related services and leading-edge technologies.

At national level, grants are available through Innosuisse (Switzerland’s federal innovation promotion agency) to promote application-oriented R&D projects carried out jointly by companies and universities.

At the cantonal level, the Foundation for Technological Innovation (FIT) provides support to startups, while the cantonal innovation promotion agency Innovaud has launched the Scale-Up Vaud initiative, which offers support to companies as they develop their businesses.

In addition, the Office for Economic Affairs and Innovation (SPEI) provides direct financial incentives for specific business projects to support the creation and establishment of enterprises, as well as the development of Vaud-based small and medium-sized enterprises (SMEs) and startups looking to innovate or expand.

Seasoned lab-to-market technology transfer capability
The region offers public and private capabilities that cover the whole spectrum necessary to launch new drone hardware and software. Capabilities currently include material sciences; aerodynamic simulation and structure testing centers; autonomous systems research; swarming and collaborative systems; and flying machine arenas with integrated weather simulation.

An export-oriented mindset
Due to its small size, the Swiss domestic market is limited. Consequently, all technology companies have to focus on international business opportunities from day one. The success of senseFly, Pix4D and Flyability is built on a network of hundreds of resellers worldwide.

An innovation-oriented ecosystem
Other Swiss companies are providing the infrastructure needed for the safe and efficient integration of unmanned aircraft into the national airspace system.
SITA, a specialist in air transport communications and IT solutions, is exploring the use of the blockchain to securely identify drones. Meanwhile, u-blox and Flarm are developing a solution to drone and manned aircraft cohabitation in airspace outside of Air Traffic Control. Service-oriented companies are also actively participating: SwissRe provides insurance policies for drone manufacturers and operators that go beyond existing regulations; while SGS helps companies identify risks associated with drone operations, as well as exploring drone applications for asset and infrastructure inspection.

**Global standards for fast adoption**

Switzerland is home to respected standards bodies, such as ISO, and many notable international organizations, like ITU, which is in charge of global interoperability and infrastructure improvements.

This historical background and strong reputation for drone development around Lake Geneva made Lausanne a natural pick for the Global Unmanned Aircraft Systems Traffic Management (UTM) Association’s headquarters. The Association works at international level to identify strategies that help smooth the integration of drones into airspace. Finally, the Swiss branch of Viasat (also based in Lausanne) leads the European H2020’s Skyopener project, responsible for establishing new foundations for civil-sector drone applications.

**Planning the future of drones from Switzerland**

The authorities are a proactive stakeholder in the ecosystem. Skysoft (a subsidiary of Swiss Air Navigation Service-provider Skyguide), is collaborating on the development of drone traffic management solutions.

Other companies are investigating the long-term impact and disruptive nature of drones on business and society. Swiss Post has already conducted multiple drone delivery trials, including Beyond Visual Line of Sight (BVLOS) missions. Droneport is going one step further, designing transport hubs that will support the drone services of tomorrow. Meanwhile, Gamaya is working on hyperspectral remote sensing and agriculture big data analytics; two technologies that will be needed if we’re to feed the planet’s 10 billion people come 2050.

OpenStratosphere is developing technologies that will enable high-altitude drones and perpetual flight – both are needed to provide regional satellite-like services.

**A one-stop drone shop**

The canton of Vaud has the right workforce, with the right mindset, to collaborate on ambitious projects. These projects are supported by an extensive and effective public-private framework.

Join this thriving ecosystem to boost your drone venture!
## MAIN ACTORS OF DRONE ECOSYSTEM

<table>
<thead>
<tr>
<th>Industry drivers</th>
<th>Key factors</th>
<th>Key actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research &amp; Development</td>
<td>Optics and detection</td>
<td>EPFL – Computer Vision Lab</td>
</tr>
<tr>
<td></td>
<td>Geodesy and geodesy algorithms</td>
<td>EPFL – Geodetic Engineering Laboratory</td>
</tr>
<tr>
<td></td>
<td>Embedded systems, multi-objective design methods...</td>
<td>EPFL – Embedded Systems Laboratory</td>
</tr>
<tr>
<td></td>
<td>Sensory and behavioral abilities</td>
<td>EPFL – Laboratory of Intelligent Systems</td>
</tr>
<tr>
<td></td>
<td>Design, modeling, control, and optimization methodologies for distributed, intelligent systems</td>
<td>EPFL – Distributed Intelligent Systems and Algorithms Laboratory</td>
</tr>
<tr>
<td></td>
<td>Next generation of materials and processes in the field of polymers and composites</td>
<td>EPFL – Laboratory of Polymer and Composite Technology</td>
</tr>
<tr>
<td></td>
<td>National innovation accelerator and acts a catalyst for the transfer of technologies and knowhow from fundamental research to industry</td>
<td>CSEM – Swiss Center for Electronics and Microtechnology</td>
</tr>
<tr>
<td></td>
<td>Fee-paying corporate membership program for industries and institutions interested in robotic technologies and innovations.</td>
<td>NCCR Robotics</td>
</tr>
<tr>
<td></td>
<td>Drone aerodynamics and flight control systems</td>
<td>HEIG-GE – Fluid and Energy Mechanics</td>
</tr>
<tr>
<td></td>
<td>Innovative design, development, and production of embedded systems for drones and scientific measurements</td>
<td>LémanTech Labs</td>
</tr>
<tr>
<td></td>
<td>Dye penetrant inspection, ultrasound, x-ray, bond testing, eddy currents, acoustic emission, and more</td>
<td>HEIG-VD – Non-destructive Testing and Materials Testing</td>
</tr>
<tr>
<td>Unmanned aircraft systems</td>
<td>Smaller and lighter airframes</td>
<td>senseFly</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Perpetual flight</td>
<td>Solar Impulse</td>
<td></td>
</tr>
<tr>
<td>High altitude missions</td>
<td>OpenStratosphere</td>
<td></td>
</tr>
<tr>
<td>Enabling technologies</td>
<td>Light weight materials &amp; structures</td>
<td>Décision</td>
</tr>
<tr>
<td>Long range inspection drones</td>
<td>Flybotix</td>
<td></td>
</tr>
<tr>
<td>Low power sensing</td>
<td>Gamaya</td>
<td></td>
</tr>
<tr>
<td>Secured and low latency communication</td>
<td>Kudelski</td>
<td></td>
</tr>
<tr>
<td>First person view</td>
<td>Lémantech Labs</td>
<td></td>
</tr>
<tr>
<td>Haptic feedback</td>
<td>MotionPilot</td>
<td></td>
</tr>
<tr>
<td>Mini joysticks with haptic feedback</td>
<td>Foldaway Haptics</td>
<td></td>
</tr>
<tr>
<td>Underwater inspection drones</td>
<td>Hydromea</td>
<td></td>
</tr>
<tr>
<td>Air traffic awareness systems for professional drones</td>
<td>INVOLI</td>
<td></td>
</tr>
<tr>
<td>Applications</td>
<td>Indoor drone inspection</td>
<td>Flyability</td>
</tr>
<tr>
<td></td>
<td>Machine learning</td>
<td>Picterra</td>
</tr>
<tr>
<td></td>
<td>Precision agriculture</td>
<td>Gamaya</td>
</tr>
<tr>
<td></td>
<td>Aerial imaging</td>
<td>Fly and Film</td>
</tr>
<tr>
<td></td>
<td>Delivery</td>
<td>Red Line</td>
</tr>
<tr>
<td></td>
<td>3D modeling</td>
<td>Pix4D</td>
</tr>
<tr>
<td></td>
<td>Agricultural analysis</td>
<td>Drone Tech</td>
</tr>
<tr>
<td></td>
<td>Drone plant and crop protection</td>
<td>Aero41</td>
</tr>
<tr>
<td></td>
<td>Drones universels pour de la logistique sur longue distance</td>
<td>RigiTech</td>
</tr>
</tbody>
</table>
CSEM – Swiss Center for Electronics and Microtechnology
CSEM is a national innovation accelerator and acts as a catalyst for the transfer of technologies and knowhow from fundamental research to industry. The Center is specialized in Microsystems Design and Process, Microsystems Integration and Packaging, Nanosurface Engineering as well as Biosurface Engineering.
csem.ch

EPFL – Computer Vision Lab
The lab proposes solutions to detect flying objects when they occupy a small portion of the field of view and are filmed by a camera that itself moves as well as algorithms to render coarse 3D models of target objects (Realistic Synthetic Data Generation).
cvlab.epfl.ch

EPFL – Distributed Intelligent Systems and Algorithms Laboratory
DISAL’s research mission focuses on the development of design, modeling, control, and optimization methodologies for distributed, intelligent systems. A special emphasis is currently set on distributed cyber-physical systems such as multi-robot systems, sensor and actuators networks, and intelligent vehicles.
disal.epfl.ch

EPFL – Embedded Systems Laboratory
The Embedded Systems Laboratory (ESL) focuses on the definition of system-level multi-objective design methods, optimization methodologies and tools for high-performance embedded systems and nano-scale Multi-Processor System-on-Chip (MPSoC) architectures.
esl.epfl.ch

EPFL – Geodetic Engineering Laboratory
The TOPO lab competencies include geodesy (surveying and cartography) and the development of algorithms in field of geodesy, as well as Integration and calibration of sensors for UAVs and ultralight aircraft.
topo.epfl.ch

EPFL – Laboratory of Intelligent Systems
The lab designs flying robots, with rich sensory and behavioral abilities that can change morphology to smoothly and safely operate in different environments.
These drones are conceived to work cooperatively and with humans to power civil applications in transportation, aerial mapping, agriculture, search-and-rescue, and augmented virtual reality.
lis.epfl.ch

EPFL – Laboratory of Polymer and Composite Technology
The lab creates the scientific base for the next generation of materials and processes in the field of polymers and composites. Its Industrial Implementation Group collaborates closely with partners on the implementation of innovative technologies.
ltc.epfl.ch
HEIG-GE – Fluid and Energy Mechanics
The laboratory currently houses aerodynamic and hydrodynamic facilities, as well as a computational infrastructure. It has the largest wind tunnel in the French speaking part of Switzerland, with wind speeds up to 250 km/h. Members of the lab actively work on drones, aerodynamics and flight control systems.

HEIG-VD – Non-destructive Testing and Materials Testing
The lab is able to perform a wide variety of tests: Dye penetrant inspection, ultrasound, X-ray, bond testing, eddy currents, acoustic emission, and more.

LémanTech Labs
Started by ex-software developers from the Test and Measurement field, LémanTech Labs provides innovative design, development, and production of embedded systems for drones and scientific measurements. They are the R&D department of drone racing company ImmersionRC.

NCCR Robotics
The Swiss National Center of Competences in Research (NCCR) Robotics federates 20 research labs from four Swiss academic institutions around a strong motto: "Intelligent robots for improving the quality of life.” The NCCR Robotics has an industry liaison program. It is a fee-paying corporate membership program for industries and institutions interested in robotic technologies and innovations. The program is committed to the transfer and exchange of knowledge through conferences, laboratory visits, sourcing of talents and licensing opportunities.

Photo: A. Herzog/EPFL
ESTABLISHED BUSINESSES AND STARTUPS

Décision
Décision was the primary supplier of carbon structures for the Solar Impulse project.
decision.ch

Drone Tech
Drone Tech specializes in agricultural and viticultural analysis, thermographic analysis and aerial imaging in high definition.
drone-tech.ch

Flyability
Flyability is developing safe, collision-tolerant robots to visit inaccessible places, replacing dangerous human operations with unmanned devices.
flyability.com

Flybotix
Flybotix has developed a UAV capable of doubling its flight time and designed for surveillance missions, particularly industrial missions.
flybotix.com

Gamaya
Gamaya provides solutions for large-scale monitoring and diagnostics of crops for precision agriculture.
gamaya.com

Involi
Involi develops and produces air traffic awareness systems for professional drone applications.
involi.com

MotionPilot
The company develops a smart radio controller to interface with every kind of drone. Its latest design uses haptic feedback technology.
motionpilot.ch

OpenStratosphere
Independent company that designs, builds and operates regional fleets of stratospheric drones.
openstratosphere.com

Picterra
Picterra is a Swiss remote sensing company providing Satellite and UAV based services.
picterra.ch

Pix4d
Advanced photogrammetry software to create professional orthomosaics, point clouds, models and more.
pix4d.com

Rigi Technologies
Rigi Technologies develops drones capable of transporting large loads and ensuring deliveries in rural areas.
drone-tech.ch

senseFly
senseFly develops and produce aerial imaging drones for professional applications.
sensefly.com

SGS
The world leader in quantifying and qualifying risk management is actively investing in UAV solutions.
sgs.ch

Solar Impulse
Swiss long-range experimental solar-powered aircraft.
solarimpulse.com

Viasat
Viasat is focused on the design and development of innovative antenna subsystems for mobile satellite telecommunications.
viasat.com
NETWORK OF SUPPORTING PARTNERS

Economic Development – Canton of Vaud (DEV)
The DEV is the main contact for foreign companies looking to set up in the region. To fulfill its role, the DEV works with both private (banks, notaries, lawyers, etc.) and public partners (various government departments). It provides advice on administrative procedures and financing, and allows newly established companies to benefit from its vast network.
dev.ch

Global UTM Association
The goal of the association is to identify actions to be taken to safely and efficiently integrate UAS into civil airspace. Its working groups draft and distribute compliant blueprints, standards and protocols for UTM systems, in collaboration with regulators and other stakeholders worldwide.
gutma.org

Innovaud
As a gateway to innovation in the canton of Vaud, Innovaud supports and provides networking opportunities for start-ups and SMEs, particularly those in life sciences, to develop solutions with them in the area of hosting, promotion, funding and/or coaching. Innovaud is firmly established in a vast network of partners, enabling it to redirect requests to the organizations most suited to the needs of each party.
innovaud.ch

Micronarc
The Micronarc communication platform brings together all the cantons of Western Switzerland. Its aim is to develop and promote the micro- and nanotechnology cluster common to this region, from a scientific, technical and economic point of view. It thus highlights the infrastructures for training, R&D, technology transfer and hosting, as well as the companies located there.
micronarc.ch

Office for Economic Affairs and Innovation (SPEI)
The SPEI supports companies established in the canton of Vaud, and more specifically those active in the sectors of industry and advanced technologies. SPEI advises and informs entrepreneurs, particularly by putting them in touch with the appropriate organizations according to their specific needs. SPEI can also provide direct financial support.
invest-vaud.swiss

SITA Lab
SITA Lab is SITA’s strategic technology research arm. Their role is to stimulate technological innovation in the air transport industry. The lab is actively investigating drone related opportunities.
sita.aero

swiss aeropole
With a total surface of 400,000m², Aeropole.ch is the home of technologically advanced projects, as well as companies and organizations within and related to the Aviation & Aerospace Industry. The site has a direct access to a 3,000m runway and a controlled airspace.
swissaeropole.com