

CANSO Academy: Improving Aviation Efficiency Through Remote and Digital Towers Webinar Series

Thank you once again for your participation in CANSO Academy: Improving Efficiency Through Remote and Digital Towers Webinar Series that took place on 19 January, 2 and 16 February 2021. As we were unable to answer all the questions submitted during the webinars we have compiled answers from our panellists here. We hope these will complement what you have learned during the webinars.

Note: Only questions that have not been covered during the presentations, panel discussion and Q&A sessions are included. Some common questions have been integrated into a single question to avoid repetitions.

Quick links

To download the presentations and watch the recordings of the webinar series, please visit the following links:

Part One – Introduction to the Guidance Material:

- canso.org/event/improving-efficiency-through-remote-and-digital-towers-part-one-of-three/

Part Two – Technology and Enhancements:

- canso.org/event/improving-efficiency-through-remote-and-digital-towers-part-two-of-three/

Part Three – Case Studies and Key Learning Points:

- canso.org/event/improving-efficiency-through-remote-and-digital-towers-part-three-of-three/

Contents

Foreword.....	Error! Bookmark not defined.
List of Panelists and Organisations.....	2
Questions from Webinar 1: Introduction to the Guidance Material.....	3
Questions from Webinar 2: Technology and Enhancements	6
Questions from Webinar 3: Case Studies and Key Learning Points.....	9

List of Panelists and Organisations

Names	Organisations
All webinars	
Helen Parker	CANSO
Conor Mullan	Think Research
Part 1: Introduction to the Guidance Material	
Coleen Hawrysko	CANSO
Niclas Gustavsson	SAAB
Rory Hedman	Think Research
Mattias Abel	LFV
Zoltan Molnar	HungaroControl
Rolf Zon	NLR
Sarah McLarty	Think Research
Elizabet Pavlova	Think Research
Part 2: Technology and Enhancements	
Neil Bowles	Searidge
Peter Gridling	Frequentis
Niclas Gustavsson	SAAB
Stig Jensen	Kongsberg
Part 3: Case Studies and Key Learning Points	
Erik Backman	SAAB
Jacob Edholm	LFV
Holger van de Sand	DFS
Csaba Gergely	HungaroControl
Torbjorn Henriksen	Avinor
AnnMarie Sullivan	FAA
Mitchell Bernstein	FAA
Sophia Healy	Airways New Zealand
Filip Meert	Skeyes
Carole Dupre	Egis

Questions from Part One: Introduction to the Guidance Material

Can Rolf Zon maybe elaborate a bit more on the results concerning the situational awareness by ATCOs with the use of a Remote Tower versus a conventional tower?

Rolf Zon, NLR: I think that there is no reason to believe that situational awareness (SA) is negatively impacted by working in Digital Towers. What is important to realise is that ATCOs may use different strategies in building and maintaining their SA. I mean differences between different ATCOs, and also in one ATCO between sitting in the conventional versus the Digital Tower. I think that different ATCOs may use different eye scanning (and therefore attention gathering) strategies, with a result that there will be differences between ATCOs in what information is picked up at what moment. This can, to a certain extent, be influenced by the positioning of tools and monitors at the airport, as well as on the controller working position. It would be good to study that for an individual tower before building the system. I trust that this is an answer to your question, but feel free to contact me if I need to be more explicit or detailed.

The transformation from normal tower operation to Digital/Remote tower for the ATCOs, do you think it needs to change the type of training from just normal operation control to be like a combined Tower/Radar rating training as the change from the open environment of the real tower to the same as in Radar and also as data appears on the screens as on radar?

Mattias Abel, LFV: No, no new (radar) rating needed. Same rating and unit endorsement level as for conventional towers. However, the ATCOs need to be trained on the new system elements such as the visual surveillance system (as for any tower, conventional or Remote, you need to be trained on the particular systems in use), which is done as part of the conversion/unit endorsement training. In the European context, see the AMC and GMs to Regulation (EU) 2015/340 compiled in [Annex II to ED Decision 2019/004/R](#) (ref to response below), particularly 'GM3 ATCO.D.060(c) Unit endorsement course' and 'GM1 ATCO.D.085 Conversion training'. (The complete (IRs+AMSc+GMs) and updated Regulation (EU) 2015/340 is available in an "easy access format" [here](#).)

For the regulatory framework, which are the last EDs or RTCA documents that can be used for the technical specifications for the Remote/Digital towers?

Mattias Abel, LFV: In the regulatory context, the latest EASA ED Decision is [ED Decision 2019/004/R](#) - containing both:

- Annex I: the 'Guidance Material on remote aerodrome air traffic services – Issue 2', and
- Annex II: updated AMC and GM to Regulation (EU) 2015/340 (the so-called ATCO training and licensing regulation).

In the technical standardisation context, the latest document/MASPS is EUROCAE ED-240A (Oct 2018). (RTCA is not producing any standards related to Remote/Digital Towers/optical systems, my understanding is that it is agreed between the two organisations that EUROCAE is covering this area in a global context.)

I spotted on Elizabet presentation that one of the main challenges is the creation of "new" roles. Are there any examples of potential new roles?

Elizabet Pavlova, Think Research: Remote and Digital Towers technology pioneers are now moving towards more complex and intelligent solutions such as incorporating AI support systems into the concept which will allow ATCOs to focus on the core ATC tasks and enable greater integration of ATC within CDM processes designed to optimise schedule adherence for airlines and airports. Such an increase in automated support will require the role of monitoring to be incorporated to ensure the support systems work as intended, do not result in overload for the controllers and improve and safety and situational awareness.

Can this Remote TWR service be thought of within the general concept of Virtual Centre?

Elizabet Pavlova, Think Research: Yes, the concept of Virtual Centres defines the delivery of air traffic services (ATS) that is independent of the physical location (decoupling of services) and the Remote Tower was the first concept to really break geographical dependencies with an initial focus to replicate visual control away from the airport control tower. We, at Think, are excited by how the [principles of the Virtual Centre Concept](#) and in particular airline and airport access to the "Common Data Layer" will support improved decision-making processes to optimise airline and airport operations.

Have we researched possible reduction in ATC situation awareness when increasing automation? Overdependence on AI?

Rolf Zon, NLR: There is a great deal of research available on the impact of automation on SA. Both in ATC environments, and also in other domains. Important, as a rule of thumb, is that, since ATCOs are responsible, they need to be in the loop, at all times. Therefore automation needs to be designed in such a way that ATCOs can indeed acquire the information, or just receive the information, that they need, in time. The question that you ask is actually touching upon a lot of subjects, did I answer your question here? Otherwise, feel free to contact me.

In relation to what Elizabet has mentioned, about UTM, are there any cases already? Is that using Artificial Intelligence?

Elizabet Pavlova, Think Research: UTM-ATM integration is currently a research topic and opportunity for Remote and Digital towers. In [Part Two](#) of this CANSO webinar series, where the technology pioneers presented, SAAB, as an example, discussed that the integration of UTM and AI is something they are looking at for the future of the concept. Searidge, on the other hand, have been exploring the AI concept for several years. In a pioneering project with NATS at London Heathrow Airport in 2019, Searidge installed an AI technology platform called [AIMEE](#) which supports controllers during low visibility conditions and recovers traffic losses due to such adverse weather.

And while currently there are no operational UTM-ATM integration use cases targeted specifically at Remote and Digital Towers, all vendors identified AI as the "next big thing" for the concept, so it is likely to say that integrating UTM using AI is the way forward.

I did my end of degree project on the study of Remote Towers, and I would like to ask if it would be possible to access real simulations, as I found it difficult to find them?

Sarah McLarty, Think Research: Real time simulations are generally organised by ANSPs who are carrying out validation exercises. Therefore, it might be worth approaching an ANSP that you know is implementing Remote Towers and ask them if you can organise a visit or get more information on their set-up. Also, look out for webinars about Remote Towers as some companies give demos of Remote Tower systems which might be of help.

How valuable is real time simulation in the deployment of Digital Towers?

Sarah McLarty, Think Research: Real time simulation is one of many validation techniques that is extremely valuable in Remote Tower development. It can allow you to test a wide range of scenarios such as different traffic densities and patterns, weather, emergencies etc which can be sometimes hard to replicate with such ease compared to other validation techniques. It also is beneficial for focussing on iterative development in early stages of maturity (e.g. through prototyping) of technical enablers, CWP layouts, operating modes and operating procedures. It does however, have drawbacks; the biggest one being the fact it uses a synthetic visual presentation and not a live feed from the airport, limiting the suitability to assess Digital Tower visual sensor presentations. Therefore, it's likely that Real time simulations are necessary during the development and/or implementation of Remote Towers but it would have to be also supplemented by other validation techniques as well such as shadow mode trials and live trials.

The rTWR would be a very useful technology. When do you predict the comprehensive spread of this technology all around Europe?

Elizabet Pavlova, Think Research: The first-ever Remote Tower project began in 2010 and took 5 years from idea to implementation. Since then the industry has learned and experienced a lot more of the concept to be able to reduce that duration significantly. In the latest [ATC Network Remote and Digital Towers Special Bulletin](#), Think Research discusses how far the concept has evolved to date and what we might expect in the next decade based on the global overview of the concept from our Think Remote and Digital Towers Map Resource available [here](#).

Questions from Part Two: Technology and Enhancements

How many flights does the busiest Remote Tower manage (pre-COVID 19 scenarios)?

Elizabet Pavlova, Think Research: Currently, the busiest airport that benefits from a virtual facility is Heathrow Airport operated by NATS, where a contingency facility is available for the controllers to relocate and ensure operational continuity in case of an emergency. There are a number of other operational facilities around the world for airports with various traffic levels. Think Research have developed the first-of-its-kind Remote and Digital Towers map which summarises all engagement with the concept and provides an overview of different aspects such as traffic levels, vendors, operations, etc. that can be accessed from [here](#).

Are there currently any Remote Towers implemented in the Caribbean/Americas Region?

Elizabet Pavlova, Think Research: Yes, within the [CANSO Remote and Digital Towers Guidance Material](#) released December 2020, you can find a detailed case study provided by FAA which details their involvement with the concept. This case study was also presented during Part Three of the webinar series. Furthermore, there is an operational single-mode facility located in South America - Santa Cruz military base, Brazil that is operated by the Brazilian Air Force. Further details regarding all Remote and Digital Tower implementations can be found [here](#).

How to rank the suitability of potential camera locations?

Neil Bowles, Searidge: Potential camera locations can be assessed in a similar way as a conventional tower - physical site survey is useful, also possible to simulate views from locations and heights using software tools.

Peter Gridling, Frequentis: Frequentis uses a special simulation tool to find out the best camera location(s). As part of a site survey, the simulated sites are validated either by drone flights or by test panorama recordings with a crane.

Niclas Gustavsson, SAAB/Stig Jenssen, Kongsberg: Operational need for ATS, Airport layout, AOR (area of responsibility), infrastructure.

What is required for communications infrastructure/solutions between an airport and a Remote Tower?

Neil Bowles, Searidge: A dedicated fibre network with sufficient bandwidth and cybersecurity/ firewalls.

Peter Gridling, Frequentis: A redundant and reliable network is key for the success of a Remote Tower project. One of the key learnings in past RT projects was, that the quality understanding of Telco providers is not the same as in the ATC business. In practice e.g.

network brownouts are acceptable for Telcos, but of course not for ATCOs because the result is, that the video image is affected.

Therefore Frequentis has developed a special ATC grade network quality of service solution, which reduces the risk of brownouts significantly and handles network quality issues automatically so that the ATCO is not affected by network issues. The technicians also get a detailed report of the issue in real-time, so that they can fix the issue quicker and more effective than with traditional Telco tools.

Niclas Gustavsson, SAAB/Stig Jenssen, Kongsberg: Dual WAN for RTC System. Capacity is various depending on supplier and needs.

What technologies do you believe most improve the efficiency for the ANSP?

Neil Bowles, Searidge: The technology is an enabler for ANSPs to host more efficient operations. Other benefits are contingency and business resilience, improved safety and the reality that a Digital Tower is now a viable solution for replacing a tower approaching the end of serviceable life.

Peter Gridling, Frequentis: Clearly integration. The possibility of integration of different ATC systems on a data level and not only on HMI level makes ATC safer and more efficient at the same time. Also, ATCOs benefit from integration by getting an environment, in which ATCOs can work more convenient and in which the possibilities of mistakes is significantly reduced.

Niclas Gustavsson, SAAB/Stig Jenssen, Kongsberg: Support and interaction between systems. Support system for rostering and more. Efficiency is increased by centralisation and multiple endorsements.

Have you ever experienced a display panel fail or line of "dead dots" that affect viewing, and is that difficult to do fix or replacement? How about cameras/servers?

Neil Bowles, Searidge: The certification of any new ATM technology relies upon the regulatory authority being assured that hazards have been identified and mitigated. For the stated failure, both technological and procedural mitigations have been identified and implemented. Redundancy can also be built in to mitigate.

Peter Gridling, Frequentis: Like all other ATC systems the Frequentis system is fully redundant and has several redundancy features. At DFS the system design foresees that even with a failure (of a camera/server/monitor/etc.) the operations can be kept up without deduction of service/capacity for at least 48 hours. The reason for that is, that DFS has no technicians at the airport anymore. The technicians are based in five bases spread over Germany and if a failure occurs, then a technician is dispatched from the base and needs about two hours to reach the airport. On-site the equipment is optimised to be exchanged as quickly as possible.

Niclas Gustavsson, SAAB/Stig Jenssen, Kongsberg: Display panel fail during live traffic is mitigated with operational procedures. Dead dots affecting viewing has not today occurred with an impact on viewing.

How do you deal with the risk that an RTC handling many airports, may cause multiple airports to become unavailable at the same time, thus reducing the alternate airports that aircraft can use?

Peter Gridling, Frequentis: The Frequentis Multi-Remote Tower system includes several redundancy features. In case of a failure at the working position, another working position can take over all airports within a few seconds. If the entire centre would be affected, several ANSPs also thinking about a contingency centre to take over control from the contingency building.

Niclas Gustavsson, SAAB/Stig Jenssen, Kongsberg: As long as possible mitigated the risk related to WAN, power and staffing. A complete blackout is not a wanted situation and contingency solutions between RTC are needed solutions for the future. One way to reduce risks i.e. is to have multiple suppliers of WAN routed differently.

Regarding the DFS solution, is any separation support tool provided through the Digital Tower, e.g. "bubbles" around aircraft, distance measuring, etc.?

Peter Gridling, Frequentis: Based on the feedback of the ATCOs the superior image quality of the Frequentis system is sufficient to do a safe separation. So they did not ask for any specific additional support tools in the past. There are some support marks as static overlays to judge visibility range better e.g. a church tower in 10km distance is marked. If the controllers see the tower, they know that they have visibility of at least 10km. Also, they have some marks on the runway.

Who is the operator of the Multiple Remote Tower in Budapest and which airports are handled?

Peter Gridling, Frequentis: The Multi-Remote Tower setup in Budapest was operated by HungaroControl in a SESAR validation (SESAR Program PJ05). The system has been used for passive shadow mode operations to validate if the concept of Multi-Remote Tower is safe. The clear answer from the ATCOs of HungaroControl is: yes, if they are supported by additional tools, which are part of the Frequentis concept.

The three airports were:

- Budapest (one runway)
- Debrecen Airport
- Papa Airbase

Questions from Part Three: Case Studies and Key Learning Points

Would Remote and Digital Towers affect and reduce the number of ATCOs?

Holger van de Sand, DFS: Yes, this could be one of the benefits of an implementation.

Csaba Gergely, HungaroControl: Essentially, no. The digitalisation of the tower environment is fundamentally a change in the technical environment rather than the resourcing model i.e. the same service is provided by the same people. However, in some cases (i.e. the introduction of Digital Tower centres) where multiple Digital Tower modules are used to deliver service across multiple aerodromes, ATCO resource requirements may be reduced enabled by the technology in conjunction with the cross-endorsement resource model.

AnnMarie Taggio & Mitchell Bernstein, FAA: In our current use case, the answer is no.

Conor Mullan, Think Research: Whilst this might be an objective for some operators, it is not always the outcome. If cost is a driver, Digital Tower has the potential – if desired – to reduce staff numbers. In a Tower Centre, consolidated training and engineering bases can bring about reduced staff in those departments. Through the potential of needing less standby staff, ATCO numbers can be reduced. The real reduction in ATCO numbers could come about through multiple mode operations but the exact scale of that is not yet known. However, those cases only apply where cost reduction is a driver. In other areas, Digital Towers and the concepts they enable can create new jobs. Tower Centres may require Centre supervisors – a new role not found today. More integrated airport operations through co-location with APOC could create new highly-skilled roles also. Often with technology, it is not that the job numbers will reduce, it is that the job roles will change. Right now in these relatively early days, we do not know enough about multiple mode or about fully integrated digital operations to say for sure what the new jobs might be.

Is there an indication on maintenance activities to be carried out in case a Remote Tower implemented in a harsh environment?

Csaba Gergely, HungaroControl: All maintenance activities which affect ATCO work are coordinated with the ATCOs and can be started only with the permission of the duty supervisor. Maintenance activities can be indicated on the A-SMGCS ground situation display if needed.

Did you consider Human Factors on the user side (pilots, passengers, etc.)?

Holger van de Sand, DFS: Yes, on a generic level, as far as the service provided remains unchanged.

Csaba Gergely, HungaroControl: Pursuant to safety regulations and standards, Digital Tower operations shall have no negative impact on prescribed safety levels. Therefore, airspace users shall not experience any difference in the level of service or safety. Generally speaking, users are briefed as any general stakeholder during implementation to be aware of the planned changes. In some special cases, user requirements may be

considered in design/implementation where a material service change may be evident (e.g. military coordination).

In our experience, although being initially advised of the change, pilots did not notice any observable difference in the level of service or safety between the digital and conventional tower.

AnnMarie Taggio & Mitchell Bernstein, FAA: Yes, they were considered.

Where are we at with the development of competencies, training, and assessment of ATCOs (and technicians)?

Holger van de Sand, DFS: The requirements for these topics were an important part of the Safety Assessment and were evaluated with ATCO and ATSEP.

Csaba Gergely, HungaroControl: Fundamentally, the development of competencies, training, and the assessment of ATCOs and ATSEPs remains equivalent for a Digital Tower i.e. the same training framework and processes are applied. That being said, the introduction of new technology within the operating environment is a change and this change requires amendments to training curriculum, plans, assessments and operational procedures. For currently rated ATCOs or ATSEPs, this also requires a transition period to become familiar with the new operating environment. All of this forms part of a broader change program that is put in place according to the Concept of Operations and is delivered in concert with the technology implementation. Remote Tower video system is an ATM system, so the same rules apply as for other ATM systems. Both at the airport and in the Remote Tower centre the system is maintained and developed by ATSEP engineers trained based on the 2017/373 regulation.

How do you deal with weather info and provision to pilots where there is a significant difference in the weather of the RT/RTC location and the airport location?

Holger van de Sand, DFS: The weather information received from the certified weather provider will be provided to pilots as the ATCO would do it from a conventional tower.

Csaba Gergely, HungaroControl: In cases where Digital Tower modules are located at a great distance from the operating aerodrome, ambient meteorological conditions can be very different. Nonetheless, this is not a severe impediment to service provision. In the case of upper-airspace services / en-route services, ATCOs are generally managing aircraft at significant distances from their location. However, during both design and implementation of a Digital Tower, meteorological information requirements must be stated and satisfied to ensure ATIS facilities, as well as any other aviation meteorological forecasts or reports are provided to pilots.

Are Remote and Digital Towers able to detect UAS with the traditional surveillance equipment?

Holger van de Sand, DFS: It depends on some circumstances (e.g. size, equipage of the UAS).

Csaba Gergely, HungaroControl: Yes, although they may not be specifically designed for this purpose. In many cases, current video surveillance technology can provide more detailed information than the human eye, so may be more conducive to detect UAS. Commercially available systems also exist which are specifically designed to detect UAS.

Are there any rules for the responsibilities of remote controllers and is it just usable in class G airspace?

Holger van de Sand, DFS: The responsibility of the ATCO remains unchanged.

Csaba Gergely, HungaroControl: The rules and responsibilities of ATCOs are the same within a conventional tower as they are within a Digital Tower. No ATC service should be provided in Class G airspace. Remote AFIS could be a solution in such an environment, and the operator's rules/responsibilities would again be equivalent to an on-site AFIS operation.

Have you, as an ANSP, found many issues with the local CAA when implementing Remote and Digital Towers?

Holger van de Sand, DFS: It is an advantage to have the early involvement of the CAA right from starting the implementation project. This reduces the number of unforeseen issues.

Csaba Gergely, HungaroControl: No, we involved our CAA in our project right from the onset, providing them with continuous opportunities to access documents, assess risk or determine requirements. As a result, there were no unresolved issues at the project's completion.

With the automatic radar labels in the video wall, isn't there a risk to block important information in the visual view?

Csaba Gergely, HungaroControl: The labels appears only in the video wall images, not on the ACTO's individual displays. Therefore no blocking of information happens. Also on many systems labels transparency is adjustable to maintain ATCO's situational awareness all the time.

For HungaroControl - have you been measuring human factors and changing your operational concept inline?

Csaba Gergely, HungaroControl: Yes, there is an extensive human factors (HF) part in our program, and design of next system and operational concept is based not only on operational experience but ATCOs insights and requirements as well.
