DIAS Drone Industry Association Switzerland

Swiss Drone Industry Report 2021

July 6th, 2021

Independent Study by Drone Industry Insights UG

Table of Content

DIAS

Source: Drone Industry Insights UG

Executive Summary

1. Swiss Drone Industry Overview 2021

- Switzerland has benefitted from early involvement into drone technology, which has led to a leading presence in all industrial drone segments
- The Swiss drone industry will reach CHF 521 million in 2021
- The Drone Ecosystem in Switzerland is centered on hubs (near universities), very startup-driven, and active in all categories
- The Swiss drone industry received 3% (CHF 214.6 million) of the global investments and most of it (57%) went into hardware companies
- 15% of Swiss drone companies received major funding (CHF 10+ million) while 85% received only minor amounts or no funding at all
- 45% of products and services are exported, with a strong emphasis on hardware and software products
- Most of these products stay within the EU, though the US is the leading destination

2. The Swiss Drone Market

- The Swiss drone market will reach CHF 435 million in 2021 – with over 70% of that being in the service sector
- In a global context, Switzerland ranks first in market size per capita and Swiss drones will have a global share of about 2%, growing from CHF 435 million in 2021 to CHF 720 million in 2026

3. What it means to be a Swiss Drone Company

- The label "Swiss-made", good access to talents and the local ecosystem make Switzerland a great place for drone companies, especially startups. 69% of the Swiss drone firms are not (directly) affected by the US/Chinese trade war
- The current Swiss regulatory framework is perceived as rather permissive than restrictive. Opinions pro domestic framework and pro EU framework are very contrary – opinions depend on the type, size and alignment of a company
- Main concerns that companies share are: access to funding, high costs (fees, taxes at the beginning), and perceived lack of government resources to adequately support emerging industries

4. Development Outlook and Market Demands

- The COVID-19 pandemic has had both negative and positive effects on Swiss drone companies, yet the optimism regarding business success prevails for both new and more established companies
- Swiss drone experts recommend a stronger collaboration amongst Swiss drone companies, supporting local access to talents in the hardware and software segment, making it easier to test and bring products to market, and promoting the value of drone technology
- Most wishes center on regulation, which is closely followed by availability and easy permission of BVLOS operation, and airspace integration.

Foreword by DIAS

Dear Reader,

Drones are a key future technology and will profoundly change the economy and society in the coming years and decades. They will have a crucial economic importance and will create opportunities for many regions in Switzerland. Unlike many other industries, this enormous growth market is still in its infancy and yet to be scaled, so there is consequently still great potential for Switzerland to take a leading role in this industry.

Since the founding of DIAS in 2017, we have been representing, supporting and promoting the Swiss drone industry and our members who offer and export drone-related products and services from Switzerland. From that day the Swiss drone industry has seen constant growth, the development of companies from startups to more mature entities, and the establishment of several market leaders in Switzerland.

With this first Swiss drone industry report, we aim to achieve three goals. First, we seek to measure and create a common understanding of the Swiss drone industry: what is the size of the drone industry (Swiss companies building products or providing services with drones) and the drone market (demand for drone products and services in Switzerland), and how much has been invested to date into Swiss drone companies? We also want to compare these numbers in an international context and confirm Switzerland's leadership position in this new technology field.

Secondly, we want to understand what it means to be a Swiss drone company: what are the origins of the Swiss drone ecosystem, what are its strengths and weaknesses, in what verticals and use cases is the leadership of Swiss drone companies particularly strong? Finally, we wanted to surface directly from the industry experts what they think is important going forward and whether there are any recommendations and opportunities to grow the Swiss drone industry further and consolidate its leadership in a global context.

Thirdly, we seek to predict the industry's outlook in Switzerland and showcase the value of the drone industry for the Swiss economy, labor market, and society: what is the industry's growth trajectory, how many jobs is the industry creating, and how important are exports of drone products and services to international markets?

To achieve these goals we commissioned the independent market research company Drone Industry Insights from Hamburg, which specializes in unmanned aviation and has already published similar market reports for other countries, to carry out the analysis, survey, interviews, and compile the report. This report was also financially supported by private and cantonal development agencies and other organizations that promote the Swiss drone industry.

We hope that national and international industry players, political and economical stakeholders, as well as the broader public and media can use this report as a baseline to keep the conversation and collaboration going and together help position Switzerland at the forefront of this key future technology.

We wish you a good reading.

Kevin Sartori, for the DIAS Board

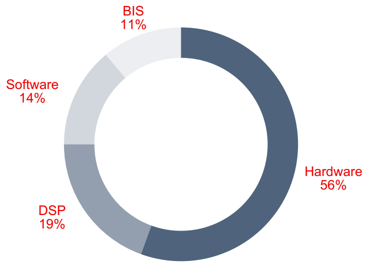
Methodology

1. General

- Drone Industry Insights, follows a proprietary research approach when creating reports and studies. This involves collecting primary and secondary data and validating the gathered insights internally with the analyst team and externally with other industry experts.
- The main objective is to create insights based on real data. The bottom-up approach used in all of DRONEII's studies makes the insights representative and valid, and the predictions from it reliable.
- There are three types of sources used to create this report: proprietary, secondary, and primary sources. Proprietary data includes knowledge acquired by the analyst team over many years. Secondary data includes, among others: databases, publicly available data (e.g. governmental), and paid data from trusted sources. Primary data is acquired in surveys and interviews while the latter one is used to discuss certain issues and to validate hypotheses and findings.
- Following the analysis of the data, the analyst team is very careful in coming to a conclusion without being brash. Therefore, a triangulation of data – a cross-check – is performed.

2. The Swiss Drone Industry Study 2021

- This study was created from April to June 2021
- In order to get an impression on the Swiss drone industry, an online survey was conducted with 36 participants. The distribution of answers is as followed:



- The majority of answers came from the hardware sector (drone platforms, counter-drone systems, air-taxies, components & systems), followed by DSP's (Drone Service Providers), Software manufacturers (navigation, UTM, data analytics, flight, fleet & operation management) and BIS (Busines-Internal Services).
- To generate data and to validate hypotheses/ insights, interviews with 10 industry experts (DIAS members, other drone industry players, and political stakeholders like the head of FOCA) have been conducted as well.

DRONEII.COM
DRONE INDUSTRY INSIGHTS

- Drone Industry Insights – or DRONEII.com – is a market research and consulting company, dedicated to the field of commercial drones.
- As a boutique agency, they help global actors and stakeholders with in-depth market research and most recent data to support critical business decisions.

www.droneii.com
info@droneii.com
+49 40 6483 0858

Astra-Tower, 6th Floor
Zirkusweg 2
20359 Hamburg
Germany

Definitions

Definition: Segments
The drone industry is divided into hardware, software, and service segments. Each of these is broken down into several sub-segments.

Hardware
- Platforms
- Components and Systems

Software
- Flight Planning
- Navigation & Computer Vison
- Workflow & Data Analysis
- UTM
- Fleet & Operation Management
- Augmented Reality & Virtual Reality

Services
- Drone Operation
- System Integration, Engineering, R&D and Advisory
- Education, Simulation & Training
- Coalitions, Organizations, Initiatives
- Other[1]

Definition: Industries
The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments. This standard is qualified to thoroughly describe the drone economy. In this report, these verticals are slightly altered and read as follows:
- Agriculture
- Arts, Entertainment & Recreation
- Construction
- Courier Services and Warehousing
- Energy (Oil & Gas Extraction and Utilities)
- Educational, Scientific & Technical Services
- Health Care & Disaster Relief
- Information & Motion Picture
- Insurance
- Mining and Quarrying
- Public Emergency Services
- Public Administration
- Real Estate and Industrial Plants
- Safety & Security
- Telecommunication
- Transportation Infrastructure
- Waste Management & Remediation Services

Example: The Safety & Security sector consists of establishments of private agencies that administer, oversee, and manage private safety & security activities. These agencies are usually commissioned by private or public entities to carry out safety and security critical tasks. Working for the Safety & Security industry means generating revenue from hardware, software or services related to Safety & Security purposes.

Definition: Drone Industry Size (generated revenue)
In contrast to the local demand, the industry size includes all revenue generated in the Swiss market, regardless of how much of this generated value is being sold abroad. In other words, it represents the Swiss drone-based gross national income.

Definition: Drone Market Size (local demand)
The market sizes shown describe the demand in the individual countries, not the value in CHF generated in the countries. These values can vary greatly if, for example, the turnover of the company is significantly greater than the demand in the country or vice versa.

Example: A Swiss company produces software and generates a turnover of CHF 20 million annually. However, the demand for software in Switzerland is only CHF 10 million. This means the market size in Switzerland is CHF 10 million and the company sells the other CHF 10 million abroad.

[1] Business Accelerators, Insurances, Maintenance, Market Research, Consulting/Advisory, Shows/Conferences/Events, and Test Sites
Source: Drone Industry Insights UG

Content

Source: Drone Industry Insights UG

1.1 Drone Industry Overview 2021 – Summary

Early Involvement in Drone Technology:
- Switzerland established a robust drone technology foundation long before broader commercial drone market reception
- In nearly all niche segments for drones, Swiss drone companies have a leading presence
- FOCA involvement into national and international rulemaking supported the Swiss drone industry
- The label "Made in Switzerland" is perceived as highly valuable across the globe

The Swiss Drone Ecosystem:
- ...has drone hubs in the greater Zurich, Bern, Lausanne and Geneva areas – especially near the Universities ETHZ and EPFL
- ...is very startup-driven. Only few companies have been able to scale their product/service in terms of both number of employees and revenue
- ...is very active and offers solutions in almost all categories (hardware, software, services). Companies are mainly active in the Energy industry, followed by Safety & Security, Transportation Infrastructure and Agriculture
- Drone companies in Switzerland are rather young – over 60% of the companies were founded in the last five years
- The Swiss drone industry will grow from CHF 521 million in 2021 to CHF 879 million in 2026
- 45% of products and services are exported, with a strong emphasis on hardware (89%) and software (96%) products
- Most (55%) of the Swiss products/services stay within the EU; the most important trade partner, however, is the USA (22%)

Startups and Investment Limitations
- Swiss companies received 3% (CHF 214.6 million) of the global investments and most of it (57%) went into hardware companies
- 56% of this funding came from Switzerland with an emphasis on early-stage venture capital investments for startups
- In general, it is hard for a startup to acquire funding in Switzerland compared to e.g. the Silicon Valley
- 15% of Swiss drone companies received major funding (CHF 10m+) while 85% received only minor amounts or no funding at all

Source: Drone Industry Insights UG

1.2 The Evolution of an Ecosystem

Regulatory milestones
Technology/Market milestones

Observations:

- Switzerland established a robust drone technology foundation 10 years before release of the DJI Phantom drone
- In nearly all drone niche segments, Swiss drone companies show a leading presence
- FOCA has strong impact on national and international rule-making

Switzerland

2004: **EPFL/Autonomous Systems Lab**[1] showed the world's first freely flying quadrotor drone.

2004: **FLARM** was founded to become the main European provider of collision-avoidance systems.

2007: **U-blox**, founded as Spin-off of ETH. Its GPS chipsets and modules can be found in almost every drone.

2007: Construction of the **ETHZ Flying Machine Arena**, which was a large, indoor space for drone navigation testing. ETHZ supported around 20 drone spin-offs.

2008: Establishing of PIXHAWK team at ETHZ. Today **PX4** is the leading open-source software technology and core enabler for enterprise drone solutions to flourish worldwide

2010: FOCA lead of JARUS[2] working group (Airworthiness)

2011: **Pix4D** was founded . Its software creates georeferenced maps and models from drone imagery. Today Pix4D is the leading photogrammetry software.

2013: Implementation of GALLO (Forerunner of SORA) into Swiss drone regulation

2013: Sensefly released the first industrial-grade fixed-wing drone **ebee**. Today, the leading commercial fixed-wing drone.

2013: **Aurora Flight Sciences** opened a research and prototype engineering office in Luzern. Aurora was acquired by Boeing in 2017.

2014: **Wingtra** started business and today is the global leader of hybrid configurated (VTOL) drones in the surveying segment.

2016: **Verity** performed the world's first ever autonomous indoor drone show over people at TED2016 in Canada. Today IKEA and DSV operate their autonomous warehouse system.

2017: Global first BVLOS operation approval in urban environment by FOCA

2018: **Flyability** released the first collision-tolerant "caged" drone. Today, the Elios drone is market leader in its segment.

2020: Declaration of Intent to strengthen collaboration with USA FAA.

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

World

2005: **ICAO** first sought to establish a regulatory framework for civilian drones.

2010: **Parrot** released the first commercial RTF drone.

2011: **ICAO** published a circular about including civilian drones into the airspace.

2013: Release of **DJI** Phantom 1 with GoPro camera. **Amazon's** Jeff Bezos announces new drone delivery method for 2019.

2015: **EASA** published first Draft of EU drone regulation (A-NPA 2015-10).

2017: Helsinki declaration: EU commitment to SESAR **U-Space** and UTM research financing.

2019: Publication of EU 2019/947 with active impact by FOCA, especially on SORA.

2021: Publication of EU U-Space regulation with active impact by FOCA and elements of SUSI.

[1] Since 2006 at ETH Zurich [2] Joint Authorities for Rulemaking on Unmanned Systems with currently 61 countries as members including EASA and Eurocontrol

Source: Drone Industry Insights UG

DIAS

1.3 Swiss Drone Industry Map

* DIAS Member

Hardware

Drone Platforms

AERO41 *, aeroscout, AEROTAIN, ANAVIA *, ARGUS AVIATION TECHNOLOGIES LTD.

DRONISTICS *, EWATT AeroSpace, FLYABILITY *, FLYBOTIX *, FOTOKITE *, RUAG

senseFly Parrot Group *, SENSIMA inspection, SKYPULL *, sunflower labs *, SWISSDRONES *, UAVOS *

TWINGTEC *, UMS SKELDAR, UASystems *, VOLIRO *, verity *, wingtra *, YUNEEC *

Passenger Drones / eVTOL / Air Taxis

DUFOUR AEROSPACE *, Ray

Counter-Drone Solutions

droptec, Meritis, RHEINMETALL *, SCG, SKYSEC counter drone systems, Swiss Aerobotics *

Components & Systems

DISTRAN SWITZERLAND, dromote *, DEPENDENT *, MotionPilot, MECAPLEX, TERABEE

Propulsion & Power

Atlantik Solar, EVOLARIS, H55 *, maxon *

Navigation, Positioning & Guidance Systems

DAEDALEAN *, FIXPOSITION *, FLARM *, insightness, meteolabor *, SENSIRION, SUIND, swiss-airdata, u-blox, uaventure, weControl *

Software

Flight, Fleet & Operation Management

Auterion *, DRONE HARMONY *, DroneLogbook *

Navigation, CV and AI

PX4 autopilot

UTM

AIRMAP *, INVOLI *, skyguide, skysoft

Data Analytics, CV & AI

GAMAYA, Picterra, PIX4D, SULZER SCHMID *

Services

Drone Service Providers & Business-internal Services

AGRAIR PRECISION FARMING, AGRO, air-shot.ch, Air-View, BSP

CA Drohnen Service, DRONES INSPECTIONS.CH, easy2map, HeliFoto.ch, helvetis

Pilatus Drones, meteomatics *, Open Stratosphere *, SBB CFF FFS

SGS, SWISS POST, Tinamu Labs *, uzufly *, Vertical Master, visualworking

Delivery

RIGITECH *, MATTERNET *

Drone Shows

SWISSDRONESHOW+

Education, Simulation, Training, Certification

CERTX *, nicopter.net, SAFEDroneFlying, SORACourse.com

Test Sites

SWITZERLAND INNOVATION, WindShape *

Market Research & Consulting

MANAGELD *, MURZILLI CONSULTING *, PACE, v2sky *, SÄFELI *, SORA CONSULTING *, swisscom, UASolutions *

Maintenance

DROHNEN SPITAL

User Groups, Networks

Robohub

Supplier, Retailers

Remote Vision

Universities & Research Centers

EPFL, ETH Zurich, robotics Swiss National Centre of Competence in Research

Coalitions, Organizations & Initiatives

DIAS, Global UTM Association, HOME OF DRONES, swiss aeropole, SVZD FSDC SFCD, REDOG, swiss aerospace cluster, We Robotics

System Integration, Engineering, R&D, Advisory

Aurora *, DRONE ADVENTURES, @Calc, KOLLER, Leica Geosystems, nivitec fly for life, SOLARSTRATOS, SONY *

Shows, Conferences, Events

FAI

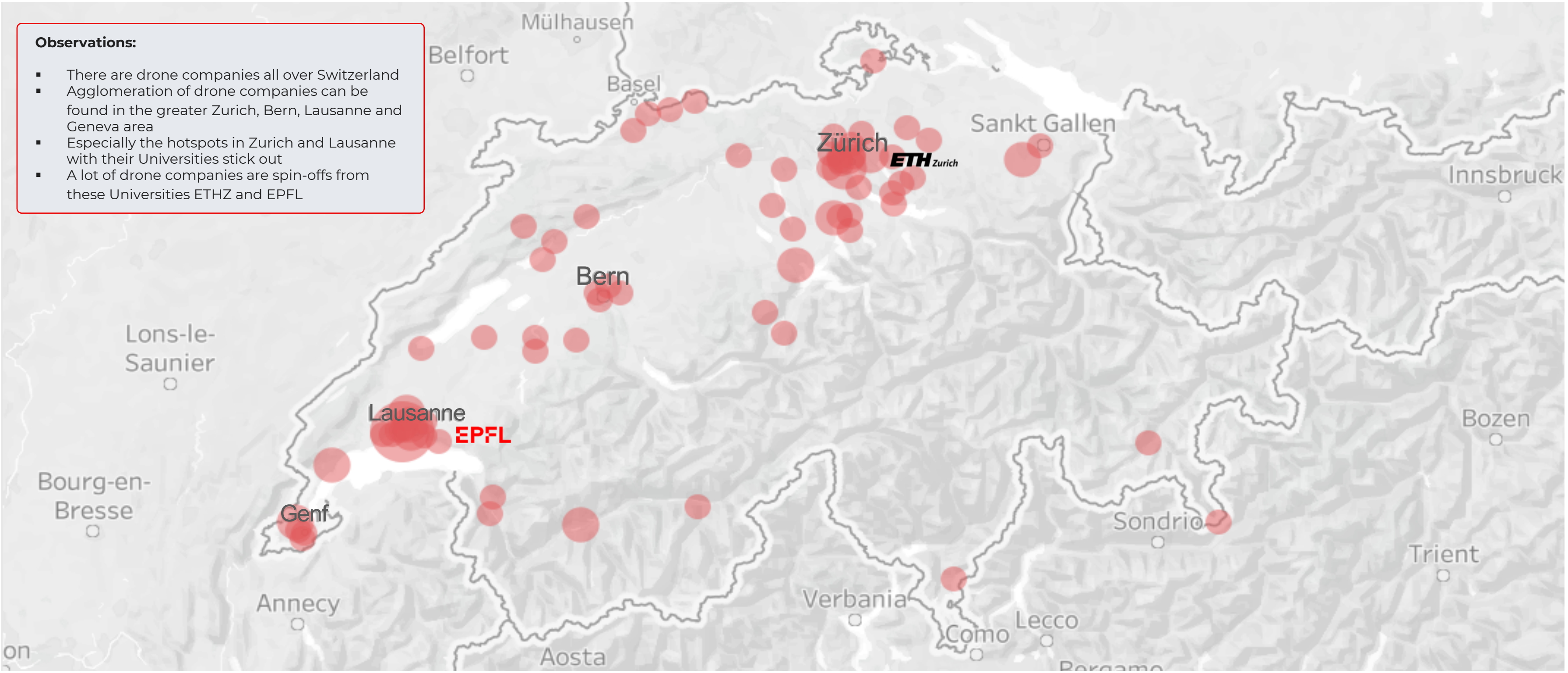
Note: List not exhaustive
Source: Drone Industry Insights UG

1.4 Localization of Swiss Drone Companies

1 Number of Companies per ZIP code

Observations:

- There are drone companies all over Switzerland
- Agglomeration of drone companies can be found in the greater Zurich, Bern, Lausanne and Geneva area
- Especially the hotspots in Zurich and Lausanne with their Universities stick out
- A lot of drone companies are spin-offs from these Universities ETHZ and EPFL

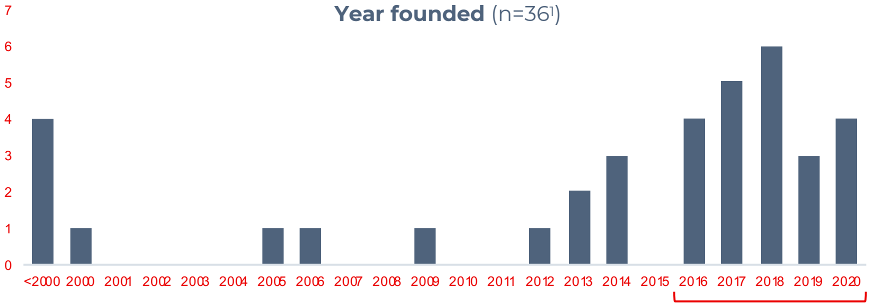


Note: List not exhaustive
Source: Drone Industry Insights UG

1.5 Swiss drone companies' demographics

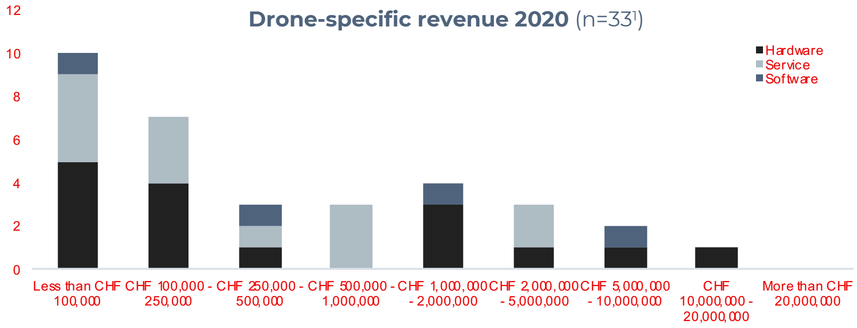
SURVEY RESULT

Year founded (n=36[1])

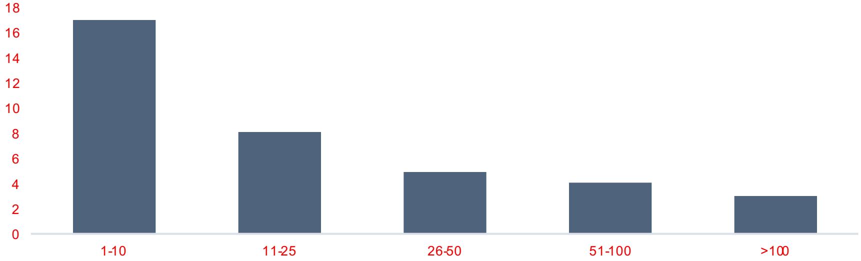


Over 60% of companies were founded in the last five years

Drone-specific revenue 2020 (n=33[1])

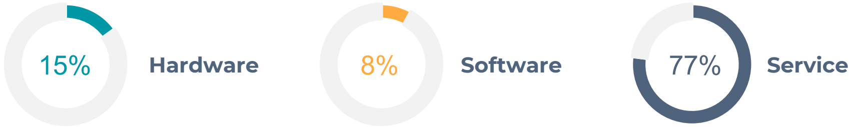


Size of drone company or drone department (n=37[1])



69% of companies have have 25 employees or less

4.800 People are involved in the drone industry in Switzerland today



Observations:

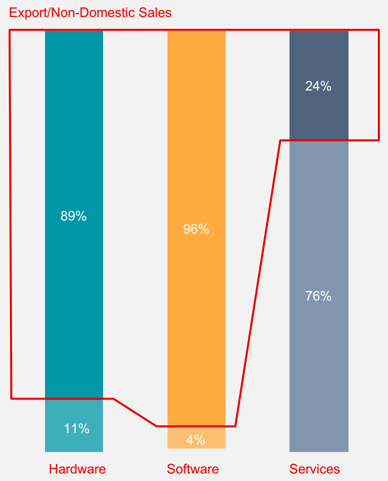
- Swiss drone companies are rather young, small, and startup-driven
- The majority of employees work in the service sector e.g. drone pilots
- A lot of entrepreneurs and small companies populate this industry. This shows that only few companies were able to substantially upscale their product/service. The revenue generated in this space underlines this observation

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

DIAS

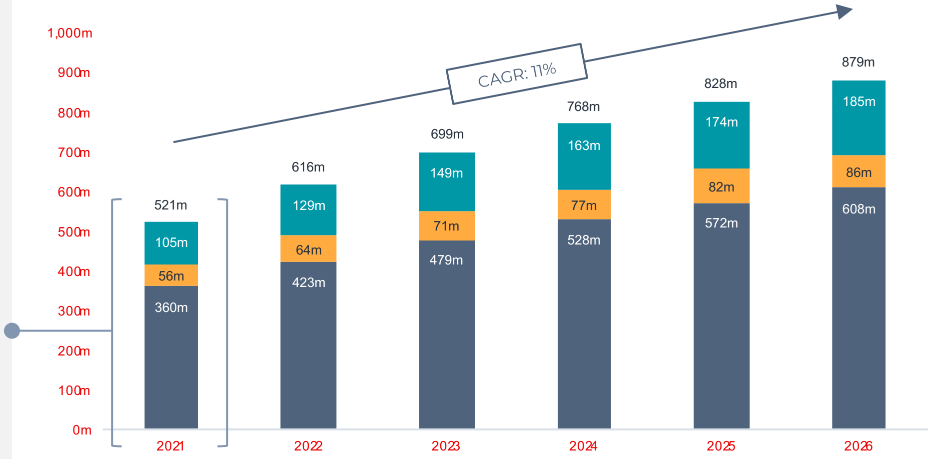
1.6 Swiss Drone Industry Value and Growth

45% Export
of products and services



CHF 233.4 mil.
of Swiss revenue is generated outside of Switzerland – mainly with hardware and software

CHF 521 mil.
of Swiss Drone Industry Value in 2021



	CAGR (2021-2026)
Hardware	12%
Software	8.7%
Sevices	11%

Hardware includes:
- Drone Platforms
- Components and Systems

Software includes:
- Flight Planning
- Navigation & Computer Vison
- Workflow & Data Analysis
- UTM
- Fleet & Operation Management

Services includes:
- Drone Operation
- System Integration, Engineering, R&D
- Consulting
- Education, Simulation & Training
- Coalitions, Organizations & Initiatives
- Others (see Definitions Page 6)

Observations:

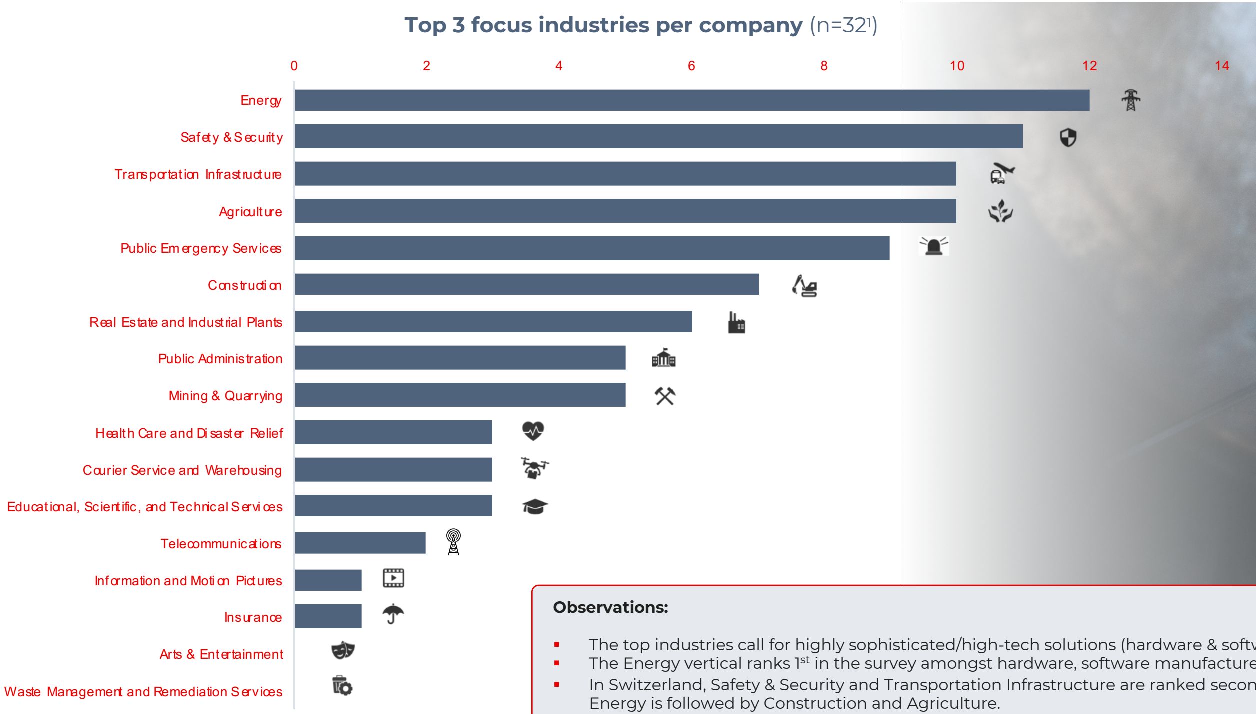
- The Swiss drone industry represents the value generated in Switzerland and will reach almost CHF 900 mil. in 2026
- Switzerland's hardware sector will grow most strongly (12% CAGR) followed by services (11% CAGR) and software (8,7% CAGR)
- The biggest share in the service segment is drone operation, including both business-internal operation and drone service providers
- 45% of products and services from Switzerland are exported. While only 24% of services are sold abroad, Swiss hardware and software companies earn money almost entirely outside Switzerland.

DIAS

Source: Drone Industry Insights UG

1.7 Market segments and industries

SURVEY RESULT



Observations:

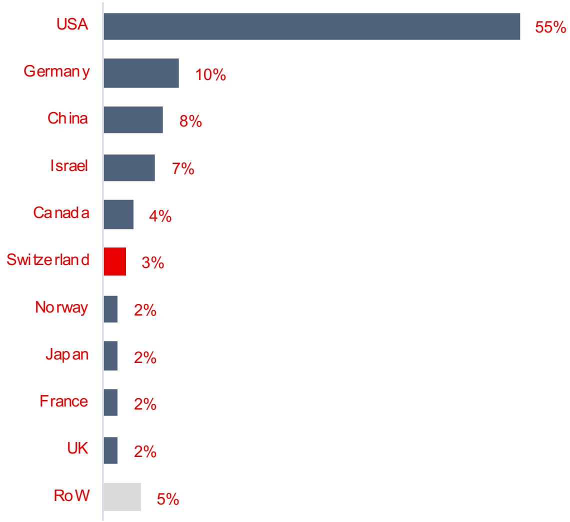
- The top industries call for highly sophisticated/high-tech solutions (hardware & software)
- The Energy vertical ranks 1st in the survey amongst hardware, software manufacturers and services providers
- In Switzerland, Safety & Security and Transportation Infrastructure are ranked second and third behind Energy, while in a global comparison Energy is followed by Construction and Agriculture.
- This correlates with the observation, that most platforms are sold abroad and that the label "Made in Switzerland" is perceived as highly valuable across the globe – and especially in the Energy and Safety & Security industry

[1] based on survey and interviews with Swiss companies conducted in May 2021, up to 3 answers possible
Source: Drone Industry Insights UG, Image credits: Flyability

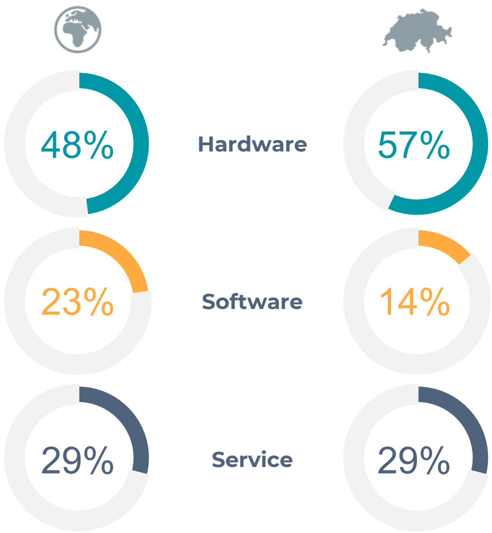
1.8 Swiss Funding in Global Comparison

Total global drone company funding
2010-Q1 2021

Countries in terms of received funding
2010-Q1 2021



Distribution of Funding for Global vs. Swiss Companies 2010-Q1 2021



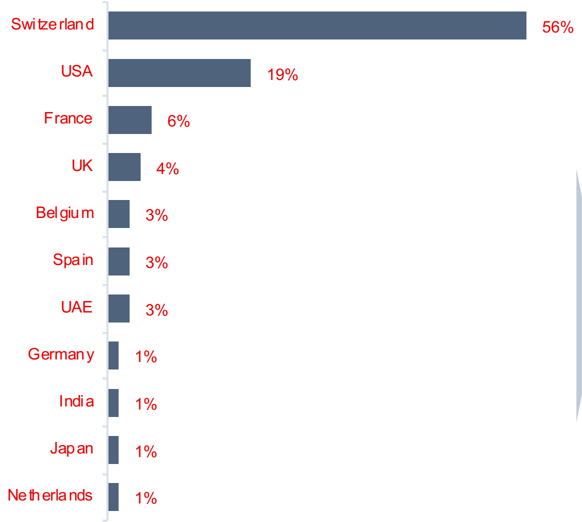
Observations:

- With 3%, Switzerland only received a small part of the global funding. This corresponds to $214.6 million USD over the course of the last decade, however, compared to the size of Switzerland this a comparatively high value
- In global comparison, Swiss hardware companies received an overproportionate amount of funding, while software received comparatively low funding

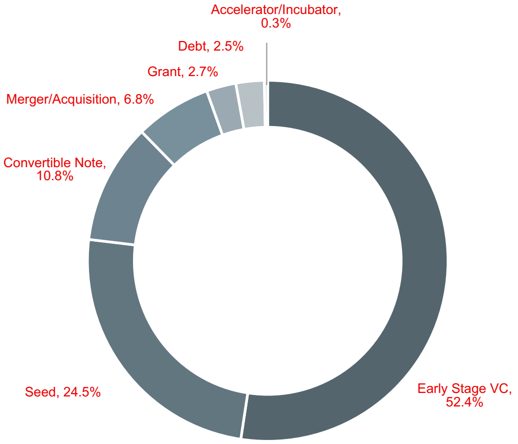
1.9 Swiss Investments & Investors

Total Swiss drone company funding
2010-Q1 2021

Country of funding origin
2010-Q1 2021



Swiss investments by stage
2010-Q1 2021



Observations:

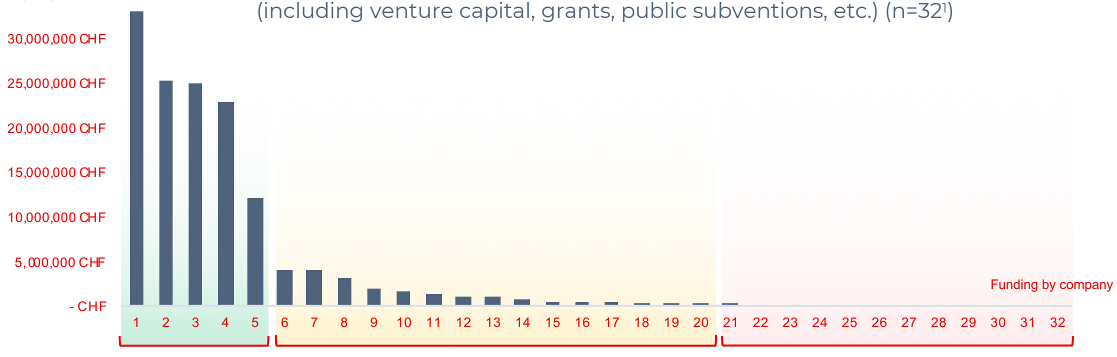
- Since 2010 Swiss drone companies received $214.6 million USD of disclosed external funding – over half of this funding came from Switzerland
- The country distribution of investors remain the same regardless of the investment size
- The main emphasis laid on early-stage venture capital investments to support startups. Larger amounts in later-stage investments cannot be found

Source: Drone Industry Insights UG

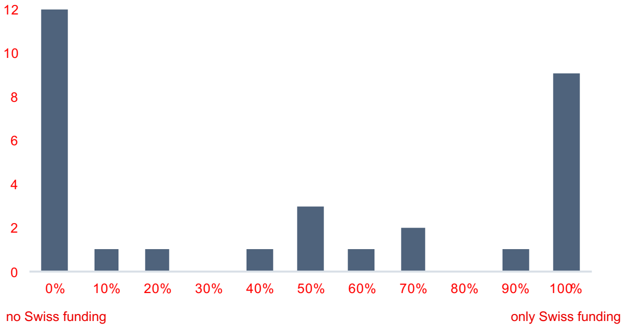
1.10 Investments on Company Level

SURVEY RESULT

Total funding received by each company
(including venture capital, grants, public subventions, etc.) (n=32[1])



Percentage of funding received from Switzerland (n=31[1])



Was it difficult to acquire funding from Swiss entities/investors? (n=27[1])

"Swiss technology funding often seems to be biased towards projects that come out of EPF Lausanne and ETH Zurich. Startups that do not come from these two institutes often struggle to get the same visibility towards investors."

"Important [funding] amounts are difficult to get in Switzerland."

"While silicon valley investors are more willing to take risks, swiss ones are way more careful, invest less and wants way more proofs to invest."

“Most investors look for mature companies with running business, not for companies in early startup stage."

"Long due-diligences processes and the pandemic led to more difficulties with investors."

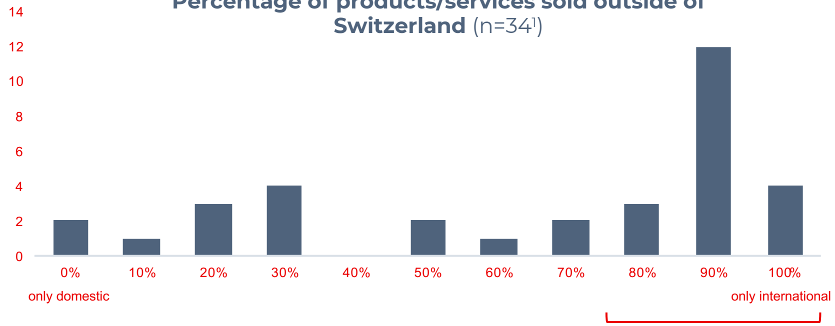
If yes, why?

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

1.11 Import & Export

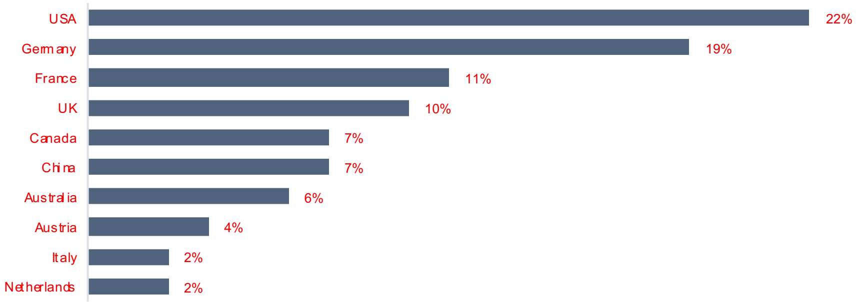
SURVEY RESULT

Percentage of products/services sold outside of Switzerland (n=34[1])

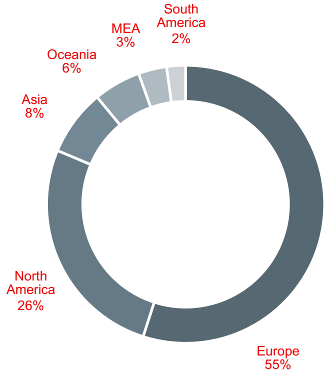


56% of Swiss companies sell all or almost all products/services abroad

Top 10 export countries (n=30[1])



Most important export regions (n=30[1])



"We do more than 95% of our revenue abroad."

"Customer-wise, we were always looking, but Switzerland is just too small."

"All of our revenues from outside Switzerland is really driven by the main part of that is that all of our projects are collaborative with our US colleagues in some way or another."

"Export is very difficult from Switzerland, export regulations are not startup-friendly, they change often and there's a lot of political bias."

"Switzerland for us is sort of a sandbox where we can test our approaches [...] once we have tested here, we can export them in the rest of Europe or even in the rest of the world."

Observations:

- Switzerland is an export country with strong reputation around the world (label "Swiss made")
- Many market leaders in software and hardware are located in Switzerland
- Most exports (in total) remain in Europe (mainly Germany, France and UK), however, most important export country is the USA
- Many companies develop/produce in Switzerland (great environment for drone tech) but not necessarily to sell their products in Switzerland (limited target market)
- Recreational and prosumer drones are almost completely imported into Switzerland – highly sophisticated solutions for commercial applications tend to be exported

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

Content

DIAS

Source: Drone Industry Insights UG

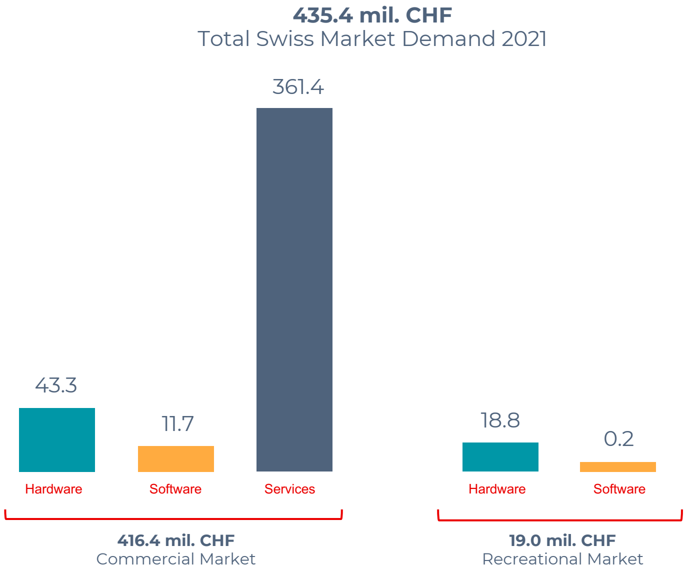
2.1 The Swiss Drone Market – Summary

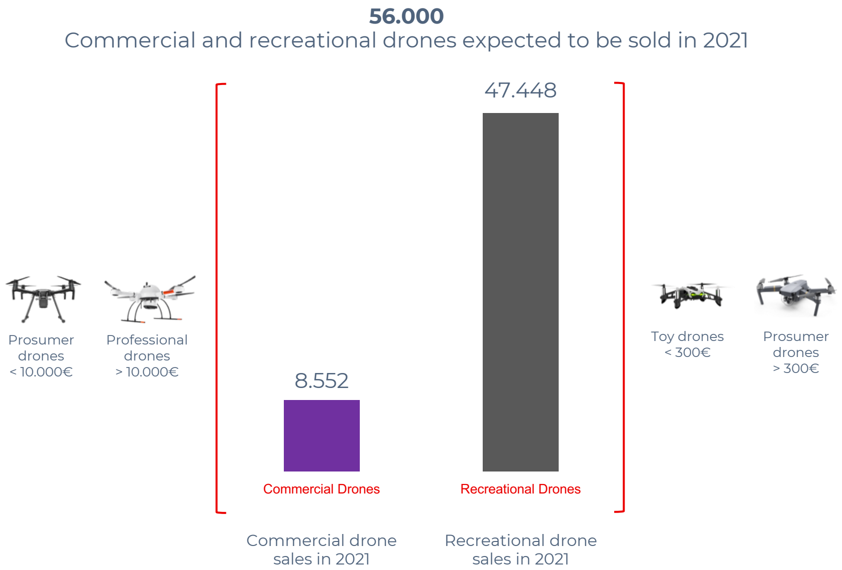
Switzerland's Drones in a Global Context:

- In global and European comparison, Switzerland ranks first in market size per capita. Reasons for this is a rich country with small population followed by rather permissive regulation, R&D hubs and a vivid startup scene
- The Swiss drone market will have a global share of about 2% and will grow from CHF 435 million in 2021 to CHF 720 million in 2026
- The commercial market accounts for 97.5% and is growing at 10.6% CAGR, while the recreational market only accounts for 2.5% with a negative growth of -0.9% CAGR
- Swiss manufacturers tend to export their products but also serve the local market. However, most products (both hardware and software) are imported.

Source: Drone Industry Insights UG

2.2 Snapshot of the Swiss Drone Market 2021





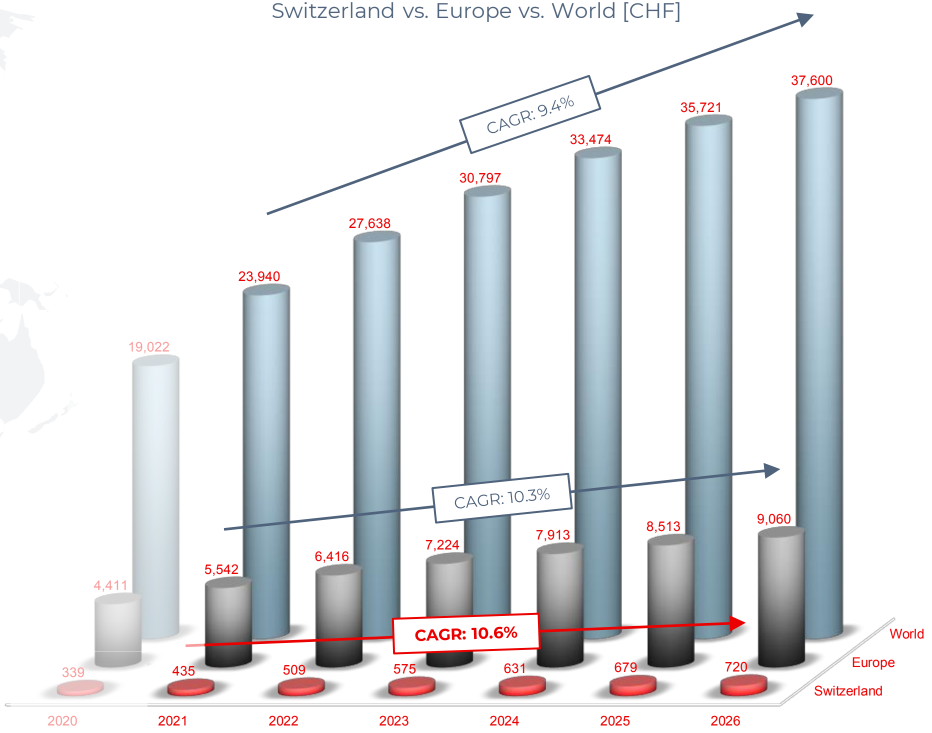
Observations:

- The commercial drone market exceeds the recreational market almost by a factor 20
- Compared to the international average, the proportion of hardware manufacturers in Switzerland is rather high.
- Even though the demand of hardware and software in Switzerland is comparatively low, big drone companies are present in Switzerland
- Swiss manufacturers tend to export their products but also serve the local market. However, most products (both hardware and software) are imported. Especially in the recreational market, almost all hardware is imported
- There are 5 times more recreational drones sold in Switzerland than commercial drones
- The share of professional drones in the commercial sector is very small (<10%)

Source: Drone Industry Insights UG

2.3 The Swiss commercial drone market in European and Global comparison

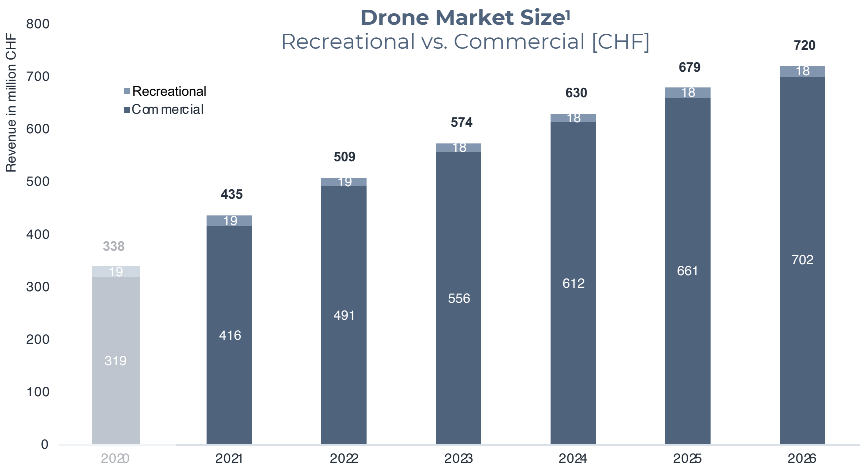
Swiss Market Demand Comparison (commercial & recreational market)
Switzerland vs. Europe vs. World [CHF]

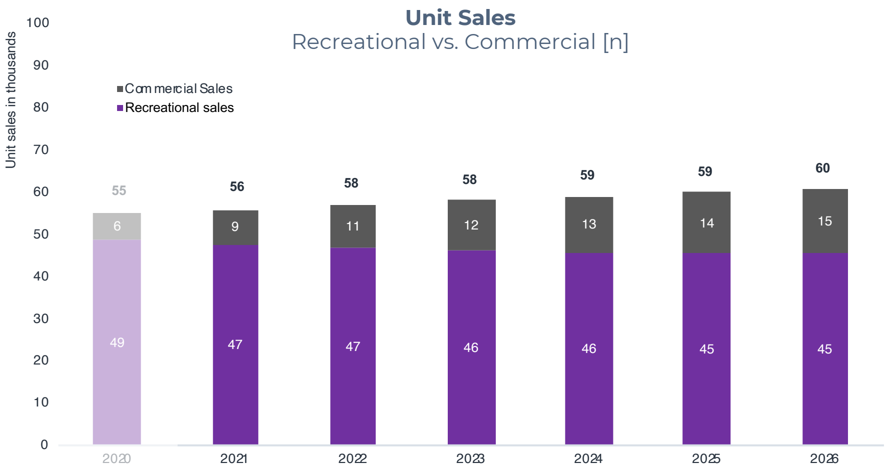


Observations:

- The global drone market demand (hobby & commercial) will grow to CHF 37.6 billion in 2026 at a CAGR of 9.4% – Dominating markets are and will continue to be the USA, China and Japan
- The European market demand will grow from CHF 5.5 billion to over CHF 9 billion in 2026– Dominating Markets in Europe are Germany, UK and France
- The Swiss drone market will have a global share of about 2% and will grow from CHF 435 million in 2021 to CHF 720 million in 2026 at an above average CAGR of 10.6%
- Changes/advancements in regulation might accelerate market growth, exceeding this conservative approach of forecasting the market size development

2.4 Recreational & Commercial Drone Market by Size and Unit Sales





Observations:

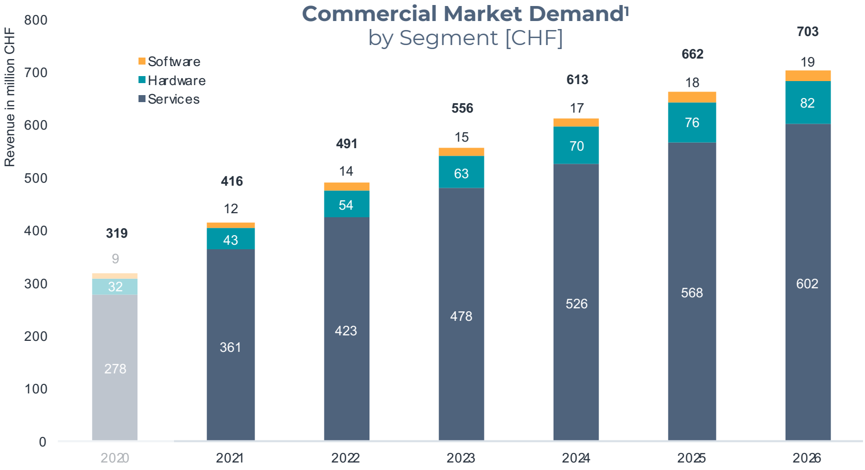
- The Swiss drone market is estimated to total CHF 435 million in 2021
- From this total, CHF 416 million is attributable to the commercial drone market and CHF 19 million to the recreational drone market
- The recreational drone market will experience a slight decline at a CAGR of -0.9%, while the commercial drone market will grow strongly at a CAGR of 11.0%
- In 2026, the commercial market will then amount to CHF 702 million and the recreational market to CHF 18 million

Observations:

- The graph above shows the sales figures for commercial and recreational drones in Switzerland The total number of drones sold in 2021 is 56.000 and will increase by 7 percent from 2021 to 2026 to a total of 60.000 drones
- The recreational sales segment will decline in the coming years. Overall, the number of privately used drones will decrease by 3 percent at a CAGR of -0.9% rom 2021 to 2026 to 45 thousand drones
- The trend is different in the commercial segment, which is forecast to grow strongly: From 2021 to 2026, the number of commercially-used drones will increase by around 60 percent at a CAGR of 11.0% to 15 thousand

[1] Market Demand in Switzerland (see definition on slide 6)
Source: Drone Industry Insights UG

2.5 Recreational & Commercial Market Demand by Segment



Observations:

- In the Swiss commercial drone market, the demand for hardware, which includes mainly the drone itself and additional equipment, is equivalent to approximately CHF 43 million in 2021. This value will grow at a CAGR of 13.5% to CHF 82 million by 2026.
- The commercial software market is comparatively small at CHF 12 million. Demand will expand at a CAGR of 9.6% to around CHF 19 million by 2026
- The service market is by far the largest segment at CHF 361 million. This includes, for example, all services provided with drones by all companies in all industry sectors. By 2026, this is expected to grow at a CARG of 10.7% to over CHF 600 million.

Observations:

- The Swiss recreational drone market consists of demand for hardware and software for non-commercial use
- Recreational hardware, which consists of toy drones below CHF 300,- and prosumer drones above CHF 300,- is equivalent to CHF 119 million in 2021 and will decline at a CAGR of -0.9% (both hardware and software) to approximately CHF 18 million in 2026
- Drone software for personal use, such as image editing programs for drone photography, accounts for a very small share. The market corresponds to 0.2 million in 2021 and stagnates until 2026

[1] Market Demand in Switzerland (see definition on slide 6)
Source: Drone Industry Insights UG

2.6 Switzerland in Global Comparison (commercial market only)

Commercial Market Europe

Position	Country
1.	Germany
2.	United Kingdom
3.	France
4.	Switzerland
5.	Italy
6.	Spain
7.	Netherlands
8.	Norway
9.	Belgium
10.	Denmark

Commercial Market Europe per Capita

Position	Country
1.	Switzerland
2.	Norway
3.	Denmark
4.	Ireland
5.	Finland
6.	Belgium
7.	Netherlands
8.	United Kingdom
9.	Germany
10.	France

Global Commercial Market

Position	Country
1.	USA
2.	China
3.	Japan
4.	Germany
5.	United Kingdom
6.	France
7.	Australia
8.	Canada
9.	Switzerland
10.	Italy

Global Commercial Market per Capita

Position	Country
1.	Switzerland
2.	Norway
3.	Denmark
4.	Australia
5.	New Zealand
6.	Singapore
7.	Ireland
8.	USA
9.	Israel
10.	Finland

Observations:

- Based on data from over 60 countries, a ranking of the largest commercial drone markets in Europe and worldwide was developed - the top three countries combined account for almost half of the European commercial drone market
- In absolute terms, Switzerland is the fourth largest commercial market in Europe with CHF 416 million. Switzerland's ranks first in a European comparison, when you look at the market size per capita
- In a global comparison, Switzerland is still the ninth largest market. Switzerland's ranks first globally when you look at the market size per capita

Source: Drone Industry Insights UG

Content

Source: Drone Industry Insights UG

3.1 What it means to be Swiss Drone Company – Summary

Switzerland Is Good for Drones

- The label “Swiss-made”, the good access to talents, and the overall ecosystem are the leading aspects to start and run a drone company in Switzerland.
- FOCA are a driving force to support the local drone ecosystem
- Most (69%) of the Swiss drone companies are not (directly) affected by the US/Chinese trade war

Eyes on Regulatory Framework

- The current Swiss regulatory framework is perceived rather permissive than restrictive
- “Complex” mission require a case-by-case exemption (waiver) which includes lot of paperwork, time and costs for the drone operator
- Opinions pro domestic framework and pro EU framework are very unaligned – opinions depend on the type, size and alignment (HW, SW, SV) of a company: locally-active companies tend to be pro domestic rules, internationally-active companies tend to be pro EU rules

Main Concerns by Swiss Companies:

- Main issues to be a startup in Switzerland are the access to later-stage funding, high costs (fees, taxes in the initial years) and a perceived lack of government resources to adequately support emerging industries.
- The majority (56%) sees public acceptance of drones as important. Drone technology often is not self-explanatory (privacy concerns) but people/companies are willing to use drones once their advantages (increase in safety, quality, ROI) are clear.
- IP protection is important to acquire funding, but patents are a slow vehicle in a very quickly moving environment

3.2 Startup friendliness and advantages of being a Swiss company

SURVEY RESULT

On a Scale from 1-10: How startup-friendly is Switzerland (n=33[1])

"Government lacks resources to adequately support emerging industries"

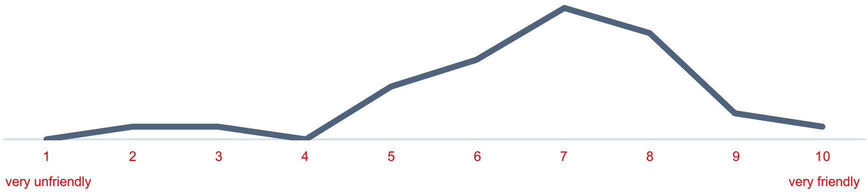
"High quality of life and good infrastructure"

"Good startup ecosystem"

"Very difficult to access capital (both public and private)"

"Too much focus is on ICT, Fintec and Bio/Pharma"

"Good access to qualified resources"



"Administrative and tax burden in the first years can be crushing"

"Administrative tasks could be easier"

"Increased appreciation that Start-ups are important for the economy"

"Export is very difficult from Switzerland, export regulations are not startup-friendly"

"The Swiss quality label"

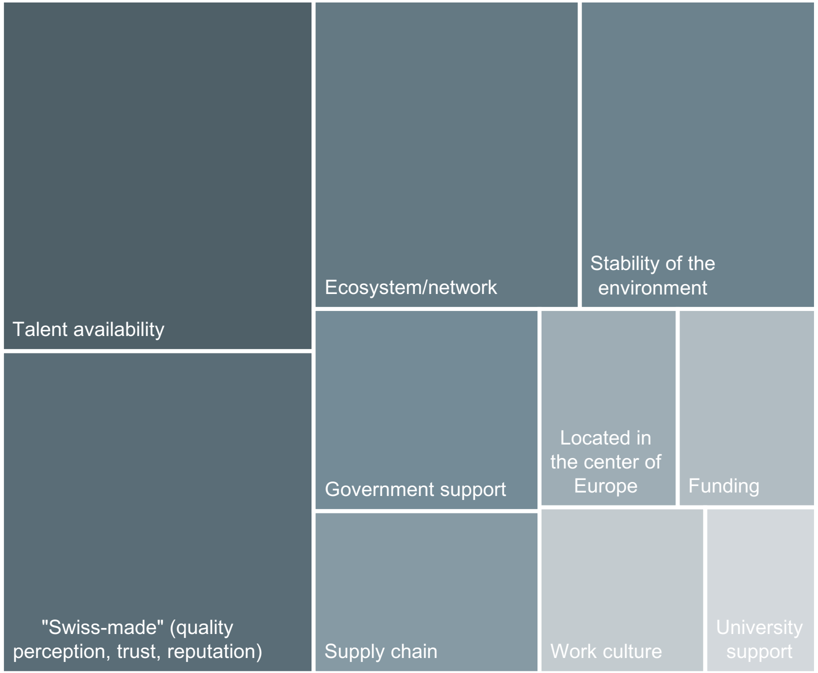
"Good support from Government and Universities"

"Comparatively high costs to start a new company"

"Good international connections"

"Liberal regulatory framework enabling innovation and commercialization"

What are the main advantages of being a Swiss company? (n=32[1])

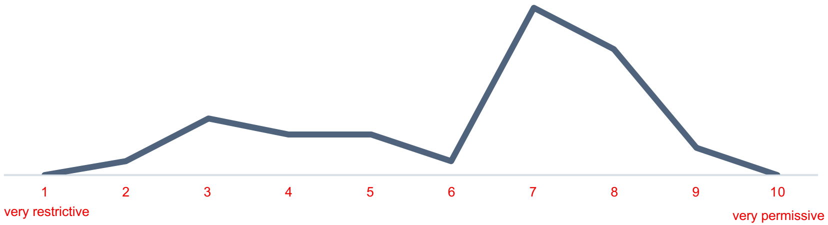


[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

3.3 Snapshot: Current Swiss Drone Regulation

SURVEY RESULT

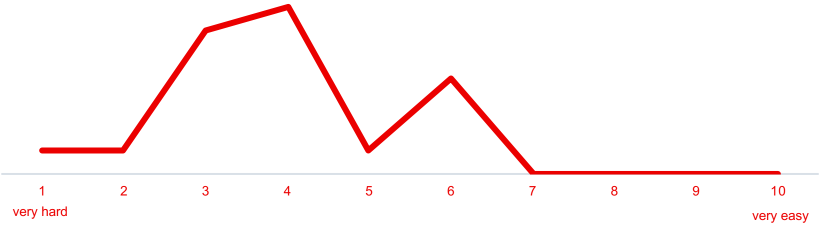
On a Scale from 1-10: how restrictive/permissive is the regulatory framework to use drones in Switzerland? (n=35[1])



almost 70% answered the regulatory framework is rather permissive than restrictive

BUT

If you operate drones: On a scale from 1-10, how easy is it to fly complex missions (BVLOS, over people, at night)? (n=20[1])



80% answered it is rather hard to fly complex missions

PROS

- Up to a weight of 30 kilograms, drones can generally be used without a permit
- Open minded and solution-driven approach by FOCA
- Switzerland and FOCA offers a progressive testing environment
- Flexible response and communication by FOCA
- Well-educated FOCA personnel
- The liberal framework has a beneficial effect during the early phases of drone related product innovation

CONS

- The current national framework is lean and permissive for small drones up to 30kg in VLOS operation only
- The local environment complicates receiving BVLOS permission – every "complex" mission requires a case-by-case permission by the FOCA
- A successful permit application requires a lot of paperwork, time and costs for the drone operator (often 3rd parties must be involved)
- Perceived lack of transparency of approval process and guidance material
- All safety measures are assessed to mitigate any air and ground risk

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

3.4 Aspects for and against an EU Drone Framework

SURVEY RESULT

Pro Current Domestic Rules

Pro EU Rules Implementation

Suppliers

No binding design requirements

Pragmatic and flexible exchange with local authority

International expansion would be more difficult without design rules

International manufacturers benefit from a harmonized EU framework to sell their products

OEMs (with designs for complex missions) benefit from EU-wide standards to design drones towards operational regulatory compliance

Passenger drone OEMs are currently not affected by EU rules, although EU compliance is beneficial for market access

Many manufacturer already built according to international standards. EU rules have no additional influence on product development

The design requirements for hardware are currently too generic

Startups lose non-administrative testing environment for product development

Operators

International operators fear non acceptance of local flight authorization which might result in establishing a local branch/subsidiary for managing flights in the EU

The Swiss drone regulation is not suited for complex and international drone operation

Approval for complex missions (waiver process) lead to long waiting time and high costs (e.g. 3rd party involvement)

Local operators have freedom of non-complex operation and testing without permission

International operators find harmonized drone pilot qualification standards

All operator can benefit from the Light Unmanned Certificate to self-authorize Swiss and EU-wide operation

Drone operators are forced to renew/upgrade their drone fleet to be compliant with the 2019/945 certification standard in the open category

EU rules tend to higher administrative work and costs

Lack of experience and capacity of authority personnel might initially slow down the application processes

advantages per scenario

disadvantages per scenario

[1] based on survey and interviews with Swiss companies conducted in May 2021

Source: Drone Industry Insights UG

DIAS

3.5 Success factors of the Swiss drone industry

SURVEY RESULT

Does public acceptance of drones have an influence on your business? (n=36[1])

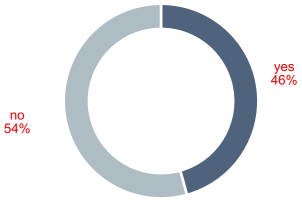
"Important to explain the benefits for society for the use of drones"

"If the public does not accept drone operations, there is no business"

"The public is very receptive and positive when drones replace heavy equipment or helicopters"

"Drones are perceived as being able to violate one's privacy"

Do you think that protecting your IP is a key factor of success for your business? (n=35[1])



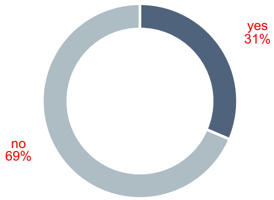
"Grow fast before competition gets more market share"

"Needed to attract further funding"

"You need to protect your investments"

"We don't want our technology and workflows to be made available to our competitors"

Did the geopolitical pressure in the US and globally against Chinese drone products influence your business? (n=35[1])



"It offers new opportunities for higher priced suppliers"

"It increased the need for an alternative, standardized (open-source) ecosystem to DJI"

"Probably the biggest opportunity for the Swiss drone industry but I do not see many companies that take advantage of it"

Observations:

- A lot of moving parts to deal with: regulation, acceptance, market dynamics, IP protection, funding and competition. Even though the environment is highly dynamic and depending on many stakeholders, being a Swiss company pays off because of the good environment, stable economy and constant talent supply
- The majority (56%) sees public acceptance as an important aspect. However, many people in the public are so distant from drone technology that they overestimate the negative aspects and are unaware of the benefits this technology can bring
- Mainly hardware companies see the need to protect their IP to get/keep investments. However, IP protection often prevents collaboration and makes everyone start from zero and reinvent the wheel all over again
- The loss of trust in closed systems (e.g. DJI) also increased the interest in open-source solutions whose software can be audited. Even though this ban might be the biggest opportunity for the Swiss drone industry, not many companies actively approach this and take advantage of it. Regulation should focus on data security in general rather than the country the platform was produced in.

DIAS

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

Content

4.1 Development, Outlook & Market Demands – Summary

COVID-19 Effects:

- Corona had a strong impact on drone companies, both positively and negatively. Travel restrictions and frozen/limited budgets are the leading negative aspects - greater acceptance and more openness towards automation are the leading positive aspects
- Nevertheless, the optimism regarding business success for both new and more established companies prevails

Swiss Drone Experts Recommendations:

- A stronger collaboration amongst Swiss drone companies. This strengthens the local industry and uses synergies in order to compete together externally rather than internally
- Supporting local access to talents in the hardware (e.g. battery-development) and software (e.g. autonomy) segments
- Regulation should make it easier, not harder, to fully test and bring products to market
- Promoting the added value of drone technology

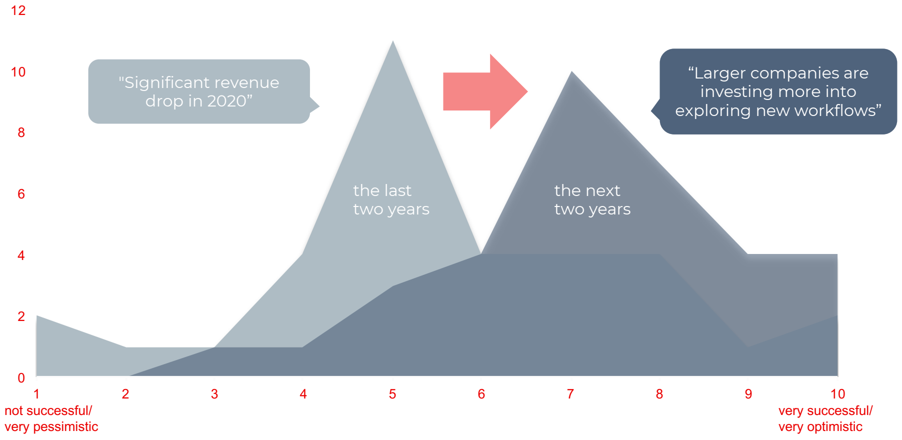
Wishes:

- Part of the survey was asking drone companies how they would use a magic wand. Most of their wishes relate to drone regulation. Core points are the availability and easy permission of BVLOS operation and airspace integration. Further wishes involve: infrastructure (physical and communication), industry adoption, investors with a greater willingness to accept risks.

4.2 Market Development

SURVEY RESULT

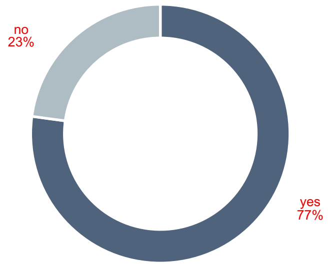
How successful were you in the last two years and how optimistic are you for the next two years? (n=34[1])



56% answered the last two years were rather challenging

85% answered they are rather optimistic for the next two years

Did the corona pandemic influence your business? (n=35[1])



Negative Impact

1. Canceled travel, meetings, events
2. Business/projects slowed down in general
3. Budget frozen or re-located
4. Delayed projects/purchasing decisions by client
5. Supply chain issues or material shortage
6. Financing slowed down
7. Great general uncertainty
8. Restrictions in operation

Positive Impact

1. Greater acceptance for touchless drone delivery
2. More openness towards automation
3. Drones as efficient tool to strengthen digital workflows
4. General "Remotization" of work

Observations:

- The great majority sees the next two years much more optimistically than the last two years
- Drone technology needs to be demonstrated to clients. Travel restrictions and budget are the leading negative impacts on the drone industry due to the pandemic
- Almost all companies saw a revenue drop in 2020
- On the other hand, you can see that drone technology is seen as a chance to digitalize workflows and streamline processes
- Drone delivery in particular benefited from the pandemic – however scaling operation remains difficult (BLVOS restrictions) even though a lot of funding was raised in this context

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

4.3 Expert Opinions[1]: What' important going forward? To learn and benefit from each other!

INTERVIEW RESULT

Public Acceptance

Observations

- People are still not very much aware of the added value and positive public impact of drones

Expert Recommendations

- Promoting the added value of drone technology (time saving, cost savings, 95% less CO_2 emissions, replacement of dangerous missions, infrastructure, maintenance, etc.)
- Pro-actively educating the public regarding privacy concerns, safety and noise issues vs. added value

Talents

Observations

- Excellent access to local talents in Swiss universities
- Switzerland is open to foreign workers and international business
- Switzerland is the tech powerhouse with ETHZ and EPFL
- Big tech companies draw talents away from SMEs

Expert Recommendations

- Stronger support hardware and software (computer vision and autonomy) talents
- Help strengthen the position of Swiss SMEs in terms of talent access
- Further support the quick implementation of measures to react on a dynamic market environment (e.g. adaption of education and R&D)

Regulation

Observations

- Lack of testing access of AAM platforms
- Proactive support by FOCA
- Conflict of interests to harmonize domestic and international regulation
- Perceived lack of training and capacity of authority personnel for complex mission approval

Expert Recommendations

- Regulation should make it easier, not harder, to test and bring products to market
- Regulation and airspace access needs to be proportionate across sectors (small vs. large drones)
- Increase efforts in implementing EU 2019/947 and 2019/945 to harmonize international business
- Enable manned and unmanned aviation in a non-segregated airspace
- More transparent management of flight authorizations
- An open failure culture as a basis for collaborative improvements of the drone industry (learnings)

Market/Competition

Observations

- Risk-averse private and governmental investment behavior in growth stage investments
- Switzerland has been a good "sandbox" to test products before exporting

Expert Recommendations

- Supporting the setup of electrical infrastructure – e.g. using the learnings of the electric car industry as a reference
- Establishment of a LUC-equivalent certification in order to be competitive in Europe
- Better organization of drone companies (similar to GA and model aircrafts) in order to act more efficiently both nationally and internationally
- Stronger involvements in working groups (e.g. EASA or standardization bodies)
- No focus on low-cost products but continue serving "complex" missions with high-end products/services
- More customer-centric instead of technology-centric entrepreneurial mindset

[1] based on interviews with Drone industry experts in Switzerland conducted in May 2021
Source: Drone Industry Insights UG

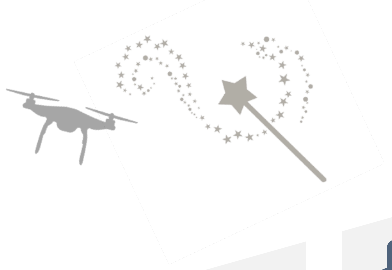
DIAS

4.4 If you (Swiss drone company) had a magic wand[1], what would it be?

SURVEY RESULT

Observations:

- Most of the "magic wands" are in the regulation sector. It shows that the current regulation has the biggest influence on drone companies and that the strongest need for action is in this field
- General requirements mainly circle around physical and communication infrastructure and industry adoption
- The funding situation is also mentioned in this context and asks for more readiness to assume risks from investors and government bodies



Investments and Investors

- "Transform Swiss investors in Californian ones"
- "Loan guarantees from government for strategic high-tech startups"

General Requirements

- "5G coverage everywhere"
- "Stronger industry adoption"
- "End of the Coronavirus crisis"
- "A more visionary mindset in politics and large entities."
- "Magic batteries with higher specific mass-to-weight ratio"
- "Outdoor flight zones with reduced restrictions for development"
- "Swiss drone companies more aggressively expanding abroad leveraging partnerships with global companies and with international customers"
- " FOCA and Swiss companies more actively pushing for global open standardization"

Drone Regulation

- "Fully automated BVLOS operation"
- "A big push on UTM to make Switzerland a global test-bed"
- "Streamline processes to obtain permissions"
- "Product requirements should be regulated on EU level"
- "Switzerland to ratify EU 945 / EU 947 regulation immediately."
- "Fast implementation of standards and regulations in order to enable the business"
- "Regulatory harmonization between EU states"
- "A reliable and certified Detect and Avoid System that meets requirements for all airspace users"
- "Regulators working together with the industry to define testing and validation methods to enable drone industry growth."
- "Make LUC applicable worldwide
- "Differentiate stronger between private and professional pilots"
- "Benefit from the advantages from being a small and independent country"
- "A more high-level political interest in actually creating a drone industry"
- "Reduce the complexity of the U-Space flight approval process"

[1] based on survey and interviews with Swiss companies conducted in May 2021
Source: Drone Industry Insights UG

Content

5.1 SWOT of the Swiss Drone Industry

Strengths:

- Research & Development, education/institutes and general access to talents (e.g. software, robotics) contribute significantly to the development of the ecosystem
- Private investors support an already strong R&D educational structure which helps the ecosystem to act as a “magnet” for other/new tech-heavy companies to move to Switzerland
- Switzerland belongs to one of the first movers with drone technology which provided practical experience to create an advanced ecosystem
- The location in general, its stable government, the strong economy are the leading aspects to start and run a drone company in Switzerland
- The label “Swiss-made” has acquired a very positive international reputation and world-leading companies are located in Switzerland, which fuels an ecosystem for innovation
- Compared to other countries, a rather permissive regulatory framework and good approval processes for standard (VLOS) missions, allow for advanced drone operation (early pro-active and pragmatic involvement by FOCA to develop SORA and U-Space) and integration
- PX4 and the open-source ecosystem was initiated in Switzerland which is a unique strength that provides a constant source of talent for this open-source technology

Weaknesses:

- Other non-EU countries have more permissive regulations especially regarding BVLOS
- Lack of approved notified bodies (e.g. training organizations) and published standards for compliance for medium and high-risk operation
- Lack of Testing environment for passenger drones
- Other aviation segments (like the general aviation and model aircrafts) are better organized to address/enforce their position
- Intransparent waiver process in terms of costs and time
- Expensive and lengthy 3rd party involvement to receive waivers
- The conservative and risk-averse attitude of investors in Swiss companies often inhibits rapid growth needed to compete in the broad market on an international level
- Uncertainty in strategic business alignment caused by the acceptance of motion 20.3916
- Startups experience great support in the beginning from Investors

Opportunities:

- Standards/Certification for design drive transparency and establish better relations with suppliers and clients derived from the improved safety of consumers
- Standards/Certification for operation will help to leverage drone operation (e.g. by flying BVLOS, over people or at night)
- More engineers and technology transfer from other industries, battery, AI (software, autonomy)
- The implementation of a resilient system to mitigate air-risk is an important factor for airspace integration
- Better social acceptance through marketing by showing what drones are capable of and what the benefits are
- More open exchange and communication between Swiss drone companies and related industries to leverage synergies (e.g. Swatch Group)

Threats:

- Tensions in bi-lateral trade agreement between EU and Switzerland
- Switzerland might lose leading position in committee work to proactively influence European rule-making
- If the resulting regulation lacks permissiveness, companies/talents will move to other countries
- Lack of public acceptance might stop the Swiss drone industry from flourishing (e.g. noise, privacy issues)
- Emerging Chinese competitors in the field of highly professional drones can put Swiss drone companies under strong(er) pressure
- Unbalanced management/prioritizing of governmental recourses for drones and passenger drones can lead to either of these sectors stalling
- “Talent poaching” from other industries or other countries
- Additional administrative work to comply with EU rules for manufacturers and operators

Source: Drone Industry Insights UG

Sponsors

Main sponsor

Bern Economic Development Agency

Gold sponsor

INNOVAUD

Silver sponsor

SWITZERLAND GLOBAL ENTERPRISE
enabling new business

Supporter

swiss aerospace cluster

About DIAS

- The Drones Industry Association Switzerland (DIAS) represents, supports, and promotes its members who export drone-related products and services from Switzerland. DIAS embraces the safe use of drones and seeks to accelerate the acceptance and adoption of drones. Founded in 2018, DIAS counts over 50 member companies active in the fields of hardware, software, and services in the drone industry.
- **Postal Address:**
  c/o Switzerland Innovation Park Zurich
  Wangenstrasse 68
  CH -8600 Dübendorf
  Switzerland
- **Email:** info@droneindustry.ch
- **Contact person for report**
  Kevin Sartori – DIAS Board Member
  ksartori@droneindustry.ch

DIAS Members

AERO41, AIRMAP, ANAVIA, Aurora, Auterion, CERTX, DAEDALEAN, DPENDENT, dronote, DRONE HARMONY, DRONISTICS, DroneLogbook, DUFOUR AEROSPACE, FIXPOSITION, FLARM, FLYABILITY, FLYBOTIX, FOTOKITE, H55, INVOLI, MANAGELD, MATTERNET, maxon, meteolabor, meteomatics, MURZILLI CONSULTING, Open Stratosphere, RIGITECH, RHEINMETALL DEFENCE, SÄFELI, senseFly, SKYPULL, SONY, SORA CONSULTING, SULZER SCHMID, sunflower labs, Swiss Aerobotics, SWISSDRONES, Tinamu Labs, TWINGTEC, UASolutions, UASystems, UAVOS, uzufly, verity, VOLIRO, V2sky, weControl, WeRobotics, WindShape, wingtra, YUNEEC

DIAS Drone Industry Association Switzerland

Thank you

www.droneindustry.ch