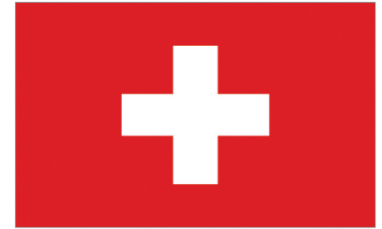


UAS Development in Switzerland



This article is a result of the 1st Swiss UAS Day (March 27, 2009) and has as purpose to give an overview of some of the companies and organizations involved with UAS development and services in Switzerland.

Aeroscout GmbH is located in Lucerne, Switzerland. Our primary flight base is close to Lucerne, Switzerland, approx. 1h from the Zurich International Airport. The company was founded in 2005 and is a spin-off company of the Swiss Federal



Institute of Technology (ETH) Zurich. Aeroscout GmbH is strongly related with the Institute of Dynamic Systems and Control (formerly Measurement and Control Laboratory) of ETH Zurich. Aeroscout provides autonomously flying, industrial unmanned helicopters for aerial imagery and photogrammetry, aerial video recording, surveillance and inspection, 3D laser mapping, search & rescue, aerial scientific measurements (online/offline), and many other applications with an airborne robot. Aeroscout offers different sizes and types of INS/GPS controlled unmanned helicopters. These UAS helicopters provide a unique payload capacity which can be used for customized solutions and requirements such as digital cameras, video camcorders, laser scanners, or infrared equipment. In addition, Aeroscout provides services with our products operated by our experienced flight crew for variable applications. In cooperation with clients, Aeroscout develops customized UAS solutions for specific usage, offers complete UAS solutions based on industrial unmanned helicopters, customized UAS solutions for various aerial applications, user-friendly UAS operational interfaces, UAS education and training, and UAS rental services in various countries. Aeroscout provides in-depth knowledge in the field of integrated navigations systems, including INS/GPS navigation, analysis of raw sensor data, navigation error modeling, error propagation, extended Kalman filtering, and implementation of data fusion algorithms. Aeroscout performs recording and analysis of real flight data from multiple platforms such as inertial measurement units (IMU), (D)GPS, magnetometer modules, and other onboard and ground-based sensors.

For additional information see: www.aeroscout.ch

The **ISPRS Working Group I/V on UAS for Mapping and Monitoring Applications** aims at creating and supporting a

new community with a specific interest and knowledgebase on the use of UAS for mapping and monitoring applications. An important aspect of this will be facilitating the networking of people active in both domains of the ISPRS Commission I, III, V, VIII and EuroSDR workgroups. Various activities and events will be organized to support this goal in co-operation with ISPRS, other national and international organisations and Geomatics-related firms. This working group will focus on two aspects of the complete application workflow: a) the UVS with its sensor systems, onboard processing capabilities, platform control capabilities such as automated navigation and data communication; b) the data processing algorithms to extract useful information with potential feedback to the UAS control system. For distribution services, the authors refer to the Open Geospatial Consortium (OGC, www.opengeospatial.org) that is leading the development of standards for geospatial and location based services. Standards such as SensorML, Sensor Planning Service (SPS), Sensor Observation Service (SOS), Sensor Alert Service (SAS), Web Notification Service (WNS) provide a set of standards to interact with a sensor. Catalog Service for Web (CSW) allows a user to query through catalogs to explore available processed information. Web map Service (WMS), Web Coverage Service (WCS) and Web Feature Service (WFS) provide a standardized way to distribute spatial information (WMS) and data (WCS and WFS). Transactional WFS (WFS-T) and Web Processing Service (WPS) allow for more interactive and dynamic applications.

Focusing on forest fires, **SwissCopter** has adopted its advanced UAS technology, which includes the UAVision software in order to suit the special fire fighting requirements. This UAS technology supports decision makers with high-performance digital video imagery, in real time, supplying quick and correct information of the fire progress. The SwissCopter technology is user friendly and cost effective. It is essential in assisting fire fighting endeavors and helps to save lives and sustain nature. SwissCopter developed a backpack and headset serving as portable ground control station in order to support the UAS up to 10 km range.



Forest fires cause a constant threat to ecological systems, infrastructure and human lives. According to prognoses, forest fires will half the world's forest stand by the year 2030. In Europe alone, up to 10,000 km² of vegetation are destroyed by fire every year, and up to 100,000 km² in Russia and North

America. Furthermore 20% of CO2 emissions into the atmosphere are caused by forest fires. SwissCopter specializes in agronomical research, border patrol, pipeline inspection and now additionally focuses on forest fire control, by developing their UASystems fire detecting and monitoring equipment.

The efficiency of fire suppression primarily depends on the information available regarding the affected area. Fire services need instant, dependable and correct data about the fire perimeters, the threatened infrastructures, endangered human lives and any other facts and figures that influence the effective intervention. Is the fire widespread or the territory untamed and difficult to access rapid and efficient reconnaissance is limited. Fire fighters often face aerial reconnaissance tasks which are time consuming and expensive and very often lack the required aircraft support. For additional information see: www.uasystems.com

Minizepp is a Swiss company specialized in manufacturing a new generation of lighter-than-air UAS. We conceive, manufacture, sell and rent a variety of electric, gas-powered and hybrid airships. Our products are simple to use, robust and trustworthy. Manufactured in an industrial way, they are cut out by thermo shaping laser, and use the finest quality components in terms of electronics, as well as material



(carbon fibre for the gondola and double coated nylon fabric for the shell). Minizepp collaborates with research teams, universities and is open minded about all new and exciting projects. Minizepp also offers numerous possibilities to customize the products. With our creative team and our pre-rendered 3D CGI, you can get an exact view of the shape of your airship. Our unmatched service is free, offers piloting lessons and technical support. With our experience we are able to give you a real feed back. For additional information see: www.minizepp.com

Omnisight GmbH was founded in January 2007 in Switzerland with the goal of focusing its strength on micro UAS in the light weight class of 1 to 5 kg take-off weight.

The company proposes various UAS, product user training, maintenance and repair worldwide. The company offers today a variety of payloads, such as daylight, dawn and thermal cameras of the unique Swiss Quality. Together with a Technical



University in Switzerland and a quarry operator the company currently is involved with a project in the field of photogrammetric applications. Omnisight commercializes the MD4-200 micro UAS, which has been successfully proven internationally by professional photography companies. The military version of the MD4-200 UAS is available in a number of formats, supporting the widest range of secure and/ or encrypted downlink and telemetry. The unit is available in a man-deployable pack featuring wireless video receiver and remote base stations.

For additional information see: www.omnisight.ch

Pergam Suisse AG, located in Zürich, Switzerland provides highly reliable data links for UAS applications together with FLIR thermal imaging cameras and gimbals. A UAS is as good as the performance of its camera. Excellent stabilisation, real time imaging and COFDM data links are the key to use UAS in real time. The company offers different gimbals from small size 6" to 15". It all depends on the application and the payload capacity of the UAS. Many different payloads can be integrated: Laser Range Finder, Cooled IR, EMCCD, Daylight camera, and several other devices. Small size gimbals have an impressive performance up to 1800 feet. 15" Gimbals equipped with a 3 field of view cooled infrared camera can detect targets at a distance of 5km in the darkest of night.



High value data transmission is the key for UAS applications. The COFDM narrow bandwidth sender transmits video, audio and telemetry up to 350 lines of sight. Used by Special Forces for surveillance, the COFDM sender found its way to UAS for border control and military applications. With a delay of only 43ms, the COFDM is designed for fast remote control. Especially the state of the art anti-jam filter helps the COFDM Filter working in high EM environment (radar).

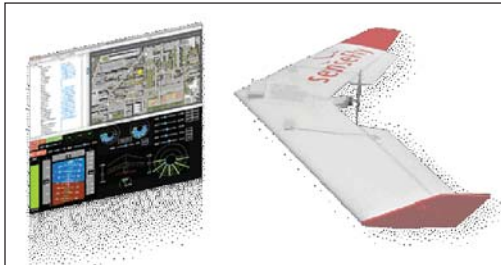
For additional information see: www.pergam-suisse.ch

RC-Tech LLC is specialized in First Person View flying of radio controlled aircraft, using a live video downlink. The company develops, manufactures and distributes ultra-light and very low cost video payloads and equipment for hobby R/C aircraft and short range UAS. Typical equipment includes wireless cameras weighing between 3.5gr & 150gr (battery included), receiving equipment, antennas, display devices like LCD monitors and video goggles, video recorders, motorized camera mounts/gimbals, head tracking systems, as well as all kinds of related accessories. Customers with special needs are welcome and the company offers customized systems in addition to catalogue items. RC-Tech also uses its technology to provide a low cost HD video and photo aerial imaging service using various types of aircraft to match each situation, and also offers a full production service from planning to shooting, editing and publishing.

For additional information see: <http://www.rc-tech.ch>

senseFly brings Micro UAS closer to humans by delivering fully-functional platforms with sensor-based intelligence for safe operation near natural and man-made structures. Its proprietary technology allows flexible deployment of multiple aerial platforms for sensing and communication in populated

or cluttered areas. senseFly also provides open-source systems and infrastructure for community-based development and rapid adoption of personal aerial technologies. senseFly will release its first product, *Swinglet*, in the third quarter of 2009. Weighing a mere 300 grams, *Swinglet* is the lightest, fully autonomous micro UAS in the world. Its flexible airframe fitted with a propulsive electrical motor makes it very safe to fly over populated areas. *Swinglet* can fly autonomously for over 20 km from hand-launch to landing while carrying a payload of 150 grms. It can remain in the air for more than 30 minutes to take pictures or gather other types of environmental information



with customized sensors. User-friendly and intuitive software makes it easy to issue commands and monitor *swinglet* as it carries out its mission. senseFly is a spin-off of the Laboratory of Intelligent Systems (LIS) at the Swiss Federal Institute of Technology in Lausanne (EPFL), which is at the leading edge of research in areas such as collective aerial robotics and vision-based flight control.

For additional information see: www.sensefly.com

Skive Aviation AG builds and has operated unmanned airship systems for more than six years, including the new ADS-12 type which has been developed for day and night surveillance and TV broadcast services. The long flight endurance of 6-8 hours enables this airship to observe a certain region continuously, while the non vibrating platform provides high camera stability for television broadcast as well as high resolution surveillance requirements. The ADS-12 is equipped with an electronic all axes stabilisation system and a GPS autopilot for full autonomous flight. Redundancy of the technical systems guarantee a high security level. Skive also builds and operates advertising airships, using fuel as well as electric propulsion. All airships are filled with non flammable helium. The airships are transported in big trailers. This way, the hull remains inflated, which reduces operating costs and enables the crew to prepare the airship on site in 15-30 minutes. The Skive airships have been in service for many years. Scheduled maintenance of the systems based on cumulated flight hours is provided by Skive at customer location. Skive provides off-the-shelf airships as well as customer specific developments. In depth pilot training enables the future crew to operate the airship safely and reliably from the first day.

Skive Aviation is a privately owned company with it's offices in Zurich, Switzerland and the airship base located in Rorbas, Switzerland.

For additional information see: www.skive.aero



Skybotix AG is a leading developer of safe, autonomously navigating mini UAS and related technologies. The company provides – Skybox™ – An easy to use and deploy robust mini UAS solution for professional applications, as well as – CoaX™ – The compact, lightweight indoor coaxial helicopter for the research market. Our customers are on one side, professionals (customs, fire brigade, police, etc.), and on the other side research agencies and universities. The know-how of Skybotix in design, integration and control of flying systems was developed since 2003 at the Swiss Federal Institute of Technology of Lausanne then of Zürich, of which Skybotix is an official spin-off. CoaX™ – is the first product Skybotix it is a ready to fly robotic platforms tailored for the research & education markets. It allows researchers to develop their own software and control strategies. For that, it is generously equipped with state-of-the-art sensors and



processing power, all in a compact and lightweight design. This product is available since April 2009 online and through distributors. Skybotix is in parallel developing its industrial product Skybox™. The idea is to provide a dedicated aerial robot for applications like security, civil-protection and defense with advanced autonomy and navigation capabilities. The company is interested in collaborations and partnerships, and is involved in EU projects.

For additional information see: www.skybotix.ch

Whoever sets high goals for himself needs the corresponding equipment to achieve them. This is exactly the case when it concerns observation, monitoring and reconnaissance flights using unmanned aerial vehicles. Whether for military or civil purposes, for research projects or to deal with emergencies – **Swiss UAV** offers what you require. Swiss UAV regards itself as a partner for all who use industrial UAS technologies. The company that is based in Switzerland has been active for two years in the development, production and sale of unmanned aircraft based on compact helicopter systems. And with



success. Following on from the NEO S-300, the new vertical take-off and landing UAS, the company is now off for the start in the form of the KOAX X-240. Manufactured to meet the strictest regulations: Simple to operate, equipped with the very best on-board electronics, and absolutely airworthy and reliable. Made to enable you to reach your goals. Wherever they are.

For additional information see: www.swiss-uav.com

The goal of the UAVision R&D project is to develop geospatially enabled software and hardware solutions supporting all phases of typical monitoring and surveillance missions with mini and micro UAS. UAVision combines state-of-the-art collaborative virtual globe technologies with advanced geospatial imaging techniques and new wireless data link technologies supporting the combined and highly reliable transmission of digital video, high-resolution still imagery and mission control data over extended operational ranges. UAVision will enable the planning, simulation, monitoring and rapid mapping of UAS missions in applications areas such as monitoring of forest fires, agronomical research, border patrol or pipeline inspection.

The geospatial components of the UAVision project are based on the Virtual Globe Technology i3D of the **University of Applied Sciences Northwestern Switzerland (FHNW)**. i3D is a new high-performance 3D geovisualisation engine supporting the web-based streaming of very large amounts of terrain and POI data. i3D provides the basis for the development of the following UAVision modules: UAVision Mission Planning &



Simulation, UAVision Mission Control with Augmented Monitoring and Virtual Monitoring capabilities, UAVision Virtual Piloting and UAVision Rapid Mapping. The second core component of the UAVision project is a compact and high-performance digital video and imagery data link, which is being developed by the UAVision project members at EPFL Lausanne and NuLink Marin. This data link will support different imaging payload configurations. First prototypes of UAVision components have undergone successful test flights on the latest mini to tactical UAS by the UAVision industry partner SwissCopter/Innosuisse using different imaging payloads.