Drones

Vision of the Republic and Canton of Geneva

REPUBLIQUE
ET CANTON
DE GENEVE

POST TENEBRAS LUX

A Brief Overview

The State of Geneva promotes the adoption of new services made possible by aircraft and operators with access to previously untapped airspace. To achieve this, the various State and private-sector services must be informed, trained, equipped, and coordinated, and they must also monitor technological developments.

Geneva's vision over the coming years is to become one of the first cities in the world to implement a coordinated solution for the management of drone traffic in urban areas, including the registration and identification of drones, as well as the electronic definition of prohibited zones (geofencing).

The State of Geneva will inform the public authorities, the population, and businesses about drone-related commercial, scientific, legal, and security challenges and opportunities. It thereby intends to create favorable conditions for the development of a regional cluster dedicated to drones, which will allow various stakeholders to meet, exchange, and innovate. The resulting strategy is based on four interconnected and complementary pillars, described below.

Innovation

The State of Geneva will use drone services when they provide a reduction in costs, improve service levels or enhance safety and security. It will also collaborate with the promotional bodies of the Canton and Lake Geneva region, as well as with the neighboring French departments, to promote the development of a regional technological and industrial cluster.

Security

The State of Geneva will actively monitor technological developments in the field of drones and their usage, as well as detection and countering solutions. In collaboration with other security sector actors, it will develop proportionate responses to the new risks created by drones. Additionally, it will implement regulation that encourages management of the risks created by drone usage, and it will integrate private sector actors in the thought process, preparing them on how to face potential threats (espionage, malicious acts, terrorism).

Regulation

The State of Geneva will adopt a flexible risk-based approach, using the reference framework of the Federal Office of Civil Aviation (FOCA). It guarantees that its implementation will be respectful of citizens' data protection rights and of their private sphere. It will also promote public acceptance of this new technology through programs of information (rights of citizens and duties of operators) and by supporting pilot training.

Promotion

The State of Geneva will use drone-related skills and its pioneering spirit regarding this technology to promote the economic and scientific vitality of Geneva. It will support the organization of dedicated events as well as advanced technology tests.

At the Heart of the Autonomous Vehicle Revolution

From 19th century hot air balloons to scale models, many objects have already flown without humans on board. The convergence of a series of developments has, however, led to major changes. First, miniaturization means that onboard processing power is sufficient to fly autonomously and sensors can be embedded to retrieve information during flight. Also, stimulated by the surge in artificial intelligence, the willingness of companies to invest in data purchasing has created favorable conditions for the emergence of new services. Finally, the extended scope of missions are made possible by advances in battery technology and improvements in connectivity networks—radio, cellular, or satellite. This contributes to maximizing the use of drones over more traditional aerial solutions.

The creation of the upcoming Internet of (moving) Things, whether in the air, on land, or even in water, will result in profound societal changes. A strong positioning in the field of flying robotics will prepare for this transition, creating jobs and wealth. The objective is to put a virtuous circle in place that identifies and maximizes new opportunities for economic growth, while controlling and minimizing the ensuing risks. As a comparison: the automobile has democratized mobility and optimized trade; seat belts and roundabouts contribute to saving lives; and radar incites respect for speed limits.
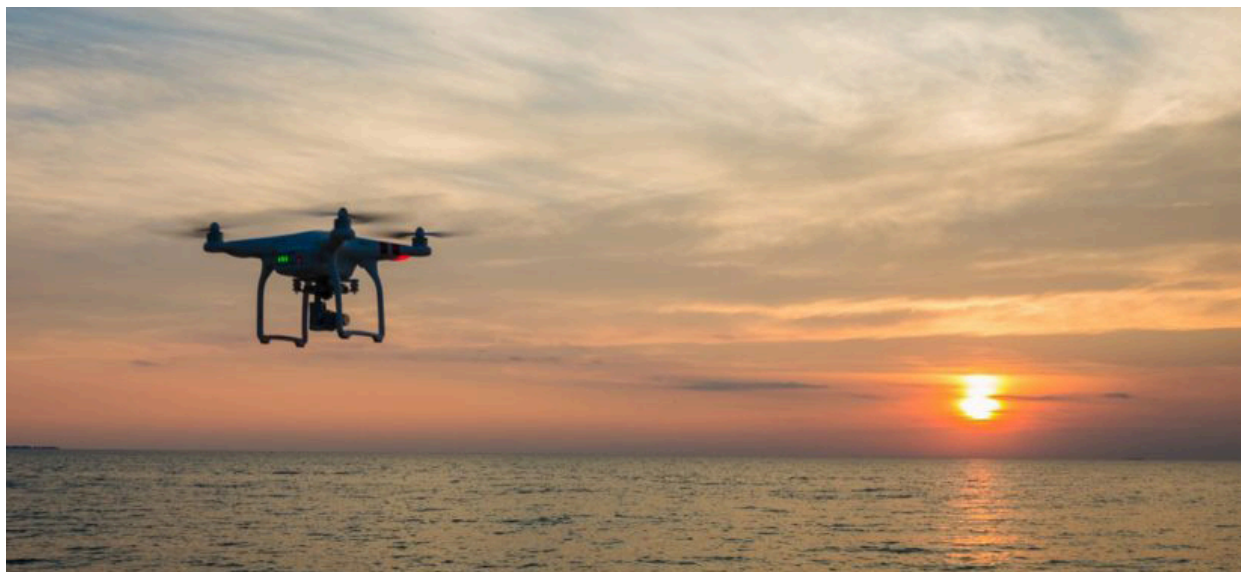
Geneva: a Unique Case

Geneva has a strong background in the field of civil aviation. At the very beginning of the 20th century, Genevan brothers Armand and Henri Dufaux wrote a chapter in the history book of pioneers of aviation.[1]

To this day, daring and creativity continue to abound in the Canton. These characteristics make Geneva a unique case, conducive to the development of safe and effective drone use.

The international airport is first and foremost a central player in any discussion about the use or operation of flying machines, autonomous or not. The national air navigation service provider SKY-

GUIDE's Geneva presence facilitates collaboration and exchange of information concerning the new challenges facing airspace management. Added to this is the favorable and flexible legal framework in aviation law, thanks to FOCA and its new Innovation Management Bureau. Similarly, sharing a border with France, another pioneering state in drone use and regulation, allows the prospect of cross-border operations. Geneva also benefits from a dynamic ecosystem in the canton of Vaud, where many drone companies and the National Centre for Competence in Research Robotics (NCCR Robotics) at the Swiss Federal Institute of Technology in Lausanne (EPFL) are headquartered.

The Canton of Geneva also has three strong traditions which strengthen its strategic position. First, humanitarian organizations are interested in the use of drones for mutual assistance or during disasters. The Swiss Foundation for Mine Action[2], the Red Cross, and a new arrival in the field of social entrepreneurship, WeRobotics[3], have genuine expertise in this field. Furthermore, as connected objects, drones will leverage the work of the standardization offices such as the Geneva-based ITU and ISO, or industry associations such as the Global UTM Association in Lausanne. Finally, the Canton

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1 See www.pionnair-ge.com/spip1/spip.php?article162
2 See www.drones.fsd.ch
3 See www.werobotics.org

has a well-established culture of aviation, with the presence of the International Air Transport Association (IATA) and the Société Internationale de Télécommunications Aéronautiques (SITA). It also hosts the annual European Business Aviation Convention and Exhibition (EBACE). The convergence of technologies related to autonomous vehicles was also showcased in a notable manner at the last International Auto Show (March 2017), when Airbus presented the world premiere of its multimodal mobility concept (wheels and flight): Pop.Up.[4]

Three structural elements complete this encouraging picture. First, being home to international organizations requires an immediate understanding of the problems and dangers related to drones, as does the presence of strategic and sensitive centers such as the Geneva Airport, prisons, Stade de Genève, and other venues. And, the border with France requires an international perspective with respect to custom control and the interoperability

between two countries that currently have different regulatory frameworks. Finally, being located at the tip of Lake Geneva enables activities above water, which are by nature less risky than activities above densely populated areas.

The presence of an ecosystem conducive to the development of this innovative technology means that one can look to the future with enthusiasm, with Geneva as a recognized and essential center in the field of drones.

Pierre Maudet
Geneva State Councilor

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4   See *www.airbus.com/newsroom/press-releases/en/2017/03/ITALDESIGN-AND-AIRBUS-UNVEIL-POPUP.html*

Drones - Challenges
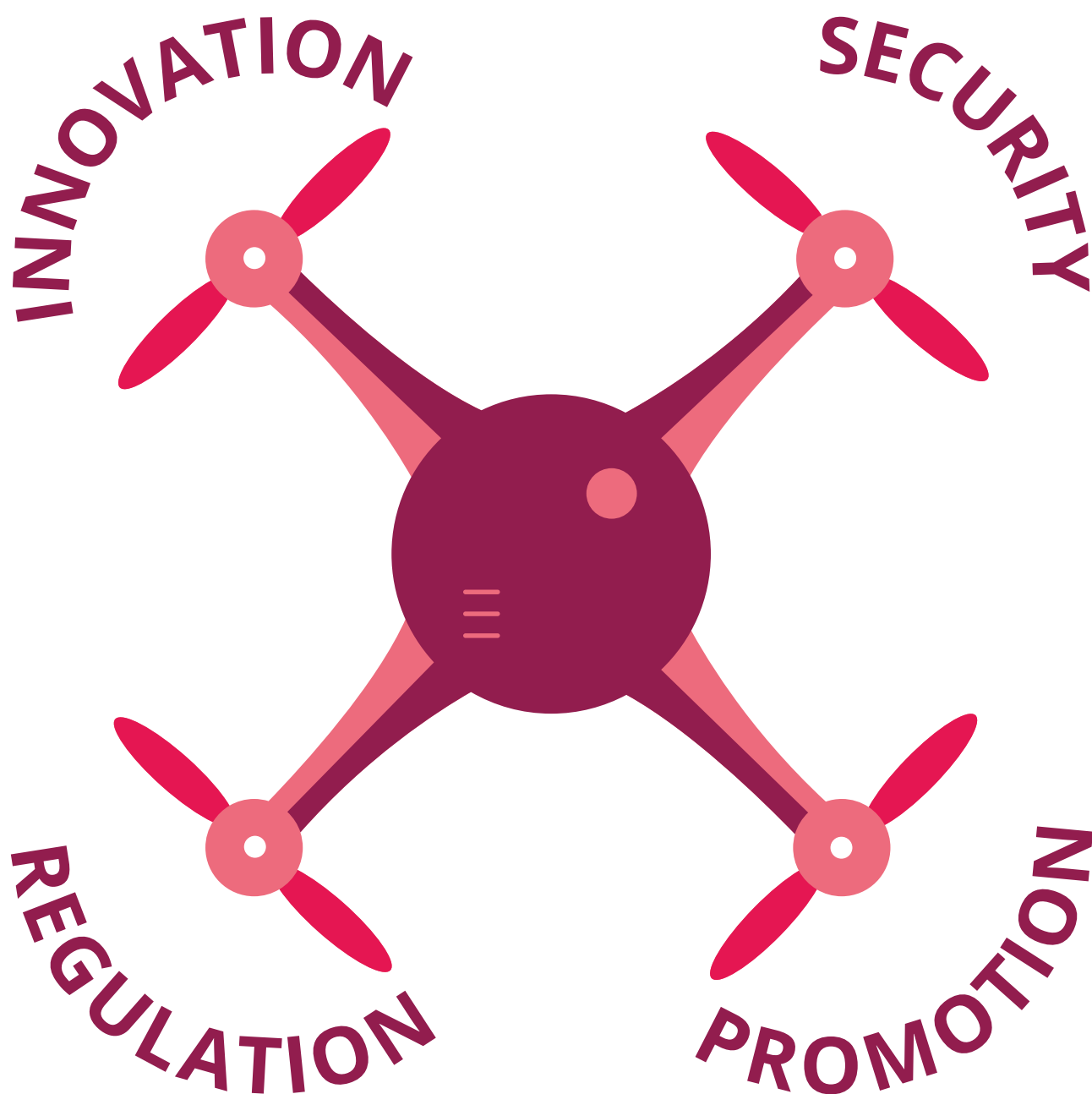
INNOVATION

SECURITY

REGULATION

PROMOTION

Illustration 1. Geneva drone vision pillars

Innovation

The establishment of a drone cluster in Geneva aims to stimulate direct and indirect economic opportunities and to encourage research and development in the field. Just as the mobile phone revolution has had many direct impacts (sales of mobile phones, connectivity subscriptions, and applications) as well as indirect ones (e-commerce platforms, mobile workers, and the sharing economy), drones will also enable the emergence of new professions and forms of work.

CREATION OF NEW SERVICES

- Drone manufacturers (senseFly, Flyability, Verity Studios)
- Components manufacturers (u-blox, Flarm, Terabee)
- Accessories manufacturers (MotionPilot)
- Publishers of drone-acquired data management software (ESRI)
- Data-handling software editors (pix4D, Gamaya)
- Management and surveillance software editors (Skysoft-ATM)
- Infrastructure and systems management for operators (Swisscom, skyguide)
- Drone insurers and related activities (Swissre)
- Energy generator (Skypull)
- System certification (SGS)

IMPROVEMENT OF EXISTING ACTIVITIES

- Aerial Imagery: photographers, reporters, filmmakers, real estate agents
- Measurements: surveyors, engineers (civil engineering, energy, etc.), farmers
- Data management: geodata analysts, geodata scientists
- Observation, surveillance and research: firefighters, border patrols, police, environmental patrols
- Protection, interception, fines: police officers, safety & security officers
- Entertainment: drone races, drone shows
- Transport of persons and goods
- Insurance

Table 1. Drones economic impact

Geneva, by its geographical situation, airport infrastructure, and international organizations, is complementary to the center of expertise in drone technology that has built up around the EPFL in Lausanne. Pix4D, senseFly, and Flyability, to name a few, are internationally recognized flagship names in the drone industry that attract talent to the region. Palexpo is in an ideal location to host various types of conferences, exhibitions, and activities related to the drone economy (business applications, protection measures, traffic management, standardization, enabling technologies, cybersecurity, insurance). Similarly, the presence of LemanTech Labs in Gland, or the World Air Sports

Federation in Lausanne, provides all the skills to organize international drone races indoors (Palexpo, Geneva stadium) or outdoors (Plaine de Plainpalais, Bout-du-Monde sports center).

In order to contribute to a healthy environment, it is important to support companies that develop or offer "native" drone services, such as schools for operators or aerial photography services, surveillance, measurements, inspections of infrastructure, agricultural management, drone shows, deliveries, or transportation of persons by drones. In order to encourage these activities in a dynamic way, support for innovators could be put in place
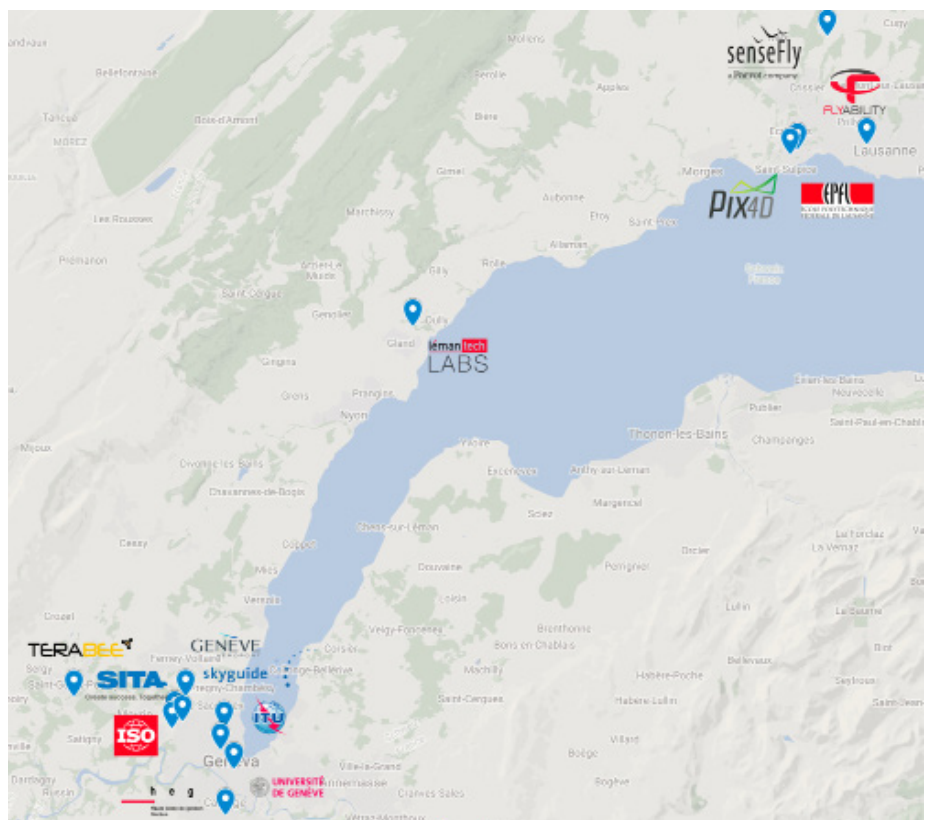

Illustration 2. Drone stakeholders in the Geneva Lake area

through existing structures (Fongit) or direct support via the purchase of services by the State. It is also important to involve the Geneva higher education schools (UNIGE, HESGE) in the development of applied research projects, targeted studies, and training.

Recommendations

STATE AS USER

- Encourage State departments to use drones (services, rentals, acquisitions)
- Support drone demonstration projects to validate, learn, raise awareness, and plan
- Monitor technological developments in drone data management systems

POLITICAL SUPPORT

- Include drones among the priorities of the economic promotional bodies
- Approach successful event organizers and invite them to Geneva
- Organize public meetings to inform, increase awareness, and exchange best practices
- Take part in ethical and socioeconomic debates (University of Geneva, international organizations, NGOs, etc.)

QUANTIFICATION AND TRANSPARENCY REGARDING THE IMPACT OF DRONES

- Systematically measure the impact of drones used for operations carried out by, or for, the State in terms of security for the parties involved, speed of execution, and environmental and financial impact
- Allocate support, or introduce restrictions, on certain types of transactions based on objective criteria collected on the ground in order to improve their effectiveness and efficiency

Security issues relating to drones can be described at several levels. First, as with any mechanical object, drones can be a source of incidents and accidents. The shock caused a drone crash in the city center in September of 2014 testifies not only to this risk, but also to the concerns that it raises among the population[5].

Above and beyond the risk of accidents, many acts of incivility or illegal acts are the result of ignorance about the regulations in force or the minimization of the risks posed by drones. Certain illegal acts are also related to the powerful and affordable sensors that can be mounted on a drone (invasion of privacy, espionage). Finally, offenses related to the physical actions of drones (disturbance of a public event, delivery of equipment to prisons, terrorist acts) are rare occurrences, but they can cause important financial damages and negatively impact Geneva's image.

Training pilots and informing the public are the main responses for addressing improper use of drones. Caution while flying drones should be compelled, and the emphasis should be on personal responsibility in cases of incivility or any adverse outcome, as it is for car owners. With regard to unlawful or even illegal acts arising from voluntary or involuntary actions, offenses are already covered by federal or cantonal regulations. Currently, no miracle solutions are available to cope with these challenges, especially since the technology is moving forward faster than regulation.

It should be noted that to date, actions in airspace are a prerogative of the armed forces. Even today, police forces (principle of subsidiarity) cannot develop the means of action other than for light drones, that is to say, drones that weigh less than 150 kg, or category I of the NATO classification.[6] It is new for the police to intervene in the third dimension; therefore, police force training must be at the heart of protecting the population (prevention, deterrence, repression). A vision that includes the resilience of all concerned stakeholders (politicians, population, tourists, businesses) regarding drone-related incidents is essential.

5   See www.tdg.ch/geneve/drone-s-ecrase-pleine-rue-plainpalais/story/12264381

6   See www.researchgate.net/figure/305760970_fig1_Figure-1-NATO-UAS-Classification-1-2

Recommendations

AWARENESS AND ACCOUNTABILITY

•   Inform the public on the appropriate response when a drone seems to engage in unlawful or even prohibited activity

•   Require drone users to consult information services about restricted-access or prohibited flight areas (see illustrations 3 and 4 below)

•   Remind drone operators to follow the environmental, noise, and privacy rules

•   Encourage a virtuous circle of best-practice exchanges within the drone community (Internet site, dedicated sessions, self-regulation)

•   Warn users about the dangers of modifying their drone hardware or software

•   Systematically prosecute abuses through FOCA and other qualified authorities

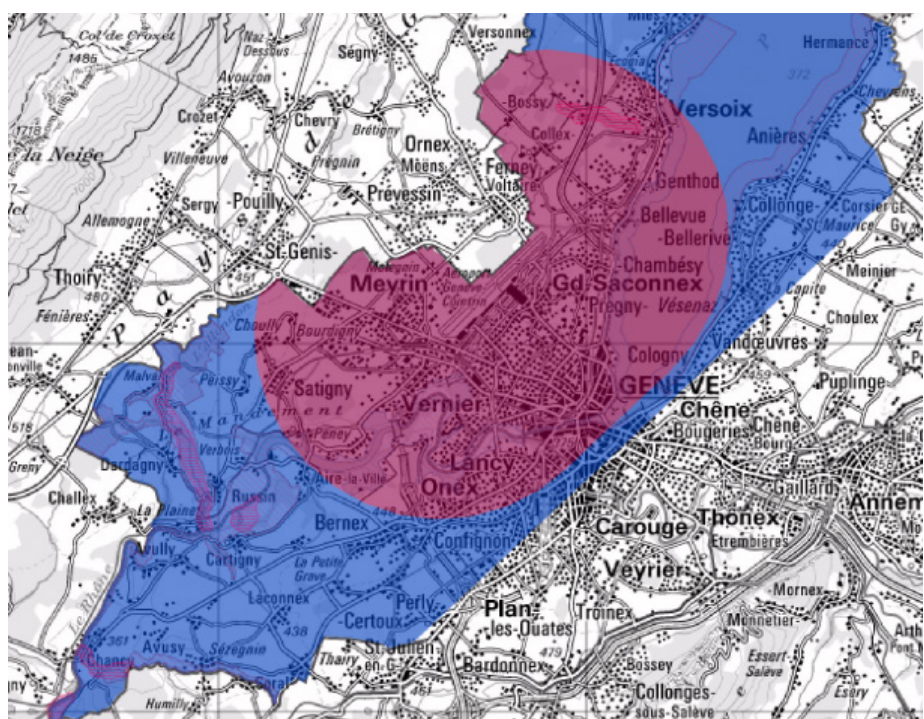•   Link these recommendations with the Safety and Security Strategy of the Canton of Geneva[7] (March 2017)

Illustration 3. View of drone restricted and prohibited areas provided by FOCA[8]

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7 See www.ge.ch/dse/doc/news/170315_DSE-Brochure_strat_securitaire.pdf
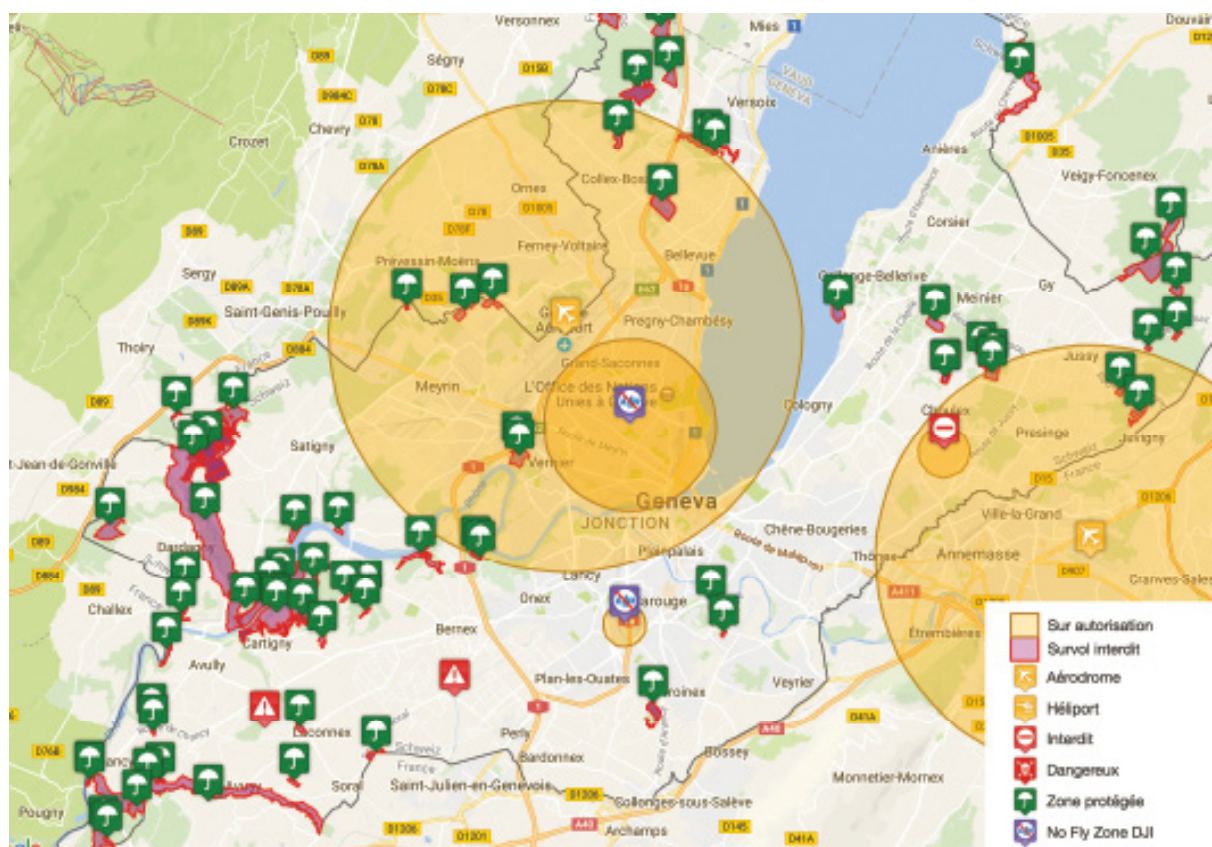*8 See www.map.geo.admin.ch/?layers=ch.bazl.einschraenkungen-drohnen*

Illustration 4. Map provided to its members by the drone association Airshoot.ch, based in Geneva

DEVELOPMENT OF NEW BLUE LIGHT SERVICES

•   Train and coordinate blue light and State services on drone usage in their respective areas of intervention

•   Participate in events to inform and educate the public and drone users

•   Monitor cutting-edge anti-drone technologies and practices

•   Inquire into, provide training for, and acquire efficient anti-drone systems

•   Conduct investigations into drone offenses and accidents

•   Encourage interoperability among key partners (Swiss Air Force, REGA, etc.)

•   Train drone experts in the use and practice of various regulations and laws specific to data protection and to air transport with the support of partners such as FOCA or the Public Ministry.

•   Establish standards and internal directives with regard to the qualification and areas of intervention of drones and anti-drone measures

PROTECTING INFRASTRUCTURE

•	Develop a strategy for the protection of sensitive sites in relation to the risks and threats associated with misuse (intentional or unintentional) of drones

•	Inform the public about sites that are prohibited from, or protected against, the presence of drones with the display of appropriate pictograms

•	Carry out regular monitoring of the vulnerability of sensitive infrastructures such as the Geneva Airport, prisons, or Geneva international institutions by adapting procedures and taking into account the evolving capabilities of drones (new risks and threats)
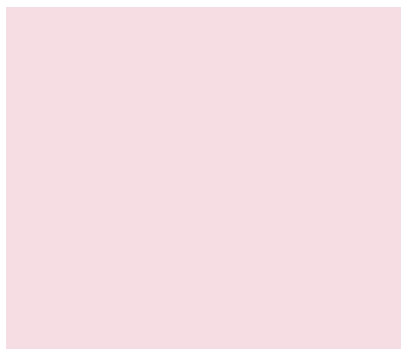
Regulation

Drones are not immune to a general trend in which new technologies develop so quickly that regulators cannot keep up. The risk-based approach of FOCA, rather than the regulation of operations or technologies, is an effective and flexible response to this challenge. The Swiss way has been recognized internationally and taken up at the European level[9], and its pragmatism provides Switzerland credibility among other regulatory agencies. Also, it is enhanced by pioneering acts such as the authorization of flights outside the pilot's visual line of sight or for the transport of goods, particularly in urban areas.

In parallel to these favorable conditions internal to the country, encouraging progress at the European level came to light in the wake of the "Drone Conference" in Warsaw in November of 2016. The European Commissioner in charge of the question has announced willingness to establish, as early as 2019, areas where drone traffic will be harmonized and secured through a series of services grouped under the name U-Space[10]. Initially, U-Space would be composed of three local services that must be interoperable across the continent: a registry of drones and operators, a system of in-flight drone identification, and a database including flight restriction areas (geofencing).

The Geneva State Council has already taken action: adopting, as early as May of 2015, a modification to the regulations affecting the implementation of federal aviation law covering civilian drones. These changes enforce a 300-meter minimum distance from public buildings, as well as the possibility to declare temporarily restricted flight areas[11].

Regarding the protection of privacy and issues relating to CCTV, the federal commissioner for data protection and transparency has issued recommendations related to the federal law on data protection (LPD; RS,235.1) applicable to the use of drones[12], in particular by private individuals. The use of drones by cantonal administration services is already being studied in preparation of the development of an appropriate legislation (LIPAD; A 208) that will guarantee citizens' data protection rights and their private sphere.

Above and beyond the aforementioned developments and benefits, it is useful to note that the tools for the detection of misdemeanours or offenses committed by drone operators, as well as means of intervention, are lacking or are not yet effective. Application of both the cantonal regulations and federal laws will be greatly facilitated by the establishment of the previously mentioned U-Space services.

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9   See www.easa.europa.eu/document-library/general-publications/concept-operations-drones

10   See www.ec.europa.eu/commission/commissioners/2014-2019/bulc/announcements/
speech-commissioner-bulc-drones-conference-warsaw_en2

11   See www.ge.ch/legislation/rsg/f/rsg_h3_05p02.html

12   See www.edoeb.admin.ch/datenschutz/00625/00729/01171/01326/index.html?lang=fr

Recommendations

Innovation

Security

Regulation

Promotion

DEVELOPMENT OF A STRATEGY FOR REGULATORY MONITORING

• Monitor the developments of the regulatory framework at national, European, and world levels (FOCA, EASA, ICAO) through active monitoring

• Internally enforce the use of international standards to ensure interoperability with neighboring regional systems and users of foreign drones

• Make Geneva the home for standardization of drone technologies by organizing meetings between relevant bodies

• Promote interoperability between the different parties flying in uncontrolled airspace (helicopters, intervention drones, paragliders)

SCANNING AND PUTTING PUBLIC INFORMATION ONLINE

•	Develop a strategy for dynamic updating of geofencing information (critical infrastructures, large events, blue light services intervention zones)

•	Publish maps and 3D data that are adapted to the needs of drone navigation as well as any other geographical data useful to the drone cluster and to the public

•	Establish a strategy for the provision and permanent updating of national and cantonal regulations in electronic form for drone manufacturers, aiming to integrate them to their operating software (regular updating of noise levels limits, restricted flight areas)

ENCOURAGE BEST PRACTICES

•	Support measures for training professional pilots and informing enthusiastic amateurs

•	Anticipate indoor drone use for professional or recreational purposes (for example a "drone ballet" in a theater or over the lake as part of a public event)

Admis sans autorisation

Remote piloting of multicopters with a total weight of less than 30 kg, providing the pilot maintains direct visual contact with the device

Multicopters operated on aerodromes for scale model aircraft or official participation at an aeronautical demonstration

Multicopters operated outdoors and in residential areas at a distance from gatherings of people (assembly of more than 24 persons). Respect privacy!

# Admis uniquement avec autorisation

Multicopters controlled with the help of video glasses without a second remote pilot maintaining the multicopter in his or her field of vision

Multicopters whose total weight is more than 30 kg

Multicopters operating at less than 100 m from a gathering of people outdoors, except in the framework of a public aeronautical demonstration or at a scale model airfield
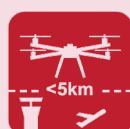
Multicopters operating at less than 5 km from a military or civilian airfield (in this case, authorization is granted by the head of the airfield or by skyguide—air navigation service

Illustration 5. FOCA drone flyer (translated from French)[13]

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13 Available at www.bazl.admin.ch/bazl/fr/home/bonasavoir/drones-et-modeles-reduits.html

More and more public and private players are using drones to improve the quality of their services while reducing the risks for employees (for example, using a drone to inspect a roof or inspect a telecommunications mast) and reducing operational costs. Contacting early adopters in Geneva will provide understanding in regards to their rationale, the means they have implemented, and what needs to be done to help them achieve their objectives quickly, legally, and safely. Exposing the Geneva drone cluster through the media, and/or conferences, will be an effective way to promote the region as a center of expertise and for gaining public acceptance (drones save lives, create new opportunities, reduce costs). The advancement of the regional drone cluster must also be done through existing multi-party organizations specializing in new technologies, such as Alp ICT.

Drones can also serve to highlight the spirit of openness and the ability of Geneva's State services to adapt and guide innovation. When a public service uses drones, or calls upon a service provider, it

will be encouraged to share its knowledge and experience with other stakeholders of the cluster.

As an important tourist region, Geneva also has the opportunity to lead the way forward when it comes to educating drone users from outside the country (media, filmmakers, tour operators), who must be informed about the regulations and the services available during their stay: "Geneva welcomes responsible drone operators."

Another element of promotion strategy is access to a wide range of quality infrastructures in Geneva. Support for the organization of events related to drones in Geneva (dedicated conferences, conventions, drone fairs, drone races, shows, open days) should become policy and should be actively encouraged by the State Council.

In the same way, acceptance and support for live tests in Geneva with state and private-business sector stakeholders, as is already practice abroad, constitute

an opportunity to position Geneva as a leader in the development of drone-related solutions (testing anti-drone measures, implementing delivery services, inspecting infrastructures). The results and lessons learned from these experiments will help with the public's acceptance of drones, best practices, and the consequent risk reduction, as well as better adoption of standards. Furthermore, learnings will be exchanged and put to good use by other actors, improving the effectiveness of the drone ecosystem and reinforcing the four pillars set out in the State of Geneva's drone strategy.

Good media coverage highlighting these various events will contribute to follow-on activities and to the success of the various innovative projects.

Recommendations

CENTRALIZATION OF INFORMATION RELATING TO DRONES

• Create a virtual information desk open to all (users, population, tourists, media) to answer questions and collect feedback about drones

• Identify and publicize the successful use of drones in various fields

• Publish statistics on the use of drones

• Leverage the Land Information System of Geneva for all geographical data

PUBLIC RELATIONS

• Publish press releases on drone-related actions and activities

• Create an information leaflet "Geneva welcomes drone doers and users" on official websites (www.ge.ch, www.geneve.com et www.gva.ch), and at airport terminals

• Coordinate promotional and economic visibility activities withwww.alpict.com

SUPPORT FOR FLAGSHIP EVENTS

• Political support for drone conferences, exhibitions, forums, and races

• Encourage the holding of innovative tests in urban areas by creating favorable conditions with the support of state services and of Geneva's land information system (like the example in Canton Ticino for package delivery between hospitals with the participation of the Swiss postal services)

PROMOTE AN OPEN REGION

• Advertise Geneva's drone vision and strategy abroad

• Develop the necessary information and support to facilitate the operations of foreign drones users

• Foster the interoperability of solutions, the exchange of information with neighboring regions, and meetings in both Switzerland and France at all the levels necessary to advance the issue
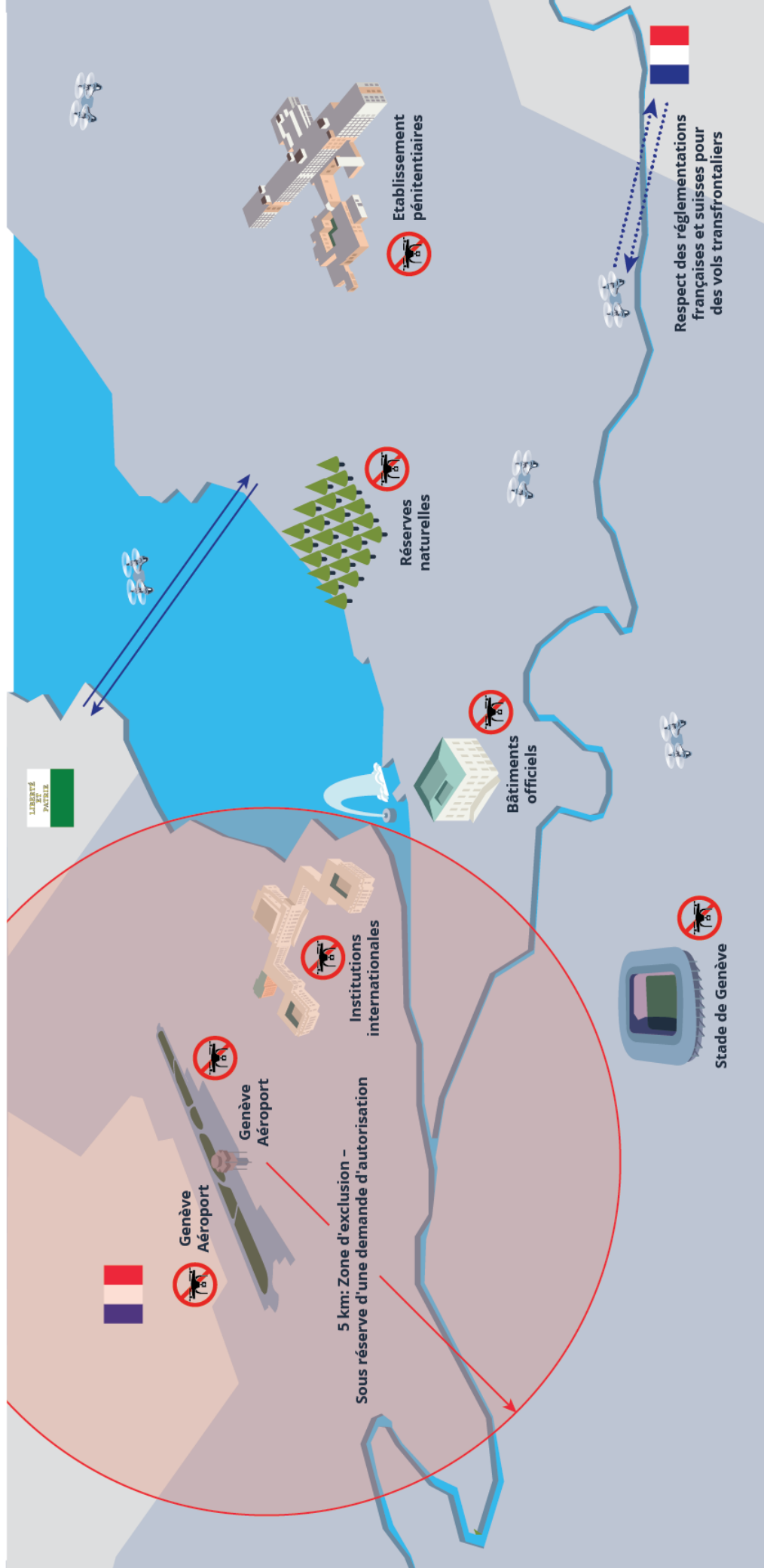
Towards a Geneva Drone Cluster

In 2019, 100 years after the creation of the airport, the State of Geneva will develop adequate infrastructure and services for the profitable, safe, open, and leading integration of drones into the skies of Geneva. Swiss contributors are already collaborating to demonstrate a solution that covers all the basic services. Skyguide works closely with FOCA and the Global Association UTM, as well as with manufacturers, operators, and

Geneva authorities for the development of a drone traffic management solution. The Geneva region has all the necessary skills, infrastructure, and experience—as well as a vision shared by public and private stakeholders. All are ready to play a pioneering role in the establishment of the drone economy and the development of innovative digital services based on data from the land information system of Geneva.

Drones - Vision of the Republic and Canton of Geneva

November 2017

(Illustrative and non exhaustive diagram)

REPUBLIQUE ET CANTON DE GENEVE

POST TENEBRAS LUX

Etablissement pénitentiaires

Respect des réglementations françaises et suisses pour des vols transfrontaliers

Réserves naturelles

Bâtiments officiels

LIBERTÉ ET PATRIE

Institutions internationales

Genève Aéroport

Genève Aéroport

Stade de Genève

5 km: Zone d'exclusion – Sous réserve d'une demande d'autorisation

Use of drones in Geneva must follow the rules listed below:

- General regulations established by FOCA: www.ofac.admin.ch
- Cantonal regulations concerning the implementation of the federal aviation law: www.ge.ch/legislation/rsg/f/rsg_h3_05p02.html
- Authorisation applications must be addressed to the Geneva Cantonal Police: +41 (22) 427.55.60

For more information, please visit drones.ge.ch

Applicable regulations in France: www.service-public.fr/particuliers/actualites/A11062

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

office fédéral de l'aviation civile OFAC

POLICE GENÈVE

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