

Business As Usual

As the ATM industry deploys ever more complex technologies and becomes progressively more integrated, how does it develop the necessary resilience to guarantee ATM safety? Frequentis' **Hannu Juurakko** shares his views on the current situation today and offers an idea of how the industry might evolve in the future

As we look to the future many things are uncertain, but there are also many things we can count on. What are five key considerations within our industry? That air traffic will grow while the airspace will stay the same; that autonomous mobility can already be seen in unmanned traffic management (UTM) and that the amount of this traffic will grow exponentially; that security will become an increasing challenge as communications and information sharing become more open; that new technologies such as remote towers will enable us to do more with less costly infrastructure and that the amount of data required for daily business operations will continue to increase and, as a result, artificial intelligence will play a larger role in taking decisions based on this data.

Before we jump to the future, let's take a look at today.

Safety is still the driver

Resilience is key to ensuring safety. We must plan for unplanned contingencies.

In other words, communications and networks must be reliable as scenarios change to keep our aircraft flying and our passengers safe. Resilience is the new redundancy, ensuring the availability of operational systems even in the case of failure, breaches or an attack.

This means that business processes and their supporting infrastructure are not only designed for high availability – today, this is redundancy – but designed for a potentially larger impact be it a cyber security attack, a terrorist attack on critical infrastructure such as ATM infrastructure or a failure of components.

As a supplier, Frequentis provides mission-critical ATC infrastructure to enable and empower its customers to perform safe air traffic control. Resilience is more than just redundancy of every component. It is the redundancy in all communications allowing end-devices to select the best and fastest available information, something Frequentis pioneered with its communication system.

The deeper we look into the physical layers of a network infrastructure, resilience is more and more about coping with degradation in communications quality. On one hand, it starts with creating diverse infrastructures, combining devices, links and software from multiple suppliers. This diversity helps to enable more options for the routing of safety-critical communications based on the current state of the end-to-end network. Software-defined networking (SDN) supports this.

I'm sure that different suppliers will approach this challenge differently. Frequentis addresses this challenge by combining fully separated networks on one converged and hybrid infrastructure that can cope with a complete loss of sub-elements.

Through the detection of degradation in the end-to-end user experience; performance and user experience measurements are considered as close to the application as possible, and this can trigger degraded performance profiles from applications.

As a result, the best course of response to ensure resilience can be initiated.



Applications need to continue to support the business with degraded performance. This is what resilience is all about. Keeping the business up-and-running while managing an incident. For example, air navigation service providers can use different surveillance data distribution profiles for normal and degraded operations. With remote towers, solutions need feedback from the network infrastructure on performance and resource availability to automatically adjust operational modes, thus reducing the requirements on the infrastructure, allowing business continuity.

This is not only important in traditional control centres, but also as we consider business processes related to virtual centres. Enabling one ANSP to temporarily delegate responsibility for an airspace to another trusted partner without losing sovereignty and accountability of the airspace takes resilience beyond a single location and a single network. This is already a reality for air traffic controllers at Eurocontrol's Maastricht Upper Area Control Centre (MUAC) and the French air navigation service provider DSN on the basis of common Functional Airspace Block Europe Central (FABEC) specifications. The joint procurement ensures economies of scale by cutting development and maintenance costs and increasing technical synergies between both ANSPs.

Last and but not least, situational awareness is of utmost importance. This is required in order to detect normal business operation being impacted, to choose the best response, to investigate causes and to prepare for the future. Voice and data recording solutions are one vital element to ensure that the investigation process includes all required data from sensors, screens and the environment – be it voice, operational data such as surveillance or security footage – to allow for a realistic reproduction of incidents.

A look to the future

Coming back to the five points I mentioned at the beginning, let's consider some of the industry experts' views on key considerations.

CANSO offers some more immediate considerations with a view to 2020 (ow.ly/yIRT30iIL1a). What is interesting to see is that the topics they are looking at are very similar to those organisations considering a farther horizon. This shows us that the overarching topics in our industry do not drastically shift between decades. The shift is more about how we as an industry - alliances, users, technology partners - address them.

IATA released a study looking toward 2035 (ow.ly/PKkG30iILcqv).

It predicts a turbulent time ahead as a result of regulatory, political and technology change. I'm paraphrasing here as they actually identify 13 drivers but the general consensus is that this period could be quite volatile to our industry driven by considerations over which we have some control and by others over which we don't, such as climate change.

The last comparison point I will mention is that of the European Union Flightpath 2050 Vision for Aviation (ow.ly/L5Y730iIEK0). This source is very similar to IATA in what it believes will impact our industry, but it also looks beyond the focus of just airline travel. Ninety per cent of travellers in Europe able to complete their door-to-door journey within the region in no more than four hours; all flights arriving within one minute of planned arrival time regardless of weather and the support of at least 25 million flights – manned and unmanned – every year. How much growth is this? Eurocontrol projects the number of flights to be supported within the region in 2018 at 10.96 million.

Let's take two areas that Frequentis is following closely and consider our views as to what will happen in our industry over the next 10 to 20 years.

Starting with unmanned UAVs and the implications to managing our airspace, there are four topics we are following:

- 4D UAV trajectory planning and conflict resolution – a drone safety net.
- direct/automated communication with UASs to resolve conflicts and manage exceptions. How to communicate with a drone? I think the challenge here requires no further explanation.
- enabling UAS swarms and integration into the airspace of fully autonomous UASs. This one sounds a bit like it could be a science fiction story about drones taking over the sky, but there are many military uses already today. Thinking about integrating a large number of unmanned aircraft into a civilian air traffic control situation could become the thing of which nightmares are made. It's the role of companies like Frequentis to ensure this doesn't happen.
- applying artificial/augmented intelligence techniques to manage the safety of the overall airspace system. Just as with autonomous driving, can it truly exist on roads together with vehicles that are not autonomous - without human intervention? Based on this consideration, we believe that augmented intelligence is a better fit in the world of ATM where the pertinent information is gathered and prioritised, but a human makes the final life-and-death decision.

Next, the SESAR European Airspace Study (ow.ly/5uZk30iIEFI) aims to define the future architecture of the region's airspace by 2035.

Frequentis is actively involved in discussions about the operational and technical building blocks of the future airspace. Topics are mainly addressing the lack of capacity:

- **Optimised airspace** topics include a Pan-ECAC Free Route airspace to fly optimal routes throughout ECAC, optimised airspace configuration to support increasing traffic and the transformation to flight/flow centric operations to address the scalability limits of sectors.
- **Advanced and automated technology** implementation to support virtual centres geographically decoupling ATM Service from Air Traffic Service Units (ATSUs), dynamic airspace configurations (DAC) allowing the network to continuously adapt to demand pattern changes and trajectory-based operations for collaborative decision-making.
- **Enablers** must include technology to allow for seamless data exchange (SWIM, IOP) across stakeholders to support new a concept of operations.

Current predictions forecast that without a drastic change of operations and technology, the EU's airspace will collapse at any time between 2030 and 2040. This must be addressed with additional investment to improve performance through advanced technology. An 'airspace collapse' would mean that flights, ready to take-off, already with boarded passengers, would stay grounded due to airspace limitations.

This is a pretty shocking concept with which to end this piece. And, although SESAR is focused on Europe, the scenario globally would have similar implications.

I believe the key to solving the scenarios put forth in this discussion centre around the industry coming together with a cohesive plan and not operating in silos.

Although there have been some great strides taken by different ANSPs working together through virtualisation, the industry as a whole – airlines, airports, ANSPs and suppliers – can still take further strides to come closer together to ensure the long term resilience of our airspace. **ATM**



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