Always on: ATC contingency approaches in support of business continuity

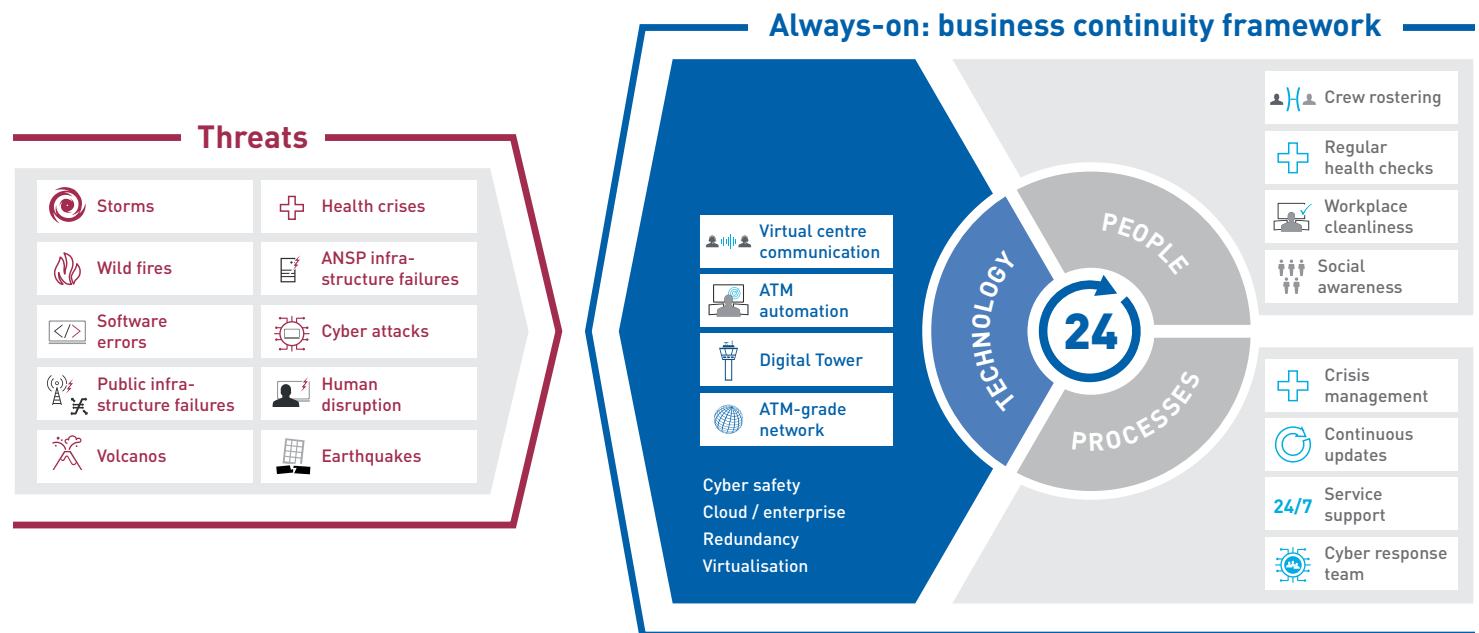## Keeping ATC services running safely and reliably at all times

Executive Summary

The aviation industry must ensure that safety-critical ATC services run uninterrupted at all times—during both the current crisis and the future recovery phase. ANSPs have responded well to the pandemic challenge, putting their operational contingency plans into action and largely avoiding significant shutdowns.

This white paper presents some key technologies that can be deployed today in support of even better ATC contingency measures, which in turn will help ensure business continuity for the whole aviation sector. The underlying goal of the contingency approaches outlined in this paper is to enable a seamless switch to alternative locations and backup systems whenever required.

First, digital tower and virtual centre concepts decouple air traffic controllers from a specific physical location, giving them the freedom to work from any location and serve any airspace—even beyond national or regional borders. Second, a flexible backup ATM automation system provides an ideal fallback option if the main automation system is unavailable.

These solutions are ready for immediate use to tackle today's challenges, while also offering significant potential benefits for the future.

Air Traffic Management

FREQUENTIS

Always-on: business continuity framework

Threats

Storms	Health crises
Wild fires	ANSP infra-structure failures
Software errors	Cyber attacks
Public infra-structure failures	Human disruption
Volcanos	Earthquakes

TECHNOLOGY

- Virtual centre communication
- ATM automation
- Digital Tower
- ATM-grade network

Cyber safety
Cloud / enterprise
Redundancy
Virtualisation

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PEOPLE

- Crew rostering
- Regular health checks
- Workplace cleanliness
- Social awareness

PROCESSES

- Crisis management
- Continuous updates
- 24/7 Service support
- Cyber response team

Avoiding ATC Zero

Our world has changed: never before we've been disconnected like this for such a long time. Travel, be it for business or leisure, to meet family, friends, business partners or just to explore the world has been interrupted for quite some time.

While commercial air traffic volumes are currently just beginning to recover from record lows, air travel will ultimately regain its position as one of the main engines of international development and bringing new regions into the global economy.

It is therefore essential for the industry to preserve safety and maintain future capacity by ensuring that ATC services run uninterrupted at all times—both during the current crisis and the future recovery phase.

ANSPs are legally required to have contingency plans in place, and these have worked well during the coronavirus pandemic. For example, many organisations were swift to set up isolated ATC crew rosters, so that a suspected infection in one crew could be resolved by switching to a completely separate back-up crew, and even to a second back-up crew in some cases.

Equally, ANSPs have implemented deep cleansing measures in towers and control centres, and created "always-clean" stand-by working positions to minimise the risk of cross-infection between the primary and back-up rosters.

These operational measures—also seen in other crucial industries such as banking and energy—have proven generally effective in protecting the health and safety of controllers. However, some so-called "ATC Zero" scenarios have occurred: for example, ATC services were completely shut in one sector of New York airspace when an entire ATC crew had to be quarantined. What can ANSPs do to increase their resilience and make ATC Zero a less likely outcome, both now and in the future?

New routes to resilience

Technology solutions are available today for strengthening contingency planning in ATC, both in ATC centres and in airport towers. In addition to meeting the immediate tactical requirement for contingency, these solutions also support longer-term strategies including evolution towards future SESAR initiatives such as Single European Sky.

Together with the operational measures already outlined, the virtualisation of ATC systems will help boost the resilience of ATC services. By geographically decoupling ATC services from their delivery location, the SESAR Virtual Centre concept aims to increase agility, capacity and cost-efficiency, while enabling better contingency planning. In a virtualised scenario, air traffic controllers are no longer bound to a specific control room but can work from any location, serving any airspace—even beyond regional or national borders. In this way, the Virtual Centre concept removes the need for an ATC suspension, even in the event of a complete area control centre (ACC) being taken out of service.

The key enabler for Virtual Centre is a smart system architecture in which deterministic use and knowledge of the required bandwidth is available upfront—without restricting the ability to make rapid changes as required—ensuring non-blocking behaviour for the systems. Of course, technology is only one element: the whole operational ecosystem must be maintained, and controllers must have the correct training and certifications to take over operations for other parts of airspace; these additional topics are not covered in this paper.

> "We must look more closely at the long-term challenges ahead of us and jointly implement solutions which enable a resilient, sustainable air transport system, robust enough to withstand potential future crises."
>
> Hannu Juurakko, Vice President ATM Civil and Chairman of the ATM Executive Team

Breaking down barriers in ATC

For control centres, Frequentis offers VCS3020X—the only ATC voice communication system on the market today that fully supports the SESAR Virtual Centre concept. And for airport towers, the Frequentis Digital Tower solution enables ATC services for airports of any size to be handled seamlessly from any location. In both cases, the only requirement for contingency operations is the availability of a secure and resilient ATM-grade network at the back-up location.

For en-route and approach control centres worldwide, ATM automation systems provide essential functions to support controllers in ensuring the safe separation of aircraft. Clearly, ANSPs need a robust contingency plan and back-up option for these vital systems. Here, Frequentis offers PRISMA: an ATM automation system for en-route and approach, including safety-net functionality and enhanced situational awareness.

Based on state-of-the art technologies, PRISMA is the most modern and efficient ATM automation system available. Its modular architecture makes it ideal for extending an existing automation system with contingency and fall-back capabilities, plus built-in virtual-centre capabilities that enable our customers to implement the vision of location-independent operations whereby any controller can control any flight, from any site within an airspace. By setting up a back-up ACC system that is dissimilar from the main ACC, ANSPs can increase their resilience and reduce the chances of ATC Zero. PRISMA provides the main interfaces for surveillance sources, flight plan data and OLDI coordination.

Rethinking airport towers

Remote digital towers are based on the principles of virtualisation, separating the physical infrastructure and location from the operations,

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allowing ATC services to be provided away from the airport in custom-built facilities rather than in airport towers. A remote tower control centre can act as a permanent back-up facility, used both at times of low traffic volume and when the primary ATC tower is out of service for any reason.

By taking advantage of the latest digital tower technology, ANSPs can rapidly deploy additional contingency centres for any other airports as well. These centres could also be used as test and training facilities, empowering ANSPs to maintain staff skill levels even when lower traffic means reduced shifts. Equally, when not in use for contingency purposes, a digital tower could be used to validate new controller tools with no impact on live operations.

Space in a conventional ATC tower is at a premium, making it essentially impossible to impose social distancing during a pandemic scenario. By contrast, a digital tower can easily occupy a large, low-rise building such as a warehouse beyond the airport perimeter; advanced digital imaging gives controllers far better visibility than in the primary tower.

The digital tower concept is mature and operationally proven; for example, Deutsche Flugsicherung, the German national ANSP, is using this technology to manage air traffic for Saarbrucken airport from a remote tower at a distance of 450 kilometres.

The remote digital tower concept provides a contingency option not just in a pandemic scenario but also in response to cyber threats, natural disasters, hardware failures, software obsolescence, network failures and other potential disruptions.

Beyond COVID-19

The world is highly connected, both in physical and digital terms. In normal times, people travel the world for business and pleasure, live in a global economy that depends on international trade and transportation, and use information systems that are closely intertwined.

In all its forms, connectivity opens up business opportunities and increases the wealth of participating nations. However, it means that

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threats—including both digital and physical viruses—move more easily from region to region. In recent years, outbreaks of both types of virus have become more frequent and spread faster and wider. This poses a real threat to the digital and physical worlds, and in particular to safety-critical infrastructure.

Imagine a world in which business continuity could be assured for all critical infrastructure. Whenever a new virtual or physical virus emerged, it would be possible to maintain safe and secure operations, thanks to:

1. Rapid detection of incidents through superior situational awareness

2. Immediate imposition of social and virtual distancing.

Employees could continue working without fear of illness, infrastructure providers would be fully prepared for contingency scenarios, effective containment actions would imposed quickly, and people everywhere would be able to rely on uninterrupted services from the critical infrastructure.

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Take action today for tomorrow

The aviation industry remains largely grounded in many countries, and recovery will undoubtedly take time. In response, the industry must pull together and remain resilient. Recent global events have shown that business continuity strategies and tactics must evolve to ensure appropriate controller staffing, even beyond national or regional borders.

Similarly, interruptions to ATC services caused by COVID-19 infections emphasise the need for flexibility and location-independence in air traffic services. To help address these requirements, Frequentis has solutions that are ready to deploy.

There is an immediate tactical need for ANSPs to boost their contingency arrangements, both to help larger airports continue operations and to reduce the threat of smaller airports closing through lack of traffic. Introducing a digital tower solution could serve both requirements, providing a back-up location that is also capable of permanently supporting smaller locations more easily and cost-efficiently.

In addition to serving the immediate need for viable operational contingency, digital tower and Virtual Centre technologies provide the flexibility to support longer-term strategic goals. And given that unmanned aviation is likely to grow much faster than conventional aviation, the flexibility of PRISMA to cover UTM integration could provide much-needed revenue opportunities for ANSPs in the post-COVID world.

Conclusion

To learn more about Frequentis solutions for contingency in ATC, visit our website today or get in contact with your local Frequentis representative.

With more than 70 years of experience serving the industry, Frequentis is a robust partner for many of the leading ANSPs. Even during difficult times, we offer 24/7 services and are committed to both innovation and reliable solution delivery.

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Frequentis solutions for contingency in ATC

Solution	Domain	Typical deployment duration	Special functions
VCS3020X Virtual Centre voice communication system	En-route / approach control	6 – 12 months (dependent on complexity of operations)	• ATM-grade IT VCS • Cloud-ready deployment (private, governmental, public) • Capacity on demand • Evergreen software solution
PRISMA ATM automation system	En-route / approach control	6 – 12 months (dependent on complexity of operations)	• Safety nets • UTM-enabled • Modular architecture with zero-downtime upgrades • OLDI coordination
Remote Digital Tower	Tower / approach	4 months (for standard solution) 6 – 9 months (for customised solution)	• Advanced vision, flexible cameras • A.I.-based object detection and tracking • Multi-remote tower • Voice-integration
vitalSphere ATM-grade network	Network	6 –12 months	• Intelligent routing and control • Network situational awareness • IP and hybrid networks • Satellite connectivity • Brown-out detection • End-to-end security concept

Frequentis offers a vast range of products and solutions for ANSPs. Building on resilient, service-oriented architectures, all Frequentis products and solutions are protected against cyber threats. The above table shows only a small selection of products with additional value-add for business continuity. Check out the full selection of ATM products at https://www.frequentis.com/en/air-traffic-management.