# TABLE OF CONTENTS

**EDITORIAL**
K. MEIER

**THE SWISS ATM FUTURE**
SKYGUIDE HAS CHOSEN THE PATH OF INNOVATION
A. BRISTOL AND K. MEIER

**FIRST TO INTRODUCE THE VIRTUAL CENTRE MODEL**
HANDLE THE GROWING AMOUNT OF TRAFFIC WITH HIGHER EFFICIENCY
J. STUCKI

**CHANGE AND ITS RISKS**
TECHNICAL AND ORGANIZATIONAL TRANSITION IN A SAFETY-CRITICAL ENVIRONMENT
M. SIEBER

**THE AGILE METHOD**
BETTER CODE QUALITY DELIVERED MORE EFFICIENTLY
F. BARNER
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSP</td>
<td>Air Navigation Service Provider</td>
</tr>
<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
</tr>
<tr>
<td>ATCO</td>
<td>Air Traffic Controller</td>
</tr>
<tr>
<td>ATM</td>
<td>Air Traffic Management</td>
</tr>
<tr>
<td>CANSO</td>
<td>Civil Air Navigation Services Organization</td>
</tr>
<tr>
<td>CIP</td>
<td>Common Integration Platform</td>
</tr>
<tr>
<td>CNS</td>
<td>Communication Navigation Surveillance</td>
</tr>
<tr>
<td>COC</td>
<td>Common Operational Concept</td>
</tr>
<tr>
<td>COPFLEX1</td>
<td>Common Operations Flexible 1</td>
</tr>
<tr>
<td>CWP</td>
<td>Controller Working Position</td>
</tr>
<tr>
<td>DRA</td>
<td>Direct Route Airspace</td>
</tr>
<tr>
<td>EASA</td>
<td>European Aviation Safety Agency</td>
</tr>
<tr>
<td>FABEC</td>
<td>Functional Airspace Block for Europe Central</td>
</tr>
<tr>
<td>FDM</td>
<td>Flight Data Management</td>
</tr>
<tr>
<td>FDP</td>
<td>Flight Data Processing</td>
</tr>
<tr>
<td>FDPZ</td>
<td>Flight Data Processing Zurich</td>
</tr>
<tr>
<td>FMP</td>
<td>Flow Management Position</td>
</tr>
<tr>
<td>FRA</td>
<td>Free Route Airspace</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>ITIL</td>
<td>IT Infrastructure Library</td>
</tr>
<tr>
<td>NM</td>
<td>Network Manager</td>
</tr>
<tr>
<td>ODD</td>
<td>Operational Deployment Date</td>
</tr>
<tr>
<td>PI</td>
<td>Programme Increment</td>
</tr>
<tr>
<td>PIPE</td>
<td>Programme Increment Planning Event</td>
</tr>
<tr>
<td>RES</td>
<td>Route Extraction Service</td>
</tr>
<tr>
<td>RP3</td>
<td>Reference Period n°3 – Single European Sky Performance Scheme for RP3</td>
</tr>
<tr>
<td>SES</td>
<td>Single European Sky</td>
</tr>
<tr>
<td>SESAR</td>
<td>Single European Sky ATM Research</td>
</tr>
<tr>
<td>SkyServer</td>
<td>Commercial name of the SkySoft-ATM server managing CWP</td>
</tr>
<tr>
<td>SkyViewer</td>
<td>Commercial name of the SkySoft-ATM client CWP</td>
</tr>
<tr>
<td>SOA</td>
<td>Service-Oriented Architecture</td>
</tr>
<tr>
<td>SOABase</td>
<td>Project implementing base service-oriented architecture by skyguide</td>
</tr>
<tr>
<td>SOI</td>
<td>Service-Oriented Infrastructure</td>
</tr>
<tr>
<td>SWIM</td>
<td>System Wide Information Management</td>
</tr>
<tr>
<td>VC</td>
<td>Virtual Centre</td>
</tr>
<tr>
<td>VCT1/2</td>
<td>Virtual Centre Tranche 1 or 2</td>
</tr>
<tr>
<td>VIS@S</td>
<td>Virtualization Infrastructure Setup @skyguide</td>
</tr>
<tr>
<td>VM</td>
<td>Virtual Machine</td>
</tr>
</tbody>
</table>
Dear reader,

Welcome to the new Blueprint 2018, skyguide’s technology outlook with focus on our strategic Virtual Centre Initiative.

We are now in the middle of Tranche 2, the phase where we are “building the foundation” for the Virtual Centre. We have started to move our systems towards a layered information centric-architecture. We successfully launched first services on the new service-oriented infrastructure and we have initiated the transformation of the two legacy Flight Data Processing systems. These ongoing Tranche 2 activities bring us closer to our “one-sky-by-one-system”.

In 2017, we received the Single European Sky Award for our leading role in introducing Service-Oriented Architecture in air traffic management. This is a strong signal that the European Commission recognizes the pathfinding innovation, which is currently taking place in Switzerland.

This award is also an incentive to push the envelope of technology and to continue with our journey towards a paradigm shift in air traffic management.

We put considerable effort into organizational change management. An architecture shift requires a change in working methods and management culture. At the core of this transformation are system modelling, an agile delivery methodology and close collaboration with partners. This Blueprint 2018 provides some insight into these aspects of the Virtual Centre.

Thank you for taking the time to follow our progress. I appreciate your continuous support in this endeavour.

Sincerely,
Klaus Meier
Alex Bristol, the former Chief Operations Officer at skyguide, has taken over his new position as CEO on the 1 July 2017 in the midst of a period of profound changes. These will have a deep and lasting impact on the company and its staff members in terms of technology as well as organization and operations. Alex Bristol and skyguide’s CIO Klaus Meier, who are driving the change, admit that the “new technology we are deploying now is not world breaking, but it is world breaking in our field.”

SKYGUIDE

Alex Bristol and Klaus Meier, could you please elucidate your vision of the role and state of skyguide in 20 years from now?

ALEX BRISTOL

I see a company that has earned the right to continue to exist. In the last years, we have driven forward innovation, we have managed to create a service-oriented system and we are implementing innovative technology. Our employees have taken that on board and have delivered the change. Furthermore, we are in close contact with partners in Europe, with other ANSPs (air navigation service providers), with aviation’s stakeholders, with the European Commission and so on. And our lean organization enables us to maximize the ability to innovate, to be quicker, and to move faster.

KLAUS MEIER

We are moving away from a national, terrestrial ground based environment. In the future we will focus more on managing the airspace, while we will get data and services from providers perhaps outside of skyguide.

The technology currently used by skyguide (and other ANSP) should embark the digitalization transformation. Some of your staff even talk about an “obsolete network”. Is the current pace of progress in replacing the existing systems fast enough? Is skyguide too early or does your company run the risk of being overtaken by others?

KM

This is always the question – is our timing right? I think it is. The existing systems arrive at the end of their life cycle, and we have to decide where we want to invest. The ATM technology available on the market is based on a classical computer architecture from the 90s. So we decided to look for more modern technology which is used in other markets, and apply this technology to ATM. It is possible that we are early in changing this paradigm. But there is no alternative. In ATM we are still in the signal processing times. What we are trying to do with the Virtual Centre (VC) is to move into a flexible, service-oriented approach which is information centric.

“ We decided to look for more modern technology which is used in other markets, and apply this technology to ATM ”
VC Tranche 2 will bring profound changes to the entire organization. Resistance can come from all parts of the company. Employees might be afraid to lose their jobs, too. How do you support and drive the transformation of your company?

KM We will replace the two existing systems with one: one system in Switzerland for two area control centre locations. Our layered, service-oriented approach with its new methodology will be a big challenge. But if we communicate these changes coherently and convincingly, people will realize that there are advantages in working differently, e.g. in a more agile way and that, consequently, we will be more successful. You have those who embrace the changes, those who oppose and those who wait and see. With those who wait and see, we have to convince that the future will be exciting if they accept the changes.

AB A lot of engineers feel threatened as well. Some have been using software code initially developed 20 years ago. We have to show them that we can create a future for them. This requires a coherent and clear vision and a significant amount of leadership, and we have to communicate it very well. The change has to be driven by that middle management.

Why implement the changes in tranches rather than in one big bang?

AB The whole thing is far too big to be implemented and explained in one single step. If you run a 10 year planning project and then it fails, it is an enormous risk which even could threaten the very existence of a company. Shorter cycles de-risk planning: when you make a mistake, you can correct it quickly. But we not only break the process down into tranches – we have created cross functional teams as well which at the same time improve our corporate culture. In this context, it is very important to celebrate the successes after each step.

How does skyguide set up new collaboration business models in-house as well as with external partners like Tata Consultancy Services?

KM The question was: do we have enough horsepower to bring in the new technology? We have enough ATM knowledge. What we lack is insight into new technologies. Therefore we look for external partners. We do not want to reinvent the wheel alone should others have solutions we could use.

AB Skyguide has chosen the path of innovation. For the sake of its safe and efficient implementation, we are moving away from doing everything ourselves. But we ask ourselves the question: which are the strategic fields we want to keep controlling ourselves? The human-machine interface for example is crucial, and we want to keep it in-house.

VC Tranche 2 will deliver your “one-sky-by-one-system” and replace the two different legacy systems in Geneva and Zurich with a new one based on a service-oriented architecture. But it only concerns the upper sectors of the Swiss airspace. Will the Virtual Centre be viable at all if not extended to all sectors?

AB The upper levels of the airspace are simpler and easier to manage, and that is exactly the reason why we started with them. The further down you go, the more conflicts you encounter. Our enterprise and information architects are now concerned with the question of how to go further down and integrate these lower layers. We will solve this by working out the architecture around the two big airports in Switzerland (ZRH and GVA) and then integrate the others. And we will be amongst the very first in this area. And why? Because we have to, it is a crucial question of our future and the survival of skyguide.

“ New technology we are deploying now is not world breaking, but it is world breaking in our field ”
Switzerland’s Virtual Centre Programme (VCP) is currently at stage 2 – or tranche 2 (VCT2). VCP is driven by the ambition of the European Commission to create a Single European Sky (SES). This will bring greater efficiency in managing the European airspace, one of the busiest and most complex in the world.

The development and implementation of the SES initiative is currently addressed through the SESAR programme. VCP is Switzerland’s pioneering contribution to SESAR. VCT2 is focusing on 4D Trajectories and Free Route Airspace (FRA) with the corresponding Flight Data Management (FDM) as the basis to modernize and simplify the current system landscape. A lot of knowledge gathered or experienced since last year will be crucial for defining the way ahead.

James Stucki, former air traffic controller for 12 years, is able to judge procedures and installations not only from a theoretical, but also from a practical point of view.

**SKYGUIDE** What is new in VCT2 and which priorities have been set?

**JAMES STUCKI** The new route handling concept has the top priority. We want to deploy it first in the Eastern Area Control Centre (ACC) and then later in the Western ACC. This concept is needed because in European airspace, it has been decided to introduce a more open way to proceed: Free Route Airspace (FRA) is the aim. It is necessary to handle the growing amount of traffic with more flexibility for airline customers.

**Why do you intend to deploy the route handling concept first in the East and then in the West?**

**JS** Because FDP-Z (flight data processing system in Zurich, introduced in 2007) is much easier to split into different services. This allows us to iteratively re-use parts of the existing system instead of having to deploy the new one in one block and with one big bang.

**We understand that the involvement of Operations (OPS) in VCT2 creates some difficulties. What are the operational challenges?**

**JS** The involvement of OPS personnel in VCT2 is constrained by the fact that we first have to guarantee safe and smooth operations each and every day before getting involved in other activities. But thanks to Scaled Agile framework and the regularity of Programme Increment (PI), events communication between the various development teams is improving and we get a better overview on how to organize OPS experts: we now plan to create a new OPS Core Team which will drive the needs for VCT2 from an OPS point of view.

**Why do OPS bring so many new features to VCT2?**

**JS** We need to update some features but also to bring some new ones in order to be able to keep or even improve the capacity when working with Direct Route Airspace (DRA, the first step towards FRA) and FRA and also with combined ACC sectors LM67 (38,000 feet and above). Otherwise, with bigger sectors and new coordination points, the capacity would decrease by putting us in a situation we have not experienced before.
In the corridors of skyguide, one can often hear that VC is crucial for the survival of the company, which is under financial pressure. What does VC signify for skyguide’s future?

JS By being the first Air Navigation Service Provider (ANSP) to introduce the Virtual Centre, we prove that combining centres into one is not the only way to bring efficiency. Additionally, we will gather a lot of knowledge, which in turn will help us to position ourselves in the European landscape, and maybe one day be able to sell our knowledge to other providers.
Marco Sieber leads a team of 120 people in Data Services and is responsible for implementing and operating the software components of the skyguide Virtual Centre Programme (VCP). His challenge is to gradually transform the existing Air Traffic Control (ATC) systems into a new Service-Oriented Architecture (SOA) while assuring the permanent availability of the systems without significantly increasing skyguide’s IT workforce. This technical transition necessitates also an organizational transformation as roles, processes and technologies fundamentally change. Marco Sieber believes that the challenges of the organizational transformation are much higher than the challenges of the technical transition.

**SKYGUIDE** What impact does the Virtual Centre Programme have on your organization?

**MARCO SIEBER** The VCP is affecting my division in two major aspects: technology and methods. On the technology side, we are changing from a vertically integrated architecture into a horizontal integration pattern using a central integration platform hosted on an on-premise private cloud that is provided and monitored by our external partner DXC in Sofia (Bulgaria). On the side of methods, we are implementing Agile software engineering practices and emphasizing collaboration and communication between development and technical operations while automating the process of software delivery and infrastructure changes (DevOps). Because we concentrate our IT infrastructure in Dübendorf and due to the cooperation with DXC, the way we will operate our platforms will be subjected to significant changes.

**During this long transitional period, all these additional tasks are increasing the workload of your staff tremendously, are they not?**

**MS** During this transition period, the legacy systems still have to be maintained and adapted to changing needs, which indeed keeps my organization busy, not allowing it to contribute to the transition and to prepare for the “new world”. This problem of “hybrid architecture” could be solved by building a new Virtual Centre Programme organization, but this entity would not benefit from internal know-how and experiences. We decided on a different approach: to hire additional staff temporarily to support the legacy systems, which allows us to delegate some of our staff to the Virtual Centre Programme. Onboarding new resources created a certain drop of performance. We have involved the line management as work stream leaders of a dedicated transformation project to ensure the best-possible transition to the line organization.

**What are the challenges in the organizational transformation?**

**MS** While the technical transition managed by the VCP is very demanding, the organizational transformation is the real challenge. Both will take years for implementation, but we are more used to conducting technical than organizational change projects. In a safety-critical business like ours, a certain risk-averseness and change resistance is linked to the resilience we have to demonstrate as a HRO (High Reliability Organization): we are relying on a stable and professional organization both on the business and the technical side. This does not positively support change. We need to unfreeze the current stable state, go through the change in a controlled way and freeze a new stable state again after the transformation. The biggest challenge in an organizational transformation is not the learning – it is the unlearning.
Change is inevitably coupled with risks, as you say. How do you explain to your people that we still need to make some changes?

**MS** Our people are very responsible, and we need to explain to them that the company is willing to accept an increased level of technical risks, which of course needs to be controlled and must not impact safety. We have to tell them, too, that the management assumes these risks and that the staff will not be blamed for mistakes or problems in the transition phase. The aim is to take away this pressure from our staff and thus increase the openness for change. Skyguide’s Just Culture is very supportive in this regard.

Where do you actually stand in the organizational transformation?

**MS** We are at the beginning of the transformation. The transformation project is currently focusing on topics relevant for the organization to operate and maintain the new technical platform and the first services running on it. This step has to be achieved in the 1st quarter of 2018. In the next phase, the focus will then be on designing the target organization in terms of people, processes and technology and to define the transition roadmap. Our people are spread in different rooms of the “Change House”, depending on the involvement in the change so far and on the willingness to change. I see more and more commitment for change and a growing momentum that we have to feed with creating success stories, involving more and more people in the change and increasing communication.

“ The biggest challenge in an organizational transformation is not the learning – it is the unlearning ”

---

**KURT LEWIN’S MODEL OF CHANGE**

- **UNFREEZE**: Ensure that employees are ready for change
- **CHANGE**: Execute the intended change
- **REFREEZE**: Ensure that the change becomes permanent

---

**THE CHANGE HOUSE**

- **CONTENTMENT ROOM**
- **RENEWAL ROOM**
- **DENIAL ROOM**
- **CONFUSION ROOM**
- **DUNGEON OF DENIAL**
- **PARALYSIS PIT**
- **WRONG DIRECTION DOOR**
- **SUN LOUNGE**

---
Frank Barner explains why skyguide uses an Agile method for the very complex task of introducing a new Air Traffic Management (ATM) system. As an experienced project manager, he has to bridge the requirements of business on the one hand and IT on the other. “Agile” as an adjective means to be “able to move quickly and easily”, as a working method, “Agile” is a time boxed, iterative approach that builds software incrementally from the start of the project, instead of trying to deliver it all at once near the end.

**What does it imply to use the Agile method instead of other ways to handle complex projects?**

**FRANK BARNER**

Agile teams make smaller deliveries of software more frequently. This provides faster feedback and therefore higher customer acceptance. Agile delivery shows an increase in code quality, less bugs and smaller, faster releases. Business value is delivered sooner and the risks are reduced because of earlier feedback from the customer. Due to the time-boxes, it brings the teams to constant planning and continuous improvement, resulting in much better visibility of project progress. Finally, with a re-planning every 2 weeks, agile teams are far more adaptable than waterfall projects. Working Agile means to consequently put the customer value and benefits into focus, and it is most of all a mindset.

**Could you please tell us how agile teams are structured and how they work?**

**FB**

An agile team is typically five to nine individuals working towards a common goal. The team is cross-functional, self-organized and co-located. This supports the agile principle that face-to-face communication is by far the most efficient and effective method of collaboration in a team. Within the Software Factory of Virtual Centre, the activities are organized in “sprints” and the teams have regular events in their sprint cadence. It starts with the sprint planning, refinement of the backlog for future sprints (grooming), showing progress with working software (sprint review) and reviewing how the efficiency can be improved (sprint retrospective).

**Could you please explain what the Programme Increment (PI) within the Agile method involves?**

**FB**

The PI is a time frame of 13 weeks or 3 months for development that uses cadence and synchronization to align the work of a number of agile teams. It supports the regular delivery of small amounts of work, thus improving the workflow. A PI starts with a face-to-face planning session for all the teams involved. Approximately 50 to 60 directly involved people, plus a dozen key stakeholders meet outside the skyguide premises. All the teams are in one large room, which makes communication easier. Socializing plays a vital role too. Once the plans are agreed, the teams work in their normal agile way in the so-called sprints.

“Working software is the primary measure of progress”
What are the benefits of the PI?

We get better code quality delivered more efficiently. The work of the teams is coordinated at a programme level with regular meetings. A major element of the PI is the system demo.

There is one of these every sprint. All the delivered results from the various teams are integrated together and then shown to stakeholders to get their feedback. These events saved us countless meetings and asynchronous coordinations as well as numerous telephone calls. It is a powerful way to drive the maturity of the agile teams, and it is based on the agile principle: “Working software is the primary measure of progress”.

When will the agile transformation at skyguide be finished?

Agile is more a mindset than a working method. For me there is no end to this road as we speak of continuous learning and improvements, continuous integration and continuous deployment.
SkySoft was created in 2001 as a joint venture between skyguide and AirSoft, an innovating ATM software company. Its core business is to produce software for air traffic management (ATM). Roughly, one third of SkySoft’s income is generated from exports projects, currently in 27 countries. SkySoft is driven like a start-up with its 50 employees. Heading the company since 2004, Pierre Henri Guisan has more than 25 years of business experience in managing IT projects and software organizations. Being the holder of a commercial pilot license with instrument rating (CPL /IR), Pierre Henri Guisan is experiencing regularly the SkySoft ATM solution from an airspace user perspective.

SkySoft is a daughter company of skyguide. In what way does SkySoft contribute to the future of its parent company?

PIERRE HENRI GUISAN
Managing Director
SkySoft-ATM

SkySoft considers itself as being a major contributor to skyguide’s objectives, which means mastering the current legacy systems under our responsibility while at the same time building the next generation of ATM systems. We are not only aiming to meet specifications, but to ensure that the specifications meet the needs of our customers. With skyguide we want to go through all the projects up to the operational implementation of the new systems. We are partners, not suppliers, if something goes wrong, it is part of our responsibility.

What are SkySoft’s contributions to VCT2?

PHG SkySoft has accumulated expertise in the development of Service-Oriented Architecture (SOA). To setup this expertise, SkySoft has hired new people with key SOA knowledge and has invested in the training of existing staff. With these new core team members, new tools and processes and a completely new development platform with a full Continuous Delivery and Continuous Integration process in place, we are a key contributor to VCT2.

You were talking about your export strategy. Can a small company like SkySoft compete in the international market and if yes, what is the purpose of this strategy?

PHG The export strategy is part of our growth strategy stipulated in our new business plan. Our idea is to break down ATM monolithic software into services and then sell such services in the export markets. Now, we act as niche players and as a partner in bigger projects. We are the worldwide leader for controller working position software recording systems. Abroad we work with local partners and train them. Research and development however are done in Switzerland.

"The change management is a key topic"

In which framework are SkySoft and skyguide collaborating?

PHG Even if the companies keep their responsibility, a new and innovative collaboration model has to be put in place. We create cross functional teams, in which all competencies are available and dispatched to accomplish the common goals. The target is to set up self-organized teams, still with strong leadership. Most of all, we would like to create a unique team spirit, where people enjoy working together and support each other.

SKYGUIDE
SkySoft is a daughter company of skyguide. In what way does SkySoft contribute to the future of its parent company?

PIERRE HENRI GUISAN
Managing Director
SkySoft-ATM

In which framework are SkySoft and skyguide collaborating?

PHG Even if the companies keep their responsibility, a new and innovative collaboration model has to be put in place. We create cross functional teams, in which all competencies are available and dispatched to accomplish the common goals. The target is to set up self-organized teams, still with strong leadership. Most of all, we would like to create a unique team spirit, where people enjoy working together and support each other.

SKYGUIDE
SkySoft is a daughter company of skyguide. In what way does SkySoft contribute to the future of its parent company?

PIERRE HENRI GUISAN
Managing Director
SkySoft-ATM

In which framework are SkySoft and skyguide collaborating?

PHG Even if the companies keep their responsibility, a new and innovative collaboration model has to be put in place. We create cross functional teams, in which all competencies are available and dispatched to accomplish the common goals. The target is to set up self-organized teams, still with strong leadership. Most of all, we would like to create a unique team spirit, where people enjoy working together and support each other.

SKYGUIDE
SkySoft is a daughter company of skyguide. In what way does SkySoft contribute to the future of its parent company?

PIERRE HENRI GUISAN
Managing Director
SkySoft-ATM

In which framework are SkySoft and skyguide collaborating?

PHG Even if the companies keep their responsibility, a new and innovative collaboration model has to be put in place. We create cross functional teams, in which all competencies are available and dispatched to accomplish the common goals. The target is to set up self-organized teams, still with strong leadership. Most of all, we would like to create a unique team spirit, where people enjoy working together and support each other.

SKYGUIDE
SkySoft is a daughter company of skyguide. In what way does SkySoft contribute to the future of its parent company?

PIERRE HENRI GUISAN
Managing Director
SkySoft-ATM

In which framework are SkySoft and skyguide collaborating?

PHG Even if the companies keep their responsibility, a new and innovative collaboration model has to be put in place. We create cross functional teams, in which all competencies are available and dispatched to accomplish the common goals. The target is to set up self-organized teams, still with strong leadership. Most of all, we would like to create a unique team spirit, where people enjoy working together and support each other.
Are your strategies successful?

PHG For skyguide we already have an important record of accomplishment. The implementation of the Stripless System for example was a big success. With this project, we launched for the first time an identical application for both centres (ZRH and GVA) – a major step towards harmonizing operations. Another success was the implementation of the new Trace System for lower levels inbound and outbound of Zurich Lower Airspace. On the export market, we could achieve an outstanding commercial success with our recording solutions. With its current worldwide implementation, we could gain a strong leading position.

In the context of VCT2, what kind of constraints does SkySoft encounter?

PHG We have to mix an Agile approach, different organizations with their own responsibilities and commitments and a cultural change. Regulatory requirements demand extensive documentary evidence. For Operations, the diversity of scenarios implies that solutions can only be confirmed with confidence after extensive validation and exposure to real-life situations. On the technical side, we moved from separated legacy equipment towards a transversal approach which requires much more collaboration and integration activities. In all cases, the change management is a key topic.

The target is to set up self-organized teams, still with strong leadership
Patricia Bomme has been Head of Safety and Compliance within the Technical Department of skyguide. She is a civil engineer, and computer science is her domain. Currently, she is preoccupied with new regulation from the European Aviation Safety Agency (EASA) concerning, among other topics, the quality of infrastructure.

There has been a lot of talk about Service-Oriented Infrastructure (SOI), which provides for a layered architecture instead of a monolithic one. In your expertise area, can you please elaborate on this?

SOI combines SOA and ITIL standards into a functioning whole. SOA or Service-Oriented Architecture means a style of software design where services are provided to the other components through a communication protocol over a network. The Infrastructure Library ITIL is a collection of predefined processes, functions and roles as they occur typically in the IT infrastructure of medium sized and large companies. In order to provide the necessary quality assurance as well as to anticipate the implementation of new European regulation, we are striving for a clear infrastructure qualification plan in VCT2.

* Virtual Machine
What are the main challenges?

PB Safety is highly related to people. They are ready to change as long as the change does not affect them! People worked in well-defined organizations. Now with VCT2 everything is changing. There is a huge amount of difficulties; you might be lost as soon as you look closely at them. We are complementing the quality management process of skyguide, for example, writing system engineering life cycle methods. Is the organization capable of digesting this in a short time? Changing the mindset of people takes time. We have to overcome the fears and resistance that come with standardizing and consolidating processes, tools and systems. When we are formalizing the components, we have to make sure people understand their new role, particularly when, at the same time, new companies come in.

What is the purpose of collaborating with an outside IT company like DXC? Surely you would have the competences in-house.

PB Technology is getting more and more complex; simultaneously we had to decide how to use our resources and how to stick to our core business. The question we asked ourselves was to determine where our core competences are? And the answer: they are in designing and providing services. So for the purpose of efficiency, our central integration platform, hosted on an on-premise private cloud, is provided and monitored by our external partner DXC in Sofia (Bulgaria): DXC already had the technology, which is widely used elsewhere. We were very impressed by the way the company is organized and how it can integrate the specificity of a customer into its organization. In its customer training centre in Sofia, it knows exactly which training is appropriate for which customer.

Skyguide is a safety critical company. Is it not dangerous to outsource some of its IT business to a private partner in a foreign country?

PB DXC have indeed many business critical customers but most probably no safety critical ones like skyguide. Therefore we provided them with insight through a dedicated training at skyguide. This training emphasized their role in the technical service delivery. Early 2018, we will also do a supplier assessment in Sofia in order to test the organization and cooperation.

One of your tasks is the relationship between skyguide and the Federal Office of Civil Aviation FOCA. How do you handle that?

PB As the Safety and Compliance Manager of the department, I am regularly in touch with the FOCA. As we are changing the business model in the frame of VCT2, we have to create trust in the new set-up. The aim being to make the situation and the technical details intelligible for FOCA.

And your conclusion of all of this?

PB I knew the process would be difficult, but I never assumed it would be as difficult, slow and energy consuming as it now appears to be. We have a tendency to look only at failure and what is missing instead of what has been achieved. But I am confident that we will make it, confident because of the quality of the people working with us.
TATA CONSULTANCY SERVICES WILL ASSIST WITH SKYGUIDE’S ORGANIZATIONAL CHANGE MANAGEMENT PROGRAMME

Tata Consultancy Services is an internationally operating organization rendering IT Services, Consulting and Business solutions. “We offer a consulting-led, integrated portfolio of IT Services, Business Process Services, IT Infrastructure Services, Engineering and Assurance Services,” says Heinz Gehri, Country Manager Tata Consultancy Services Switzerland Ltd. “This is delivered through our unique Global Network Delivery Model™, recognized as the benchmark of excellence in software development. As part of the Tata group, India’s largest industrial conglomerate, Tata Consultancy Services employs 389’000 well-trained staff in 45 countries. More than 5’000 of them are working for our clients in Switzerland, skyguide being one of them.”

HEINZ GEHRI
Country Manager
Tata Consultancy Services
Switzerland Ltd

Mr Gehri, what role does Tata Consultancy Services play as a partner of skyguide accompanying its transformation process?

HEINZ GEHRI
Tata Consultancy Services is the strategic IT partner to skyguide, primarily to help skyguide succeed in their strategic mission to deliver the Virtual Centre (VC). Skyguide will benefit from the extensive experience that Tata Consultancy has amassed across the globe in accompanying such transformations.

In your opinion, how important is the VC Programme for the future of skyguide?

HG We consider the Virtual Centre Programme to be the right step for skyguide to embrace the future. The Virtual Centre will enable skyguide to stay relevant, cost effective and competitive as the Airspace Navigation Services industry evolves into the future. The Virtual Centre is also positioning skyguide to be the leader in achieving Europe’s vision to move towards one Single European Sky.

In your view, what are the main challenges and difficulties skyguide is facing?

HG The major challenge appears to lie in skyguide’s transformation of its current organization in order to adapt to the changes that are being introduced by the Virtual Centre Programme. These include changes in business operations, technology, infrastructure, processes and skyguide’s operating model. Historically, Operations and IT at skyguide had been set up vertically whereas the need for a horizontal integration and coordination was minimal. The Virtual Centre Programme is transforming the entire organization to become more horizontally focused, and hence it is a major cultural shift for the employees as well, particularly in the way they are working.
Philippe Chauffoureaux compares his role of Chief Information Architect with the role of his equivalent in town planning: whereas in the medieval town some houses were randomly built and eventually formed a street and then a town, nowadays you need careful planning and a global overview in order to not create chaos. The same applies to IT services and their growing complexity. Philippe Chauffoureaux draws, so to say, a city map of IT systems with their technical as well as their operational dimensions in mind. This is particularly crucial in a period of transition when legacy systems and new items have to be integrated, new management methods like Agile have to be implemented, the Virtual Centre Tranche 2 (VCT2) developed and best practices in creating solutions established.

**SKYGUIDE** In which way are you participating in VCT2, and how many of your staff are directly involved in its development?

**PHILIPPE CHAUFFOUREAUX** Two of my people are involved, and our task is to provide basic landscape information to achieve a smooth transition. The system architecture efforts have been pursued in support of the infrastructure and technical issues encountered by the VCT2 programme. However, this bottom-up approach has shown its limits, and it will be time to address the architecture discipline with a more canonical top-down approach. This is essentially needed in order to ensure a proper and coherent assembly of the numerous piecemeal design decisions taken across the whole company and to align them with the VC target architecture.

**PHILIPPE CHAUFFOUREAUX** Chief Information Architect

**How does this approach fit into the business architecture prevalent in skyguide?**

**PHILIPPE CHAUFFOUREAUX** To realize this classical top-down approach implies naturally to broaden the scope of the relevant technical services and to align this effort with the business architecture dimensions.

Thankfully, the new business architect has been efficiently supporting us with his team in this new challenge and is present to ensure a proper alignment of the modelling of the technical services on the business architecture.

**Does this top-down approach not come very late or even too late in the process of designing skyguide’s system architecture?**

**PHILIPPE CHAUFFOUREAUX** Of course, one could find this top-down approach an evidence and to come late in the process after having explored for a while a bottom-up path. This is true but not totally strange as it has been the way to gain maturity to start the modelling in the classical way since our business domain is scarce of strong best practices and references in this area. We were especially interested to stay pragmatic, adaptable and realistic in our modelling approach to ensure support and acceptance of the field actors when harvesting the fruits from such an initiative.

**Could you please explain in which way Information Architecture is influencing the evolution of existing models and the development of new ones?**

**PHILIPPE CHAUFFOUREAUX** We have especially fought against the two extreme models: to copy what is existing today or to start from a blank sheet. The narrow path that we follow is to be inspired by the current set-up while openly questioning the coherence of the current model to create useful evolutions of it with the Virtual Centre, the System Wide Information Management (SWIM) concept and a Service-Oriented Architecture in mind. Concretely, the current efforts are focused on establishing complete maps of our business capabilities and of the IT application landscape, then to reconcile them in a unified top-down model in 2018. Through these efforts, in intense cooperation with our colleagues from the business architecture domain, we are building the foundations of the skyguide Enterprise Architecture framework.
Ten years ago, the International Civil Aviation Organization (ICAO) identified issues hindering the development of air traffic. One of the topics was the lack of information exchanged between aviation stakeholders on flights due to antiquated communication technologies, formats and networks. ICAO then set up an ambitious plan which basically aims to replace over the next 10 years the obsolete old networks with a new modern IP network where the System Wide Information Management (SWIM) can be operated to seamlessly exchange more data between all aviation stakeholders. Ross Wilson is part of a pilot project to receive this SWIM Flight Data notification service to evaluate whether it could be operationally used within the short to medium term.

**ROSS WILSON**

SWIM Services Architect

**SKYGUIDE** Why would you want to replace a system which, over many years, has proven to be reliable and safe?

ROSS WILSON We are getting to the stage where the existing formats are reaching the limits of their evolution. Basically we need to replace the obsolete old network in order to exchange more data between all aviation stakeholders: between airports, airlines and ATM. The task is to find the most direct route possible with the least obstruction and thus to increase safety and capacity in an airspace which is more and more crowded. The Eurocontrol Network Manager has, since May 2017, started offering some SWIM services. At skyguide, we launched a pilot project to test these SWIM services. We successfully demonstrated the utilisation of this enhanced flight data model and the display of the flight data on a Controller Working Position (CWP). The goal was to receive this data over a modern network, in a modern protocol and modern format and to process it for the Air-Traffic Controller (ATCO). ATCOs are interested in getting the data exactly as it is filed by the Aircraft Operator directly on their CWPs.

Is there a financial goal in the introduction of a new system?

ROSS WILSON SWIM would contribute to deliver prediction based flight data which would show exactly the predicted position of the aircraft at any given time. Optimising the flight plans would reduce flight time, fuel consumption and emissions.

Seeing today’s internet being accessible in most areas worldwide, why is aviation using such old communication technology?

ROSS WILSON It was only in the last 10 years that the internet has become mature and reliable enough to even consider using it as the aviation communication backbone. Our world is also becoming more conscious of security on these networks, which with internet based technologies and tools can now be provided.

What is the time frame for implementing these new means of communication?

ROSS WILSON Europe wants a fully integrated system. The vision from the ICAO SWIM concept supported by SESAR is that everyone in Europe can communicate in these new formats by 2025.

“Optimising the flight plans would reduce flight time, fuel consumption and emissions”
CURRENT ATM BASED ON REGIONAL/STATE PROCESSES AND TARGETS

FF-ICE FACILITATED ATM BASED ON GLOBAL CONCEPTS, PROCESSES AND TARGETS
REFINING THE SCOPE
A DEEP UNDERSTANDING
OF THE VIRTUAL CENTRE
TRANCHE 2 (VCT2) TARGETS

Joël Jordan is at the forefront of skyguide’s One-Sky-by-One-System, and responsible for breaking down the overall concept of the Virtual Centre into small bits of “daily deliverables”. The challenge, he states, is to introduce new items whilst assuring the stability of skyguide’s normal air navigation services. Joël Jordan and his team are now fully concerned with the development and delivery phase of Virtual Centre Tranche 2 (VCT2), which will keep them busy until 2020. Due to its innovative content, Joël Jordan talks about the challenge of holding up predictability in this programme. This is an issue which he and his team try to address with a dynamic and flexible scope management while the parameters of time and finances are fixed to provide stability. In this context, one can talk about continuous scope refining, inspired by the findings of the agility philosophy.

SKYGUIDE
How do you act exactly? What is your time frame, and how is the programme funded?
JOËL JORDAN
The Executive Board and the Board of Directors have agreed upon a set of intentions for the programme duration with an estimated financial budget. This agreement also fixes the financial cadence and allocates certain sums to every calendar year. Annually, the programme management defines the scope and has it approved in the governance process. It is represented by a set of expected objectives and deliverables for one year. This is then further broken down by the agile projects for software development and by classical projects for others.

Refining the scope surely comes into play when unexpected problems occur. What specific measures do you take in this case?
JJ Depending on the magnitude of the problem, we act at macro-level or micro-level. A continuous dialogue between micro and macro level takes place weekly in the framework of the programme governance.

At macro-level, the programme management proposes adaptations to our steering committee and programme owner. These adaptations must not endanger the core of our intentions and the engagement of skyguide and the partner organizations. This requires cautious attention in order not to salvage progresses by too brutal actions. These adaptations will be finally reported to the Executive Board and the Board of Directors in the annual review. This proceeding also enables us to integrate learnings and consequences for the next year.

At micro-level, we empower the projects, especially the agile ones. Together with key programme and business stakeholders, using their backlogs, considering their velocity, the teams decide the features they can include in their planning according to the minimal value our goals demand to deliver. In this process, a deep understanding of the superordinate intentions and goals is vital. The progress is measured at certain commissioning points according to what the agile or classical project commission requires.

Does an ongoing scope refining with a fixed time frame and a fixed budget not lead to inefficiencies? And is there not a certain danger of disengagement of some of the staff when these fixed requirements cause repeated stops-and-goes in the development of the programme?
JJ Yes, these dangers exist, especially when you act at macro-level. You can be led to pause work temporarily to focus progress onto an initiative in the portfolio of your programme. Understanding the interdependencies and the value contributions in the programme is very critical at that point. A transparent and calm dialogue with stakeholders, steering members and programme owner is crucial. Scope refining is an uncertainty and therefore a stress factor for organizations. It can also create conflicts. Scope refining and flexibility have a price;
Capabilities that are closer to Programme Increment need breaking down (in Features), re-estimation and re-prioritization.

The 2018 skyguide technology outlook

“Managing the unexpected in innovation is a matter of the entire organization”

Capacitive disengagement from the organization is part of it. This is where margins of tolerance in the definition of time and budget can really help. The resilience of such an approach is also very dependent on a strong alignment and commitment of the various governance boards. Managing the unexpected in innovation is a matter of the entire organization. Actually scope refining has to continuously involve all decision levels. A coherent communication adapted at each level is a must to maintain common understanding, trust and motivation across the entire organization. This is the true challenge of scope refining.
“Our layered, service-oriented approach with its new methodology will be a big challenge. But if we communicate these changes coherently and convincingly, people will realize that there are advantages in working in a different, more agile way and that, consequently, we will be more successful.”