In the Leipzig Remote Tower Control Centre, DFS operates a five-screen set-up for vision with five support screens. *DFS*

Improving cost savings and sustainability

Reducing digital tower footprint

As digital tower technology continues to prove itself at airports, Frequentis DFS Aerosense is exploring even more efficiency gains and cost savings in a sustainable, compact version.

Remote digital towers (RDT) have been an industry favourite for a number of years, helping organisations to reduce operating costs while also acting as a safety, performance and capacity enhancement.

However, the financial benefits were immediately acknowledged in a second wave of interest in the technology, and air navigation service providers (ANSPs) and airports are exploring the extended business case for implementation. The long-term benefits centre around the potential for complete air traffic services in a nation's country-wide network of airports because the benefits duplicate when we look at multiple airport towers in remote tower centre (RTC) settings.

Panoramic view

Made up of cameras around the airport and numerous high-definition screens, often in bespoke facilities, RDT allow the air traffic controller (ATCO) to visualise the airport as if looking out of the window. Configuration of an RDT can vary from eight screens (five panorama, one interaction and potentially two to three support screens) up to even 20, our project in Brazil with 18 screens being a prime example. The screens are placed together either horizontally or vertically, to typically show a "pseudo-panoramic" view of the airport – a 360° view compressed and displayed in a 180° or 220° layout of display screens.

With the RTC concept, multiple airports can be controlled from the same facility. This not only reduces costs for infrastructure, but also brings financial benefits associated with shared resources, controller job satisfaction, increased human performance and reduced training costs.

The typical space required for a remote tower working position is 15-20 square metres, which seems low when compared with a traditional air traffic control tower, but, when several airports are to be managed from one bespoke facility requiring multiple working positions within the same area, size does become a factor for consideration. However, space is not the only factor at play. Rising energy prices also mean the operational costs of full-size RDT positions could be increasing up to ten-fold.

These factors led to the creation of the compact set-up of an RDT, whereby the number of screens could be reduced to a minimum of four (three panorama and one interaction screen), filling a floorspace of just ten square metres. This would not only reduce physical footprint but also, energy consumption by reducing the number of screens and the air conditioning required to keep the centre cool. In our experience, the compact remote tower working position can reduce energy consumption by up to 70 per cent, increasingly important with the current inflated energy prices.

Controller fatigue

ATCOs have a critical role to ensure safety in the sky and must be alert and operating at their best. Visual and mental fatigue must therefore be managed, common in a role that requires communicating and processing information in front of a screen. Fatigue can have a serious impact on a controller's ability to make decisions so, of course, during research and implementation of a digital tower system it was vital that human factor studies were carried out to understand the impact and response.

German ANSP, DFS (Deutsche Flugsicherung) implemented its first RDT in 2018, utilising technology from Frequentis, and considered both the large and compact set-ups in its analysis. In the evaluations, ATCOs found that bigger screens do not provide more information than smaller screens, but with larger monitors the risk of missing very small details increased, because of the distance between the ATCOs' eyes and the monitor surface. Therefore, DFS finally decided to go with a compact working position to eliminate this risk.

From the outset, the intention of DFS was to add further airports to the facility in Leipzig and in April 2022, almost four years later, the second airport, Erfurt, was added to the RTC facility – a third, Dresden, will follow in 2023. The set-up requires one air traffic controller managing one airport at a time, but every air traffic controller will be cross-trained on each airport in the facility, enabling them to provide aerodrome services to other airports as required, easing staffing issues. Here, DFS uses five screens for vision and five support screens, but this can be reduced to three compact screens, like the set-up in Jersey UK, Akureyri in Iceland and Vienna, Austria.

About

The authors

Peter Gridling, senior solution consultant, Frequentis

Peter joined Frequentis in 2016 to support the digital tower team and is remote tower expert for Frequentis DFS Aerosense. He recently moved to the Frequentis Singapore office to help with solution awareness in the region.

Cengiz Özdemir, senior project manager, DFS Deutsche Flugsicherung GmbH

After a position in quality management, Cengiz became project manager for the DFS Remote Tower project. He is responsible for the stepwise transition of the three airports – Saarbrücken, Erfurt and Dresden – into a Remote Tower Centre in Leipzig.

DFS Aerosense

Frequentis AG and DFS, through its wholly owned subsidiary DFS Aviation Services (DAS), formed the joint venture Frequentis DFS Aerosense in 2018, to deliver turnkey remote tower solutions worldwide.

Another ANSP already preparing for an RTC is Danish Naviair, which selected an integrated remote tower and approach system from us in 2020, initially to manage Billund Airport and surrounding air traffic, with the intention of providing central air traffic control (ATC) to other regional airports, instead of locally from individual airports.

Agile approach

Modern remote and digital tower projects are typically very complex. Various ATC systems are involved and often have to be integrated, bringing technical challenges. In addition, the changing environment of the ATCOs, as well as the technicians, comes with additional challenges and requires active change management.

The ancient "waterfall-style" project approaches no longer work; often the buy-in from users is not considered enough, consequently leading to delays, costly change requests and, in the worst cases, even project failure. The resulting costs of which often exceed the costs of the remote tower itself.

For this reason, a new agile and iterative project approach was used in the DFS remote tower programme, which involved including all stakeholders from the start. The requirement specification was not fixed at the beginning and instead defined in multiple iterative steps within the project. After each step, the feedback of the air traffic controllers was collected and used in the next step to satisfy the end-users. Thanks to user involvement from the start, the chance of project success significantly increased. Frequentis DFS Aerosense now uses this experience in its delivery of other remote tower projects, including those in multiple remote tower settings and with both compact and large set-ups, and has proven this approach to maximise the project success and minimise delays and costly change requests.

This is a success factor for delivering a remote and digital tower project on time and in budget.

Outlook

The compact working position, invented and used by Frequentis DFS Aerosense in its implementation project, has proved its ability for complex environments, like the international airports in Germany with a traffic mix of 50:50 visual flight rules and instrument flight rules.

Although Frequentis DFS Aerosense can offer both large and compact RDT working positions, three of four of the recent project wins in 2022 chose the compact version, highlighting the trend towards using a compact working position, which we see making the implementation of multiple airports much easier in the future.

And, when we look at a heliport's use of just two controller screens, we also see a future use case for vertiports to further support the integration of drones within smart cities. But, back to today... when it comes to sustainability the choice for a compact RDT is very clearly the one offering the most savings for both ANSPs and the environment. **ATM**

The pan-tilt-zoom camera at Erfurt Weimar, Germany, can see 360° around the airport *DFS*