Beyond the digital tower

As pressure on airspace capacity continues to mount, **Frequentis**' Michael Ellinger and Jorge Minguez talk about the natural progression from digital towers to a hybrid tower and approach control system that would allow aviation to meet increasing demand.

Air traffic growth is soaring, and we know that the aviation industry is struggling to keep up with current passenger demand. Flight delays are becoming more common and predicted air traffic growth sees no signs of slowing down, with passenger numbers forecast to double by 2036. Studies reveal that the factors limiting growth are in the areas of airspace organisation, communications and automation support.

At the same time, today's air traffic controllers (ATCOs) are under increasing pressure to manage larger volumes, which is increasing the potential for human error. This is shortsighted and not in line with a safety-first approach in aviation. As we look more closely, we start to see that capacity is limited and hardly scalable in the approach-control area surrounding the airports. In Europe alone, there are 415 airports with tower air traffic services and 278 approach services; most of these are co-located and therefore not flexible to scale. There needs to be a change to the way that airports and corresponding approach centres operate. Without it the situation will continue to deteriorate.

Adapting to change

Remote digital towers and digital tower tools have come some way to offering a solution to the increasing controller workload by enhancing visibility, and automating functions and workflows. From replacing paper strips with electronic ones, to fully digital tower solutions with automatic object detection, automated warnings, and tracking and data fusion, ATCOs are supported by technology in the tower.

Most importantly, a remote digital tower provides location independence for ATC services – something that couldn't exist in traditional towers. However, the same is not yet true for approach services. Fitting more aircraft in the sky and enabling ATCOs to safely manage them is futile if the same number can't land and take off as planned.

However, a solution to this has been outlined in the SESAR 'Virtual Centre' framework. In a virtual centre, ATC services are completely location-independent and can be transferred from one location to another, even across national borders. This is where we start to look at a networked solution, which seamlessly integrates the air traffic flow from the airports in the upper airspace, and which is scalable and flexible in terms of resources. This allows ANSPs to integrate remote digital tower and approach solutions, therefore adapting to traffic demands in a more holistic way.

Approaching this from the tower side means additional capabilities can be added quite easily. If remote tower facilities are already in place, and a virtual controller working position has already been established, increased capacity can be managed by the controller. It is then about integrating that with approach control so that traffic flow in the upper airspace can be monitored, and aircraft landing and departure slots can be scheduled more efficiently. An added benefit of a centre solution that combines tower and approach operations is the potential for the same ATCO to manage both elements, with the option to combine or split the service based on traffic load.

Connecting the dots

In 2008, Frequentis Comsoft was already working on an automated en-route ATM system, creating a bespoke solution that combined all modern air navigation service functions, from pre-flight planning to real-time air navigation – that product was PRISMA. Due to the modular nature of the PRISMA system it became clear that it could fit with several other use cases. Frequentis has now been building on this experience and using the legacy assets of that system, including designing an approach solution based on PRISMA components and Frequentis smartSTRIPS.

The hybrid tower and approach centre is a combination of a remote digital tower and an approach automation solution, including Frequentis' electronic flight strips, called smartSTRIPS. These are already operational for their specific use cases, but this is the first time they have been arranged in such a way.
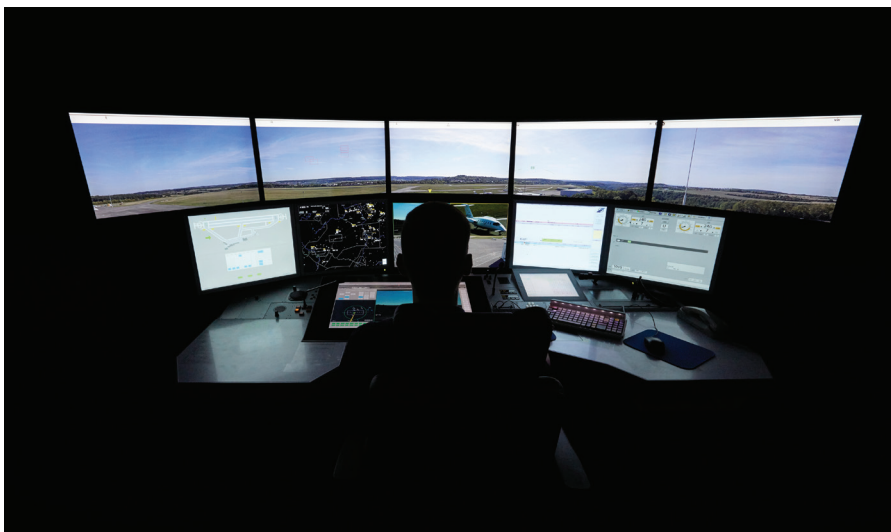
The Frequentis remote tower solution at the Remote Tower Control Center in Leipzig, for German ANSP DFS.
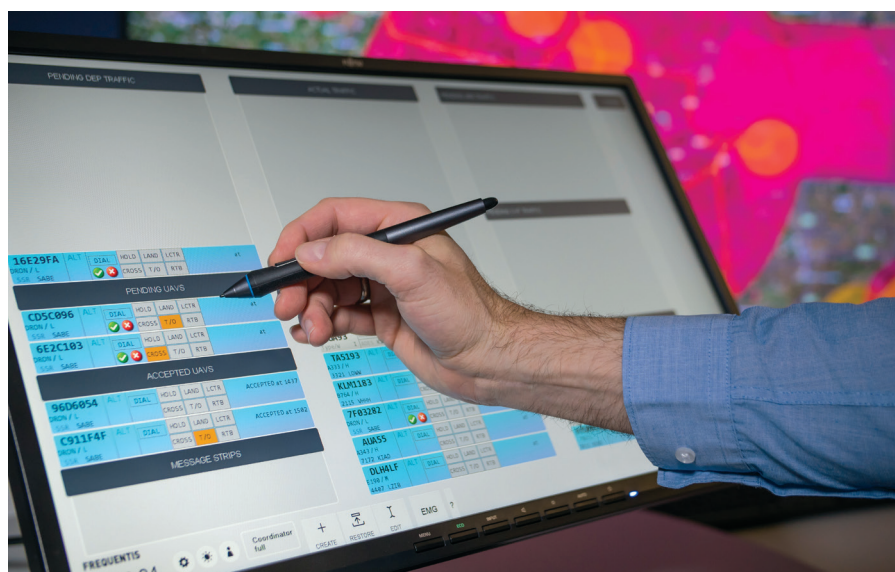
The PRISMA approach solution (PRISMA APP) is designed to autonomously process flight plan data and surveillance data for air traffic services (ATS). The APP function includes SafetyNet functionality such as short-term conflict detection, area proximity warnings and minimum safe altitude warnings, all designed to assist the ATCO with optimal situational awareness.

PRISMA APP offers the option to forecast routes, calculate estimated time of arrivals and validate distances between targets. This enables Approach Controllers to operate as effectively as with traditional flight data-processing systems (FDPS). To further support future operations, the PRISMA APP is also ready to support multi-tower operations and allows supervisors to dynamically change the configuration as needed, with zero downtime.

Frequentis smartSTRIPS supports the ATCO with efficiently handling, sharing and coordinating flight data.

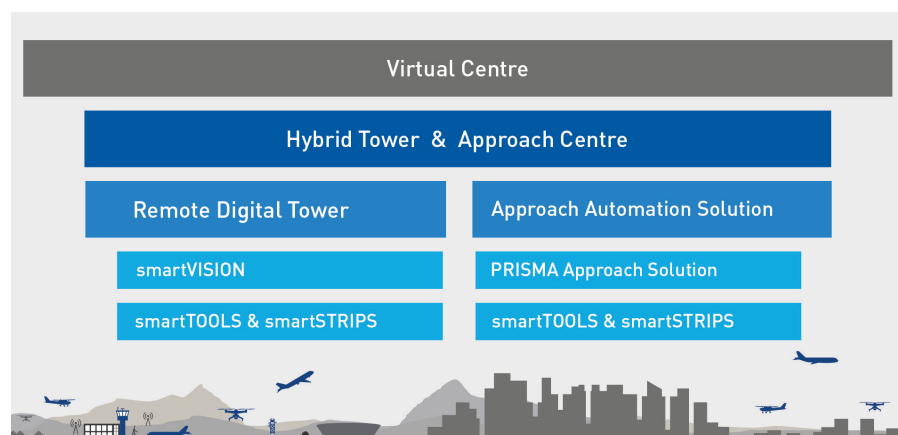automatic and instant coordination between tower and approach systems.

Similarly, Frequentis smartSTRIPS are specifically designed to support the ATCO

"With customers on all continents, the Frequentis remote digital tower solution is already widely deployed and used operationally."

Supporting the transformation

With customers on all continents, the Frequentis remote digital tower solution is already widely deployed and used operationally, providing advanced visual surveillance to controllers, using cameras and sensors at the airport to replace and enhance the traditional out-of-window tower view. This combination also allows the user to handle multiple airports from one centralised system, allowing

with efficiently handling, sharing and coordinating flight data, and today are already capable of managing several airports and approaches. In addition, running in distributed systems, deployed to towers and approach units around the world, smartSTRIPS were involved in the multi-remote tower testing in Hungary in 2019, where six air traffic controllers successfully managed the operations of three airports simultaneously. This high

level of adaptability allows controllers to have their multifaceted, airport-specific workflows and screen designs reflected in a single display.

And it is the operation of multiple airports from the same facility that will see the biggest efficiency gains when it comes to combined tower and approach services. The Frequentis remote tower solution at the Remote Tower Control Centre in Leipzig, for the German ANSP DFS, is already managing air traffic for Saarbrucken International Airport, 450km away. The intention is to add two additional airports to the facility in the future, which will be operated as single remote tower operations, so that an individual controller manages one airport at one time.

By integrating tower and approach operations into a hybrid tower and approach centre, operations can be managed by the same ATCO when required. This not only increases efficiency but also the flexibility to combine or split the service based on air traffic demand.

Integration and automation would allow better decision-making, reduce controller errors and increase safety. If capacity demands are going to be met and safety levels maintained, working smarter and allowing technology to support ATCOs will be required. ●

For further information
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Virtual Centre		
Hybrid Tower & Approach Centre		
Remote Digital Tower	Approach Automation Solution	
smartVISION	PRISMA Approach Solution	
smartTOOLS & smartSTRIPS	smartTOOLS & smartSTRIPS	

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