



Multiple Remote Tower

Small and regional airports are challenged to reconcile the high cost of running a full capability air traffic control tower with the low revenue derived from landing and other flight-related charges when traffic throughput is scarce and intermittent. Therefore, an innovative and more cost-efficient approach to providing control tower functionality at airports must be put into play.

The remote tower concept provides a solution to this problem. Remote tower works by deploying high-definition cameras complemented by a suite of supporting technologies and network links. A live video feed is securely relayed to an air traffic controller at a remote location. This live feed is combined with a panoramic array of high-definition screens, representing an 'out of the window'-like view of a single or multiple airports.

Controlling one small airport remotely can offer several advantages, such as reduced maintenance and operational costs or assistance in low visibility conditions. However, to fully utilize the advantages of the remote tower concept, remote tower centers need to be connected to more than one airport. This would allow for a much more efficient allocation of airports to controllers. The controllers flexibly work at airports where and when the traffic occurs: During high traffic load or complex situations, one or two controllers can provide air traffic control to one airport. In times of low traffic volume and less complexity, two or more airports can be combined into one Multiple Remote Tower Module and managed by one controller.

Handling more than one airport simultaneously – Human Performance in the Spotlight of Research Activities

Under which conditions is one air traffic controller able to provide high quality air traffic control to more than one airport simultaneously? To assess this key topic, the SESAR 2020 research project "PJ05 – Remote Tower for Multiple Airports," was started in 2016 as a part of the European Union's Horizon 2020 research and innovation programme. Coordinated by the DLR Institute of Flight Guidance, a group of 39 international partners carry out joint research activities covering technical and human factors topics.



One controller (left) is handling the simulated airports Kaunas and Palanga while his fellow controller (right) deals with an emergency at Vilnius airport (lower third in the panorama)

Proven Safety and Viability

The results of a series of realistic simulation exercises showed that “Multiple Remote Tower” does not impair safety and that the system can become a viable concept in the near future. Together with DLR’s partners—Frequentis AG, Leonardo Germany GmbH, the Hungarian air navigation service provider (ANSP) HungaroControl and the Lithuanian ANSP Oro Navigacija—four simulation exercises were conducted between November 2017 and December 2018. Using DLR’s Remote Tower Laboratory, a single controller handled complex traffic at up to three airports simultaneously. The participants were challenged with different weather scenarios, runway direction changes, runway inspections and emergency situations. Additionally, they had to coordinate with approach control, the weather service and airport operators. To assess the limits of human performance, the controllers were deliberately challenged. Depending on traffic load and complexity, the controllers felt anywhere from underutilized to excessively overloaded.

Both workload extremes should be avoided, therefore a new procedure was suggested and tested. To mitigate these workload extremes the controllers could split and merge airports, i.e. handing over one or more airports to a colleague if their workload was too high or taking over control of one or more airports during low-load situations. The feedback from the controller suggests that this procedure is a very promising measure to balance the workload in under- or overload situations. After the trials, the controllers stated they became familiarised with the new concept in a short time and never experienced any safety-critical situations. They felt confident that “Multiple Remote Tower” could become a future working environment.



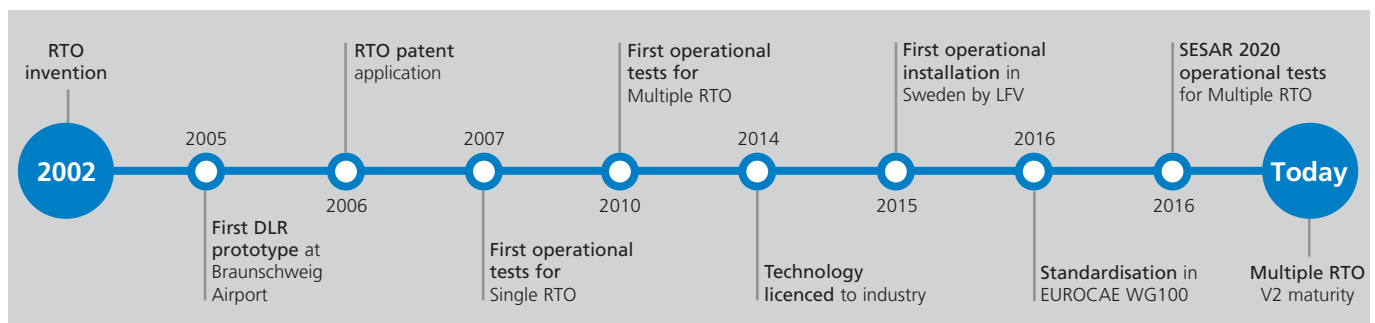
The Invention of Remote Tower

The idea of a remote or “virtual” tower was first formulated by DLR in 2002 on behalf of an internal competition for new technology visions. The idea received an innovation award and in 2005 the world’s first remote tower prototype was employed by DLR at Braunschweig-Wolfsburg Airport to test the concept’s technical and operational feasibility. Several national and international research and development activities followed and numerous ANSPs, such as the Swedish Civil Aviation Administration (LFV) and the DFS Deutsche Flugsicherung GmbH (DFS) in Germany, expressed their interest in this concept and collaborated with DLR. In 2014, DLR licensed the technology to the industry and in 2015 the first remote tower installation went operational in Sweden, providing control of Örnköldsvik airport from Sundsvall.

In Germany, the DFS is interested in controlling the airports of Saarbrücken, Erfurt and Dresden remotely from a Remote Tower Center in Leipzig. Therefore, the concept was initially validated for safety and operational feasibility in a simulator environment at the DLR Remote Tower Laboratory. The positive results supported this concept and in December 2018, the DFS went operational at Saarbrücken Airport, its first remotely controlled airport. Erfurt and Dresden are expected to follow soon.

From the initial idea in 2002 until its operational exploitation in 2015, only 13 years were needed to turn the concept into reality. The DLR Institute of Flight Guidance played an important role in this development process: The original idea stems from DLR, the first prototype was running and tested at DLR Braunschweig and the results of numerous research activities and their dissemination helped the aviation industry to realise the concept in an exceptionally short time period.

Remote tower camera array at Braunschweig Wolfsburg Airport



Remote tower operations – from vision to reality