



Will digital transformation make ATC towers obsolete?

Air traffic control towers are as expensive as they are iconic, and are rapidly going the way of the Pan Am Clipper. Virtual systems now provide real-time understanding of the traffic picture without looking out a window, and mixed reality will potentially change the way controllers work.

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Why look out the window?

Despite the great strides that have been made, air traffic management still relies largely on principles and technologies that were developed decades ago.

The ATC tower window is often the controllers' main source of information while giving clearances to aircraft landing, taking off, or taxiing to and from the gate.

Obstacles such as hangars and stands, poor weather conditions, and far-distant runways all present challenges, and ATC instructions are usually still given by voice communication to the pilots although data-link messaging and automatic routing and guidance are features being tested and implemented at forward-looking airports.

Is virtual reality unthinkable?

20 years ago, integrated tower systems were virtually unattainable. Today, using systems like Indra's InNOVA, air traffic controllers have cleaned up their desks and can manage airport traffic from a single display.

10 years ago, automated tower systems were still largely a dream. Today, intelligent systems enable more efficient and safer airport operations, particularly at the larger hubs. Indra's InNOVA system provides a range of safety net functionalities to assist the controllers maintain safety and efficiency at airports like Heathrow, Prague, Charles de Gaulle, Zurich and many more.

Today, virtual tower systems like Indra's InNOVA draw on a range of advanced technologies to de-couple air traffic control services from the airport infrastructure, freeing the controller from reliance on the view out the window, and enabling air traffic management from any location – even off-airport.

Mixed reality is already a reality in air traffic management. Indra has developed and tested a pioneer solution based on the Microsoft HoloLens to improve the design of air routes with a focus on final approach. Among the advantages offered by mixed reality, the user sees real time computer-generated data (virtual reality) blended into the real-world view. Studies carried out, among others at Lund University in Sweden, and the SESAR-funded RETINA project in Italy, indicate that controllers can use mixed reality tools to visualize a three dimensional situation and build a superior mental model of the traffic picture.



Big data applies to airports too

But at most airports, all the information needed by the controller is already available digitally. Big data is increasingly utilized by airports to better analyze market demand, optimize security control and enhance the passenger experience. The use of big data analytics is now being put to work to better understand how passenger behavior can impact air traffic management.

Connected, intelligent, autonomous aircraft

Global air traffic doubles in volume every 15 years or so, and is expected to reach 4 times its current level by 2050. Air traffic management will need to adapt to this increased traffic, particularly as aircraft become more connected, more intelligent, and more autonomous.

Artificial Intelligence in air traffic management

A number of ongoing research projects are investigating the use of artificial intelligence to address airport operations and greater automation of the ATC system, leading to smart strategies for managing air traffic. Some air navigation service providers have introduced electronic flight strip systems that replicate the paper strips traditionally used by controllers, and NATS in the UK is using machine-learning techniques in predicting potential safety events in the London terminal area.

Automated air traffic control?

Could air traffic controllers be replaced altogether by automated systems? Not likely. But the ability of humans and machines to collaborate in enhancing the overall performance of aviation will be the defining characteristic of future air traffic management.



Is there a business case for building a new concrete tower?

Virtual tower systems provide the controller real-time understanding of the traffic picture without a window, enabling remote tower operations as well as enhanced operations at complex airports. Exploiting automation coupled with artificial intelligence, controllers can handle larger amounts of data and achieve a more accurate awareness of the ground situation and the airspace around the airport than with vision alone.

The biggest challenge to artificial intelligence and mixed reality becoming everyday tools in air traffic control is building trust in the technology and automation, and finding the right balance between humans and machines. Not all safety concerns have been fully resolved, but the future air traffic controller will be like a professional gamer, managing air traffic with artificial intelligence and virtual reality.

Virtual tower solutions already enable enhanced safety and operational efficiency, and free up valuable real estate that could be put to more profitable use. The last physical tower may already be under construction.



Creating skies together

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About Indra

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America through its affiliate Minsait. Its business model is based on a comprehensive range of proprietary products, with a high-value focus and with a high innovation component. In the 2017 financial year, Indra achieved revenue of €3.011 billion, with 40,000 employees, a local presence in 46 countries and business operations in over 140 countries.