Highlights 2019

-33 500 t/y CO₂
Improved arrival management

-200 MWh/y
New “Smart Radio” system

+37.4%
Energy efficiency since 2006

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People today are more mobile than ever. Worldwide air transport volumes have quadrupled since the 1980s. And they continue to grow at a rapid pace, especially in other parts of the world such as China and India.

The rising volumes of air transport flights are contributing to advancing climate change. Aviation presently accounts for 2% to 2.5% of the world’s total carbon dioxide (CO2) emissions. Technological improvements, aircraft fleet renewals and enhanced operating efficiencies have mitigated the adverse effects of the growth in air traffic volumes to a certain extent. But more efforts are needed here, given the current forecasts of further traffic growth.

Skyguide regards protecting the environment as an integral part of its mandate and mission, and consistently implements its environmental strategy. On the ground we invest in efficiency enhancing measures; and in the air we strive to provide even better air traffic handling. Our actions are having their effect: between 2006 and 2019, skyguide improved its energy efficiency by over 37%. By optimising some 60 flight routes over Switzerland, we have also substantially reduced the CO2 emissions of airspace users. And parallel to this, we are actively involved in various European projects to enhance the entire air traffic management system’s ecological credentials.

According to Eurocontrol’s estimates, air navigation services providers (ANSPs) have an influence over about 6% of Europe’s air traffic emissions. The greatest reductions here can be achieved by optimising flight routes. Once this has been done, the various interests involved should be reappraised: CO2 emission targets are sometimes less than wholly compatible with other concerns, such as lowering noise levels; and because of such conflicts, ANSPs – skyguide included – cannot always fully exploit their operational improvement potential.

We at skyguide are dedicated to working with our partners and our customers to make our flight procedures as efficient as possible, in the interests of safety and of the environment. And by constantly further refining our Environmental Management System and implementing our green innovations – such as using drones for our calibration flights – we aim to continue to make a tangible contribution to further easing the impact of aviation in ecological terms.

Alex Bristol
CEO skyguide

skyguide.ch/CEOinterview
Environmental strategy: a twin-track approach

Sustainability and protecting the environment have always been prime Skyguide priorities. The company is committed to reducing the impact of its business and operations in ecological terms. And it has defined two strategic pillars to achieve its environmental objectives:

1. Skyguide handles air traffic efficiently to help reduce the CO2 it generates as much as possible. The more direct its route, the less impact a flight will have in environmental terms.

2. Skyguide ensures efficient energy use in its premises and facilities, to minimise its own environmental footprint.

For both these pillars, Skyguide has defined action areas and associated measures, which it constantly promotes and monitors under its Environmental Management System. Its foundations in doing so are provided by the relevant Swiss and European environmental provisions. Close collaboration among all the parties involved is also an essential element in optimising the overall system.

The global aviation sector has been improving its energy efficiency for years. But additional actions are still required to offset the CO2 emissions caused by growing air traffic volumes. Skyguide aims to play its part here, by developing green innovations.

The Skyguide Green Team

Skyguide has created its own interdisciplinary “Green Team” to ensure that all national and international environmental targets are duly and fully respected. The team, which was established in 2014, meets regularly and reports directly to the Skyguide Executive Board. With the team’s broad-based approach, Skyguide can ensure that environmental concern and responsibility are firmly anchored in all parts of the company and its activities.
The aviation community has substantially reduced its CO₂ emissions per flight over the past few years. But air traffic volumes continue to grow and, as a result, so do their CO₂ emissions in absolute terms. So further climate protection measures are needed to minimise the impact of this continued traffic growth.

The amount of fuel that an aircraft consumes on a particular flight will depend to a large extent on the route the flight follows from takeoff to landing. Air traffic control can influence this. Skyguide has identified three action areas here: optimised routes, new flight procedures and efficient traffic management. And in each of these areas, the company has defined a number of measures that it is now taking, in collaboration with Swiss and international partners.

The efficiency of Europe’s air navigation services providers is monitored by the Single European Sky initiative to unify the continent’s airspace. And it does so by means of its horizontal flight efficiency (HFE) metric, which measures the difference between the shortest possible flight route between two points and the route actually flown. For 2019 the FABEC functional airspace block, to which skyguide belongs, achieved an HFE of 3.32% – a level which was broadly unchanged from the previous year, but which failed to meet the 2019 target value of 2.96%. Switzerland’s individual contribution to FABEC’s overall HFE amounted to around 4.60%. This is largely attributable to the current measurement method, which combines Switzerland’s performance with a network performance (for further information here, please see the remarks on Page 9).

**Shorter routes over Switzerland**

Shorter flight routes mean lower fuel consumption. And this is why skyguide is steadily developing an extensive network of direct routes for flights through Switzerland’s airspace. These more direct routes shorten flying times, ease airspace pressure and reduce aircraft weights, since less fuel needs to be carried. Skyguide has made over 60 optimised route segments available to airlines in the last five years.

**Promoting energy-efficient flight operations**

![Diagram showing energy-efficient flight operations](image)
The higher the altitude, the greater the energy efficiency
Vertical flight profiles affect environmental impact, too: the energy efficiency of an aircraft in flight is strongly influenced by the altitude it is flying at. At higher flight levels, the air resistance is lower. So the higher an aircraft flies, the lower its fuel consumption will be, and thus also its CO2 emissions.

Skyguide has concluded an agreement with its neighbouring ANSPs that enables vertical flight profiles to be aligned more flexibly to seasonal variations in air traffic volumes. In the past, aircraft have been passed from one airspace area to another at fixed points, regardless of the current utilisation levels of the airspace areas concerned. The new collaborative model will enable aircraft to remain longer at their optimum flight levels at times of low traffic volumes, and thereby fly more efficiently in energy terms.

Continuous instead of stepped descents
Skyguide is constantly further refining its flight procedures together with its customers and partners. The continuous descent approach or CDO is now an established approach procedure which allows an aircraft to descend for landing with minimum engine thrust. CDO is particularly energy-efficient compared to the stepped approach alternative.

Many pilots today will adopt the continuous descent procedure not only for the approach but from farther out, too. This enables them to delay the start of their descent; and this means they can remain longer at higher altitudes, with a corresponding reduction in their flight’s fuel consumption.

The full potential here is yet to be exploited. Eurocontrol has calculated that an additional 340,000 tonnes of fuel – and thus 1.1 million tonnes of CO2 emissions – could be saved per year in Europe if all airspace users adopted energy-saving approach and departure procedures. Skyguide is a member of a Eurocontrol working group that is striving to further increase the use of the procedures concerned.

More efficient flight procedures
Satellite navigation offers environmental benefits, too. The use of such technology enables flight routes to be set independently of ground facilities and thus more flexibly. And this means more efficient routes with less fuel consumption and lower CO2 and noise emissions. It also means that ground navigation aids can be dismantled, with the areas they occupied returned to nature and with resulting energy savings, too. To date, skyguide has adopted over 200 satellite-based approach procedures. Some 110 of these are in airport terminal control areas such as around Zurich, Geneva, St. Gallen-Altenrhein and Les Eplatures or are for helicopters such as at Bern’s Inselspital, while a further 90 have been adopted for upper airspace areas.

Less congestion aloft
Optimised approach sequences ensure fluid air traffic movements before the landing phase and help to avoid congestion aloft and the resulting holding patterns. Skyguide has worked with its airline customers at Zurich Airport to introduce XMAN (see Page 7), a new arrival management system that now extends to a radius of 160 kilometres. Under XMAN, flights heading for Zurich will adjust their speeds while still in adjacent airspace to ensure well-coordinated arrivals. The radius of the XMAN programme should be extended to 360 kilometres by 2023.

Assigning arrival slots to every aircraft heading for Zurich Airport is also having a positive impact in environmental terms. Here skyguide has been working with SWISS and airport operator Flughafen Zürich under SESAR’s Atlantic Interoperability Initiative to Reduce Emissions (AIRE) programme, which is helping to improve the efficiency of transatlantic flights destined for Zurich Airport. AIRE has already reduced the holding times for such flights by 90%, which translates into annual CO2 emission reductions of 2100 tonnes (see also iStream, Page 7).
Direct routes
Skyguide has established some 60 optimised flight routes in its airspace since 2015. One example: time and fuel savings in the Geneva area by using a direct route between Pontarlier (Jura, Switzerland) and Chambéry (Savoie, France).

XMAN: optimised arrival sequences

Previous situation

iStream: assigning arrival slots

iStream:
assigning arrival slots

2.1 kt/year

700 t/year

1.7 kt/year

527 t/year

kerosene consumption

CO2 emissions

kerosene consumption

CO2 emissions

AMIKI

ZRH

ZRH

GIPOL

GIPOL

AMIKI

Previous situation

Direct routes

Direct route

2.1 kt/year Situation

Direct route

2.1 t/year Situation

Direct route

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AMIKI

Previous situation

Direct routes

Direct route

2.1 kt/year Situation

Direct route

2.1 t/year Situation

Direct route
Global challenges demand global solutions
Climate change knows no national borders, which is why it can only be tackled with a global approach. Skyguide is involved in a number of international programmes that are designed to improve the environmental credentials of the entire aviation system.

The company is an active participant in the development and adoption of various SESAR initiatives. As the research arm of the Single European Sky project, SESAR is seeking to bring greater harmonisation to the continent’s various air traffic management services. SESAR is also pursuing the ambitious goal of reducing air traffic emissions by 10% through the adoption of new procedures and technologies.

Skyguide is also a member of the FABEC functional airspace block, which consists of the airspace of Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland. Together with its FABEC partners, skyguide defines and introduces international direct routes through the airspace concerned. This particular drive should be a cornerstone of Europe’s future air traffic management, enabling pilots to freely select their upper airspace routes between predetermined airspace entry and exit points and thereby achieve substantial savings in their fuel consumption.
Sustainable solutions demand precision measuring tools

How much has a flight deviated from its shortest possible route? This metric – which is known as horizontal flight efficiency or HFE – is the prime criterion by which the Single European Sky (SES) programme assesses the efficiency of Europe’s air navigation services providers. But HFE pays no regard to factors that may influence this figure yet are entirely beyond any ANSP’s control, such as increased capacity requirements, meteorological conditions, short-notice route changes by the airspace user or military activities in some airspace areas.

The present HFE approach measures these extra route distances at the wrong point in the process. As a result, many ANSPs today exhibit inefficiencies that originate beyond their sphere of influence or control. In view of this, it is not surprising that FABEC, the functional airspace block in the heart of Europe to which skyguide belongs, reported an HFE for 2019 of 3.32%, well above the target of 2.96% which it had been set. Because of its central location, FABEC “inherits” a particularly high volume of network inefficiencies elsewhere. The same is true of Switzerland, which, if only those flight routes within Swiss airspace were considered, would post a relatively strong HFE result.

There is still scope for improvement, though. For Switzerland, this is primarily to be found in the adjacent areas of German, French and Italian airspace that have been delegated to skyguide’s control. Estimates suggest that further traffic flow enhancements in these areas would help reduce CO2 emissions by more than 100,000 tonnes a year. But conflicting interests are making it difficult to implement the desired improvements in the areas concerned.

SES aims to reduce the environmental impact of air traffic by 10%. This is to be welcomed. But if it is to be achieved, measuring instruments must be adopted that reflect the realities of the situation, to give greater comparability to the results they produce. Skyguide is working with its FABEC partners to further develop the tools required to measure flight efficiency. Because this is the only way to achieve the sustainable improvements sought.

Thierry Brégou
Head of Environmental Affairs, skyguide
Airspace congestion solution earns an eco-award

Time and again, the airspace around major international airports is inundated by the air traffic using it during peak operating hours. With more aircraft arriving than are able to land, many flights are diverted into temporary holding patterns. Which means delayed landings, longer flying times and more CO2 emissions.

Greater international collaborations among all the parties involved have already led to tangible improvements in the arrival management at busy airports in the past few years. The approach traffic flows better, and congestion has been eased. The cross-border arrival management tool that skyguide uses at Zurich Airport currently covers 75% of the airport’s inbound flights.

Its range of action is set to be extended, too, to bring even greater efficiency to Zurich’s arrival traffic management. And this is the objective of the xStream project, in which skyguide is participating together with various further European ANSPs, airlines and research institutions.

2019 saw the xStream project participants conduct extensive trials of a new approach procedure at various airports including Zurich, Frankfurt, London and Paris. In addition to providing more reliable forecasts and greater plannability, the new system should also permit more effective prioritisation of the flights being handled. Sometimes, a few minutes of better punctuality can be all it needs for a flight’s transfer passengers – who may be in their dozens – to make their onward connection.

Thanks to the trial’s positive results, the project partners now plan to introduce the procedure at 24 major European airports by 2024. The xStream project also earned broad international recognition in December 2019 when it was honoured with the ATM Award in the “Environment” category.
Finding the right compromise

Environmental issues must often compete with other interests in the aviation world. While airport area residents usually have aircraft noise as their prime concern, airspace users will tend to make efficient air traffic handling their number-one priority. Elsewhere still, reducing pollutant emissions often tops the demands.

Additional developments can often hinder the provision of more direct and thus more efficient flight routes. The steady increase in air traffic volumes, for instance, requires greater airspace capacities. At the same time, new airspace users such as drone operators are putting new demands on air traffic management.

When it comes to route planning, costs are also a major consideration. Airlines will accept a longer routing if the fuel procurement savings exceed the additional fuel consumption. Which is why, time and again, conflicts will arise between noise, capacity and cost considerations and environmental concerns.

Finding a middle way is not an easy task. In all its discussions with customers, partners and the authorities, skyguide consistently champions safe and efficient flight procedures. But at Zurich Airport in particular, complex procedures and longer routings are being developed, in the interests of noise abatement.

The Zurich Airport operating concept switches several times a day between northerly, easterly and southerly approaches. During the day, most takeoffs are on Runway 28, with landings on Runway 14. Runway 16 is also partially used, for both arrivals and departures. But the intersecting runways and the need to avoid flying over densely populated areas create multiple crossings on the ground and in the air, which only add to the operating complexity.

The state of affairs in Zurich is not without its ramifications, for flight operations and the environment alike. Well-balanced solutions here can only be achieved through an intelligent collaboration among all the partners involved. And this is what skyguide seeks daily to ensure.
Skyguide is also determined to optimise its own energy consumption, and is an active participant in the “Energy Strategy 2050” of the Swiss Confederation. To this end, the company constantly adopts actions under the Confederation’s “Exemplary in Energy” initiative. With success, too: despite increasing automation, skyguide raised its energy efficiency by 37.4% between 2006 and the end of 2018 – over ten percentage points more than the initiative prescribes.

It was to lower energy consumption, raise energy efficiency and promote the use of renewable energy sources that the Swiss Federal Council approved its “Energy Strategy 2050” in 2013. Skyguide was also involved in developing the associated range of energy-saving and energy efficiency actions.

The company is particularly active in three key areas: buildings & renewable energy, mobility and data centres & green IT. For several years now, skyguide has been promoting some 36 different actions, 80% of which it seeks to have implemented by 2020. By 2019 the degree of implementation had already reached 79.9% (compared to 76% for the previous year). Skyguide expects to exceed its 80% target in 2020.

**Buildings and renewable energy sources**

The “Buildings and renewable energy” action area covers all the actions designed to ensure energy-efficient construction and conversions, obtaining electricity and heating from renewable energy sources and eco-power procurement. Some 80% of the actions here had been taken at skyguide by 2019.

**Energy-efficient buildings**

With the gradual refurbishment of the Geneva computer centre by 2020, skyguide will have fully exploited its potential for optimising its current energy use. The Dübendorf operating centre, which was completed in 2009, is among the newer generation of energy-efficient buildings. In addition to purely structural insulation features, the centre features motion sensors to control the lighting and air-conditioning, light sensors to activate the blinds, efficient lighting, extracted air heat recovery, a smart centralised building management system and the re-use of the heat from the computer centre, all to reduce energy consumption in all areas. By bringing its Dübendorf centre into operation, skyguide improved its energy efficiency by 43%.

Skyguide expects to exceed the goals set in 2020.

**Latest-generation radio equipment**

For the communications between its air traffic controllers and pilots, skyguide currently uses a radio system that consists of 700 radiotelephones and 46 receiver-transmitters. The “Smart Radio” project, which was launched in 2012 to replace the main radio system, will be completed in 2021. The latest-generation radio facilities here are a substantial improvement in energy efficiency terms: they use 30% less energy than the present equipment, saving up to 200,000 kilowatt hours of electricity a year. Skyguide’s technicians will also be able to maintain the new system remotely, which will eliminate some 13,000 kilometres of duty travel trips.

**Satellite-based navigation**

Skyguide is working on introducing new energy-efficient flight procedures such as satellite navigation. There are now 202 satellite-based flight navigation procedures in Swiss civil aviation alone. The new procedures will replace traditional ground-based navigation facilities such as instrument landing systems and VOR beacons in the medium term, and this in turn will permit sizeable energy savings. Skyguide has already started to decommission its first VOR beacons.
Multilateration technology instead of radar facilities

For many years, secondary radar was the standard technology for identifying a civil or military aircraft’s position. Skyguide’s six secondary radar facilities will reach the end of their service lives in 2023. For cost and energy efficiency reasons, and in view of its superior performance, the company has decided to gradually replace them with multilateration technology. In the multilateration procedure, a series of spatially distributed high-frequency transmitter and receiver sensors detect status reports which aircraft transmit via their transponder. This enables an aircraft’s position to be determined with a high degree of precision. Since the multilateration sensors consist of small antennas that can be mounted on existing infrastructure, both the space needed and their power consumption are smaller than are required for traditional radar facilities.

Electricity from renewable energy sources

Skyguide procures all its electricity from renewable energy sources. Some 20% of this is “naturemade star” certificated. Thanks to various actions it has taken since 2016, such as new lighting systems for Dübendorf and improved building technologies, the company has further reduced electricity consumption at its air traffic control centres.

Skyguide’s total consumption of electrical energy in 2018 amounted to 13.6 gigawatt hours. The 202-megawatt-hour reduction from the previous year’s level is the equivalent of the annual electricity consumption of the skyguide buildings in Bern.

A sustainable supply chain

Skyguide also puts an emphasis on sustainability in its supply chain. With the SV Group, for instance, the company has developed an individual sustainability plan for logistics, operations, procurement, products and services that is designed to minimise all these activities’ CO2 emissions. The SV Group concept also puts a special emphasis on regional and seasonal products in the company’s staff restaurants, and on reducing the proportions of meat dishes served.

The “Exemplary in Energy” initiative

The Swiss Federal Council has set itself the goal of raising energy efficiency within the federal administration by 25% between 2006 and 2020. And its “Exemplary in Energy” initiative lays down a binding action plan and frames the joint activities required to achieve this objective. The programme extends to the Civil Federal Administration, the Federal Department of Defence, Civil Protection & Sport (DDPS), parastatal companies, the Swiss Federal Institutes of Technology (ETH), Geneva Airport and the Services Industriels de Genève. All these partners have undertaken to make their own substantial contribution to ensuring greater energy efficiency and to expanding their use of energy from renewable sources. The initiative has also been opened up to further public-sector companies since 2016. According to the initiative’s annual Performance Report, skyguide is the smallest energy consumer of the currently seven members of the Exemplary in Energy group.
Mobility
Skyguide had implemented 94% of the actions agreed in the mobility field by the end of 2019.

Supporting public transport
Skyguide subsidises the public transport season tickets of all its employees, to encourage the use of the public transport option. The company also provides a limited number of parking spaces for its employees at all its business and operating locations, which can be used for a fee. In addition to work-hours considerations, these spaces are increasingly assigned on the basis of the distance to and from the employee’s home and the public transport alternatives available.

Electric vehicles preferred
Skyguide currently owns around 60 vehicles which are used for business purposes, primarily in connection with maintenance work on technical installations. In 2016 the company introduced a set of guidelines under which its new vehicles should be procured on the basis of their energy efficiency. In procuring its first electric and hybrid vehicle in Geneva, skyguide has begun to switch its vehicles fleet to more energy-efficient cars.

» Digitalisation and the shared use of systems are central planks in our innovation strategy. «

Energy-efficient mobility
In a further move to promote ecofriendly mobility, skyguide has installed six electric car charging stations at its Dübendorfer site with the support of Zurich’s electricity company. Electric cars emit 95% less CO2 per journey than combustion-engine vehicles.

Business travel, videoconferences and working from home
Thanks to today’s communications technologies, skyguide can keep its employees’ business travel activities to a minimum and ensure effective communications among its 14 operating locations. A programme to equip all its meeting rooms and computers with Skype for Business, to permit video and web conferences, was concluded in 2019. Skyguide also supports employees who wish to work from home wherever this is feasible in operational terms, to further reduce their work-related travel. And in those cases in which such travel is unavoidable, the company puts a firm emphasis on the public transport option.

Green IT
Skyguide develops and operates the technical infrastructure it needs to provide its air navigation services in accordance with the best practices of Green IT. In doing so, it bases its strategy in particular on virtualising its systems. These endeavours are well under way: 66% of the Green IT actions defined in the Swiss Confederation’s “Exemplary in Energy” drive were taken in 2019.
Energy-optimised IT systems through digitalisation

Some 98% of skyguide’s office automation servers had already been digitalised by the end of 2019. The digitalisation process is steadily being extended to air navigation services systems, too. System virtualisation and shared systems use are two core elements in skyguide’s innovation strategy. The Virtual Centre programme is designed to virtually merge the Geneva and Dübendorf control centres, to derive further efficiency benefits. Air traffic forecasts are the first function here to be put into daily working use. Its pioneering Virtual Centre project has earned skyguide a distinction from the European Commission.

A virtualised telephone system

Skyguide’s telephone exchange was successfully switched from ISDN to Voice over Internet Protocol (VoIP) in 2018. The company also took the opportunity to digitalise the internal servers that are used for such telephone system applications as the welcome messages and the answerphone functions. This saw the previous 14 physical servers distributed among Geneva, Dübendorf, Lugano and Bern replaced by a single virtual server in Geneva. The move has reduced electricity consumption for the central telephone system by some 40%, which translates into an annual power saving of 14 megawatt hours.

Paper and printing

The greatest progress has been made on the printing front. Annual paper consumption per employee amounted to 6 kilograms for 2019, an improvement on the 7.9 kilograms of the previous year that brings such consumption close to its 5-kilogram objective. The printing targets should be met in 2020, thanks not least to the digitalisation strategy at the skyguide academy, which currently has the highest paper consumption within the organisation. The number of printers companywide was also reduced in 2019, with 144 previous devices superseded by 90 new and more efficient models.

Promoting wind energy

As part of the Swiss Confederation’s Energy Strategy 2050, the adoption of alternative energy sources is well under way. The renewable energies here include wind energy, which, according to the Federal Office of Energy, is set to grow substantially in importance in the next few years. Wind energy facilities should be producing 4000 gigawatt hours of electricity a year – enough to power around a million Swiss households – by 2050.

Skyguide has been receiving a growing number of requests for impact assessments from wind farm operators for some years now. Wind turbines produce clean energy. But they can interfere with air traffic management facilities such as radar, navigation aids and communications systems through their electromagnetic effects. Skyguide is committed to ensuring the safe coexistence of wind energy facilities and aviation activities. In the video Matthias Fries, Head of the Competence Centre for Wind Energy Facilities, explains how it does so and what challenges this involves.

© Suisse Eole - Hans Peter Jost
Sparing resources by re-using old equipment

Every year, skyguide replaces up to 400 PCs and notebooks with new IT devices. Instead of disposing of the items replaced as waste, the company works with an IT broker to offer them at a reduced price to its own employees or the free market. In doing so, it makes a major contribution to avoiding waste. Andreas Custodis, Senior End-User Computing Specialist at skyguide, explains what happens to these used hardware items.

Andreas, how long does skyguide use its computers before replacing them?
It’s an ongoing process: they’re replaced whenever they reach the end of their useful service lives. For laptops that’s usually after four years, and for PCs it’s after five to six years.

What do you do with these used devices?
We contact our IT broker, who collects them. They then delete all the data that are still on them, check their technical condition, clean them and prepare them for resale. They’ll also add more memory if necessary.

What if the device isn’t working any more?
Then it will be passed on to a certificated recycling company, where it will be properly disposed of. The broker looks after this for us, too.

Who are these devices resold to?
First they’re offered to skyguide employees in an online shop at attractively low prices. If they’re not sold here by a certain time, the broker will offer them for sale via other channels in and outside Switzerland.

Is there also a sales market for more specialist used equipment like radar screens?
No. These items have a much longer service life – up to 30 years for navigation facilities. So any old or faulty items here that are taken out of our operations are just disposed of in an ecofriendly way, as are all our other electrical devices.

Small gesture, big impact
Skyguide replaced 120 tablets used by its air traffic controllers with new devices in 2019. Instead of disposing of the old tablets as waste, the company decided to donate them to a girls’ school in the Democratic Republic of the Congo. The school is run by the Malaika charity organisation, which supports girls and their communities in the DRC by offering free education and health programmes. Some 350 girls currently attend the private Malaika school in Kalebuka in the southeast of the country. The tablets will be handed over in 2020, and will then be used in class.
Energy efficiency

Europe’s airspace is still structured along strongly national lines. Every country has its own airspace, which is managed and monitored by its own air navigation services provider. And each of these ANSPs develops and maintains its own systems and infrastructures.

The present arrangement has long been far from ideal. Digitalisation is rapidly extending to the air navigation services world, too. And today’s technologies offer new ways and means of making air traffic management both safer and more efficient.

In future, the continent’s air navigation services providers will focus more on managing their airspace, says skyguide’s Chief Information Officer Klaus Meier, while obtaining their data and further services from external providers. This will offer benefits not only in safety and capacity terms, but also in terms of their energy efficiency. For further information on the digitalisation of European airspace, technological change at skyguide and the internationally pioneering Virtual Centre project, see the video interview with skyguide’s CIO.

skyguide.ch/CIOinterview
Skyguide is making good progress towards its environmental objectives. With the planned improvements to its air traffic handling and its own energy consumption, the main efficiency gains will all be achieved. After this, further interests can be prioritised anew, because the different demands that are made of them currently prevent Europe’s air navigation services providers from fully exploiting the potential offered by the operational actions planned (see also “Finding the right compromise” on Page 11).

To ensure that it continues to make its own contribution to reducing aviation’s carbon dioxide emissions, skyguide will be focusing on developing further new flight procedures and green innovations, and on safely integrating highly efficient aircraft or new technologies such as drones into airspace areas.

In the transportation sector in particular, drones offer sizeable potential for establishing themselves as an energy-efficient alternative to traditional transport vehicles. Skyguide has also adopted drones to perform some 50% of the calibration flights which previously had to be conducted using a specially equipped aircraft – a development that will save 142 tonnes of CO2 emissions a year from 2020 onwards.

Skyguide also participated in a feasibility study for taxi drones in 2018, as part of a broader European initiative on urban innovations. The study, which was jointly conducted with Canton Geneva and the Federal Office of Civil Aviation, showed that the basic conditions were available in Switzerland for prototype taxi drones to be developed.

The project will be further pursued in 2020 with the aim of performing some of the non-time-critical patient transports between the Geneva university hospitals and the Trois Chênes geriatric hospital with taxi drones in the longer term. Over 30 000 patients a year are currently transported between these hospitals by car. One third of such transports could in future be performed with drones.

Drones technology is still in its early stages, and further economically and socially relevant applications are sure to be found. These developments will bring challenges of their own – such as ensuring the safe integration of these new traffic elements into Switzerland’s airspace. But skyguide views drone development as a clear opportunity, and will continue to do its utmost to help provide the favourable conditions in which this growing industry can thrive.

**Developers and trailblazers of green innovations**

Improvements per year

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<th>From 2020</th>
<th>From 2023</th>
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<tr>
<td>Calibration flights</td>
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<td>-70%</td>
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<tr>
<td>Tonnes of CO2</td>
<td>-142</td>
<td>-199</td>
</tr>
<tr>
<td>Daytime noise</td>
<td>-33%</td>
<td>-60%</td>
</tr>
<tr>
<td>Nighttime noise</td>
<td>-66%</td>
<td>-80%</td>
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The calibration drone in action at Geneva Airport.

**Developers and trailblazers of green innovations**

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