Airspace and Aviation Infrastructure Strategy of Switzerland (AVISTRAT-CH)

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Contents

Foreword

Christian Hegner

Director General of the FOCA, client of the AVISTRAT-CH strategy project

“I am pleased to be able to present this strategy report, which is the second milestone in the AVISTRAT-CH programme. It identifies the route we will take to achieve the vision that was first formulated in 2019 as the guiding light of the project.

We worked with several partners within and outside the system to develop the content of the strategy. The process was described as the “architecture competition” in reference to the well-known procedure used for large construction and design projects. The result was a comprehensive collection of ideas that opened up a broad spectrum of perspectives and gave us an unbiased panoramic view of the Swiss aviation system.

I am particularly pleased that we have succeeded in formulating a joint perspective agreed by all the participants in this strategy report, despite the sometimes intense discussions about conflicting ideas and interests between the different branches of the aviation industry and the relevant public authorities. It is essential for the successful implementation of the project that all the players pull together in the same direction.

I am waiting with anticipation for the next steps in the implementation process and I am convinced that this strategy provides us with a solid foundation to build on. It only remains for me to thank everyone involved for their enormous commitment and the programme management team for planning the strategy formulation process so carefully.”

Stefan Tschudin
COO of Flughafen Zürich AG, member of the AVISTRAT-CH project committee

"AVISTRAT-CH forms an important foundation for the development of aviation in Switzerland in the years to come. The strategy defines the guidelines for the future development of the Swiss airport system and the structure of the airspace and is designed to guarantee that Switzerland's essential connection to the rest of the world remains safe, efficient and sustainable in future. AVISTRAT-CH has been drawn up under the leadership of the FOCA in partnership with the aviation industry. We now need to continue to work together on the next steps in the implementation process."

Thomas Frick
Strategic Operations Project Management, Swiss International Air Lines,
member of the AVISTRAT-CH project committee

"AVISTRAT-CH is taking a holistic, partnership-based approach to overcoming the enormous challenges facing the entire aviation system in Switzerland. New approaches and also clear priorities are essential in the light of the limited capacities, the new stakeholder groups and the ever more demanding and complex economic and environmental conditions.

AVISTRAT-CH provides the necessary guidelines for this and highlights solutions based primarily on innovation and technology that will enable the Swiss aviation industry to continue performing its systemically important role of connecting Switzerland to the rest of the world safely, sustainably and efficiently in future."

Alex Bristol
CEO of Skyguide, member of the project committee of AVISTRAT-CH

"AVISTRAT-CH gives us the foundation that we urgently need for managing Swiss airspace more effectively and efficiently. The decisive consideration now is to implement this strategy consistently. This is the only way of achieving the intended benefits for all the current and future users of the airspace. Skyguide will definitely be making its contribution to achieving this."

Yves Burkhardt
Secretary General of the Aero-Club of Switzerland, member of the project committee of AVISTRAT-CH

"The AVISTRAT-CH airspace and infrastructure strategy will pave the way and highlight the opportunities for the airspace and infrastructure, both of which are in limited supply in Switzerland, to be used and managed efficiently and without excluding individuals, by means of a partnership consisting of everyone involved. In the process, we need to make use of the available technologies and the existing competence of all the airspace participants to manage the airspace dynamically in such a way that the interaction within the field of aviation is safe and financially and environmentally viable for the economy of Switzerland as a landlocked country by 2035."

List of abbreviations

AD	Aerodrome
AMC	Airspace management cell: a joint civil/military cell responsible for the day-to-day management and temporary allocation of national or sub-regional airspace.
ANS	Air navigation services: includes communication, navigation, aviation information and surveillance services and meteorological services for air navigation.
ANSO	Ordinance on the Air Navigation Service.
ANSP	Air navigation service provider: an organisation that supervises aircraft in the air and when manoeuvring and that is the legitimate holder of that responsibility.
APR	Aviation policy report: Federal Council policy paper on aviation in Switzerland.
ARE	Federal Office for Spatial Development: the specialist authority on issues concerning spatial development, mobility policy and sustainable development.
AviA	Federal Act on Civil Aviation.
ATCO	Air traffic controller.
ATM	Air traffic management: ensuring that aircraft movements are safe and efficient.
ATS	Air traffic services.
AVSEC	Aviation security: joint rules concerning the safety of civil aviation that safeguard passengers and freight against unlawful interference.
BPPR	Booking principles and priority rules: safeguard the flow of civil aviation while at the same time ensuring and improving the effectiveness of military missions.
CDM	Collaborative decision-making: individuals jointly make a selection from various different alternatives. In this document, this refers to airport operators and the affected stakeholders at national airports in particular.
CDO/CCO	Continuous climb and descent operations: continuous climb and descent profiles for arriving and departing aircraft.
CIV	Civil.
CNS	Communication, navigation and surveillance: the main functions that form the infrastructure for air traffic management and ensure that air traffic is safe and efficient.
CO_2	Carbon dioxide.
CTR	Control zone: controlled airspace that extends to a specified limit.
DETEC	Federal Department of the Environment, Transport, Energy and Communications.
DDPS	Federal Department of Defence, Civil Protection and Sport.
EMPA	Swiss Federal Laboratories for Materials Science and Technology.
ETH	Swiss Federal Institute of Technology.
EU	European Union.
FEDRO	Federal Roads Office: the Swiss federal authority responsible for road infrastructure and private road transport.
FIS	Federal Intelligence Service.
FOCA	Federal Office of Civil Aviation: responsible for aviation development and the oversight of civil aviation in Switzerland.
FOEN	Federal Office for the Environment: responsible among other things for protecting and ensuring the sustainable use of natural resources, including soil, water, air, quietness and forests.

FOT	Federal Office of Transport: committed to ensuring that Switzerland's public transport and rail freight transport systems are operated sustainably and are continuously adapted to changing needs and developments.
FRA	Free route airspace: a specified airspace within which users may freely plan a route between a defined entry point and a defined exit point.
FUA	Flexible use of airspace: an airspace management concept based on the principle that airspace should not be designated as purely civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent.
GASCO	General Aviation Steering Committee Switzerland: its aim is to provide effective representation for the interests of the general and business aviation sectors in Switzerland by means of coordination and joint activities.
GDP	Gross domestic product: a measure of the economic performance of a country's economy over a period of time.
GS-DETEC	General Secretariat of the Federal Department of the Environment, Transport, Energy and Communications.
ICAO	International Civil Aviation Organization.
IFR	Instrument flight rules.
KPI	Key performance indicator: figures that make it possible to measure or determine the progress and the fulfilment of business objectives within an organisation.
MAA	Military Aviation Authority: the independent organisation responsible for regulation and oversight in military aviation.
MaaS	Mobility as a Service: a new type of service that enables users to plan, book and pay for different types of mobility services via a shared digital channel.
MIL	Military
MIL-ATCO	Military air traffic controller.
MOBI	National mobility data infrastructure.
NADIM	National data network infrastructure for mobility.
NASP	National Aviation Security Programme.
NCS	National Strategy for the Protection of Switzerland against Cyber Risks.
PBN	Performance-Based Navigation: flight paths requiring a high level of navigation accuracy.
RMZ	Radio mandatory zone: an airspace where the carriage and operation of radio equipment is mandatory.
SAF	Sustainable aviation fuel: fuel that is not refined from crude oil, but manufactured from sustainable resources such as waste oils of biological origin, agricultural residues or non-fossil CO_2.
SAIP	Sectoral Aviation Infrastructure Plan: the Confederation's planning and coordination instrument for civil aviation. It provides the public authorities with a mandatory definition of the objectives and specifications for the infrastructure of civil aviation.
SESAR	Single European Sky ATM Research: the technological basis of the Single European Sky. The goal is to improve the performance of air traffic management by modernising and harmonising ATM systems through the definition, development, validation and deployment of innovative technological and operational ATM solutions.
SFOE	Swiss Federal Office of Energy: responsible for the energy supply in Switzerland.
SNSF	Swiss National Science Foundation.

SWIM	System-Wide Information Management: a global aviation industry initiative to harmonise the exchange of aviation, weather and flight information for all airspace users and stakeholders.
TBO/4D-Trajectory	Trajectory-based operations: uses the four-dimensional data (latitude, longitude, altitude, time) of the trajectory of aircraft to allow the airspace to be managed more efficiently.
TMA	Terminal manoeuvring area: the airspace immediately around airports with a control zone.
TMZ	Transponder mandatory zone: an airspace where the carriage and operation of transponder equipment is mandatory.
VFR	Visual flight rules.
VTOL	Vertical take-off and landing: a system that enables an aircraft to take off and land vertically.
ZHAW	Zurich University of Applied Sciences

1 Introduction to the AVISTRAT-CH strategy

This report describes the strategy of the Federal Office of Civil Aviation (FOCA) and the aviation stakeholders for the reform of the airspace and aviation infrastructure of Switzerland in accordance with the AVISTRAT-CH vision. It includes guidelines for the future activities to create a better airspace and aviation infrastructure and therefore forms a joint foundation that will allow the Confederation and the industry to develop Switzerland's aviation system further. This document is the result of the strategy phase of the AVISTRAT-CH programme.

1.1 The AVISTRAT-CH programme

The Swiss airspace and aviation infrastructure has grown up over decades and has undergone repeated selective adjustments. This has made flying in Swiss airspace increasingly complex and challenging. In addition, new usage requirements have recently emerged, for example the operation of unmanned aircraft.

The growing number of airspace violations, some of which have affected scheduled and charter flights, demonstrates that the existing system can no longer meet current requirements and that there is a need for action. For these reasons, in 2016, shortly after the adoption of the report on aviation policy in Switzerland (APR) by the Federal Council, the Department of the Environment, Transport, Energy and Communications (DETEC) commissioned the FOCA to launch a programme to address the problems referred to above. The aim of the programme is, on the one hand, to reduce the risks involved in using Swiss airspace and, on the other hand, to allow for the efficient, environmentally friendly use of the airspace, which is a limited resource.

The FOCA launched a programme to resolve these problems in the long term and gave it the name "Airspace and Aviation Infrastructure Strategy of Switzerland" or AVISTRAT-CH. The timeframe for implementing the AVISTRAT-CH project is 2035. It is not the case that the coordinated implementation must be completed by this time. Instead the objective is to create a system that fulfils the foreseeable user requirements in 2035 and that is safe, efficient and environmentally friendly.

The most important methodological principles of the AVISTRAT-CH programme are the clean sheet approach (including solutions without taking into consideration the existing structures) and the consistent involvement of aviation stakeholders and experts from the industry, the industry associations and the federal authorities, in particular the FOCA and the Federal Department of Defence, Civil Protection and Sport (DDPS). The previous milestones in the programme are the adoption of the AVISTRAT-CH vision and the formulation of this strategy paper.

It is important to mention that AVISTRAT-CH is fundamentally consistent with the APR. However, AVISTRAT-CH concentrates in greater detail on specific focus areas, as explained below. The AVISTRAT-CH strategy report is not intended to compete with the Sectoral Aviation Infrastructure Plan (SAIP) adopted by the Federal Council. However, it is possible that some of the approaches taken by AVISTRAT-CH will result in initiatives to amend the SAIP detailed plans or even the SAIP concept section. Finally, it is also conceivable that applications to the FOCA will lead to amendments to aviation law.

1.2 The AVISTRAT-CH vision

The first project completed as part of the programme was the formulation of the AVISTRAT-CH vision. This should be seen as a description of the desired status of the Swiss aviation system. The vision was drawn up on the basis of the needs of the airspace users and service providers in Switzerland and formulated together with the aviation stakeholders. It is a joint, widely accepted objective for the next steps in the programme to upgrade the system by 2035. The AVISTRAT-CH vision was adopted in 2019 by the General Secretariat of DETEC (GS-DETEC). It presents a picture of the Swiss aviation system in which a flexible architecture allows new user requirements and technologies to be integrated much more quickly, high levels of efficiency and transparency to be achieved in relation to costs and, at the same time, the environmental impacts caused by the use of the aviation system to be kept to a minimum. The AVISTRAT-CH vision is divided into eight areas of action on three levels: background, target areas and impact areas. A vision statement was developed for each area of action.

The AVISTRAT-CH vision

Background

01 Society and government: The aviation system is based on the anticipated sociopolitical requirements.

02 Technologies and innovation: The deployment of technologies supports the use within the aviation system of high-quality, user-friendly, coordinated solutions. The aviation system is able to adapt easily to changes in users' requirements and to integrate new technologies and work processes.

Target areas

03 Environmental impacts: The targeted development of the aviation system will ensure that the current and future impacts of air traffic on the population and the environment are reduced.

04 Safety and security: The accepted level of overall risk in the aviation system has been identified and will not be exceeded even if there is an increase in air traffic. A comprehensive risk management system ensures the safety of people, the environment and the infrastructure.

05 Efficiency: The airspace and the aviation infrastructure can be used by and are accessible to all users in accordance with the sociopolitical requirements. The services required for the use of the airspace and aviation infrastructure are cost-effective. The aviation system is competitive on an international level and allows for long-term planning of the use of and access to the airspace and aviation infrastructure. It also leaves leeway for creativity and innovation and for the training of highly qualified staff.

Impact areas

06 Structure of ground and air: The aviation infrastructure and the airspace are designed in such a way that they meet users' needs. In particular, the aviation system can develop dynamically to accommodate new types of use (or technological opportunities). Take-offs and landings, both within and independently of the ground infrastructure, are safe and flexible and can easily be implemented.

07 Regulations: Aviation regulations are based on an assessment of the requirements relating to safety and security, efficiency and environmental impacts and respond within an appropriate period of time to changes in these requirements. The regulations allow for innovation and for oversight activities based on risk and performance. The regulations are drawn up in accordance with international obligations on the principle of as little as possible and as much as necessary.

08 Management: The use of the airspace and the aviation infrastructure is managed in a targeted and flexible way with the help of the available technology. The management and use of the airspace and the aviation infrastructure is based on the principles of procedural simplicity and compatibility with neighbouring countries.

Figure 1: The AVISTRAT-CH vision and vision statements on the eight areas of action.

The three target areas of safety and security, efficiency and environmental impacts are closely related and cannot be considered independently of one another. The AVISTRAT-CH strategy as a whole (key areas and strategic and underlying initiatives) addresses these three target areas and enables the objectives described in these areas to be achieved (see Annex 2: Impact of the initiatives).

For the development of the strategy, the AVISTRAT-CH technical committee converted the content of the vision into system requirements (see the following section 1.3 and Annex 1: System requirements). The AVISTRAT-CH vision and further information about the programme can be found (in German, French and Italian only) via the following link to the FOCA website: https://www.bazl.admin.ch/bazl/de/home/sicherheit/infrastruktur/avistrat.html.

1.3 The creation of the strategy

The consistently participatory approach was deliberately continued with the aim of creating a strategy that reflected the concerns of the entire Swiss aviation industry and, at the same time, took into consideration the diverse needs of the population. The AVISTRAT-CH vision formed the foundation for the work on the strategy. In the first stage, the AVISTRAT-CH technical committee drew up the system requirements (see Annex 1: System requirements) on this basis. Subsequently, the system requirements were used as the input for an architecture competition with aim of developing five draft strategies. From the perspective of the FOCA, it was particularly important that these drafts came from a wide variety of sources. An external, unbiased view of the aviation system was intended to help with finding new approaches to resolving difficult problems and a route to achieving the vision. However, an internal system perspective was equally crucial. For this reason, Skyguide and a group of experts who are fully familiar with the circumstances in Switzerland both produced draft strategies. On the principle that the more varied the ideas are, the better the end product, the following five parties were commissioned to formulate a draft strategy:

- **Aviation Research Center Switzerland (ARCS) and Aviation Capacity Resources Switzerland AG (ACR):** The ARCS is the national competence centre for aviation research in Switzerland and brings together the ZHAW School of Engineering, the University of St. Gallen, the ETH Lausanne and the University of Zurich. Its specialist fields include research, as already mentioned, plus consulting and the transfer of knowledge in the aviation industry. In addition, the ARCS coordinates the universities in this area and therefore makes an important contribution to the competitiveness of Switzerland as an aviation location. ACR is the subsidiary of the Swedish air navigation service provider ACR Sweden. The company specialises in providing consultancy in the aviation industry and international air navigation services.

- **Netherlands Aerospace Centre (NLR) and PvL Partners:** The NLR sees itself as creating a link between science, industry and government. The prestigious organisation carries out research and provides consultancy in the fields of civil aviation, defence, industry and space flight. PvL Partners is a strategy consultancy based in Zurich which aims to fill the gap between strategy and operations on behalf of its customers.

- **Oliver Wyman:** Oliver Wyman is a global management consultancy that prepares its customers for the implementation of projects and provides them with support. It is a subsidiary of Marsh & McLennan Companies (MMC) and has proven expertise in a wide range of business fields, including transport.

- **AVISTRAT-CH expert group:** As its name suggests, the expert group is made up of experts from the aviation industry and representatives of aviation associations and was able to contribute considerable expertise to the strategy development process. The following organisations were represented in the expert group: Swiss Hang Gliding Association (SHV), Air Force (AF), FOCA, Swiss Federation of Civil Drones (SFCD), Swiss International Air Lines, Zurich Airport, Skyguide, Swiss Aerodromes Association (SAA), Aero-Club of Switzerland (AeCS), Aircraft Owners and Pilots Association (AOPA), EasyJet, Military Aviation Authority (MAA), Swiss Business Aviation Authority (SBAA) and the drones interest group.

- **Skyguide:** Skyguide is the Swiss national air navigation service provider (ANSP) with responsibility for air navigation in Switzerland and neighbouring countries. It provides additional services in this area, including training air traffic controllers in the Skyguide Academy.

The draft strategies from the five architects were submitted at the start of 2021 and presented to both the technical and the project committees of AVISTRAT-CH. A prize was awarded for the best attempt at fulfilling the system requirements. However, it is important to note that the prize had no influence on the subsequent consolidation process and that all the ideas received equal treatment. The draft strategies can be found on the FOCA website referred to in section 1.2.

From March 2021 onwards, the technical committee focused on clustering, summarising and ultimately consolidating the draft strategies to produce the final AVISTRAT-CH strategy. An agile approach was chosen which allowed the project committee to intervene repeatedly with guidance. After the content had been completed, the strategy paper was written in the winter of 2021 for the programme committee and the programme client. The final strategy was then visualised and filmed in cooperation with Zense GmbH.

2 Trends and development scenarios

The strategy activities are based on development trends which were taken from the architecture competition at the start of the strategy formulation phase, with only constant trends, in other words those that were mentioned repeatedly by different parties, being included. Using this information, the AVISTRAT-CH project team outlined four development scenarios.

2.1 Expected trends

This section introduces some of the trends referred to several times in the architecture competition. To allow the following strategy report to be positioned more effectively, they give a non-committal insight into the AVISTRAT-CH target year of 2035.

General trends

At the end of the first quarter of 2021, the population of Switzerland was around 8.7 million. By 2035, this figure will increase to almost 10 million, which will lead to further challenges in terms of capacity and mobility (Federal Statistical Office (FSO), 2021). In the same period, GDP will rise to more than CHF 900 billion (State Secretariat for Economic Affairs (SECO), 2021). Switzerland's main connection to international growth markets will continue to be via aviation.

Expected trends in air traffic

Following the drop in air traffic during the COVID-19 pandemic, demand for commercial flights will increase again worldwide, including in Switzerland. For this reason, the existing capacity bottlenecks (particularly in relation to the ground infrastructure) at Zurich, Geneva and Basel airports during peak periods will become more problematic. As a consequence, sport and light aircraft will find it more difficult to access these national airports.

Regional airports will continue to play an important role in the Swiss aviation infrastructure (for example, for pilot training). Even though they will still have limited significance for regional connections, new business models will emerge against the background of technological developments.

Expected trends in airspace structure and management

The diversity of airspace users will also increase (see Expected trends in unmanned aviation). Airspace surveillance and management will become increasingly automated. By providing technological support for the air traffic controllers and pilots, the automated systems will be an important means of increasing capacity, in particular with regard to advances made in the context of Single European Sky ATM Research (SESAR). This will give a boost to technological integration across European airspace boundaries and further steps will be taken towards a Single European Sky (SES).

Projects and measures for the more efficient use of airspace and the integration of new technologies, such as Free Route Airspace (FRA), Performance-Based Navigation (PBN), U-Space and Flexible Use of Airspace (FUA), will be implemented and further improved.

Expected trends relating to the environment, the climate and energy

Alongside population growth, the subject of sustainability will become more important from both a social and a political perspective. This makes it likely that environmental costs will increasingly be internalised. For example, there will be higher subsidies for sustainable fuels and propulsion systems.

Expected trends in innovation, research and training

It is probable that fossil fuels will still be used in commercial aviation in 2035. However, significant progress will have been made concerning the cost-effectiveness and widespread use of sustainable solutions, such as sustainable aviation fuels or SAFs. In addition, new propulsion systems for commercial use (electric and hydrogen aircraft) will be close to market launch or at least at an advanced stage of development.

Expected trends in intermodality and mobility chains

Switzerland will still have a significant need for connections with the rest of the world. However, the transport mix will be quite different from today. Most importantly, investments in the European high-speed networks will have increased the competitiveness of rail transport (on shorter routes). The transport chains will be heavily networked, which will lead to a greater variability in the means of transport used.

Expected trends in safety and security

Safety: In future, further operational and technological improvements will be introduced to make flying safer. Because of the growing diversity of airspace users, it will become increasingly challenging to maintain existing safety levels in the aviation system.

Security: Aviation will remain the focus of terrorist groups. As past experience has shown, potential attackers will constantly re-evaluate and adapt their methods and targets depending on the vulnerabilities of the aviation system. The aim of attacks of this kind is to attract the greatest possible publicity by means of sabotage and to cause both direct damage and considerable indirect damage by disrupting or interrupting flows of passengers and goods. As technologies become more advanced, sabotage of this kind will increasingly take the form of breaches of information security in future.

In addition, there will be new types of threats, such as hacker attacks on computer systems. Applications will need reliable protection against this growing wave of cyber crime. The aviation industry will therefore have to constantly increase its safety standards and adapt to future circumstances.

Expected trends in aviation policy

There will be greater European cooperation on the management of the airspace and aviation infrastructure. In the field of airspace management and the formulation and introduction of regulations, Switzerland will be heavily influenced by European agreements. Against the background of European integration, overall national interests will play an increasingly important role in infrastructure decisions. Funding will be concentrated primarily on infrastructure of national importance and there will be a greater need for transparency with regard to the costs and the management of the aviation system.

Expected trends in policy and rulemaking

Switzerland will continue to adopt the European and international specifications and standards that are relevant to aviation. The regulations will focus mainly on safety and security and, depending on the form they take, they will play a decisive part in the success or failure of innovations. In particular the use of new technologies and the development of automation, plus digitalisation and virtualisation will require targeted, innovation-friendly guidelines. The legal framework must be expanded to accommodate the new requirements of the stakeholders and to support the transformation of the aviation industry within the necessary implementation period.

Expected trends in digitalisation

Digitalisation and automation will play a growing role in all areas of society. The emergence of new technologies will allow for a more integrated approach to mobility and intermodal routes, with users choosing the most environmentally friendly means of transport in each case.

Automation will be given a major boost in the field of ATM (for example, the shift from air traffic controllers to air traffic managers with a greater focus on system surveillance). There will be very few aircraft in the airspace that do not share data (the exceptions will be military and unpowered aircraft). This will allow for greater self-separation.

Expected trends in unmanned aviation

New unmanned aircraft of different sizes and with different functions will have reached technical maturity. Therefore, there will be new forms of traffic in the skies, which will result in greater diversity among the users of the airspace. This in turn will lead to increasing complexity in the airspace infrastructure and its management (different speeds, aircraft and types of traffic), including the accompanying challenge for capacity management. The consequence will be a more complex political and regulatory environment and the need for the revision of the safety criteria and the oversight function.

Vertiports and air taxis will make aviation more decentralised. In particular on domestic and European short-haul routes, a new form of traffic will emerge that will not only complement short-haul flights, rail travel and long-distance coaches but will also compete with them.

2.2 Development scenarios

Following the architecture competition, the AVISTRAT-CH project team analysed the various trends referred to above and, on this basis, formulated development scenarios. Against the background of the task of simplifying the Swiss aviation system and the use of airspace, the scenarios can be characterised on the basis of two main driving forces: technological development and the number of aircraft movements (as an indicator of the usage of Swiss airspace).
In the following section, four scenarios are used to describe potential directions that the Swiss aviation system will move in by 2035.[1] Each of the four scenarios differs from the others and has its own logic, which means that in theory the scenarios should only be considered individually. As the scenarios are abstract portrayals of future developments, in reality a mixture of the different scenarios is more likely to occur.

The following figure gives an overview of the four scenarios. The vertical axis represents the *number of aircraft movements* and is therefore an indicator of the popularity of and demand for air travel in Switzerland. The category of aircraft movements includes everything that moves through Swiss airspace, from drones to passenger aircraft. This axis allows conclusions to be drawn about the use of capacity and the complexity of the system, because more aircraft movements put greater stresses on the airspace and the aviation infrastructure. One of the main driving forces is the number of passengers transported and, therefore, the demand for public air traffic services. This model does not consider the size and capacity usage of the aircraft. The horizontal axis shows the *adaptation and integration of new technologies*. The plus symbol (or minus symbol) indicates whether the axis value will increase (or decrease) by 2035. The table that follows summarises the content of the four scenarios. The scenarios are not in order of the likelihood of their occurrence. They are numbered simply for ease of understanding.

[1] Note: These scenarios are not identical to those in the study “Perspektiven Luftanbindung 2050” (Prospects for air travel 2050) (Infras, 2022). This study, which was commissioned by the FOCA, highlights possible scenarios for future passenger and movement volumes on scheduled and charter flights in the period up to 2050. Other types of traffic are not covered. By contrast, AVISTRAT-CH investigates in detail the different requirements of airspace users, which is why the focus and the timeframe of the two projects are different.

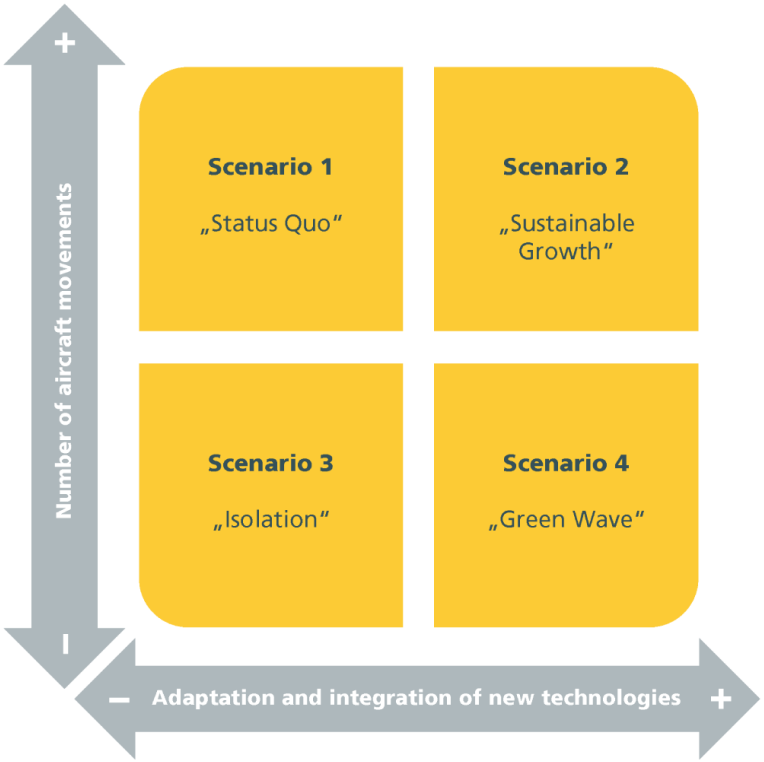

Figure 2: Overview of the development scenarios.

Example of how to read the chart: Scenario 4 is based on the assumption that good progress will be made with adapting and integrating new technologies (the field is on the plus side of the horizontal axis). This means that the increasing complexity involved in using and managing the airspace and aviation infrastructure can be overcome with the help of the new technologies. At the same time, this scenario assumes that the number of aircraft movements will decrease (the field is on the minus side of the vertical axis), which will result in less adaptation of the airspace and aviation infrastructure being needed.

Scenario	Brief description
Scenario 1 “Status Quo”	In this scenario the number of aircraft movements will constantly increase, while technological progress will have difficulty keeping up. As this scenario assumes that the level of technology will remain the same as it is today and the growth in aircraft movements will reflect that of the last decade (before COVID-19), it is known as “Status Quo”. There are several different arguments in favour of this scenario, which, with regard to the new technologies, range from excessive regulatory obstacles to a lack of incentives for companies to develop or introduce new technologies. One possible explanation for the increasing number of aircraft movements is the contradiction that in recent years the Swiss people have chosen to fly increasingly often, despite a growing awareness of environmental issues.
Scenario 2 “Sustainable Growth”	In this scenario the number of aircraft movements in Swiss airspace will constantly increase. At the same time, good progress will be made with the adaptation and integration of new technologies. As the growth in the number of flights can be managed with the help of new technologies, this scenario is known as “Sustainable Growth”. There are three key messages in this scenario. Firstly, aircraft will become more efficient because of new technological opportunities and will also become more attractive in terms of their carbon footprint when compared with other forms of transport. Secondly, new technologies will allow for the more cost-effective operation of aircraft, despite the potentially higher costs of alternative fuels. The result of this will be increased demand. Thirdly, automation and digitalisation will enable the air space to be managed more efficiently.
Scenario 3 “Isolation”	Scenario 3 assumes that the number of aircraft movements will fall. The trend for the adaptation and integration of new technologies is also negative. As this scenario predicts a drop in aircraft

	movements and a lack of technological innovations, it is known as “Isolation”, in line with the following arguments. This scenario expects a societal shift that runs counter to globalisation. Growing populism and nationalism could lead to a more unstable and fragmented world where international connections and cooperation are seen as being less important than today (for example, as was the case in some regions at the time when the strategy was being finalised because of the conflict in Ukraine). For this reason, there will be a greater concentration of aircraft movements within Swiss airspace and a significant drop in the number of international connections. In addition, the protectionist approach would lead to a lower level of innovation, which explains the setbacks in the adaptation and integration of new technologies.
Scenario 4 “Green Wave”	This scenario also sees a fall in the number of aircraft movements, but it is accompanied by an increase in the adaptation and integration of new technologies. As people are flying less often in this scenario despite the availability of technological options, it is known as “Green Wave”. The scenario is based on the assumption that governments will take drastic measures to bring about a long-term reduction in the supply and demand for all air traffic services. This assumes that there is a consensus within society because of the need for climate action. Even new technologies (for example sustainable fuels and propulsion systems) cannot compensate for the fall in demand and, in certain circumstances, could even exacerbate it (for instance fewer business trips because of improvements in the options available for holding virtual meetings or the choice of more sustainable long-haul transport options for holidays).

2.3 Conclusion on the trends and development scenarios for AVISTRAT-CH

The need for adaptation in the air space and aviation infrastructure is based on the underlying scenario. Different types of changes may be needed in the aviation system depending on the assumptions about developments. The assessment of the development scenario therefore forms an important basis for the following strategy report.

After analysing the trends from the architecture competition and given the current levels of knowledge, the project team considers **“Sustainable Growth”** to be the most realistic future scenario, while also being well aware that a mixture of all the scenarios is the most likely outcome in reality. Because of the growing diversity of airspace users, a new generation of increasingly efficient and environmentally friendly aircraft, the expected population growth and rising economic performance, it is reasonable to assume that in future the impact and the use of the airspace and aviation infrastructure will continue to increase. This has important implications for the AVISTRAT-CH programme. The airspace and aviation infrastructure must be able to handle the additional aircraft movements, which means that measures must be taken well in advance. At the same time, technological progress will allow for a more efficient and sustainable aviation system both on the part of the managers (for example in the form of a more dynamic use of airspace) and on the part of the users (for instance the more environmentally friendly generation of aircraft referred to above). These technological advances must be fully exploited in the context of the AVISTRAT-CH programme to enable aviation to continue making a valuable contribution to society in the future and, at the same time, to allow Switzerland to achieve its climate targets.

3 The AVISTRAT-CH strategy

3.1 The structure of the AVISTRAT-CH strategy

The AVISTRAT-CH strategy consists of two high-priority **strategic focus areas**. These focus areas – ***Design of the airport system in Switzerland*** *(SFA-1)* and ***Improving the structure and management of the airspace*** *(SFA-2)* – form the foundation for achieving the vision of the future airspace and aviation infrastructure of Switzerland with regard to the target areas of safety and security, efficiency and environmental impacts.

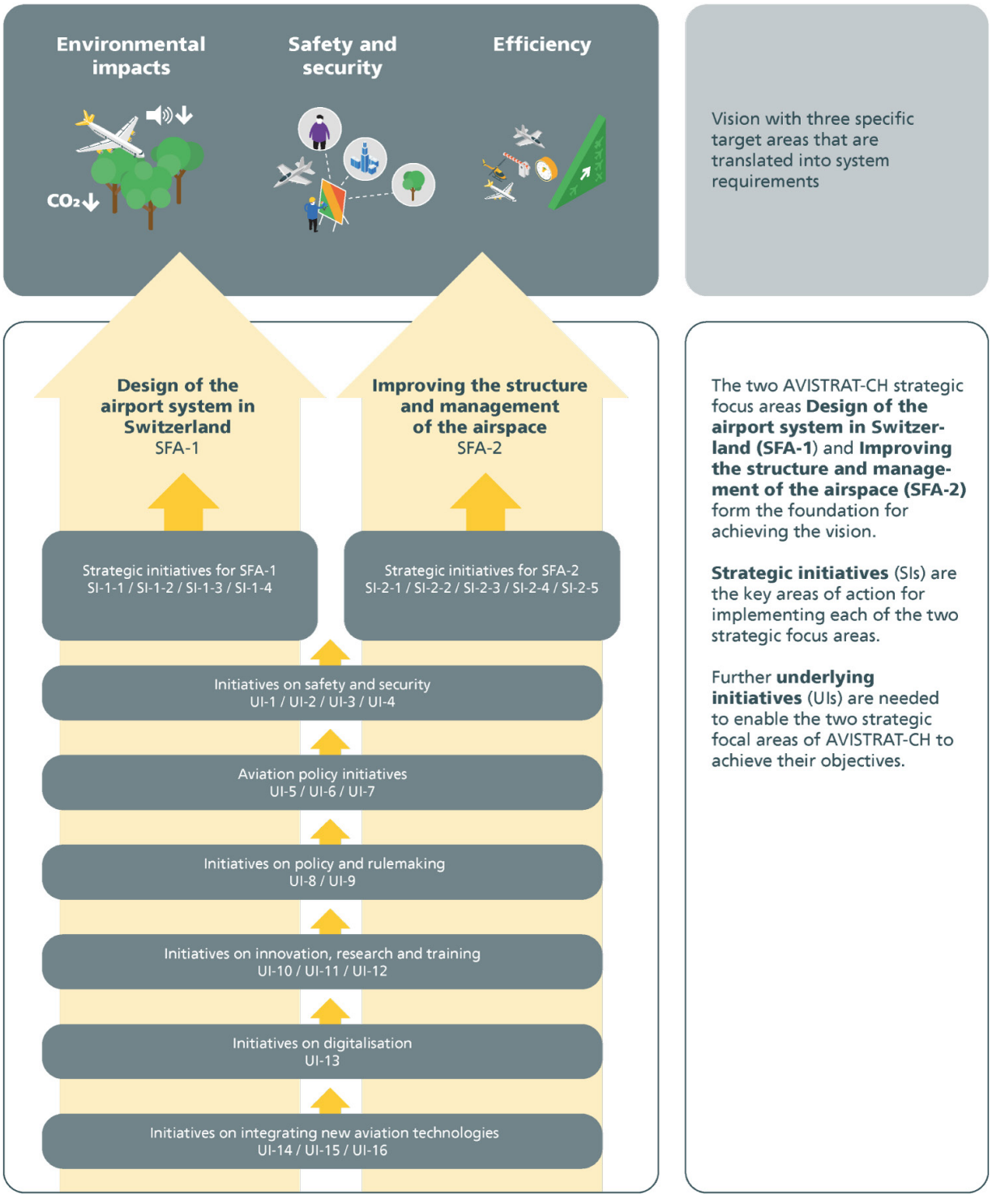

Figure 3: Diagram of the structure of the AVISTRAT-CH strategy.

The **strategic initiatives** (SIs) form the key areas of action for implementing each of the two strategic focus areas of AVISTRAT-CH. These initiatives describe the actions that determine the success of the strategy implementation and ensure that the objectives are achieved. The following four strategic initiatives (SI-1) are needed to ensure that strategy is successfully implemented in relation to the focus area *Design of the airport system in Switzerland (SFA-1)*:

Strategic initiatives for focus area 1 (see section 3.2.3).	
SI-1-1	Coordinated development and use of the airport system
SI-1-2	Development and use of the national airports to meet users' needs
SI-1-3	Sustainable development of Swiss airports
SI-1-4	Increased intermodality at the national airports

To effectively implement the second strategic focus area *Improving the structure and management of the airspace (SFA-2)*, the following five strategic initiatives (SI-2) are needed:

Strategic initiatives for focus area 2 (see section 3.3.3).	
SI-2-1	Targeted development of the airspace
SI-2-2	Principles of route design
SI-2-3	Dynamic management of the airspace
SI-2-4	Access to the airspace using equipment
SI-2-5	Staggered implementation of airspace initiatives

Because of the complexity of the aviation system and the interdependencies of various fields with the two focus areas, further **underlying initiatives** (UIs) are needed. These must be structured in such a way that the two strategic focus areas of AVISTRAT-CH can achieve the objectives of the vision:

Initiatives on safety and security (see section 3.4.1).	
UI-1	Establishing an integrated safety and security culture
UI-2	Risk-based action in the field of safety
UI-3	Minimum safety requirements in the Swiss aviation system
UI-4	Protecting the integrity of the Swiss aviation system

Aviation policy initiatives (see section 3.4.2).	
UI-5	Amending the political guidelines
UI-6	Coordinated national mobility planning
UI-7	CIV-MIL integration

Initiatives on policy and rulemaking (see section 3.4.3).	
UI-8	International coordination of Swiss regulations
UI-9	International cooperation in the field of policy and rulemaking

Initiatives on innovation, research and training (see section 3.4.4)	
UI-10	Sustainable fuels and technologies
UI-11	Targeted funding for innovation and research
UI-12	Safeguarding training in Switzerland

Initiatives on digitalisation (see section 3.4.5)	
UI-13	Guidelines on data sharing, management and protection

Initiatives on integrating new aviation technologies (see section 3.4.6)	
UI-14	Designing the infrastructure for unmanned aviation
UI-15	Guidelines for airspace services in the U-Space
UI-16	Targets for regulating innovative aviation technologies

3.2 AVISTRAT-CH focus area SFA-1: Design of the airport system in Switzerland

3.2.1 Objective of focus area SFA-1

Civil aviation is of outstanding importance to Switzerland. It connects Switzerland to Europe and the rest of the world and its economic output makes a key contribution to Switzerland's prosperity. The aim of Swiss aviation policy is to establish the conditions which ensure that Switzerland and its regions have international air connections and that the demand for air travel and air freight into and out of Switzerland is met. At same time, protection must be provided for the Swiss people and for travellers. The government must also ensure that the demand for training, rescue, supply and aerial work flights can be met (see the APR 2016).

According to the AVISTRAT-CH vision, the future airport system in Switzerland will be upgraded to a high standard that meets users' needs and takes into account the requirements of integrated mobility. The infrastructure will be adapted to the sociopolitical mobility requirements and designed in such a way that its environmental impacts are kept to a minimum. Aviation in Switzerland should operate sustainably and on the basis of long-term planning so that the facilities are integrated as effectively as possible in terms of spatial planning. When compared with aviation in other countries, it should have high levels of safety, generate economic benefits, meet the mobility requirements of the population and of business and, as far as possible, avoid harmful impacts on people and the natural world. By coordinating the impacts of aircraft noise and the development of housing at an early stage, it should be possible to safeguard the long-term coexistence of airports and of the interests of residents and businesses in the surrounding area (see the APR 2016). An efficient, well-functioning aviation infrastructure is an important requirement for achieving this.

3.2.2 Fundamental alignment of the AVISTRAT-CH focus area SFA-1

Switzerland has a dense, evenly distributed airport system that has grown up over time. The national airports are in need of development and there is potential for cooperation, role allocation and the exploitation of synergies among the regional airports and with other aerodromes (including heliports, airfields and military air bases). Therefore the emphasis of the focus area *Design of the airport system in Switzerland (SFA-1)* should be on creating an optimised, coordinated airport system in Switzerland. This must take into consideration the future requirements of users (for example vertiports) and also include the national airports, so that the expected growth in passengers and traffic can be managed.

3.2.3 Strategic initiatives for focus area SFA-1

SI-1-1 Coordinated development and use of the airport system

The role of the regional airports (plus heliports and airfields) is determined on the one hand by the public interest. On the other hand, private interests in air traffic services contribute to the usage profile of the airports (companies located there, associations, private individuals). Both the public and the private interests must be taken into account and compared with the other (non-aviation-related) interests.

The public interest consists of regional interests (connecting the region to the air traffic network) and national interests (for example rescue and military flights, state flights). The Swiss aviation system also performs other important functions, such as offering training opportunities for pilots and providing reserve capacity in the event of general aviation having to be excluded from the national airports.

What is lacking in the current aviation system is a cross-regional perspective on the airports. Among other things, this has resulted in the regional airports in some cases developing similar offerings which are not financially viable (primarily because of the high cost of air navigation services). The strategic initiative *Coordinated development and use of the airport system (SI-1-1)* addresses this challenge with the following three steps:

1) Analysis of the current status

Before starting to improve the airport system in Switzerland across all the regions, it is essential to understand the current status. For this purpose, the various parties (the Swiss Confederation and the industry) are creating a data set which includes current figures, capacity use and opportunities for the Swiss airport system (by analysing existing documents and updating the statistics). For example, this involves recording which airports in Switzerland could accept “aviation overflow” as a result of their current use of capacity.

2) Overall planning concept

On the basis of the current status, the industry is creating a bottom-up overall planning concept from a cross-regional perspective. This is being led by the regional airports and airfields. During this process, the Air Force, the public authorities, Skyguide and the national airports are playing an advisory and supporting role.

In the overall planning concept, the regional interests will be recorded, coordinated and balanced out on a national level.[2] The concept provides instructions for action:

- Specialisation and/or cooperation of regional airports and airfields
- Coordinating and sharing the administrative resources between the operators
- Developing new business models for regional airports (for example in the field of unmanned aviation)
- Exploiting economies of scale and aligning interfaces (for example in ANS, CNS and ground handling)
- Developing platforms and connection solutions for capacity bottlenecks (the exclusion of general aviation traffic as a result of prioritisation at the national airports must be taken into consideration at an early stage of the work involved in SI-1-1.)
- National coordination and efficient use of infrastructure elements (for example training capacity)
- Improvements in the environmental impacts of air traffic

Military interests and questions of the shared civil use of military air bases must explicitly be included in the considerations.

[2] During the implementation of the Würth motion (MO 20.4412/Safeguarding regional airports as key infrastructure), the basic conditions for federal financing of air navigation services at the regional airports will be drawn up. The resulting specifications must be taken into consideration in the overall planning concept.

3) Implementation

After the completion of the overall planning concept, the Confederation will carry out the necessary planning steps at the request of the industry in accordance with the established SAIP processes and with the close involvement of the cantons and municipalities. Any newly agreed intended uses and basic conditions for the airports will be included as mandatory requirements in the sectoral plan. In addition, the Confederation will amend the law to allow performance goals for the airports to be set and evaluated.

SI-1-2 Development and use of the national airports to meet users' needs

The national airports are the national hubs of international air traffic. They form part of Switzerland's basic infrastructure and of the overall transport system. They should be able to meet market demands for flight connections. For this reason, restrictions on their operating hours should be investigated only if longer night-time curfews are introduced in Europe that go beyond the existing scheme in Switzerland. The Confederation manages the development of the national airports by means of sectoral planning and can specify mandatory performance and capacity targets in the detailed plans.

The Confederation is addressing the challenges of the future together with the national airports and the air navigation service provider. From today's perspective, these challenges include capacity bottlenecks, the implementation of European safety and security regulations, the local impact of noise, environmental sustainability and new forms of transport. Therefore, the future developments determine the focus on maintaining the capability for development and on applying clear traffic priorities at the national airports. Because general aviation is expected to be excluded from the national airports as a result of prioritisation, the overall planning concept (see *Coordinated development and use of the airport system (SI-1-1)*) must include solutions for the relocation and the new home of general aviation.

The Confederation, the cantons where the national airports are located and the air navigation service provider will focus on the following tasks on the basis of the current allocation of roles:

- The continuous improvement of the infrastructure and technical systems (including the design of the routes, see *Principles of route design (SI-2-2)*) to provide the necessary capacity, taking into consideration the safety requirements

- Clarification and preparations for new forms of use (for example vertiports, see *Designing the infrastructure for unmanned aviation (UI-14)*)

- Connecting the national airports to the various means of transport (rail, bus, tram, road, electric vehicles, air taxis etc.) to ensure the accessibility and connectivity of the national airports and, where possible, to shift the modal split in favour of public transport (see *Increased intermodality at the national airports (SI-1-4)* and *Coordinated national mobility planning (UI-6)*)

SI-1-3 Sustainable development of Swiss airports

Sustainable development of the infrastructure and the operation of the airports will help with achieving the noise and CO_2 reduction targets. The objective of AVISTRAT-CH is for the airports in Switzerland to be carbon neutral (without offsetting) by 2050 at the latest.

The statements on protecting the environment in the Sectoral Aviation Infrastructure Plan (SAIP) remain valid. The following measures should be regarded as key themes within the AVISTRAT-CH implementation timeframe and in the context of the Swiss airport system:

- The Confederation has introduced incentives for reducing noise and CO_2 emissions from the infrastructure and from flight operations, taking into consideration national and international requirements and conditions.

- The airports have provided incentives to reduce aircraft noise at source in the form of noise charges.

- The implementation of measures to reduce the noise pollution experienced by the population using the “Nationale Massnahmenplan zur Verringerung der Lärmbelastung” (National action plan to reduce noise pollution) as a guideline.

- The airports are putting in place the infrastructure for using sustainable fuels in good time (see *Sustainable fuels and technologies (UI-10)*).

SI-1-4 Increased intermodality at the national airports

The relevant federal authorities, the cantons where the airports are located and the municipalities, public transport companies and associations that are affected will help the national airports to develop into transport hubs with attractive transfer connections and the accompanying information. The objective is to create a physical and digital network connecting the various means of transport and mobility offerings in order to guarantee a seamless mobility chain.

The main challenges involved are ensuring connectivity between rail, road and air transport (including VTOL aircraft in future) and increasing the efficiency of the entire transport system. This calls for integrated planning and the rapid implementation of the related projects. There is also a need to secure finance from the existing funding instruments (for example, in the case of road and rail, the National Highways and Urban Transport Fund and the Rail Infrastructure Fund).

Passengers must be offered a seamless travel experience in line with the principles of Mobility as a Service (MaaS) (see *Development and use of the national airports to meet users’ needs (SI-1-2)* and *Coordinated national mobility planning (UI-6)*). This can be achieved, among other things, by the consistent use of CDM processes, the involvement of the key players and the sharing of data.

To implement the initiative *SI-1-4* and to lay the necessary legal foundations for a national mobility data infrastructure (MOBI), the public authorities and the industry will support in particular the projects relating to the national data network infrastructure for mobility (NADIM) under the leadership of the Federal Office of Transport (FOT) and relating to the Transportation network CH under the leadership of swisstopo, the Federal Office of Topography. This will prevent a special solution being developed solely for aviation. With the support of the planned regulations, the industry will ensure that its specific requirements concerning the development of the data infrastructure will be taken into account.

3.2.4 The impact of SFA-1 on the target areas

3.2.4.1 Environmental impacts

The industry target of “net zero by 2050” presents a challenge for airspace users and the operators of airports and airfields in Switzerland. The AVISTRAT-CH programme is continuing to work towards existing aims and reinforcing some of the key themes relating to the implementation timeframe of 2035, for example, the requirements for the use of sustainable aviation fuels (SAFs). Another positive influence on the environmental impacts is the growing perception of travel experiences as Mobility as a Service. Close cooperation between the different forms of transport will ensure that the best possible mode of transport (including with the regard to the environmental impacts) can be chosen for a planned journey. The national airports will perform an important function in this respect as national transport hubs (see also *Coordinated national mobility planning (UI-6)*).

3.2.4.2 Safety and security

Against the background of an expected increase in traffic and the correspondingly intensive use of airspace in Switzerland, an integrated view of the airspace and the ground infrastructure plays an important role. This is because a defined airspace has generally been created to protect the ground infrastructure or one form of use (for example, control zones and scheduled flights at national airports). The current increase in violations of airspace can be counteracted by working towards unbundling the transport on the ground. An efficient bottom-up overall planning concept with nationwide coordination can achieve this and, at the same time, improve safety levels.

3.2.4.3 Efficiency

The aviation system will be made more efficient by implementing *SI-1-1*, *SI-1-2* and *SI-1-4*. A coordinated bottom-up overall planning concept which is drawn up by the industry will allow the use of the regional airports and airfields to be better coordinated in future. This will help to eliminate competing operating concepts and achieve greater efficiency across the whole airport system.

Continuous improvements to the infrastructure and systems at the national airports will also ensure that they can manage the expected increase in traffic. An important example of this is the redesign of the approach and departure routes that has been made possible by the use of new technologies. At the same time, efficiency levels will be increased by pushing ahead with the connection to different modes of transport and forms of use and improving their connectivity, either by integrating new users (for example unmanned aviation) or by working closely with other forms of transport in Switzerland (for example by coordinating state programmes on the level of DETEC).

3.3 AVISTRAT-CH focus area SFA-2: Improving the structure and management of the airspace

3.3.1 Objective of focus area SFA-2

According to the AVISTRAT-CH vision, in future the design of the airspace in Switzerland will be upgraded to a high standard that meets users' needs. It will be structured to fulfil the sociopolitical requirements, for example by prioritising public transport and the Air Force. It can also be adapted quickly and flexibly to the rapidly changing needs of users. Available technologies will be used to allow the airspace to be managed in a targeted way. During the design of the processes, the focus will be on effectiveness and simplicity. In addition, the interfaces and boundaries of the airspace will be made compatible with neighbouring countries and it will be possible to manage them efficiently, against the background of the fact that the Swiss aviation system is an integral part of the European aviation/ATM system (including the accompanying regulation).

The following objectives for the focus area *Improving the structure and management of the airspace (SFA-2)* are taken from the AVISTRAT-CH vision:

- The only restrictions on the free use of the airspace are based on state and public interest. The structure of the airspace has been further developed and the restrictions are implemented dynamically, efficiently and in accordance with requirements.

- The system of approach and departure routes is based on users' needs and the operating concepts of the airports. The airspace around the airports can be used dynamically, where operations permit this.

- Laterally and vertically separated flight paths allow for efficient air navigation and traffic management. This also enables the impact of flight operations on the environment to be kept to a minimum.

- The central airspace management system is integrative and ensures that airspace is allocated dynamically and flexibly to users on the basis of their actual needs. Information about current and planned airspace use is made available in real time and is platform-independent.

- The equipment belonging to airspace users corresponds with the equipment regulations of the airspace that users are requesting access to. This lays the foundations for a dynamic, flexible airspace structure with efficient processes.

3.3.2 Fundamental alignment of the AVISTRAT-CH focus area SFA-2

The challenges facing the airspace structure and management are growing as a result of the more intensive and more diverse use of the airspace. The focus area *Improving the structure and management of the airspace (SFA-2)* aims to maintain safety levels, meet the needs of the various users, make access to the airspace as simple as possible and only restrict access on the basis of the priorities of state and public interest (see the statements on air sovereignty in *Protecting the integrity of the Swiss aviation system (UI-4)*).

By using the available technological options and by introducing automated systems, the existing airspace structure can be made more flexible and more open in the face of future challenges. At the same time, the cost and complexity of managing it will be reduced. As a consequence, the necessary foundation for achieving the objectives is that all the players involved in aviation have standardised technological equipment. This will be required on the basis of the principle of proportionality. In addition, the Confederation will define all the services to be provided for the management of the airspace in a service catalogue, for the purpose of increasing transparency and cost-effectiveness.

3.3.3 Strategic initiatives for focus area SFA-2

SI-2-1 Targeted development of the airspace

The Confederation is responsible for defining the airspace structure, taking into consideration national public interest. It can delegate the design activities to third parties, providing that the funding is clearly specified and the required safety levels can be achieved. The Confederation remains responsible for the integrative coordination and consultation process and, by specifying and complying with standardised principles, ensures the nationwide consistency of the airspace structure. The following parameters must be noted during the process of improving the airspace structure:

- The primary purpose of the airspace structure is to guarantee the safety and efficiency of air traffic. It must be designed in such a way that the cost and complexity of managing it are kept to a minimum.

- The airspace must be designed in accordance with the current minimum requirements for safety (see *Minimum safety requirements in the Swiss aviation system (UI-3)*) and system efficiency (optimising capacity and costs). It is integrated into the European network planning and provides for the (cross-border) delegation of airspace with neighbouring countries in the way that is most suitable for Switzerland.

- Where the defined airspace is used to protect approach and departure routes to airports (CTR/TMA), its structure must be based on the corresponding principles of route design (see *Principles of route design (SI-2-2)*). The objective is the greatest possible flexibility against the background of the viable operating concepts.

- The available technological options must be exploited to the full during the design of the airspace in order to minimise harmful impacts on the environment (CO_2 and noise). In specific terms, this means laying the foundations for short, efficient flight paths, for example by means of free routing, CDO/CCO (continuous climb and descent operations) and non-intersecting routes between the system of flight paths and the airports.

- A harmonised design for the airspace, taking into account international specifications.

- Flexible, efficient and system-oriented airspace management (for example CIV-MIL integration or U-Space).

- Taking into consideration users' needs with regard to access to the airspace.

The airspace structure will be prepared and developed to meet future challenges. The industry and the regulators will attempt to develop the airspace gradually, moving away from controlled and uncontrolled air traffic that is clearly segregated by airspace structures and towards a technology-based, flexible management approach (with or without ATS) and a largely integrated usage model. This transformation will be made possible by the greater use of technology (PBN, TBO, 4D-Trajectory) to increase flight efficiency and airspace capacity.

All the airspace will become managed airspace, which will be divided into controlled and self-managed airspace.[3] Controlled airspace will be established wherever this is necessary to guarantee safe, efficient and ordered air traffic in the public interest. Self-managed airspace must be used wherever the purposes of controlled airspace do not apply (see the following table for details).

[3] In certain peripheral areas of Swiss airspace, there can still be areas that are uncontrolled and that can be freely used without any technological requirements. However, these are reserved for unpowered aircraft and urgent military use and must be communicated accordingly.

Managed airspace		
	Controlled airspace	**Self-managed airspace**
Description	Controlled airspace is restrictive airspace with automated processes and a mandatory code of conduct. It can be managed with or without conventional air navigation services. The increasingly flexible and dynamic nature of controlled airspaces allows them to be used more efficiently. For example, airspaces intended for higher priority types of usage that are not being used to full capacity can be made available dynamically to other airspace users. Example: Dividing terminal control areas into lateral and vertical sectors that can be used flexibly depending on the situation (traffic, weather etc.). The same applies to military training areas. In order to make consistent use of these options, priority must be given to representing the airspaces in real time on the devices of all the affected users.	Uncontrolled airspaces where users are responsible for separating themselves from other users, from the terrain (VFR and IFR) and from hazards (for example firing ranges). The principle of "see and avoid" will gradually be expanded with the support of technology. Extending this to "see, sense and avoid" will increase the (technological) visibility of airspace users and therefore allow the uncontrolled airspaces in Switzerland to be enlarged. A mandatory code of conduct will be introduced if this is necessary to maintain safety levels (for example TMZ, RMZ, measures to allow for IFR in Golf).
Objective	Protecting air traffic in the public interest. In managed airspace, priority is given to specific types of users (see *Dynamic management of the airspace (SI-2-3)*).	Free access to the airspace for users wherever possible.
Airspace classes affected*	Charlie, Delta Alpha, Bravo (not used in Switzerland)	Echo (primarily)**, Golf Foxtrot (not used in Switzerland)
Areas covered (not exhaustive)	Control zones, terminal control areas, airspace for flight paths for scheduled flights, military training areas, areas with temporary restrictions.	Airspace where the purposes of controlled airspace do not apply.

*During the AVISTRAT-CH implementation phase, the ICAO airspace classes will continue to be used in order to ensure international compatibility.

**The use of the Echo airspace class will be reduced by creating the necessary conditions for self-managed airspace. Echo airspace will eventually be classified entirely as Golf while at the same time being opened for IFR traffic.

The industry functions according to the "give and take" principle. Attempts will be made to open up airspaces to all users by means of dynamic use. However, the complexity of the management process for the air navigation service provider must not exceed an acceptable level. If conflicts of use within the airspace cannot be resolved by flexible or dynamic usage (for example because of peaks in arrivals and departures at the national airports or MIL use), the priority rule will be applied (see *Dynamic management of the airspace (SI-2-3)*).

SI-2-2 Principles of route design

The approach and departure routes to and from the airports in Switzerland form an integral part of the airport system. The design of approach and departure routes as a connection to the system of flight paths must be aligned with the efficiency targets in the sectoral plan (see section 3.2). In addition, fulfilling the minimum safety requirements is a basic prerequisite (see *Minimum safety requirements in the Swiss aviation system (UI-3)* and *Risk-based action in the field of safety (UI-2)*). Once these two priorities have been achieved, the next consideration is the altitude-dependent reduction in noise and CO_2 emissions. Altitude-dependent means that in the lower air space the focus must be put on noise and in the upper segment on short flight paths (reducing CO_2 emissions). The dividing line can vary depending on the location and must be specified by the regulators.

When these priorities have been met, the approach and departure routes must be reorganised. This will form the basis for the flexible and efficient use of airspace in accordance with the current operating concept. As far as possible, the approach and departure routes must be laterally and vertically independent. This can be achieved by means of route design (CDO/CCO/TBO) and by specifying the accuracy of the navigation (PBN).

The parties responsible for route design must clearly indicate the expected effects of new routes and must make their deliberations public. The regulators will investigate the changes that have been made and ensure that the aviation industry can also benefit from the new technological options for reducing pollution. Appropriate consideration must be given to the public interest in connections with other countries. During the process of designing the airspace, the principles of the initiative *Targeted development of the airspace (SI-2-1)* must be applied to protect the approach and departure routes.

SI-2-3 Dynamic management of the airspace

The Confederation will draw up a service catalogue to define all the services to be provided for the management of the airspace, including the technologies and data management methods to be used. The services will be listed and the costs of management will be assigned to the users. The adjustments needed for the dynamic management of the airspace are on two levels: airspace management and traffic management (see the following table for details).

	Levels of management	
	Airspace management	**Traffic management**
Description	Airspace management is the allocation of airspace and in particular the management (for example activation and deactivation) of the airspace designated in future as controlled airspace (see *Targeted development of the airspace (SI-2-1)*).	Traffic management is the prioritisation and the management of traffic operating in a specific airspace.

Levels of management (continued)		
	Airspace management	**Traffic management**
Principles	• Increasingly flexible handling of the airspace designated as controlled airspace with allocation based on actual need. • Exploitation of the technological options that allow for a rapid adaptation of the airspace and simple communication with airspace users. • Integrative management of the entire airspace. This is achieved by means of an AMC defined using CDM and BPPR processes that coordinates the various civil and military uses. • Transparent provision of the necessary data to the parties involved in airspace management and to the users to improve efficiency and integrity.	Use of a priority rule wherever conflicts of use cannot be resolved by dynamic use of airspace: 1. Air police deployments 2. Medical emergencies 3. Rescue, border protection and police flights 4. Flights of special state interest 5. Scheduled and charter flights under instrument flight rules 6. Other flights under instrument flight rules 7. Flights under visual flight rules 8. Flights of unmanned aircraft (if they cannot be assigned to one of the priorities listed above) The priority rule for use can be adjusted according to the requirements of the applicant and the purpose of the relevant airspace.

SI-2-4 Access to the airspace using equipment

All airspace users must play their part in equipping their aircraft to ensure that the improvement in safety, access to airspace and capacity can be achieved.

Access to the various airspaces and services can be made dependent on equipment requirements. This applies both to the controlled airspace (for example the necessary level of navigation accuracy (PBN) to improve efficiency when traffic volumes are high or to ensure that the design is improved) and for self-managed airspace (for example with regard to the (technological) visibility of the airspace users).

When introducing new equipment requirements, the regulators will focus on an acceptable implementation for users with the aim of providing simple access to the necessary technologies, which are largely determined by EU regulations. In addition, the Confederation will take action on an international level to make available data transmission capacity of adequate quantity and quality for the safe operation of aviation (including frequencies and bandwidths).

SI-2-5 Staggered implementation of airspace initiatives

The contents of the strategic initiatives relating to the strategic focus area *Improving the structure and management of the airspace (SFA-2)* require staggered implementation. The objective of the initiative *SI-2-5* is therefore to implement the previously described airspace initiatives using an integrated and coordinated approach. Three steps are planned within the implementation timeframe of AVISTRAT-CH which in some cases will have to be implemented in parallel because of mutual dependencies. The steps outlined below will be used to create a detailed implementation roadmap on the basis of the AVISTRAT-CH strategy and will subsequently be implemented by the Confederation and the industry taking a coordinated approach. In the case of all the steps, international regulations must be taken into consideration and incorporated accordingly (for example ATM Master Plan, SESAR etc.):

Step 1: Concept design

Some examples of the first step, which are not intended to be exhaustive, include, on the part of the regulator, the analysis and identification of the need for regulatory action and the corresponding formulation of a regulatory framework. In addition, comparisons will be made with international regulations and the service catalogue will be drawn up. Proposals for funding the necessary projects will also be prepared. The industry is responsible for identifying possible changes to the approach and departure routes and the necessary adaptations to the airspace users' equipment.

Step 2: Planning

Before the specific changes can be made to the airspace, different versions of the decisions need to be formulated and weighed up. In addition, the necessary adaptations to the airspace users' equipment must be made so that the new requirements for airspace use are met.

Step 3: Implementation

In the final step, the airspace change projects will be implemented. The decisive factor here is a coordinated, nationwide implementation taking into consideration the previous steps.

3.3.4 The impact of SFA-2 on the target areas

3.3.4.1 Environmental impacts

The new technological options for route design (CDO, CCO, TBO) allow the routes to be made increasingly environmentally friendly. Continuous flight profiles for climbs and descents have a positive impact on environmental and noise pollution. During the AVISTRAT-CH implementation timeframe, these positive effects must be fully exploited in the lower airspace and in flight paths (for example free routing).

3.3.4.2 Safety and security

The realignment of the airspace will lead to a simpler airspace structure. This will also result in greater clarity, in combination with a real-time representation of airspaces on the users' devices. As described in the strategic initiative *Access to the airspace using equipment (SI-2-4)*, the additional equipment will in future improve airspace users' perception of the situation. If "sense" functionality is added to the "see and avoid" principle, this will lead to the improved (technical) visibility of airspace users and therefore to less likelihood of collisions occurring. The clear priority rule in controlled airspace will also ensure that airspace can be used safely in the public interest.

3.3.4.3 Efficiency

The exploitation of technological options in the design of approach and departure routes will result in the design of flight paths being increasingly unbundled. This will lead to greater efficiency in day-to-day operations. The possibility of continuing to create restrictive airspaces in problematic areas of the Swiss airspace will also ensure that, for example, at national airports the necessary airspace capacity for priority uses can be provided.

The more dynamic use of the airspace will result in a more efficient system. Therefore, airspaces can be used more flexibly and released when not in use. The increasing use of technology, including "sense" functionality is likely to lead to less controlled airspace and less mixed airspace.

3.4 Underlying initiatives

The initiatives listed in section 3.4 form the backbone of the implementation of the two strategic focus areas of AVISTRAT-CH – *Design of the airport system in Switzerland (SFA-1)* and *Improving the structure and management of the airspace* – and therefore play a decisive role in achieving the objectives of the vision.

3.4.1 Initiatives on safety and security

For the purposes of implementing AVISTRAT-CH, the terms “safety” and “security” must largely be regarded as being separate:

- **Safety** refers to the protection of the population and the people in the aviation system. It involves constantly working to reduce risk and, most importantly, to ensure that the risks for the civil population do not exceed the acceptable level. The safety goals must be met and international requirements complied with.

- Annex 17 of the Chicago Convention defines **aviation security** (AVSEC) as safeguarding civil aviation against acts of unlawful interference. The risk in this case is a combination of the threat and the vulnerability. Information about current threats come from the FIS and from the ICAO Risk Context Statement (this is not available to the public).

In a similar way to safety, the security requirements are largely determined by international organisations (EU, ICAO). This is why Switzerland is involved on an international level in this area, because its ability to follow its own path is limited. The security provisions that govern Swiss aviation are laid down in the National Aviation Security Programme (NASP) of the FOCA, which is classified as confidential.

The underlying initiative *Establishing an integrated safety and security culture (UI-1)* aims to continue the development of an integrated safety and security culture in the affected organisations. The initiative *Risk-based action in the field of safety (UI-2)* describes the fundamental risk-based action taken by the organisations in the aviation system. The underlying initiative *Minimum safety requirements in the Swiss aviation system (UI-3)* covers the fulfilment of the safety goals. Finally, the initiative *Protecting the integrity of the Swiss aviation system (UI-4)* concerns the protection of the aviation system from unlawful interference and can therefore be regarded as a security initiative.

UI-1 Establishing an integrated safety and security culture

The Swiss aviation system aims to establish an integrated safety and security culture so that the safety of flight operations can be guaranteed. This will be implemented by the industry and the regulators across all the levels of the hierarchy. The awareness and the knowledge of risks and safety on the decision-making levels of the organisations will be increased and the organisations will introduce a safety culture that involves taking a responsible approach to risks. However, this applies not only to the decision-making level but to everyone in the organisation. Because everyone in an organisation can, on the one hand, help to identify acts of unlawful interference and mistakes, but, on the other hand, is also a potential source of acts of unlawful interference and mistakes and represents a risk. The main components of an end-to-end safety and security culture are as follows:

- A just culture: An organisational climate where mistakes in general are seen as the product of a faulty organisational culture and not only as being caused by the person or people directly involved.

- A reporting culture: An organisational climate where people are prepared to report their mistakes and near misses.

- A flexible culture: An organisational climate where both the people and the organisation are able to adapt quickly to any given circumstances.

- A learning culture: An organisational climate where there is the readiness and the ability to draw the correct conclusions from the safety information system and the determination to introduce reforms on a large scale.

- An informed culture: An organisational climate where data and safety-related information is systematically collected, analysed and distributed.

- A security culture: An organisational climate consisting of a series of standards, convictions, values, attitudes and assumptions that are embedded in the daily activities of the organisation and reflected in the actions and behaviour of all the units and employees within the organisation. Everyone should be responsible for security and make their own contribution to it.

UI-2 Risk-based action in the field of safety

The oversight activities of the regulators support the risk-based approach. Measures to reduce risk and improve safety margins will be introduced in the industry and implemented providing that they are operationally and financially viable, in the awareness that air transport services can never be provided entirely without risk.

When adapting system components, the organisations will apply the principle of safety by design/process, which means that the design of adaptations to the aviation system must be based on a comprehensive, systematic and traceable risk assessment. This risk assessment must be carried out as early as possible in the design process, so that the resulting safety requirements can be incorporated into the design.

UI-3 Minimum safety requirements in the Swiss aviation system

The establishment of safety goals (risk criteria) is a continuous process for evaluating the maximum acceptable risk that the entire aviation system can be exposed to, taking into consideration the specific conditions, balance of interests and operating features.

When adaptations or changes are made to the aviation system, the safety goals are used as a reference point, which means that they must be determined by the Confederation and the industry before the start of the adaptation projects. The military safety goals may differ from the civil safety goals. However, the civil safety goals must be fulfilled at a minimum if an operation relates to the civil safety area.

Because of the diversity of the Swiss aviation system, it is important to evaluate and confirm the feasibility of each unique safety goal in order to ensure that the solution is productive and works in practice and not just in theory. On an international level, Switzerland is still actively involved in regulatory discussions about safety.

UI-4 Protecting the integrity of the Swiss aviation system

Measures in the field of aviation security are often costly precautions for the organisations concerned. However, it is extremely important for these precautions to be taken, particularly with regard to threats of terrorism and cyber attacks (which also have safety implications). The precautionary security measures are based on the following four cornerstones:

- Findings made by the intelligence service
- Security measures in accordance with the National Aviation Security Programme (NASP)
- Measures to counter unpredictable events, in particular threats from insiders
- The security culture (see *Establishing an integrated safety and security culture (UI-1)*).

Digitalisation offers new opportunities in the field of airspace management, but at the same time it creates new vulnerabilities, because the necessary infrastructure is becoming increasingly digital. Crisis-resistant, secure methods of sharing data require a certain level of security in the electricity supply and a consistently high level of protection of data integrity. This is extremely important to ensure that operations are safe and to provide protection against deliberate disruption and cyber attacks.

During the implementation of AVISTRAT-CH, there must be a critical focus on the general and obvious conflict of objectives in the field of security (cost-effectiveness and efficiency vs. measures to increase security). This must also be included in the evaluation, as is already being done by means of impact assessments and the NASP revisions in the context of the National Security Committee. In addition, these guidelines must be followed:

- During the implementation of AVISTRAT-CH, measures to ensure state security and air sovereignty are given a high priority.
- The key measures to ensure state security and air sovereignty are in particular:
  - Safeguarding air sovereignty and air defence
  - Training measures to safeguard air sovereignty and air defence
  - Border protection and deployment of the emergency services
  - Measures to protect civil aviation, in other words, AVSEC measures, are implemented to a high standard of quality in accordance with national and international regulations.
- The implementation of AVISTRAT-CH must be coordinated with the NASP.
- Measures to protect civil aviation against hazards in cyber space are given in chapter 19 of the NASP. The corresponding cyber security measures are risk-based and must be coordinated with the National Strategy for the Protection of Switzerland against Cyber Risks (NCS) and with international regulations

- Terrorism remains an ongoing threat to the aviation system. It is important to be aware that the types of threat are constantly changing and that the anti-terrorism bodies are repeatedly faced with new challenges (for example terrorist attacks with drones). The measures needed to avert these threats are therefore monitored on an ongoing basis and, if necessary, modified.

- To ensure that the AVSEC measures can have a preventive effect, an integral overview of the situation in civil aviation must be available. For this reason, the intelligence service of the Confederation should prepare more threat analyses that focus specifically on aviation. In addition, the effectiveness of the measures is based on carefully coordinated action on the part of all the stakeholders.

3.4.2 Aviation policy initiatives

The following initiatives support the implementation of the two strategic focus areas *Design of the airport system in Switzerland (SFA-1)* and *Improving the structure and management of the airspace (SFA-2)* by providing guidance about the necessary amendments to the political guidelines in the Swiss aviation system.

UI-5 Amending the political guidelines

To ensure that aviation in Switzerland can develop, amendments are needed to laws, ordinances and sectoral plans, alongside the development projects in the strategic focus areas. The following factors must be taken into consideration:

High-level guidelines

The infrastructure and services of national importance and the sovereign duties (for example air defence) must be guaranteed at all times. The DETEC and the DDPS specify where operations must be guaranteed within the civil and military aviation infrastructure.

The infrastructure necessary for international air connections and for maintaining the Swiss airport network is protected by the federal authorities (or by appointed organisations) and the interests of the cantons must be given appropriate consideration.

Aviation financing

The regulators and the authorities concerned must ensure that the sovereign interests in the field of national aviation are safeguarded and financed in the long term. The sovereign aviation interests include both the critical infrastructure and the services (for example, services of national importance in accordance with the AviA and ANSO).

All actions are taken on the basis of the principles of the market economy. For example, in the field of critical infrastructure, the Confederation can provide support in the form of sureties, start-up and risk funding or investments. In addition, the Confederation also safeguards the financing of areas where it pursues its own interests and where financing on a purely market-driven basis would not be available.

The regulators manage and monitor the provision of services in accordance with the following process:

- After consultation with the airport operators and air navigation service provider, the regulators define mandatory, coordinated performance and capacity targets for the individual services in the airports and in ATM (taking into consideration the European conditions).

- The Confederation takes active management measures using the available instruments, such as KPIs, performance targets and economic regulation. The conditions for guaranteeing that the targets are met are specified, together with the mechanisms in the event that they are not met.

- The service must be paid for directly by the users in the form of charges (a one-off usage charge or individual consumption charges) or compensated for by the Confederation (in accordance with the above-mentioned catalogue of state interventions).

The regulators apply the following two principles to the process of managing and monitoring the provision of services:

- Significant cost transparency and cost-effectiveness in the mandated area

- The “user pays” principle wherever this results in greater efficiency and does not conflict with any higher-level interests.

Cooperation in international aviation policy

The executive authorities play an active role in all the areas of European and international policy that are relevant to Switzerland. The representatives of the authorities take into consideration the position of the national stakeholders. The stakeholders themselves also form part of international networks with the aim of supporting Switzerland’s consolidated position.

Environmental impacts

The authorities support a coordinated approach on an international level that helps to create more effective instruments in the field of aviation for achieving the targets relating to environmental impacts. Income from environmental charges must be used, among other things, for decarbonising air traffic and for promoting sustainable, innovative, low-emission technologies.

UI-6 Coordinated national mobility planning

The objective of this initiative is to integrate aviation into the overall transport system and to position it on an equal footing with land transport. In future, aviation should be incorporated into mobility chains as an integrated means of transport, in particular where it can offer profitable and cost-effective added value because of its comparative advantages and where, in comparative terms, there are no negative consequences for the use of resources and for the environment. The objective is to make more efficient use of the existing infrastructures and mobility offerings. An integral approach to all the means of transport and mobility offerings is needed in order to achieve this. On the one hand, we need attractive physical transport hubs with largely seamless transfer connections to all forms of mobility. On the other hand, we need simple digital access to information and booking services for these offerings to allow in particular for intermodal and multimodal mobility that meets customers’ needs. This will make it possible for new mobility services (such as air taxis) to be introduced in the future. The promotion of intermodal connectivity at appropriate points where there are good mobility services will be supported by the “Transport hubs” programme that covers different areas at state level and is being led by the Federal Office for Spatial Development (ARE) in close cooperation with the Federal Roads Office (FEDRO) and the FOT.

The DETEC is responsible for coordinating the national overall mobility plan and will ensure that the planning process is integrated. This coordination will take the form of corresponding provisions in the Sectoral Plan for Transport, Programme Part and of cooperation with the agglomeration programmes and the transport hubs programme. This will ensure consistent development on an appropriate level in the cantonal structure plans and the mobility and overall transport concepts. As an active participant in these processes, the FOCA ensures that the interests of aviation are adequately represented and, in particular, that the airports are involved. The objective is for aviation and the Swiss airports to form an integrative part of the overall Swiss mobility system and to further improve the connection between the airports and land transport and the accompanying mobility offerings. This will allow the potential synergies between the individual forms of transport, including aviation, to be better exploited in future and the efficiency of the overall transport system to be further increased (see *Development and use of the national airports to meet users’ needs (SI-1-2)* and *Increased intermodality at the national airports (SI-1-4)*).

UI-7 CIV-MIL integration

There are certain points of contact between civil and military aviation, but the two forms of aviation are regulated and organised in different ways. The contact points are the joint use of the airspace over Switzerland, the shared use of military airbases in some cases by civil aviation and the air navigation service provider. The last of these points is due to the fact that both civil and military air navigation services are provided by Skyguide. Wherever there are points of contact, the competencies and responsibilities are regulated by the Aviation Act or the accompanying implementing regulations. In some cases they are defined in more detail in the ongoing revision of the Armed Forces Act, which lays the foundations for the MAA, among other things. Where there are interfaces, the FOCA and the MAA regularly share information. At the same time, it is clear that there is potential for joint coordination of the infrastructure, use, regulation, oversight and operation. This potential can be exploited where possible by taking the following measures.

Wherever there are points of contacts or joint interests, the national civil and military policy and rulemaking will in future be more closely coordinated. In this context, the focus should be on identifying solutions that will increase efficiency and performance. Where necessary, structures will be created or adapted to promote integration, to allow for the use of synergies (in areas such as finance, staff, expertise etc.) and to avoid duplication in the operation of systems and infrastructures. In addition, the Swiss aviation system will be operated, supervised and developed in an integrative and efficient way. The most important priority is always to fulfil the sovereign duties. As far as possible, the needs of the stakeholders will be integrated into the policy and rulemaking process on the basis of these principles.

To ensure that the national cooperation in the field of policy and rulemaking is better coordinated in future, the regulators will attempt to put in place coordinated safety requirements on a national level and coordinated development and procurement plans (including, among other things, coordinating timing, finance and requirements).

3.4.3 Initiatives on policy and rulemaking

In the field of civil aviation, the legal framework takes the form of a dense network of international regulations (EU and ICAO). These cover all the relevant areas. Therefore, there is very little room for manoeuvre in the national regulations or at least only in niche sectors which are not covered by international rules. For this reason, the following underlying initiatives mainly concern international cooperation on the part of the regulators and the coordinated introduction of regulations in the Swiss aviation system.

UI-8 International coordination of Swiss regulations

This initiative aims to ensure that the Swiss representatives on the relevant international committees have the greatest possible influence with regard to Swiss national interests as specified in *Amending the political guidelines (UI-5)* and *International cooperation in the field of policy and rulemaking (UI-9)*. The interests of the stakeholders must be taken into consideration in this respect in accordance with *UI-5* and *UI-9*. Where international law allows room for manoeuvre, specific national objectives can be pursued (providing that the risks are acceptable).

In the national regulations, the focus is on safety, cost-effectiveness, cost accuracy and transparency, simplicity, easy application and clarity for those affected, together with adaptability. This allows for a rapid response to changing conditions. The regulators allow and ensure free market access to airport services.

In the area of sustainability, the regulators define the standards for sustainable infrastructure and fuels on the basis of their national regulatory competence. The industry implements the corresponding measures to comply with the new standards. As a result, the regulators and the industry take joint responsibility for facing up to these challenges.

In the regulatory process (including approval and oversight), the principles of risks, performance and proportionality must be taken into consideration (see *Risk-based action in the field of safety (UI-2)* and *Minimum safety requirements in the Swiss aviation system (UI-3)*).

UI-9 International cooperation in the field of policy and rulemaking

Cooperation on a European and international level in the field of policy and rulemaking is coordinated with the national objectives and alignments (see *Amending the political guidelines (UI-5)*). The regulators and the industry work increasingly closely together in this area while retaining their existing roles, coordinate their representation on the various committees and, as far as possible, ensure that their participation and position are coordinated on a national basis. In particular, in the interest of Swiss aviation they attempt to:

- ensure its ability to develop
- coordinate and ensure cooperation on international committees and in international development projects across different stakeholders
- coordinate national objectives and positions as part of stakeholder involvement

3.4.4 Initiatives on innovation, research and training

The three following initiatives support the achievement of the objectives of the AVISTRAT-CH strategy by laying the necessary foundations for a sustainable and competitive Swiss aviation system by means of research, innovation and training. Important requirements for this include qualified employees, expertise and the ongoing development of technologies.

UI-10 Sustainable fuels and technologies

The impacts of aviation on the environment represent the biggest challenge that the industry is facing. Alongside noise, pollution and other impacts (such as electromagnetic radiation), the focus is primarily on the effect on the climate. In order to achieve the climate targets of the Paris agreement and implement the long-term climate strategy of the Swiss Confederation, a significant reduction in the emissions of greenhouse gases from aviation is needed. The industry has implemented the “Roadmap to sustainable aviation” to meet the targets of AVISTRAT-CH for reducing emissions and the impact on the population and the environment.

Sustainable aviation fuels play a key role in this respect. The aviation fuels available on the basis of current research and other climate technologies are already included in the implementation plans for AVISTRAT-CH:

- Fossil kerosene is gradually being replaced by biofuels and, in particular, by synthetic aviation fuels (SAFs) as part of an internationally coordinated obligation to blend fuels. The Federal Council favours an obligation to blend fuels while taking international developments into consideration. In its draft of the Federal Act on the Protection of the Climate, the DETEC has introduced a corresponding proposal. The market that would be created in this way would make it possible to sell large volumes of renewable aviation fuels, which would enable manufacturers to invest in the related technologies and scale up their production processes.
- To support the supply side of the market, the Confederation is also planning to offer state start-up funding for the development of renewable synthetic aviation fuels. These technologies, which are known as power-to-liquid and sun-to-liquid, are currently relatively underdeveloped, but have significant potential for reducing climate impacts when used as renewable biofuels in the aviation industry.

- The regulators plan to introduce incentives to increase the use of fuel-efficient aircraft on long-haul routes: In the medium to long term, support will be provided for the use of electric aircraft (short-haul flights) and hydrogen aircraft (short- and medium-haul flights).

- The training organisations support this initiative and aim to use the existing technologies that are best for the environment (electrification, hydrogen etc.) in their pilot training programmes and focus more on simulator training.

- It should always be possible to introduce new and innovative technologies during the implementation of AVISTRAT-CH.

UI-11 Targeted funding for innovation and research

This underlying initiative outlines opportunities for funding innovation and research in the field of aviation, but initially focuses on the existing situation.

Starting point for funding aviation research and development

In the field of basic research, a number of departments at the Swiss Federal Institutes of Technology in particular are focusing on research into manned and unmanned aviation. The Paul Scherrer Institute, the EMPA and the Centre for Aviation Competence (CFAC) at the University of St. Gallen are investigating the technical, economic and legal aspects of aviation research. In the field of applied research, projects are underway at a variety of universities and, in particular, at the Centre for Aviation (ZAV) at ZHAW. On a federal level, there are well-known funding instruments for basic and applied research, such as the SNSF and Innosuisse. The FOCA and the SFOE also have corresponding funding programmes. The SFOE provides funding for measures on technology readiness level (TRL) 6 and above as part of its pilot and demonstration programme. The special financing for aviation provided by the FOCA supports measures in the fields of the environment, security and safety. The financial aid with a comparatively high contribution rate (up to 80 percent of the project costs) supports measures throughout the innovation cycle from the basic research through to the market launch.

Swiss researchers also take part in European funding programmes, in particular Horizon and Clean Sky, a public-private partnership between the EU Commission and the European aviation industry. However, because of the lack of a framework agreement with the EU, there are currently restrictions on the participation in programmes and tenders. In addition, there are several hundred companies in the aviation sector in Switzerland and the technical businesses in particular often have their own research facilities. For this reason, a partner from industry should be included in the process wherever possible to ensure that the research is productive.

Aviation fund

The report on the aviation policy of the Federal Council, APR 2016, comes to the conclusion that Switzerland should be made into a more important location for aviation research. The funding in this area is currently provided by the aviation fund. However, less special financing will be available for aviation in the years to come because the money currently comes from the tax on mineral oil and factors such as a reduction in flights (COVID-19 pandemic) and more efficient operations (more efficient propulsion systems and alternative fuels) have a direct impact on this source of funding. In addition, a large proportion of the money is intended for air navigation services at regional airports (implementation of the Würth motion “Safeguarding regional airports as key infrastructure”).

A partial revision of the Aviation Act in 2011 resulted in the inclusion of a very rudimentary article (103b) on funding. However, the preliminary work on the implementation of this funding showed that new money would be required and that the article needed to be formulated in more detail. During the revision of the CO_2 Act, which is a consolidation bill, the Federal Council proposed in the autumn of 2021 to add specific content concerning the reduction of the climate impact of aviation to article 103b of the Aviation Act. Alongside synthetic aviation fuels, all measures that could potentially reduce the climate impact of aviation should be considered for funding, including research and development of improved flying

processes, alternative propulsion systems, hydrogen filling systems etc. This bill is under consultation until April 2022 and must then be put before the Swiss parliament and, if necessary, the Swiss people. The bill is likely to come into force on 1 January 2025.

In addition to climate technologies, there are many other areas of research and development in the field of aviation. For this reason, it is very important to create an additional instrument, for example an aviation fund. This could be made up of both private funding and contributions from the state. It would allow technical developments of different kinds in the field of aviation to be funded, such as new flight processes, seamless ground operations, higher levels of automation and the use of artificial intelligence.

If the industry identifies an additional need for funding in future to support innovations, the FOCA will help with coordinating the relevant public funding instruments. The Aviation Research Center Switzerland (ARCS), which was founded in 2017, is also involved in coordinating research and development relating to aviation, as explained in the APR 2016. The ARCS and the FOCA regularly share information.

Tech scouting

The FOCA has also set up an organisation to identify and fund ideas that could benefit Swiss aviation and, in particular, the implementation of AVISTRAT-CH. Its activities take the form of targeted networking with international research institutes, public authorities and other organisations. The tech scouting organisation also identifies areas of research that could bring benefits for aviation in the future.

UI-12 Safeguarding training in Switzerland

The regulators and the industry work together to ensure that enough qualified employees are available for Swiss aviation companies and for the organisations that are responsible for national security. They achieve this by providing sufficient training courses and positioning aviation as an industry with promising career opportunities. This initiative directly supports the objective in the AVISTRAT-CH vision relating to the training of highly qualified employees:

- All the training for the aviation professions that are relevant for national security (for example military pilots and ATCOs) is provided in Switzerland. However, training courses can take place outside Switzerland or be purchased from foreign organisations, provided that the control over the training remains in Swiss hands.

- All basic training for business-related aviation professions including the supporting professions (engineering, aircraft maintenance, airport operation, IT etc.) must be provided in Switzerland. Where it is useful to do so, cooperating with similar businesses outside Switzerland is a possibility.

Another objective is to ensure that adequate infrastructure, in other words, airports and airspace, is available for training purposes. The training requirements of the Air Force are met by means of suitable processes (for example FUA) or airspace measures.

3.4.5 Initiatives on digitalisation

In the context of the AVISTRAT-CH programme, the term “digitalisation” means the digital transformation of society, which leads to high-quality, data-centric processes, applications and technologies across different systems and organisations. The initiatives help to put in place the necessary technological prerequisites for implementing the AVISTRAT-CH strategy.

UI-13 Guidelines on data sharing, management and protection

To ensure that the strategy can be successfully implemented, digitalisation must be taken into account to an appropriate extent and, in relation to this, new technologies must be integrated quickly into the existing aviation system. These new technologies put new demands in particular on the management of data among all the players. The driving force behind digitalisation in the aviation system is the industry, supported by a forward-looking regulatory framework. The regulatory efforts are focused in particular on

international harmonisation and standardisation of data management (including with regard to data quality and security and performance requirements). The harmonisation and standardisation take place primarily on an international level.

Guidelines

The industry ensures that the aviation system is improved by the use of innovative technologies and that the necessary investments are made. At the same time, the following factors should be taken into account in the regulatory framework:

- The transition from location-dependent to location-independent services.
- Enabling new players to enter the market and ensuring fair competition.
- The role of people in the aviation system, which will shift as a result of the use of new technologies from implementation and control to monitoring automated processes. As a result of this shift, different skills will be required.
- The protection of privacy and cyber security.

Sharing data

The relevant authorities will work with the national and international industry and with the international regulation and standardisation organisations to develop concepts for data sharing that cover data content, formats, security and interfaces throughout the system.

The objective is to harmonise and standardise the growing volume of aviation data on an international basis. Depending on the requirements of the strategy implementation process, the regulators are obliged to determine the ideal form of data management and the responsible bodies.

In future, the existing air traffic data, in particular concerning arrival and departure times, will also be made available on the opentransportdata.swiss platform. After the legal foundations have been put in place, the aviation data will also be made easily available via NADIM.

Data protection

Data is the key raw material of the knowledge society and the digital economy. This means that it must be available in aggregated form and to a high standard of quality. As a result of the technological options for collecting, storing and processing data, there is considerable potential for developing new and innovative products and services and for improving procedures and decision-making (see the “Digital Switzerland Strategy” September 2020).

Alongside the potential highlighted in the “Digital Switzerland Strategy”, the growing volume of data also gives rise to risks in the aviation system that need to be addressed. In relation to national and personal security, a distinction is therefore made when drawing up standards between sensitive and non-sensitive data.

- Sensitive data: The authorities responsible identify data that can be categorised as critical, confidential or sensitive and process or protect it accordingly (for example against falsification).

- Non-sensitive data: Non-sensitive data is recorded, collected and monitored by a variety of players on the market, if this data is publicly available in the relevant context (if necessary, the players are compensated by the users). When large volumes of data and information from different sources are processed and linked, the sensitivity of sensitive or personal data may change depending on the purpose it is used for. It is the responsibility of the regulators to provide guidelines on the management of publicly available data and to ensure that the players comply with them.

3.4.6 Initiatives on integrating new aviation technologies

Within the implementation timeframe of AVISTRAT-CH, unmanned aviation is likely to be the main disruptor in the aviation system. For this reason, the following initiatives concentrate on developments in this area. In the context of a strategy process, the technology horizon must be constantly monitored and any additional developments included in the implementation. To ensure that the strategic focus areas can achieve the objectives relating to efficiency, these three initiatives aim to identify innovative technologies at an early stage, investigate them throughout the system and, where relevant, integrate them into the existing system. The objective is the full integration of technological innovations, such as unmanned aviation, into the Swiss aviation system and the creation of favourable conditions for the export-based manufacturing and development industry in Switzerland.

UI-14 Designing the infrastructure for unmanned aviation

Unmanned aviation will be fully integrated into the aviation system by means of a collaboration between the public and private sector (for example as part of a public-private partnership). The focus will be, on the one hand, on the necessary digital infrastructure (for example U-Space/SWIM) and, on the other, on the needs of the different stakeholders inside and outside the aviation industry.

The necessary adaptations to the infrastructure will be investigated and addressed on an ongoing basis. Using the example of the ground infrastructure, in the first step (1) it is important to identify what the requirements of unmanned aviation are (for example vertiports), (2) which existing elements of the infrastructure can be used for this purpose and where pilot projects are needed and (3) finally, how the new elements can be integrated into the overall transport concepts (for example at national airports or railway stations). The relevant infrastructure operators, in cooperation with the air navigation service provider, are responsible for the proactive integration of unmanned aviation into the existing aviation infrastructures. These activities must be coordinated across Switzerland.

UI-15 Guidelines for airspace services in the U-Space

It is expected that a number of U-Space service providers (USSPs) will offer the various services in the U-Space (for example remote identification, traffic information, flight clearance, geo-awareness, airspace management etc.) on a decentralised basis. The relevant authorities will therefore draw up specifications for the implementation of the U-Space in Switzerland. In addition, they will ensure that the providers meet

the required standards of data integrity and quality and comply with the regulations on safety and security (for example, precautionary measures against system attacks or terrorism). AVISTRAT-CH is concerned with the strategic side of the integration. ATM and U-Space must be integrated as soon as the necessary technological developments are available.

UI-16 Targets for regulating innovative aviation technologies

The assumption is that the EU will issue regulations governing new and innovative technologies. This makes it all the more important for Switzerland to play an active role in decision-making on a European level (via international committees) and to exploit Switzerland's freedom to manoeuvre when implementing the regulations. The overall objectives for unmanned aviation within the implementation timeframe of AVISTRAT-CH are as follows:

- Representing Swiss interests (attractiveness of the location).
- Actively identifying and exploiting synergies between manned and unmanned aviation.
- Working towards the full integration of unmanned aviation into the aviation system.

It is important to note that the interests of the stakeholders must be taken into consideration.

4 Prospects and next steps

This report forms an important foundation for the next steps in the development of the Swiss aviation system. The authorities, organisations and businesses responsible for the different areas of aviation will now need to investigate the initiatives presented here, plus the measures, approaches and guidelines they include, and to prioritise their implementation. Many of these matters concern the FOCA. However, a large number of the initiatives and measures described here can also be implemented or applied by the stakeholders themselves. A decisive factor for the forthcoming implementation planning phase is the close cooperation between the authorities and the stakeholders.

The representatives of the stakeholders will need to be heavily involved, in the same way as the representatives of AEROSUISSE, the umbrella organisation of Swiss aviation and space-related companies, (such as commercial aviation, airports, air navigation service provider) and a representative of the General Aviation Steering Committee Switzerland (GASCO) were on a management level during the vision and strategy phase of AVISTRAT-CH. Representatives from the public authorities will also need to be brought in. Depending on the subject in question, these will include the FOCA, FOT, Federal Office for the Environment (FOEN) and DDPS (plus the Air Force). The objective of this cooperation is to establish a consolidated position (common voice) for the aviation industry and to monitor the progress in the industry with regard to the environmental objectives. Existing platforms should ideally be used for the implementation, such as the “Aviation Days” held by the FOCA from 2016 to 2019.

The adoption of this strategy report brings to an end the strategy phase of the AVISTRAT-CH programme. Now the FOCA must lead the planning process for the implementation phase and begin the implementation in coordination with the stakeholders.

Glossary

ATM Master Plan: The European ATM Master Plan is the agreed roadmap that connects ATM research and development activities with deployment scenarios to achieve the performance objectives of the Single European Sky.

CIV-MIL integration: The process of bringing together the defence and civil aviation industry and authorities so that technologies, staff and facilities etc. can be shared to meet both military and civil aviation needs.

CO_2 offsetting: Compensating for the calculated CO_2 emissions of companies by means of climate projects.

Confederation: The Confederation is made up of all the cantons and is the highest level of the political hierarchy in Switzerland.

Economic regulation: The independent and effective economic regulation of airports and air navigation service providers is necessary to protect airlines and passengers and to ensure that the airports and air navigation service providers do not exploit their substantial market power.

FIS status report: The status report of the FIS describes the most important developments from the perspective of the intelligence service and informs the public about threats and risks to the security of Switzerland. Available at www.vbs.admin.ch.

General aviation: This includes all non-commercial flights, such as private travel and training flights, aerobatic flights, flights in historic and experimental aircraft and flights for training purposes. Pleasure flights with passengers also belong in this category, although they are often commercial, together with transporting passengers for tourism purposes and heli-skiing, plus gliders, balloons and hang gliders.

Geo-zones: These are virtual geographic zones which determine where it is safe to fly unmanned aircraft, where it can be risky and where flights are restricted or banned.

Ground handling: A broad spectrum of services provided in preparation for a flight or after it has ended and including both customer and apron services.

National action plan to reduce noise pollution: Document adopted by the Federal Council with the aim of combating noise increasingly at its source and promoting quietness and relaxation in residential development.

National airports: Transport infrastructure of national importance. These airports are used primarily for public transport purposes (scheduled flights) and, if they have sufficient remaining capacity, for other flights in the public interest. They enable Switzerland to connect to the international aviation system by means of direct flights or transfer connections. The national airports of Switzerland are Basel-Mulhouse, Geneva und Zurich.

National Security Committee: Among other things, the committee monitors the threat situation on an ongoing basis, sets priorities and specifies safety measures. The committee is headed by the FOCA and is made up of representatives of the Federal Office of Police, the relevant cantonal police forces and the airport operators and Swiss airlines.

Public authority: An official body (cantonal, national, international) that performs public administration tasks assigned to it on the basis of material enactments (laws).

Regional airports: Transport infrastructure of regional importance. These airports are used primarily for flights in the public interest. If the regional airports are suitably equipped, they can offer scheduled flights to the national airports and to destinations abroad. The regional airports of Switzerland are Bern-Belp (BE), Birrfeld (AG), Bressaucourt (JU), Ecuvillens (FR), La Chaux-de-Fonds–Les-Eplatures (NE), Grenchen (SO), Lausanne–La Blécherette (VD), Lugano-Agno (TI), St. Gallen-Altenrhein (SG, no operating concession), Samedan (GR), Sion (VS).

Regulators: The regulator in the field of civil aviation is the Federal Office of Civil Aviation. The FOCA involves other authorities with responsibilities in this area, in particular the Military Aviation Authority (MAA), which is the regulator in the field of military aviation.

Safety and security: Safety is the avoidance of incidents and accidents, while security is the avoidance of damage resulting from unlawful interference by insiders and third parties. AVISTRAT-CH covers both of these areas.

Safety culture: Safety culture is defined as being all the lasting values and attitudes to safety issues that are shared by all employees on all levels of an organisation. The safety culture is the extent to which each individual and group in the organisation is aware of the risks and unknown hazards resulting from the activities of the organisation.

Self-separation: The ability of an aircraft to maintain an acceptable safe distance from other aircraft, terrain and airspace (for example firing zones) without following the instructions or guidance of a responsible official (for example, the air navigation service provider).

Short-haul flight: There is no internationally valid definition. However, the EU Air Passenger Rights Regulation defines short-haul flights as flights covering a distance of up to 1500 kilometres.

Technology readiness level 6: Technology readiness levels (TRLs) are a method for estimating the maturity of technologies during the acquisition phase. TRL 6 is the start of the genuine technical development of the technology as a usable system, which means that the prototype should be able to perform all the functions that will be needed in the operational system. This represents an important step towards demonstrating the usability of the technology.

U-Space: A set of services relying on a high level of digitalisation and automation of functions and specific procedures designed to support safe, efficient and secure access to airspace for the growing numbers of civil drones. The U-Space is a framework designed to simplify any kind of operation, in all classes of airspace and all types of environment, while providing an organised interface with manned aviation and air navigation services.

Vertiports: Take-off and landing facilities for (e)VTOLs (vertical take-off and landing aircraft).

Participants

The AVISTRAT-CH programme is managed by the Federal Office for Civil Aviation on behalf of the GS-DETEC with the close involvement of the aviation industry. In the same way as the AVISTRAT-CH vision, the AVISTRAT-CH strategy is regarded as a joint result.

AVISTRAT-CH programme committee

- Matthias Ramsauer, Secretary General of the DETEC, client for the AVISTRAT-CH programme
- Roman Schwarzenbach, FOCA, programme manager (previously Florian Kaufmann)
- Christian Hegner, Director General of the FOCA
- Peter Merz, Air Force Commandant
- Frédéric Rocheray, Head of the Safety Office, GS-DETEC (previously Andrea Nora Muggli)
- Bruno Rösli, Head of Defence and Arms Procurement Policy, GS-DDPS

AVISTRAT-CH strategy project committee

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- Roman Schwarzenbach, FOCA, project leader
- Alex Bristol, representative for air navigation services at AEROSUISSE, CEO of Skyguide
- Yves Burkhardt, representative of the General Aviation Steering Committee GASCO, Secretary General of the Aero-Club of Switzerland
- Thomas Frick, representative for commercial aviation at AEROSUISSE, Strategic Operations Projects Management Swiss International Air Lines
- Pierre de Goumoëns, Director of the MAA
- Frédéric Rocheray, observer, GS-DETEC (previously Andrea Nora Muggli)
- Bruno Rösli, Head of Defence and Arms Procurement Policy, GS-DDPS
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- Roger Bosonnet, FOCA, aviation development
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- Pierre-Yves Eberle, Air Force
- Markus Farner, FOCA, strategy and innovation
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- Urs Ziegler, FOCA, aviation development

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Annexes

Annex 1: System requirements

To allow for a better understanding of the system requirements, it is important to explain that these are taken from the vision and represent a “breakdown” of the vision statements into their individual aspects. The evaluation of the strategy drafts was based on the fulfilment of the system requirements.

Origin (vision level and area of action)		No.	System requirements
Background	01 Society and government	1	As part of the overall transport system, the aviation system plays its part in fulfilling society’s mobility requirements.
		2	The aviation system is firmly rooted in the political landscape and can anticipate and adapt to sociopolitical requirements.
	02 Technologies and innovation	3	New technologies are used when they address specific user requirements and, after the costs and benefits have been weighed up, provide added value.
		4	The aviation system is designed as an open, flexible architecture so that new technologies can easily be integrated.
Target areas	03 Environmental impacts	5	Pollutant emissions, including electromagnetic radiation: The impact of the aviation system on the population/environment has been reduced for each transport unit compared with today’s figures.
		6	Noise emissions: The impact of the aviation system on the population/environment has been reduced for each transport unit compared with today’s figures.
		7	The aim is to achieve a reduction in the other impacts on the environment for each transport unit compared with today’s figures.
	04 Safety and security	8	The authorities involved can perform their state security duties at all times.
		9	Risk management: The socially acceptable risk level for the aviation system has been defined. The risk level and the individual risks are continuously monitored.
	05 Efficiency	10	The airspace and the aviation infrastructure can be used by and are accessible to all users in accordance with the sociopolitical requirements.
		11	The order of priorities has been determined on the basis of the sociopolitical requirements of the system. It is applied when required by the strategic position or when there are conflicts of use.
		12	The conditions in the aviation system allow users in Switzerland to be internationally competitive.
		13	The necessary aviation services are provided cost-effectively and transparently.
		14	The aviation system enables users to make long-term plans for the use and development of the airspace and aviation infrastructure.
		15	The aviation system provides good conditions for training highly qualified employees in the field of aviation.
		16	The aviation system provides opportunities for creativity and innovation in order to enable the industry to develop its technologies and work processes further.

Origin (vision level and area of action)		No.	System requirements
Impact areas	06 Structure of ground and air	17	Dynamics: The aviation system is designed in such a way that the airspace and aviation infrastructure can develop dynamically, for example with regard to new types of use or new technologies.
		18	Design: The aviation system (airspace, take-off and landing options, infrastructure etc.) allows all the users to make use of the system in the way that best meets their needs and ensures that the requirements of integrated mobility are taken into consideration on a global scale.
	07 Regulations	19	RBO/PBO: The oversight of the aviation system is based on the principles of risk and performance.
		20	Agility: The regulatory processes are designed in such a way that they can respond quickly to new requirements (for example new user needs, innovations).
		21	International obligations concerning the application of standards must be met.
		22	The regulatory process allows special national regulations to be introduced if they bring added value for the Swiss aviation system (reduction of the risks or increase in the efficiency while the risks remain unchanged). Principle: As little as possible, as much as necessary.
		23	The aviation system enables users to make long-term plans for the regulation of the airspace and aviation infrastructure. The stakeholders must become involved in the regulation process at an early stage.
		24	The administrative work involved in the regulatory requirements is kept to a minimum for the aviation companies. Local variations are possible if there is a guarantee that safety levels will be maintained.
	08 Management	25	The management of the airspace and aviation infrastructure is targeted and flexible, as a result, among other things, of using the available technologies.
		26	In order to minimise the work that does not add value, simple and efficient processes are used to manage the airspace and aviation infrastructure.

Annex 2: Impact of the initiatives

The following table shows the impact of the initiatives on the three target areas of the vision in a simplified form. The simplified presentation implies that further interactions are possible, but are not listed in the table. In addition, the table does not distinguish between the intensity of the individual impacts.

Initiatives		Impact on the target areas of the AVISTRAT-CH vision		
		Environmental impacts	**Safety and security**	**Efficiency**
SI-1-1	Coordinated development and use of the airport system	●	●	●
SI-1-2	Development and use of the national airports to meet users' needs	●	●	●
SI-1-3	Sustainable development of Swiss airports	●		
SI-1-4	Increased intermodality at the national airports	●		●
SI-2-1	Targeted development of the airspace	●	●	●
SI-2-2	Principles of route design	●	●	●
SI-2-3	Dynamic management of the airspace	●		●
SI-2-4	Access to the airspace using equipment		●	●
SI-2-5	Staggered implementation of airspace initiatives			
UI-1	Establishing an integrated safety and security culture		●	
UI-2	Risk-based action in the field of safety		●	
UI-3	Minimum safety requirements in the Swiss aviation system		●	
UI-4	Protecting the integrity of the Swiss aviation system		●	
UI-5	Amending the political guidelines	●	●	
UI-6	Coordinated national mobility planning	●		●
UI-7	CIV-MIL integration		●	●

Initiatives		Impact on the target areas of the AVISTRAT-CH vision		
		Environmental impacts	**Safety and security**	**Efficiency**
UI-8	International coordination of Swiss regulations	●	●	
UI-9	International cooperation in the field of policy and rulemaking	●	●	
UI-10	Sustainable fuels and technologies	●		
UI-11	Targeted funding for innovation and research	●	●	●
UI-12	Safeguarding training in Switzerland			●
UI-13	Guidelines on data sharing, management and protection		●	●
UI-14	Designing the infrastructure for unmanned aviation		●	●
UI-15	Guidelines for airspace services in the U-Space		●	●
UI-16	Targets for regulating innovative aviation technologies		●	●